Attachment 4

Air Quality/Greenhouse Gas Emissions Modeling Data

CalEEMod Inputs (Operation)

Name:	San Vicente Redwoods State Park
County/Air Basin:	Unincorporated Santa Cruz County
Climate Zone:	5
Land Use Setting:	Urban
Operational Year:	2025
Utility Company:	Pacific Gas and Electric

Total Project Site Acreage:	8,532	*acres*
Acreage to be Distrubed:	4.70	*acres*

	Size	
Park	8,532	*Acres*
Staging Area	*4.7*	*Acres*
Trails	38	*Miles*
Initial	*3.5*	*Miles*
Future	*34*	*Miles*
Parking	98	*Space*

CalEEMod Land Use Inputs

Land Use	Land Use Type	Land Use Subtype	Unit Amount	Size Metric	Lot Acreage	Square Feet
Staging Area	Recreation	City Park	3.82	acre	3.82	166,399
Parking	Parking	Parking Lot	98.00	Space	0.88	39,200
					4.70	**205,599**

Trip Generation

		Existing	Existing Plus Project		Cumulative			
Roadway Segment	**Type**	**Existing Conditions**	**Initial**	**Future**	**Without Project**	**With Project (Initial)**	**With Project (Future)**	**Net Increase (ADT)**
Empire Grade	Weekday ADT	550	566	610	605	621	665	60
	Weekend ADT	630	694	910	693	757	973	280
Felton Empire Road	Weekday ADT	2350	2358	2380	2585	2593	2615	30
	Weekend ADT	2,340	2372	2480	2574	2610	2714	140
							Total	**510**

	Total Trip Generation	CalEEMod Trip Generation Rate	
Weekday	90	**23.56**	*trips/acre*
Weekend	420	**109.95**	*trips/acre*

Mott MacDonald. San Vicente Redwoods Public Access Plan Draft Report. September 20, 2017.

Solid Waste

Park Solid Waste	0.33	**TPY**

**Based on CalEEMod Defaults*

Architectural Coating

Exterior Paint VOC content:	150

**Provided by the Applicant.*

Non-Residential Structures	Land Use Square Feet	CalEEMod Application Factor	Total Paintable Surface Area[2]	Paintable Interior Area[1]	Paintable Exterior Area[1]
Parking	39,200	0.06	2,352	0	2,352

Notes:

1 *CalEEMod methodology calculates the paintable interior and exterior areas by multiplying the total paintable surface area by 75 and 25 percent, respectively. Architectural coatings for the parking lot is based on CalEEMod methodology applied to a stadium (i.e., striping), in which 6% of surface area is painted.

2

** Applied CalEEMod Methodology in calculating total. The program assumes the total surface for painting equals 2.7 times the floor square footage for residential and 2 times that for nonresidential square footage defined by the user. The default values based on SCAQMD methods used in their coating rules are 75% for the interior surfaces and 25% for the exterior shell

Changes to the CalEEMod Defaults - Fleet Mix 2025

Trips 420

Default	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH	
FleetMix (Model Default)	0.586	0.026671	0.206176	0.113932	0.017728	0.004552	0.021301	0.012716	0.001229	0.002351	0.00543	0.000986	0.000914	100%
Trips	246	11	87	48	7	2	9	5	1	1	2	0	0	420
Percent	82%			11%	6%									100%
without buses/MH*	0.586012	0.026671	0.206176	0.113932	0.017728	0.004552	0.021301	0.012716	0	0	0.005430	0.0000000	0	99%
Percent	82%			11%	6%									99%
Adjusted without buses/MH	0.586012	0.026671	0.206176	0.113932	0.019454	0.004995	0.023374	0.013954	0.000000	0.000000	0.005959	0.000000	0.000000	
Percent check	82%			11%	6%									100%
Assumed Mix	97.0%			2.00%	1.00%									100%
adjusted with Assumed	0.689160	0.031366	0.242467	0.020000	0.003149	0.000809	0.003784	0.002259	0.000000	0.000000	0.007007	0.000000	0.000000	100%
Trips	289	13	102	8	1	0	2	1	0	0	3	0	0	420
Check	*407*			*8*	*4*									

Greenhouse Gas Emissions Summary - Operation

Proposed Project - 2025 GHG Emissions

MT/yr	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e	
Area Sources	0	2.53E-03	2.53E-03	1.00E-05	0	2.69E-03	0%
Total Energy Use	0	0	0	0.00E+00	0.00E+00	0	0%
Mobile Sources	0	113.05	113.05	4.73E-03	0	113.17	100%
Waste Generation	0.067	0	0.067	3.96E-03	0	0.166	0%
Water/Wastewater	0	0	0	0.00E+00	0.00E+00	0	0%
Total	0	113	113	0	0	**113**	100%

Criteria Air Pollutant Emissions Summary - Operations

Winter Emissions											
					Fugitive	Exhaust	PM10	Fugitive	Exhaust	PM2.5
lbs/day	ROG	NOx	CO	SO2	PM10	PM10	Total	PM2.5	PM2.5	Total
Area Sources	0.0279	9.00E-05	1.04E-02	0		4.00E-05	4.00E-05		4.00E-05	4.00E-05
Energy Use	0.00E+00	0	0	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Mobile Sources	0.5673	0.8726	6.7758	0.0157	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104
Total	0.60	0.87	6.79	0.02	1.87	0.01	1.89	0.50	0.01	0.51

Summer Emissions										
					Fugitive	Exhaust	PM10	Fugitive	Exhaust	PM2.5
lbs/day	ROG	NOx	CO	SO2	PM10	PM10	Total	PM2.5	PM2.5	Total
Area Sources	0.0279	9.00E-05	1.04E-02	0		4.00E-05	4.00E-05		4.00E-05	4.00E-05
Energy Use	0.00E+00	0	0	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Mobile Sources	6.21E-01	7.46E-01	6.3504	1.64E-02	1.87E+00	1.44E-02	1.89E+00	4.97E-01	1.33E-02	5.10E-01
Total	0.65	0.75	6.36	0.02	1.87	0.01	1.89	0.50	0.01	0.51

Max Daily										
					Fugitive	Exhaust	PM10	Fugitive	Exhaust	PM2.5
lbs/day	ROG	NOx	CO	SO2	PM10	PM10	Total	PM2.5	PM2.5	Total
Area Sources	0.0279	0.00009	0.0104	0	0	0.00004	0.00004	0	0.00004	0.00004
Energy Use	0	0	0	0	0	0	0	0	0	0
Mobile Sources	0.6209	0.8726	6.7758	0.0164	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104
Total	0.6488	0.8727	6.7862	0.0164	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104
MBUAPCD Threshold (lbs/day)	137	137	550	150	NA	NA	82	NA	NA	NA
Exceeds Threshold	No	No	No	No	NA	NA	No	NA	NA	NA

San Vicente Redwoods State Park - Santa Cruz County, Annual

San Vicente Redwoods State Park

Santa Cruz County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Parking Lot	98.00	Space	0.88	39,200.00	0
City Park	3.82	Acre	3.82	166,399.20	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	1.8	**Precipitation Freq (Days)**	61
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Vehicle Trips - See CalEEMod Assumptions

Water And Wastewater - See CalEEMod Assumptions File

Water Mitigation -

Fleet Mix - See CalEEMod Assumptions

Energy Use - No Lighting/Minimal emissions source

Table Name	Column Name	Default Value	New Value
tblEnergyUse	LightingElect	0.35	0.00
tblFleetMix	HHD	0.01	2.2590e-003
tblFleetMix	LDA	0.59	0.69
tblFleetMix	LDT1	0.03	0.03
tblFleetMix	LDT2	0.21	0.24
tblFleetMix	LHD1	0.02	3.1490e-003
tblFleetMix	LHD2	4.5520e-003	8.0900e-004
tblFleetMix	MCY	5.4300e-003	7.0070e-003
tblFleetMix	MDV	0.11	0.02
tblFleetMix	MH	9.1400e-004	0.00
tblFleetMix	MHD	0.02	3.7840e-003
tblFleetMix	OBUS	1.2290e-003	0.00
tblFleetMix	SBUS	9.8600e-004	0.00
tblFleetMix	UBUS	2.3510e-003	0.00
tblVehicleTrips	ST_TR	22.75	109.95
tblVehicleTrips	SU_TR	16.74	109.95
tblVehicleTrips	WD_TR	1.89	23.56
tblWater	OutdoorWaterUseRate	4,551,458.76	0.00

2.0 Emissions Summary

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	5.0400e-003	1.0000e-005	1.3000e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5300e-003	2.5300e-003	1.0000e-005	0.0000	2.6900e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0455	0.0655	0.5092	1.2500e-003	0.1442	1.1500e-003	0.1454	0.0384	1.0600e-003	0.0394	0.0000	113.0520	113.0520	4.7300e-003	0.0000	113.1701
Waste						0.0000	0.0000		0.0000	0.0000	0.0670	0.0000	0.0670	3.9600e-003	0.0000	0.1660
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0505**	**0.0655**	**0.5105**	**1.2500e-003**	**0.1442**	**1.1500e-003**	**0.1454**	**0.0384**	**1.0600e-003**	**0.0394**	**0.0670**	**113.0545**	**113.1215**	**8.7000e-003**	**0.0000**	**113.3388**

Mitigated Operational

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Area	5.0400e-003	1.0000e-005	1.3000e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5300e-003	2.5300e-003	1.0000e-005	0.0000	2.6900e-003
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0455	0.0655	0.5092	1.2500e-003	0.1442	1.1500e-003	0.1454	0.0384	1.0600e-003	0.0394	0.0000	113.0520	113.0520	4.7300e-003	0.0000	113.1701
Waste						0.0000	0.0000		0.0000	0.0000	0.0670	0.0000	0.0670	3.9600e-003	0.0000	0.1660
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0505**	**0.0655**	**0.5105**	**1.2500e-003**	**0.1442**	**1.1500e-003**	**0.1454**	**0.0384**	**1.0600e-003**	**0.0394**	**0.0670**	**113.0545**	**113.1215**	**8.7000e-003**	**0.0000**	**113.3388**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0455	0.0655	0.5092	1.2500e-003	0.1442	1.1500e-003	0.1454	0.0384	1.0600e-003	0.0394	0.0000	113.0520	113.0520	4.7300e-003	0.0000	113.1701
Unmitigated	0.0455	0.0655	0.5092	1.2500e-003	0.1442	1.1500e-003	0.1454	0.0384	1.0600e-003	0.0394	0.0000	113.0520	113.0520	4.7300e-003	0.0000	113.1701

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	90.00	420.01	420.01	393,427	393,427
Parking Lot	0.00	0.00	0.00		
Total	90.00	420.01	420.01	393,427	393,427

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.689160	0.031366	0.242467	0.020000	0.003149	0.000809	0.003784	0.002259	0.000000	0.000000	0.007007	0.000000	0.000000
Parking Lot	0.586012	0.026671	0.206176	0.113932	0.017728	0.004552	0.021301	0.012716	0.001229	0.002351	0.005430	0.000986	0.000914

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Mitigated	5.0400e-003	1.0000e-005	1.3000e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5300e-003	2.5300e-003	1.0000e-005	0.0000	2.6900e-003
Unmitigated	5.0400e-003	1.0000e-005	1.3000e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5300e-003	2.5300e-003	1.0000e-005	0.0000	2.6900e-003

6.2 Area by SubCategory

<u>Unmitigated</u>

SubCategory	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Architectural Coating	8.2000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.1000e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.2000e-004	1.0000e-005	1.3000e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5300e-003	2.5300e-003	1.0000e-005	0.0000	2.6900e-003
Total	**5.0400e-003**	**1.0000e-005**	**1.3000e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5300e-003**	**2.5300e-003**	**1.0000e-005**	**0.0000**	**2.6900e-003**

Mitigated

SubCategory	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	tons/yr										MT/yr					
Architectural Coating	8.2000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	4.1000e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.2000e-004	1.0000e-005	1.3000e-003	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	2.5300e-003	2.5300e-003	1.0000e-005	0.0000	2.6900e-003
Total	**5.0400e-003**	**1.0000e-005**	**1.3000e-003**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**2.5300e-003**	**2.5300e-003**	**1.0000e-005**	**0.0000**	**2.6900e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

Category	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 0	0.0000	0.0000	0.0000	0.0000
Parking Lot	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0670	3.9600e-003	0.0000	0.1660
Unmitigated	0.0670	3.9600e-003	0.0000	0.1660

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0.33	0.0670	3.9600e-003	0.0000	0.1660
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0670**	**3.9600e-003**	**0.0000**	**0.1660**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0.33	0.0670	3.9600e-003	0.0000	0.1660
Parking Lot	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0670**	**3.9600e-003**	**0.0000**	**0.1660**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

San Vicente Redwoods State Park

Santa Cruz County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Parking Lot	98.00	Space	0.88	39,200.00	0
City Park	3.82	Acre	3.82	166,399.20	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	1.8	**Precipitation Freq (Days)**	61
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Vehicle Trips - See CalEEMod Assumptions

Water And Wastewater - See CalEEMod Assumptions File

Water Mitigation -

Fleet Mix - See CalEEMod Assumptions

Energy Use - No Lighting/Minimal emissions source

Table Name	Column Name	Default Value	New Value
tblEnergyUse	LightingElect	0.35	0.00
tblFleetMix	HHD	0.01	2.2590e-003
tblFleetMix	LDA	0.59	0.69
tblFleetMix	LDT1	0.03	0.03
tblFleetMix	LDT2	0.21	0.24
tblFleetMix	LHD1	0.02	3.1490e-003
tblFleetMix	LHD2	4.5520e-003	8.0900e-004
tblFleetMix	MCY	5.4300e-003	7.0070e-003
tblFleetMix	MDV	0.11	0.02
tblFleetMix	MH	9.1400e-004	0.00
tblFleetMix	MHD	0.02	3.7840e-003
tblFleetMix	OBUS	1.2290e-003	0.00
tblFleetMix	SBUS	9.8600e-004	0.00
tblFleetMix	UBUS	2.3510e-003	0.00
tblVehicleTrips	ST_TR	22.75	109.95
tblVehicleTrips	SU_TR	16.74	109.95
tblVehicleTrips	WD_TR	1.89	23.56
tblWater	OutdoorWaterUseRate	4,551,458.76	0.00

2.0 Emissions Summary

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0279	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.6209	0.7464	6.3504	0.0164	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104		1,634.2178	1,634.2178	0.0655		1,635.8545
Total	**0.6488**	**0.7465**	**6.3607**	**0.0164**	**1.8739**	**0.0144**	**1.8883**	**0.4971**	**0.0133**	**0.5104**		**1,634.2401**	**1,634.2401**	**0.0655**	**0.0000**	**1,635.8782**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0279	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.6209	0.7464	6.3504	0.0164	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104		1,634.2178	1,634.2178	0.0655		1,635.8545
Total	**0.6488**	**0.7465**	**6.3607**	**0.0164**	**1.8739**	**0.0144**	**1.8883**	**0.4971**	**0.0133**	**0.5104**		**1,634.2401**	**1,634.2401**	**0.0655**	**0.0000**	**1,635.8782**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.6209	0.7464	6.3504	0.0164	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104		1,634.2178	1,634.2178	0.0655		1,635.8545
Unmitigated	0.6209	0.7464	6.3504	0.0164	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104		1,634.2178	1,634.2178	0.0655		1,635.8545

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	90.00	420.01	420.01	393,427	393,427
Parking Lot	0.00	0.00	0.00		
Total	90.00	420.01	420.01	393,427	393,427

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.689160	0.031366	0.242467	0.020000	0.003149	0.000809	0.003784	0.002259	0.000000	0.000000	0.007007	0.000000	0.000000
Parking Lot	0.586012	0.026671	0.206176	0.113932	0.017728	0.004552	0.021301	0.012716	0.001229	0.002351	0.005430	0.000986	0.000914

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0279	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Unmitigated	0.0279	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.4800e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0225					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	9.5000e-004	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Total	**0.0279**	**9.0000e-005**	**0.0104**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**		**0.0223**	**0.0223**	**6.0000e-005**		**0.0237**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.4800e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0225					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	9.5000e-004	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Total	**0.0279**	**9.0000e-005**	**0.0104**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**		**0.0223**	**0.0223**	**6.0000e-005**		**0.0237**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

San Vicente Redwoods State Park

Santa Cruz County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Parking Lot	98.00	Space	0.88	39,200.00	0
City Park	3.82	Acre	3.82	166,399.20	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	1.8	**Precipitation Freq (Days)**	61
Climate Zone	5			**Operational Year**	2025
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Vehicle Trips - See CalEEMod Assumptions

Water And Wastewater - See CalEEMod Assumptions File

Water Mitigation -

Fleet Mix - See CalEEMod Assumptions

Energy Use - No Lighting/Minimal emissions source

Table Name	Column Name	Default Value	New Value
tblEnergyUse	LightingElect	0.35	0.00
tblFleetMix	HHD	0.01	2.2590e-003
tblFleetMix	LDA	0.59	0.69
tblFleetMix	LDT1	0.03	0.03
tblFleetMix	LDT2	0.21	0.24
tblFleetMix	LHD1	0.02	3.1490e-003
tblFleetMix	LHD2	4.5520e-003	8.0900e-004
tblFleetMix	MCY	5.4300e-003	7.0070e-003
tblFleetMix	MDV	0.11	0.02
tblFleetMix	MH	9.1400e-004	0.00
tblFleetMix	MHD	0.02	3.7840e-003
tblFleetMix	OBUS	1.2290e-003	0.00
tblFleetMix	SBUS	9.8600e-004	0.00
tblFleetMix	UBUS	2.3510e-003	0.00
tblVehicleTrips	ST_TR	22.75	109.95
tblVehicleTrips	SU_TR	16.74	109.95
tblVehicleTrips	WD_TR	1.89	23.56
tblWater	OutdoorWaterUseRate	4,551,458.76	0.00

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0279	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.5673	0.8726	6.7758	0.0157	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104		1,560.4812	1,560.4812	0.0669		1,562.1533
Total	**0.5952**	**0.8727**	**6.7862**	**0.0157**	**1.8739**	**0.0144**	**1.8883**	**0.4971**	**0.0133**	**0.5104**		**1,560.5035**	**1,560.5035**	**0.0669**	**0.0000**	**1,562.1770**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0279	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.5673	0.8726	6.7758	0.0157	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104		1,560.4812	1,560.4812	0.0669		1,562.1533
Total	**0.5952**	**0.8727**	**6.7862**	**0.0157**	**1.8739**	**0.0144**	**1.8883**	**0.4971**	**0.0133**	**0.5104**		**1,560.5035**	**1,560.5035**	**0.0669**	**0.0000**	**1,562.1770**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.5673	0.8726	6.7758	0.0157	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104		1,560.4812	1,560.4812	0.0669		1,562.1533
Unmitigated	0.5673	0.8726	6.7758	0.0157	1.8739	0.0144	1.8883	0.4971	0.0133	0.5104		1,560.4812	1,560.4812	0.0669		1,562.1533

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	90.00	420.01	420.01	393,427	393,427
Parking Lot	0.00	0.00	0.00		
Total	90.00	420.01	420.01	393,427	393,427

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	9.50	7.30	7.30	33.00	48.00	19.00	66	28	6
Parking Lot	9.50	7.30	7.30	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.689160	0.031366	0.242467	0.020000	0.003149	0.000809	0.003784	0.002259	0.000000	0.000000	0.007007	0.000000	0.000000
Parking Lot	0.586012	0.026671	0.206176	0.113932	0.017728	0.004552	0.021301	0.012716	0.001229	0.002351	0.005430	0.000986	0.000914

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Parking Lot	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Mitigated	0.0279	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Unmitigated	0.0279	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237

6.2 Area by SubCategory

Unmitigated

SubCategory	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Architectural Coating	4.4800e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0225					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	9.5000e-004	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Total	**0.0279**	**9.0000e-005**	**0.0104**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**		**0.0223**	**0.0223**	**6.0000e-005**		**0.0237**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.4800e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0225					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	9.5000e-004	9.0000e-005	0.0104	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005		0.0223	0.0223	6.0000e-005		0.0237
Total	**0.0279**	**9.0000e-005**	**0.0104**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**		**0.0223**	**0.0223**	**6.0000e-005**		**0.0237**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Attachment 5

Biological Resources Assessment

COUNTY OF SANTA CRUZ

PLANNING DEPARTMENT

701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060
(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123
KATHLEEN MOLLOY, PLANNING DIRECTOR

July 16, 2018

Bryan Largay
Land Trust of Santa Cruz County
617 Water Street
Santa Cruz, CA 95060

Subject: San Vicente Woods Biological Report, Application REV181099

Dear Mr. Largay:

The review of the Biological Resource Assessment, prepared by WRA, Inc., dated June 2018, has been completed. The subject report evaluates the potential impacts to known biological resources resulting from the development of a parking area and recreational trails in the Santa Cruz mountains along the north coast of unincorporated Santa Cruz County.

After a thorough review of the reports submitted and the resources on site, the County accepts the report and finds the proposed recommendations adequate to ensure no significant impacts to biological resources occur as a result of this project, with the exception of modifications to two recommendations.

Biology Minimization Measure 3C recommends that when a special status plant species cannot be avoided, the approved biologist shall develop appropriate mitigation measures based upon the species present, and references minimization approaches recommended by the CNPS. The initial study will be revised to require that if a species cannot be avoided, the impact shall be mitigated through some combination of propagation from local seed and habitat enhancement.

Construction Protocol BR 3.9 allows for the deconstruction of woodrats nests. The mitigation in the initial study shall be revised to include the following measures, based on the recommendations of the report and personal communication with Suzanne Deleon, Biologist for the California Department of Fish and Wildlife (CDFw) (April 29, 2009) in the event that a nest must be relocated:

1. Prior to nest disturbance, the biologist shall obtain from CDFW a scientific collection permit for the trapping of the dusky-footed wood rats.
2. Nests shall be disturbed/dismantled only during the non-breeding season, between October 1 and December 31.
3. At least two weeks prior to construction, the qualified biologist shall survey the project disturbance area to confirm the wood rat nest location and locate any other nests that may have been built in the project vicinity that may be affected by the proposed development.

4. Prior to nest disturbance, wood rats shall be trapped at dusk of the night set for relocation of the nest(s).
5. Any existing nest that may be disturbed by construction activities shall be mostly dismantled and the material spread in the vicinity of identified nest relocation site(s).
6. In order to avoid the potential health effects associated with handling rodents and their milieu, all workers involved in the handling of the wood rats or the nest materials should wear protective gear to prevent inhalation of contaminant particulates, contact with conjunctiva (eyes), and protection against flea bites; a respirator, eye protection and skin protection should all be used.
7. Dismantling shall be done by hand, allowing any animals not trapped to escape either along existing woodrat trails or toward other available habitat.
8. If a litter of young is found or suspected, nest material shall be replaced, and the nest left alone for 2-3 weeks before a recheck to verify that young are capable of independent survival before proceeding with nest dismantling.
9. Woody debris shall be collected from the area and relocated nests shall be partially constructed in an area determined by the qualified biologist to be both suitable for the wood rats and far enough away from the construction activities that they will not be impacted.
10. Rats that were collected at dusk shall be released hours before dawn near the newly constructed nests to allow time for rats to find refuge.
11. Once construction is complete, the biologist shall survey the nest area to note whether the new nests are in use, the wood rats have built new nests, or the nest area has been completely abandoned. This information shall be reported in a letter report to the Environmental Planning Section of the Planning Department, and the local CDFW biologist.

If you have any questions regarding this letter, please call me at 831-454-3201.

Sincerely,

Matt Johnston

Matthew Johnston
Principal Planner

Biological Resources Assessment
Draft San Vicente Redwoods Public Access Plan

SANTA CRUZ COUNTY, CALIFORNIA

Prepared For:

Land Trust of Santa Cruz County
617 Water Street
Santa Cruz, California 95060

Contact: Bryan Largay
bryan.largay@landtrustsantacruz.org

Prepared By:

WRA, Inc.
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Contact: Matt Richmond
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Date: June, 2018

WRA Project No.: 22287

ENVIRONMENTAL CONSULTANTS

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LIST OF ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
CCA	California Coastal Act
CCR	California Code of Regulations
CDFG	California Department of Fish and Game (currently the CDFW)
CDFW	California Department of Fish and Wildlife (formerly the CDFG)
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
CRLF	California Red-Legged Frog
CSRL	California Soil Resource Lab
DBH	Diameter at Breast Height
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ESA	Federal Endangered Species Act
ESU	Ecologically Significant Unit
Inventory	CNPS Inventory of Rare and Endangered Plants
LCP	Local Coastal Program
MBTA	Migratory Bird Treaty Act
NMFS	National Marine Fisheries Service
OWHM	Ordinary High Water Mark
PCE	Primary Constituent Element
PFMC	Pacific Fisheries Management Council
Rank	California Rare Plant Rank
RWQCB	Regional Water Quality Control Board
USFWS	U.S. Fish and Wildlife Service
WBWG	Western Bat Working Group
WRA	WRA, Inc.

EXECUTIVE SUMMARY

This report provides an analysis of natural community and special-status species issues for the proposed trail alignment associated with the Draft San Vicente Redwoods Public Access Plan (Draft Public Access Plan; PlaceWorks 2018) located in unincorporated Santa Cruz County, California. In December 2015, January, February, June, August, and October 2016, and May, June, and August 2017 WRA, Inc. (WRA) conducted a biological resources assessment within the Project Area for the proposed trail network. WRA observed 13 biological communities, 242 plant taxa and 18 wildlife taxa. Eleven sensitive biological communities were identified, including three sensitive aquatic communities. One special-status plant species and three special-status wildlife were determined to be present based on direct observations made by WRA or documented historical occurrences from the site. An additional 18 special-status plant species known from the region were originally determined to have potential to occur within the trail alignment. However, these plants were not observed within the trail alignment during seasonally timed rare plant surveys in 2016 and 2017, and it was subsequently determined that these species have low potential to occur within the proposed trail alignment, although they may have potential occur elsewhere on the property. An additional 13 special-status wildlife species known from the region were determined to have a moderate to high potential to occur within the proposed trail alignment or the immediate vicinity based on the presence of suitable habitat conditions and the proximity of known occurrences within the vicinity of the Project Area.

Although the proposed Project covers a large amount of land, the proposed Project itself is relatively minimal in nature. As a result of the intensive conservation and planning analyses conducted by the Project team, the proposed trail alignment and staging area have been designed to minimize impacts on the land and the sensitive resources found there. The proposed trail design has incorporated the best available design practices for trail construction and maintenance, reducing the potential for long-term adverse impacts related to erosion, sedimentation, and other issues that can arise from poor trail design. The trail network was designed to occupy only a small fraction of the land within the larger San Vicente Redwoods property, thereby providing ample untouched lands for plant and wildlife conservation. Moreover, the minimal nature of the proposed trail network and the activities that will be allowed there are by their very nature compatible with wildland conservation. With the implementation of the avoidance and minimization measures built into the project, WRA believes that all potential adverse impacts associated with the proposed Project can be reduced to a less-than-significant level.

1.0 INTRODUCTION

On multiple dates in December 2015, January, February, June, August, and October 2016, and May, June, and August 2017, WRA, Inc. (WRA) performed an assessment of biological resources for a proposed trail network within the approximately 8,532-acre San Vicente Redwoods property. The trail network is described in the Draft San Vicente Redwoods Public Access Plan (PlaceWorks 2018). The site is composed of two properties located in unincorporated Santa Cruz County, California (Figure 1). For the purpose of this report, the “main parcel” refers to the approximately 8,159-acre property located off of Empire Grade Road, and the “Laguna parcel” refers to the approximately 373-acre property located adjacent to the Bonny Doon Ecological Reserve. The “Project Area” refers to the alignment for the proposed trail network on both properties and an associated parking and staging area on the main parcel, adjacent to Empire Grade Road. The Project Area includes an approximately 50-foot buffer on either side of the trail alignment and around the parking and staging area (Figure 2).

The purpose of the assessment was to gather information necessary to complete a review of biological resources under the California Environmental Quality Act (CEQA) for the proposed trail network. This report describes the results of the site visit, which assessed the Project Area for the (1) potential to support special-status species and (2) presence of other sensitive biological resources protected by local, state, and federal laws and regulations. Special-status species observed during the site visit were documented and are discussed herein. Specific findings on the habitat suitability or presence of special-status species or sensitive habitats may require that protocol-level surveys be conducted. This report also contains an evaluation of potential impacts to special-status species and sensitive biological communities that may occur as a result of the proposed Project, including potential mitigation measures to compensate for any such impacts.

A biological resources assessment provides general information on the potential presence of sensitive species and habitats. The biological resources assessment is not an official protocol-level survey for listed species which may be required for Project approval by local, state, or federal agencies. This assessment is based on information available at the time of the study and on site conditions that were observed on the dates of the site visits.

Note to the Reader: All Figures referenced in the text are included in Appendix A.

2.0 REGULATORY BACKGROUND

The following sections explain the regulatory context of the biological assessment, including applicable laws and regulations that were applied to the field investigations and analysis of potential Project impacts.

2.1 Sensitive Biological Communities

Sensitive biological communities include habitats that fulfill special functions or have special values, such as wetlands, streams, riparian habitat, and sensitive terrestrial communities. These habitats are protected under federal regulations such as the Clean Water Act; state regulations such as the Porter-Cologne Act, the California Department of Fish and Wildlife (CDFW; formerly the California Department of Fish and Game [CDFG]) Streambed Alteration Program, and the CEQA; and/or local ordinances or policies such as Special Habitat Management Areas or General Plan Elements. Where these communities occur within the Coastal Zone, they may also be regulated under the California Coastal Act (CCA), as administered by the Santa Cruz County Local Coastal Program (LCP).

2.1.1 Clean Water Act Section 404

The U.S. Army Corps of Engineers (Corps) regulates “Waters of the United States” under Section 404 of the Clean Water Act. Waters of the U.S. are defined in the Code of Federal Regulations (CFR) as waters susceptible to use in commerce, including interstate waters and wetlands, all other waters (intrastate waterbodies, including wetlands), and their tributaries (33 CFR 328.3). Potential wetland areas, according to the three criteria used to delineate wetlands as defined in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987), are identified by the presence of (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. Areas that are inundated at a sufficient depth and for a sufficient duration to exclude growth of hydrophytic vegetation are subject to Section 404 jurisdiction as “other waters” and are often characterized by an ordinary high water mark (OHWM). Other waters, for example, generally include lakes, rivers, and streams. The placement of fill material into Waters of the U.S generally requires an individual or nationwide permit from the Corps under Section 404 of the Clean Water Act. The Project Area is within the jurisdiction of the Corps’ San Francisco District.

2.1.2 Clean Water Act Section 401 and Porter-Cologne Water Quality Control Act

The term “Waters of the State” is defined by the Porter-Cologne Act as “any surface water or groundwater, including saline waters, within the boundaries of the state.” The Regional Water Quality Control Board (RWQCB) protects all waters in its regulatory scope and has special responsibility for wetlands, riparian areas, and headwaters. These waterbodies have high resource value, are vulnerable to filling, and are not systematically protected by other programs. RWQCB jurisdiction includes “isolated” wetlands and waters that may not be regulated by the Corps under Section 404. Waters of the State are regulated by the RWQCB under the State Water Quality Certification Program which regulates discharges of fill and dredged material under Section 401 of the Clean Water Act and the Porter-Cologne Water Quality Control Act. Projects that require a Corps permit, or fall under other federal jurisdiction, and have the potential to impact Waters of the State, are required to comply with the terms of the Water Quality Certification determination. If a proposed project does not require a federal permit, but does involve dredge or fill activities that may result in a discharge to Waters of the State, the RWQCB has the option to regulate the dredge and fill activities under its state authority in the form of Waste Discharge Requirements. The Project Area is within the jurisdiction of the Central Coast RWQCB.

2.1.3 California Fish and Game Code Section 1600

Streams and lakes, as habitat for fish and wildlife species, are subject to jurisdiction by the CDFW under Sections 1600-1616 of California Fish and Game Code (CFGC). Alterations to or work within or adjacent to streambeds or lakes generally require a 1602 Lake and Streambed Alteration Agreement. The term “stream”, which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as “a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life [including] watercourses having a surface or subsurface flow that supports or has supported riparian vegetation” (14 CCR 1.72). In addition, the term “stream” can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife (CDFG 1994). “Riparian” is defined as “on, or pertaining to, the banks of a stream.” Riparian vegetation is defined as “vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself” (CDFG 1994). Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from the CDFW. The Project Area is within the jurisdiction of the CDFW’s Bay Delta Region.

2.1.4 Essential Fish Habitat

Essential Fish Habitat (EFH) is regulated through the National Marine Fisheries Service (NMFS), a division of the National Oceanic and Atmospheric Administration. Protection of EFH is mandated through changes implemented in 1996 to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to protect the loss of habitat necessary to maintain sustainable fisheries in the United States. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" [16 USC 1802(10)]. The NMFS further defines Pacific coast salmon fishery essential fish habitat as “waters and substrate necessary for salmon production needed to support a long-term sustainable salmon fishery and salmon contributions to a healthy ecosystem” (Pacific Fisheries Management Council [PFMC] 1999). California salmonid species covered by this Fisheries Management Plan include Chinook salmon (*Oncorhynchus tshawytscha*) and Coho salmon (*O. kisutch*), and the EFH “must include all streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon” in California (PFMC 1999). Under regulatory guidelines issued by the NMFS, any federal agency that authorizes, funds, or undertakes action that may affect EFH is required to consult with the NMFS (50 CFR 600.920).

The Project Area is located outside of viable areas to Chinook salmon and Coho salmon (as described in more detail in Section 4.2.2) and Project activities will be minimized to prevent downstream impacts to EFH (as described in Section 6.1.2). Therefore, while EFH was evaluated for the regulatory context of this Project; no further discussion of EFH is warranted.

2.1.5 CDFW Sensitive Terrestrial Communities

Sensitive terrestrial biological communities include terrestrial habitats that fulfill special functions or have special values. The CDFW ranks sensitive communities as "threatened" or "very threatened" and keeps records of their occurrences in its California Natural Diversity Database (CNDDB; CDFW 2016a). Sensitive plant communities are also identified by CDFW (CNPS 2016a, CDFW 2016b). CNDDB vegetation alliances are ranked 1 through 5 based on NatureServe's (2010) methodology, with those alliances ranked globally (G; referred to herein as the “Global Rank”) or statewide (S; referred to herein as the “State Rank”) as 1 through 3 considered sensitive. Impacts to sensitive natural communities identified by the CDFW must be considered and evaluated under the CEQA (CCR Title 14, Div. 6, Chap. 3, Appendix G). Specific habitats may also be identified as sensitive in city or county general plans or ordinances (see sections 2.1.6 and 2.1.7).

2.1.6 Sensitive Communities Identified by Santa Cruz County Code

Chapter 16 of the Santa Cruz County Code pertains to the protection of natural resources, and includes sections relating to topics such as grading regulations, erosion control, and water quality control, among others. The sections of Chapter 16 which are relevant to the Project are summarized as follows:

<u>Riparian Corridor and Wetlands Protection</u>

County approval is required for projects that may result in impacts to “riparian corridors.” In Chapter 16.30, a riparian corridor is defined as:

(1) Lands within a stream channel, including the stream and the area between the mean rainy season (bankfull) flowlines;

(2) Lands extending 50 feet (measured horizontally) out from each side of a perennial stream. Distance shall be measured from the mean rainy season (bankfull) flowline;

(3) Lands extending 30 feet (measured horizontally) out from each side of an intermittent stream. Distance shall be measured from the mean rainy season (bankfull) flowline;

(4) Lands extending 100 feet (measured horizontally) from the high water mark of a lake, wetland, estuary, lagoon or natural body of standing water;

(5) Lands within an arroyo located within the urban services line, or the rural services line;

(6) Lands containing a riparian woodland.

<u>Sensitive Habitat Protection</u>

County approval is required for projects that may result in impacts to "sensitive habitat." Chapter 16.32 includes the following definition of a "sensitive habitat":

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

(2) Areas which provide habitat for locally unique biotic species/communities including but not limited to: oak woodlands, coastal scrub, maritime chaparral, native rhododendrons and associated Elkgrass, indigenous Ponderosa Pine, indigenous Monterey Pine, mapped grassland in the Coastal Zone and sand parkland; and special forests including San Andreas Oak Woodlands, indigenous Ponderosa Pine, indigenous Monterey Pine and ancient forests.

(3) Areas adjacent to essential habitats of rare, endangered or threatened species as defined in subsections (5) and (6) of this definition.

(4) Areas which provide habitat for species of special concern as listed by the California Department of Fish and Game in the special animals list, natural diversity database.

(5) Areas which provide habitat for rare or endangered species which meet the definition of Section 15380 of the California Environmental Quality Act guidelines.

(6) Areas which provide habitat for rare, endangered or threatened species as designated by the State Fish and Game Commission, United States Fish and Wildlife Service or California Native Plant Society.

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

(8) Dune plant habitats.

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

(10) Riparian corridors.

County code allows for limited uses within these sensitive habitats, including nature study and research and hunting, fishing, and equestrian trails that have no adverse impact on the species or habitat. Although no hunting or fishing will be allowed on the site, the proposed use of the site for pedestrian, bicycle, and equestrian trails is in line with the spirit of the County code.

Development within any sensitive habitat area is subject to the following conditions:

- *All development shall mitigate significant environmental impacts, as determined by the Environmental Coordinator.*

- *Dedication of an open space or conservation easement or an equivalent measure shall be required as necessary to protect the portion of a sensitive habitat which is undisturbed by the proposed development activity or to protect a sensitive habitat on an adjacent parcel.*

- *Restoration of any area which is a degraded sensitive habitat or has caused or is causing the degradation of a sensitive habitat shall be required; provided, that any restoration required shall be commensurate with the scale of the proposed development.*

2.1.7 Environmentally Sensitive Habitats Identified by the Santa Cruz County Local Coastal Program

The County of Santa Cruz Local Coastal Program (LCP; County of Santa Cruz 1994) defines Environmentally Sensitive Habitats protected under the California Coastal Act in the unincorporated portions of Santa Cruz County. In addition to areas shown on County General Plan and LCP Resources and Constraints Maps, the LCP considers all of the habitats listed above in Section 2.1.6 as Environmentally Sensitive Habitats for purposes of the California Coastal Act. The LCP also identifies a number of specific special-status plant and wildlife species, the habitat for which constitutes Environmentally Sensitive Habitat.

The LCP regulates development and other activities within and adjacent to Environmentally Sensitive Habitats and defines required buffers or setbacks from such habitats. The LCP defines allowed uses within Environmentally Sensitive Habitats and their buffers and specifically identifies "non-motorized recreation and pedestrian trails" as an allowed use compatible with riparian habitat. Because the Santa Cruz County LCP is contained within their General Plan, many of the LCP protections over Environmentally Sensitive Habitats within the Coastal Zone are aligned with the County Code regarding sensitive biological resources and implementation of the LCP is through the Riparian Corridor and Wetlands Protection Ordinance (16.30) and the Sensitive Habitat Ordinance (16.32) (see Section 2.1.6).

2.2 Special-Status Species

2.2.1 Special-Status Plants and Wildlife

Special-status species include those plants and wildlife species that have been formally listed, are proposed as endangered or threatened, or are candidates for such listing under the Federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA). These acts afford protection to both listed species and those that are formal candidates for listing. In addition, CDFW Species of Special Concern, CDFW California Fully Protected species, USFWS Birds of Conservation Concern, and CDFW Special-Status Invertebrates are all considered special-status species. Although these aforementioned species generally have no special legal status, they are given special consideration under the CEQA. Bat species are also evaluated for conservation status by the Western Bat Working Group (WBWG), a non-governmental entity. Bats listed as a “High Priority” or “Medium Priority” species for conservation by the WBWG are typically considered special-status and are considered under the CEQA. In addition to regulations for special-status species, most birds in the United States, including non-special-status native species, are protected by the Migratory Bird Treaty Act of 1918 (MBTA) and the CFGC, i.e., sections 3503, 3503.5 and 3513. Under these laws, destroying active bird nests, eggs, and/or young is illegal.

Plant species on the California Native Plant Society (CNPS) Rare and Endangered Plant Inventory (Inventory) with California Rare Plant Ranks (Rank; formerly known as CNPS “Lists”) of 1 and 2 are also considered special-status plant species and must be considered under the CEQA. Rank 3 and Rank 4 species are afforded little or no protection under the CEQA, but are included in this analysis for completeness.

Table 1. Description of California Rare Plant Ranks and Threat Codes

California Rare Plant Ranks	
Rank 1A	Presumed extirpated in California and either rare or extinct elsewhere
Rank 1B	Rare, threatened, or endangered in California and elsewhere
Rank 2A	Presumed extirpated in California, but more common elsewhere
Rank 2B	Rare, threatened, or endangered in California, but more common elsewhere
Rank 3	Plants about which more information is needed - A review list
Rank 4	Plants of limited distribution - A watch list
Threat Ranks	
0.1	Seriously threatened in California
0.2	Moderately threatened in California
0.3	Not very threatened in California

2.2.2 Critical Habitat

Critical habitat is a term defined in the ESA as a specific geographic area that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. The ESA requires federal agencies to consult with the USFWS to conserve listed species on their lands and to ensure that any activities or projects they fund, authorize, or carry out will not jeopardize the survival of a threatened or endangered species. In consultation for those species with critical habitat, federal agencies must also ensure that their activities or projects do not adversely modify critical habitat to the point that it will no longer aid in the species’ recovery. In many cases, this level of protection is similar to that already provided to species by the ESA jeopardy standard. However, areas that are currently unoccupied by the species but which are needed for the species’ recovery are protected by the prohibition against adverse modification of critical habitat.

2.3 Protected Trees

Chapter 16 of the Santa Cruz County Municipal Code outlines polices for the protection of significant trees within the unincorporated portions of the County. County approval is required for projects that may result in impacts to “significant trees.” Per Chapter 16.34, a permit is needed for trees within the Coastal Zone that meet Definitions 1 or 2, below. A permit is also needed for trees within Sensitive Habitat (Definition 3).

1. *Within the Urban Services Line or Rural Services Line, any tree which is equal to or greater than 20 inches d.b.h. (approximately 5 feet in circumference); any sprout clump of five or more stems each of which is greater than 12 inches d.b.h. (approximately 3 feet in circumference); or any group consisting of five of more trees on one parcel, each of which is greater than 12 inches d.b.h. (approximately 3 feet in circumference).*

2. *Outside the Urban Services Line or Rural Services line, where visible from a scenic road, any beach, or within a designated scenic resource area, any tree which is equal to or greater than 40 inches d.b.h. (approximately 10 feet in circumference); any sprout clump of five or more stems, each of which is greater than 20 inches d.b.h. (approximately 5 feet in circumference); or, any group consisting of ten or more trees on one parcel, each greater than 20 inches d.b.h. (approximately 5 feet in circumference).*

3. *Any tree located in a sensitive habitat as defined in Chapter 16.32. Also see Section 16.34.090(c), exemption of projects with other permits.*

The following work is exempted from all provisions of Chapter 16.34 :

(A) Timber operations which are in accordance with a timber harvesting plan submitted pursuant to the provisions of the Z’berg-Nejedly Forest Practices Act of 1973 (commencing with Section 4511).

(B) Any activity done pursuant to a valid timber harvest permit, or a notice of timber harvesting, approved pursuant to Chapter 16.52 SCCC.

(C) Any tree removal authorized pursuant to a valid discretionary permit approved pursuant to Chapter 13.10 (Zoning Regulations), Chapter 13.20 (Coastal Zone Regulations), Chapter 14.01 (Subdivision Regulations), Chapter 16.20 (Grading Regulations), Chapter 16.22 (Erosion Control), Chapter 16.30 (Riparian Corridor and Wetlands Protection), Chapter 16.32 (Sensitive Habitat Protection), or Chapter 16.54 SCCC (Mining Regulations).

(D) Removal of tree crops pursuant to agricultural operations. [Ord. 3443 § 1, 1983; Ord. 3341 § 1, 1982].

3.0 METHODS

On December 16-17, 2015; January 20-22, February 10-12, June 15-16, August 15-17, August 24-25, and October 21, 2016; and May 30-June 1, and August 8-9, 2017 the Project Area was traversed on foot to determine (1) plant communities present within the Project Area, (2) whether existing conditions may provide suitable habitat for any special-status plant or wildlife species, and (3) whether sensitive habitats are present. In addition, these surveys included a comprehensive mapping of San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) middens and seasonally timed surveys for special-status plants. The Project Area for the assessment was defined to include the proposed trail alignment plus an approximately 50-foot buffer on both sides, as well as the proposed parking area adjacent to Empire Grade Road and a 50-foot buffer (Figure 2).

All plant and wildlife species encountered were recorded and are listed in Appendix B. Plant nomenclature follows Baldwin et al. (2012) and subsequent revisions by the Jepson Flora Project (2017), except where noted. Because of recent changes in classification for many of the taxa treated by Baldwin et al. and the Jepson Flora Project, relevant synonyms are provided in brackets. For cases in which regulatory agencies, CNPS, or other entities base rarity on older taxonomic treatments, precedence was given to the treatment used by those entities.

3.1 Biological Communities

Prior to the site visit, an online soil survey of the Project Area (California Soil Resource Lab 2016) was examined to determine whether any unique soil types that could support sensitive plant communities and/or aquatic features are present in the Project Area. In addition, aerial imagery (Google Earth) of the Project Area was reviewed to determine where sensitive landscape features may occur. Biological communities present in the Project Area were classified based on existing plant community descriptions described in the *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986) and *A Manual of California Vegetation, Online Edition* (CNPS 2016a). However, in some cases it was necessary to identify variants of community types or to describe non-vegetated areas that are not described in the literature.

Mapping of plant communities relied on a high-level analysis of the site based on data from CalVeg (U.S. Forest Service 2009) which were augmented by local experts and the Land Trust of Santa Cruz County to document important local habitats such as sandhills, sandhill parklands, and stands of the Federal Endangered Santa Cruz cypress (*Hesperocyparis abramsiana* var. *abramsiana*) and to reflect the boundaries of urban and cultivated lands (ESA 2012). WRA did not refine the mapping of biological communities; however, WRA did note the occurrence of any sensitive biological communities within the Project Area (see Section 3.1.2). Sensitive biological communities with discrete boundaries (e.g., wetlands and streams) were mapped in the field; however, sensitive communities lacking discrete boundaries (e.g., forest types) were not mapped. Instead, the assessment focused on developing avoidance and minimization measures to prevent adverse impacts to such communities. Biological communities observed within the Project Area were classified as sensitive or non-sensitive as defined by the CEQA and other applicable laws and regulations (see below).

3.1.1 Non-Sensitive Biological Communities

Non-sensitive biological communities are those communities that are not afforded special protection under the CEQA or other state, federal, or local laws, regulations or ordinances. These communities may, however, provide suitable habitat for some special-status plant or wildlife species and are identified or described in Section 4.1.1 below.

3.1.2 Sensitive Biological Communities

Sensitive biological communities are defined as those communities that are given special protection under the CEQA or other applicable federal, state, or local laws, regulations or ordinances. Applicable laws and ordinances are discussed above in Section 2.0. Special methods used to identify sensitive biological communities are discussed below.

Wetlands and Non-Wetland Waters

The Project Area was surveyed to determine whether any wetlands and waters potentially subject to jurisdiction by the Corps, RWQCB, or CDFW are present. The assessment was based primarily on the presence of wetland plant indicators, but may also include any observed indicators of wetland hydrology or wetland soils. Potential wetland areas were identified as areas dominated by plant species with a wetland indicator status[1] of OBL, FACW, or FAC as given on the National Wetlands Plant List (Lichvar et al. 2016). Evidence of wetland hydrology can include direct evidence (primary indicators), such as visible inundation or saturation, algal mats, and oxidized root channels, or indirect (secondary) indicators, such as a water table within two feet of the soil surface during the dry season. Some indicators of wetland soils include dark colored soils, soils with a sulfidic odor, and soils that contain redoximorphic features as defined by the Corps Manual (Environmental Laboratory 1987) and Field Indicators of Hydric Soils in the United States (Natural Resources Conservation Service 2010).

Coastal Act/Local Coastal Program Wetlands

Whereas wetlands regulated under the Clean Water Act or the Porter-Cologne Act are identified based on the presence of three parameters (hydrophytic vegetation, hydric soils, and wetland hydrology), the Coastal Act defines wetlands as those areas meeting any one or more of the three wetland parameters. As such, WRA used the Coastal Act wetland definition to identify potentially jurisdictional wetlands within the portion of the Project Area that occurs within the Coastal Zone. Areas which were dominated by FACW- or OBL-rated vegetation or which contained hydric soils or displayed evidence of wetland hydrology were always treated as wetlands for the purposes of the Coastal Act. Areas which were dominated by FAC-rated vegetation and which were located in a suitable topographic position to support wetland hydrology were also always treated as wetlands for the purposes of the Coastal Act. Because FAC-rated vegetation is by definition equally likely to occur in wetlands and uplands (Lichvar et al. 2016), WRA biologists examined areas dominated by FAC-rated vegetation but which were not located in a typical wetland topographic position on a case by case basis. In those situations, WRA biologists looked for evidence that the vegetation was being supported by wetland hydrology (e.g., the presence of hydric soils, evidence of wetland hydrology, or suitable topographic position) before determining that the area should be considered a wetland for the purposes of the Coastal Act.

Sensitive Terrestrial Biological Communities

Prior to the site visit, aerial photographs, local soil maps, and *A Manual of California Vegetation, Online Edition* (CNPS 2016a) were reviewed to assess the potential for sensitive biological communities to occur in the Project Area. During the site visits, the Project Area was evaluated for the presence of sensitive terrestrial biological communities, including sensitive plant communities recognized by the CDFW and sensitive habitats identified in the General Plan/Local Coastal Program and the Santa Cruz County Code. Communities were identified based on descriptions and membership rules developed by the CDFW and the CNPS (Sawyer et al. 2009 and subsequent online updates). All alliances observed within the Project Area with a State Ranking ("S") of 1 through 3 were considered sensitive biological communities and are described in Section 4.1.2, below. Due to the scale of the Project Area, both its narrow width and its long length, and given the comparatively coarse scale at which vegetation alliances are mapped, it

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[1] OBL = Obligate, always found in wetlands (> 99% frequency of occurrence); FACW = Facultative wetland, usually found in wetlands (67-99% frequency of occurrence); FAC = Facultative, equal occurrence in wetland or non-wetlands (34-66% frequency of occurrence).

was not practical or feasible to map discrete boundaries between sensitive terrestrial communities in the Project Area. Instead, the presence of these communities was noted, and potential impacts to such communities were assessed collectively at a programmatic level.

3.2 Special-Status Species

3.2.1 Literature Review

Potential occurrence of special-status species in the Project Area was evaluated by first determining which special-status species occur in the vicinity of the Project Area through a literature and database search. Database searches for known occurrences of special-status species focused on the Davenport 7.5-minute U.S. Geological Survey (USGS) quadrangle and the six surrounding quadrangles (Año Nuevo, Franklin Point, Big Basin, Castle Rock Ridge, Felton, and Santa Cruz). The following sources were reviewed to determine which special-status plant and wildlife species have been documented to occur in the vicinity of the Project Area:

- CNDDB records (CDFW 2016a)
- USFWS quadrangle species lists (USFWS 2016a)
- CNPS Inventory records (CNPS 2016b)
- CDFG publication “California’s Wildlife, Volumes I-III” (Zeiner et al. 1990)
- CDFG publication “California Bird Species of Special Concern” (Shuford and Gardali 2008)
- CDFG publication “An Annotated Checklist of Amphibian and Reptile Species of California and Adjacent Waters” (Jennings 2004)
- A Field Guide to Western Reptiles and Amphibians (Stebbins 2003)
- University of California at Davis California Fish Data and Management Software (PISCES 2016)
- National Marine Fisheries Service Distribution Maps for California Salmonid Species (NMFS 2013)

In addition to these resources, WRA received additional unpublished information regarding the presence of local special-status plant occurrences, including for Rank 4 species which are not tracked in the CNDDB (Nadia Hamey, Big Creek forester, personal communication to Matthew Richmond, April 6, 2016).

3.2.2 Site Assessment

Multiple site visits were made to the Project Area to search for suitable habitats for special-status species. Surveys covered the trail network and parking area, including approximately 50 feet on either side of the proposed trail alignment (25 feet on either side of the alignment for wood rat nest mapping) as well as 50-feet around the parking area. Habitat conditions within these areas were used to evaluate the potential for special-status species to occur there. The potential for each special-status species to occur in the Project Area was evaluated according to the following criteria:

> **Unlikely.** Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.

Moderate Potential. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.

High Potential. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

Present. Species is observed on the site or has been recorded (e.g., CNDDB, other reports) on the site recently.

Not Observed. Species is identifiable year-round but was not observed during surveys or the survey occurred when the species should have been apparent and identifiable but the species was not observed. These species are assumed to not be present.

The site assessment is intended to identify the presence or absence of suitable habitat for each special-status species known to occur in the vicinity in order to determine its potential to occur in the Project Area. The site visit does not constitute a protocol-level survey and is not intended to determine the actual presence or absence of a species; however, if a special-status species is observed during the site visit, its presence was recorded and is discussed in the following sections.

In cases where little information is known about species occurrences and habitat requirements, the species evaluation was based on best professional judgment of WRA biologists with experience working with the species and habitats. If necessary, recognized experts in individual species biology were contacted to obtain the most up-to-date information regarding species biology and ecology.

All special-status species observed during the site visit were documented and are discussed below in Section 4.2. For some species, a site assessment at the level conducted for this report may not be sufficient to determine the presence or absence of a species to the specifications of regulatory agencies. In these cases, a species may be assumed to be present or further protocol-level special-status species surveys may be necessary. In some cases, focused surveys may be sufficient to determine the presence or absence of a species for the purposes of the CEQA. WRA conducted seasonally-timed, focused surveys for special-special status plants documented from the region and focused surveys for San Francisco dusky-footed woodrat. The methods for these surveys are described in the following sections. Special-status species for which further focused or protocol-level surveys may be necessary are described below in Section 6.0.

3.2.3 Special-Status Species Surveys

Special-Status Plants

Surveys for special-status plants were conducted on the dates listed below; surveys were stratified such that each portion of the alignment was subjected to early- (December-February), mid- (May-June), and late-season (August-October) surveys.

Special-Status Plant Survey Dates:

2015	**2016**	**2017**
December 16-17	January 20-22	May 30-June 1
	February 10-12	August 8-9
	June 15-16	
	August 15-17, 24-25	
	October 21	

Surveys were conducted by WRA botanists familiar with the plants and vegetation of the Santa Cruz Mountains. Surveys covered the trail segments shown on Figure 2, including an approximately 50-foot buffer on all sides. Surveys were also conducted in the proposed parking and staging area adjacent to Empire Grade Road, including an approximately 50-foot buffer. All areas were traversed on foot and all species encountered were identified to the taxonomic level necessary to determine rarity. Occurrences of rare plants were captured as GPS points (for single plants or closely spaced, small groups of plants) and polygons (for larger or more widely spaced groups of plants).

Anderson's manzanita (*Arctostaphylos andersonii*; CNPS Rank 1B.2) was the only special-status plant observed within the Project Area. To calculate potential impacts to Anderson's manzanita associated with the proposed Project, WRA overlaid Anderson's manzanita point and polygon occurrences over a map of the proposed trail alignment; to give them dimensions, individual manzanita points were assigned an average 5-foot radius based on the average plant size observed in the field. All occurrences of Anderson's manzanita that intersected a 7-foot band representing the width of trail construction (5 feet of trail tread plus 1 foot of vegetation clearance on either side) running down the centerline of the trail alignment were considered to be directly impacted. Such impacts are theoretical given that there is flexibility to move the trail anywhere within the 100-foot-wide band surveyed for this report; however, it gives an indication of the maximum number of individuals that could be impacted.

Special-Status Wildlife

WRA wildlife biologists conducted a general assessment of habitat quality within the Project Area on December 16-17, 2015 and January 20-22 and February 10-12, 2016. Wildlife biologists walked the entirety of the proposed alignment, including an approximately 50-foot buffer on either side of the alignment, to note habitat conditions and document unique features for wildlife.

Concurrent with this assessment, biologists mapped all active San Francisco dusky-footed woodrat middens observed within the Project Area. WRA biologists familiar with the identification of woodrat middens and the biology of the species conducted the surveys. Surveys covered the trail alignments shown on Figure 2; all areas were traversed on foot and woodrat middens located within approximately 25 feet of the proposed trail alignment were mapped using handheld GPS units with sub-meter accuracy. Woodrat middens within the proposed parking area adjacent to Empire Grade Road, including a 50-foot buffer, were also mapped following the same approach. To estimate potential direct impacts to woodrat nests, each nest, or group of nests, was mapped using handheld GPS equipment, and all nests that intersect with a 7-foot band (5 feet of trail tread plus 1 foot of vegetation clearance on either side) running down the centerline of the trail alignment were considered to be directly impacted. Such impacts are theoretical in that there is flexibility to move the trail anywhere within the 50-foot-wide band surveyed for this report.

Within the Project Area, WRA biologists mapped locations of large old-growth trees with unique habitat features that may support special-status wildlife species such as roosting bats. Noted as "wildlife trees", these features had various combinations of exposed snags, open cavities, exfoliating bark, or unique crown formations that may provide good thermal properties for roosting or unique nesting habitat. In addition to WRA's observations, locations of old-growth Douglas fir and redwood trees and stands of old-growth that should be evaluated for the potential to support marbled murrelet have been historically mapped at the site by multiple groups and are shown on the associated special-status wildlife Figures in Appendix A (see ESA 2012 for additional information).

3.2.4 Critical Habitat

To determine whether Critical Habitat for listed plant or wildlife species has been designated within the Project Area, WRA reviewed the USFWS online Critical Habitat mapping tool (USFWS 2016b). For cases in which Critical Habitat has been designated at the site, WRA biologists assessed the area to determine whether it contained the primary constituent elements (PCEs) required by the species in question.

3.4 Protected Trees

WRA did not conduct a tree survey or any other type of assessment to determine whether protected trees occur within the Project Area. In the staging area, native trees were identified by registered professional forester Nadia Hamey and mapped by Fall Creek Engineers. Staging area construction is anticipated to result in the removal of the following native trees with diameter at breast height (DBH) greater than 12 inches: 11 oak tress (including coast live oak, canyon live oak, tanoak): 4 @ 12 inch DBH, 13 inch DBH, 15 inch DBH, 20 inch DBH, 2 @ 18 inch DBH, 19 inch DBH, 36 inch DBH, one Douglas fir: 30 inch DBH and, four madrone:12 inch DBH, 13 inch DBH, 16 inch DBH, 17 inch DBH.

4.0 ENVIRONMENTAL SETTING

The larger San Vicente Redwoods property (i.e., the main parcel) is located in the heart of the Santa Cruz Mountains, situated among a number of other large, protected properties with very limited development. Rural residences occur in small communities adjacent to the site along Empire Grade Road and Pine Flat Road. The Project Area occurs within the North Coast Watersheds, an important area for multi-species benefits conservation identified in the Land Trust of Santa Cruz County's *A Conservation Blueprint* (Mackenzie et al. 2011). The San Vicente Redwoods property is contiguous with a large amount of protected lands including Cal Poly's Swanton Ranch, the Coast Dairies, Bonny Doon Ecological Preserve, Wilder Ranch State Park, and UC Santa Cruz's Natural Reserve (ESA 2012).

The majority of the main parcel and adjacent lands are characterized by dense redwood, coast/canyon live oak, and tanoak forest, with smaller areas of scrub and chaparral habitat. Elevations within the main parcel range from approximately 500 to 2,500 feet above sea level. The Project Area within the main parcel contains a number of east-west trending ridges extending from Empire Grade, transitioning into a north-south trending ridge that dips down into Cotoni Coast Dairies at the southern end of the main parcel. The southern portion of the Project Area burned in 2009, resulting in a mosaic of chaparral and forest regrowth and standing dead trees which provide high value for wildlife. The largest creek on the main parcel is San Vicente Creek, a perennial stream with its headwaters near Empire Grade.

The Laguna parcel is located to the southeast of the main parcel, adjacent to the Bonny Doon Ecological Reserve, home to a number of sensitive plant species adapted to the sandy soils that occur there. The Laguna parcel occurs on a different soil type and supports some sandhills or sand parkland habitat similar to that found on the adjacent Bonny Doon Ecological Reserve, however, the trail network avoids this area. On the Laguna parcel, the Project Area follows a more gentle south-westerly slope along the riparian corridor along Laguna Creek, a perennial creek with its headwaters near Empire Grade. Elevations within the Laguna parcel range from approximately 750 to 1,600 feet above sea level.

Both parcels were historically used for timber harvesting and contain dirt logging roads. Some active logging operations also occur on the main parcel. The main parcel contains portions of a utility road for high-tension electric transmission lines (referred to herein as the "powerline road"). The main parcel also contains a former quarry pit and a private inholding. Otherwise, both parcels are undeveloped and provide ample opportunity for both public access and wildland conservation.

5.0 RESULTS

The following sections present the results and discussion of the biological assessment within the Project Area. Figures showing the results of the assessment area included as Appendix A. Lists of all plant and wildlife species observed within the Project Area are included as Appendix B. An analysis of the potential for special-status plant species to occur within the Project Area is included as Appendix C. Photographs of the Project Area are included as Appendix D.

5.1 Biological Communities

Biological communities documented by ESA (2012) within the larger San Vicente Redwoods property are listed in Table 2 and are shown on Figure 3. These communities span a range of classification types ranging from high-level communities (*sensu* Holland 1986) to more refined vegetation alliances (*sensu* USFS 2009, Sawyer et al. 2009). Many of these communities, or elements of them, are present within the Project Area. Specific vegetation alliances and other biological communities observed by WRA within the Project Area are listed in Table 3. Descriptions of each community observed are provided in the following sections.

In general, the Project Area is dominated by a mix of redwood- and Douglas fir-dominated communities, with inclusions of other conifer and hardwood stands and patches of manzanita chaparral. Although some old-growth trees are present, most areas are dominated by second- or third-growth stands. Some stands appear to be relatively young, with a diverse understory. Other stands are well established and lack substantial understory vegetation. In many areas, it is clear that plant communities are transitioning from species that occur under open, sunny growing conditions to species that occur under dense, closed-canopy conditions. At the southern end of the Project Area within the main parcel, a large tract of forest was burned during 2009 and is currently dominated by a mix of chaparral and forest regrowth. A portion of the Laguna Parcel appears to have been burned in the 2008 Martin fire that affected the Bonny Doon Ecological Reserve; however, the portion of the Project Area that occurs on the Laguna Parcel is located away from the burned area. Limited riparian vegetation was observed in association with ephemeral and intermittent streams observed within the Project Area; often the vegetation adjacent to streams was indiscernible from adjacent upland vegetation. Larger intermittent and perennial streams contained more well-developed riparian vegetation.

In some portions of the Project Area (e.g., along Empire Grade Road and Warrenella Road), a shaded fuel break (*sensu* Agee et al. 2000) has been implemented. In these areas, all non-sensitive understory vegetation is removed and some overstory trees may be thinned. Shaded fuel breaks are thought to reduce fire fuel loads while maintaining habitat for species that prefer cover such as mountain lions. Shaded fuel breaks may also provide other habitat benefits, such as opening habitat for plant species that prefer light shade to open sun such as Anderson's manzanita. Within the Project Area, Anderson's manzanita was flagged and protected from removal. In these areas, Anderson's manzanita may benefit from the removal of dense understory brush and young saplings that can outcompete the species for sunlight and other resources.

Table 2. Coarse-Scale Biological Communities Mapped within the Larger San Vicente Redwoods Property by ESA (2012)

Community Name	Scientific Name[1]
Redwood	*Sequoia sempervirens* Alliance
Redwood-Douglas Fir	*Sequoia sempervirens- Pseudotsuga menziesii* Alliance
Pacific Douglas Fir	*Pseudotsuga menziesii* Alliance
Santa Cruz Cypress	*Callitropsis* [*Cupressus*] *abramsiana* Alliance
Maritime Chaparral	Multiple
Coast Live Oak	*Quercus agrifolia* Alliance
Knobcone Pine	*Pinus attenuata* Alliance
Coastal Scrub	Multiple
Grasslands	Multiple
Sandhills	n/a
Cultivated	n/a
Barren/Rock	n/a
Urban	n/a
Water	n/a

[1]Scientific names from USFS (2009).

Table 3. Biological Communities Observed by WRA within the Project Area

Common Name	Scientific Name[1]	State Rank	Sensitive?
Tree-Dominated Communities			
Madrone Forest	*Arbutus menziesii* Forest Alliance	S3.2	Yes
Tanoak Forest	*Notholithocarpus densiflorus* Forest Alliance	S3.2	Yes
Coulter Pine Woodland (planted)	*Pinus coulteri* Woodland Alliance	S4	No
Douglas Fir Forest	*Pseudotsuga menziesii* Forest Alliance	S4	No
Coast Live Oak Woodland	*Quercus agrifolia* Woodland Alliance	S4	Yes
Canyon Live Oak Forest	*Quercus chrysolepis* Forest Alliance	S5	Yes
Redwood Forest	*Sequoia sempervirens* Forest Alliance	S3.2	Yes
California Bay Forest	*Umbellularia californica* Forest Alliance	S3	Yes
Shrub-Dominated Communities			
Anderson's Manzanita Chaparral[2]	*Arctostaphylos andersonii* Shrubland Alliance[2]	n/a	Yes
Brittle Leaf Manzanita Chaparral	*Arctostaphylos crustacea* Shrubland Alliance	S2	Yes
Aquatic Habitats			
Seasonal Wetland	n/a	n/a	Yes
Shrub-Scrub Wetland	n/a	n/a	Yes
Ephemeral/Intermittent Streams	n/a	n/a	Yes
Developed/Disturbed Areas			
Developed/Disturbed	n/a	n/a	No

[1]Scientific names from CNPS (2016).
[2]Community not described by CNPS (2016).

5.1.1 Non-Sensitive Biological Communities

Non-sensitive biological communities observed within the Project Area include Coulter pine woodland, Douglas fir forest, and developed/disturbed areas. These communities and habitats are described below.

Coulter Pine Woodland (*Pinus coulteri* Woodland Alliance); Rank G4 S4. Coulter pine woodlands typically occur on steep upper slopes and ridges on dry soils. Coulter pine is the dominant tree, with other species such as canyon live oak (*Quercus chrysolepis*) or black oak (*Q. kelloggii*) as subdominants. This community typically occurs from 2,250 to 6,500 feet in elevation and occurs from the San Francisco Bay south into Baja California (Sawyer et al. 2009). No natural stands are known to occur within Santa Cruz County (CNPS 2016a).

Within the Project Area, Coulter pine occurs as planted stands, primarily adjacent to Empire Grade Road and in other locations on the main parcel. The high density of these planted stands has resulted in a dense overstory canopy and a thick layer of pine needles on the forest floor. Understory vegetation is generally lacking in these areas due to the dark conditions resulting from the dense overstory canopy and the smothering effect of the thick layer of pine needles on the forest floor. Areas of planted Coulter pine woodland within the Project Area offer high potential for restoration particularly for Anderson's manzanita.

Douglas Fir Forest (*Pseudotsuga menziesii* Forest Alliance); Rank G5 S4. Douglas fir forests occur in a broad range of topographic positions and aspects and on a variety of substrates extending from the Pacific Northwest south to southern California (Sawyer et al. 2009). The community typically occurs from 2,250 to 5,000 feet in elevation (CNPS 2016a). Due to the wide distribution of this community, co-dominant and non-dominant understory species vary widely.

Within the Project Area, Douglas fir forest occurs as both single-species stands and mixed with other conifers and hardwoods on both the main parcel and the Laguna parcel. In many parts of the Project Area, Douglas fir occurs as a co-dominant with tanoak (*Notholithocarpus densiflorus*) in what has been described as a Douglas fir-tanoak forest (*Pseudotsuga menziesii-Notholithocarpus densiflorus* Forest Alliance; Rank G4 S4), also a non-sensitive community (State Rank S4). In most portions of the Project Area, Douglas fir forest and Douglas fir-tanoak forest occurs in dense stands with limited understory development. In younger stands, the understory is dominated by tanoak and madrone (*Arbutus menziesii*) saplings.

Developed/Disturbed Areas; No Rank. Developed and/or disturbed areas are not described in the literature, but include areas that have been significantly modified by human activity. Within the Project Area, disturbed areas are primarily limited to dirt roads and logging landings. Some of the roads are actively used for utility maintenance and by local residents with properties adjacent to the San Vicente Redwoods property; however, most roads within the Project Area are former logging roads that have been decommissioned. These areas generally lack natural vegetation or are dominated by early seral species, many of which are weedy non-natives. Developed and/or disturbed areas are not considered sensitive under the CEQA.

5.1.2 Sensitive Biological Communities

Sensitive biological communities observed within the Project Area include eight terrestrial communities (madrone forest, tanoak forest, redwood forest, coast live oak woodland, canyon live oak forest, California bay forest, Anderson's manzanita chaparral, and brittle leaf manzanita chaparral) and three aquatic communities (seasonal wetlands, shrub-scrub wetlands, and streams). These communities and habitats would be considered sensitive under the CEQA and some may also be protected under other federal, state, or local laws (e.g., wetlands and streams).

__Sensitive Terrestrial Communities__

Madrone Forest (*Arbutus menziesii* Forest Alliance); Rank G4 S3.2. Madrone forests form a network of small stands extending along the west coast from British Columbia to the California border with Mexico (CNPS 2016a). These forests are located within a range of topographic positions and on a variety of soil types (Sawyer et al. 2009).

Within the Project Area, madrone forest occurs as small patches within a larger matrix of mixed coniferous forest primarily on the main parcel. Although only a few areas might be considered true madrone forest, the species occurs in large numbers throughout the Project Area and provides a valuable food source for birds and small mammals. During surveys conducted in early 2016, large numbers of migrating American robins (*Turdus migratorius*) were observed foraging among stands of fruiting madrone. The species responds well to fire, resprouting from burned stumps. This community would be considered sensitive under the CEQA.

Tanoak Forest (*Notholithocarpus densiflorus* Forest Alliance); Rank G4 S3.2. Tanoak forests occur primarily in hilly to mountainous regions from Oregon to Point Conception in southern California (CNPS 2016a). Tanoak forests occur on a range of topographic positions and aspects; however, they are generally restricted to areas with deep, well-drained soil (Sawyer et al. 2009). Tanoak seedlings and saplings are adapted to growth in densely forested areas with low light levels under the canopy (CNPS 2016a). The species responds well to fire, resprouting from burned stumps. Tanoaks produce large seed crops every other year, with mast years in 6-year cycles (CNPS 2016a).

Within the Project Area, tanoak occurs as a dominant understory species in redwood and Douglas fir forests and is the dominant overstory tree in many areas on both the main parcel and the Laguna parcel. Where tanoak is the dominant overstory tree, a dense layer of leaf litter accumulates, preventing the germination and establishment of many understory herbs and shrubs, creating a relatively sparse, low-diversity understory. The widespread distribution of this species within the larger San Vicente Redwoods property undoubtedly provides a valuable food source for many mammals. This community would be considered sensitive under the CEQA.

Coast Live Oak Woodland (*Quercus agrifolia* Woodland Alliance); Rank G5 S4. Coast live oak woodland is known from the outer and inner Coast Ranges and Transverse Ranges, and along the coast from northern Mendocino County south to San Diego County. This community is typically located on terraces, canyon bottoms, slopes, and flats underlain by deep, well-drained sandy or loam substrates with high organic content (Sawyer et al. 2009).

Within the Project Area, coast live oak woodland occurs in limited stands within pockets of other forest types, primarily on the main parcel. Coast live oak appears to co-occur with Canyon live oak (*Quercus chrysolepis*) and potentially with Shreve oak (*Quercus parvula* var. *shrevei*). However, due to the tall size of the trees, WRA biologists were limited to identifying trees using leaves and acorns that were fallen on the ground. Due to the co-occurrence of multiple oak species and potential hybridization, it was difficult to discern the relative dominance of each oak species. In addition, many of the oaks observed by WRA biologists displayed characteristics from multiple species, suggesting that the oaks may be hybridizing. Although coast live oak forest is not considered a sensitive community by the CDFW, it is considered sensitive by Santa Cruz County and would be considered sensitive under the CEQA.

Canyon Live Oak Forest (*Quercus chrysolepis* Forest Alliance); Rank G5 S5. Canyon live oak forest is known to occur throughout California, with the exception of the Modoc Plateau, the Central Valley, and parts of the desert region (CNPS 2016a). The community is known to occur in a wide range of topographic positions, from stream benches and canyon bottoms to steep, rocky slopes on infertile soils (CNPS 2016a). Due to the large range of this community, co-dominant species vary widely based on location within the State.

Within the Project Area, canyon live oak forest occurs in limited stands within pockets of other forest types, primarily on the main parcel. As noted for coast live oak woodland, canyon live oak appears to co-occur with other oaks such as coast live oak or Shreve oak. However, due to the difficulty in reaching fresh leaves and acorns and potential issues with hybridization, it was difficult to discern the relative dominance of each oak species. Although canyon live oak forest is not considered a sensitive community by the CDFW, it is considered sensitive by Santa Cruz County and would be considered sensitive under the CEQA.

Redwood Forest (*Sequoia sempervirens* Forest Alliance); Rank G3 S3.2. Redwood forests are known from extensive, nearly contiguous, stands in the North Coast Ranges and isolated stands in the Central Coast Ranges, from Del Norte County to Santa Barbara County (Sawyer et al. 2009). These forests are typically located on stream terraces, benches, coastal slopes, and canyon bottoms underlain by deep, well-drained loams (Sawyer et al. 2009). The species responds well to fire, resprouting from burned stumps (CNPS 2016a).

Within the Project Area, redwood forest forms the dominant plant community, often co-occurring with subdominant trees such as Douglas fir and tanoak on both the main parcel and the Laguna parcel. The dense overstory canopy of the redwood forest prevents the establishment of a diverse understory community; however, in many areas, the understory is dominated by tanoak saplings and young trees. Although most of the redwoods within the Project Area are second or third growth, some trees are considered old-growth, and many of the second or third growth trees are relatively large and provide valuable wildlife habitat. This community would be considered sensitive under the CEQA.

California Bay Forest (*Umbellularia californica* Forest Alliance); Rank G4 S3. California bay forests are known from the inner and outer Coast Ranges, Transverse Ranges, and Sierra Nevada Foothills from Del Norte County south to San Diego County (Sawyer et al. 2009). This community is typically located on terraces, canyon bottoms, north-facing slopes, and rock outcrops underlain by shallow to deep sand to loam substrates (Sawyer et al. 2009). The species responds well to fire, resprouting from burned stumps (CNPS 2016a).

Within the Project Area, California bay primarily occurs as a subdominant species within other forest types, primarily on the main parcel. Although it does not occur in as high of numbers as species such as tanoak or madrone, California bay is likely an important food source for wildlife within the Project Area. This community would be considered sensitive under the CEQA.

Anderson's Manzanita Chaparral (*Arctostaphylos andersonii* Shrubland Alliance); No Rank. Anderson's manzanita chaparral has not been described in the literature; however, given the widespread distribution of this species within the Project Area and its occurrence in many areas as large, single-species stands, WRA believes that it deserves consideration as its own plant community. Although this community has not been described and does not have an official global or state ranking, the dominant species in this community, Anderson's manzanita, has a California Rare Plant Rank of 1B.2, and therefore, the community should be considered sensitive under the CEQA. As a species, Anderson's manzanita is restricted to the Southern Santa Cruz Mountains (Kauffmann et al. 2015).

Within the Project Area, Anderson's manzanita occurs both as scattered individuals or small groups of individuals and as large, single-species stands, primarily on the main parcel, but also on the Laguna parcel. Because the dominant species in this community is a special-status plant, occurrences of this community were mapped during rare plant surveys. Collectively, these occurrences were estimated to occupy approximately 7.75 acres within the Project Area; this likely represents a small fraction of the total occurrences on the greater San Vicente Redwoods site.

The species is adapted to lightly shaded to open, sunny conditions and is best represented in forest openings and along road cuts within the forest. Where this species occurs under dense overstory canopy, it is experiencing significant mortality; in these areas, it is clear that the species became established under more open, sunny conditions following a timber harvest but is currently dying off due to the subsequent reestablishment of the overstory canopy. In the presence of fire suppression, active management may be required to maintain suitable open habitat for this species. This community would be considered sensitive under the CEQA.

Brittle Leaf Manzanita Chaparral (*Arctostaphylos crustacea* Shrubland Alliance); Rank G2 S2. Although brittle leaf manzanita is not considered a special-status species, as a community it has limited distribution and is therefore considered sensitive. The community occurs in the Coast Ranges, from the San Francisco Bay Area south to near Point Conception, and on the Catalina Islands (CNPS 2016a). Brittle leaf manzanita chaparral occurs in uplands near the coast and in adjacent areas subject to the maritime climate, primarily on nutrient-poor soils derived from sandstone, shale, and granite (CNPS 2016a).

Within the Project Area, this community is composed of the *crinita* subspecies. This community occurs in mixed conifer forest, as well as in open areas on ridges and other high points, primarily on the main parcel, but also on the Laguna parcel. The community typically occurs as small patches with a limited number of individuals; however, in some areas, this community occurs as large, single-species stands. This community would be considered sensitive under the CEQA.

Sensitive Aquatic Communities

The Project Area generally contains steep topography and well-drained soils. The proposed trail alignment occurs primarily on side slopes and ridges, avoiding low spots where water may collect and create wetland conditions. As such, the Project Area contained a relatively limited amount of sensitive aquatic resources. These resources were primarily limited to seasonal to perennial wetlands associated with seeps and compacted portions of old logging roads, as well as stream crossings and associated riparian wetlands. Wetlands, including both three-parameter Corps/RWQCB wetlands and one-parameter Coastal Act Wetlands, documented within or adjacent to the Project Area are shown on Figure 4. Locations where the proposed trail alignment crosses drainages or streams potentially subject to regulatory authority by one or more agency are shown on Figure 5. These features are protected by local, state, and federal laws and would be considered sensitive under the CEQA.

Seeps and Seasonal Wetlands; No Rank. Seeps and seasonal wetlands occur throughout the state in a wide range of topographic settings. As such, vegetation associated with seeps and seasonal wetlands varies greatly across the state. Outside of the Coastal Zone, seeps and seasonal wetlands are mapped following guidance from the U.S. Army Corps of Engineers which requires the presence of three parameters: wetland vegetation, wetland soils, and wetland hydrology. Within the Coastal Zone, wetlands are mapped based on the presence of a single parameter (wetland vegetation, wetland soils, or wetland hydrology; see Section 3.1.2).

A limited number of seeps and seasonal wetlands were observed within the Project Area. These features included hillside and roadside seeps dominated by golden chain fern (*Woodwardia fimbriata*) and a variety of sedge (*Carex* sp.) and rush (*Juncus* sp.) species, as well as compacted portions of old logging roads dominated by sedges and rushes.

Shrub-Scrub Wetlands, No Rank. The Project Area contained a limited number of shrub-scrub wetlands located at stream or drainage crossings. These areas were dominated by wetland- and riparian-associated shrubs such as western azalea (*Rhododendron occidentale*), ocean spray (*Holodiscus discolor*), or hazelnut (*Corylus cornuta*). In many cases, these wetlands lacked strong indicators of wetland hydrology or hydric soils and were considered wetlands only for the purposes of the Coastal Act. In other cases, all three parameters were present and the wetlands were mapped as wetlands for the purposes of the Clean Water Act and other laws. These tended to be larger, more well-developed wetlands associated with streams. These wetlands often had a strong understory dominated by species such as slough sedge (*Carex obnupta*), California spikenard (*Aralia californica*), and golden chain fern.

Ephemeral, Intermittent, and Perennial Streams; No Rank. The Project Area contains a number of ephemeral drainages and intermittent to perennial streams. The headwaters of these streams are typically shallow swales which convey water after major storms, but are differentiated from jurisdictional streams which convey water with greater regularity and for longer duration by the lack of a clear bed and bank, lack of an ordinary high water mark, and lack of any riparian vegetation that is discernably different from the adjacent vegetation. Larger intermittent and perennial streams occur lower in the watershed, and Laguna Creek, a perennial stream, features prominently in the Project Area for the Laguna parcel. These streams often contained more well-developed riparian vegetation.

The Project Area includes 64 crossings of ephemeral drainages and intermittent to perennial streams that would be considered jurisdictional by the U.S. Army Corps of Engineers, the Regional Water Quality Control Board, and the California Department of Fish and Wildlife. These crossings are shown on Figure 5. Streams within the Project Area are protected under State and Federal laws and would be considered sensitive under the CEQA.

5.2 Special-Status Species

5.2.1 Special-Status Plants

Based upon a review of the resources and databases given in Section 3.2.1, it was determined that 69 special-status plant species have been documented from the vicinity of the Project Area, exclusive of mosses and lichens. Figure 6 shows special-status plant species that have been documented in the CNDDB within 5 miles of the Project Area (CDFW 2016a). Appendix C summarizes the potential for occurrence for each special-status plant species documented from the vicinity of the Project Area.

One special-status plant species was observed in the Project Area during the assessment site visits: Anderson's manzanita (*Arctostaphylos andersonii*; Rank 1B.2). Other special-status plants, such as Point Reyes horkelia (*H. marinensis*; Rank 1B.2), are known to occur on the greater San Vicente Redwoods Property, but were not observed within the Project Area. Figure 7 shows the special-status plant species that were observed within the Project Area during surveys conducted for this report.

In addition to the two special-status plant species known to occur within the Project Area, 24 additional special-status plant species were originally determined to have a moderate to high potential to occur in the Project Area based on the presence of potentially suitable habitat and known occurrences of the plants from the immediate vicinity, including reports of some species from within the larger San Vicente Redwoods property:

- Schreiber's manzanita (*Arctostaphylos glutinosa*; Rank 1B.2)
- Ohlone manzanita (*A. ohloneana*; Rank 1B.1)
- Pajaro manzanita (*A. pajaroensis*; Rank 1B.1)
- Kings Mountain manzanita (*A. regismontana*; Rank 1B.2)
- Bonny Doon manzanita (*Arctostaphylos silvicola*; Rank 1B.2)
- Brewer's red maids (*Calandrinia breweri*; Rank 4.2)
- Santa Cruz Mountains pussypaws (*Calyptridium parryi* var. *hesseae*; Rank 1B.1)
- Bristly sedge (*Carex comosa*; Rank 2B.1)
- Deceiving sedge (*Carex saliniformis*; Rank 1B.2)
- Robust spineflower (*Chorizanthe robusta* var. *robusta*; FE, Rank 1B.1)
- Mountain lady's-slipper (*Cypripedium montanum*; Rank: 4.2)
- California bottle-brush grass (*Elymus californicus*, CNPS Rank 4.3)
- Santa Cruz cypress (*Hesperocyparis abramsiana* var. *abramsiana*; FE, SE, Rank 1B.2)
- Butano Ridge cypress (*Hesperocyparis abramsiana* var. *butanoensis*; FE, SE, Rank 1B.2)
- Point Reyes horkelia (*Horkelia marinensis*; Rank 1B.2)
- Arcuate bush-mallow (*Malacothamnus arcuatus*; Rank 1B.2)
- Santa Cruz County monkeyflower (*Mimulus rattanii* ssp. *decurtatus*; Rank 4.2)
- Northern curly-leaved monardella (*Monardella sinuata* ssp. *nigrescens*; Rank 1B.2)
- Dudley's lousewort (*Pedicularis dudleyi*; State Rare, Rank 1B.2)
- Santa Cruz Mountains beard tongue (*Penstemon rattanii* var. *kleei*; Rank 1B.2)
- White-flowered rein orchid (*Piperia candida*; Rank 1B.2)
- Pine rose (*Rosa pinetorum*; Rank 1B.2)
- Hoffmann's sanicle (*Sanicula hoffmannii*; Rank 4.3)
- Rayless ragwort (*Senecio aphanactis*; Rank 2B.2)
- San Francisco campion (*Silene verecunda* ssp. *verecunda*; Rank 1B.2)
- Santa Cruz microseris (*Stebbinsoseris decipiens*; Rank 1B.2)

None of these species were observed during seasonally-timed, focused surveys along the entirety of the proposed alignment and parking and staging areas. The lack of additional special-status plant observations was largely attributed to the dense, closed canopy conditions and deep tanoak leaf litter that dominate a large percentage of the Project Area. Based on the lack of observations, it was determined that these species are unlikely to occur within the Project Area and no additional surveys are recommended. Details about these species are included in Appendix C.

The remaining 43 species documented from the vicinity of the Project Area were determined to be unlikely to occur based on a lack of suitable habitat conditions. In general, these are plants that occur along the immediate coast or that occur in open, sunny habitats such as grasslands, which are generally lacking within the Project Area. Many of these species are also known to occur on specific soil types which are not present within the Project Area such as serpentine soils or Zayante sands (Zayante sands are mapped at the western edge of the larger San Vicente Redwoods property, but do not occur near the Project Area). Finally, many of these species occur in perennially wet marsh or swamp habitats which generally do not occur within the Project Area. These species may have potential to occur within other portions of the larger San Vicente Redwoods property; however, they are unlikely to occur within the Project Area.

Special-status plant species that are present within in the Project Area are discussed below, as are federally listed plant species that were not observed and determined to be not present.

Special-Status Plant Species Present within the Project Area

Anderson's manzanita (*Arctostaphylos andersonii*). Rank 1B.2. Anderson's manzanita is a perennial shrub that occurs in the Santa Cruz Mountains in chaparral and at the openings and edges of broadleaf upland forest and North Coast coniferous forest habitats at elevations from 60 to 760 meters (Baldwin et al. 2012; Kauffmann et al 2015). The species blooms between November and May (CNPS 2016b). During surveys conducted for this report, numerous occurrences of this species were observed within the Project Area, both on the main parcel and the Laguna parcel (Figure 7). In many cases, the species occurs as scattered individuals or small clusters of individuals. However, in some areas, the species occurs as large, single-species stands. In open areas, the shrub is generally healthy in appearance; however, where the species occurs under closed canopy conditions, it is in decline. Many dead or dying individuals were observed within heavily forested portions of the Project Area. It is clear that many occurrences of this species became established under more open, sunny conditions such as after a timber harvest and are now in decline as the forest returns.

Federally Listed Plants that Occur in the Region but are Unlikely to Occur in the Project Area

Marsh sandwort (*Arenaria paludicola*); Federal Endangered, State Endangered, Rank 1B.1. Marsh sandwort is a stoloniferous herb in the pink family (Caryophyllaceae) that blooms from May to August (CNPS 2016b). This species occurs in sandy openings in freshwater or brackish marshes and swamps from 10 to 558 feet in elevation and is known from seven USGS 7.5-minute quadrangles in Los Angeles and San Luis Obispo counties (CDFW 2016a, CNPS 2016b). The species is believed extirpated from San Bernardino, Santa Cruz, and San Francisco counties, and Washington State. This species was determined to be unlikely to occur within the Project Area due to a lack of extant populations within the region and a lack of suitable marsh or swamp habitat within the Project Area.

Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*); Federal Endangered, Rank 1B.1. Ben Lomond spineflower is an annual herb in the buckwheat family (Polygonaceae) that blooms from April to July (CNPS 2016b). The species occurs in maritime ponderosa pine sandhills habitat in six USGS 7.5-minute quadrangles Santa Cruz County (CDFW 2016a, CNPS 2016b). The species is thought to be threatened by sand mining, development, and non-native plants (CNPS 2016b). This species was determined to be unlikely to occur within the Project Area due to a lack of suitable habitat. Suitable habitat for this species may be present within the larger San Vicente Redwoods property, but is not found within the Project Area.

Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*); Federal Endangered, Rank 1B.1. Scotts Valley spineflower is an annual herb in the buckwheat family (Polygonaceae) that blooms from April to July (CNPS 2016b). This variety occurs in meadows and seeps with sandy soils and in valley and foothill grassland on mudstone and Purisima outcrops from 755 to 804 feet in elevation (CDFW 2016a, CNPS 2016b). The species is a California endemic documented from only two USGS 7.5-minute quadrangles in Santa Cruz County (CNPS 2016b). Development and vehicles threaten the variety (CNPS 2016b). This species was determined to be unlikely to occur within the Project Area due to a lack of suitable meadows, seeps, or grasslands.

Robust spineflower (*Chorizanthe robusta* var. *robusta*); Federal Endangered, Rank 1B.1. Robust spineflower is a summer-flowering annual herb in the buckwheat family (Polygonaceae) found on sandy soils in chaparral, coastal dune, coastal scrub, sandy coastal prairie sites, and openings in cismontane woodland communities with coarse soils and relatively sparse ground cover (CDFW 2016a, CNPS 2016b). This species requires sand- or gravel-based soils and is found at elevations from 10 to 1000 feet. Its blooming period is from April to September, although in years with late fall rains, fruiting structures may be obvious as late as November. It is found in Monterey, Santa Cruz, San Francisco, and San Mateo counties, and is thought to be extirpated in its historic range in Santa Clara and Alameda counties. The species is threatened by development, recreation, mining, and non-native plants (CNPS 2016b). Within the Project Area, this species was originally determined to have potential to occur in openings such as at road crossings. However, this species was not observed during seasonally-timed surveys and it is assumed to be not present.

Santa Cruz wallflower (*Erysimum teretifolium*); Federal Endangered, State Endangered, Rank 1B.1. Santa Cruz wallflower is a perennial herb in the mustard family (Brassicaceae) that blooms from March to July (CNPS 2016b). This species occurs on inland marine sands (Zayante sands) in chaparral and lower montane coniferous forest from 394 to 2001 feet in elevation (CDFW 2016a, CNPS 2016b). The range of this California endemic spans three USGS 7.5-minute quadrangles in Santa Cruz County (CNPS 2016b). Development, sand mining, and vandalism pose serious threats to the species (CNPS 2016b). This species was determined to be unlikely to occur within the Project Area due to a lack of suitable substrate (Zayante sands). Although potentially suitable substrate may be present within the larger San Vicente Redwoods property, it is unlikely to occur within the Project Area.

Santa Cruz cypress (*Hesperocyparis abramsiana* var. *abramsiana*); Federal Endangered, State Endangered, Rank 1B.1. Santa Cruz cypress is an evergreen, coniferous tree in the cypress family (Cupressaceae) with an elevational range of approximately 920 to 2650 feet (CNPS 2016b). This species is not a flowering plant and does not bloom, but produces male and female cones on the same plant and remnants, early cones, and/or open cones of one or both sexes should be visible on reproductive individuals year-round (i.e., the species is identifiable year-round). Santa Cruz cypress occurs in closed-cone coniferous forests, chaparral, and lower montane coniferous forests in areas underlain with sandstone-derived or granitic soils (CDFW 2016a, CNPS 2016b). The species is endemic to California and is known from less than ten natural populations in four USGS quadrangles in San Mateo and Santa Cruz counties (CNPS 2016b). This species may be threatened by development, agriculture, alteration of fire regimes, and introgression from the closely related species Monterey cypress (*H. macrocarpa)* (CNPS 2016b), which is planted as a common ornamental tree in the area. Although this species has been documented from the immediate vicinity of the Project Area along Empire Grade Road, WRA received anecdotal evidence that the population has been extirpated (Nadia Hamey, Big Creek forester, personal communication to Matthew Richmond, April 6, 2016). Moreover, this species is identifiable year-round, but was not observed during surveys within the Project Area. As such, this species was determined to be not present within the Project Area.

Butano Ridge cypress (*Hesperocyparis abramsiana* var. *butanoensis*); Federal Endangered, State Endangered, Rank 1B.1. Butano Ridge cypress is an evergreen, coniferous tree in the cypress family (Cupressaceae) with an elevational range of approximately 920 to 2650 feet (CNPS 2016b). This species is not a flowering plant and does not bloom, but produces male and female cones on the same plant and remnants, early cones, and/or open cones of one or both sexes should be visible on reproductive individuals year-round (i.e., the species is identifiable year-round). Butano Ridge cypress occurs in closed-cone coniferous forests, chaparral, and lower montane coniferous forests in areas underlain with sandstone-derived soils (CDFW 2016a, CNPS 2016b). The species is endemic to California and is known from Butano Ridge (CNPS 2016b), located over 8 miles from the Project Area. This species may be threatened by alteration of fire regimes and recreation (CNPS 2016b). This species was determined to be unlikely to occur within the Project Area based on its hyperlocal occurrence on Butano Ridge. Moreover, the species is identifiable year-round, but was not observed during surveys within the Project Area. As such, this species was determined to be not present within the Project Area.

Santa Cruz tarplant (*Holocarpha macradenia*); Federal Threatened, State Endangered, Rank 1B.1. Santa Cruz tarplant is an annual herb from the sunflower family (Asteraceae) that blooms from June to October (CNPS 2016b). The species is found on grassy coastal terraces at elevations ranging from 33 to 726 feet (CDFW 2016a, CNPS 2016b). Suitable habitats include coastal prairie, coastal scrub, and valley and foothill grasslands (CDFW 2016a, CNPS 2016b). This species often occurs on moderately disturbed, sandy or clay soils (CNPS 2009). However, specific microhabitat preferences for this plant are not well known and some populations described in the CNDDB occur on loamy soils (CDFW 2016a). The only remaining natural occurrences are known from Santa Cruz and Monterey counties, and the species has been largely extirpated from Marin, Contra Costa, and Alameda counties (CNPS 2016b). Extant populations in Solano County are recent re-introductions; most re-introduced populations have failed (CNPS 2016b). This species is severely threatened by urbanization, agriculture, and non-native plants and also depends on appropriate ecological disturbance for persistence in an area, which may be lacking from many areas (CNPS 2016b). This species was determined to be unlikely to occur within the Project Area due to a lack of suitable coastal terrace, coastal prairie, coastal scrub, and valley and foothill grassland habitats.

White-rayed pentachaeta (*Pentachaeta bellidiflora*); Federal Endangered, State Endangered, Rank 1B.1. White-rayed pentachaeta is an annual herb in the sunflower family (Asteraceae) that blooms from March to May (CNPS 2016b). The species occurs in cismontane woodlands and valley and foothill grassland habitats at elevations of approximately 115 - 2050 feet (CDFW 2016a, CNPS 2016b). When occurring in grassy habitats, this species is often found on serpentine-derived substrates (CNPS 2016b). Within other habitats, this species occurs on dry, rocky slopes (CDFW 2016a). White-rayed pentachaeta was known from 12 USGS 7.5-minute quadrangles in Marin, Santa Cruz, and San Mateo counties, but is now presumed extirpated from all historical locations except those in the Woodside quadrangle in San Mateo County. All of the previously known occurrences were lost to development, making this a major threat for the species. This species was determined to be unlikely to occur within the Project Area to a lack of suitable grassland habitat and dry, rocky openings within woodland habitat, in addition to being considered extirpated from the region.

Scotts Valley polygonum (*Polygonum hickmanii*); Federal Endangered, State Endangered, Rank 1B.1. Scotts Valley polygonum is an annual herb in the knotweed family (Polygonaceae) that blooms from May to August (CNPS 2016b). This species occurs on mudstone- and sandstone-derived substrates in valley and foothill grassland habitats from 689 to 820 feet in elevation. This California endemic is only known from two occurrences in Scotts Valley (CDFW 2016a). The species is threatened by development and invasive plants (CNPS 2016b). This species was determined to be unlikely to occur within the Project Area due to a general lack of grassland habitat.

5.2.2 Special-Status Wildlife

Seventy-seven special-status wildlife species have been recorded in the vicinity or have ranges that overlap with the Project Area based on a review of the resources outlined in Section 3.2.1. Figure 8 shows special-status wildlife species documented within 5 miles of the Project Area (CDFW 2016a). Appendix C summarizes the potential for each of these species to occur in the Project Area. Three special-status wildlife species were observed in the Project Area during the site assessment: oak titmouse (*Baeolophus inornatus*; USFWS Bird of Conservation Concern), San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*; CDFW Species of Special Concern), and California red-legged frog (*Rana draytonii*; Federal Threatened, CDFW Special of Special Concern). In addition to these three species, six special-status wildlife species were determined to have a high potential to occur in the Project Area, seven special-status wildlife species were determined to have a moderate potential to occur, and it was determined that the

Project Area contains designated Critical Habitat for California red-legged frog (*Rana draytonii*). The remaining 61 species documented from within the vicinity of the Project Area were determined to be unlikely or have no potential to occur. Special-status wildlife species observed during WRA's site visits and significant wildlife life habitat features (i.e., large, complex old-growth trees) that may support special-status species are shown on Figure 9.

Special-Status Wildlife Present within the Project Area

Oak titmouse (*Baeolophus inornatus*); USFWS Bird of Conservation Concern. This relatively common species is a year-round resident throughout much of California, including most of the coastal slope, the Central Valley, and the western Sierra Nevada foothills. In addition, the species may also occur in residential settings where landscaping provides foraging and nesting habitat. Its primary habitat is woodland dominated by oaks. Local populations have adapted to woodlands of pines and/or junipers in some areas (Cicero 2000). Oak titmouse nests in tree cavities, usually natural cavities or those excavated by woodpeckers, although they may partially excavate their own cavities (Cicero 2000). Seeds and arboreal invertebrates comprise the bird's diet. This species was observed foraging within various forest and edge habitat throughout the Project Area. Impacts to this species may be considered significant under the CEQA.

San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*); CDFW Species of Special Concern. This subspecies of the dusky-footed woodrat occurs in the Coast Ranges between San Francisco Bay and the Salinas River (Matocq 2003). Occupied habitats are variable and include forest, woodland, and chaparral habitats, including riparian areas. Woodrats feed on woody plants, but will also consume fungi, grasses, flowers, and acorns. Foraging occurs on the ground and in bushes and trees. This species constructs robust stick houses/structures, also referred to as middens, in areas with moderate cover and an understory containing woody debris. Breeding takes place from December to September. Individuals are active year-round and are generally nocturnal.

This species was observed within the Project Area and large stick houses (i.e., middens) were found to be prolific throughout the Project Area, but concentrated in the northern portion of the main parcel. Middens were commonly found in every terrestrial/upland biological community within the Project Area, and were frequently encountered in high density. Surveyors mapped 1,815 middens within 25-feet on either side of the proposed trail alignment and within the proposed parking area and an associated 25-foot buffer (Figure 9). Based on the representative densities of woodrat middens within the Project Area (approximately 8.7 middens per acre), it is estimated that the greater San Vicente Redwoods site may harbor as many as 74,000 woodrat nests. Based on a 5-foot wide trail and 1 foot of vegetation clearance on either side (7 feet total disturbance), it is estimated that up to 144 woodrat middens could be directly impacted by trail construction. However, such impacts are theoretical given that there is flexibility to move the trail anywhere within the 50-foot-wide band surveyed for this report. Impacts to dusky-footed woodrat species must be considered under the CEQA; however, given the large number of middens potentially present at the site and the minor number of middens that would be directly impacted by trail construction, such impacts would clearly not threaten the existence of the species at the site and therefore should not be considered significant under the CEQA.

California red-legged frog (*Rana draytonii*); Federal Threatened, CDFW Species of Special Concern. The California red-legged frog (CLRF) is dependent on suitable aquatic, estivation, and upland habitats. During the rainy season, starting with the first rainfall in late fall, red-legged frogs disperse away from their estivation sites to seek suitable breeding habitat. Dispersal is more prevalent during wet weather such as during rain or heavy fog. Aquatic and breeding habitats are characterized by dense, shrubby, riparian vegetation and deep, still or slow-moving water. Breeding occurs between late November and late April. California red-legged frogs estivate (a period of inactivity similar to hibernation) during the dry months in small mammal burrows, moist leaf litter, incised stream channels, and large cracks in the bottom of dried ponds.

This species has been documented to occur within the larger San Vicente Redwoods property, and the Project Area contains Critical Habitat for the species (Unit SCZ-1; see Section 4.2.3 for a discussion of CRLF Critical Habitat). A CRLF occurrence from 1997 is located adjacent to the Project Area, and there are many additional documented occurrences within 2 miles of the Project Area (CDFW 2016a). Although no suitable breeding habitat was observed (i.e., no slow or standing water with adequate depth to support breeding), the Project Area provides potential dispersal and aquatic non-breeding habitat that may support the species. During a June 2017 site visit WRA biologists observed an adult CRLF in a shallow pool along an existing road within the proposed alignment (Figure 9). The Project Area is located within dispersal distance of known occurrences. Although the species is unlikely to breed within the Project Area, it may occur seasonally, during dispersal events.

<u>Special-Status Wildlife with High Potential to Occur within the Project Area</u>

Townsend's big-eared bat, (*Corynorhinus townsendii townsendii*); State Candidate, CDFW Species of Special Concern, WBWG High Priority. This species ranges throughout western North America, from British Columbia to central Mexico. Its local distribution is strongly associated with the presence of caves, but roosting also occurs within human-made structures, including mines and buildings. While many bats species wedge themselves into tight cracks and crevices, big-eared bats hang from walls and ceilings in the open. Males roost singly during the spring and summer months whereas females aggregate at maternity roosts to give birth in the spring. Females roost with their young until late summer or early fall, until the young become independent, flying and foraging on their own. In central and southern California, hibernation roosts tend to be composed of small aggregations of individuals (Pierson and Rainey 1998). Foraging typically occurs along edge habitats near streams and wooded areas, where moths are the primary prey (WBWG 2015). This species has been documented roosting within cave habitat in close proximity to the Project Area and there are numerous occurrences documented within 5 miles of Project Area (CDFW 2016a). Therefore, the species was determined to have a high potential to occur within the Project Area. Impacts to this species could be considered significant under the CEQA.

Marbled murrelet (*Brachyramphus marmoratus*); Federal Threatened, State Endangered. The marbled murrelet is a small seabird that breeds up to 30 miles inland from the coast on large limbs of redwood and Douglas fir trees. At sea, it feeds on small fish near the shore and travels from nesting sites to feed at the coast at dawn and dusk during the breeding season. Breeding requirements for this species are not well documented in the southern portion of its range; however, it appears that dense, humid coastal forests of old-growth trees are necessary for breeding. The breeding range of the marbled murrelet in California is considered to be split, with the majority of the population breeding within the extreme northwest portion of its range (i.e., Oregon border south to Eureka) and a smaller population breeding south of San Francisco (Pillar Point south to Santa Cruz) (Small 1994).

There are numerous occurrences of this species documented throughout the Santa Cruz Mountains, the closest of which are located approximately 1 mile to the west and 1.9 miles to the east of the Project Area (CDFW 2016a). Critical Habitat for the species is also located approximately 1.2 miles south (Unit CA-15) and 2.4 miles north (Unit CA-14-b). Within the Project Area, several stands of old-growth redwood occur and provide potentially suitable nesting habitat for the species. Several large old-growth trees with complex canopy structures have also been documented within the Project Area and are shown on Figure 9. Therefore, although the species has not been documented within the Project Area, nor does the Project Area contain Critical Habitat, the presence of trees that could support potentially suitable nesting habitat and the proximity of known occurrences and designated Critical Habitat gives this species a high potential to occur within the greater Project Area.

Vaux's swift (*Chaetura vauxi*); CDFW Species of Special Concern. The Vaux's swift is a summer resident in California, breeding on the coast from central California northward and in the Cascade and Sierra Nevada ranges. Nesting occurs in large, accessible, chimney-like tree cavities that allow birds to fly within the cavity directly to secluded nest sites. Such cavities usually occur in conifers, especially old-growth redwoods (Shuford and Gardali 2008). Chimneys and similar human-made substrates are also used for nesting. This species is highly aerial and forages widely for insects in areas of open airspace. During migration, nocturnal roosting occurs communally and favored sites may host thousands of individuals. Within the Project Area, large stands of coniferous forest with complex canopies and snags occur throughout and provide potentially suitable nesting and foraging habitat. Due to presence of available nesting and foraging habitat, this species was determined to have a high potential to occur within the Project Area.

Allen's hummingbird (*Selasphorus sasin*); USFWS Bird of Conservation Concern. Allen's hummingbird, common in many portions of its range, is a summer resident along the majority of California's coast and a year-round resident in portions of coastal southern California and the Channel Islands. Breeding occurs in association with the coastal fog belt, and typical habitats used include coastal scrub, riparian habitat, woodland and forest edges, and eucalyptus and cypress groves (Mitchell 2000). The species feeds on nectar, as well as insects and spiders. Within the Project Area, mature oaks, riparian woodland, and edge habitat provide potentially suitable nesting habitat, and thus, the species was determined to have a high potential to occur.

Nuttall's woodpecker (*Picoides nuttallii*); USFWS Bird of Conservation Concern. Nuttall's woodpecker, common in much of its range, is a year-round resident throughout most of California, west of the Sierra Nevada Range. Typical habitat is oak or mixed woodland, and riparian areas (Lowther 2000). Nesting occurs in tree cavities, principally those of oaks and larger riparian trees. Nuttall's woodpecker also occurs in older residential settings and orchards where trees provide suitable foraging and nesting habitat. This species forages on a variety of arboreal invertebrates. Within the Project Area, mature oaks and riparian woodland provide potentially suitable nesting habitat, and thus, the species was determined to have a high potential to occur.

Olive-sided flycatcher (*Contopus cooperi*); USFWS Bird of Conservation Concern, CDFW Species of Special Concern. This species is found within the coniferous forest biome, most often associated with forest openings, forest edges near natural openings (e.g., meadows, canyons, rivers) or human-made openings (e.g., harvest units), or open to semi-open forest stands (Altman and Sallabanks 2000). The species is most numerous in montane coniferous forests where tall trees overlook canyons, meadows, lakes, or other open terrain. Within the Project Area, mixed conifer, redwood, pine forest, and edge habitats may provide suitable nesting habitat for this species. The species has also been observed frequently along roads surrounding the Project Area (eBird 2016). Therefore, this species was determined to have a high potential to occur within the Project Area.

<u>Special-Status Wildlife with Moderate Potential to Occur within the Project Area</u>

Hoary bat (*Lasiurus cinereus*); WBWG Medium Priority. Hoary bats are highly associated with forested habitats in the western United States, particularly in the Pacific Northwest. They are a solitary species and roost primarily in foliage of both coniferous and deciduous trees, near the ends of branches, usually at the edge of a clearing. Roosts are typically located 10 to 30 feet above the ground. They have also been documented roosting in caves, beneath rock ledges, in woodpecker holes, in grey squirrel nests, under driftwood, and clinging to the side of buildings, although the latter behavior is not typical. Hoary bats are thought to be highly migratory; however, wintering sites and migratory routes have not been well documented. This species tolerates a wide range of temperatures and has been captured at air temperatures between 0 and 22 degrees Celsius. Hoary bats probably mate in the fall, with delayed implantation leading to birth in May through July. They usually emerge late in the evening to forage, typically from just over one hour after sunset to after midnight. This species reportedly has a strong preference for moths, but is also known to eat beetles, flies, grasshoppers, termites, dragonflies, and wasps (WBWG 2015). This species has been documented to occur within 3.75 miles of the Project Area (CDFW 2016a). Within the Project Area, mature conifer and broadleaf trees have the potential to support roosting sites. Therefore, this species was determined to have a moderate potential to occur within the Project Area.

Pallid bat (*Antrozous pallidus*); CDFW Species of Special Concern, WBWG High Priority. Pallid bats are distributed from southern British Columbia and Montana to central Mexico and east to Texas, Oklahoma, and Kansas. This species occurs in a number of habitats ranging from rocky, arid deserts to grasslands and into higher-elevation coniferous forests. They are most abundant in the arid Sonoran life zones below 6,000 feet in elevation, but have been found at elevations of up to 10,000 feet in the Sierra Nevada. Pallid bats often roost in colonies of between 20 and several hundred individuals. Roosts are typically located in rock crevices, tree hollows, mines, caves, and a variety of human-made structures, including vacant and occupied buildings. Tree roosting has been documented in large conifer snags, inside basal hollows of redwoods and giant sequoias, and within cavities in large oak trees. Pallid bats are primarily insectivorous, feeding on large prey that is usually taken on the ground, but also sometimes in flight. Prey items include arthropods such as scorpions, ground crickets, and cicadas (WBWG 2015). This species has been documented from within 3.75 miles of the Project Area (CDFW 2016a). Cavities within large, mature trees within the Project Area may provide potential roost habitat for pallid bat. Additionally, higher-quality rock outcroppings and cave features that may have the potential to support roosting sites are known to occur within the larger San Vicente Redwoods property, in close proximity to the Project Area. Therefore, this species was determined to have a moderate potential to occur within the Project Area.

Western red bat (*Lasiurus blossevillii*); CDFW Species of Special Concern, WBWG High Priority. This species is highly migratory and broadly distributed, ranging from southern Canada through much of the western United States. Western red bats are believed to make seasonal shifts in their distribution, although there is no evidence of mass migrations (Pierson et al. 2006). They are typically solitary, roosting primarily in the foliage of trees or shrubs. Day roosts are commonly located in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas, possibly in association with riparian habitat (particularly willows, cottonwoods, and sycamores) (Pierson et al. 2006). It is believed that males and females maintain different distributions during pupping, where females take advantage of warmer inland areas and males occur in cooler areas along the coast. The Project Area contains potentially suitable maternity roosting habitat within riparian habitats along streams. Suitable foraging habitat is supported within and adjacent to streams throughout the Project Area. Although perennial streams and associated well-developed riparian habitat are not present within the Project Area, the species may utilize the Project Area for roosting and foraging, and therefore was determined to have a moderate potential to occur.

Silver-haired bat (*Lasionycteris noctivagans*); WBWG Medium Priority. Silver-haired bats occur in temperate conifer, mixed-conifer, and deciduous forests from southern Alaska to northeastern Mexico. Females form maternity roosts almost exclusively inside hollows or under loose bark of large trees and may switch roosts multiple times (WBWG 2015). Hibernation occurs in trees, rock crevices, leaf litter, in and under buildings, and in caves and mines. Foraging occurs above the tree canopy where the silver-haired bat preys on insects. Silver-haired bats are known to migrate south in the winter, although overwintering at northern latitudes has also been documented (WBWG 2015). The Project Area may contain potentially suitable maternity roosting habitat within mixed conifer forest. Suitable foraging habitat may be supported within and adjacent to streams throughout the Project Area. Therefore, this species was determined to have a moderate potential to occur.

Fringed myotis (*Myotis thysanodes*), WBWG High Priority. The fringed myotis ranges through much of western North America from southern British Columbia, Canada, south to Chiapas, Mexico and from Santa Cruz Island in California, east to the Black Hills of South Dakota. This species is found in desert scrubland, grassland, sage-grass steppe, old-growth forest, and subalpine coniferous and mixed deciduous forests. Oak and pinyon-juniper woodlands are most commonly used. The fringed myotis roosts in colonies from 10 to 2,000 individuals, although large colonies are rare. Caves, buildings, underground mines, crevices in cliff faces, and bridges are used for maternity and night roosts, whereas hibernation has only been documented in buildings and underground mines. Tree-roosting has also been documented in Oregon, New Mexico, and California (WBWG 2015). Within the Project Area, roosting habitat may occur in the large stands of conifer and hardwood forest habitat; however, higher quality roost habitat may be found in cave and cliff habitats that occur near the San Vicente Quarry in the southern portion of the larger site. The species is likely to forage over the Project Area, and based on the proximity to roost habitat, the species was determined to have a moderate potential to occur.

Ring-tailed cat (*Bassariscus astutus*); CDFW Fully Protected Species. The ring-tailed cat is an uncommon but widespread resident of California, excluding the Central Valley, south to Mexico. This species is found in remote riparian habitats, rocky canyons, and stands of forest and shrub habitats that contain trees, brush, and rock crevices for cover. This species is also usually found within 0.6 mile of water (Zeiner et al. 1990). Hollow trees, snags, rock crevices, and other cavities are used for cover and nesting. Ring-tailed cats are primarily carnivorous and mostly nocturnal. Within the Project Area, wooded habitat of varying composition could support the species and its foraging needs. The Project Area is also surrounded by large tracts of undeveloped forest, which provides a habitat corridor for the species. Although perennial water sources were not observed within the Project Area, seasonal streams may make portions of the Project Area more suitable under during different periods of the year. Based on these conditions, it was determined that this species has a moderate potential to occur.

Purple martin (*Progne subis*); CDFW Species of Special Concern. Purple martin is an uncommon summer resident in California, occurring in woodlands and low-elevation hardwood and coniferous forests. It usually feeds on insects captured in flight 100 to 200 feet above the ground. Purple martin nests in cavities often located in tall, isolated trees or snags in open forest or woodland habitats. The Project Area contains large tracts of coniferous forest that may provide suitable nesting habitat for this species. This species has been observed east of the Project Area, in the Bonny Doon Ecological Reserve (eBird 2016). Foraging habitat is also likely to be supported above the tree canopy above Project Area. Due to the dominance of coniferous forest habitat within the Project Area, this species was determined to have a moderate potential to occur.

Mountain Lion and Wildlife Corridors

While not protected by the CESA or the ESA, the 1990 California Wildlife Protection Act prohibits sport hunting of mountain lion (*Puma concolor*) in California. These top predators serve an important ecological role within the region, and while mountain lion are primarily solitary, individuals exhibit localized approaches to foraging and spatial use (Allen et al. 2015). Mountain lion are active year-round and tend to hunt and move between the hours of dawn and dusk; however, mountain lions have been found to opportunistically hunt during daytime hours when prey is available (Allen et al. 2015). This carnivore is primarily an ambush hunter, and feeds mainly on black-tailed deer, but will also take a number of species including rabbit, rodents, turkey, and various smaller predators including coyote and raccoon. Mountain lions are capable of breeding any time of year, but kittens are typically born in June or July in dens such as a shallow cave, rock overhang, or area of dense vegetation.

Mountain lions maintain large home ranges, with females utilizing areas 3 to 12 square miles and males occupying habitats from 25 to 96 square miles (CDFW 2016a). Population densities for mountain lions have been found to vary from 0.37 individuals per 100 square kilometers in resource-limited portions of Utah up to 3.6 individuals per 100 square kilometers in coastal California (Allen et al. 2015). Whereas home range size and habitat use vary based on prey availability, illegal hunting has also been found to result in lower population densities (Allen et al. 2015).

The species is well documented within the Santa Cruz Mountains, as UC Santa Cruz and the CDFW have collaborated on tracking studies with radio-collared individuals to better understand their movement and the status of the population. Sign from this species (i.e., scrapes, tracks, and scat) was observed during WRA's fieldwork, and the Santa Cruz Puma Project has documented radio-collard individuals moving through the Project Area.

The Project Area is known to support mountain lions and is located within an area identified by the CDFW as a wildlife corridor and part of the essential connectivity for this species (CDFW 2014). Maintaining large, interconnected tracks of contiguous forest habitats allows the movement of mountain lion, their prey, and other native species. Because of the ecological importance mountain lion play within the region and the critical role wildlife corridors play in facilitating the movement of native species, wildlife corridors are considered a significant resource under the CEQA, and the potential impact of the Project on wildlife corridors is discussed in more detail in Section 6.3.7.

Federally Listed Wildlife that Occur in the Region but are Unlikely to Occur in the Project Area

Federally listed species that have been documented to occur within the vicinity or adjacent to the Project Area but which are unlikely to occur there include: least Bell's vireo (*Vireo bellii pusillus*), steelhead Central California Coast DPS (*Oncorhynchus mykiss*), and Central California Coast Ecologically Significant Unit (ESU) of Coho salmon (*Oncorhynchus kisutch*). These species are discussed below (also see Appendix C).

Least Bell's vireo (*Vireo bellii pusillus*); Federal Endangered, State Endangered, CDFW Species of Special Concern. This subspecies of Bell's vireo is a neotropical migrant and summer resident in California and northern Baja California, wintering in southern Baja California (Brown 1993). Nesting occurs in riparian areas in the vicinity of water or in dry river bottoms. Nests are often located along margins of bushes or on twigs projecting into pathways, usually on species such as willow, coyote brush, or mesquite. This vireo was once common in lowland riparian habitats throughout California but declined precipitously during the twentieth century

(USFWS 1998). By the time its federal listing in 1986, the population was restricted to an estimated 300 pairs in southern California, primarily in San Diego County (USFWS 1998). The population has increased since that time, with the number of nesting territories in the state in 2006 estimated to be approximately ten times greater than in 1986 (USFWS 2006). However, the distribution of the vireo at that time remained almost entirely within southern California (USFWS 2006). This species was determined to be unlikely to occur within the Project Area due to the absence of suitable riparian and scrub habitats required by the species for nesting. Furthermore, the species is not known to nest or occur within the Santa Cruz Mountains.

Steelhead - Central California Coast DPS (*Oncorhynchus mykiss irideus*), Federal Threatened. The Central California Coast distinct population segment (DPS) of steelhead includes all naturally spawned populations of steelhead (and their progeny) in California streams from the Russian River to Aptos Creek, and the drainages of San Francisco and San Pablo Bays eastward to the Napa River (inclusive), excluding the Sacramento-San Joaquin River Basin. Steelhead typically migrate to marine waters after spending two years in freshwater, although they may stay in freshwater for up to seven years. They then reside in marine waters for 2 or 3 years prior to returning to their natal stream to spawn as 4- or 5-year-olds. Steelhead adults typically spawn between December and June. In California, females typically spawn two times before they die. Preferred spawning habitat for steelhead includes perennial streams with cool to cold water, high dissolved oxygen levels, and fast-flowing water. Abundant riffle areas (i.e., shallow areas with gravel or cobble substrate) for spawning and deeper pools with sufficient riparian cover for rearing are necessary for successful breeding. This species is known to occur within the mainstem of San Vicente Creek, up to the quarry tunnel and the lower reaches of Mill Creek; however, partial fish passage barriers, narrow, steep channels, and the ephemeral nature of the streams within the Project Area make it unlikely for this species to occur (ESA 2012; Ross Taylor and Associates 2004). Similarly, a natural fish passage barrier on Laguna Creek, downstream of the Laguna Parcel, precludes the presence of steelhead in that reach of Laguna Creek Ross Taylor and Associates 2004). Given these reasons, it was determined that steelhead are unlikely to occur within the Project Area.

Coho Salmon - Central California Coast ESU (Oncorhynchus kisutch), Federal Endangered, State Endangered. The Central California Coast ESU of Coho salmon includes all naturally spawned populations of Coho salmon (and their progeny) in California streams from the Eel River to Aptos Creek, including the Russian River and its tributaries, excluding the Sacramento-San Joaquin River Basin. Coho salmon typically migrate in late fall to early winter to spawn in smaller coastal streams. Spawning migration, known as “runs”, occur throughout the year. Spawning occurs mainly between November and January, but can occur as late as March during drought conditions. Juveniles may spend several years in the freshwater habitat before migrating to the ocean. Most adult fish return “home”, maintaining fidelity to their natal stream. Preferred spawning habitat for Coho salmon is small freshwater streams with cool to cold water temperature, medium to small gravel substrate, and high dissolved oxygen levels at the head of a riffle where water changes from laminar flow to turbulent flow (providing greater dissolved oxygen). Abundant riffle areas (i.e., shallow areas with gravel substrate) for spawning and deeper pools with sufficient riparian cover for rearing are necessary for successful breeding. This species is known to occur within the mainstem of San Vicente Creek, up to the quarry tunnel and the lower reaches of Mill Creek; however, fish passage barriers, narrow, steep channels, and the ephemeral nature of the streams make the Project Area unsuitable for the species (ESA 2012). Similarly, a natural fish passage barrier on Laguna Creek prevents the occurrence of Coho salmon within the Laguna parcel (Ross Taylor and Associates 2004).

5.2.3 Critical Habitat

Based on WRA's review of the USFWS Critical Habitat Mapper (USFWS 2016b), it was determined that the Project Area contains Critical Habitat for CRLF. There are four physical and biological features, formerly referred to as PCEs, that are considered to be essential for the conservation or survival of a species. The features for the CRLF include: aquatic breeding habitat; non-breeding aquatic habitat; upland habitat; and dispersal habitat (USFWS 2010).

Aquatic breeding habitat consists of low-gradient fresh water bodies, including natural and manmade (e.g., stock) ponds, backwaters within streams and creeks, marshes, lagoons, and dune ponds. It does not include deep water habitat, such as lakes and reservoirs. Aquatic breeding habitat must hold water for a minimum of 20 weeks in most years. This is the average amount of time needed for egg, larval, and tadpole development and metamorphosis so that juveniles can become capable of surviving in upland habitats (USFWS 2010).

Aquatic non-breeding habitat may or may not hold water long enough for this species to hatch and complete its aquatic life cycle, but it provides shelter, foraging, predator avoidance, and aquatic dispersal habitat for juvenile and adult CRLF. These waterbodies include plunge pools within intermittent creeks; seeps; quiet water refugia during high water flows; and springs of sufficient flow to withstand the summer dry period. The third habitat type is upland habitats, which include areas within 300 feet of aquatic and riparian habitat and are composed of grasslands, woodlands, and/or vegetation that provides shelter, forage, and predator avoidance. Upland habitat can include structural features such as boulders, rocks, and organic debris (e.g., downed trees), as well as small mammal burrows and moist leaf litter (USFWS 2010). Finally, dispersal habitat includes accessible upland or riparian habitats between occupied locations within 0.7 mile of each other that allow for movement between these sites. Although California red-legged frog is highly aquatic, this species has been documented to make overland movements of several hundred meters and up to one mile during a winter/spring wet season in Northern California (Bulger et al. 2003, Fellers and Kleeman 2007) and 2,860 meters (1.8 miles) in the central California coast (Rathbun and Schneider 2001).

The Project Area does not contain aquatic breeding habitat for CRLF; however, the Project Area may provide dispersal habitat to off-site breeding features. Additionally, intermittent drainages within the Project Area may be considered seasonal aquatic non-breeding habitat by the USFWS; associated areas within 300 feet of seasonal aquatic non-breeding habitat would be considered upland foraging habitat.

5.3 Protected Trees

Although a tree survey was not conducted for this report, any tree located within one of the sensitive habitats described in Section 4.1.2 may be protected by the County. A tree removal permit may be required for the removal of such trees.

6.0 PROJECT DESCRIPTION

The Draft Public Access Plan outlines a site-wide, programmatic approach to public access for recreation at the San Vicente Redwoods. The Plan outlines goals and policies related to public access, access plans for recreation, an implementation plan, and design and maintenance guidelines. This report focuses on the trail network and attendant features described in the Draft Public Access Plan (PlaceWorks 2018), and more specifically on the trail segments shown on Figure 2.

Under the Draft Public Access Plan, a network of approximately 38 miles of trails will be constructed as part of the overall proposed Project. The trail network will include a combination of single- and multi-use trails which will allow public access for the following allowable uses:

- Hiking
- Biking
- Horse riding
- Dog walking (on-leash only)
- Picnicking and small group gatherings
- Nature observation

These uses will be allowed during daylight hours only, except on a limited basis by permit.

Prohibited uses will include:

- Smoking
- Unpermitted alcohol use
- Fire making
- Collecting
- Hunting
- Fishing
- Off-road vehicles or motorized dirt biking
- Rock climbing
- Rappelling
- Caving

Key design goals for the development of the trail network include the following:

- Provide for a variety of experiences through different habitats
- Concentrate loop trails in the northern part of the property, where they can be accessed from the Empire Grade staging area(s)
- Establish through-trails connecting the Empire Grade staging areas down to the Coast Dairies property
- Provide buffers around private property
- Accommodate other property uses, including timber harvest and research uses
- Avoid, to the extent possible: neighbor views, safety hazards, and impacts to sensitive resources including water sources, mountain lions, and cultural resources
- Allow for sustainable trail grades and orientation. Use of existing roads as recreational trails should be limited to roads identified as suitable (grades under 15 percent and without fall-line alignment) where possible, and new trail construction should emphasize narrow trails and should result in separate use trails

The Draft Public Access Plan will be implemented in two phases: an initial 10-mile set of multi-use trails easily accessible from the proposed parking and staging area adjacent to Empire Grade Road. Hiking, horse riding, and mountain biking would be allowed on the Phase I trails, with dog walking limited to a frontage trail that parallels Empire Grade Road. Implementation of the Phase I trails is expected to occur over a 1- to 3-year period. Phase II will include approximately 9-11 additional miles of trails to be implemented over a 2- to 3-year period, as well as an expansion of the staging and parking area adjacent to Empire Grade Road. Phase III will include approximately 16-19 additional miles of trails over a 2- to 3-year period.

During the phased implementation of the Draft Public Access Plan, trail use for all phases will be approximately 35% horse/hike, 40% horse/bike, 25% hike/horse/bike with 1.5 miles of the hike/horse/bike trails allowing dog walking.

In conjunction with the construction of the Phase I trails, a staging area will be constructed along Empire Grade Road, as shown on Figure 2. The staging area will initially have space for at least 45 cars and may be expanded in later phases of the proposed Project. Staging areas may include entry gates, signage, informational kiosks, benches, picnic area/gathering area, trash and recycling receptacles, dog-courtesy stations and restrooms (composting or pump-out toilets).

Trail dimensions will be determined based on the type (or use) of trail as shown on Table 4. Additional details regarding specific design specifications or construction methods are provided in the Draft Public Access Plan. Most trail construction will occur by hand with limited use of heavy machinery or vehicles; the use of the latter would be limited to areas with existing vehicular access (e.g., on former logging roads). However, it is expected that construction of the parking area adjacent to Empire Grade Road will entail the use of standard construction machinery and equipment.

Table 4. Trail Dimensions by Type

Trail Type	Constructed Tread Width	Vegetation Clearance
Accessible Trails	5 feet +	2 feet horizontal 10 feet vertical
Multi-Use Trails	5 feet +	1 foot horizontal 10 feet vertical
Equestrian and Hiking Trails	2 to 5 feet	1 foot horizontal 10 feet vertical
Mountain Biking and Hiking Trails	2 to 4 feet	1 foot horizontal 10 feet vertical

7.0 POTENTIAL IMPACTS, MINIMIZATION, AND AVOIDANCE MEASURES

As described in Section 5.0, the proposed Project entails the construction of approximately 38 miles of recreational trails and an associated 4.7-acre parking area. To the extent feasible, trails and the parking area have been located in non-sensitive habitat and have been designed to have minimal impact on the land and the sensitive biological resources that may occur there. Although the proposed Project covers a large amount of undeveloped land in an area with a rich diversity of biological resources, the proposed Project is relatively minimal in scope and is not expected to result in significant adverse impacts to sensitive resources. The following sections discuss potential impacts to sensitive biological resources associated with the proposed trail alignment (including both initial construction and subsequent use and maintenance) and provide recommended avoidance and minimization measures. With the implementation of these measures, WRA believes that the proposed Project will not result in significant adverse impacts to the environment.

7.1 Sensitive Biological Communities

A range of sensitive terrestrial and aquatic biological communities occur within the Project Area, including: madrone forest, tanoak forest, coast live oak woodland, canyon live oak forest, redwood forest, California bay forest, Anderson's manzanita chaparral (not described in the literature), brittle leaf manzanita chaparral, seasonal wetlands, shrub-scrub wetlands, and streams (including limited riparian vegetation). The proposed trail network has the potential to impact these communities through both initial trail construction and subsequent use and maintenance.

7.1.1 Sensitive Terrestrial Communities

Biology Impact 1

The proposed trail network and staging area have the potential to directly impact sensitive terrestrial communities through removal of vegetation and grading activities during construction, as well as by subsequent damage (e.g., trampling) from pedestrians, cyclists, equestrians, or dogs. The proposed Project also has potential to indirectly impact sensitive terrestrial communities through compaction, erosion, and other disturbances caused by pedestrians, cyclists, horses, or dogs. This may include the introduction of invasive weeds or plant diseases (e.g., sudden oak death or other *Phytophthora*-related diseases) which could adversely affect susceptible species. With the implementation of the minimization measures listed below, WRA believes that the project will not result in any significant adverse impacts to sensitive terrestrial communities within the Project Area.

Biology Minimization Measure 1A

Given the widespread nature of sensitive terrestrial communities, protective fencing or flagging is not practical or feasible (fencing or flagging is recommended for occurrences of Anderson's manzanita chaparral due its dual role as a special-status plant; see Section 6.2). However, to minimize impacts to sensitive vegetation, the work area, including any staging areas, should be minimized to the fullest extent feasible and trails should be the minimum width necessary to support the proposed use (i.e., hiking, cycling, horse riding) as defined in the Draft San Vicente Redwoods Public Access Plan (PlaceWorks 2018).

Biology Minimization Measure 1B

To minimize inadvertent impacts to sensitive vegetation, all construction personnel should be educated on the sensitivity of the biological communities and species at the site and the importance of minimizing impacts to vegetation outside of the work area. This should occur prior to the start the construction for each phase of trail and staging area construction during a pre-construction environmental awareness training by a qualified, County-approved biologist and given to all construction personnel working on the proposed Project. A designated staff member from the contractor's crew should provide follow-up training to any employees who begin work after the initial pre-construction training.

The training should include a photograph and/or description of sensitive communities and species at the site, measures being taken to avoid or reduce impacts to the community, reporting and follow-up actions if sensitive communities are impacted, and the worker's responsibility under the applicable environmental regulation(s).

Biology Minimization Measure 1C

To minimize removal of sensitive vegetation, trails should be routed around sensitive vegetation to the fullest extent feasible. At a minimum, the full width of the trail (i.e., the full extent of vegetation removal and ground disturbance during construction) should avoid the dripline of sensitive vegetation, with greater separation between the trail and sensitive vegetation being preferred. If trails are re-routed, they should be re-routed downslope of any sensitive vegetation to avoid causing erosion or sedimentation issues which could be detrimental to sensitive vegetation. If other considerations such as slope or soil stability make it impossible to avoid sensitive vegetation, a qualified, County-approved biologist should develop appropriate mitigation measures based on the type of sensitive vegetation, the size of the impact, and the likelihood of success with various mitigation approaches such as transplantation, propagation, or habitat enhancement. Mitigation measures for unavoidable impacts should be approved by the County prior to any removal of sensitive vegetation.

Biology Minimization Measure 1D

To avoid the introduction of invasive weeds or plant pathogens that could adversely impact sensitive vegetation, prior to arriving on the site all equipment and vehicles shall be inspected to ensure they are clean of any dirt or debris.

Biology Minimization Measure 1E

To minimize both construction-related and post-construction impacts to sensitive vegetation, trail design should incorporate the best available technology and industry-standard Best Management Practices (BMPs) to minimize the potential for detrimental impacts such as erosion or sedimentation and to minimize the need for future maintenance. Specific standards (including standard details) for trail construction are provided in the Draft San Vicente Redwoods Public Access Plan (PlaceWorks 2018).

Biology Minimization Measures 1F

To minimize effects on sensitive vegetation from erosion and sedimentation due to construction activities, all disturbed ground should be stabilized concurrent with trail construction. Stabilization methods may include: compacting the soil[1], covering disturbed soils with duff and leaf litter as well as branches removed for construction of trails, revegetation using appropriate native plant species, or use of other standard erosion control measures such as weed-free straw or hydromulch. If disturbed areas are to be revegetated, only native plants appropriate for the habitat should be used as outlined in Biology Minimization Measure 1H. If other erosion control materials are to be used, they should be certified weed-free and as otherwise specified in Biology Minimization Measures 1I.

Biology Minimization Measure 1G

To minimize the introduction of invasive plants or plant pathogens that could threaten sensitive vegetation, parking and staging areas should include signage or other materials aimed at instructing the general public on the potential threats associated with invasive plants, plant pathogens, and other pests of concern. These materials should include basic prevention methods that the general public can implement such as inspecting shoes and pet fur for weed seeds or avoiding the movement of plant material or soil from one area to another. This education signage should be in place prior to opening the trails for public access and should be maintained annually by the Public Access Manager to ensure that signage is not obstructed and is legible at all times.

[1] Although compaction may be used with any of the other soil stabilization measures, it is only suitable for use on its own on trail surfaces which typically would not be treated with other erosion control materials.

Biology Minimization Measure 1H

To minimize the introduction of invasive plant species and/or plant pathogens which could adversely impact sensitive vegetation, any restoration or landscape plantings (e.g., plantings around the proposed parking/staging area) should use native species appropriate for plant communities found at the site. To the extent feasible, plant material should be salvaged from trail construction activities at the site. If not possible, plant material should be propagated by a reputable nursery with protocols in place for minimizing the potential spread of *Phytophthora* or other plant diseases. Any propagated plant material should be sourced from as close to the site as possible, ideally from within the site itself.

Biology Minimization Measure 1I

To avoid the introduction of weed seed or plant pathogens that could adversely impact sensitive vegetation, the importation of soils for construction of the parking/staging area or other parts of the Project Area should be minimized to the fullest extent feasible. To the extent feasible, soils should be salvaged from onsite before being imported from offsite. If it is necessary to import soils, they should be certified weed-free and from a County-approved source with protocols in place for minimizing the potential spread of *Phytophthora* or other plant diseases.

Biology Minimization Measure 1J

To minimize impacts to sensitive vegetation from use of the trail network, the Trail Maintenance System should be implemented as described in Chapter 6 of the Draft San Vicente Redwoods Public Access Plan. The Trail Maintenance System includes an annual monitoring program aimed at identifying maintenance issues (e.g., erosion) and other problems (e.g., nuisance trash areas or other impacts from trail users). The Trail Maintenance System should include specific methods for routinely documenting and implementing the necessary maintenance by the Public Access Manager.

7.1.2 Sensitive Aquatic Communities

Biology Impact 2

The proposed trail network and staging area have the potential to directly affect sensitive aquatic communities that may be protected by the Clean Water Act or other Federal, State, or local laws through removal of vegetation, placement of fill, or other grading activities that could impact wetlands, the bed and bank of streams, or riparian vegetation. The proposed Project also has potential to indirectly impact sensitive aquatic communities through increased rates of erosion and sedimentation, the introduction of invasive weeds, and other disturbances from trail users or trail maintenance. The proposed trail network may entail minor impacts to vegetation within the buffers of Environmentally Sensitive Habitats protected under the County of Santa Cruz LCP; however, passive recreational trails are an allowed use within the riparian corridor. With the implementation of the minimization measures listed below, WRA believes that the proposed trail network will not have a significant adverse impact to any wetlands, streams, or their buffers/riparian corridor.

Biology Minimization Measure 2A

To minimize adverse impacts to sensitive aquatic communities, implement Biology Minimization Measures 1A through 1J.

Biology Minimization Measure 2B

To the extent feasible, wetlands and streams should be avoided by trail and staging area construction by a minimum of 100 feet. The jurisdictional boundaries of wetlands, within the 100-foot survey buffer, should be re-flagged in the field prior to construction by a qualified, County-approved individual and trails should be routed around these areas when possible. Trails should be routed downslope of wetland areas, if possible, to avoid the potential for detrimental erosion or sedimentation. When not possible, trails should be sited to avoid altering any obvious source of wetland hydrology and should be sloped downhill crossways so no water accumulates and instead flows off immediately. This avoids concentration of stormwater into "gutters" which then have to be discharged via water bars.

Crossings of regulated streams should be appropriately located to minimize impacts to riparian vegetation and to minimize the potential for long-term impacts to the stream. Trails should be routed in areas with less riparian vegetation to minimize the need for vegetation removal in these areas. Trails should also be located in areas that will minimize the potential for detrimental erosion or sedimentation. Stream crossings should be designed to minimize trail erosion following the specific standards for trail construction provided in the Draft Public Access Plan (PlaceWorks 2018). Crossings should be designed to freespan the channel and should ideally be anchored above the top of bank. In some locations however, hardened crossings that include work below the top of bank may be the least impactful approach.

Crossings of regulated streams that avoid work below the ordinary high water mark do not require a permit from the United States Army Corps of Engineers. However, such crossings may require notification to the California Department of Fish and Wildlife (CDFW), the Regional Water Quality Control Board (RWQCB), and the County, even if located above the top of bank. If the CDFW, RWQCB, or County issue authorizations for such work, the measures included in any such authorizations should be incorporated into the proposed Project design.

Biology Minimization Measure 2C

Where wetlands or streams cannot be avoided, appropriate approvals from the United States Army Corps of Engineers (for impacts to regulated wetlands or areas below the ordinary high water mark of regulated streams) and/or the Regional Water Quality Control Board and the California Department of Fish and Wildlife (for impacts to regulated wetlands, riparian vegetation, or areas below the top of bank of regulated streams) should be secured prior to initiating work in these areas. Additional County approvals may be required under the Riparian Corridor and Wetlands Protection Ordinance. The measures included in any such authorizations should be incorporated into the proposed Project design.

Biology Minimization Measure 2D

To prevent erosion or sedimentation during construction, appropriate Best Management Practices (BMPs) (e.g., silt fencing, wattles, sterile straw, hydromulch, geotextile fabrics, sediment traps, drainage swales, or sand bag dikes) should be installed around wetlands and streams. All materials should be certified weed-free and must be constructed of natural materials. No plastic monofilament netting may be used. The exact location and configuration of BMPs should be determined by the contractor based on specific Project site conditions and the type of work being conducted. BMPs should remain in place until all disturbed ground has been stabilized either through compaction, re-vegetation, or other methods provided for in Biology Minimization Measure 1F.

Biology Minimization Measure 2E

Any fueling or maintenance of equipment or vehicles should be conducted at a minimum of 100 feet from any wetland or stream. A spill containment kit should be maintained at any fueling or maintenance area. Any spills should be cleaned as soon as feasibly possible and all resulting materials should be disposed of properly. All construction vehicles should be inspected daily for leaks of oil, hydraulic fluid, or other potentially hazardous materials by a qualified, construction-crew member and drip pans should be placed under parked vehicles during prolonged periods of disuse (e.g., during evenings and weekends).

7.2 Special-Status Plant and Wildlife Species

7.2.1 Special-Status Plants

One special-status plant species is known to occur within the Project Area: Anderson's manzanita (Rank 1B.2). Based on the current alignment, there is potential for impacting up to 0.54 acre of Anderson's manzanita. These impacts are based on a 7-foot band of disturbance (5-foot trail tread plus 1 foot of vegetation clearance on either side) located down the centerline of the trail alignment and may not reflect actual impacts due to the potential for reducing the width of the trail in critical areas and for re-routing the trail alignment anywhere within the 100-foot-wide band surveyed for this report. It is anticipated that the flexibility built into the trail alignment will help to minimize impacts to Anderson's manzanita.

The proposed Project has the potential to impact Anderson's manzanita through both initial trail construction and subsequent use and maintenance. Suitable measures for avoiding, minimizing, or mitigating impacts to Anderson's manzanita, are provided below.

Biology Impact 3

The proposed trail network and staging area have the potential to directly impact Anderson's manzanita through direct vegetation removal and grading activities, as well as by subsequent damage (e.g., trampling) from pedestrians, cyclists, horses, or dogs. The proposed Project also has potential to indirectly impact Anderson's manzanita through compaction and other disturbances caused by pedestrians, cyclists, horses, or dogs. This may include the introduction of invasive weeds or plant diseases (e.g., sudden oak death or other *Phytophthora*-related diseases) which could adversely affect susceptible species. With the implementation of the minimization measures listed below, WRA believes that the proposed trail network will not have a significant adverse impact to Anderson's manzanita.

Biology Minimization Measure 3A

Implement Biology Minimization Measures 1A-1J.

Biology Minimization Measure 3B

Where work will occur within 10 feet of a special-status plant to be preserved, orange construction fencing (or similar) should be installed at the edge of the work area and no work should occur beyond the fence. If such occurrences of special-status plants occur downslope from the work area, silt fencing should be installed at the edge of the work area to prevent soil or other materials from being transported downslope where they may impact special-status plants.

Biology Minimization Measure 3C

To the extent feasible and practicable, occurrences of special-status plants should be avoided by re-routing the trail alignment. At a minimum, the full width of the trail (i.e., the full extent of vegetation removal) should avoid the dripline of any special-status shrubs and should avoid special-status herbs by a minimum of 10 feet. If trails are re-routed, they should be re-routed downslope, where feasible, of any special-status plants to avoid causing erosion or sedimentation issues which could be detrimental to special-status plants. If not feasible then re-route the drainage away from the special-status plants. If other considerations such as slope or soil stability make it impossible to avoid special-status plants, a qualified, County-approved biologist should develop appropriate mitigation measures based on the species in question, the size and type of the anticipated impact, and the likelihood of success with various minimization approaches approved by the CNPS (1998) including:

(a) Avoiding the impact altogether by not taking a certain action

(b) Minimizing impacts by limiting the degree or magnitude of the action

(c) Rectifying the impact by repairing, rehabilitating or restoring the impacted environment

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the Project

(e) Compensating for the impact by replacing or providing substitute resources or environments (for example Anderson's manzanita habitat enhancement could be used to offset impacts on-site near disturbance areas by the removal of overstory trees, including non-native trees)

7.2.2 Special-Status Wildlife

Two special-status wildlife species were observed within the Project Area: San Francisco dusky-footed woodrat and oak titmouse. An additional 13 special-status wildlife species were determined to have moderate to high potential to occur there. The proposed Project has the potential to impact these wildlife species through both initial trail construction and subsequent use and maintenance.

Special-Status Bats

Biology Impact 4

The proposed trail network and staging area have the potential to directly impact special-status bats with the potential to occur within the Project Area through direct tree removal and grading activities. Tree removal and roost disturbance could occur during vegetation clearing associated with the establishment of parking and multi-use trail areas. Additionally, the operation of loud machinery in the immediate vicinity of a maternity roost site could impact the species by causing the parent to abandon the roost or induce elevated stress levels for the individuals occupying the maternity site. Although there are potential direct and indirect impacts to roost habitat associated with the Project, the clearing of vegetation may actually improve foraging habitat in locations that are currently too dense for bats to forage within. With the implementation of the minimization measures listed below, WRA believes that the proposed trail network will not have a significant adverse impact to any special-status bats.

Biology Minimization Measure 4A

Potentially significant impacts to roosting special-status bats may be minimized through avoiding disturbance to active roost sites. If any tree removal, regardless of size, or trimming is required, it is recommended to take place between September and October. This window falls outside of both the maternity and hibernation period for bats and avoids the breeding bird window (see Biology Minimization Measure 5A, below). Tree removal can take place during this period without a breeding bird or bat roost survey, although a tree removal permit may still be necessary.

Biology Minimization Measure 4B

If removal of large trees (diameter at breast height >12 inches) occurs during the bat roosting season (November through August), these trees should be inspected by a qualified, County-approved biologist for the presence of bat roosts. Potential bat roosts include large oak trees, riparian trees, exfoliating bark, tree cavities, and snags. If a maternity roost is detected, up to a 200-foot buffer should be placed around the maternity site until the bats are no longer utilizing the site. Non-maternity roost sites can be removed under the direction of a qualified, County-approved biologist.

Biology Minimization Measure 4C

Any large tree (diameter at breast height >12 inches) that will be removed should be left on the ground for 24 hours before being taken offsite or being chipped. This period will allow any day-roosting bats the opportunity to leave before the tree is either removed from the area or is chipped.

Biology Minimization Measure 4D

Consultation with the California Department of Fish and Wildlife (CDFW) should be initiated to determine appropriate mitigation measures if roosts are disturbed; this should be conducted by a qualified, County-approved biologist and any mitigation measures required by the CDFW should be implemented under the guidance of the same biologist.

Special-Status Birds and Other Avian Species

Biology Impact 5

Several species of special-status birds were observed or were determined to have the potential to occur within the Project Area; they include: oak titmouse, Vaux's swift, Nuttall's woodpecker, Allen's hummingbird, olive-sided flycatcher, and purple martin. (In addition to these species, marbled murrelet may also occur within the Project Area; however, impacts and minimization for this species is discussed under Biology Impact 6.)

The proposed Project will entail minor amounts of vegetation removal which has the potential to impact potential nesting and foraging habitat for avian species. The operation of construction machinery during the breeding season could also cause disturbance to breeding birds and could impact nesting activity. Indirect impacts to nesting birds may also occur as increased noise and human disturbance will occur as hikers, cyclists, horses, and dogs utilize various trail segments. Special-status and other native bird species are protected during the nesting season by the Migratory Bird Treaty Act and the California Fish and Game Code, as well as the California Environmental Quality Act. Potential significant impacts to nesting special-status birds may be minimized through avoiding disturbance to active nests through implementation of the following measures.

Biology Minimization Measure 5A

If construction, vegetation removal, or ground disturbance activities occur during the breeding season (February 1 to August 31), pre-construction breeding bird surveys should be conducted by a qualified individual within 14 days of the start of these activities to avoid disturbance of active nests, eggs, and/or young.

Biology Minimization Measure 5B

If construction, vegetation removal, or ground disturbance activities stop or lapse for a period of 14 days or more during the breeding season, a follow-up breeding bird survey should be conducted to ensure no new breeding activity has occurred within the anticipated work area. Outside of the breeding season, no pre-construction breeding bird survey would be required for construction, vegetation removal, or ground disturbance activities.

Biology Minimization Measure 5C

If nesting birds are located, an exclusion zone in which no construction activities would be allowed should be established around any active nests of any avian species protected by the Migratory Bird Treaty Act and California Fish and Game Code until a qualified, County-approved biologist has determined that all young have fledged. Suggested exclusion zone distances differ depending on species, location, and placement of nest, and should be at the discretion of the approved biologist based on the species in question, the proximity of the nest to the work area, and the type of work being conducted (e.g., use of hand tools versus gas-operated machinery).

Marbled Murrelet

Biology Impact 6

Marbled murrelet may occur within stands of old-growth forest with complex canopy such as shown on Figure 9. However, these areas have not been evaluated for their potential to support marbled murrelet following United States Fish and Wildlife Service protocols and it is unknown whether they represent potential habitat for marbled murrelet. If the species is present, the operation of construction machinery during the breeding season could result in disturbance to breeding individuals and could impact nesting activity. Additionally, although direct impacts to this species from vegetation and tree removal are unlikely, the species may still be impacted from a resulting increase in edge habitat and the presence of trash or food waste from trail users. An increase in edge habitat and/or food waste can result in an increased occurrence of corvids, including Steller's jay (*Cyanocitta stelleri*), which can increase nest predation and reduce reproductive success. This may be particularly prevalent in or around the parking lot and picnic areas where trash and food scraps are more likely to concentrate. Potential significant impacts to marbled murrelet may be minimized through the measures listed below. Informal consultation with the United States Fish and Wildlife Service (USFWS) should be initiated and any additional measures recommended by the USFWS should be implemented as part of the project.

Biology Minimization Measure 6A

During construction, all workers should ensure that food scraps, paper wrappers, food containers, cans, bottles, and other trash from the construction area is deposited in wildlife-proof trash containers. The trash containers should not be left open and unattended overnight.

Biology Minimization Measure 6B

Ensure the Public Access Plan includes specific measures that include the installation of animal-proof trash receptacles and describe specific methods for routine trash pickup and ongoing monitoring by the Public Access Manager to ensure that trash removal occurs at a frequency sufficient to prevent trash overflow at the receptacles.

Biology Minimization Measure 6C

Educational signage should be placed within the parking lot and at picnic areas informing the public to remove trash and food waste. Signage should provide information on the marbled murrelet and the impact that corvid and avian predators can have on nest sites. This education signage should be in place prior to opening the trails for public access and should be routinely maintained by the Public Access Manager to ensure that signage is not obstructed and is legible at all times.

Biology Minimization Measure 6D

Picnic locations should be located outside of old-growth stands.

San Francisco Dusky-Footed Woodrat

Biology Impact 7

The proposed trail network and staging area have the potential to directly impact San Francisco dusky-footed woodrat through mortality and destruction of their large stick nests, potentially containing young, that could occur during vegetation removal, grubbing, grading, or other ground-disturbing activities. Potential indirect impacts to woodrats may include increased predation through increased access for predators, such as raccoon or coyote. Predators may also be attracted to food waste and trash created by trail users, particularly within the picnic and parking lot areas. Multi-use trail and parking lot areas will also introduce domestic animals including dogs to the Project Area, which could disturb nests by marking their scent or direct destruction of nests in close proximity to multi-use trails. The Draft Public Access Plan (PlaceWorks 2018) limits dogs to the proposed 1.5-mile-long Northern Frontage Trail that parallels Empire Grade Road.

San Francisco dusky-footed woodrat middens are found in very high numbers throughout all portions of the Project Area. Approximately 1,815 woodrat middens were mapped within the Project Area; based on the representative densities (8.7 middens per acre) observed across the 38 miles of trail surveyed for this report, it is estimated that the greater San Vicente Redwoods property may support up to 74,000 woodrat middens. Based on the current trail alignment, it is estimated that 144 middens may be directly impacted; this represents less than 0.2% of the estimated population of the greater site.

As with all impacts to special-status species discussed in this Biological Resources Assessment, these impacts are theoretical in that they are based on a 7-foot-wide area of disturbance running down the center of the proposed trail alignment shown on Figure 2; by strategically aligning the trail within the survey corridor, these impacts may be reduced or avoided. While some direct impacts to woodrat nests may be unavoidable, this would not be considered a significant impact as the species is prolific at the site and suitable habitat is abundant within both the Project Area and the greater San Vicente Redwoods. Minimization measures listed below are recommended to reduce impacts to woodrat to a less-than-significant level.

Biology Minimization Measure 7A

Implement Biology Minimization Measures 1A, 1B, 6A, and 6B.

Biology Minimization Measure 7B

A pre-construction survey of the parking lot area should be conducted by a qualified, County-approved biologist to flag and delineate any woodrat middens within the planned disturbance footprint. During construction of the parking lot, a biological monitor should be onsite to ensure vegetation and ground disturbance with heavy equipment should not impact those delineated resources. When avoidance of woodrat middens is not possible, the qualified, County-approved biologist should dismantle the nest in accordance with Minimization Measure 7D.

Biology Minimization Measure 7C

During construction and trail installation, a qualified, County-approved biologist or trained designee from the contractor's crew should identify woodrat middens located along the trail alignment. If the latter, a qualified, County-approved biologist should provide the training prior to the start of each construction phase. To the extent feasible and practicable, the trail alignment should avoid woodrat middens by re-routing the trail alignment. The trail should avoid woodrat nests. To accomplish this, a qualified member of the contractor's crew should be trained in the identification of woodrat nests and this person should be responsible for making minor adjustments to the trail alignment during construction to avoid woodrat nests. Where is not possible to avoid all woodrat nests, impacts to woodrats and their middens implementation of Minimization Measure 7D would be required.

Biology Minimization Measure 7D

When construction of the trail alignment or the parking area will result in a direct impact to a woodrat midden, a qualified, County-approved biologist should dismantle the nest and scatter the nest material a minimum of 10 feet outside of the trail alignment or the footprint of the parking area. If young are encountered during the dismantling process, the material should be placed back on the nest and the nest should remain unmolested for three weeks in order to give the young enough time to mature and leave of their own accord. After three weeks, the nest dismantling process may resume.

Biology Minimization Measure 7E

For trail segments where dogs on leash are permitted, educational signage should be posted to inform trail users of woodrats, their middens, and the importance of keeping dogs on trails and away from the structures. This educational signage should be in place prior to opening the trails for public access and should be routinely maintained by the Public Access Manager to ensure that signage is not obstructed and is legible at all times.

California Red-Legged Frog

Biology Impact 8

The proposed trail network and staging area have the potential to directly impact California red-legged frog (CRLF) which may disperse through the Project Area. Furthermore, the Project Area contains Critical Habitat for the species. The development of stream crossings and the associated vegetation and ground clearing activities may impact or impede CRLF movement. Indirect impacts to CRLF may include increased predation through increased access for predators, such as raccoon or coyote. Predators may also be attracted to food waste and trash created by hikers within the picnic and parking lot areas.

Impacts to CRLF and the species Critical Habitat may also occur if aquatic features are degraded through increased rates of erosion and sedimentation, the introduction of invasive weeds, and other disturbances from trail users or trail maintenance. Minimization measures listed below are recommended to prevent impacts to CRLF and to maintain the physical or biological features of the species Critical Habitat. If these measures are implemented, no take is expected to occur during the proposed Project. Consultation with the United States Fish and Wildlife Service (USFWS) may still be required due to the presence of Critical Habitat; however, the physical and biological features of the species' Critical Habitat is anticipated to remain unchanged with the Project. If consultation with the USFWS is required, and additional measures by the USFWS are warranted, those measures should be implemented with the Project in addition to those identified below.

Biology Minimization Measure 8A

Implement Biology Minimization Measures 2B through 2E.

Biology Minimization Measure 8B

For stream crossings and areas within 100 feet of wetted features, pre-construction surveys by a qualified, County-approved biologist should be performed immediately prior to the start of any ground-disturbing activities. If California red-legged frog (CRLF) are found within the Project Area, all work should cease within the immediate vicinity (approximately 25-feet around the work area) until the individual(s) have been allowed to leave the Project Area on their own. If CRLF cannot passively leave the Project Area, work should cease and the United States Fish and Wildlife Service (USFWS) should be contacted by the approved biologist to determine the appropriate course of action. The approved biologist should then implement the appropriate course of action as determined by the USFWS.

Biology Minimization Measure 8C

Because dusk and dawn are often the times when California red-legged frog (CRLF) are most active and likely to disperse, all construction activities should cease one half hour before sunset and should not begin prior to one half hour before sunrise. Furthermore, no mechanized work should occur during significant rain events, defined here as 0.25 inch or greater within a 24 hour period, when CRLF are more likely to disperse and occur within the Project Area.

Wildlife Corridors

Biology Impact 9

The Project Area is located within the western portion of an important wildlife corridor, as identified by the California Department of Fish and Wildlife's (CDFW) essential connectivity network mapping project (CDFW 2014). Wildlife corridors and essential connectivity areas have been mapped by the CDFW to include the Project Area and continuing through to the north, east, and southeast (CDFW 2014). The proposed trail network and staging area have the potential to impact wildlife migration, including mountain lion, through the introduction of new human disturbance and increased noise. New scents will also occur as multi-use trails allow horses and dogs to access the area. The Project will not, however, result in the development of any physical structures or barriers that would restrict or prevent wildlife migration (i.e., no new roads, large fences, urban development, etc.). Mountain lion and other native species often utilize trail networks, and the development of trails within the Project Area is not anticipated to result in an impact to wildlife corridors or movement.

Biology Minimization Measure 9

The proposed Project is not anticipated to impact wildlife corridors within Santa Cruz County, and therefore no additional minimization measures are recommended.

7.3 Protected Trees

Biology Impact 10

The proposed trail network and staging area have the potential to directly impact trees protected under the Santa Cruz County Tree Protection Ordinance. Protected trees include trees within any of the sensitive habitats defined by the Santa Cruz County Municipal Code (see Section 2.3).

Biology Minimization Measure 10

All tree removals should adhere to the County's tree protection ordinance. Tree removal should be conducted by a licensed arborist or a registered professional forester using industry-standard best management practices (BMPs) to prevent the spread of invasive weeds or plant pathogens and avoid damage to vegetation to be retained.

8.0 CONCLUSION

Based on the results of this Biological Resources Assessment, it was determined that the Project Area contains sensitive resources which could be adversely impacted by the proposed Project. Elements of at least eight sensitive terrestrial biological communities and three sensitive aquatic biological communities were observed within the areas designated for trail construction. One special-status plant, Anderson's manzanita, was determined to be present. Based on a lack of observations during seasonally-timed surveys, it was determined that other special-status plants are unlikely to occur within the Project Area. Two special-status wildlife species were determined to be present, San Francisco dusky-footed woodrat and oak titmouse, and another 13 special-status wildlife species were determined to have moderate to high potential to occur. Additionally, the Project Area contains designated Critical Habitat for CRLF.

Although the proposed Project covers a large amount of wild lands containing a high diversity of biological resources, the proposed Project is relatively minimal in scope and is not expected to result in significant adverse impacts to sensitive resources. Due to the significant efforts that have gone into understanding ecology of the property (ESA 2012) and developing the proposed trail network (PlaceWorks 2018), areas with the most sensitive resources have been avoided and large tracts of wild land will remain off limits to public access. When implemented appropriately, the proposed trail network and the associated recreational, research, and educational activities are compatible with the conservation and long-term maintenance of sensitive biological resources. To this effect, the alignment of the trail and the specific construction methods proposed will largely avoid sensitive resources and will reduce the potential for long-term adverse impacts. With the implementation of the minimization measures included in Section 6.0, as well as the detailed management actions listed in the Draft Public Access Plan, it is anticipated that any potential impacts to sensitive biological resources associated with the Project will be reduced to a less-than-significant level.

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APPENDIX A

PROJECT FIGURES

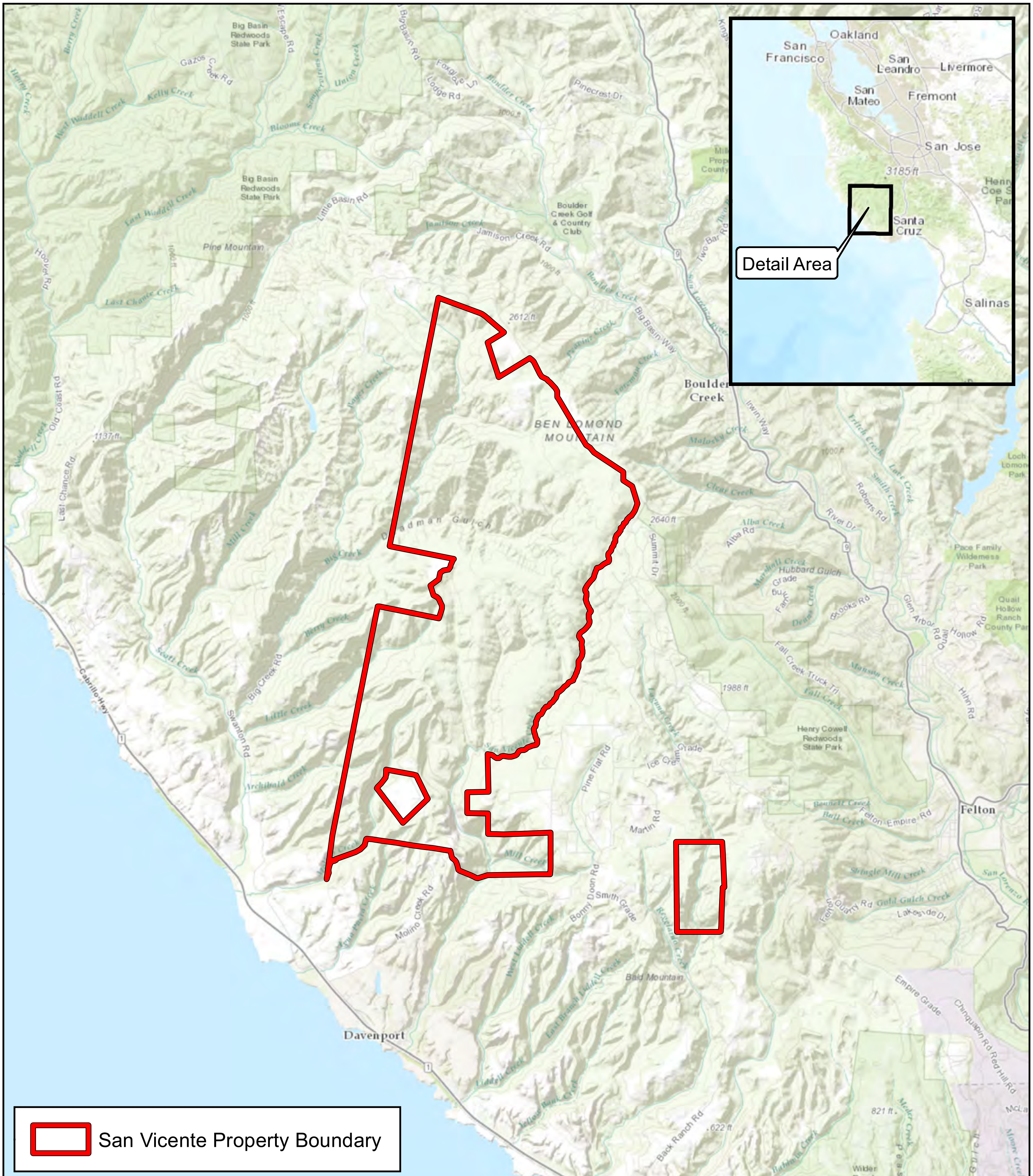

Figure 1. Location Map

San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 11/8/2016
Map Prepared By: sgillespie
Base Source: Esri World Topo
Data Source(s): WRA

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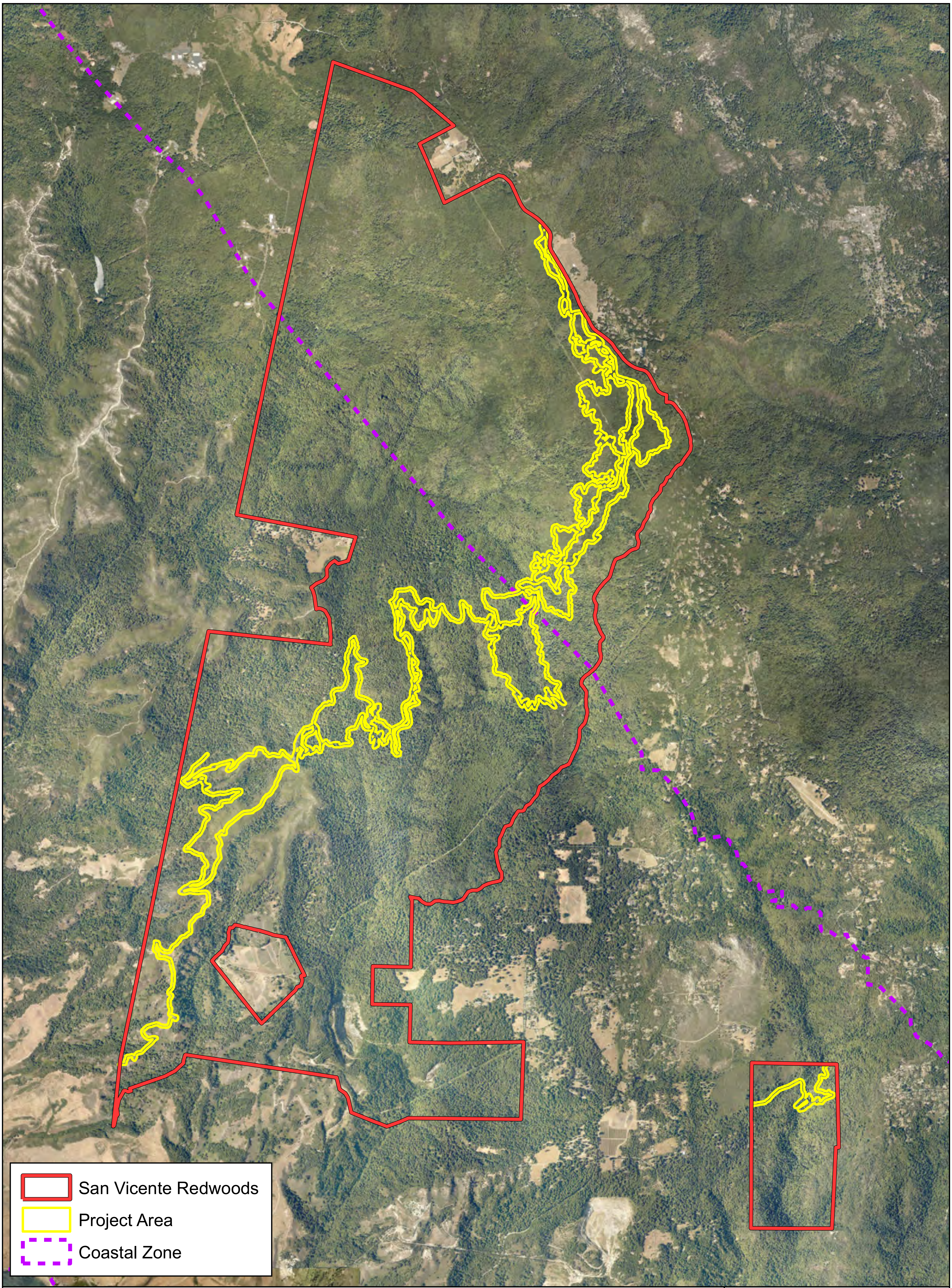

Figure 2. Overview of Project Area

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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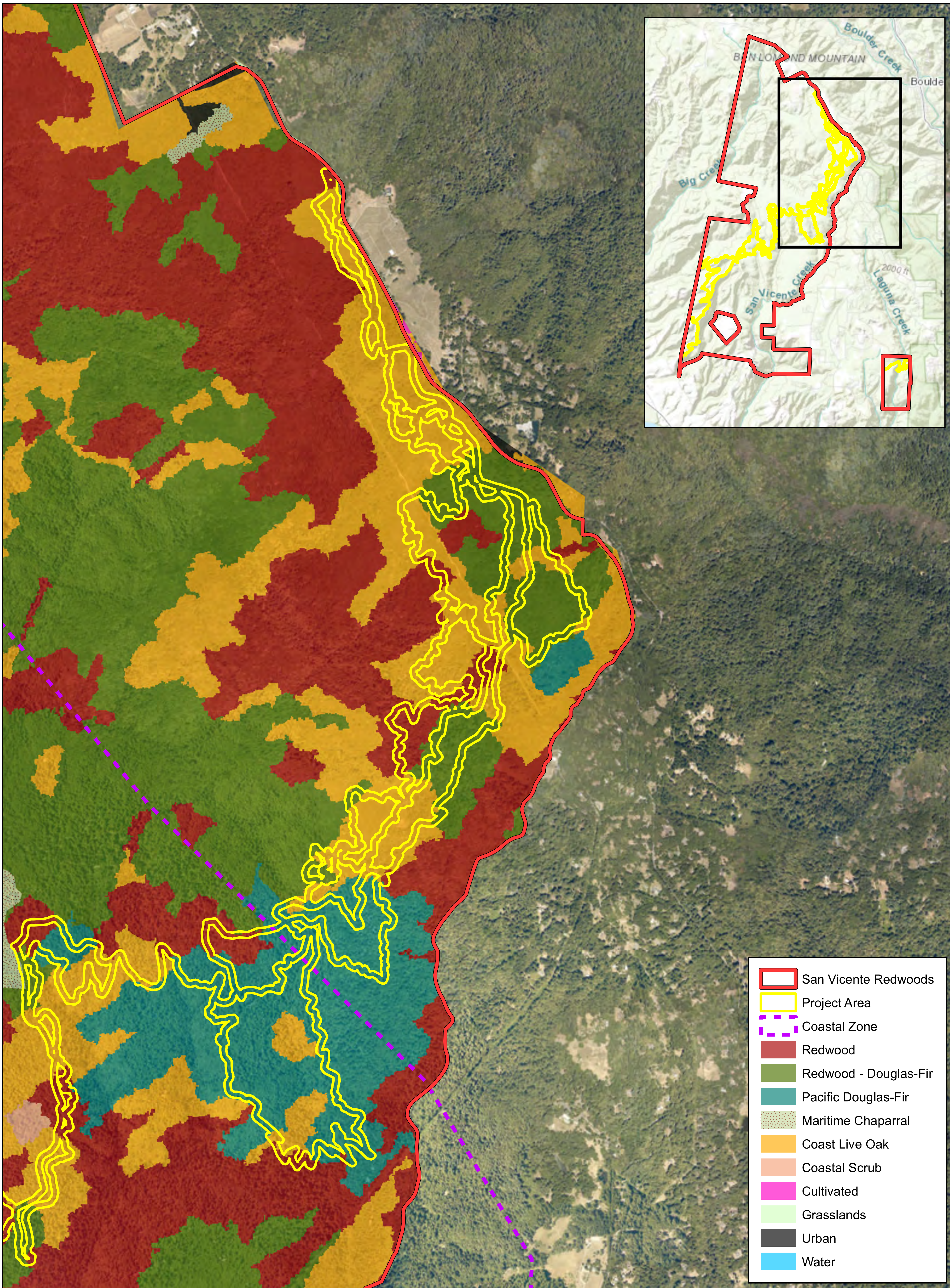

Figure 3A. Biological Communities North

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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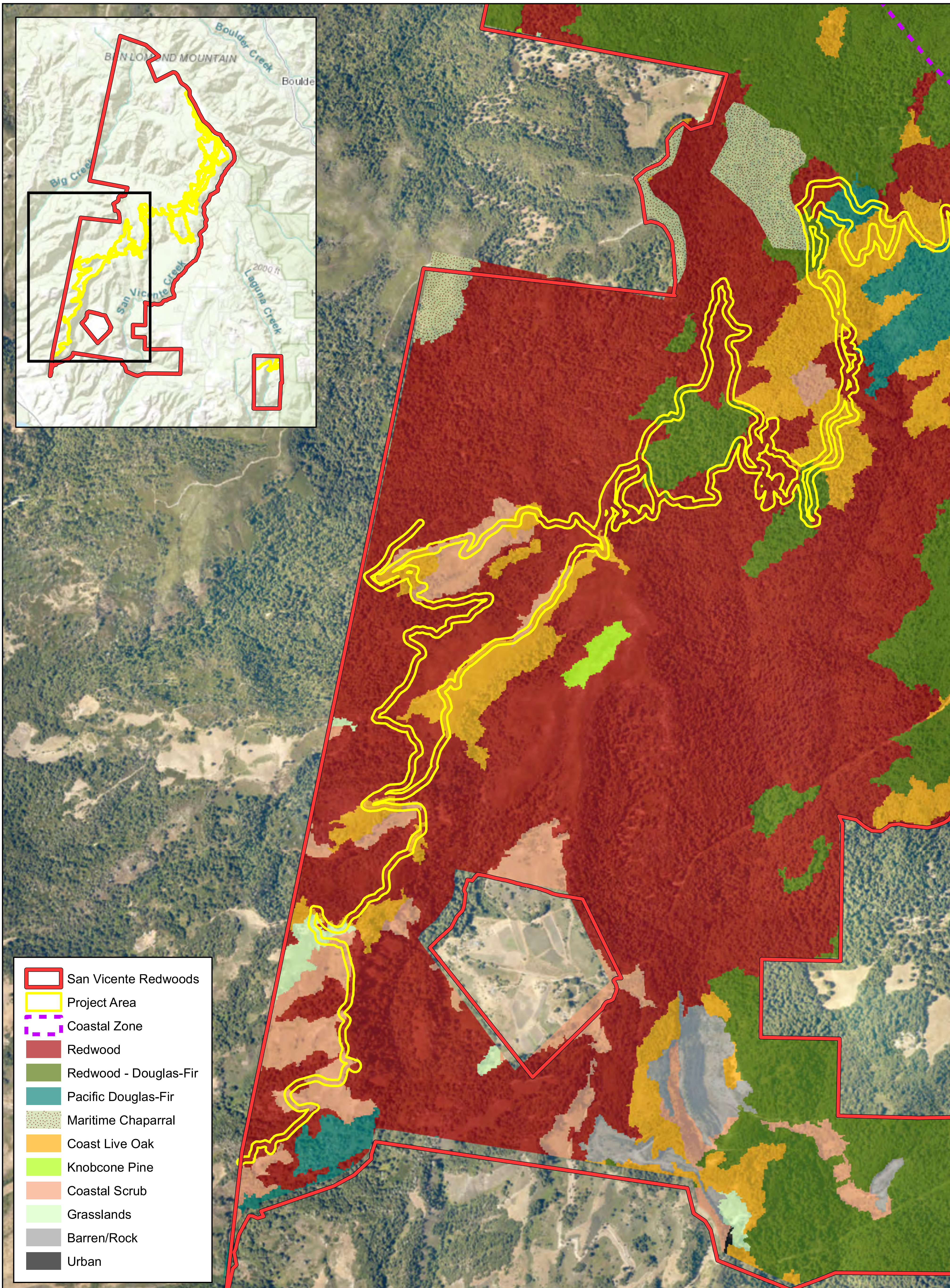

Figure 3B. Biological Communities South

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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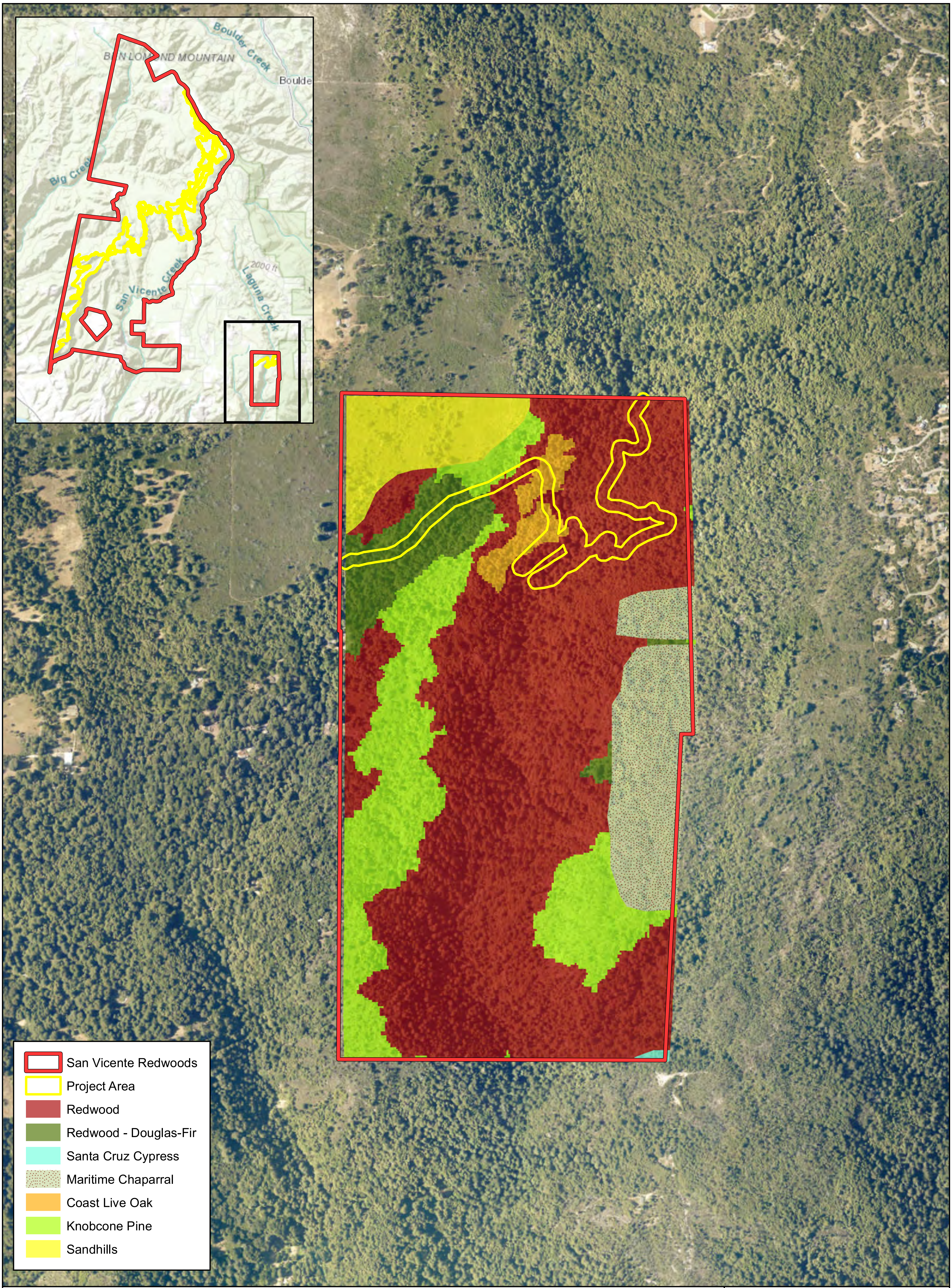

Figure 3C. Biological Communities Laguna Parcel

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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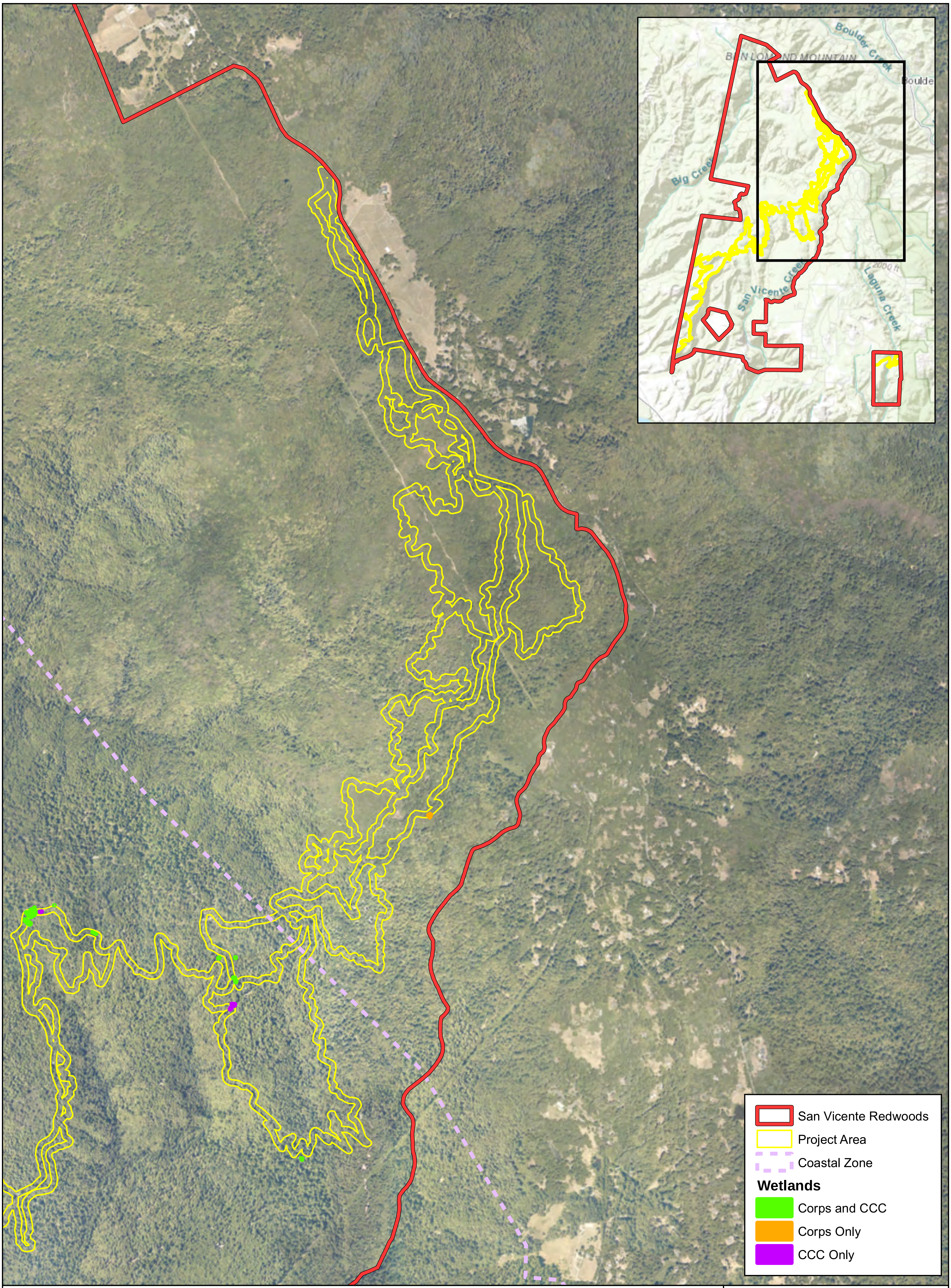

Figure 4A. Wetlands North

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Draft Public Access Plan
Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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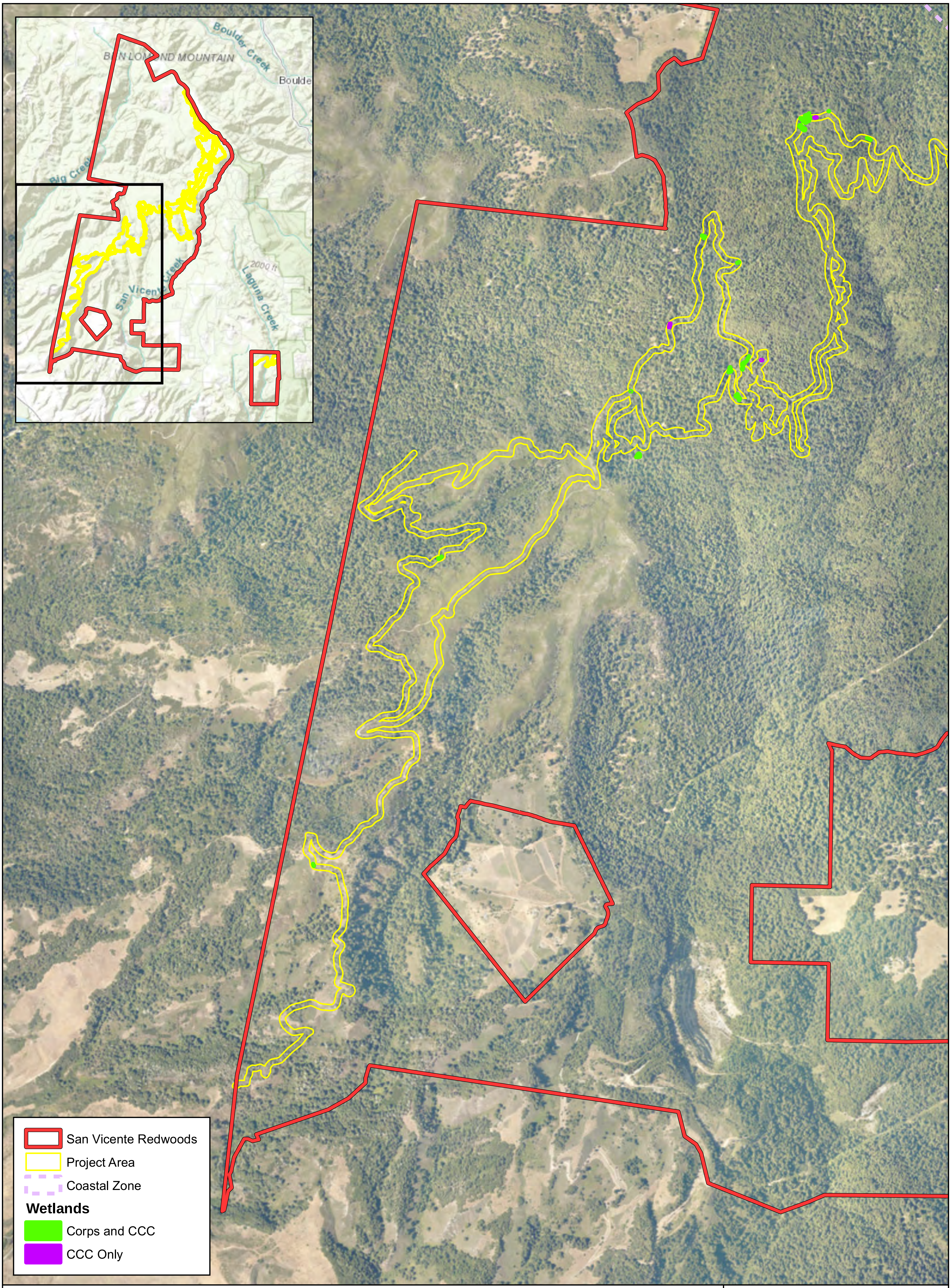

Figure 4B. Wetlands South

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Draft Public Access Plan
Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
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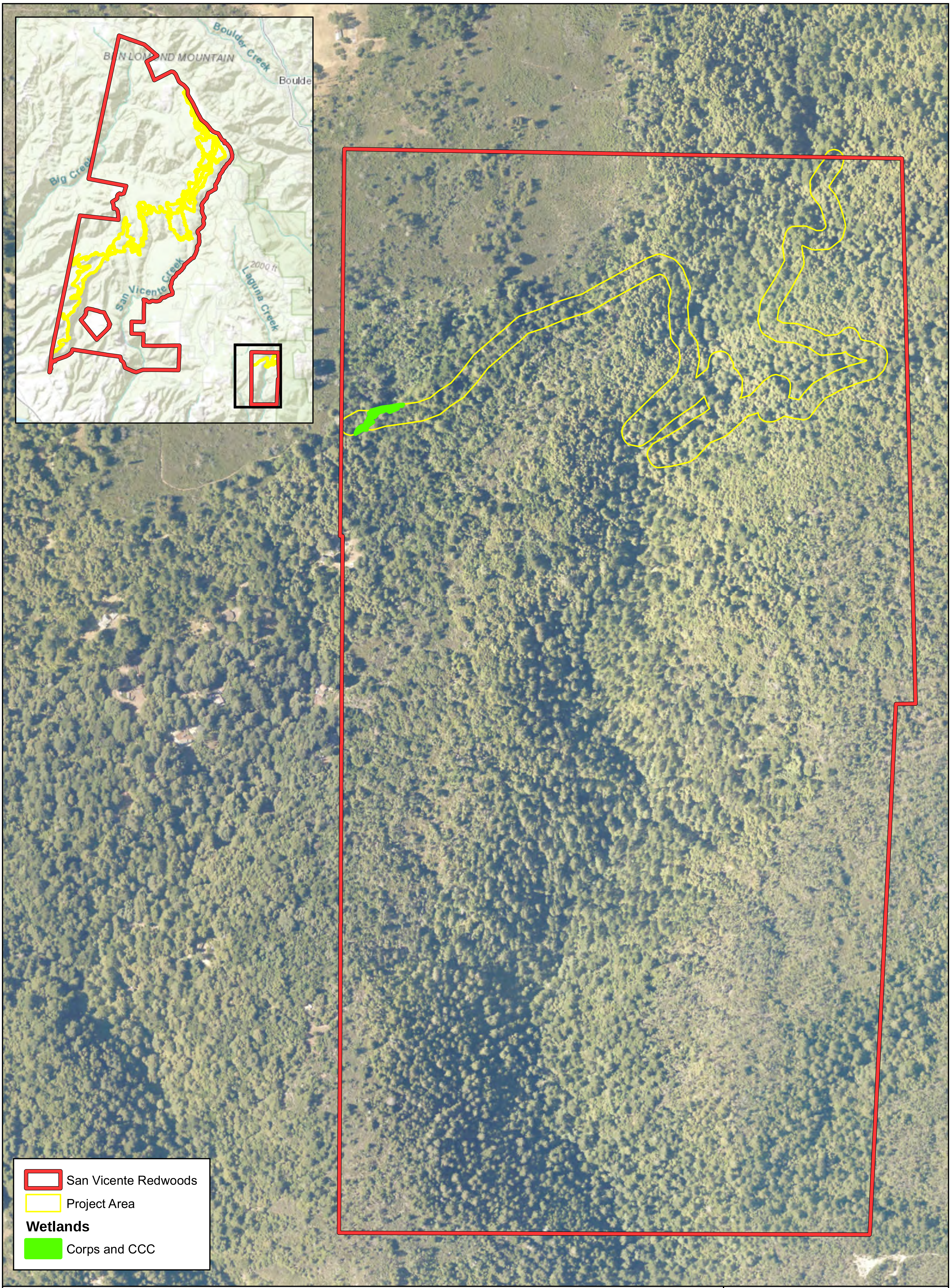

Figure 4C. Wetlands Laguna Parcel

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
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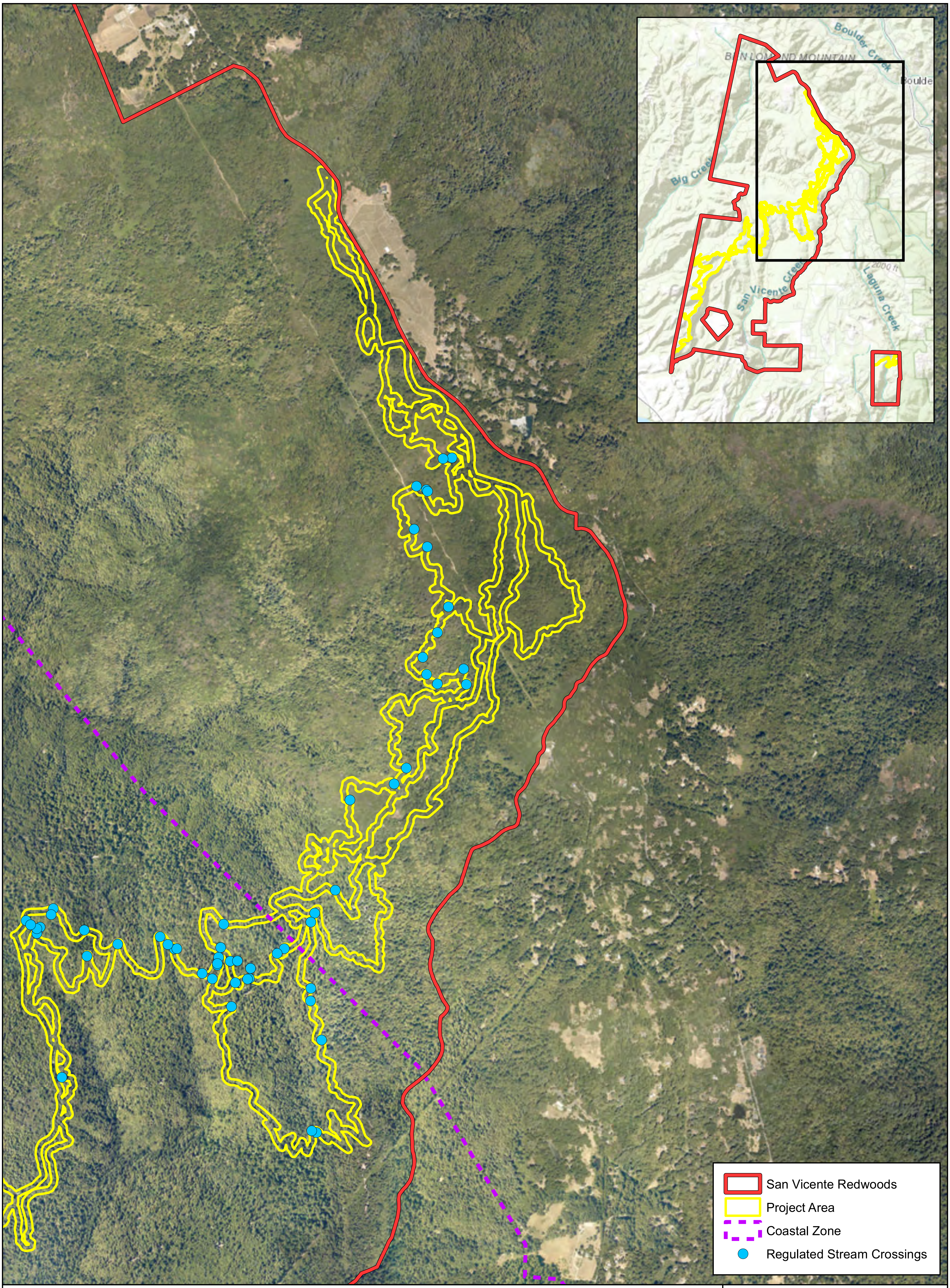

Figure 5A.Regulated Stream Crossings North

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Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
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Data Source(s): WRA, DCE, SCCBP

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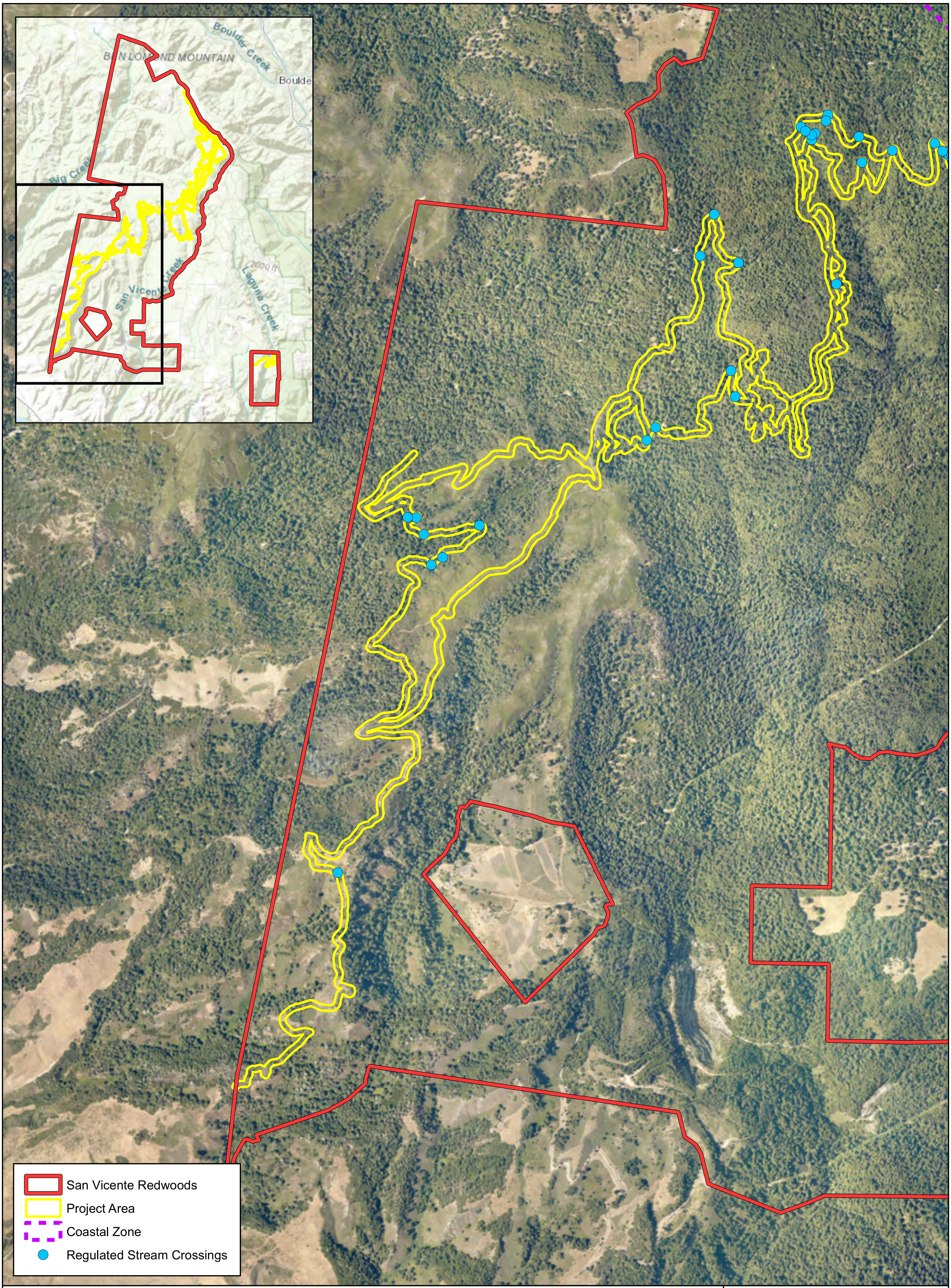

Figure 5B. Regulated Stream Crossings South

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Santa Cruz County, California

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ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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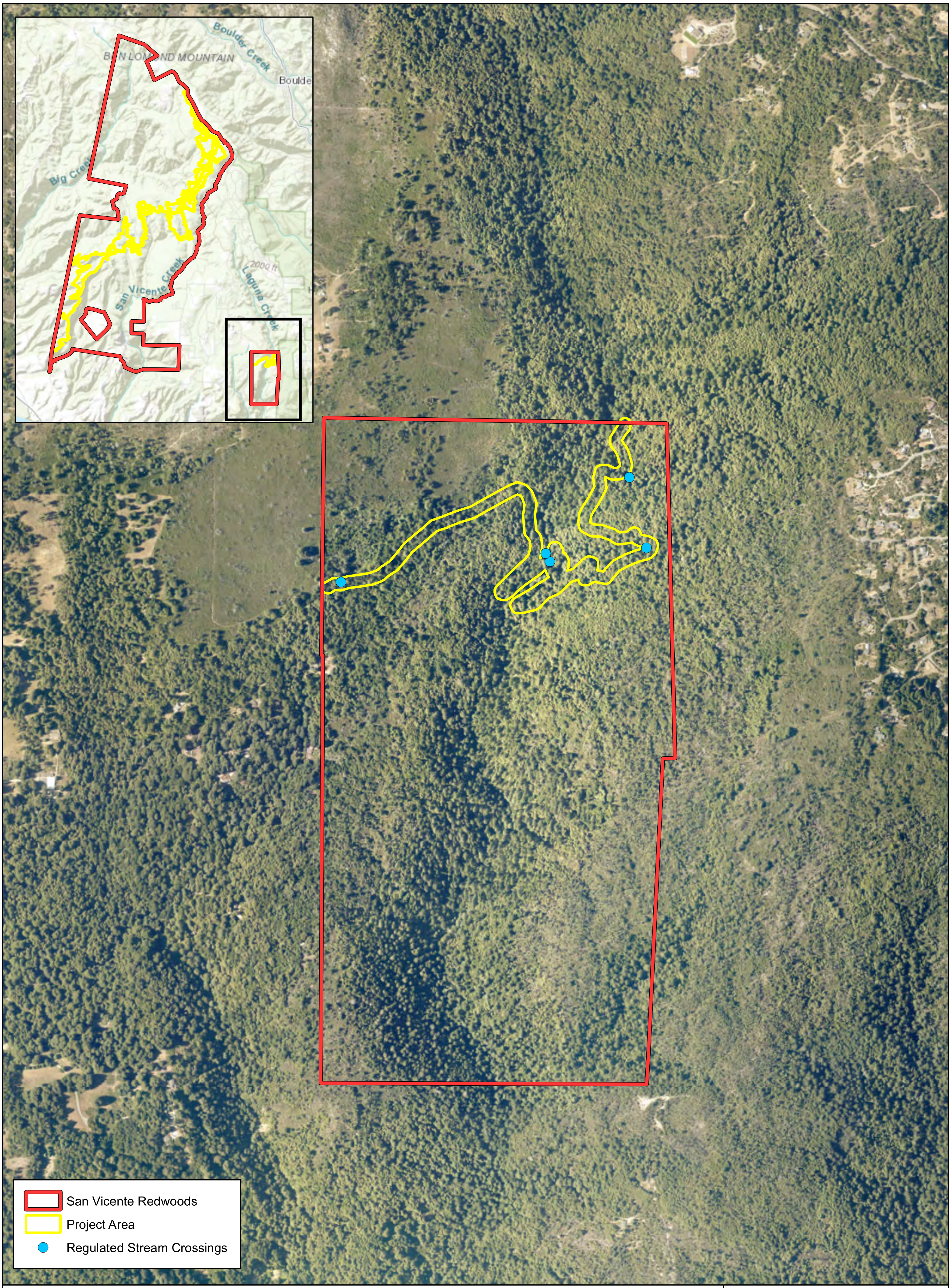

Figure 5C. Regulated Stream Crossings Laguna Parcel **DRAFT**

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Draft Public Access Plan
Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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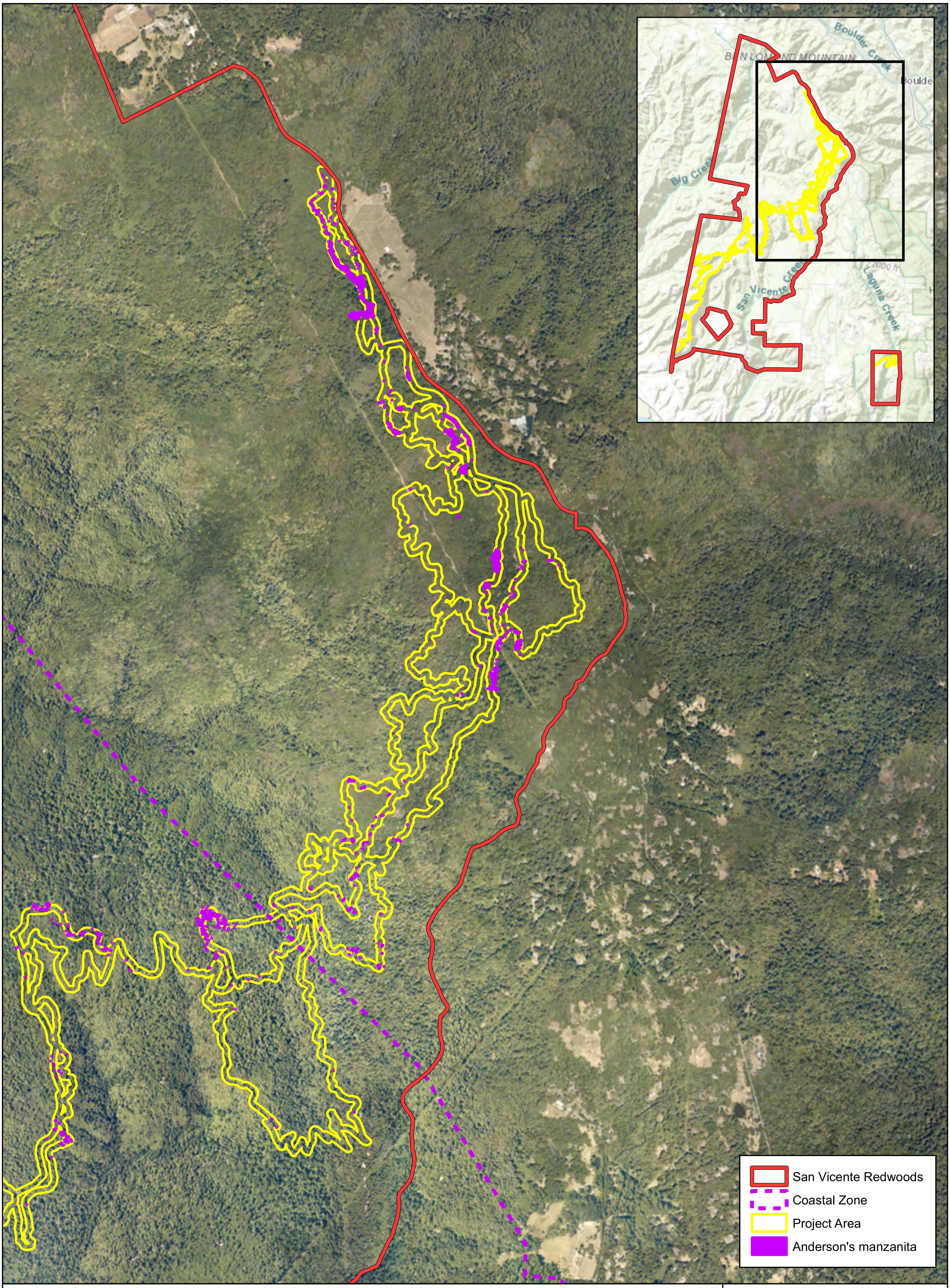

Figure 7A. Special-Status Plant Species North

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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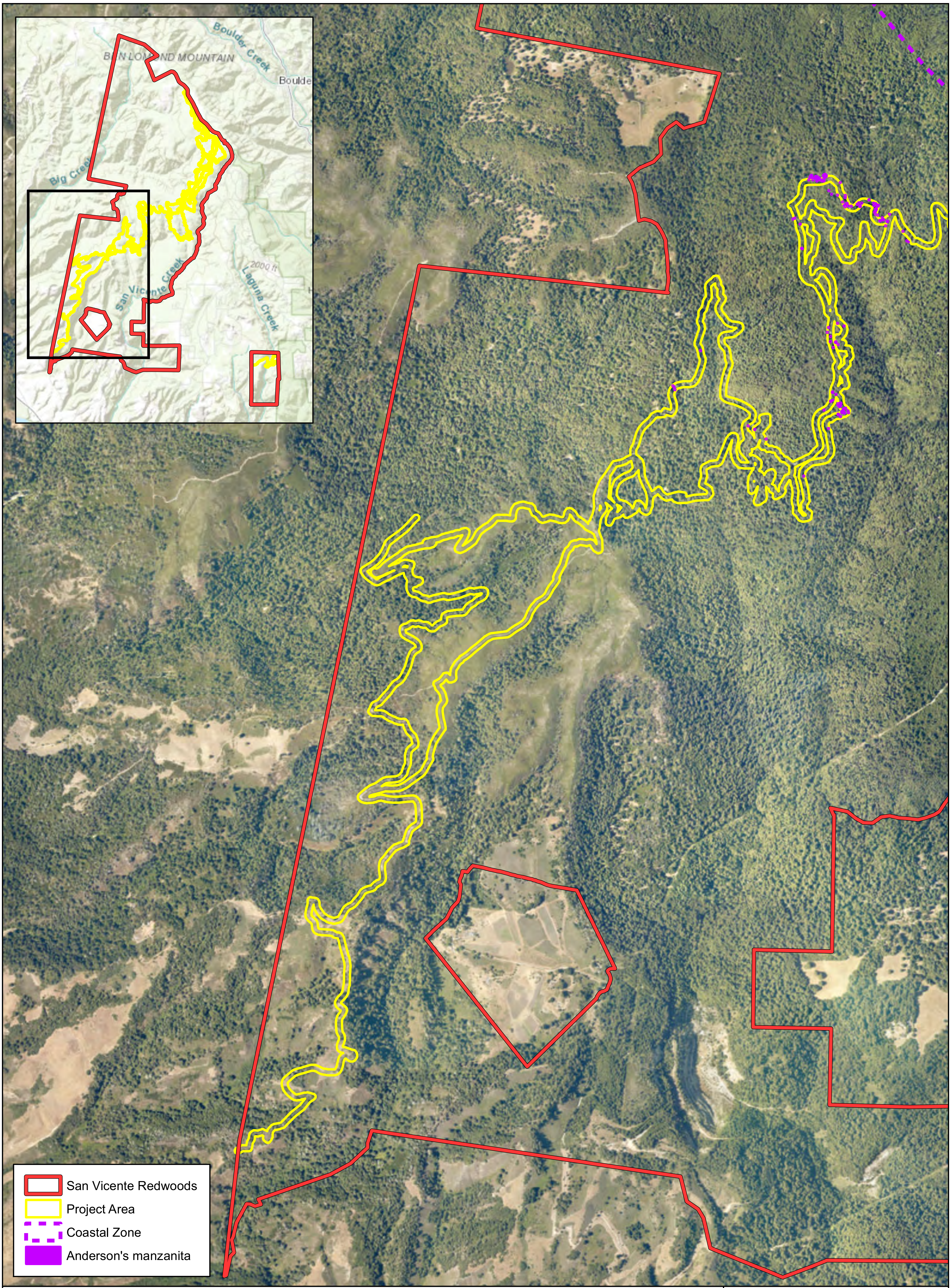

Figure 7B. Special Status Plants South

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
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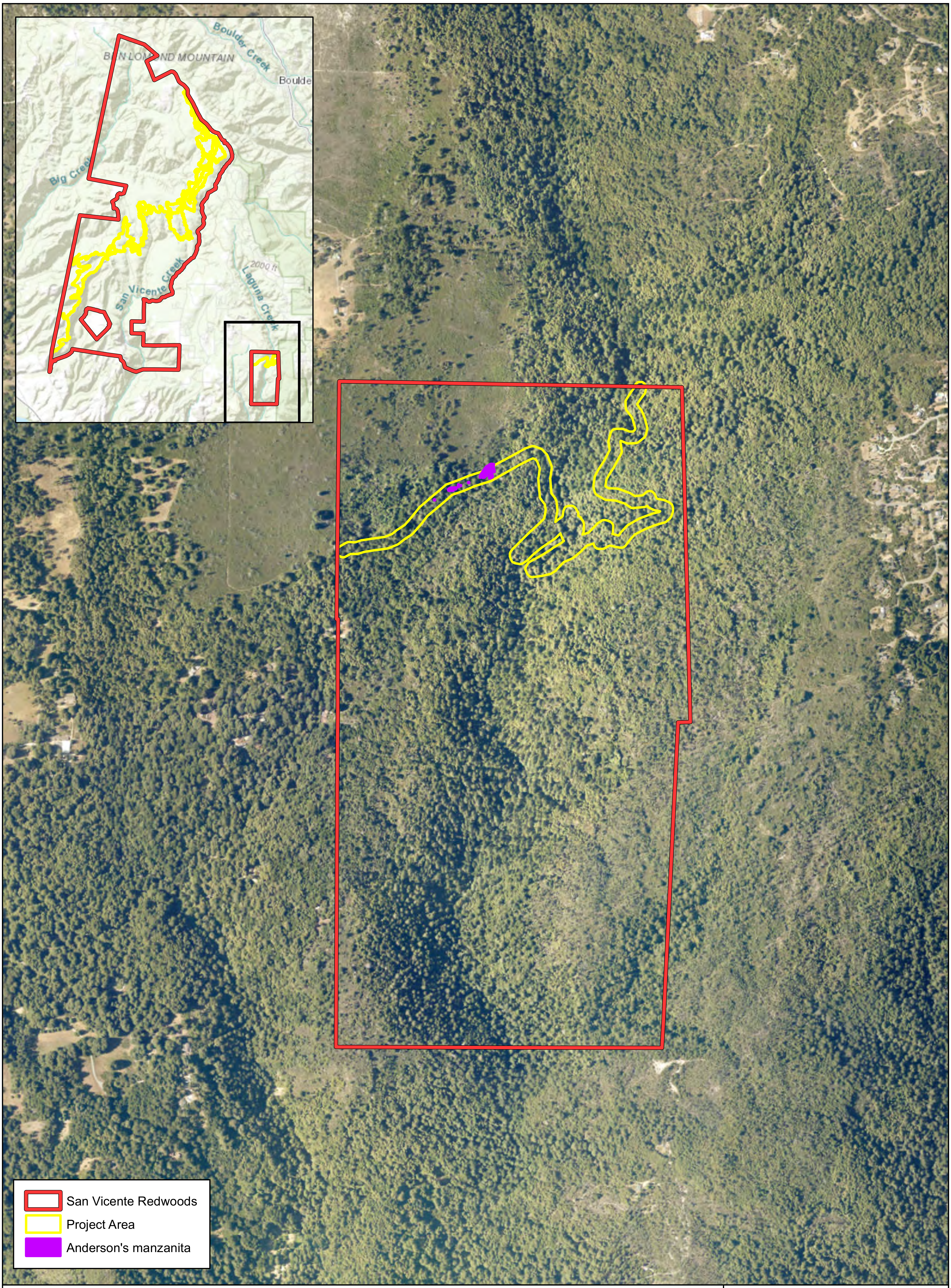

Figure 7C. Special Status Plants Laguna Parcel

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
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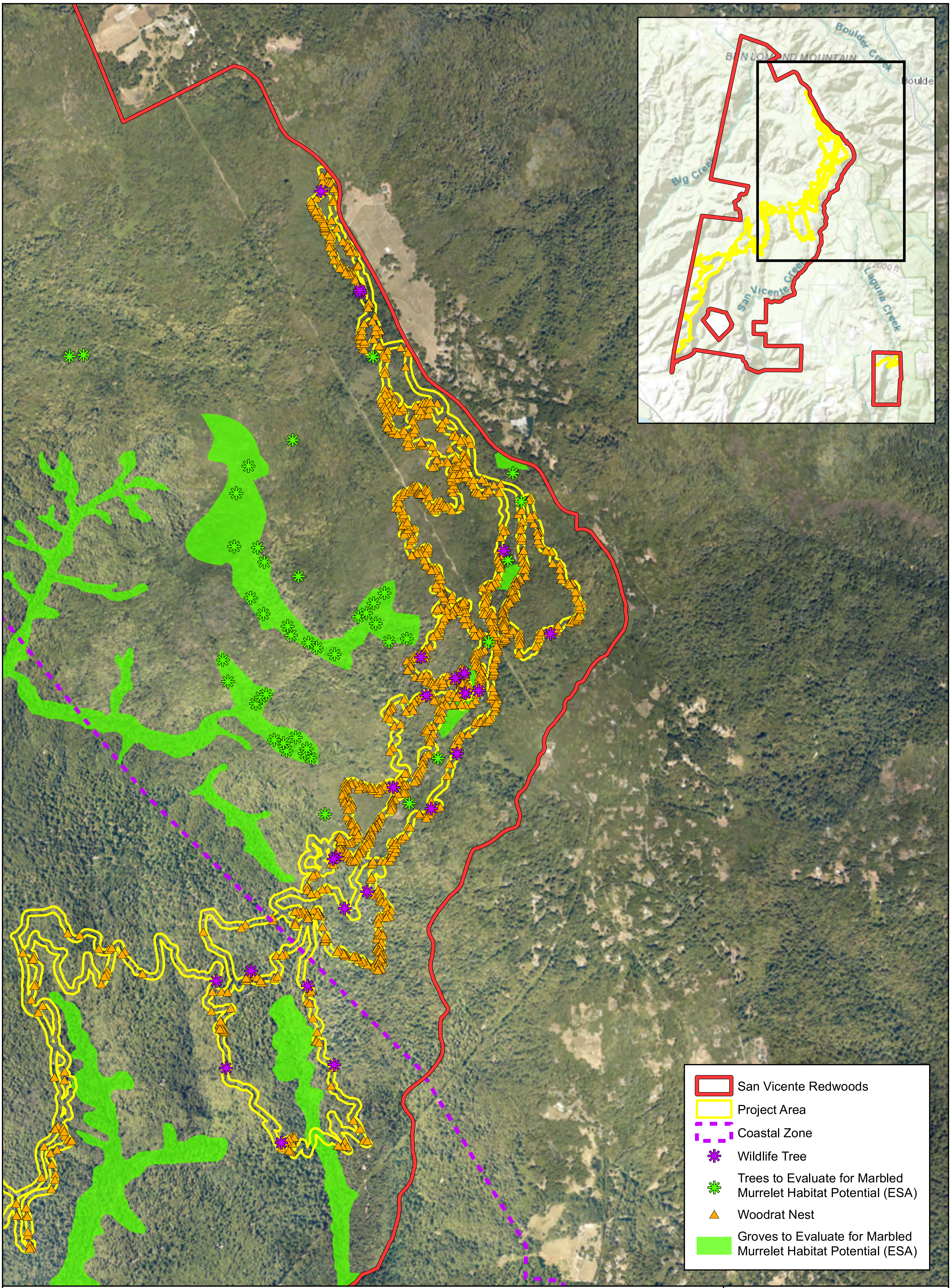

Figure 9A. Special-Status Wildlife Species North

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
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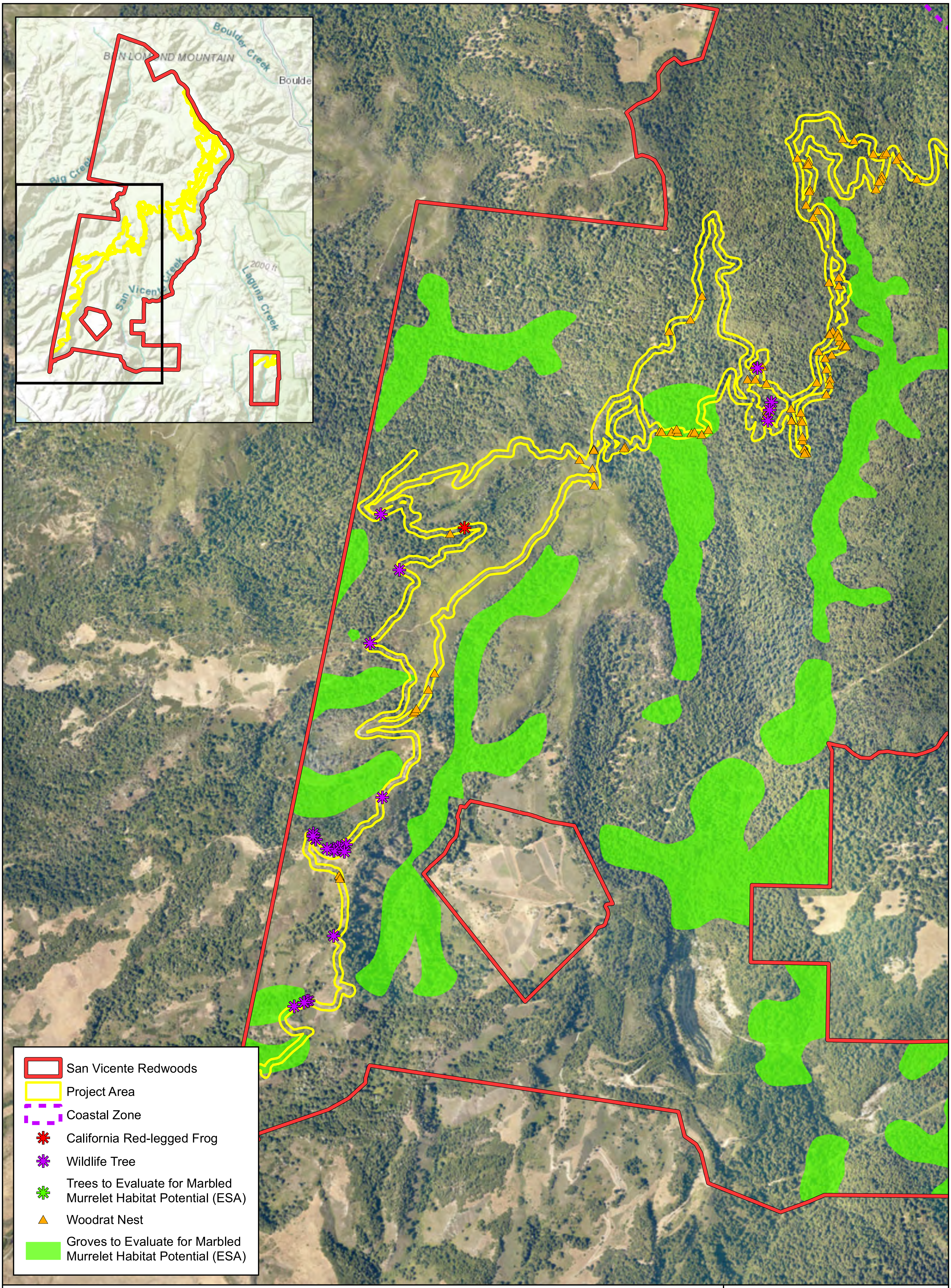

Figure 9B. Special Status Plants South

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San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

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ENVIRONMENTAL CONSULTANTS

Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
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Data Source(s): WRA, DCE, SCCBP

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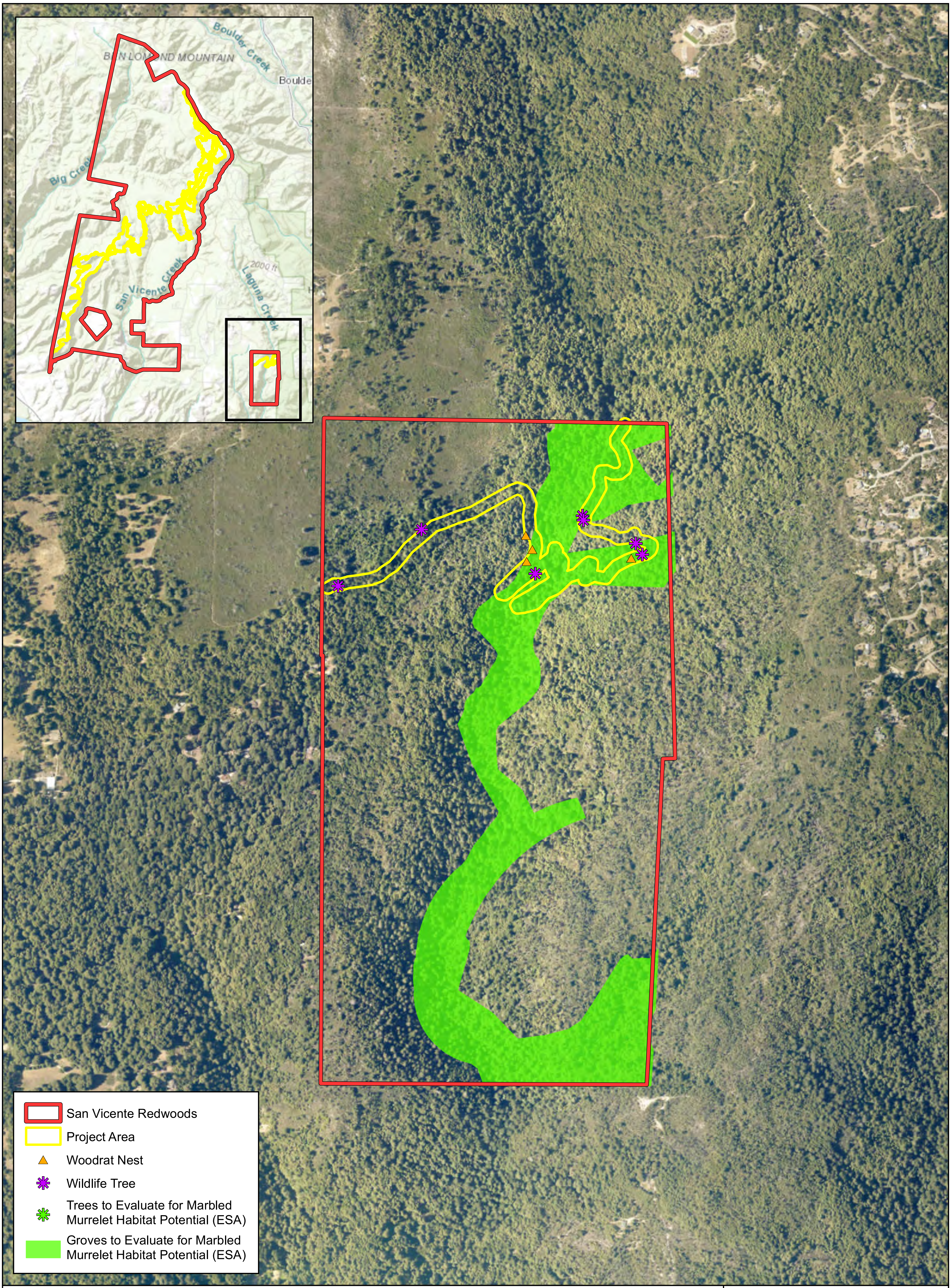

Figure 9C. Special Status Wildlife Laguna Parcel

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WRA ENVIRONMENTAL CONSULTANTS

San Vicente Redwoods
Draft Public Access Plan
Santa Cruz County, California

Map Prepared Date: 4/23/2018
Map Prepared By: SGillespie
Base Source: Esri World Imagery
Data Source(s): WRA, DCE, SCCBP

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APPENDIX B

LIST OF OBSERVED PLANT AND WILDLIFE SPECIES

Appendix B1. Plant species observed within the Project Area for the San Vicente Redwoods Public Access Plan (PlaceWorks 2018) during surveys conducted by WRA biologists on December 16-17, 2015, January 20-22, February 10-12, June 15-16, August 15-17 and 24-25, and October 21, 2016, and May 30-June 1 and August 8-9, 2017. Plant nomenclature follows Baldwin et al. (2012) and subsequent revisions by the Jepson Flora Project (2017).

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Acacia dealbata	Silver wattle	non-native (invasive)	tree, shrub	-	Moderate
Acer macrophyllum	Bigleaf maple	native	tree	-	-
Achillea millefolium	Yarrow	native	perennial herb	-	-
Acmispon americanus var. americanus	Spanish lotus	native	annual herb	-	-
Acmispon glaber	Deerweed, california broom	native	perennial herb	-	-
Acmispon heermannii var. orbicularis	Round leaved heermann's lotus	native	perennial herb	-	-
Acmispon parviflorus	Hill lotus	native	annual herb	-	-
Adenostoma fasciculatum	Chamise	native	tree, shrub	-	-
Agoseris grandiflora	Giant mountain dandelion	native	perennial herb	-	-
Agrostis sp.	-	-	-	-	-
Aira caryophyllea	Silvery hairgrass	non-native (invasive)	annual grass	-	-
Anaphalis margaritacea	Pearly everlasting	native	perennial herb	-	-
Anisocarpus madioides	Woodland madia	native	perennial herb	-	-
Aralia californica	California spikenard	native	perennial herb	-	-
Arbutus menziesii	Madrono	native	tree	-	-
Arctostaphylos andersonii	Anderson’s manzanita	native	shrub	Rank 1B.2	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Arctostaphylos crustacea ssp. crinita	Crinite manzanita	native	shrub	-	-
Arnica discoidea	Rayless arnica	native	perennial herb	-	-
Artemisia californica	Coastal sage brush	native	shrub	-	-
Artemisia douglasiana	California mugwort	native	perennial herb	-	-
Asarum caudatum	Creeping wild ginger	native	perennial herb	-	-
Asyneuma prenanthoides	California harebell	native	perennial herb	-	-
Athyrium filix-femina var. cyclosorum	Western lady fern	native	fern	-	-
Avena barbata	Slim oat	non-native (invasive)	annual, perennial grass	-	Moderate
Baccharis pilularis ssp. consanguinea	Coyote brush	native	shrub	-	-
Brachypodium distachyon	Purple false brome	non-native (invasive)	annual, perennial grass	-	Moderate
Briza maxima	Rattlesnake grass	non-native (invasive)	annual grass	-	Limited
Briza minor	Little rattlesnake grass	non-native	annual grass	-	-
Bromus carinatus	California bromegrass	native	perennial grass	-	-
Bromus diandrus	Ripgut brome	non-native (invasive)	annual grass	-	Moderate
Bromus hordeaceus	Soft chess	non-native (invasive)	annual grass	-	Limited

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Bromus laevipes	Narrow flowered brome	native	annual, perennial grass	-	-
Bromus racemosus	Smooth brome	non-native	perennial grass	-	-
Calochortus albus	White fairy lantern	native	perennial herb	-	-
Calyptridium monandrum	Common pussypaws	native	annual herb	-	-
Calystegia macrostegia ssp. cyclostegia	Coast morning glory	native	perennial herb, vine	-	-
Calystegia purpurata ssp. purpurata	Smooth western morning glory	native	perennial herb	-	-
Camissoniopsis hirtella	Hairy sun cup	native	annual herb	-	-
Cardamine hirsuta	Hairy bitter cress	non-native	annual herb	-	-
Carduus pycnocephalus ssp. pycnocephalus	Italian thistle	non-native (invasive)	annual herb	-	Moderate
Carex barbarae	Valley sedge	native	perennial grasslike herb	-	-
Carex globosa	Round fruit sedge	native	perennial grasslike herb	-	-
Carex leptopoda	Slender-footed sedge	native	perennial grasslike herb	-	-
Carex obnupta	Slough sedge	native	perennial grasslike herb	-	-
Carex tumulicola	Split awn sedge	native	perennial grasslike herb	-	-
Castilleja affinis ssp. affinis	Wight's indian paint brush	native	perennial herb	-	-
Ceanothus leucodermis	Chaparral whitethorn	native	shrub	-	-
Ceanothus papillosus	Wartleaf ceanothus	native	shrub	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Ceanothus thyrsiflorus var. thyrsiflorus	Blue blossom	native	tree, shrub	-	-
Centaurea melitensis	Tocalote	non-native (invasive)	annual herb	-	Moderate
Centaurium tenuiflorum	Slender centaury	non-native	annual herb	-	-
Cephalanthera austiniae	Phantom orchid	native	perennial herb	-	-
Cerastium glomeratum	Large mouse ears	non-native	annual herb	-	-
Chlorogalum pomeridianum var. pomeridianum	Common soaproot	native	perennial herb	-	-
Chorizanthe diffusa	Diffuse spineflower	native	annual herb	-	-
Chrysolepis chrysophylla var. chrysophylla	Golden chinquapin	native	tree, shrub	-	-
Cirsium brevistylum	Indian thistle	native	perennial herb	-	-
Cirsium occidentale	Western thistle	native	perennial herb	-	-
Cirsium vulgare	Bull thistle	non-native (invasive)	perennial herb	-	Moderate
Claytonia parviflora	Narrow leaved miner's lettuce	native	annual herb	-	-
Claytonia perfoliata	Miner's lettuce	native	annual herb	-	-
Clinopodium douglasii	Yerba buena	native	perennial herb	-	-
Clintonia andrewsiana	Red clintonia	native	perennial herb	-	-
Collomia heterophylla	Varied leaved collomia	native	annual herb	-	-
Conium maculatum	Poison hemlock	non-native (invasive)	perennial herb	-	Moderate
Corallorhiza maculata	Summer coral root	native	perennial herb	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Cortaderia jubata	Andean pampas grass	non-native (invasive)	perennial grass	-	High
Corylus cornuta ssp. californica	Beaked hazelnut	native	shrub	-	-
Crassula connata	Sand pygmy weed	native	annual herb	-	-
Crocanthemum scoparium	Bisbee Peak Rushrose	native	shrub	-	-
Croton setiger	Turkey-mullein	native	perennial herb	-	-
Cryptantha sp.	Cryptantha	native	annual herb	-	-
Cuscuta sp.	Dodder	-	annual herb	-	-
Cynoglossum grande	Houndstongue	native	perennial herb	-	-
Cynosurus echinatus	Dogtail grass	non-native (invasive)	annual grass	-	Moderate
Cyperus eragrostis	Tall cyperus	native	perennial grasslike herb	-	-
Dactylis glomerata	Orchardgrass	non-native (invasive)	perennial grass	-	Limited
Daucus pusillus	Wild carrot	native	annual herb	-	-
Deinandra increscens ssp. increscens	Grassland tarweed	native	annual herb	-	-
Dendromecon rigida	Bush poppy	native	shrub	-	-
Dichelostemma capitatum ssp. capitatum	Wild hyacinth	native	perennial herb	-	-
Digitalis purpurea	Foxglove	non-native (invasive)	perennial herb	-	Limited
Drymocallis glandulosa	Sticky cinquefoil	native	perennial herb	-	-
Dudleya lanceolata	Southern California dudleya	native	perennial herb	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Elymus glaucus	Blue wildrye	native	perennial grass	-	-
Epilobium canum	California fuchsia, zauschneria	native	perennial herb	-	-
Epilobium ciliatum	Slender willow herb	native	perennial herb	-	-
Epilobium minutum	Minute willowherb	native	annual herb	-	-
Epipactis helleborine	Helleborine	non-native	perennial herb	-	-
Equisetum telmateia ssp. braunii	Giant horsetail	native	fern	-	-
Ericameria arborescens	Golden fleece	native	shrub	-	-
Erigeron canadensis	Canada horseweed	native	annual herb	-	-
Eriodictyon californicum	Yerba santa	native	shrub	-	-
Eriogonum nudum	Naked buckwheat	native	shrub	-	-
Eriophyllum confertiflorum	Yellow yarrow	native	shrub	-	-
Eriophyllum lanatum	Wooly sunflower	native	perennial herb	-	-
Eriophyllum staechadifolium	Lizard tail	native	perennial herb	-	-
Erodium botrys	Big heron bill	non-native (invasive)	annual herb	-	-
Erodium cicutarium	Coastal heron's bill	non-native (invasive)	annual herb	-	Limited
Eschscholzia californica	California poppy	native	annual, perennial herb	-	-
Eurybia radulina	Roughleaf aster	native	perennial herb	-	-
Festuca bromoides	Brome fescue	non-native	annual grass	-	-
Festuca californica	California fescue	native	perennial grass	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Festuca myuros	Rattail sixweeks grass	non-native (invasive)	annual grass	-	-
Festuca perennis	Italian rye grass	non-native	annual, perennial grass	-	-
Festuca rubra	Red fescue	native	perennial grass	-	-
Fragaria vesca	Wild strawberry	native	perennial herb	-	-
Frangula californica	California coffeeberry	native	shrub	-	-
Fumaria parviflora	Fine leaved fumitory	non-native	annual herb	-	-
Galium aparine	Cleavers	native	annual herb	-	-
Galium californicum	California bedstraw	native	perennial herb	-	-
Galium porrigens	Climbing bedstraw	native	vine, shrub	-	-
Gamochaeta ustulata	Featherweed	native	perennial herb	-	-
Garrya elliptica	Coast silk tassel	native	tree, shrub	-	-
Gastridium phleoides	Nit grass	non-native	annual grass	-	-
Gaultheria shallon	Salal	native	shrub	-	-
Genista monspessulana	French broom	non-native (invasive)	shrub	-	High
Helenium puberulum	Sneezeweed	native	perennial herb	-	-
Heracleum maximum	Common cowparsnip	native	perennial herb	-	-
Heteromeles arbutifolia	Toyon	native	shrub	-	-
Heterotheca sessiliflora ssp. bolanderi	Golden aster	native	perennial herb	-	-
Heuchera micrantha	Alum root	native	perennial herb	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Hieracium albiflorum	White flowered hawkweed	native	perennial herb	-	-
Holcus lanatus	Common velvetgrass	non-native (invasive)	perennial grass	-	Moderate
Holodiscus discolor	Oceanspray	native	shrub	-	-
Hulsea heterochroma	Red rayed hulsea	native	perennial herb	-	-
Hypericum perforatum ssp. perforatum	Klamathweed	non-native	perennial herb	-	-
Hypochaeris glabra	Smooth cats ear	non-native (invasive)	annual herb	-	Limited
Hypochaeris radicata	Hairy cats ear	non-native (invasive)	perennial herb	-	Moderate
Iris fernaldii	Fernald's iris	native	perennial herb	-	-
Juncus bufonius	Common toad rush	native	annual grasslike herb	-	-
Juncus effusus ssp. pacificus	Pacific rush	native	perennial grasslike herb	-	-
Juncus hesperius	Coast or bog rush	native	perennial grasslike herb	-	-
Juncus patens	Spreading rush	native	perennial grasslike herb	-	-
Lathyrus vestitus	Common pacific pea	native	perennial herb	-	-
Lepechinia calycina	Pitcher sage	native	shrub	-	-
Linum bienne	Flax	non-native	annual herb	-	-
Logfia gallica	Narrowleaf cottonrose	non-native	annual herb	-	-
Lonicera hispidula	Pink honeysuckle	native	vine, shrub	-	-
Lupinus albifrons var. collinus	Silver bush lupine	native	shrub	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Lupinus bicolor	Bicolored lupine	native	annual, perennial herb	-	-
Lupinus succulentus	Arroyo lupine	native	annual herb	-	-
Lysimachia arvensis	Scarlet pimpernel	non-native	annual herb	-	-
Lysimachia latifolia	Pacific starflower	native	perennial herb	-	-
Madia gracilis	Gumweed	native	annual herb	-	-
Maianthemum racemosum	Feathery false lily of the valley	native	perennial herb	-	-
Marah fabacea	California man-root	native	perennial herb, vine	-	-
Melica geyeri	Geyer's onion grass	native	perennial grass	-	-
Melica imperfecta	Coast range melic	native	perennial grass	-	-
Mimulus aurantiacus	Sticky monkeyflower	native	shrub	-	-
Mimulus moschatus	Musk monkeyflower	native	perennial herb	-	-
Mimulus pilosus	Snouted monkeyflower	native	annual herb	-	-
Monardella villosa	Coyote mint	native	perennial herb	-	-
Morella californica	California wax myrtle	native	shrub	-	-
Myosotis latifolia	Wide leaved forget-me-not	non-native (invasive)	perennial herb	-	Limited
Navarretia squarrosa	Skunkweed	native	annual herb	-	-
Nemophila parviflora	Small flowered nemophila	native	annual herb	-	-
Notholithocarpus densiflorus var. densiflorus	Tanoak	native	tree, shrub	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Nuttallanthus texanus	Blue toadflax	native	annual, perennial herb	-	-
Orobanche fasciculata	Pinyon broomrape	native	perennial herb (parasitic)	-	-
Osmorhiza berteroi	Sweetcicely	native	perennial herb	-	-
Oxalis corniculata	Creeping wood sorrel	non-native (invasive)	perennial herb	-	-
Oxalis oregana	Redwood sorrel	native	perennial herb	-	-
Panicum sp.	-	-	-	-	-
Pellaea andromedifolia	Coffee fern	native	fern	-	-
Pentagramma triangularis	Gold back fern	native	fern	-	-
Perideridia kelloggii	Yampah	native	perennial herb	-	-
Phacelia malvifolia	Stinging phacelia	native	annual herb	-	-
Phacelia rattanii	Rattan's phacelia	native	annual herb	-	-
Pinus attenuata	Scrub pine	native	tree	-	-
Pinus coulteri	Coulter pine	native	tree	-	-
Pinus ponderosa	Yellow pine	native	tree	-	-
Piperia elegans ssp. elegans	Elegant piperia	native	perennial herb	-	-
Plantago lanceolata	Ribwort	non-native (invasive)	perennial herb	-	Limited
Polygala californica	Milkwort	native	perennial herb	-	-
Polypogon interruptus	Ditch beard grass	non-native	perennial grass	-	-
Polystichum munitum	Western sword fern	native	fern	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Prosartes hookeri	Drops of gold	native	perennial herb	-	-
Prunella vulgaris	Self heal	native	perennial herb	-	-
Pseudognaphalium californicum	Ladies' tobacco	native	annual, perennial herb	-	-
Pseudognaphalium luteoalbum	Jersey cudweed	non-native	annual herb	-	-
Pseudognaphalium ramosissimum	Pink cudweed	native	biennial herb	-	-
Pseudotsuga menziesii var. menziesii	Douglas fir	native	tree	-	-
Pteridium aquilinum var. pubescens	Western bracken fern	native	fern	-	-
Quercus agrifolia var. agrifolia	Coast live oak	native	tree	-	-
Quercus chrysolepis	Gold cup live oak	native	tree	-	-
Quercus parvula var. shrevei	Shreve's oak	native	tree	-	-
Quercus wislizeni var. wislizeni	Interior live oak	native	tree, shrub	-	-
Rhododendron occidentale	Western azalea	native	tree, shrub	-	-
Ribes sp.	Currant, gooseberry	native	shrub	-	-
Rosa gymnocarpa var. gymnocarpa	Wood rose	native	shrub	-	-
Rubus leucodermis	White bark raspberry	native	shrub	-	-
Rubus parviflorus	Thimbleberry	native	vine, shrub	-	-
Rubus ursinus	California blackberry	native	vine, shrub	-	-
Rumex acetosella	Sheep sorrel	non-native (invasive)	perennial herb	-	Moderate
Rumex salicifolius	Willow leaved dock	native	perennial herb	-	-
Rupertia physodes	Common rupertia	native	perennial herb	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Rytidosperma penicillatum	Purple awned wallaby grass	non-native (invasive)	perennial grass	-	Limited
Salix scouleriana	Scouler willow	native	tree, shrub	-	-
Sambucus nigra ssp. caerulea	Blue elderberry	native	shrub	-	-
Sambucus racemosa var. racemosa	Red elderberry	native	shrub	-	-
Scirpus microcarpus	Mountain bog bulrush	native	perennial grasslike herb	-	-
Scrophularia californica	California bee plant	native	perennial herb	-	-
Senecio minimus	Coastal burnweed	non-native (invasive)	annual, perennial herb	-	-
Sequoia sempervirens	Coast redwood	native	tree	-	-
Sisyrinchium bellum	Blue eyed grass	native	perennial herb	-	-
Solanum douglasii	Douglas' nightshade	native	perennial herb	-	-
Solanum umbelliferum	Blue witch	native	shrub	-	-
Solidago velutina ssp. californica	California goldenrod	native	perennial herb	-	-
Sonchus asper ssp. asper	Sow thistle	non-native (invasive)	annual herb	-	-
Sonchus oleraceus	Sow thistle	non-native	annual herb	-	-
Stachys rigida var. quercetorum	Rough hedgenettle	native	perennial herb	-	-
Stephanomeria exigua ssp. coronaria	White plume wirelettuce	native	annual herb	-	-
Stipa pulchra	Purple needle grass	native	perennial grass	-	-
Symphoricarpos mollis	Snowberry	native	shrub	-	-
Symphyotrichum subspicatum	Douglas aster	native	perennial herb	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Torilis arvensis	Field hedge parsley	non-native (invasive)	annual herb	-	Moderate
Toxicodendron diversilobum	Poison oak	native	vine, shrub	-	-
Toxicoscordion fremontii	Fremont's star lily	native	perennial herb	-	-
Trifolium angustifolium	Narrow leaved clover	non-native	annual herb	-	-
Trifolium campestre	Hop clover	non-native	annual herb	-	-
Trifolium dubium	Shamrock	non-native	annual herb	-	-
Trifolium glomeratum	Clustered clover	non-native	annual herb	-	-
Trifolium hirtum	Rose clover	non-native (invasive)	annual herb	-	Limited
Trifolium microcephalum	Small head clover	native	annual herb	-	-
Trifolium variegatum	Variegated clover	native	annual herb	-	-
Trifolium willdenovii	Tomcat clover	native	annual herb	-	-
Trillium chloropetalum	Giant wakerobin	native	perennial herb	-	-
Trillium ovatum ssp. ovatum	Western wakerobin	native	perennial herb	-	-
Umbellularia californica	California bay	native	tree	-	-
Urtica dioica	Stinging nettle	native	perennial herb	-	-
Vaccinium ovatum	Evergreen huckleberry	native	shrub	-	-
Verbascum thapsus	Woolly mullein	non-native (invasive)	perennial herb	-	Limited
Verbascum virgatum	Wand mullein	non-native	perennial herb	-	-
Verbena lasiostachys var. lasiostachys	Vervain	native	perennial herb	-	-
Vicia hassei	Hasse's vetch	native	vine	-	-

Scientific Name	Common Name	Origin	Form	Rarity Status[1]	Cal-IPC Status[2]
Vicia sativa	Spring vetch	non-native	annual herb, vine	-	-
Viola ocellata	Western heart's ease	native	perennial herb	-	-
Viola sempervirens	Redwood violet	native	perennial herb	-	-
Whipplea modesta	Modesty	native	vine, shrub	-	-
Woodwardia fimbriata	Western chain fern	native	fern	-	-
Zeltnera muehlenbergii	Muehlenberg's centaury	native	annual herb	-	-

[1]Key to Rarity Status

FE	Federal Endangered
FT	Federal Threatened
SE	State Endangered
ST	State Threatened
SR	State Rare
Rank 1B.1	CNPS Rank 1B.1: Rare, threatened, or endangered in California and elsewhere (seriously threatened in California)
Rank 1B.2	CNPS Rank 1B.2: Rare, threatened, or endangered in California and elsewhere (moderately threatened in California)
Rank 2B.1	CNPS Rank 2B.1: Rare, threatened, or endangered in California, but more common elsewhere (seriously threatened in California)
Rank 2B.2	CNPS Rank 2B.2: Rare, threatened, or endangered in California, but more common elsewhere (moderately threatened in California)
Rank 3.1	CNPS Rank 3.1: Plants about which more information is needed - A review list (seriously threatened in California)
Rank 3.2	CNPS Rank 3.2: Plants about which more information is needed - A review list (moderately threatened in California)
Rank 4.2	CNPS Rank 4.2: Plants of limited distribution - A watch list (moderately threatened in California)
Rank 4.3	CNPS Rank 4.3: Plants of limited distribution - A watch list (not very threatened in California)

[2]Key to Cal-IPC Status

High	These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
Moderate	These species have substantial and apparent-but generally not severe-ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
Limited	These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Appendix B2. Wildlife species observed within the Project Area for the San Vicente Redwoods Public Access Plan (PlaceWorks 2018) during surveys conducted by WRA biologists on December 16-17, 2015, January 20-22, February 10-12, June 15-16, August 15-17 and 24-25, and October 21, 2016, and May 30-June 1 and August 8-9, 2017.

Common Name	**Species**
MAMMALS	
mountain lion	*Puma concolor*
black-tailed deer	*Odocoileus hemionus*
coyote	*Canis latrans*
mole	*Scapanus spp.*
San Francisco dusky-footed woodrat	*Neotoma fuscipes annectens*
Western grey squirrel	*Sciurus griseus*
BIRDS	
American robin	*Turdus migratorius*
Anna’s Hummingbird	*Calypte anna*
chestnut-backed chickadee	*Poecile rufescens*
dark-eyed junco	*Junco hyemalis*
Eurasian collared-dove	*Streptopelia decaocto*
oak titmouse	*Baeolophus inornatus*
pileated woodpecker	*Dryocopus pileatus*
Steller’s jay	*Cyanocitta stelleri*
Townsend’s warbler	*Setophaga townsendii*
western scrub-jay	*Aphelocoma californica*
AMPHIBIANS	
California slender salamander	*Batrachoseps attenuatus*
black salamander	*Aneides flavipunctatus*

APPENDIX C

POTENTIAL FOR SPECIAL-STATUS SPECIES TO OCCUR IN THE PROJECT AREA

Appendix C. Potential for special-status species to occur in the Project Area. List compiled from the California Department of Fish and Wildlife (CDFW) Natural Diversity Database, U.S. Fish and Wildlife Service (USFWS) Species Lists, and California Native Plant Society (CNPS) Electronic Inventory search of the Franklin Point, Big Basin, Año Nuevo, Davenport, Felton, Castle Rock Ridge, and Santa Cruz USGS 7.5 minute quadrangles and a review of other CDFW lists and publications (Jennings and Hayes 1994, Zeiner et al. 1990).

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Plants				
Blasdale's bent grass *Agrostis blasdalei*	Rank 1B.2	Coastal bluff scrub, coastal dunes, coastal prairie. Elevation ranges from 20 to 490 feet (5 to 150 meters). Blooms May-Jul.	**Unlikely.** Although the Project Area is located within 2 miles of an occurrence of this species, the Project Area does not contain coastal bluff scrub, coastal dune, or coastal prairie habitat.	No further action recommended for this species.
bent-flowered fiddleneck *Amsinckia lunaris*	Rank 1B.2	Coastal bluff scrub, cismontane woodland, valley and foothill grassland. Elevation ranges from 10 to 1640 feet (3 to 500 meters). Blooms Mar-Jun.	**Unlikely.** Although this species has been documented less than 2 miles to the west of the Project Area, the Project Area lacks suitable grassy openings required to support this species.	No further action recommended for this species.
coast rockcress *Arabis blepharophylla*	Rank 4.3	Broadleaved upland forest, coastal bluff scrub, coastal prairie, coastal scrub/rocky. Elevation ranges from 10 to 3610 feet (3 to 1100 meters). Blooms Feb-May.	**Unlikely.** Although the Project Area contains suitable broadleaved upland forest habitat, it does not contain the open, rocky habitat required by this species.	No further action recommended for this species.
Anderson's manzanita *Arctostaphylos andersonii*	Rank 1B.2	Broadleaved upland forest, chaparral, north coast coniferous forest/openings, edges. Elevation ranges from 200 to 2490 feet (60 to 760 meters). Blooms Nov-May.	**Present.** This species was observed in the Project Area.	See Section 7.0 of the BRA for recommended avoidance, minimization, and mitigation measures for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Schreiber's manzanita *Arctostaphylos glutinosa*	Rank 1B.2	Closed-cone coniferous forest, chaparral; on diatomaceous shale. Elevation ranges from 560 to 2250 feet (170 to 685 meters). Blooms (Nov), Mar-Apr.	**Not Observed.** This species has been documented adjacent to the west of the Project Area on siliceous shale soil, which is also present in the Project Area. However, all *Arctostaphylos* species observed within the Project Area were identified to species level; *A. glutinosa* was not observed. It is assumed this species is not present.	No further action recommended for this species.
Ohlone manzanita *Arctostaphylos ohloneana*	Rank 1B.1	Closed-cone coniferous forest, coastal scrub/siliceous shale. Elevation ranges from 1480 to 1740 feet (450 to 530 meters). Blooms Feb-Mar.	**Not Observed.** This species has been documented adjacent to the west of the Project Area on siliceous shale soil, which is also present in the Project Area. However, all *Arctostaphylos* species observed within the Project Area were identified to species level; *A. ohloneana* was not observed. It is assumed this species is not present.	No further action recommended for this species.
Pajaro manzanita *Arctostaphylos pajaroensis*	Rank 1B.1	Chaparral (sandy). Elevation ranges from 100 to 2490 feet (30 to 760 meters). Blooms Dec-Mar.	**Not Observed.** Although this species is reported in the CNDDB to occur within the larger San Vicente Redwoods property, all *Arctostaphylos* species observed within the Project Area were identified to species level, and *A. pajaroensis* was not observed. It is assumed that this species is not present.	No further action recommended for this species.
Kings Mountain manzanita *Arctostaphylos regismontana*	Rank 1B.2	Broadleaved upland forest, chaparral, north coast coniferous forest/granitic or sandstone. Elevation ranges from 1000 to 2400 feet (305 to 730 meters). Blooms Jan-Apr.	**Not Observed.** All *Arctostaphylos* species observed within the Project Area were identified to species level; *A. regismontana* was not observed. It is assumed that this species is not present.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Bonny Doon manzanita *Arctostaphylos silvicola*	Rank 1B.2	Closed-cone coniferous forest, chaparral, lower montane coniferous forest/inland marine sands. Elevation ranges from 390 to 1970 feet (120 to 600 meters). Blooms Jan-Mar.	**Not Observed.** All *Arctostaphylos* species observed within the Project Area were identified to species level; *A. silvicola* was not observed. In addition, the Project Area does not contain suitable Zayante coarse sands required to support this species. It is assumed that this species is not present.	No further action recommended for this species.
marsh sandwort *Arenaria paludicola*	FE, SE, Rank 1B.1	Marshes and swamps (freshwater or brackish)/sandy, openings. Elevation ranges from 10 to 560 feet (3 to 170 meters). Blooms May-Aug.	**Unlikely.** The Project Area does not contain suitable open marsh or swamp habitat and the species is thought to be extirpated from Santa Cruz County.	No further action recommended for this species.
coastal marsh milk-vetch *Astragalus pycnostachyus var. pycnostachyus*	Rank 1B.2	Coastal dunes (mesic), coastal scrub, marshes and swamps (coastal salt, streamsides). Elevation ranges from 0 to 100 feet (0 to 30 meters). Blooms Apr-Oct.	**Unlikely.** The Project Area does not contain suitable coastal marsh, swamp, or other saline mesic habitats required to support this species. The Project Area is also outside of the known elevation range for this species.	No further action recommended for this species.
Brewer's calandrinia *Calandrinia breweri*	Rank 4.2	Disturbed or burned sites on sandy or loamy soils in chaparral or coastal scrub. Elevation ranges from 30 to 4000 feet (10-1220 meters). Blooms Jan-Jun.	**Unlikely.** This species was originally determined to have potential to occur in open, disturbed areas such as along the powerline road; however, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
Santa Cruz Mountains pussypaws *Calyptridium parryi var. hesseae*	Rank 1B.1	Chaparral, cismontane woodland/sandy or gravelly, openings. Elevation ranges from 1000 to 5020 feet (305 to 1530 meters). Blooms May-Aug.	**Unlikely.** This species has been documented in the vicinity and was originally determined to have potential to occur in suitable sandy openings in chaparral and cismontane woodland habitat. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
swamp harebell *Campanula californica*	Rank 1B.2	Bogs and fens, closed-cone coniferous forest, coastal prairie, meadows and seeps, marshes and swamps (freshwater), north coast coniferous forest/mesic. Elevation ranges from 0 to 1330 feet (1 to 405 meters). Blooms Jun-Oct.	**Unlikely.** The Project Area does not contain suitable bog, marsh, or other mesic habitats required to support this species and the nearest known occurrence is located over 8 miles away.	No further action recommended for this species.
bristly sedge *Carex comosa*	Rank 2B.1	Coastal prairie, marshes and swamps (lake margins), valley and foothill grassland. Elevation ranges from 0 to 2050 feet (0 to 625 meters). Blooms May-Sep.	**Unlikely.** This species was originally determined to have potential to occur along streams within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
deceiving sedge *Carex saliniformis*	Rank 1B.2	Coastal prairie, coastal scrub, meadows and seeps, marshes and swamps (coastal salt)/mesic. Elevation ranges from 10 to 750 feet (3 to 230 meters). Blooms Jun (Jul).	**Unlikely.** This species was originally determined to have potential to occur along streams within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
johnny-nip *Castilleja ambigua var. ambigua*	Rank 4.2	Coastal bluff scrub, coastal prairie, coastal scrub, marshes and swamps, valley and foothill grassland, vernal pool margins. Elevation ranges from 0 to 1430 feet (0 to 435 meters). Blooms Mar-Aug.	**Unlikely.** The Project Area does not contain suitable openings in coastal prairie, coastal scrub, marsh, swamp, grassland, or other mesic habitats required to support this species.	No further action recommended for this species.
Ben Lomond spineflower *Chorizanthe pungens var. hartwegiana*	FE, Rank 1B.1	Lower montane coniferous forest (maritime ponderosa pine sandhills). Elevation ranges from 300 to 2000 feet (90 to 610 meters). Blooms Apr-Jul.	**Unlikely.** The Project Area does not contain suitable ponderosa pine sandhill habitat or Zayante coarse sands required to support this species.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Scotts Valley spineflower *Chorizanthe robusta var. hartwegii*	FE, Rank 1B.1	Meadows and seeps (sandy), valley and foothill grassland (mudstone and purissima outcrops). Elevation ranges from 750 to 800 feet (230 to 245 meters). Blooms Apr-Jul.	**Unlikely.** The Project Area does not contain suitable open grassland habitat necessary to support this species.	No further action recommended for this species.
robust spineflower *Chorizanthe robusta var. robusta*	FE, Rank 1B.1	Chaparral (maritime), cismontane woodland (openings), coastal dunes, coastal scrub/sandy or gravelly. Elevation ranges from 10 to 980 feet (3 to 300 meters). Blooms Apr-Sep.	**Unlikely.** Although most of the Project Area is dominated by dense forest which is not suitable for this species, this species was originally determined to have potential to occur in openings at road crossings such as along the powerline alignment may have potential to support this species. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
Franciscan thistle *Cirsium andrewsii*	Rank 1B.2	Broadleaved upland forest, coastal bluff scrub, coastal prairie, coastal scrub/mesic, sometimes serpentine. Elevation ranges from 0 to 490 feet (0 to 150 meters). Blooms Mar-Jul.	**Unlikely.** Although the Project Area may contain suitable habitat elements, it does not contain mesic sites on serpentine soils. Additionally, the nearest known occurrence is over 8 miles from the Project Area.	No further action recommended for this species.
Santa Clara red ribbons *Clarkia concinna ssp. automixa*	Rank 4.3	Chaparral, cismontane woodland. Elevation ranges from 300 to 4920 feet (90 to 1500 meters). Blooms (Apr), May-Jun (Jul).	**Unlikely.** Although the Project Area contains suitable habitat elements, the nearest known occurrences are located over 10 miles away on the eastern slopes of the Santa Cruz Mountains. No occurrences are known from the western slopes.	No further action recommended for this species.
San Francisco collinsia *Collinsia multicolor*	Rank 1B.2	Closed-cone coniferous forest, coastal scrub/sometimes serpentine. Elevation ranges from 100 to 820 feet (30 to 250 meters). Blooms (Feb), Mar-May.	**Unlikely.** The Project Area lacks suitable closed cone coniferous forest or coastal scrub necessary to support this species. In addition, the Project Area is located above the known elevation range of this species.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
branching beach aster *Corethrogyne leucophylla*	Rank 3.2	Closed-cone coniferous forest, coastal dunes. Elevation ranges from 10 to 200 feet (3 to 60 meters). Blooms May-Dec.	**Unlikely.** The Project Area lacks suitable closed cone coniferous forest or coastal dunes and is located above the known elevation range for this species.	No further action recommended for this species.
clustered lady's-slipper *Cypripedium fasciculatum*	Rank 4.2	Lower montane coniferous forest, north coast coniferous forest/usually serpentine seeps and streambanks. Elevation ranges from 330 to 7990 feet (100 to 2435 meters). Blooms Mar-Aug.	**Unlikely.** Although the Project Area contains streams, they are located high in the watershed and do not support the hydrology required by this species. In addition, no serpentine seeps occur within the Project Area.	No further action recommended for this species.
mountain lady's-slipper *Cypripedium montanum*	Rank 4.2	Broadleaved upland forest, cismontane woodland, lower montane coniferous forest, north coast coniferous forest. Elevation ranges from 610 to 7300 feet (185 to 2225 meters). Blooms Mar-Aug.	**Unlikely.** This species was originally determined to have potential to occur in broadleaved upland forest, cismontane woodland, and lower montane coniferous forest within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
California bottle brush *Elymus californicus*	Rank 4.3	Moist openings in mixed evergreen/redwood forest and oak/riparian forest. Elevation ranges from 50-155 feet (15-47 meters). Blooms May-Nov.	**Moderate Potential.** This species was originally determined to have potential to occur in moist openings in forested habitats within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
Ben Lomond buckwheat *Eriogonum nudum var. decurrens*	Rank 1B.1	Chaparral, cismontane woodland, lower montane coniferous forest (maritime ponderosa pine sandhills)/sandy. Elevation ranges from 160 to 2620 feet (50 to 800 meters). Blooms Jun-Oct.	**Unlikely.** The Project Area does not contain suitable Ponderosa pine sandhill habitat required to support this species.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
sand-loving wallflower *Erysimum ammophilum*	Rank 1B.2	Chaparral (maritime), coastal dunes, coastal scrub/sandy, openings. Elevation ranges from 0 to 200 feet (0 to 60 meters). Blooms Feb-Jun.	**Unlikely.** The Project Area does not contain suitable sandy openings in maritime chaparral, coastal dunes, or coastal scrub required to support this species and the nearest known occurrence is located over 8 miles from the Project Area.	No further action recommended for this species.
Santa Cruz wallflower *Erysimum teretifolium*	FE, SE, Rank 1B.1	Chaparral, lower montane coniferous forest/inland marine sands. Elevation ranges from 390 to 2000 feet (120 to 610 meters). Blooms Mar-Jul.	**Unlikely.** Although the Project Area may contain suitable habitat elements, it does not contain Zayante coarse sands necessary to support this species.	No further action recommended for this species.
stinkbells *Fritillaria agrestis*	Rank 4.2	Chaparral, cismontane woodland, pinyon and juniper woodland, valley and foothill grassland/clay, sometimes serpentine. Elevation ranges from 30 to 5100 feet (10 to 1555 meters). Blooms Mar-Jun.	**Unlikely.** The Project Area does not contain suitable grassy openings required by this species and the nearest known occurrence is over 8 miles away.	No further action recommended for this species.
fragrant fritillary *Fritillaria liliacea*	Rank 1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland/often serpentine. Elevation ranges from 10 to 1350 feet (3 to 410 meters). Blooms Feb-Apr.	**Unlikely.** The Project Area does not contain suitable grassy openings, heavy clay, or serpentine soils required by this species.	No further action recommended for this species.
San Francisco gumplant *Grindelia hirsutula var. maritima*	Rank 3.2	Coastal bluff scrub, coastal scrub, valley and foothill grassland/sandy or serpentine. Elevation ranges from 50 to 1310 feet (15 to 400 meters). Blooms Jun-Sep.	**Unlikely.** The Project Area does not contain suitable open, coastal habitats or serpentine soils required to support this species.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
short-leaved evax *Hesperevax sparsiflora var. brevifolia*	Rank 1B.2	Coastal bluff scrub (sandy), coastal dunes, coastal prairie. Elevation ranges from 0 to 710 feet (0 to 215 meters). Blooms Mar-Jun.	**Unlikely.** The Project Area does not contain suitable coastal bluff scrub, coastal dunes, or coastal prairie. Although an occurrence is located in seemingly unsuitable habitat less than 2 miles from the site, the occurrence is from 1954 and no other occurrences occur within the quadrangles examined for this report.	No further action recommended for this species.
Santa Cruz cypress *Hesperocyparis abramsiana var. abramsiana*	FE, SE, Rank 1B.2	Closed-cone coniferous forest, chaparral, lower montane coniferous forest/sandstone or granitic. Elevation ranges from 920 to 2620 feet (280 to 800 meters).	**Not Observed.** Although this species is known to occur within the immediate vicinity of the Project Area, WRA received anecdotal evidence that the population has been extirpated (Nadia Hamey, forester for Santa Cruz Land Trust, pers comm, April 6, 2016). The species was not observed during surveys conducted for this report. The species is identifiable year-round and would have been observed if present. Therefore, it is assumed that the species is not present within the Project Area.	No further action recommended for this species.
Butano Ridge cypress *Hesperocyparis abramsiana var. butanoensis*	FE, SE, Rank 1B.2	Closed-cone coniferous forest, chaparral, lower montane coniferous forest/sandstone. Elevation ranges from 1310 to 1610 feet (400 to 490 meters). Blooms Oct.	**Not Observed.** This species was not observed during surveys conducted for this report. The species is identifiable year-round and would have been observed if present. Moreover, the species is only known from Butano Ridge, located over 8 miles from the Project Area. Therefore, it is assumed that the species is not present within the Project Area.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Loma Prieta hoita *Hoita strobilina*	Rank 1B.1	Chaparral, cismontane woodland, riparian woodland/usually serpentine, mesic. Elevation ranges from 100 to 2820 feet (30 to 860 meters). Blooms May-Jul (Aug), (Oct).	**Unlikely.** Suitable mesic serpentine soils are not present within the Project Area and the nearest known occurrence is located over 12 miles away on the eastern slopes of the Santa Cruz Mountains.	No further action recommended for this species.
Santa Cruz tarplant *Holocarpha macradenia*	FT, SE, Rank 1B.1	Coastal prairie, coastal scrub, valley and foothill grassland/often clay, sandy. Elevation ranges from 30 to 720 feet (10 to 220 meters). Blooms Jun-Oct.	**Unlikely.** The Project Area does not contain suitable coastal prairie, coastal scrub, or valley or foothill grassland habitats required to support this species and the Project Area is located above the known elevation range for this species.	No further action recommended for this species.
Kellogg's horkelia *Horkelia cuneata var. sericea*	Rank 1B.1	Closed-cone coniferous forest, chaparral (maritime), coastal dunes, coastal scrub/sandy or gravelly, openings. Elevation ranges from 30 to 660 feet (10 to 200 meters). Blooms Apr-Sep.	**Unlikely.** The Project Area does not contain suitable coastal sandhill habitat necessary to support this species and the Project Area is located above the known elevation range of this species.	No further action recommended for this species.
Point Reyes horkelia *Horkelia marinensis*	Rank 1B.2	Coastal dunes, coastal prairie, coastal scrub/sandy. Elevation ranges from 20 to 2480 feet (5 to 755 meters). Blooms May-Sep.	**Unlikely.** Although the Project Area contains at least three known occurrences of this species and the species was observed outside of the Project Area by WRA biologists, the species was not observed within the Project Area.	No further action recommended for this species.
harlequin lotus *Hosackia gracilis*	Rank 4.2	Wet areas in meadows and other grassy habitats, roadside ditches, etc. Elevation ranges from 0-2300 feet (0-700 meters). Blooms Mar-Jul.	**Unlikely.** The Project Area does not contain suitable mesic meadows, grasslands, or grassy road shoulders capable of supporting this species.	No further action recommended for this species.
coast iris *Iris longipetala*	Rank 4.2	Coastal prairie, lower montane coniferous forest, meadows and seeps/mesic. Elevation ranges from 0 to 1970 feet (0 to 600 meters). Blooms Mar-May.	**Unlikely.** The Project Area does not contain suitable mesic sites on heavy soils required to support this species.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
large-flowered leptosiphon *Leptosiphon grandiflorus*	Rank 4.2	Sandy soils in open, grassy flats. Elevation ranges from 15-4000 feet (5-1220 meters). Blooms Apr-Aug.	**Unlikely.** The Project Area does not contain suitable open, grassy habitats necessary to support this species.	No further action recommended for this species.
woolly-headed lessingia *Lessingia hololeuca*	Rank 3	Broadleaved upland forest, coastal scrub, lower montane coniferous forest, valley and foothill grassland/clay, serpentine. Elevation ranges from 50 to 1000 feet (15 to 305 meters). Blooms Jun-Oct.	**Unlikely.** The Project Area does not contain suitable serpentine soils required to support this species.	No further action recommended for this species.
smooth lessingia *Lessingia micradenia var. glabrata*	Rank 1B.2	Chaparral, cismontane woodland/serpentine, often roadsides. Elevation ranges from 390 to 1380 feet (120 to 420 meters). Blooms (May), (Jun), Jul-Nov.	**Unlikely.** The Project Area does not contain suitable serpentine soils required to support this species.	No further action recommended for this species.
Point Reyes meadowfoam *Limnanthes douglasii ssp. sulphurea*	SE, Rank 1B.2	Coastal prairie, meadows and seeps (mesic), marshes and swamps (freshwater), vernal pools. Elevation ranges from 0 to 460 feet (0 to 140 meters). Blooms Mar-May.	**Unlikely.** The Project Area does not contain suitable vernally wet depressional features required to support this species and the nearest known occurrence is located over 10 miles away.	No further action recommended for this species.
arcuate bush-mallow *Malacothamnus arcuatus*	Rank 1B.2	Chaparral, cismontane woodland. Elevation ranges from 50 to 1160 feet (15 to 355 meters). Blooms Apr-Sep.	**Unlikely.** This species was originally determined to have potential to occur in gravelly openings such as along the powerline road. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
Mt. Diablo cottonweed *Micropus amphibolus*	Rank 3.2	Broadleaved upland forest, chaparral, cismontane woodland, valley and foothill grassland/rocky. Elevation ranges from 150 to 2710 feet (45 to 825 meters). Blooms Mar-May.	**Unlikely.** The Project Area does not contain sunny, open rocky areas necessary to support this species.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
marsh Microseris *Microseris paludosa*	Rank 1B.2	Closed-cone coniferous forest, cismontane woodland, coastal scrub, valley and foothill grassland. Elevation ranges from 20 to 1160 feet (5 to 355 meters). Blooms Apr-Jun (Jul).	**Unlikely.** The Project Area does not contain sunny openings on mesic soils necessary to support this species.	No further action recommended for this species.
Santa Cruz County monkeyflower *Mimulus rattanii ssp. decurtatus*	Rank 4.2	Chaparral, lower montane coniferous forest/margins, gravelly. Elevation ranges from 1310 to 1640 feet (400 to 500 meters). Blooms May-Jul.	**Unlikely.** This species was originally determined to have potential to occur in gravelly openings such as along the powerline road. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
northern curly-leaved Monardella *Monardella sinuata ssp. nigrescens*	Rank 1B.2	Chaparral, coastal dunes, coastal scrub, lower montane coniferous forest (ponderosa pine sandhills)/sandy. Elevation ranges from 0 to 980 feet (0 to 300 meters). Blooms (Apr), May-Jul (Aug), (Sep).	**Unlikely.** This species was originally determined to have potential to occur in openings on sandy soils throughout the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
woodland woolythreads *Monolopia gracilens*	Rank 1B.2	Broadleaved upland forest (openings), chaparral (openings), cismontane woodland, north coast coniferous forest (openings), valley and foothill grassland/serpentine. Elevation ranges from 330 to 3940 feet (100 to 1200 meters). Blooms (Feb), Mar-Jul.	**Unlikely.** The Project Area does not contain serpentine soils or suitable forest openings required to support this species. In addition, the nearest known occurrence is located over 6 miles away from the Project Area.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Dudley's lousewort *Pedicularis dudleyi*	SR, Rank 1B.2	Chaparral (maritime), cismontane woodland, north coast coniferous forest, valley and foothill grassland. Elevation ranges from 200 to 2950 feet (60 to 900 meters). Blooms Apr-Jun.	**Unlikely.** An occurrence of this species is located approximately 2 miles to the northeast of the Project Area and this species was originally determined to have potential to occur in cismontane woodland and coniferous forest within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
Santa Cruz Mountains beardtongue *Penstemon rattanii var. kleei*	Rank 1B.2	Chaparral, lower montane coniferous forest, north coast coniferous forest. Elevation ranges from 1310 to 3610 feet (400 to 1100 meters). Blooms May-Jun.	**Unlikely.** An occurrence is known within less than 1 mile from the Project Area and this species was originally determined to have potential to occur in coniferous forest habitat within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
white-rayed pentachaeta *Pentachaeta bellidiflora*	FE, SE, Rank 1B.1	Cismontane woodland, valley and foothill grassland (often serpentine). Elevation ranges from 110 to 2030 feet (35 to 620 meters). Blooms Mar-May.	**Unlikely.** The Project Area does not contain suitable open, dry rocky slopes and grassy areas necessary to support this species, nor does the Project Area contain serpentine soils.	No further action recommended for this species.
Monterey pine *Pinus radiata*	Rank 1B.1	Closed-cone coniferous forest, cismontane woodland. Elevation ranges from 80 to 610 feet (25 to 185 meters).	**Not Observed.** Monterey pine is identifiable year-round, but was not observed within the Project Area during surveys conducted for this report. It is assumed that this species is not present.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
white-flowered rein orchid *Piperia candida*	Rank 1B.2	Broadleaved upland forest, lower montane coniferous forest, north coast coniferous forest/sometimes serpentine. Elevation ranges from 100 to 4300 feet (30 to 1310 meters). Blooms (Mar), May-Sep.	**Unlikely.** There is a known occurrence of this species within 2.5 miles from the site and the species was originally determined to have potential to occur in suitable habitat within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
Choris' popcornflower *Plagiobothrys chorisianus var. chorisianus*	Rank 1B.2	Chaparral, coastal prairie, coastal scrub/mesic. Elevation ranges from 50 to 520 feet (15 to 160 meters). Blooms Mar-Jun.	**Unlikely.** The Project Area does not contain suitable mesic sites in chaparral, coastal prairie, or coastal scrub habitats necessary to support this species. In addition, the Project Area is located above the known elevation range for this species.	No further action recommended for this species.
Hickman's popcorn flower *Plagiobothrys chorisianus var. hickmanii*	Rank 4.2	Moist depressions in sandy deposits over clay. Elevation ranges from 50-600 feet (15-185 meters). Blooms Apr-Jun.	**Unlikely.** The Project Area does not contain suitable open, mesic sites necessary to support this species.	No further action recommended for this species.
San Francisco popcornflower *Plagiobothrys diffusus*	SE, Rank 1B.1	Coastal prairie, valley and foothill grassland. Elevation ranges from 200 to 1180 feet (60 to 360 meters). Blooms Mar-Jun.	**Unlikely.** The Project Area does not contain suitable coastal prairie or other grassland habitats required to support this species.	No further action recommended for this species.
Scotts Valley Polygonum *Polygonum hickmanii*	FE, SE, Rank 1B.1	Valley and foothill grassland (mudstone and sandstone). Elevation ranges from 690 to 820 feet (210 to 250 meters). Blooms May-Aug.	**Unlikely.** The Project Area does not contain suitable grassland habitats required to support this species and the species is only known from one location in Scott's Valley.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
pine rose *Rosa pinetorum*	Rank 1B.2	Closed-cone coniferous forest, cismontane woodland. Elevation ranges from 10 to 3100 feet (2 to 945 meters). Blooms May-Jul.	**Unlikely.** This species was originally determined to have potential to occur in coniferous forest or cismontane woodland within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
Sanicula hoffmannii Hoffmann's sanicle	Rank 4.3	Broadleaved upland forest, coastal bluff scrub, chaparral, cismontane woodland, coastal scrub, lower montane coniferous forest/often serpentine or clay. Elevation ranges from 100 to 980 feet (30 to 300 meters). Blooms Mar-May.	**Unlikely.** This species was originally determined to have potential to occur in broadleaved upland forest and lower montane coniferous forest within the Project Area. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
chaparral ragwort *Senecio aphanactis*	Rank 2B.2	Chaparral, cismontane woodland, coastal scrub/sometimes alkaline. Elevation ranges from 50 to 2620 feet (15 to 800 meters). Blooms Jan-Apr.	**Unlikely.** This species was originally determined to have potential to occur in openings such as along the powerline road. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
maple-leaved checkerbloom *Sidalcea malachroides*	Rank 4.2	Broadleaved upland forest, coastal prairie, coastal scrub, north coast coniferous forest, riparian woodland/often in disturbed areas. Elevation ranges from 0 to 2400 feet (0 to 730 meters). Blooms (Mar), Apr-Aug.	**Unlikely.** Although the Project Area may contain suitable habitat elements, the nearest known occurrence is located over 10 miles to the southeast of the site and is listed as possibly extirpated.	No further action recommended for this species.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
San Francisco campion *Silene verecunda ssp. verecunda*	Rank 1B.2	Coastal bluff scrub, chaparral, coastal prairie, coastal scrub, valley and foothill grassland/sandy. Elevation ranges from 100 to 2120 feet (30 to 645 meters). Blooms (Feb), Mar-Jun (Aug).	**Unlikely.** This species was originally determined to have potential to occur in openings such as along the powerline road. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
Santa Cruz Microseris *Stebbinsoseris decipiens*	Rank 1B.2	Broadleaved upland forest, closed-cone coniferous forest, chaparral, coastal prairie, coastal scrub, valley and foothill grassland/open areas, sometimes serpentine. Elevation ranges from 30 to 1640 feet (10 to 500 meters). Blooms Apr-May.	**Unlikely.** This species was originally determined to have potential to occur in openings such as along the powerline road. However, this species was not observed during seasonally-timed surveys and was determined to be unlikely to occur in the Project Area.	No further action recommended for this species.
slender-leaved pondweed *Stuckenia filiformis ssp. alpina*	Rank 2B.2	Marshes and swamps (assorted shallow freshwater). Elevation ranges from 980 to 7050 feet (300 to 2150 meters). Blooms May-Jul.	**Unlikely.** The Project Area lacks suitable marsh or swamp habitat necessary to support this species.	No further action recommended for this species.
Santa Cruz clover *Trifolium buckwestiorum*	Rank 1B.1	Broadleaved upland forest, cismontane woodland, coastal prairie/gravelly, margins. Elevation ranges from 340 to 2000 feet (105 to 610 meters). Blooms Apr-Oct.	**Unlikely.** The Project Area lacks openings with moist grassland and gravelly margins necessary to support this species.	No further action recommended for this species.
Mammals				
Hoary bat *Lasiurus cinereus*	WBWG Medium	Hoary bats are solitary and roost primarily in foliage of both coniferous and deciduous trees, near the ends of branches, 3-12 meters above the ground (WBWG 2012). Roosts are usually at the edge of a clearing. Summer tree roosts are typically located along edge habitats close to feeding grounds.	**Moderate.** This species has been documented to occur within 3.75 miles of the Project Area (CDFW 2016). Mature conifer and broadleaf trees in the Project Area have the potential to support roosting sites.	Recommendations for this species are provided in Section 7.2.2

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Pallid bat *Antrozous pallidus*	SSC, WBWG High	Roost habitat for this species includes buildings, hollows in trees, caverns, and bridges.	**Moderate.** This species has been documented to occur within 3.75 miles of the Project Area (CDFW 2016). Cavities within large mature trees in the Project Area and nearby rock outcroppings, and cave features in the have the potential to support roosting sites.	Recommendations for this species are provided in Section 7.2.2
Townsend's big-eared bat *Corynorhinus townsendii*	SSC, WBWG High	Lives in a wide variety of habitats but most common in mesic sites. Day roosts highly associated with caves and mines. Need appropriate roosting, maternity, and hibernacula sites free from human disturbance.	**High.** This species has been documented roosting within cave habitat within the property and near the Project Area and there are numerous occurrences within 5 miles of Project Area.	Recommendations for this species are provided in Section 7.2.2
western red bat *Lasiurus blossevillii*	SSC, WBWG; High	This species is typically solitary, roosting primarily in the foliage of trees or shrubs. Day roosts are commonly in edge habitats adjacent to streams or open fields, in orchards, and sometimes in urban areas. There may be an association with intact riparian habitat (particularly willows, cottonwoods, and sycamores).	**Moderate.** The Project Area contains potentially suitable maternity roosting habitat within the riparian habitat. Suitable foraging habitat is supported within and adjacent to creek habitat throughout the Project Area.	Recommendations for this species are provided in Section 7.2.2
silver-haired Bat *Lasionycteris noctivagans*	WBWG; Medium	Summer habitats include coastal and montane coniferous forests, valley foothill woodlands, pinyon-juniper woodlands, and valley foothill and montane riparian habitats. This species is primarily a forest dweller, feeding over streams, ponds, and open brushy areas. It roosts in hollow trees, snags, buildings, rock crevices, caves, and under bark.	**Moderate.** The Project Area contains potentially suitable maternity roosting habitat within the forest habitat. Suitable foraging habitat is supported within and adjacent to creek habitat throughout the Project Area.	Recommendations for this species are provided in Section 7.2.2

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
fringed myotis *Myotis thysanodes*	WBWG; High	Associated with a wide variety of habitats including mixed coniferous-deciduous forest and redwoods/sequoia groves. Buildings, mines, and large snags are important day and night roosts.	**Moderate.** The Project Area contains potentially suitable maternity roosting habitat within the large stands of conifer and hardwood forest habitat found throughout the Project Area. Nearby cave and cliff area of the San Vicente Quarry may also support roosting.	Recommendations for this species are provided in Section 7.2.2
long-legged myotis *Myotis volans*	WBWG; High	Generally associated with woodlands and forested habitats. Large hollow trees, rock crevices and buildings are important day roosts. Other roosts include caves, mines and buildings.	**Unlikely.** This species is more common in coastal regions with redwood/sequoia stands. This species may occasionally forage or occur as a migrant through the area; however, roosting habitat is suboptimal and the Project Area is unlikely to support maternity roosting.	No further actions are recommended.
western mastiff bat *Eumops perotis*	SSC, WBWG; High	Found in a wide variety of open, arid and semi-arid habitats. Distribution appears to be tied to large rock structures which provide suitable roosting sites, including cliff crevices and cracks in boulders.	**Unlikely.** The Project Area does not contain open arid habitats. While potential roosting habitat for this species may occurs within the rock and cliff crevices of the San Vicente Quarry, the Project Area does not contain such rock habitat and therefore is unlikely to support roosting.	No further actions are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
ringtail (ring-tailed cat) *Bassariscus astutus*	CFP	Ringtail is widely distributed throughout most of California, absent from some portions of the Central Valley and northeastern California. Found in a variety of habitats throughout the western US including riparian areas, semi-arid country, deserts, chaparral, oak woodlands, pinyon pine woodlands, juniper woodlands and montane conifer forests usually under 1400m in elevation. Typically uses cliffs or large trees for shelter.	**Moderate.** The Project Area provides wooded habitat of varying composition that could support the species and it's foraging needs. The Project Area is also surrounded by forest which provides a habitat corridor for the species.	Due to the elusive nature of this species, it is unlikely to be directly impacted by construction or trail activities and no further surveys or avoidance measures are recommended.
Salt-marsh harvest mouse *Reithrodontomys raviventris*	FE, SE, CFP	Found only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is the primary habitat. Does not burrow, but builds loosely organized nests and requires higher areas for flood escape.	**No Potential.** Suitable salt-marsh habitat is not present in the Project Area. There are no documented occurrences within 5 miles of the Permanente Property (CDFW 2016).	No further surveys or avoidance measures are recommended.
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	SSC	Forest habitats of moderate canopy and moderate to dense understory. Also in chaparral habitats. Constructs nests of shredded grass, leaves, and other material. May be limited by availability of nest-building materials.	**Present.** This species has been observed throughout the Project Area.	Recommendations for this species are provided in Section 7.2.2
Monterey ornate shrew *Sorex ornatus salarius*	SSC	Riparian, wetland and upland areas in the vicinity of the Salinas River delta. Prefers moist microhabitats. Feeds on insects and other invertebrates found under logs, rocks, and litter.	**Unlikely.** The Project Area is located outside of the species known range.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
American badger *Taxidea taxus*	SSC	Occurs in drier open stages of most scrub, forest, and herbaceous habitats where friable soils and prey populations are present.	**Unlikely.** Dense woodland within the Project Area provides unsuitable habitat for this species, and no badger burrows were observed in the Project Area during the site assessment. While there are documented occurrences >2.5 miles southeast of the Project Area, burrow habitat and open herbaceous habitat more characteristic of the species does not occur.	No further surveys or avoidance measures are recommended.
Birds				
California brown pelican *Pelecanus occidentalis californicus*	FD, SD, CFP	Generally a winter visitor to the region (though present nearly year-round). Nests colonially on offshore islands; nearest rookeries are on the Channel Islands. San Francisco Bay provides important foraging and loafing habitat.	**No Potential.** No foraging or nesting habitat is present, and this species does not nest in the area.	No further surveys or avoidance measures are recommended.
golden eagle *Aquila chrysaetos*	CFP, BCC	Resident in rolling foothill and mountain areas, sage-juniper flats, and desert. Cliff-walled canyons provide nesting habitat in most parts of range.	**Unlikely.** The Project Area does not provide suitable nesting habitat for this species, nor does it provide foraging habitat. The species may fly over the Project Area.	No further surveys or avoidance measures are recommended.
bald eagle *Haliaeetus leucocephalus*	FD, SE, CFP, BCC	Occurs year-round in California, but primarily a winter visitor. Nests in large trees in the vicinity of larger lakes, reservoirs and rivers. Wintering habitat somewhat more variable but usually features large concentrations of waterfowl or fish.	**Unlikely.** The Project Area does not provide suitable nesting habitat for this species, nor does it provide foraging habitat. The species may fly over the Project Area.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
white-tailed kite *Elanus leucurus*	CFP	Resident in coastal and valley lowlands. Preys on small mammals and other small vertebrates, and insects. Nests in trees and larger shrubs, often in relatively isolated stands.	**Unlikely.** The dense forest that dominates the Project Area does not provide typical nesting or foraging habitat for this species.	No further surveys or avoidance measures are recommended.
ferruginous hawk *Buteo regalis*	BCC	Frequents open grasslands, sagebrush flats, desert scrub, low foothills surrounding valleys and fringes of pinyon-juniper habitats. Winters west of Cascades-Sierra Nevada.	**Unlikely.** Occasionally observed along the open coast terraces of Santa Cruz County (eBird 2016). However, dense forest within the Project Area provides unsuitable habitat for this species.	No further surveys or avoidance measures are recommended.
northern harrier *Circus cyaneus*	SSC	Nests and forages in grassland habitats, usually in association with coastal salt and freshwater marshes. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas. May also occur in alkali desert sinks.	**Unlikely**. The dense forest habitat that dominates the Project Area does not provide suitable nesting for the species. Foraging habitat is largely precluded, and while the species may occur along nearby open coast terraces of Santa Cruz County (eBird 2016), the Project Area is not anticipated to support the species.	No further surveys or avoidance measures are recommended.
prairie falcon *Falco mexicanus*	BCC	Inhabits dry, open terrain, either level or hilly. Breeding sites located on cliffs. Forages far afield, even to marshlands and ocean shores.	**Unlikely**. Occasionally observed in coastal Santa Cruz County (eBird 2016). However, dense forest that dominates the Project Area provides unsuitable habitat for this species.	No further surveys or avoidance measures are recommended.
American peregrine falcon *Falco peregrinus anatum*	FD, SD, CFP	Largely resident. Requires protected cliffs, ledges or manmade structures for nesting. Often associated with coasts, bays, marshes and other open expanses of water. Preys primarily upon waterbirds; forages widely.	**Unlikely.** The Project Area does not contain suitable cliff habitat to support nesting. While the species has been documented to nest along the cliffs of the San Vicente Quarry, and may fly overhead, the Project Area does not support nesting.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
California clapper rail *Rallus longirostris obsoletus*	FE, SE, CFP	Resident in salt marshes of the San Francisco Bay Estuary, with largest populations in south San Francisco Bay. Requires mud flats for foraging and dense marsh vegetation on higher ground for nesting.	**No Potential.** Suitable salt-marsh habitat is not present in the Project Area.	No further surveys or avoidance measures are recommended.
marbled murrelet *Brachyramphus marmoratus*	FT, SE	(Nesting) Feeds near shore; nests inland along the Pacific coast, from Eureka to Oregon border, and from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to six miles inland. Nests often built in Douglas-fir or redwood stands containing platform-like branches.	**High Potential.** There are numerous occurrences of this species throughout the Santa Cruz Mountains, the closest of which are approximately 1 mile to the west and 1.9 miles to the east of the Project Area (CDFW 2016). Within the Project Area, several stands of old-growth redwood potentially suitable for nesting habitat occur. Therefore, while the species has not be documented within the Project Area, the presence of potentially suitable nesting habitat and the proximity to known occurrences makes it likely that the species would utilize the Project Area.	Recommendations for this species are provided in Section 7.2.2
western snowy plover *Charadrius alexandrinus nivosus*	FT, SSC, BCC	Federal listing applies only to the Pacific coastal population. Found on sandy beaches, dry salt ponds, mudflats and adjacent levees, and shores of large alkali lakes. Requires sandy, gravelly or friable soils for nesting.	**No Potential.** Project Area lacks sandy beaches, dry salt ponds, mudflats, levees or shores.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
California least tern *Sterna antillarum browni*	FE, SE, CFP	Summer resident. Breeds along the California coast from San Francisco Bay south. Nests colonially on barren or sparsely vegetated, flat substrates near water. Forages for small fish, typically in shallow shoreline habitats. San Francisco Bay colonies usually located on dry/abandoned salt ponds and along estuarine shores.	**No Potential.** Project Area lacks nesting colony and foraging habitat.	No further surveys or avoidance measures are recommended.
California black rail *Laterallus jamaicensis coturniculus*	ST, CFP	Year-round resident in marshes (saline to freshwater) with dense vegetation within four inches of the ground. Prefers larger, undisturbed marshes that have an extensive upper zone and are close to a major water source. Extremely secretive and cryptic.	**No Potential.** The Project Area does not contain suitable marsh habitat.	No further surveys or avoidance measures are recommended.
burrowing owl *Athene cunicularia*	SSC, BCC	Largely resident in the region. Found in grasslands and other open habitats with a sparse to absent shrub/tree canopy. Nests and roosts in old mammal burrows, typically those of ground squirrels. Preys upon insects, and also small mammals, reptiles and birds.	**Unlikely.** The dense forest that dominates the Project Area precludes the presence of this species. No ground squirrel burrows were observed in the Project Area and the dense woodlands do not provide suitable habitat for this species. No sign of burrowing owl was observed during the site assessment.	No further surveys or avoidance measures are recommended.
short-eared owl *Asio flammeus*	SSC	Found in swamp lands, both fresh and salt; lowland meadows; irrigated alfalfa fields. Tule patches/tall grass needed for nesting/daytime seclusion. Nests on dry ground in depression concealed in vegetation.	**No potential.** No suitable marshland to support nesting or foraging is present within the Project Area.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
long-eared owl *Asio otus*	SSC	Riparian bottomlands grown to tall willows and cottonwoods; also, belts of live oak paralleling stream courses. Require adjacent open land productive of mice and the presence of old nests of crows, hawks, or magpies for breeding.	**Unlikely**. The Project Area does not provide suitable riparian bottomland habitat characteristic of the species nesting areas.	No further surveys or avoidance measures are recommended.
Vaux's swift *Chaetura vauxi*	SSC	Redwood, Douglas-fir, and other coniferous forests. Nests in large hollow trees and snags. Often nests in flocks. Forages over most terrains and habitats but shows a preference for foraging over rivers and lakes.	**High potential**. Large stands of coniferous forest with complex canopies and snags occur throughout the Project Area. Potentially suitable nesting and foraging habitat is prevalent in the Project Area.	Recommendations for this species are provided in Section 7.2.2
black swift *Cypseloides niger*	SSC, BCC	Summer resident. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above surf. Forages widely.	**Unlikely.** The Project Area is not known to contain cliffs with waterfall features that would be suitable for nesting. While nesting along the coastline to the west and south has been documented, and the species may opportunistically forage or fly over the Project Area, nesting is not anticipated to be supported in the Project Area.	No further surveys or avoidance measures are recommended.
Allen's hummingbird *Selasphorus sasin*	BCC	Inhabits mixed evergreen, riparian woodlands, eucalyptus and cypress groves, oak woodlands, and coastal scrub during breeding season. Nest in shrubs and trees with dense vegetation.	**High Potential.** Mature oak and riparian woodland within the Project Area provides suitable nesting habitat.	Recommendations for this species are provided in Section 7.2.2

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Lewis' woodpecker *Melanerpes lewis*	BCC	Uncommon winter resident occurring on open oak savannahs, broken deciduous and coniferous habitats.	**Unlikely.** The species does not nest along coastal California, and while the species has been sporadically observed in Santa Cruz County, the dense woodland of the Project Area is not conducive to the open foraging areas needed for the species (eBird 2016).	No further surveys or avoidance measures are recommended.
Nuttall's woodpecker *Picoides nuttallii*	BCC	Relatively dense oak and riparian woods. Can also occur in urban and residential settings.	**High Potential.** Mature oak and riparian woodland provides suitable nesting habitat for this relatively common species.	Recommendations for this species are provided in Section 7.2.2
olive-sided flycatcher *Contopus cooperi*	SSC, BCC	Nesting habitats are mixed conifer, montane hardwood-conifer, Douglas-fir, redwood, red fir and lodgepole pine. Most numerous in montane conifer forests where tall trees overlook canyons, meadows, lakes or other open terrain.	**High Potential.** Mixed conifer, redwood, and pine forest throughout the Project Area provide suitable nesting habitat for this species. The species has been observed frequently along roads surrounding the Project Area (eBird 2016).	Recommendations for this species are provided in Section 7.2.2
willow flycatcher *Empidonax traillii*	SE, BCC	Inhabits extensive thickets of low, dense willows on edge of wet meadows, ponds, or backwaters; 2000 to 8000 foot elevation. Require dense willow thickets for nesting/roosting. Low, exposed branches are used for singing posts/hunting perches	**Unlikely.** No suitable willow nesting habitat exists within the Project Area, and there are no CNDDB records within the vicinity (CDFW 2016). The species may occur briefly during migration.	No further surveys or avoidance measures are recommended.
loggerhead shrike *Lanius ludovicianus*	SSC, BCC	Broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	**Unlikely.** The dense forest and woodland within the Project Area is not typical foraging and nesting habitat for this species.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Least Bell's vireo *Vireo bellii pusillus*	FE, SE	This species is a Summer resident of Southern California but whose range is extending northward. Nesting occurs in riparian areas in the vicinity of water or in dry river bottoms. Nests placed along margins of bushes or on twigs projecting into pathways, usually willow, coyote brush or mesquite.	**Unlikely.** The Project Area is outside of the known range for this species.	No further surveys or avoidance measures are recommended.
bank swallow *Riparia riparia*	ST	Migrant in riparian and other lowland habitats in western California. Colonial nester in riparian areas with vertical cliffs and bands with fine-textured or fine-textured sandy soils near streams, rivers, lakes or the ocean.	**Unlikely.** No suitable nesting habitat exists within the Project Area, and the species is unlikely to forage/ pass through here. The nearest CNDDB record for this species is located 8 miles northwest of the Project Area and dated 1987 (CDFW 2016).	No further surveys or avoidance measures are recommended.
oak titmouse *Baeolophus inornatus*	BCC	Oak woodland and savannah, open broad-leaved evergreen forests containing oaks, and riparian woodlands. Associated with oak and pine-oak woodland and arborescent chaparral.	**Present.** This species is commonly found within mature oak woodland habitat, which occurs in the Project Area.	Recommendations for this species are provided in Section 7.2.2
yellow warbler *Setophaga petechia*	SSC, BCC	Frequents riparian plant associations. Prefers willows, cottonwoods, aspens, sycamores and alders for nesting and foraging. Also nests in montane shrubbery in open conifer forests.	**Unlikely.** No suitable willow nesting habitat exists within the Project Area, and there are no CNDDB records within the vicinity (CDFW 2016). The species may occur briefly during migration.	No further surveys or avoidance measures are recommended.
San Francisco (saltmarsh) common yellowthroat *Geothlypis trichas sinuosa*	SSC, BCC	Resident of the San Francisco Bay region, in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	**Unlikely.** No suitable marsh habitat exists in or near the area.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
yellow-breasted chat *Icteria virens*	SSC	Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape; forage and nest within 10 feet of ground.	**Unlikely.** Suitable riparian thickets do not exist in the Project Area, and the species has not been observed in the vicinity of the Project Area (CDFW 2016, eBird 2016).	No further surveys or avoidance measures are recommended.
grasshopper sparrow *Ammodramus savannarum*	SSC	Dense grasslands on rolling hills, lowland plains, in valleys and on hillsides on lower mountain slopes. Favors native grasslands with a mix of grasses, forbs, and scattered shrubs. Loosely colonial when nesting.	**Unlikely.** Dense forest and woodland habitat occurs throughout the Project Area, which does not provide suitable grassland habitat.	No further surveys or avoidance measures are recommended.
Bryant's savannah sparrow *Passerculus sandwichensis alaudinus*	SSC	Associated with the coastal fog belt, primarily between Humboldt and northern Monterey Counties. Occupies low tidally influenced habitats, adjacent to ruderal areas; often found where pickleweed communities merge into grassland. Infrequently found in drier grasslands.	**Unlikely.** The Project Area is outside of the known range for this species.	No further surveys or avoidance measures are recommended.
Bell's sage sparrow *Amphispiza belli belli*	BCC	Year-round resident, though shows seasonal movements. Prefers dense chaparral and scrub habitats for breeding; strongly associated with chamise. Also occurs in more open habitats during winter.	**Unlikely.** The Project Area does not contains patches of scrub habitat and lacks suitable nesting habitat for the species. While the species has been documented to the east and north of the Project Area (eBird 2016), the Project Area contains suboptimal foraging habitat relative to areas outside of the Project Area and is unlikely to support nesting.	No further surveys or avoidance measures are recommended.
Lawrence's goldfinch *Spinus lawrencei*	BCC	Nests in open oak or other arid woodland and chaparral, near water. Nearby herbaceous habitats used for feeding. Closely associated with oaks.	**Unlikely.** The Project Area is outside of the known range for this species.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
tricolored blackbird *Agelaius tricolor*	SSC	Resident, though disperses somewhat when not breeding. Typically nests over or near freshwater in dense cattails, tules, or thickets of willow, blackberry, wild rose or other tall herbs. Highly colonial; breeding aggregations tend to be large.	**Unlikely.** No suitable freshwater marsh or riparian thicket habitat is present in the Project Area. There are no CNDDB records in the vicinity (CDFW 2016).	No further surveys or avoidance measures are recommended.
purple martin *Progne subis*	SSC	Inhabits woodlands and low elevation coniferous forests. Nests in old woodpecker cavities and human-made structures. Nest is often located in tall, isolated tree or snag.	**Moderate Potential.** The Project Area contains coniferous forests that may provide suitable nesting habitat. This species has been observed east of the Project Area in Bonny Doon Ecological Preserve (eBird 2016).	Recommendations for this species are provided in Section 7.2.2
Reptiles and Amphibians				
California tiger salamander *Ambystoma californiense*	FT, ST, SSC	Inhabits annual grasslands, spending most of the year underground in mammal burrows. Breeding occurs in vernal pools and other seasonal aquatic features. In the immediate vicinity of San Francisco Bay, occurs only in Fremont.	**No Potential.** There is no suitable aquatic breeding or upland aestivation habitat present for this species. This species has not been documented to occur within 5 miles of the Project Area (CDFW 2016).	No further surveys or avoidance measures are recommended.
Santa Cruz long-toed salamander *Ambystoma macrodactylum croceum*	FE, SE, CFP	Wet meadows near sea level in a few restricted locales in Santa Cruz and Monterey counties. Aquatic larvae prefer shallow (<12 inches) water, using clumps of vegetation or debris for cover. Adults use mammal burrows.	**No Potential.** This species has a limited range, and is not documented to occur north of Aptos, which is over 15 miles southeast of the Project Area (USFWS 2009). The Project Area does not support habitat for this species, and the species is not known for the area.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
California red-legged frog *Rana aurora*	FT, SSC	Associated with quiet perennial to intermittent ponds, stream pools and wetlands. Prefers shorelines with extensive vegetation. Documented to disperse through upland habitats after rains.	**Moderate Potential.** This species has been documented to occur within the property and adjacent to the Project Area in 1997 and there are many documented occurrences within 2 miles (CDFW 2016). While no suitable aquatic breeding habitat was observed, the Project Area provides dispersal and seasonal aquatic non-breeding habitat that may support the species. The Project Area is located within dispersal distance of known occurrences.	Recommendations for this species are provided in Section 7.2.2
foothill yellow-legged frog *Rana boylii*	SSC	Found in rocky streams in a variety of habitats. Feeds on both aquatic and terrestrial invertebrates. Closely associated with water.	**Unlikely.** There are no CNDDB occurrences within 5 miles of the Project Area (CDFW 2016). The Project Area does not contain perennial streams with suitable basking habitat.	No further surveys or avoidance measures are recommended.
Alameda whipsnake *Masticophis lateralis euryxanthus*	FT, ST	Alameda Whipsnake is restricted to valley-foothill hardwood habitat of the Coast Ranges between Monterey and San Francisco Bay. They inhabit south-facing slopes and ravines where shrubs form a vegetative mosaic with oak trees and grasses.	**No Potential.** The Project Area is outside of the species' known range, and does not contain suitable habitat.	No further surveys or avoidance measures are recommended.
Blainville's (coast) horned lizard *Phrynosoma blainvillii*	SSC	Habitat variable, most common in lowlands along sandy washes with low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, and an abundant supply of insect forage are primary microhabitat components.	**No Potential.** No suitable lowland or wash habitat is present in the Project Area.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE, SE, CFP	Found in the vicinity of freshwater marshes, ponds and slow-moving streams in San Mateo County and extreme northern Santa Cruz County. Prefers dense cover and water depths of at least one foot. Upland areas near water are also very important. Adults prey chiefly on large frogs.	**No Potential.** The Project Area is outside of this subspecies' known range, and provides no typical aquatic habitat or forage.	No further surveys or avoidance measures are recommended.
Pacific pond turtle *Actinemys marmorata*	SSC	Occurs in perennial ponds, lakes, rivers and streams with suitable basking habitat (mud banks, mats of floating vegetation, partially submerged logs) and submerged shelter. Nests are excavated in areas with friable soil and vegetative cover.	**Unlikely.** There are no perennial streams or pond habitat that would support the species. Basking habitat is limited within the dense woodland of the Project Area. The nearest CNDDB occurrence for this species is over 4 miles east of the Project Area (CDFW 2016).	No further surveys or avoidance measures are recommended.
Fishes				
green sturgeon *Acipenser medirostris*	FT, SSC	Anadromous. Spawns in the Sacramento and Klamath River systems. Lingering transients may be found throughout the San Francisco Bay Estuary, particularly juveniles.	**No Potential.** The Project Area is outside of the known range for this species.	No further surveys or avoidance measures are recommended.
tidewater goby *Eucyclogobius newberryi*	FE, SSC	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**No Potential.** No brackish water habitat is present within or immediately adjacent to the Project Area.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Delta smelt *Hypomesus transpacificus*	FT, ST	Endemic to the Sacramento-San Joaquin delta area; found in areas where salt and freshwater systems meet. It occurs seasonally in Suisun Bay, Carquinez Strait and San Pablo Bay.	**No Potential.** The Project Area is outside of the range for this species and does not contain suitable habitat.	No further surveys or avoidance measures are recommended.
longfin smelt *Spirinchus thaleichthys*	FC, ST, SSC	Euryhaline, nektonic and anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15 to 30 ppt, but can be found in completely freshwater to almost pure seawater.	**No Potential.** The Project Area does not contain suitable estuarine habitat.	No further surveys or avoidance measures are recommended.
Coho salmon - Central CA Coast ESU *Oncorhynchus kisutch*	FE, SE	Federal listing includes populations between Punta Gorda and San Lorenzo River. State listing includes populations south of San Francisco Bay only. Occurs inland and in coastal marine waters. Requires beds of loose, silt-free, coarse gravel for spawning. Also needs cover, cool water and sufficient dissolved oxygen.	**No Potential.** Coho is known to occur within the lower reaches of San Vicente Creek; however, fish passage barriers, steep gradient, and the ephemeral nature of the streams in the Project Area make it unlikely for this species to occur. Coho is not known from Laguna Creek, and known natural fish passage barriers downstream of the Project Area make it unlikely that Coho to occur.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
steelhead - Central CA Coast DPS *Oncorhynchus mykiss irideus*	FT	Anadromous, spending most of life cycle in the ocean. This ESU occurs from the Russian River south to Soquel Creek and Pajaro River, including the San Francisco and San Pablo Bay Basins. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams. Juveniles remain in fresh water for 1 or more years before migrating downstream to the ocean.	**Unlikely.** Steelhead occur within the mainstem of San Vicente Creek up to the quarry tunnel and the lower reaches of Mill Creek; however, partial fish passage barriers, narrow steep channels, and the ephemeral nature of the streams in the main parcel make it unlikely for this species to occur there. Steelhead are known from the lower reaches of Laguna Creek; however, a known natural barrier occurs downstream of the site, making it unlikely that steelhead would occur there.	No further surveys or avoidance measures are recommended.
steelhead – South/ Central CA Coast DPS *Oncorhynchus mykiss irideus*	FT	Occurs in coastal basins from the Pajaro River south to, but not including, the Santa Maria River. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams. Juveniles remain in fresh water for 1 or more years before migrating downstream to the ocean.	**Unlikely.** Steelhead occur within the mainstem of San Vicente Creek up to the quarry tunnel and the lower reaches of Mill Creek; however, this location is in the territorial area for Central California Coast DPS steelhead. Therefore the Project Area is outside of the range for this DPS. Further, steelhead are unlikely to occur in the Project Area for the reasons outlined for the Central California Coast DPS.	No further surveys or avoidance measures are recommended.
Chinook salmon - Winter-run ESU *Oncorhynchus tshawytscha*	FE, SE	Occurs in the Sacramento River below Keswick Dam. Spawns in the Sacramento River but not in tributary streams. Requires clean, cold water over gravel beds with water temperatures between 6 and 14 degrees C for spawning. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams. Juveniles typically migrate to the ocean soon after emergence from the gravel.	**No Potential.** The Project Area is outside of the known range for this species.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Chinook salmon - Central Valley Spring-run ESU *Oncorhynchus tshawytscha*	FT, ST	Occurs in the Feather River and the Sacramento River and its tributaries, including Butte, Mill, Deer, Antelope and Beegum Creeks. Adults enter the Sacramento River from late March through September. Adults migrate upstream to spawn in cool, clear, well-oxygenated streams from mid-August through early October. Juveniles migrate soon after emergence as young-of-the-year, or remain in freshwater and migrate as yearlings.	**No Potential.** The Project Area is outside of the known range for this species.	No further surveys or avoidance measures are recommended.
Invertebrates				
Conservancy fairy shrimp *Branchinecta conservatio*	FE	Lives in ephemeral or temporary pools of freshwater (vernal pools) that form in the cool, wet months of the year. Highly turbid water is preferred.	**No Potential.** No vernal pool or seasonal wetland habitat is present within the Project Area.	No further surveys or avoidance measures are recommended.
vernal pool fairy shrimp *Branchinecta lynchi*	FT	Inhabits small, clear-water sandstone-depression pools, grassy swales, slumps, or basalt-flow depression pools.	**No Potential.** No vernal pool or seasonal wetland habitat is present within the Project Area.	No further surveys or avoidance measures are recommended.
Ohlone tiger beetle *Cicindela ohlone*	FE	Sparsely vegetated native grasslands on costal terrace in Santa Cruz County. Substrate is poorly-drained clay or sandy clay soil over bedrock of Santa Cruz mudstone.	**No Potential.** The nearest CNDDB occurrence for this species is located 4.8 miles southeast of the Project Area (CDFW 2016). The Project Area is not within the coastal terrace and does not contain native grasslands.	No further surveys or avoidance measures are recommended.
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	FT	Occurs only in the central valley of California, in association with blue elderberry (*Sambucus mexicana*). Prefers to lay eggs in elderberrry 2 to 8 inches in diameter; some preference shown for "stressed" elderberry.	**No Potential.** The Project Area is out of the species' known range.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
vernal pool tadpole shrimp *Lepidurus packardi*	FE	VPTS pools are commonly found in grass bottomed swales of unplowed grasslands. Some pools are mud-bottomed and highly turbid.	**No Potential.** The Project Area provides no suitable vernal/seasonal pool habitat, and is outside of this species' known range (the nearest population is isolated in Fremont on the eastern shore of the Bay).	No further surveys or avoidance measures are recommended.
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	FE	Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be *Viola adunca*.	**No Potential.** The Project Area is outside of the species known range.	No further surveys or avoidance measures are recommended.
monarch butterfly *Danaus plexippus*	Roost Habitat Protected by CDFW	Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico. Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, Monterey cypress), with nectar and water sources nearby.	**Unlikely.** Typical winter roost sites do not exist in the Project Area.	No further surveys or avoidance measures are recommended.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant.	**No Potential.** No native serpentine grasslands or larval host or nectar plants are present in the Project Area.	No further surveys or avoidance measures are recommended.
Smith's blue butterfly *Euphilotes enoptes smithi*	FE	Most commonly associated with coastal dunes and coastal sage scrub plant communities in Monterey and Santa Cruz counties. *Eriogonum latifolium* and *Eriogonum parvifolium* are utilized as host plants and adult food plants.	**No Potential.** Suitable habitat and host/food plants are not present in the Project Area.	No further surveys or avoidance measures are recommended.

SPECIES	STATUS[1]	HABITAT REQUIREMENTS	POTENTIAL FOR OCCURRENCE[2]	RECOMMENDATIONS
Mount Hermon (=barbate) June beetle *Polyphylla barbata*	FE	Known only from sand hills in Santa Cruz County (type locality). Occurs in open, sandy habitat on Zayante series soils.	**No Potential.** The nearest CNDDB occurrence for this species is located 4.8 miles east of the Project Area (CDFW 2016). No sand hill habitat or suitable Zayante soils are present in the Project Area.	No further surveys or avoidance measures are recommended.
Zayante band-winged grasshopper *Trimerotropis infantilis*	FE	Endemic to isolated sandstone deposits in the Santa Cruz Mountains (the Zayante Sand Hills ecosystem). Restricted to sand parkland habitat found on ridges and hills within this very limited ecosystem.	**No Potential.** No sandhills habitat or suitable Zayante soils are present in the Project Area.	No further surveys or avoidance measures are recommended.

[1]Key to status codes

FE	Federal Endangered
FT	Federal Threatened
FD	Federal Delisted
FC	Federal Candidate
BCC	USFWS Birds of Conservation Concern
SE	State Endangered
ST	State Threatened
SR	State Rare
SSC	CDFW Species of Special Concern
CFP	CDFW Fully Protected Animal
WBWG	Western Bat Working Group Priority Species
Rank 1B.1	CNPS Rank 1B.1: Rare, threatened, or endangered in California and elsewhere (seriously threatened in California)
Rank 1B.2	CNPS Rank 1B.2: Rare, threatened, or endangered in California and elsewhere (moderately threatened in California)
Rank 2B.1	CNPS Rank 2B.1: Rare, threatened, or endangered in California, but more common elsewhere (seriously threatened in California)
Rank 2B.2	CNPS Rank 2B.2: Rare, threatened, or endangered in California, but more common elsewhere (moderately threatened in California)
Rank 3.1	CNPS Rank 3.1: Plants about which more information is needed - A review list (seriously threatened in California)
Rank 3.2	CNPS Rank 3.2: Plants about which more information is needed - A review list (moderately threatened in California)
Rank 4.2	CNPS Rank 4.2: Plants of limited distribution - A watch list (moderately threatened in California)
Rank 4.3	CNPS Rank 4.3: Plants of limited distribution - A watch list (not very threatened in California)

[2]Key to Potential for Occurrence

No Potential	None of the habitat components meeting the species requirements are present. The habitat is clearly unsuitable for the species.
Unlikely	Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.
Moderate Potential	Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.
High Potential	All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.
Present	Species is observed on the site or has been recorded (i.e. CNDDB, other reports) on the site recently.
Not Observed	The species is identifiable year-round but was not observed during surveys or the survey occurred when the species should have been apparent and identifiable but the species was not observed. These species are assumed to not be present.

APPENDIX D

SITE PHOTOGRAPHS


Example of shaded fuel break within the Project Area.


Example of shaded fuel break within the Project Area.

Example of open, sunny edge habitat where plant diversity is expected to be higher and a larger number of rare plants have potential to occur.

Example of dense, shaded understory habitat where plant diversity is expected to be lower and fewer rare plants have potential to occur.

Anderson's manzanita flowers.

Typical leaf arrangement for Anderson's manzanita.

Anderson's manzanita in flower.

Anderson's manzanita growth form under open, sunny conditions.

Example of a regulated stream.

Example of a regulated stream.

Example of a drainage feature determined to be non-jurisdictional.

Example of a drainage feature determined to be non-jurisdictional.

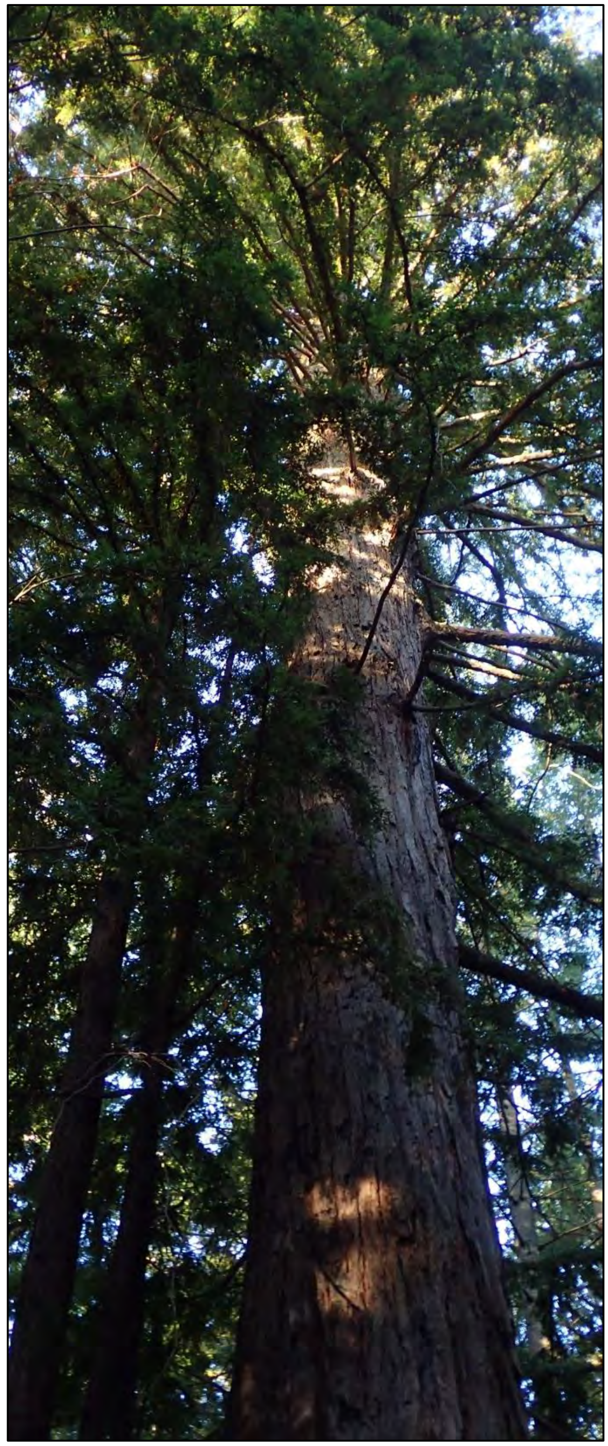

Example of a woodrat midden in the Project Area.


Example of a woodrat midden in the Project Area.


Example of a woodrat midden in the Project Area.


Example of a woodrat midden in the Project Area.

Example of a potentially significant wildlife tree.



Example of a potentially significant wildlife tree.

Laguna Creek, a perennial stream located on the Laguna parcel.

Attachment 6

Cultural Resources Analysis

(Note: The Cultural Resources Study includes confidential information regarding the locations of archaeological resources that is protected by law and is not available to the general public.)

COUNTY OF SANTA CRUZ

PLANNING DEPARTMENT
701 OCEAN STREET, 4TH FLOOR, SANTA CRUZ, CA 95060
(831) 454-2580 FAX: (831) 454-2131 TDD: (831) 454-2123
KATHLEEN MOLLOY, PLANNING DIRECTOR

July 16, 2018

Bryan Largay
Land Trust of Santa Cruz County
617 Water Street
Santa Cruz, CA 95060

Subject: San Vicente Woods Archaeologic Report, Application REV181100

Dear Mr. Largay:

The review of your archaeological report, prepared by Rachel M. Hennessy and Thomas Origer, dated November 7, 2016, revised October 25, 2017, has been completed. The subject report evaluates the potential impact to known cultural and historic resources resulting from the development of a parking area and recreational trails in the Santa Cruz mountains along the north coast of unincorporated Santa Cruz County.

After a thorough review of the reports submitted and the resources on site, the County accepts the report and finds the proposed recommendations adequate to ensure no significant impacts to cultural or historic resources occur as a result of this project, with the exception of recommendation 3. Post Construction Monitoring. This recommendation, and the accompanying Construction Protocol CR1.4 in the Initial Study Checklist, qualify as deferred mitigation and as such are not allowed under CEQA. For the initial study, the identification of impacts due to the intensification of activity around known historic resources that could be subject to vandalism or removal shall be mitigated through a signage program at all entrances to the property that includes a brief description of the history San Vicente Railroad, including various camps throughout the area, a discussion of the historic value of these sites, and the citation of the codes which protect artifacts. The signage will also include the requirements to stay on trails.

The changes to the recommendation will take place in the initial study, but it will be the applicants responsibility to put the signage program together and identify posting locations.

If you have any questions regarding this letter, please call me at 831-454-3201.

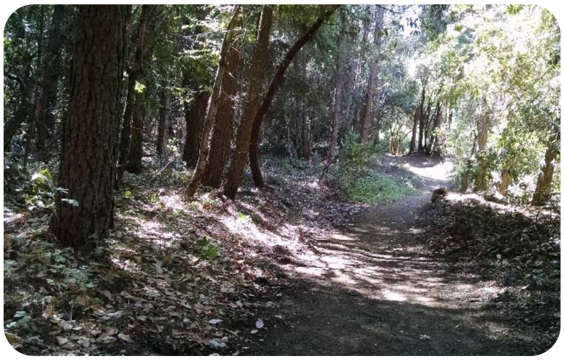
Sincerely,

Matthew Johnston
Environmental Coordinator

Note A *Cultural Resources Study*, prepared by Tom Origer & Associates, October 2017, includes confidential information and is not be made available to the general public.

Attachment 7

Geotechnical Investigation



GEOTECHNICAL INVESTIGATION

SAN VICENTE REDWOODS STAGING AREA
CEMEX PROPERTY EMPIRE GRADE
SANTA CRUZ, CALIFORNIA

FOR
FALL CREEK ENGINEERING
SANTA CRUZ, CALIFORNIA

Pacific Crest
ENGINEERING INC

CONSULTING GEOTECHNICAL ENGINEERS

17103-SZ23-E11
JANUARY 11, 2018
www.4pacific-crest.com

Pacific Crest
ENGINEERING INC

GEOTECHNICAL | ENVIRONMENTAL | CHEMICAL | MATERIAL TESTING | SPECIAL INSPECTIONS

January 11, 2018

Project No. 17103-SZ23-E11

Mr. Peter Haase
c/o Ms. Samantha Sharp
Fall Creek Engineering Inc.
1525 Seabright Avenue
Santa Cruz, CA

Subject: **Geotechnical Investigation – Design Phase**
San Vicente Redwoods Staging Area
APN 080-011-42
Santa Cruz County, California

Dear Ms. Sharp,

In accordance with your authorization, we have performed a geotechnical investigation for the proposed parking lot and entry road for the San Vicente Redwoods, off of Empire Grade in Santa Cruz County, California.

The accompanying report presents our findings, conclusions and recommendations for the subject project. If you have any questions concerning the information presented in this report, please call our office.

Very truly yours,

PACIFIC CREST ENGINEERING INC.

Prepared by:

Soma Goresky
Associate Engineer
GE 2252
Expires 6/30/19

Reviewed by:

Elizabeth M. Mitchell, GE
President/Principal Geotechnical
GE 2718
Expires 12/31/18

Copies: 3 to Client

444 AIRPORT BLVD., SUITE 106 | WATSONVILLE, CA 95076 | PHONE 831-722-9446 | WWW.4PACIFIC-CREST.COM

TABLE OF CONTENTS

I. **INTRODUCTION**

PURPOSE AND SCOPE

This report describes the geotechnical evaluation and presents our conclusions and recommendations for the proposed parking lot for the San Vicente Redwoods off of Empire Grade, in Santa Cruz, California.

Our scope of services for this project has consisted of:

1. Site reconnaissance to observe the existing conditions.

2. Review of the following published maps:
   - Geologic Map of Santa Cruz County, California, Brabb, 1997.
   - Preliminary Map of Landslide Deposits in Santa Cruz County, California, Cooper-Clark and Associates, 1975.
   - Map Showing Geology and Liquefaction Potential of Quaternary Deposits in Santa Cruz County, California, Dupré, 1975.
   - Map Showing Faults and Their Potential Hazards in Santa Cruz County, California, Hall, Sarna-Wojcicki, Dupré, 1974.
   - Geographic Information System – Santa Cruz County, "GISWEB Interactive Mapping Application" http://gis.co.santa-cruz.ca.us/internet/wwwgisweb/ viewer.htm

3. The drilling and logging of 5 test borings.

4. Laboratory testing of selected soil samples retrieved from our borings.

5. Engineering analysis of the field and laboratory test results.

6. Preparation of this report documenting our investigation and presenting geotechnical recommendations for the design and construction of the project.

PROJECT LOCATION

The subject site is located on the northwest side of Empire Grade about 0.1 miles north of its intersection with Braemoor Drive. Please refer to the Regional Site Map, Figure No. 1, in Appendix A for the general vicinity of the project site, which is located by the following coordinates:

Latitude = 37.115901 degrees
Longitude = -122.1555557 degrees

PROPOSED IMPROVEMENTS

The Santa Cruz Land Trust is planning a staging area and parking lot for access to the San Vicente Redwoods trails. We have been provided with a set of preliminary plans titled "San Vicente Redwoods, Staging Area" dated June 2017. These plans depict the layout of the proposed parking lot and access roads. Proposed improvements include a vault toilet and two, 5,000 gallon water tanks. Maximum cuts and fills are shown to be about 5 to 7 feet in depth with a total grading volume of about 3,000 cubic yards. We understand the parking lot and access roads we either be unsurfaced (full depth baserock) or surfaced with asphalt concrete.

II. INVESTIGATION METHODS

FIELD INVESTIGATION

Five, 6-inch diameter test borings were drilled at the site on October 4, 2017. The approximate location of the test borings is shown on the Site Map, Figure No. 2, in Appendix A. The drilling method used was hydraulically operated continuous flight augers on a truck mounted drill rig. An engineer from Pacific Crest Engineering Inc. was present during the drilling operations to log the soil encountered and to choose sampler type and locations.

Relatively undisturbed soil samples were obtained at various depths by driving a split spoon sampler 18 inches into the ground. This was achieved by dropping a 140 pound hammer a vertical height of 30 inches. The hammer was actuated with a wire winch. The number of blows required to drive the sampler each 6 inch increment and the total number of blows required to drive the last 12 inches was recorded by the field engineer. The outside diameter of the samplers used was 3 inch or 2 inch and is designated on the Boring Logs as "L" or "T", respectively.

The field blow counts in 6 inch increments are reported on the Boring Logs adjacent to each sample as well as the standard penetration test data. All standard penetration test data has been normalized to a 2 inch O.D. sampler and is reported on the Boring Logs as SPT "N" values. The normalization method used was derived from the second edition of the Foundation Engineering Handbook (H.Y. Fang, 1991). The method utilizes a Sampler Hammer Ratio which is dependent on the weight of the hammer, height of hammer drop, outside diameter of sampler, and inside diameter of sample.

The soils encountered in the borings were continuously logged in the field and visually described in accordance with the Unified Soil Classification System (ASTM D2488) as described in the Boring Log Explanation, Figures No. 3 and 4, in Appendix A. The soil classification was verified upon completion of laboratory testing in accordance with ASTM D2487.

Appendix A contains the site plan showing the locations of the test borings, our borings logs and an explanation of the soil classification system used. Stratification lines on the boring logs are approximate as the actual transition between soil types may be gradual.

LABORATORY TESTING

The laboratory testing program was developed to aid in evaluating the engineering properties of the materials encountered at the site. Laboratory tests performed include:

- Moisture Density relationships in accordance with ASTM D2937.
- Field penetrometer testing to approximate unconfined compressive strength.
- Gradation testing in accordance with ASTM D422.
- "R" Value testing in accordance with California 301

The results of the laboratory testing is presented on the boring logs opposite the sample tested and/or presented graphically in Appendix A.

III. FINDINGS AND ANALYSIS

GEOLOGIC SETTING

The site is located on a bedrock ridge crest that is roughly parallel to Empire Grade. The surficial geology in the area of the project site is mapped as quartz diorite. The deposits locally are a decomposed highly weathered granite.

The bedrock encountered during our field investigation is consistent with this description and the native soils overlain the bedrock are consistent with residual soils typically derived from this formation.

Based on the mapping by Cooper Clark (1975), the nearest landslides to the site are over 2000 feet away. No faults are mapped in the vicinity.

SURFACE CONDITIONS

The subject property is about 4½ acres in size and gently slopes at about a 10:1 (horiz:vert) inclination downwards towards the west. It is bordered by Empire Grade to the northeast and undeveloped forested land on the remaining 3 sides.

The area is covered with a dense growth of mature trees, mostly consisting of oak, madrone and fir.

A rough graded, unsurfaced road borders the area with associated grading consisting of cuts and fills generally less than 1 to 2 feet in depth. Beyond this, no signs of prior development are evident.

SUBSURFACE CONDITIONS

Our subsurface exploration consisted of five test boring drilled as across the site. The borings extended between 11 and 21 feet below existing grade. The soil profiles and classifications, laboratory test results and groundwater conditions encountered for each test boring are presented in the Logs of Test Borings, in Appendix A. The general subsurface conditions are described below.

Subsurface conditions encountered within our borings generally consisted of about 3½ to 5 feet of colluvial soil composed of a loose to very loose silty sand.

Decomposed granite bedrock was encountered between 3½ to 5 feet below ground surface. The bedrock we encountered is a fine grained sandstone, has a medium rock hardness, and based on our field blow counts is weathered to a competent medium dense to dense silty sand.

Groundwater was encountered in one of our five borings at about 15 feet below ground surface. Outside of this, no evidence of shallow ground water was observed at the site.

The groundwater conditions described in this report reflect the conditions encountered during our drilling investigation at the specific locations drilled. It must be anticipated that perched and regional groundwater tables may vary with location and could fluctuate with variations in rainfall, runoff, irrigation and other changes to the conditions encountered at the time our observations were made.

Please refer the Logs of Test Borings in Appendix A, for a more detailed description of the subsurface conditions encountered in each of our test borings at the subject site.

FAULTING AND SEISMICITY

Faulting

Mapped faults which have the potential to generate earthquakes that could significantly affect the subject site are listed in Table No. 1. The fault distances are approximate distances based the U.S. Geological Survey and California Geological Survey, Quaternary fault and fold database, accessed on March 2017 from the USGS website (http://earthquake.usgs.gov/hazards/qfaults/) and overlaid onto Google Earth.

Table No. 1 - Distance to Significant Faults

Fault Name	Distance (miles)	Direction
Zayante-Vergeles	1½	Northeast
Butano	7.0	Northeast
San Gregorio	7.0	Southwest
San Andreas	9.0	Northeast

Seismic Shaking and CBC Design Parameters

Due to the proximity of the site to active and potentially active faults, it is reasonable to assume the site will experience high intensity ground shaking during the lifetime of the project. Structures founded on thick soft soil deposits are more likely to experience more destructive shaking, with higher amplitude and lower frequency, than structures founded on bedrock. Generally, shaking will be more intense closer to earthquake epicenters. Thick soft soil deposits large distances from earthquake epicenters, however, may result in seismic accelerations significantly greater than expected in bedrock.

Selection of seismic design parameters should be determined by the project structural designer. The site coefficients and seismic ground motion values shown in the table below were developed based on CBC 2016 incorporating the ASCE 7-10 standard, and the project site location.

Table No. 2 - 2016 CBC Seismic Design Parameters [1]

Seismic Design Parameter	ASCE 7-10 Value
Site Class	D
Spectral Acceleration for Short Periods	$S_S = 1.5g$
Spectral Acceleration for 1-second Period	$S_1 = 0.6g$
Short Period Site Coefficient	$F_a = 1.0$
1-Second Period Site Coefficient	$F_v = 1.5$
MCE Spectral Response Acceleration for Short Period	$S_{MS} = 1.5g$
MCE Spectral Response Acceleration for 1-Second Period	$S_{M1} = 0.9g$
Design Spectral Response Acceleration for Short Period	$S_{DS} = 1.0g$
Design Spectral Response Acceleration for 1-Second Period	$S_{D1} = 0.6g$
Seismic Design Category [2]	D

Note 1: Design values have been obtained by using the Ground Motion Parameter Calculator available on the USGS website at http://earthquake.usgs.gov/hazards/designmaps/usdesign.php.
Note 2: The Seismic Design Category assumes a structure with Risk Category I, II or III occupancy as defined by Table 1604.5 of the 2016 CBC. Pacific Crest Engineering Inc. should be contacted for revised Table 2 seismic design parameters if the proposed structure has a different occupancy rating than that assumed.

The recommendations of this report are intended to reduce the potential for structural damage to an acceptable risk level, however strong seismic shaking could result in architectural damage and the need for post-earthquake repairs. It should be assumed that exterior improvements such as pavements, slabs or sidewalks may need to be repaired or replaced following strong seismic shaking.

GEOTECHNICAL HAZARDS

A quantitative analysis of geotechnical hazards was beyond our scope of services for this project. In general however, the geotechnical hazards associated with the project site include seismic shaking (discussed above), ground surface fault rupture, liquefaction, lateral spreading, landsliding and expansive soils. A qualitative discussion of these hazards is presented below.

Ground Surface Fault Rupture

Pacific Crest Engineering Inc. has not performed a specific investigation for the presence of active faults at the project site. Based upon our review of the Santa Cruz County GIS Hazard Maps, the project site is not mapped within a fault hazard zone.

Ground surface fault rupture typically occurs along the surficial traces of active faults during significant seismic events. Since the nearest known active, or potentially active fault trace is mapped approximately 1½ miles from the site, it is our opinion that the potential for ground surface fault rupture to occur at the site should be considered low.

Liquefaction and Lateral Spreading

Based upon our review of the Santa Cruz County GIS Hazard Maps, the project site is not mapped within a liquefaction hazard zone.

Liquefaction tends to occur in loose, saturated fine grained sands and coarse silt, or clay with low plasticity. The project site is shallowly underlain by granitic bedrock, an earth material that is not susceptible to liquefaction. Consequently, it is our opinion that liquefaction is not a hazard associated with the subject site.

Liquefaction induced lateral spreading occurs when a liquefied soil mass fails toward an open slope face, or fails on an inclined topographic slope. Our analysis indicates that the site has a low potential for liquefaction, consequently the potential for lateral spreading is also considered low.

Landsliding

No landslide deposits are mapped within the subject property (Cooper-Clark, 1975). The subject site and immediate vicinity are relatively flat to gently sloping. It is our opinion that the potential for shallow landsliding to occur and adversely affect the proposed development should be considered low.

Expansive Soils

The subject site is underlain by a relatively thick surficial layer of silty sand which is non-plastic and we infer has a low expansion potential.

IV. DISCUSSION AND CONCLUSIONS

GENERAL

1. The results of our investigation indicate that the proposed development is feasible from a geotechnical engineering standpoint, provided our recommendations are included in the design and construction of the project.

2. Grading and foundation plans should be reviewed by Pacific Crest Engineering Inc. during their preparation and prior to contract bidding.

3. Pacific Crest Engineering Inc. should be notified at least four (4) working days prior to any site clearing and grading operations on the property in order to observe the stripping and disposal of unsuitable materials, and to coordinate this work with the grading contractor. During this period, a pre-construction conference should be held on the site, with at least the client or their representative, the grading contractor, a County representative and one of our engineers present. At this meeting, the project specifications and the testing and inspection responsibilities will be outlined and discussed.

4. Field observation and testing must be provided by a representative of Pacific Crest Engineering Inc., to enable them to form an opinion as to the degree of conformance of the exposed site conditions to those foreseen in this report, the adequacy of the site preparation, the acceptability of fill materials, and the extent to which the earthwork construction and the degree of compaction comply with the specification requirements. Any work related to grading or foundation excavation that is performed without the full knowledge and direct observation of Pacific Crest Engineering Inc., the Geotechnical Engineer of Record,

will render the recommendations of this report invalid, unless the Client hires a new Geotechnical Engineer who agrees to take over complete responsibility for this report's findings, conclusions and recommendations. The new Geotechnical Engineer must agree to prepare a Transfer of Responsibility letter. This may require additional test borings and laboratory analysis if the new Geotechnical Engineer does not completely agree with our prior findings, conclusions and recommendations.

PRIMARY GEOTECHNICAL CONSIDERATIONS

5. Based upon the results of our investigation, it is our opinion that the primary geotechnical issues associated with the design and construction of the proposed project at the subject site are the following:

a. *Soft Surficial Soils and Settlement:* Surficial conditions at the site generally consist of 3 to 5 feet of very loose silty sand that is compressible under vehicle loading. Settlement of this surficial soil could affect gradients and drainage in the proposed parking lot and driveways and potentially cause damage or distress to proposed foundations or flatwork. In order to reduce settlement we recommend surficial soils within all improvement areas be subexcavated and recompacted as engineered fill. Detailed recommendations are provided in the following section of this report.

b. *Moisture Sensitive Soils:* The surficial soils consist of fine sands and silts which are highly moisture sensitive. Meeting the minimum compaction specifications with these types of soil can be difficult. Contractors should be made aware of the difficult compaction characteristics of the site soils.

c. *Strong Seismic Shaking:* The project site is located within a seismically active area and strong seismic shaking is expected to occur within the design lifetime of the project. Improvements should be designed and constructed in accordance with the most current CBC and the recommendations of this report to minimize reaction to seismic shaking. Structures built in accordance with the latest edition of the California Building Code have an increased potential for experiencing relatively minor damage which should be repairable, however strong seismic shaking could result in architectural damage and the need for post-earthquake repairs.

V. **RECOMMENDATIONS**

EARTHWORK

Clearing and Stripping

1. The initial preparation of the site will consist of tree and brush removal. Surface vegetation, tree roots and organically contaminated topsoil should be removed ("stripped") from areas that will support engineered fill, buildings foundations, concrete slabs-on-grade or other improvements. This should include removal of the entire stump and root ball.

2. It is anticipated that the depth of organic material and strippings may be 6 inches or more. To remove the root balls of the dense stand of trees may require subexcavations of 12 inches or more across the site. Final required depth of stripping must be based upon visual observations by a representative of Pacific Crest Engineering Inc., in the field. The required depth of stripping will vary based upon the type and density of vegetation across the project site.

3. Septic tanks and leaching lines, if found, must be completely removed. The extent of removal of debris should be designated by a representative of Pacific Crest Engineering Inc. in the field. This material must be removed from the site.

4. Any voids created by the removal of tree and root balls must be backfilled with properly compacted engineered fill which meets the requirements of this report.

5. Any wells encountered shall be capped in accordance with the requirements and approval of the County Health Department. The strength of the cap shall be equal to the adjacent soil and shall not be located within 5 feet of a structural footing.

Subgrade Preparation

6. It is possible that there are areas of man-made fill at the site that our field investigation did not detect. Areas of man-made fill, if encountered, will need to be completely excavated to undisturbed native material. The excavation process should be observed and the extent designated by a representative of Pacific Crest Engineering Inc., in the field. Any voids created by fill removal must be backfilled with properly compacted engineered fill.

7. After clearing and stripping are completed the following subexcavation depths are recommended:

Roadway and parking areas:	24 inches below existing grade
Concrete flatwork/slabs and foundations:	12 inches below bottom of slab/footing or 36 inches below existing grade, whichever is greater.

8. Subexcavations should extend at least 5 feet horizontally beyond foundations and at least 2 feet horizontally beyond pavements and flatwork.

9. Final depth of subexcavation should be determined by a representative of Pacific Crest Engineering Inc., in the field.

10. After completion of any subexcavations the base of the excavation should be scarified 8 inches, moisture conditioned and compacted as engineered fill. The moisture conditioning procedure will depend upon the time of year that the work is done, but it should result in the soils being 1 to 3 percent over optimum moisture content at the time of compaction.

Material for Engineered Fill

11. Native or imported soil proposed for use as engineered fill should meet the following requirements:

a. free of organics, debris, and other deleterious materials,
b. free of “recycled” materials such as asphaltic concrete, concrete, brick, etc.,
c. granular in nature, well graded, and contain sufficient binder to allow utility trenches to stand open,
d. free of rocks in excess of 2 inches in size.

12. In addition to the above requirements, import fill should have a Plasticity Index between 4 and 12, and a minimum Resistance “R” Value of 30, and be non-expansive.

13. Samples of any proposed imported fill planned for use on this project should be submitted to Pacific Crest Engineering Inc. for appropriate testing and approval not less than ten (10) working days before the anticipated jobsite delivery. This includes proposed import trench sand, drain rock and for aggregate base materials. Imported fill material delivered to the project site without prior submittal of samples for appropriate testing and approval must be removed from the project site.

Engineered Fill Placement and Compaction

14. Following the subexcavation and subgrade preparation areas should be brought up to design grades with engineered fill that is moisture conditioned and compacted according to the recommendations of this report. Recompacted sections should extend at least 5 feet horizontally beyond all footings, slabs and pavement areas, where possible.

15. Engineered fill should be placed in maximum 8 inch lifts, before compaction, at a water content which is within 1 to 3 percent of the laboratory optimum value.

16. All soil on the project should be compacted to a minimum of 90% of its maximum dry density. The upper 8 inches of the soil subgrade in the pavement areas, and all aggregate subbase and aggregate base should be compacted to a minimum of 95% of its maximum dry density.

17. The maximum dry density will be obtained from a laboratory compaction curve run in accordance with ASTM Procedure #D1557. This test will also establish the optimum moisture content of the material. Field density testing will be performed in accordance with ASTM Test #D6938 (nuclear method).

18. The site soils are highly moisture sensitive and meeting the required compaction specifications will be highly dependent on careful moisture control. Earthwork contractors should be made aware of the moisture sensitivity of the soils and potential compaction difficulties.

19. We recommend field density testing be performed in maximum 2 foot elevation differences. In general terms, we recommend at least one compaction test per 200 linear feet of utility trench or retaining wall backfill, and at least one compaction test per 2,000 square feet of building or structure area. This is a subjective value and may be changed by the geotechnical engineer based on a review of the final project layout and exposed field conditions.

20. Engineered fill placed on existing slopes that are steeper than 5:1 (horizontal:vertical) should be keyed and benched into competent native material. Toe keys should be constructed at the base of the fill slope with a minimum 10 foot wide width and sloped negatively at least 2% into the bank. The depth of the keyways will vary, depending on the materials encountered. It is anticipated that the depth of the keyways may be 3 to 6 feet, but at all locations shall be at least 2 feet into firm material.

21. Subsequent benches may be required as the fill section progresses upslope. Benches and keys will be designated in the field by a representative of Pacific Crest Engineering Inc

Cut and Fill Slopes

22. Fill slopes should be constructed with engineered fill meeting the minimum density requirements of this report and have a gradient no steeper than 2:1 (horizontal to vertical). Fill slopes should not exceed 15 feet in vertical height unless specifically reviewed by Pacific Crest Engineering Inc. Where the vertical height exceeds 15 feet, intermediate benches must be provided. These benches should be at least 6 feet wide and sloped to control surface drainage. A lined ditch should be used on the bench.

23. Permanent cut slopes in soil shall not exceed a 2:1 (horizontal to vertical) gradient. All cut slopes should not exceed a 15 foot vertical height unless specifically reviewed by a representative of Pacific Crest Engineering Inc. Where the vertical height exceeds 15 feet, intermediate benches must be provided. These benches should be at least 6 feet wide and sloped to control surface drainage. A lined ditch should be used on the bench.

24. The above slope gradients are based on the strength characteristics of the materials under conditions of normal moisture content that would result from rainfall falling directly on the slope, and do not take into account the additional activating forces applied by seepage from spring areas or subsurface groundwater. Therefore, in order to maintain stable slopes at the recommended gradients, it is important that any seepage forces and accompanying hydrostatic pressure (if encountered) be relieved by adequate drainage. Drainage facilities may include subdrains, gravel blankets, rock fill surface trenches or horizontally drilled drains. Configurations and type of drainage will be determined by a representative of Pacific Crest Engineering Inc. during the grading operations.

25. The surfaces of all cut and fill slopes should be prepared and maintained to reduce erosion. This work, at a minimum, should include track rolling of the slope and effective planting. The protection of the slopes should be installed as soon as practicable so that a sufficient growth will be established prior to inclement weather conditions. It is vital that no slope be left standing through a winter season without the erosion control measures having been provided.

26. The above recommended gradients do not preclude periodic maintenance of the slopes, as minor sloughing and erosion may take place.

27. If a fill slope is to be placed above a cut slope, the toe of the fill slope should be set back at least 8 feet horizontally from the top of the cut slope. A lateral surface drain should be placed in the area between the cut and fill slopes.

28. All flatwork should be set back at least 5 feet horizontally from the top of cut and fill slopes. All foundations should be set back at least 8 feet horizontally from the top of cut and fill slopes.

Soil Moisture and Weather Conditions

29. If earthwork activities are done during or soon after the rainy season, the on-site soils and other materials may be too wet in their existing condition to be used as engineered fill. These materials may require a diligent and active drying and/or mixing operation to reduce the moisture content to the levels required to obtain adequate compaction as an engineered fill. If the on-site soils or other materials are too dry, water may need to be added. In some cases the time and effort to dry the on-site soil may be considered excessive, and the import of aggregate base may be required.

Utility Trench Backfill

30. Utility trenches that are parallel to the sides of the building should be placed so that they do not extend below a line sloping down and away at a 2:1 (horizontal to vertical) slope from the bottom outside edge of all footings.

31. Utility pipes should be designed and constructed so that the top of pipe is a minimum of 24 inches below the finish subgrade elevation of any road or pavement areas. Any pipes within the top 24 inches of finish subgrade should be concrete encased, per design by the project civil engineer.

32. For the purpose of this section of the report, backfill is defined as material placed in a trench starting one foot above the pipe, and bedding is all material placed in a trench below the backfill.

33. Unless concrete bedding is required around utility pipes, free-draining clean sand should be used as bedding. Sand bedding should be compacted to at least 95 percent relative compaction. Clean sand is defined as 100 percent passing the #4 sieve, and less than 5 percent passing the #200 sieve.

34. Approved imported clean sand or native soil should be used as utility trench backfill. Backfill in trenches located under and adjacent to structural fill, foundations, concrete slabs and pavements should be placed in horizontal layers no more than 8 inches thick. This includes areas such as sidewalks, patios, and other hardscape areas. Each layer of trench backfill should be water conditioned and compacted to at least 95 percent relative compaction

35. All utility trenches beneath perimeter footing or grade beams should be backfilled with controlled density fill (such as 2-sack sand\cement slurry) to help minimize potential moisture intrusion below interior floors. The length of the plug should be at least three times the width of the footing or grade beam at the building perimeter, but not less than 36 inches. A representative from Pacific Crest Engineering Inc. should be contacted to observe the placement of slurry plugs. In addition, all utility pipes which penetrate through the footings, stemwalls or grade beams (below the exterior soil grade) should also be sealed water-tight, as determined by the project civil engineer or architect.

36. Utility trenches which carry "nested" conduits (stacked vertically) should be backfilled with a control density fill (such as 2-sack sand\cement slurry) to an elevation one foot above the nested conduit stack. The use of pea gravel or clean sand as backfill within a zone of nested conduits is not recommended.

37. A representative from our firm should be present to observe the bottom of all trench excavations, prior to placement of utility pipes and conduits. In addition, we should observe the condition of the trench prior to placement of sand bedding, and to observe compaction of the sand bedding, in addition to any backfill planned above the bedding zone.

38. Jetting of the trench backfill is not recommended as it may result in an unsatisfactory degree of compaction.

39. Trenches must be shored as required by the local agency and the State of California Division of Industrial Safety construction safety orders.

Excavations and Shoring

40. It should be understood that on-site safety is the *sole responsibility* of the Contractor, and that the Contractor shall designate a *competent person* (as defined by CAL-OSHA) to monitor the slope excavation prior to the start of each work day, and throughout the work day as conditions change. The competent person designated by the Contractor shall determine if flatter slope gradients are more appropriate, or if shoring should be installed to protect workers in the vicinity of the slope excavation. Refer to Title 8, California Code of Regulations, Sections 1539-1543.

41. All excavations must meet the requirements of 29 CFR 1926.651 and 1926.652 or comparable OSHA approved state plan requirements.

42. If shallow ground water is encountered excavation de-watering may be necessary. Temporary dewatering may be achieved by sloping the excavation to a system of sump pumps placed within the excavation, trenching from the base of excavations to discharge water by gravity flow, or other means. It is the Contractor's responsibility to design an adequate de-watering system for the project site, and to submit a detailed de-watering plan to the geotechnical engineer for review at least two weeks prior to the start of construction.

43. The "top" of any temporary cut slope and excavations should be set-back at least ten feet (measured horizontally) from any nearby structure or property line. Any excavations which cannot meet this requirement will need to have a shoring system designed to support steeper sidewall gradients.

44. Temporary shoring is not currently anticipated for this project. Should these requirements change, please contact our office for additional recommendations.

FOUNDATIONS

Spread Footings

45. Foundations are anticipated for two water tanks and a restroom vault only. We recommend that these structures be supported on a mat foundation bearing on engineered fill that is prepared and compacted as outlined in the earthwork section of this report.

46. For dead plus live loading, the mat may be designed for a net allowable bearing pressure of 2,500 pounds per square foot or a vertical modulus of subgrade reaction (K_{V1}) of 100 tons per cubic foot. This value may be increased by one-third when transient wind or seismic loads are included.

47. The mat should be designed to distribute the building loads uniformly over the entire area of the mat, and should have a minimum thickness of 8 inches.

48. The perimeter of the mat should be deepened and/or have a thickened edge so that it extends at least 12 inches below lowest adjacent compacted grade.

49. Lateral loads may be resisted by a combination of friction between the foundation bottom and the supporting subgrade. An ultimate friction coefficient of 0.3 may be used for friction between the foundations and supporting subgrade.

50. An ultimate passive pressure of 400 psf/foot may be used for footings embedded in compacted engineered fill. The upper 1 foot of soil should be ignored when calculating passive soil resistance.

51. Provided our recommendations are followed, total and differential settlement due to applied dead and live loads is expected to be within tolerable limits.

52. No footing should be placed closer than 8 feet horizontally from the top of a cut or fill slope.

53. Slab subgrades and footing excavations must be free of loose material prior to placing concrete. The footing excavations should be thoroughly saturated prior to placing concrete.

54. Slab subgrades and footing excavations must be observed by a representative of Pacific Crest Engineering Inc. before placement of formwork, steel and concrete to verify bedding into proper material.

55. The footings should contain steel reinforcement as determined by the project civil or structural engineer in accordance with applicable CBC or ACI Standards.

SLAB-ON-GRADE CONSTRUCTION

56. All concrete slabs-on-grade should be underlain by a minimum 6 inch thick capillary break consisting of ¾ inch clean crushed rock (no fines). If moisture sensitive floor coverings are not anticipated 6 inches of Class 2 baserock that is placed and compacted as specified in the earthwork section of this report may be used in lieu of the capillary break material.

57. Where floor coverings are anticipated or vapor transmission may be a problem, a vapor retarder/membrane should be placed between the capillary break layer and the floor slab in order to reduce the potential for moisture condensation under floor coverings. We recommend a high quality vapor retarder at least 10 mil thick and puncture resistant (Stego Wrap or equivalent). The vapor retarder must meet the minimum specifications for ASTM E-1745, Standard Specification For Water Vapor Retarder. Low density polyethylene film (such as Visqueen) does not meet minimum current standards and should not be used. Laps and seams should be overlapped at least six inches and properly sealed to provide a continuous layer beneath the entire slab that is free of holes, tears or gaps. Joints and penetrations should also be properly sealed.

58. If a sand layer is chosen as a cushion for slabs without floor coverings, it should consist of a clean sand. Clean sand is defined as 100 percent passing the #4 sieve, and less than 5 percent passing the #200 sieve.

59. Slab thickness, reinforcement, and doweling should be determined by the project civil or structural engineer. The use of welded wire mesh is not recommended for slab reinforcement.

60. Recommendations given above for the reduction of moisture transmission through the slab are general in nature and present good construction practice. Moisture protection measures for concrete slabs-on-grade should meet applicable ACI and ASTM standards. Pacific Crest Engineering Inc. are not waterproofing

experts. For a more complete and specific discussion of moisture protection within the structure, a qualified waterproofing expert should be consulted to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. The waterproofing consultant should provide recommendations for mitigation of potential adverse impacts of moisture vapor transmission on various components of the structure as deemed appropriate.

PAVEMENT DESIGN

61. A bulk sample of soil was recovered from the upper 3 feet within the 2 borings excavated in the parking lot area (B-2 and B-3). "R" values of 60 and 64 were measured in the laboratory on these samples. Based on the Caltrans Highway Design Manual Chapter 630 latest edition and an assumed R-value of 55, Table 3 below provides alternative pavement sections for traffic indices ranging from 4.5 and 6.0. This procedure assumes a 20-year design life, although it should be understood that if the pavement section is not surfaced with asphalt or oil and screenings the life expectancy may be significantly less. Final pavement section and design traffic index should be determined by the project civil engineer

TABLE No. 3 Recommended Alternative Pavement Sections
(Based on R value = 55)

Assumed Traffic Index	Asphalt Concrete (inches)	Class 2 Baserock R = 78 min (inches)	Total Section (inches)
4.5	0.0	7.0	7.0
4.5	2.0	3.0	5.0
5.0	0.0	8.0	8.0
5.0	2.0	3.5	5.5
5.5	0.0	8.5	8.5
5.5	2.0	4.5	6.5
6.0	0.0	9.5	9.5
6.0	2.5	4.5	7.0

62. To have the selected pavement sections perform to their greatest efficiency, it is very important that the following items be used in design and construction:

a. Properly scarify and moisture condition the upper 8 inches of the subgrade soil and compact it to a minimum of 95% of its maximum dry density, at a moisture content of 1 to 3% over the optimum moisture content for the soil.

b. Provide sufficient gradient to prevent ponding of water.

c. Use only quality materials of the type and thickness (minimum) specified. All aggregate base and subbase must meet Caltrans Standard Specifications for Class 2 materials, and be angular in shape. All Class 2 aggregate base should be ¾ inch maximum in aggregate size.

d. Compact the base and subbase uniformly to a minimum of 95% of its maximum dry density.

e. Maintenance should be undertaken on a routine basis. As mentioned above exposed baserock in pavement areas will likely require an accelerated maintenance program.

SURFACE DRAINAGE

63. Surface water drainage is the responsibility of the project civil engineer. The following should be considered by the civil engineer in design of the project.

64. Surface water must not be allowed to pond or be trapped adjacent to foundations, or on building pads and parking areas.

65. If the parking lot and driveway areas are to remain unsurfaced the owner should anticipate that higher than normal maintenance will be required to maintain drainage, fill potholes and smooth washboard conditions on the baserock surface. Regular maintenance to maintain drainage of water off of the baserock surface is important in order to increase the life of the pavement.

66. Slope failures can occur where surface drainage is allowed to concentrate on unprotected slopes. Appropriate landscaping and surface drainage control around the project area is imperative in order to minimize the potential for shallow slope failures and erosion. Stormwater discharge locations should not be located at the top or on the face of any slope.

67. Final grades should be provided with positive gradient away from all foundation elements. Soil grades should slope away from foundations at least 5 percent for the first 10 feet. Impervious surfaces should slope away from foundations at least 2 percent for the first 10 feet. Concentrations of surface runoff should be handled by providing structures, such as paved or lined ditches, catch basins, etc.

68. Irrigation activities at the site should be done in a controlled and reasonable manner.

69. Following completion of the project we recommend that storm drainage provisions and performance of permanent erosion control measures be closely observed through the first season of significant rainfall, to determine if these systems are performing adequately and, if necessary, resolve any unforeseen issues.

70. Surface drainage facilities must not be altered nor any filling or excavation work performed in the area without first consulting Pacific Crest Engineering Inc. Surface drainage improvements developed by the project civil engineer must be maintained by the property owner at all times, as improper drainage provisions can produce undesirable affects.

EROSION CONTROL

71. The surface soils are classified as having a moderate potential for erosion. Therefore, the finished ground surface should be planted with ground cover and continually maintained to minimize surface erosion. For specific and detailed recommendations regarding erosion control on and surrounding the project site, the project civil engineer or an erosion control specialist should be consulted.

PLAN REVIEW

72. We respectfully request an opportunity to review the project plans and specifications during preparation and before bidding to ensure that the recommendations of this report have been included and to provide additional recommendations, if needed. These plan review services are also typically required by the reviewing agency. Misinterpretation of our recommendations or omission of our requirements from the project plans and specifications may result in changes to the project design during the construction phase, with the potential for additional costs and delays in order to bring the project into conformance with the requirements outlined within this report. Services performed for review of the project plans and specifications are considered "post-report" services and billed on a "time and materials" fee basis in accordance with our latest Standard Fee Schedule.

VI. LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. This Geotechnical Investigation was prepared specifically for Fall Creek Engineering and for the specific project and location described in the body of this report. This report and the recommendations included herein should be utilized for this specific project and location exclusively. This Geotechnical Investigation should not be applied to nor utilized on any other project or project site. Please refer to the ASFE "Important Information about Your Geotechnical Engineering Report" attached with this report.

2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the time, our firm should be notified so that supplemental recommendations can be provided.

3. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are called to the attention of the Architects and Engineers for the project and incorporated into the plans, and that the necessary steps are taken to ensure that the Contractors and Subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural process or the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or partially, by changes outside of our control. This report should therefore be reviewed in light of future planned construction and then current applicable codes. This report should not be considered valid after a period of two (2) years without our review.

5. This report was prepared upon your request for our services in accordance with currently accepted standards of professional geotechnical engineering practice. No warranty as to the contents of this report is intended, and none shall be inferred from the statements or opinions expressed.

6. The scope of our services mutually agreed upon for this project did not include any environmental assessment or study for the presence of hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site.

Important Information About Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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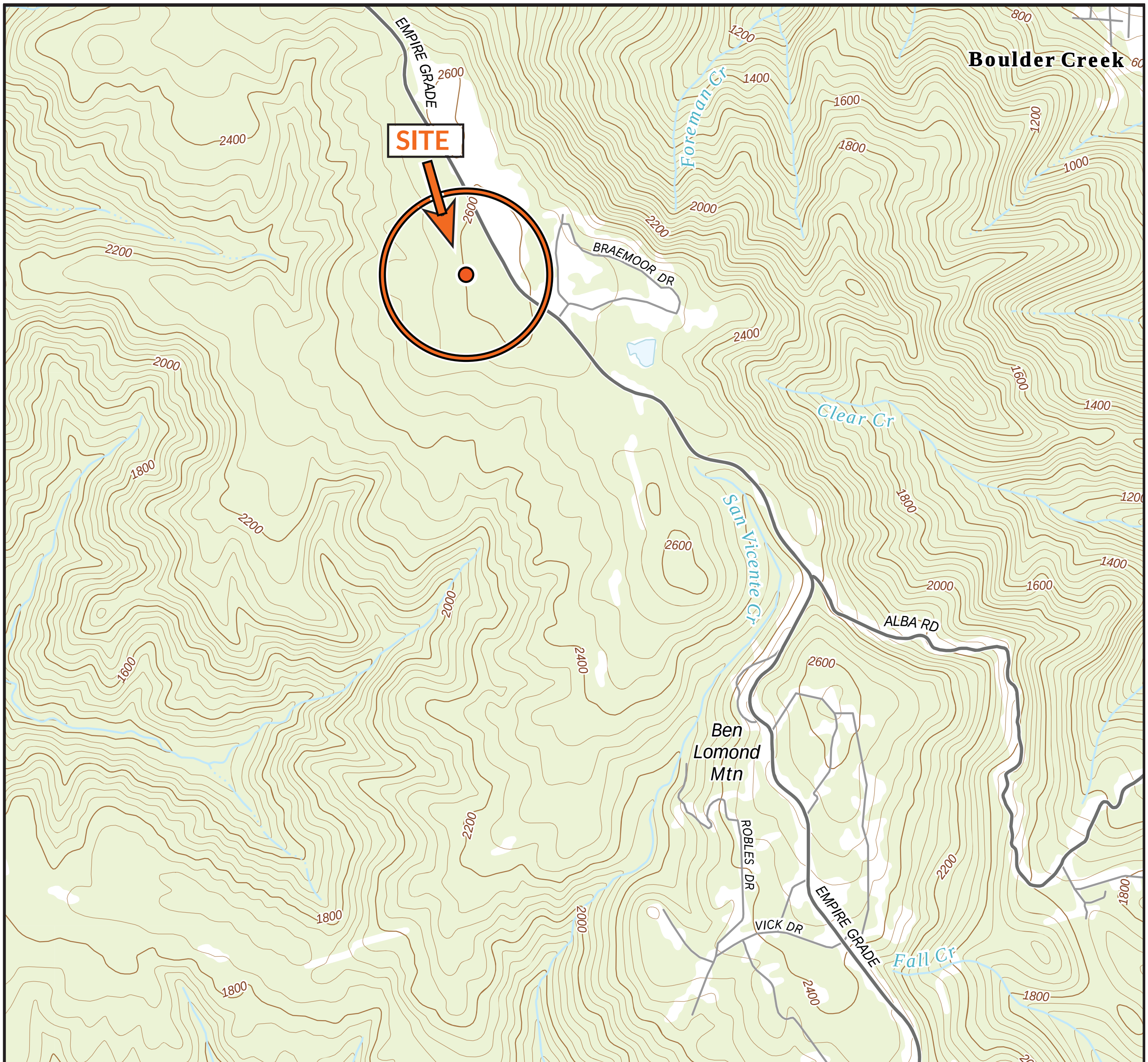
APPENDIX A

Regional Site Map
Site Map Showing Test Borings
Key to Soil Classification
Log of Test Borings
Particle Size Analysis
R-Value Test Reports



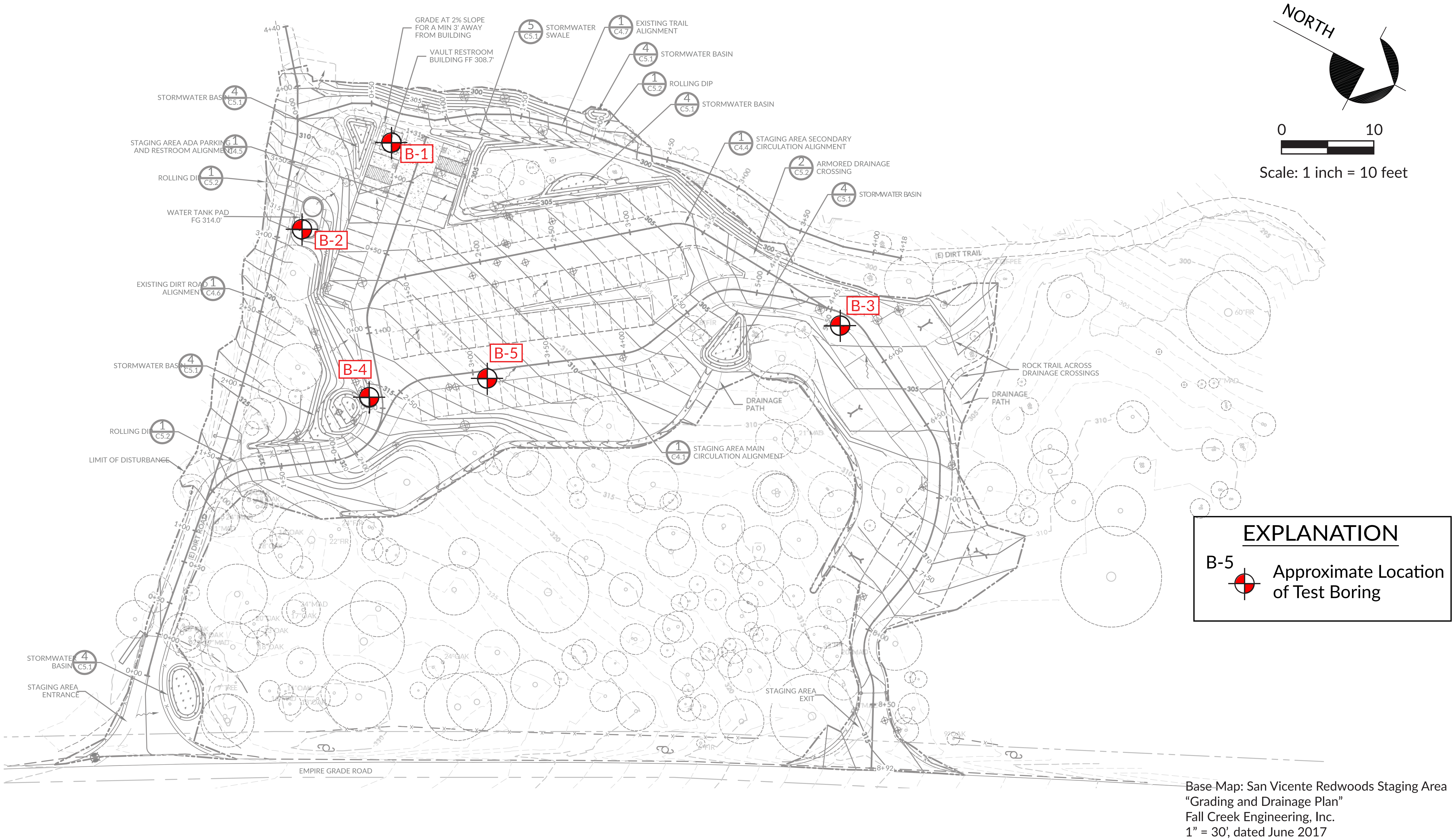
0 2000 ft.

Scale

N

Base Map: United States Geological Survey
Davenport Quadrangle, California - Santa Cruz County
7.5 Minute Series, Davenport, CA 2015

Pacific Crest ENGINEERING INC	**Regional Site Map** San Vicente Staging Area Santa Cruz County, California	Figure No. 1 Project No. 17103 Date: 1/11/18



Pacific Crest ENGINEERING INC

Site Map Showing Test Boring Locations
San Vicente Staging Area
Santa Cruz County, California

Figure No. 2
Project No. 17103
Date: 1/11/18

KEY TO SOIL CLASSIFICATION - FINE GRAINED SOILS (FGS)

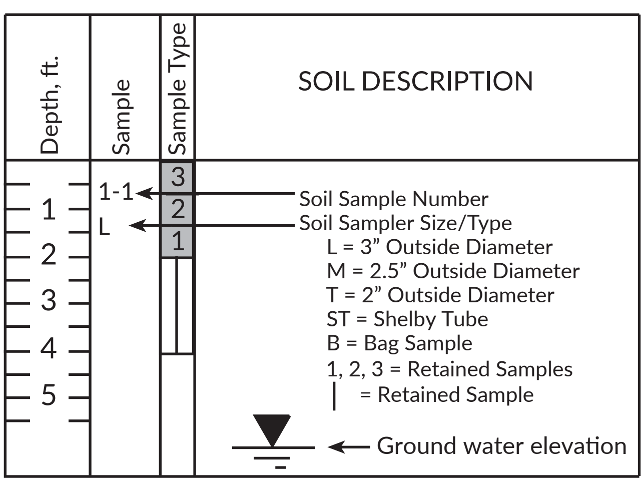
UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2487 (Modified)

MAJOR DIVISIONS		SYMBOL	FINES	COARSENESS	SAND/GRAVEL	GROUP NAME
SILT AND CLAY	*LL < 35% Low Plasticity	**CL** Lean Clay PI > 7 Plots Above A Line -OR- **ML** Silt PI > 4 Plots Below A Line	<30% plus No. 200	<15% plus No. 200		Lean Clay / Silt
				15-30% plus No. 200	% sand ≥ % gravel	Lean Clay with Sand / Silt with Sand
					% sand < % gravel	Lean Clay with Gravel / Silt with Gravel
			≥30% plus No. 200	% sand ≥ % gravel	< 15% gravel	Sandy Lean Clay / Sandy Silt
					≥ 15% gravel	Sandy Lean Clay with Gravel / Sandy Silt with Gravel
				% sand < % gravel	< 15% sand	Gravelly Lean Clay / Gravelly Silt
					≥ 15% sand	Gravelly Lean Clay with Sand / Gravelly Silt with Sand
		CL - ML 4 < PI < 7	<30% plus No. 200	<15% plus No. 200		Silty Clay
				15-30% plus No. 200	% sand ≥ % gravel	Silty Clay with Sand
					% sand < % gravel	Silty Clay with Gravel
			≥30% plus No. 200	% sand ≥ % gravel	< 15% gravel	Sandy Silty Clay
					≥15% gravel	Sandy Silty Clay with Gravel
				% sand < % gravel	< 15% sand	Gravelly Silty Clay
					≥15% sand	Gravelly Silty Clay with Sand
	35% ≤ *LL < 50% Intermediate Plasticity	**CI**	<30% plus No. 200	<15% plus No. 200		Clay
				15-30% plus No. 200	% sand ≥ % gravel	Clay with Sand
					% sand < % gravel	Clay with Gravel
			≥30% plus No. 200	% sand ≥ % gravel	< 15% gravel	Sandy Clay
					≥ 15% gravel	Sandy Clay with Gravel
				% sand < % gravel	< 15% sand	Gravelly Clay
					≥ 15% sand	Gravelly Clay with Sand
	*LL > 50% High Plasticity	**CH** Fat Clay Plots Above A Line -OR- **MH** Elastic Silt Plots Below A Line	<30% plus No. 200	<15% plus No. 200		Fat Clay or Elastic Silt
				15-30% plus No. 200	% sand ≥ % gravel	Fat Clay with Sand Elastic Silt with Sand
					% sand < % gravel	Fat Clay with Gravel / Elastic Silt with Gravel
			≥30% plus No. 200	% sand ≥ % gravel	< 15% gravel	Sandy Fat Clay / Sandy Elastic Silt
					≥ 15% gravel	Sandy Fat Clay with Gravel / Sandy Elastic Silt with Gravel
				% sand < % gravel	< 15% sand	Gravelly Fat Clay / Gravelly Elastic Silt
					≥ 15% sand	Gravelly Fat Clay with Sand / Gravelly Elastic Silt with Sand

* LL = Liquid Limit

* PI = Plasticity Index

BORING LOG EXPLANATION



MOISTURE

DESCRIPTION	CRITERIA
DRY	Absence of moisture, dusty, dry to the touch
MOIST	Damp, but no visible water
WET	Visible free water, usually soil is below the water table

CONSISTENCY

DESCRIPTION	UNCONFINED SHEAR STRENGTH (KSF)	STANDARD PENETRATION (BLOWS/FOOT)
VERY SOFT	< 0.25	< 2
SOFT	0.25 - 0.5	2 - 4
FIRM	0.5 - 1.0	5 - 8
STIFF	1.0 - 2.0	9 - 15
VERY STIFF	2.0 - 4.0	16 - 30
HARD	> 4.0	> 30

Pacific Crest ENGINEERING INC	**Boring Log Explanation - FGS** San Vicente Staging Area Santa Cruz County, California	Figure No. 3 Project No. 17103 Date: 1/11/18

KEY TO SOIL CLASSIFICATION - COARSE GRAINED SOILS
UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2487 (Modified)

MAJOR DIVISIONS		FINES	GRADE/TYPE OF FINES	SYMBOL	GROUP NAME *
GRAVEL	More than 50% of coarse fraction is larger than No. 4 sieve size	<5%	Cu ≥ 4 and 1 ≤ Cc ≤ 3	**GW**	Well-Graded Gravel / Well-Graded Gravel with Sand
			Cu < 4 and/or 1 > Cc > 3	**GP**	Poorly Graded Gravel/Poorly Graded Gravel with Sand
		5-12%	ML or MH	**GW - GM**	Well-Graded Gravel with Silt / Well- Graded Gravel with Silt and Sand
				GP - GM	Poorly Graded Gravel with Silt / Poorly Graded Gravel with Silt and Sand
			CL, CI or CH	**GW - GC**	Well-Graded Gravel with Clay / Well-Graded Gravel with Clay and Sand
				GP - GC	Poorly Graded Gravel with Clay / Poorly Graded Gravel with Clay and Sand
		>12%	ML or MH	**GM**	Silty Gravel / Silty Gravel with Sand
			CL, CI or CH	**GC**	Clayey Gravel/ Clayey Gravel with Sand
			CL - ML	**GC - GM**	Silty, Clayey Gravel/ Silty, Clayey Gravel with Sand
SAND	50% or more of coarse fraction is smaller than No. 4 sieve size	<5%	Cu ≥ 6 and 1 ≤ Cc ≤ 3	**SW**	Well-Graded Sand / Well-Graded Sand with Gravel
			Cu < 6 and/or 1 > Cc > 3	**SP**	Poorly Graded Sand / Poorly Graded Sand with Gravel
		5-12%	ML or MH	**SW - SM**	Well-Graded Sand with Silt / Well- Graded Sand with Silt and Gravel
				SP - SM	Poorly Graded Sand with Silt / Poorly Graded Sand with Silt and Gravel
			CL, CI or CH	**SW - SC**	Well-Graded Sand with Clay / Well-Graded Sand with Clay and Gravel
				SP - SC	Poorly Graded Sand with Clay / Poorly Graded Sand with Clay and Gravel
		>12%	ML or MH	**SM**	Silty Sand / Silty Sand with Gravel
			CL, CI or CH	**SC**	Clayey Sand / Clayey Sand with Gravel
			CL - ML	**SC - SM**	Silty, Clayey Sand / Silty, Clayey Sand with Gravel

* The term "with sand" refers to materials containing 15% or greater sand particles within a gravel soil, while the term "with gravel" refers to materials containing 15% or greater gravel particles within a sand soil.

US STANDARD SIEVE SIZE: 3 inch | ¾ inch | No. 4 | No. 10 | No. 40 | No. 200 | 0.002 µm

	COARSE	FINE	COARSE	MEDIUM	FINE		
COBBLES AND BOULDERS	GRAVEL		SAND			SILT	CLAY

RELATIVE DENSITY

DESCRIPTION	STANDARD PENETRATION (BLOWS/FOOT)
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	> 50

MOISTURE

DESCRIPTION	CRITERIA
DRY	Absence of moisture, dusty, dry to the touch
MOIST	Damp, but no visible water
WET	Visible free water, usually soil is below the water table

Pacific Crest ENGINEERING INC

Boring Log Explanation - CGS
San Vicente Staging Area
Santa Cruz County, California

Figure No. 4
Project No. 17103
Date: 1/11/18

LOGGED BY CLA DATE DRILLED 10/4/17 BORING DIAMETER 6" SS BORING NO. 1

DRILL RIG CCD Tractor with Wireline HAMMER TYPE 140 lb Down-Hole Safety Hammer

Depth (feet)	Sample	Sample Type	Soil Description	USCS	Field Blow Counts	SPT "N" Value	Pocket Pen. (tsf)	% Passing #200 Sieve	Dry Density (pcf)	Moisture Content (%)	Additional Lab Results
0–2	1-1 L	2 1	**SILTY SAND:** Dark brown (10YR 3/3) changing to yellowish brown (10YR 5/6), very fine to fine grained with trace medium and coarse grains, poorly graded, quartz rich, poorly indurated, scattered rootlets, trace granitic gravels up to ½ inch in diameter, micaceous, 2 inch diameter sandstone gravel at 2 feet, dry, loose	SM	6 7 9	8		34	76	7	Non Plastic
3–4	1-2 L	2 1	Increase in coarse to very coarse grained granitic sand and gravel, (completely weathered DG)		7 7 8	8		20	80	8	
5–6	1-3 T		**DECOMPOSED GRANITE: WEATHERED TO SILTY SAND:** Olive brown (2.5Y 4/3), brownish yellow (10YR 6/8), white (WHITE 9.5/N), and black (10YR 2/1), very fine to very coarse grained, angular to sub-rounded shaped, poorly graded, friable, micaceous, scattered rootlets, trace sub-rounded shaped granitic gravels up to ½ inch in diameter, dry, medium dense	SM	7 10 14	24					
8–9	1-4 L	2 1	More competent/less weathered than the previous sample, increase in content of coarse to very coarse grains, lack of rootlets, very dense		29 15 50/6"	50/6"		11	110	5	
10	1-5 L	1	Increase in content of coarse to very coarse sand grains		50/6"	50/6"			102	5	
15–16	1-6 T		Less competent/more pulverized than the previous sample, slightly moist		32 50/6"	50/6"					
17–18			Increase in drilling resistance at 17½ feet, granitic gravels up to 1½ inches in diameter present in the cuttings								
20–21	1-7 T		**GRANITIC ROCK: WEATHERED TO SAND WITH SILT:** Olive brown (2.5Y 4/3), brownish yellow (10YR 6/8), white (WHITE 9.5/N), and black (10YR 2/1), very fine to very coarse grained, sub-angular to sub-rounded shaped, poorly graded, friable, micaceous, slightly moist, soft rock hardness		27 50/6"	50/6"					
22			Boring terminated at 21 feet. No groundwater encountered.								

Depth scale: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Pacific Crest ENGINEERING INC

Log of Test Borings
San Vicente Staging Area
Santa Cruz County, California

Figure No. 5
Project No. 17103
Date: 1/11/18

LOGGED BY CLA | DATE DRILLED 10/4/17 | BORING DIAMETER 6" SS | BORING NO. 2

DRILL RIG CCD Tractor with Wireline | HAMMER TYPE 140 lb Down-Hole Safety Hammer

Depth (feet)	Sample	Sample Type	Soil Description	USCS	Field Blow Counts	SPT "N" Value	Pocket Pen. (tsf)	% Passing #200 Sieve	Dry Density (pcf)	Moisture Content (%)	Additional Lab Results
1–2	2-1 L	2, 1	**SILTY SAND:** Dark brown (10YR 3/3) very fine to fine grained, poorly graded,quartz rich, poorly indurated, scattered mica flakes, scattered rootlets, trace sub-rounded shaped, granitic gravels up to ½ inch, dry, very loose	SM	3 3 4	4					
3–4	2-2 L	2, 1	Slight increase in gravel and rootlet content, trace coarse to very coarse grained granitic sand, loose		4 5 6	6			78	9	
5–6	2-3 T		Medium dense		12 18 25	43					
			DECOMPOSED GRANITE: WEATHERED TO SILTY SAND: Olive brown (2.5Y 4/3), brownish yellow (10YR 6/8), white (WHITE 9.5/N), and black (10YR 2/1), very fine to very coarse grained, angular to sub-rounded shaped, poorly graded, friable, pulverized, micaceous, dry, dense	SM							
8	2-4 L	1	More competent/less weathered than the previous sample, lack of brownish yellow, trace red (2.5YR 4/6) patches, very dense		17 50/6"	50/6"		7	106	5	Sand = 89% Gravel = 49% Fines = 7%
10–11	2-5 L	1	Slightly less weathered, trace sub-angular shaped granitic gravels up to ½ inch in diameter		19 50/6"	50/6"					
13			Dense, consistent drilling to 15 feet								
15–16	2-6 T		White, black, and yellowish red (5YR 4/6), fairly competent, increase in content of coarse to very coarse grains, moist		27 50/6"	50/6"					
			Boring terminated at 16 feet. Groundwater initially encountered at 14'9".								

Pacific Crest ENGINEERING INC

Log of Test Borings
San Vicente Staging Area
Santa Cruz County, California

Figure No. 6
Project No. 17103
Date: 1/11/18

LOGGED BY CLA | DATE DRILLED 10/4/17 | BORING DIAMETER 6" SS | BORING NO. 3

DRILL RIG CCD Tractor with Wireline | HAMMER TYPE 140 lb Down-Hole Safety Hammer

Depth (feet)	Sample	Sample Type	Soil Description	USCS	Field Blow Counts	SPT "N" Value	Pocket Pen. (tsf)	% Passing #200 Sieve	Dry Density (pcf)	Moisture Content (%)	Additional Lab Results
1	3-1 L	2, 1	**SILTY SAND:** Brown (10YR 4/3), very fine to fine grained with trace medium and coarse grains, poorly graded, quartz and granitic sand, poorly indurated, micaceous, scattered rootlets, dry, loose	SM	3 4 5	5			80	8	R2 = 22% fines
3	3-2 L	2, 1			7 8 10	9			85	9	
4			**DECOMPOSED GRANITE: WEATHERED TO SILTY SAND:** Olive brown (2.5Y 4/3), brownish yellow (10YR 6/8), white (WHITE 9.5/N), and black (10YR 2/1), very fine to very coarse grained, angular to sub-rounded shaped, poorly graded, friable, micaceous, trace rootlets, dry, loose	SM							
5–6	3-3 T		Olive brown, reddish yellow (7.5YR 6/9), white and black, increase incontent of coarse to very coarse grained sand, less weathered dense		17 23 34	57		17		9	
8	3-4 L	1	Yellowish red (5YR 5/6), very dense		28 50/6"	50/6"					
10–11	3-5 L	1	Yellowish red, brownish yellow, olive brown, white, and black, slightly more competent than the previous sample, slightly moist		28 50/6"	50/6"					
			Boring terminated at 11 feet. No groundwater encountered.								

Depth scale: 1–23 feet

Log of Test Borings
San Vicente Staging Area
Santa Cruz County, California

Pacific Crest ENGINEERING INC

Figure No. 7
Project No. 17103
Date: 1/11/18

LOGGED BY CLA   DATE DRILLED 10/4/17   BORING DIAMETER 6" SS   BORING NO. 4

DRILL RIG CCD Tractor with Wireline   HAMMER TYPE 140 lb Down-Hole Safety Hammer

Depth (feet)	Sample	Sample Type	Soil Description	USCS	Field Blow Counts	SPT "N" Value	Pocket Pen. (tsf)	% Passing #200 Sieve	Dry Density (pcf)	Moisture Content (%)	Additional Lab Results
1	4-1 L	2 1	**SILTY SAND:** Dark brown (10YR 3/3), very fine to fine grained, poorly graded, quartz rich, poorly indurated, trace medium grains, scattered mica flakes, scattered rootlets, slightly damp to dry, loose	SM	3 5 6	6			78	8	
2											
3	4-2 L	2 1	Decrease in rootlet content		3 5 13	9			84	8	
4			**DECOMPOSED GRANITE: WEATHERED TO SILTY SAND:** Olive brown (2.5Y 4/3), brownish yellow (10YR 6/8), and white (WHITE 9.5/N), very fine to very coarse grained, angular to sub-rounded shaped, poorly graded, friable, micaceous, pulverized, dry, loose	SM							
5–6	4-3 T				5 8 13	21		16		8	
7											
8	4-4 L	2 1	Decrease in silt content, slight decrease in coarse to very coarse grains, medium dense Not as competent as the previous sample, slightly moist to dry		19 14 19	17			100	8	
9											
10–11	4-5 L	2 1	Slight increase in coarse to very coarse grained material		19 25 27	27			105	8	
12			Boring terminated at 11½ feet. No groundwater encountered.								
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											

Pacific Crest ENGINEERING INC

Log of Test Borings
San Vicente Staging Area
Santa Cruz County, California

Figure No. 8
Project No. 17103
Date: 1/11/18

LOGGED BY CLA	DATE DRILLED 10/4/17	BORING DIAMETER 6" SS	BORING NO. 5
DRILL RIG CCD Tractor with Wireline		HAMMER TYPE 140 lb Down-Hole Safety Hammer	

Depth (feet)	Sample	Sample Type	Soil Description	USCS	Field Blow Counts	SPT "N" Value	Pocket Pen. (tsf)	% Passing #200 Sieve	Dry Density (pcf)	Moisture Content (%)	Additional Lab Results
0–2	5-1 L	1	**SILTY SAND:** Dark brown (10YR 3/3), very fine to fine grained, poorly graded, quartz rich, poorly indurated, micaceous, scattered rootlets, trace coarse to very coarse grains, trace sub-rounded shaped granitic gravels up to ½ inch, dry, very loose	SM	1 5 3	4		21	81	11	R1 = 22% fines
2.5–4	5-2 L	2 1	Decrease in rootlet content, slightly damp to dry		4 6 9	8			81	9	
4			**DECOMPOSED GRANITE: WEATHERED TO SILTY SAND:** Brownish yellow (10YR 6/6), very pale brown (10YR 8/2), and white (WHITE 9.5/N), very fine to coarse grained, angular to sub-rounded shaped, poorly graded, scattered mica flakes, trace rootlets, friable, dry, loose	SM							
5–6.5	5-3 T		Less weathered/more competent than the previous sample, trace yellowish red (5YR 5/8) patches, slightly moist to dry, medium dense		6 12 12	24		12	105	9	
7.5–9	5-4 L	2 1	Red (2.5Y 4/6) changing to yellowish red (5YR 5/8), gray (10YR 6/1), white (10YR 8/1), and brownish yellow (10YR 6/8), trace binder		14 15 27	22					
10–11.5	5-5 L	1	Red, gray, and white, increase in coarse grain content, less weathered/more competent than the previous sample		19 50/6"	50/6"			112	7	
			Boring terminated at 11½ feet. No groundwater encountered.								

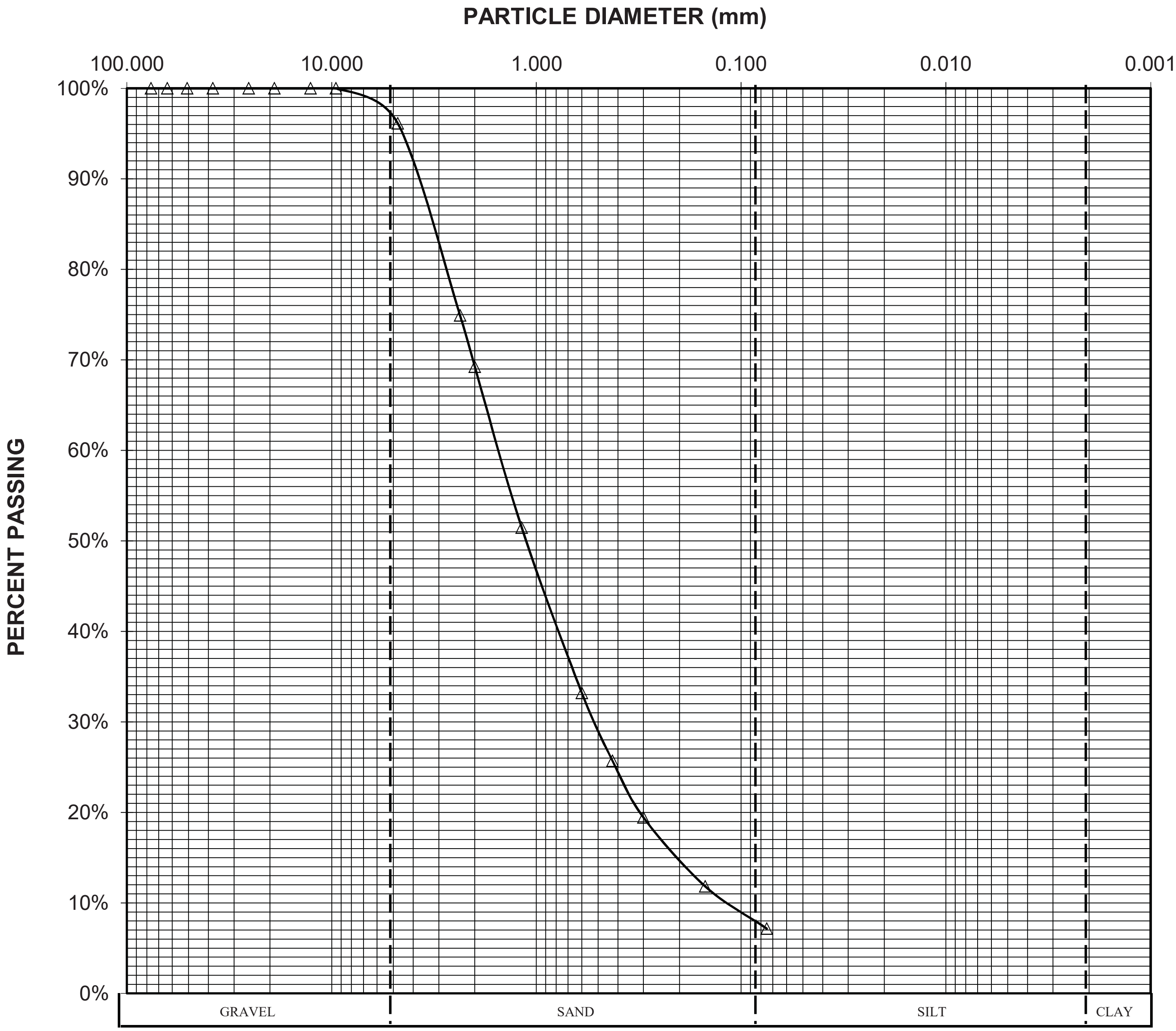
Log of Test Borings
San Vicente Staging Area
Santa Cruz County, California

Pacific Crest ENGINEERING INC

Figure No. 9
Project No. 17103
Date: 1/11/18

PARTICLE SIZE ANALYSIS - T11/C136

SAMPLE NO: 2-4-1	% PASSING No. 4	% PASSING No. 200
	96.1%	7.2%



GRAVEL	SAND	SILT + CLAY
3.9%	89.0%	7.2%

Pacific Crest ENGINEERING INC

Gradation Test Results
San Vicente Redwoods Staging Area
Santa Cruz, California

Figure No. 10
Project No. 17103
Date: 1/11/18

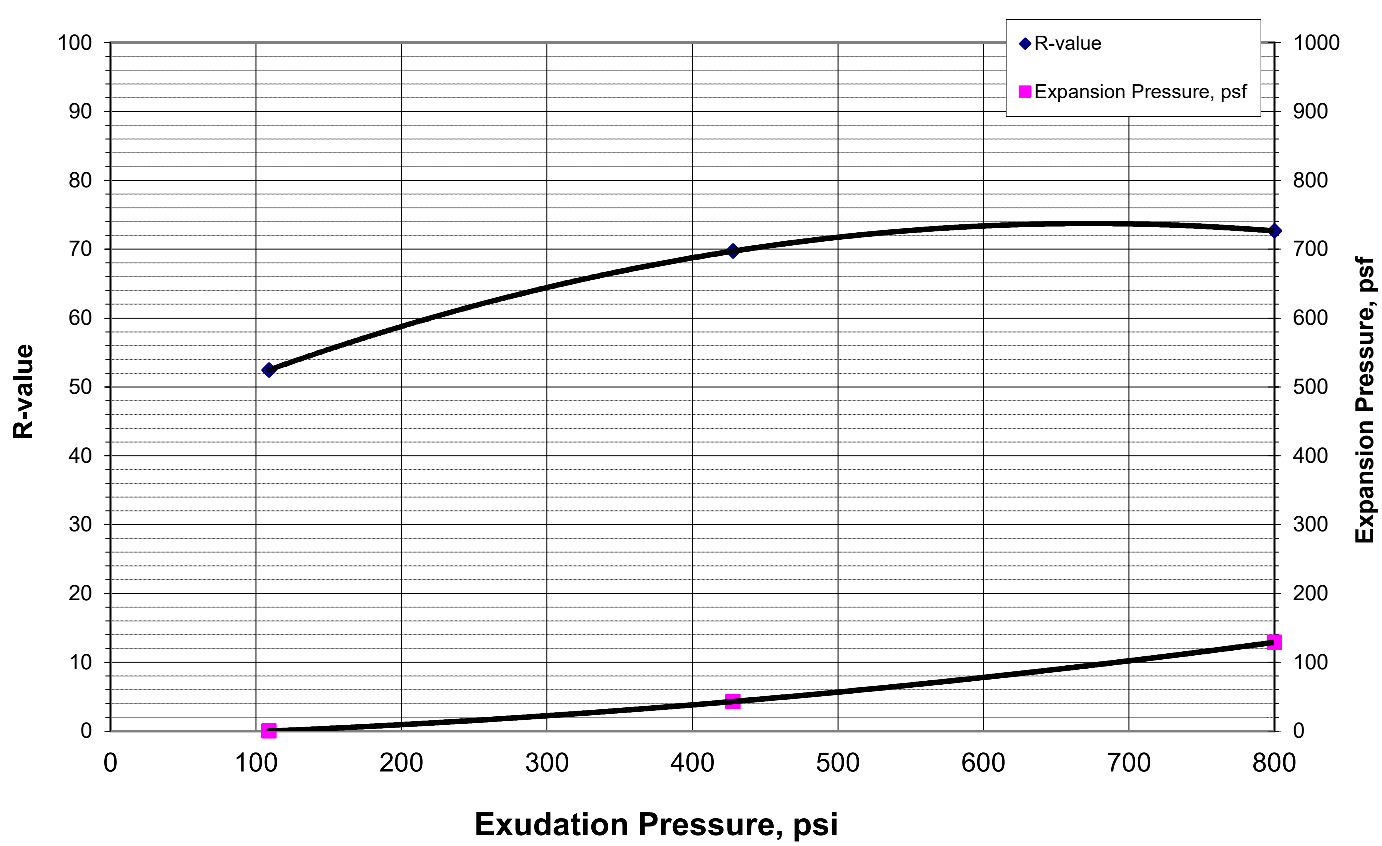
R-value Test Report (Caltrans 301)

COOPER TESTING LABORATORY

Job No.:	416-568	**Date:**	10/27/17	**Initial Moisture,**	11.5
Client:	Pacific Crest Engineering	**Tested**	PJ	**R-value**	**64**
Project:	San Vicente - 17103	**Reduced**	RU		
Sample	B-3;R-2 @ 3-6'	**Checked**	DC	**Expansion Pressure**	**20** psf
Soil Type:	Olive Brown Silty SAND (slightly plastic)				

Specimen Number	A	B	C	D
Exudation Pressure, psi	800	109	428	
Prepaired Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	27	85	54	
Weight of Soil & Mold, grams	3031	3096	3084	
Weight of Mold, grams	2106	2098	2083	
Height After Compaction, in.	2.31	2.38	2.42	
Moisture Content, %	14.0	19.4	16.5	
Dry Density, pcf	106.5	106.4	107.6	
Expansion Pressure, psf	129	0	43	
Stabilometer @ 1000				
Stabilometer @ 2000	26	50	31	
Turns Displacement	4.15	4.38	4.20	
R-value	73	52	70	

Remarks:



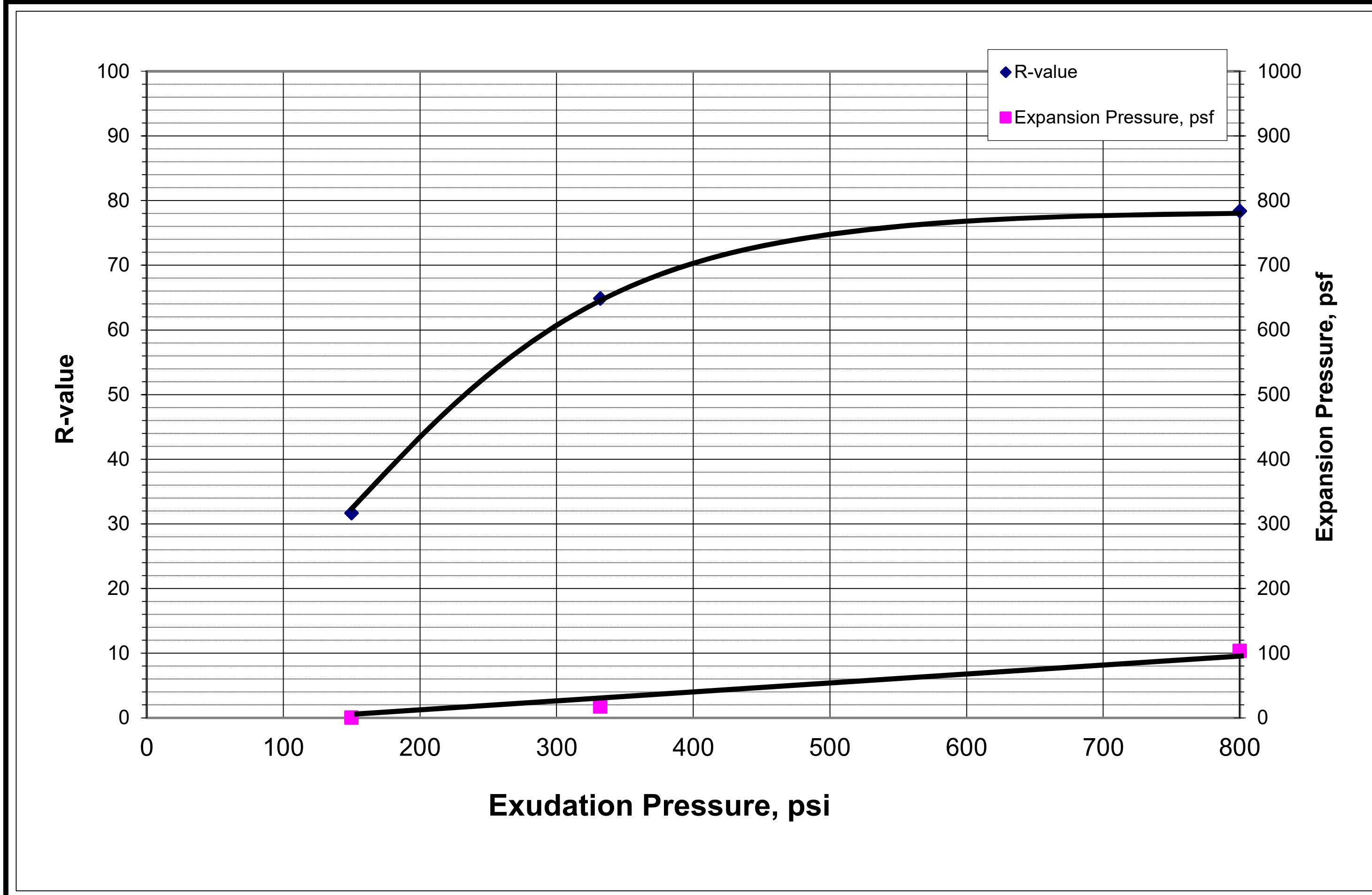
R-value Test Report (Caltrans 301)

COOPER TESTING LABORATORY

Job No.:	416-568	**Date:**	10/27/17	**Initial Moisture,**	12.1
Client:	Pacific Crest Engineering	**Tested**	PJ	**R-value**	**60**
Project:	San Vicente - 17103	**Reduced**	RU		
Sample	B-5;R-1 @ 3-6'	**Checked**	DC	**Expansion Pressure**	**20 psf**
Soil Type:	Olive Brown Silty SAND (slightly plastic)				

Specimen Number	A	B	C	D
Exudation Pressure, psi	332	800	150	
Prepaired Weight, grams	1200	1200	1200	
Final Water Added, grams/cc	43	24	66	
Weight of Soil & Mold, grams	3112	3027	3153	
Weight of Mold, grams	2076	2077	2093	
Height After Compaction, in.	2.44	2.31	2.45	
Moisture Content, %	16.1	14.3	18.2	
Dry Density, pcf	110.9	109.1	110.9	
Expansion Pressure, psf	17	103	0	
Stabilometer @ 1000				
Stabilometer @ 2000	35	20	84	
Turns Displacement	4.56	4.20	4.65	
R-value	65	78	32	

Remarks:



Attachment 8

Drainage Analysis

FALL CREEK ENGINEERING, INC.
Civil • Environmental • Water Resource Engineering and Sciences
Tel. (831) 426-9054 1525 Seabright Avenue, Santa Cruz, CA 95062 fallcreekengineering.com

August 15, 2018

Bryan Largay
Land Trust of Santa Cruz County
617 Water Street
Santa Cruz, CA 95060

Subject: **Drainage Analysis**
San Vicente Redwoods Staging Area, APN 080-011-420
Empire Grade, Santa Cruz County, California

Dear Bryan:

Fall Creek Engineering, Inc. (FCE) is pleased to present to you this drainage analysis for the proposed staging area at San Vicente Redwoods located off Empire Grade in Santa Cruz County, California. The purpose of this letter report is to present our evaluation of the existing and proposed drainage conditions at the site. In summary, FCE recommends on-site retention of stormwater through the use of best management practices (BMPs) that include vegetated retention basins (vegetated basins) and vegetated conveyance swales (vegetated swales).

The proposed staging area project includes new roads, parking stalls, accessible parking stalls, and a vault restroom building. The majority of the roads and parking area will be surfaced with aggregate base rock material. The new accessible parking spaces, driving aisle, and pad for the vault restroom will be surfaced with concrete. The accessible access routes from the accessible parking spaces will be surfaced with stabilized DG. The entrance and exit to the site off Empire Grade will be surfaced with asphalt concrete. Additional impervious surfaces include the vault restroom building and two new above-grade water tanks.

Onsite drainage improvements have been designed to infiltrate runoff from the proposed improvements. The drainage improvements have been designed to meet the requirements of the County of Santa Cruz Design Criteria (Feb 2017 edition). Attachment 1 presents the Site Improvement Plan for the staging area, which includes an overview of the existing and proposed drainage conditions.

The proposed drainage improvements include vegetated basins and vegetated swales. The vegetated basins are designed for retention of the 2-year, 2-hour storm and detention of the 10-year, 15-minute storm event. The vegetated swales are designed to convey stormwater runoff to vegetated basins.

FCE has performed drainage calculations for the proposed drainage improvements on the site. This letter report presents these drainage calculations and the results.

1. Existing Conditions

The site is located off of Empire Grade in the Santa Cruz Mountains. The site is situated on a northwest facing hillside with an average slope of 10%. The runoff on the site sheet flows from east to west in undeveloped forested areas to a swale downslope, which eventually feeds into Big

Creek located approximately 1.5 miles downstream of the site. There are two minor drainages that cross the site with small drainage areas and poor definition. Plants species on site consist primarily of coulter pine, douglas fir, madrone, coast live oak, tan oak, manzanita, and coffee berry.

The existing site includes an existing unpaved road with a gate at the entrance off Empire Grade and an existing unpaved trail. The staging area is proposed in an undeveloped area that is currently forested, with the primary tree species of Coulter Pine. This site was selected for development as these planted Coulter Pines pose both a fire hazard and are planted trees not native to this area that are aesthetically unpleasing, so tree removal is desirable.

The site includes an existing dirt road that is used to access the site for emergencies and for PG&E maintenance. The existing road is thru-cut in many locations and currently concentrates stormwater on the road until it is dispersed as sheetflow to vegetated areas downslope of the site. Drainage is an issue on this road and there is currently active erosion, causing the road to become more eroded and thru-cut over time. Additionally, runoff from Empire Grade flows onto the road, which is exacerbating the road's drainage issues.

The site also includes an existing trail that, in general, runs parallel to Empire Grade Road. The existing trail is outsloped and includes grade reversals to allow runoff to flow off the trail. The existing trail does not currently have any issues with drainage or erosion.

Soil Conditions

FCE evaluated the soils on the site using the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey. The results of the soil survey show that the primary soil type within the proposed site improvements area is Ben Lomond Sandy Loam. The Ben Lomond Sandy Loam soils are characterized as well-drained with moderate permeability (Ksat) ranging from 0.03 – 0.28 inch/hour of the most limiting layer. The site soils are a part of hydrologic soil group A and are appropriate for stormwater infiltration through the creation of vegetated basins. To be conservative, FCE has designed the vegetated basins using the lowest Ksat value of the published range of 0.03 in/hr. The USDA Soil Survey for this site is included in Attachment 6.

The project geotechnical engineer completed a site investigation including subsurface exploration with soil borings. The results of the site investigation are documented in the project geotechnical engineering report, included in Attachment 7. The soil borings encountered 3.5 – 5 feet of colluvial soil composed of loose to very loose silty sand overlying decomposed granite bedrock. Groundwater was encountered in one boring at a depth of 15 feet below ground surface.

2. Proposed Site Improvements

The proposed site improvements include a new staging area and trailhead for public access to the proposed trail network within San Vicente Redwoods. The staging area includes roads for access and circulation, parking areas, fire water storage and a wharf fire hydrant, and a vault restroom building. The roads and parking areas will be primarily surfaced with compacted aggregate base. The accessible parking and the vault restroom building pad will be surfaced with concrete. The accessible paths of travel from the accessible parking will be surfaced with stabilized DG. The entrance and exit to the site off Empire Grade will be surfaced with asphalt concrete.

The existing unpaved road will be re-graded and filled, in lifts, to eliminate the existing thru-cut condition and alleviate the concentration of stormwater. The existing road will increase in elevation in order to meet the elevation of the vault restroom building. The existing trail will also be graded in order to meet the elevation of the vault restroom building and to provide an accessible route to the project's accessible trail segment. The existing road and existing trail will have a finished surfaced of compacted native soil, similar to their current condition.

FCE calculated the impervious area for the project, which is summarized in Table 1.

Table 1. Proposed Project Impervious Area

Improvement	Area (ft^2)	Surface Type	Weight	Impervious Area (SF)
Vault Restroom	171	Roof	100%	171
Accessible Parking and Driving Aisle	2,243	Concrete	100%	2,243
Water Tanks	226	Roof	100%	226
Accessible Access Route	489	Stabilized DG	100%	489
Armored Drainage Crossing	1,003	Articulated Concrete Mat	100%	1,003
Roads and Parking Areas	44,196	Compacted Aggregate Base	50%	22,098
Entrance and Exit	4,029	Asphalt Concrete	100%	4,029
Impervious Area Created by Project				30,259

The compacted aggregate base surfacing is considered a "semi-pervious" material. FCE gave a weight of 50% to this material towards the total impervious area calculations for the site, which is consistent with published runoff values for this material. The total impervious area created by the project is 30,259 square feet.

3. Regulatory Criteria

The drainage improvements for the staging area at San Vicente Redwoods have been designed to comply with the 2017 County of Santa Cruz Design Criteria, Part 3 Stormwater Management (Design Criteria). The Design Criteria defines "Large Projects" as site development projects where the land disturbing activity results in the addition or replacement of impervious surfaces greater than 5,000 square feet. Large projects shall be designed to include BMPs to minimize and mitigate pollutant and hydrologic impacts that may result from the site development. The proposed staging area at San Vicente Redwoods creates 30,259 square feet of impervious surface and is therefore considered a large project.

The new compacted aggregate base roadway and parking lot are considered semi-pervious areas and are self-mitigating due to the porosity of the material (as shown in the drainage calculations below). In addition, the site BMPs have been sized to accommodate runoff from these semi-pervious areas to manage stormwater from high intensity rain events, where stormwater may not have the chance to infiltrate fully into the porous pavement section. BMP sizing calculations are summarized in the sections below. FCE has included a detailed site assessment and BMP analysis required by the Design Criteria for large projects. The Design Criteria call for use of retention treatment systems for management of stormwater runoff. These BMPs shall be designed to infiltrate the 2-year, 2-hour storm as well as manage the 10-year, 15-minute storm such that site discharge rates do not exceed those for pre-development conditions.

FCE analyzed the stormwater runoff for retention of a 2-year, 2-hour storm, and detention of a 10-year, 15-minute storm event. For sizing of the proposed vegetated basins, FCE utilized the Runoff Retention by the Storage Percolation Method, as provided by the County and cited as Figure SWM-24. Each vegetated basin proposed at the site was sized for retention of a 2-year, 2-hour storm, and detention of a 10-year, 15-minute storm event. Furthermore, the site as a whole was reviewed to ensure that site runoff does not exceed the pre-development condition for a minimum 10-year, 15-minute storm event. Finally, the proposed vegetated basins have all been over-sized and will accommodate larger storms than required by the Design Criteria. Any overflow from the vegetated basins will sheetflow to natural, landscaped areas. This overflow conveyance via sheetflow will accommodate the 25-year storm as required by the Design Criteria for a site size of 0 – 100 acres. The following section summarizes these drainage calculations.

4. Drainage Calculations

FCE proposes to use seven vegetated basins to manage both concentrated stormwater runoff from the proposed impervious areas and runoff from areas with existing drainage issues. Other areas of the site that are surfaced by semi-pervious surfaces, such as aggregate base road surfacing, are designed to be self-mitigating due to the porosity of the material. Any runoff occurring from these areas during high intensity storms will sheetflow to natural vegetated areas where soil infiltration will occur.

The seven vegetated basins proposed at the site are labeled Drainage Features #1 - #7. The locations of the proposed drainage features and their contributing drainage areas are shown in Attachment 2.

- Drainage Feature #1 will collect and manage run-on to the site from existing Empire Grade, which is paved with asphalt concrete as well as run-off from the adjacent entrance to the site, which is also paved with asphalt concrete.
- Drainage Feature #2 will collect and manage runoff from the top of the existing entrance road to the site in order to minimize stormwater runoff down the existing road, which is currently a drainage issue on the site.
- Drainage Feature #3 will collect and manage runoff from the adjacent concrete paved accessible parking area and roof runoff from the vault restroom building.
- Drainage Feature #4 will collect and manage runoff from the concrete paved accessible parking areas.
- Drainage Feature #5 will collect and manage runoff from a portion of the main aggregate base paved parking area.
- Drainage Feature #6 will collect and manage run-on to the site from undeveloped areas. An existing drainage path crosses Drainage Feature #6, and the intention of this vegetated basin is to minimize concentrated flow over the parking area circulation road.

In addition to the vegetated basin, an armored drainage crossing will be installed on the road where the drainage path leaves from the vegetated basin.

- Drainage Feature #7 will collect and manage run-off from the adjacent exit from the site, which is paved with asphalt concrete.

Any overflow from the proposed vegetated basins will sheetflow to natural, vegetated areas.

FCE calculated the storage volume required to retain a 2-year, 2-hour storm as required by the Design Criteria, using the Runoff Retention by the Storage Percolation Method. The Storage Percolation Method is based on the Modified Rational Method, with adaptations to account for soil infiltration. Additionally, the drainage features were sized for detention of the 10-year, 15-minute storm event using the Modified Rational Method as indicated from the Design Criteria. Finally, the proposed vegetated basins are designed such that any overflow will sheetflow from the site. This overflow method has been designed to accommodate the 25-year storm.

The Design Criteria stipulate that only impervious areas should be used in the Runoff Retention by the Storage Percolation Method sizing spreadsheet. FCE used the impervious and semi-impervious areas with a weighted runoff coefficient in the sizing spreadsheet. One of the proposed vegetated basins at the site will only manage run-off from natural vegetated areas. This basin was sized with the spreadsheet using the entire drainage area and the pre-development runoff coefficient for the entire drainage area.

The site has been broken into drainage areas for each drainage feature for the analysis. The drainage areas are presented in Attachment 2. Several overall site parameters were used in all calculations as shown in Table 2, including the site isopleth value, rational runoff coefficients, and soil parameters.

Table 2. General Parameters for Retention Drainage Feature Sizing

Parameters	Value	Source
Site location P60 isopleth	2.4	Fig. SWM-2
Site rational runoff coefficients		
Pre-development	0.45	Chow, *Applied Hydrology*
Saturated soil permeability (in/hr)	0.03	USGS Soils Report: Ben Lomond Sandy Loam - Ksat
Available water storage in soil (in)	6.1	USGS Soils Report: Ben Lomond Sandy Loam

The site isopleth P60 value was determined based on the project location and using the Design Criteria's Figure SWM-2.

The runoff coefficients were determined for both the pre-development conditions and the post-development conditions (see Rational Method calculations in Attachment 5 for post-development runoff coefficients). Runoff coefficients were determined from published values[1]. Weighted runoff coefficients were determined for each drainage area based on the surface types and areas within that drainage area. The overall post-development weighted runoff coefficient for

[1] Chow, et al, 1988, *Applied Hydrology*, McGraw-Hill. Table 15.1.1 Runoff coefficients for use in the rational method.

the site was also determined. The drainage area for the site is defined as the drainage area to a point downstream which contains the entire site. A complete description of the drainage area parameters, including the overall weighted runoff coefficients, for each drainage area are presented in Attachment 3, and a summary is presented below in Table 3.

Lastly, the saturated soil permeability value and available water storage in soil came from the USGS Soils Report (Attachment 6) for Ben Lomond Sandy Loam.

Aggregate Base Surfaced Areas Self-Mitigation

FCE analyzed the proposed semi-impervious compacted aggregate base roads and parking areas for self-mitigation via storage of rainfall in the void spaces in the pavement surface. FCE utilized a porosity for compacted aggregate base of 30%[2]. The proposed pavement section for compacted aggregate base road surfacing is 8-inches thick per the recommendations in the project geotechnical engineering report (Attachment 7) for a traffic index of 5.0. An 8-inch compacted aggregate base pavement section will have a void space equivalent to 2.4 inches based on a porosity of 30%. The 2 year, 2 hour storm for the site is 0.82 inches (calculated from the P60 isopleth for the site of 2.4). Therefore, the proposed semi-impervious compacted aggregate base roads and parking areas are self-mitigating and will retain the rainfall depth for the 2 year, 2 hour storm as required by the design criteria.

Drainage Feature Sizing Calculations

FCE completed drainage calculations for sizing the proposed drainage features on the site using Figure SWM-24 from the Design Criteria. The basin parameters and drainage area parameters used for sizing the drainage features are presented in Attachment 3. Many of the basin characteristics and the drainage areas were determined in AutoCAD and from the basin design parameters. The percent of void space was calculated based on a weighted average of the percent of the soil void space and the open space in the basin. The soil void space value was determined from published values on soil porosity[3]. The basin parameters were input into the retention calculator (Figure SWM-24) and the required storage was calculated in order to size the vegetated basins or confirm that the provided size is adequate. The results from the retention calculator (Figure SWM-24) are presented in Attachment 4.

The proposed drainage features were found to meet the retention and detention requirements from the Design Criteria. Table 3 below provides a summary of the results from drainage analysis.

[2] WEF and ASCS, 1998, *Urban Runoff Quality Management*, Table 5.12
[3] USGS, 1983, *Basic Groundwater Hydrology,* USGS Water Supply Paper 2220.

Table 3. Drainage Analysis Summary

Drainage Feature	Area (ft^2)	Depth (ft)	Storage Volume* (ft^3)	Drainage Area (ft^2)	New Impervious & Semi-Impervious Area (ft^2)	Cpre	Cpost	Required Storage Volume (ft^3)**
1	692	2	1,041	12,925	1,851	0.45	0.86	272
2	1,069	3	2,093	25,509	3,350	0.45	0.50	48
3	480	2.5	769	30,981	4,506	0.45	0.60	113
4	294	2	379	5,583	2,138	0.45	0.69	86
5	598	2	707	22,718	11,374	0.45	0.50	157
6	864	2	1,168	52,864	0	0.45	0.45	512
7	349	2	415	16,772	1,732	0.45	0.86	185

*Does not include available water storage in soil
**Required Storage Volume (does not include available water storage in soil) results from Figure SWM-24 Runoff Retention by the Storage Percolation Method

The storage volume for each drainage feature exceeds the required storage volume. Therefore, all seven drainage features have more than sufficient volume to accommodate the runoff generated by their drainage areas. All of the drainage features are over-sized as space allowed in order to accommodate larger storm events.

Site Runoff Calculations

In addition to sizing the proposed drainage features on the site, FCE completed drainage calculations to confirm that the runoff from the site does not increase as a result of the proposed development for the 10-year, 15-minute storm as required by the Design Criteria. FCE completed runoff calculations for the site under pre-development and post-development conditions using the Rational Method following the Design Criteria as presented in Attachment 5. In addition, FCE calculated the runoff from each drainage feature's drainage area using the Rational Method. Because the drainage features have all been sized to more than accommodate detention of the 10-year, 15-minute storm, these runoff volumes were subtracted from the overall site post-development runoff. A summary of the results of the site runoff calculations is presented in Table 4.

Table 4: Site Runoff Calculations using the Rational Method
($Q = C_a * C * i * A$)

Description	C_a	C	i (inches)	A (acres)	Q (cfs)
Overall Site, Pre-development	1.1	0.45	2.61	8.63	11.17
Overall Site, Post-development	1.1	0.47	2.61	8.63	11.53
Drainage Feature #1	1.1	0.56	2.61	0.30	0.48
Drainage Feature #2	1.1	0.46	2.61	0.59	0.77
Drainage Feature #3	1.1	0.47	2.61	0.71	0.96
Drainage Feature #4	1.1	0.54	2.61	0.13	0.20
Drainage Feature #5	1.1	0.48	2.61	0.52	0.71
Drainage Feature #6	1.1	0.45	2.61	1.21	1.57
Drainage Feature #7	1.1	0.51	2.61	0.39	0.56
Overall Site, Post-development with drainage features					6.28

The parameters used in the Rational Method include antecedent moisture factors (C_a), weighted runoff coefficients (C), rainfall intensity (i), and drainage area (A). These parameters are multiplied in order to determine the resultant runoff (Q). The antecedent moisture factor of 1.1 was used for all the runoff calculations as required by the Design Criteria for a return period of 25 years, which is required for site of 0 – 100 acre size. The weighted runoff coefficients were calculated for the various surface types using published values[4] and assumed values. The rainfall intensity was calculated per the Design Criteria for a 10-year, 15-minute storm using the P60 value for the site determined from the Design Criteria's Figure SWM-2. The drainage areas were determined from AutoCAD using surveyed topographic contours, proposed grading contours, and LiDAR contours outside the limit of survey.

The results of the runoff analysis for the site show that the post-development site with the proposed drainage features does not exceed the pre-development site runoff.

5. Conclusions

Based on our Drainage Analysis, FCE concludes the following:

1. The existing site is mostly undeveloped, forested area. There is an existing unpaved road off Empire Grade to the location of the proposed Staging Area. The existing road is thru-cut and has drainage issues, with runoff concentrating on the road, causing erosion.
2. The soils on the site are well drained with moderate permeability in Hydrologic soil group A. These soils are appropriate for stormwater infiltration in vegetated basins.
3. The proposed site development creates 30,259 square feet of impervious area. This size development is classified as a "Large Project" by the Santa Cruz County Design Criteria for stormwater management (Design Criteria).
4. The majority of the parking area and proposed roads will be surfaced with compacted aggregate base, which was determined to be self-mitigating based on a porosity of 30% for this semi-impervious material.

[4] Chow, et al, 1988, *Applied Hydrology*, McGraw-Hill. Table 15.1.1 Runoff coefficients for use in the rational method.

5. The proposed site development includes seven vegetated basins, which have been sized for retention of the 2-year, 2-hour storm and detention of the 10-year, 15-minute storm as required by the Design Criteria.
6. Two of the proposed vegetated basins have been strategically located to manage the existing drainage issues along the existing unpaved road on the site.
7. The post-development runoff rate is less than the pre-development site runoff rate, and therefore meets the requirements of the County of Santa Cruz and does not pose a risk of erosion of downstream drainage features.

This concludes our drainage analysis for the proposed staging area at San Vicente Redwoods. Thank you for the opportunity to assist you with this project. Please contact us if you have any questions or require any additional information.

Sincerely,

ROBYN COOPER, MS, PE
Senior Engineer

SAMANTHA SHARP, PE
Senior Associate Engineer

Attachments

Attachment 1. San Vicente Redwoods Staging Area – Site Improvement Plan
Attachment 2. San Vicente Redwoods Staging Area – Drainage Areas
Attachment 3. San Vicente Redwoods Staging Area Basin Parameters
Attachment 4. Figure SWM-24 Runoff Retention by Storage Percolation Method
Attachment 5. Rational Method Calculations Overall Site and Drainage Features
Attachment 6. USDA NRCS Soil Survey Report for San Vicente Redwoods Staging Area
Attachment 7. Geotechnical Investigation – San Vicente Redwoods Staging Area, completed by Pacific Crest Engineering, Inc., Dated January 11, 2018

ATTACHMENTS

ATTACHMENT 1

San Vicente Redwoods Staging Area – Site Improvement Plan

NOTES:

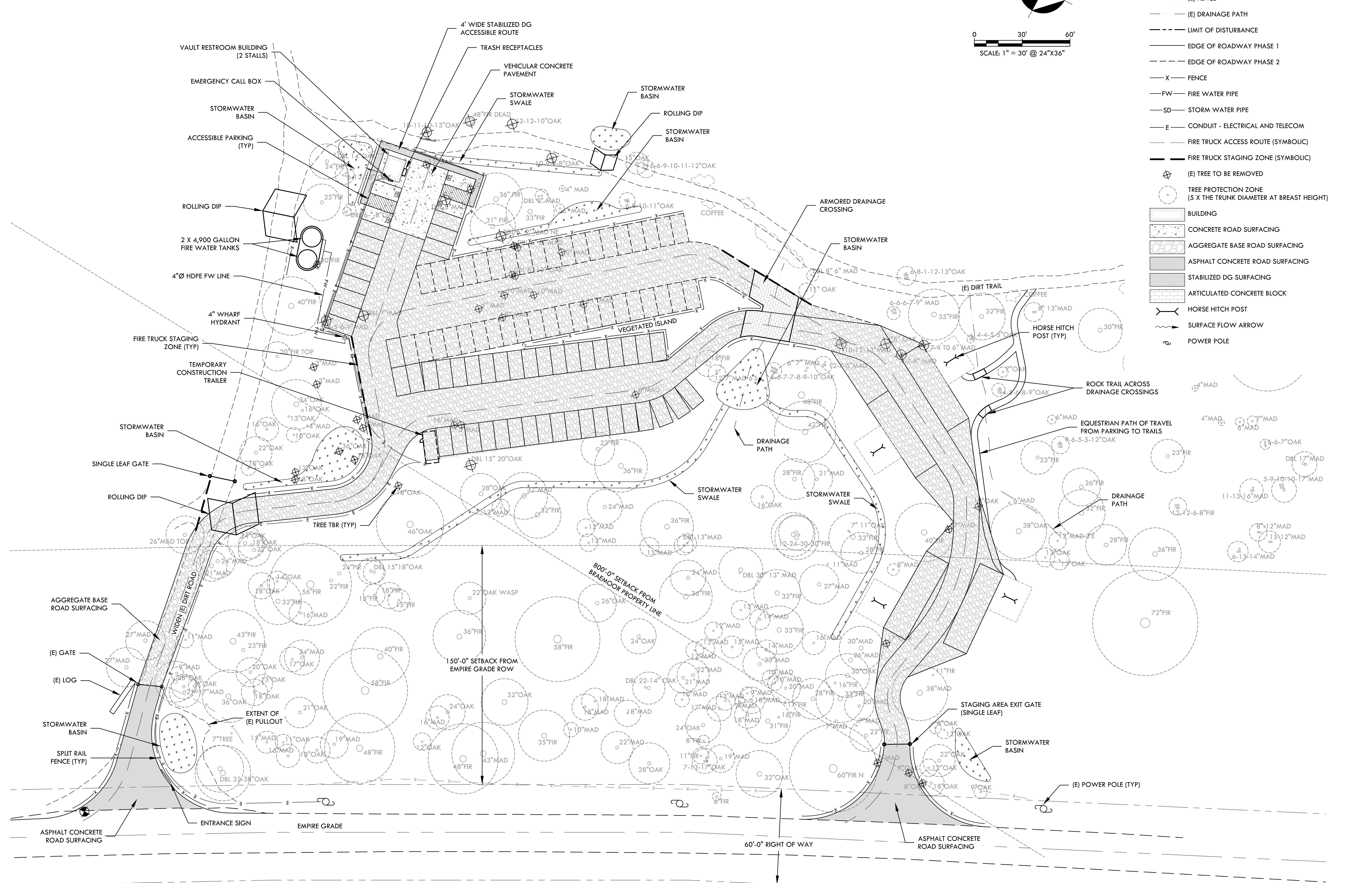
1. TREES TO BE REMOVED DO NOT INCLUDE COULTER PINES ON SITE, WHICH WERE NOT INCLUDED IN THE SURVEY.
2. FIRE HYDRANT SHALL BE LOCATED A MINIMUM OF 50' AND A MAXIMUM OF 150' FROM THE RESTROOM.

NORTH

0 30' 60'
SCALE: 1" = 30' @ 24"X36"

LEGEND:

- (E) CONTOUR
- (E) DIRT ROAD/TRAIL EDGE
- (E) ASPHALT ROAD EDGE
- (E) FENCE
- (E) DRAINAGE PATH
- LIMIT OF DISTURBANCE
- EDGE OF ROADWAY PHASE 1
- EDGE OF ROADWAY PHASE 2
- FENCE
- FIRE WATER PIPE
- STORM WATER PIPE
- CONDUIT - ELECTRICAL AND TELECOM
- FIRE TRUCK ACCESS ROUTE (SYMBOLIC)
- FIRE TRUCK STAGING ZONE (SYMBOLIC)
- (E) TREE TO BE REMOVED
- TREE PROTECTION ZONE (5 X THE TRUNK DIAMETER AT BREAST HEIGHT)
- BUILDING
- CONCRETE ROAD SURFACING
- AGGREGATE BASE ROAD SURFACING
- ASPHALT CONCRETE ROAD SURFACING
- STABILIZED DG SURFACING
- ARTICULATED CONCRETE BLOCK
- HORSE HITCH POST
- SURFACE FLOW ARROW
- POWER POLE



1 SITE IMPROVMENT PLAN
SCALE: 1" = 30' @ 24" X 36"

24"x36" SHEET. IF SHEET SIZE IS SMALLER, DRAWING HAS BEEN REDUCED.

PRELIMINARY DRAWINGS NOT FOR CONSTRUCTION

SHEET TITLE: SITE IMPROVEMENT PLAN

CLIENT: LAND TRUST OF SANTA CRUZ COUNTY
ATTN: BRYAN LARGAY
617 WATER STREET
SANTA CRUZ, CALIFORNIA, 95060

PROJECT TITLE: SAN VICENTE REDWOODS
STAGING AREA
CEMEX PROPERTY, EMPIRE GRADE
SANTA CRUZ COUNTY, CALIFORNIA

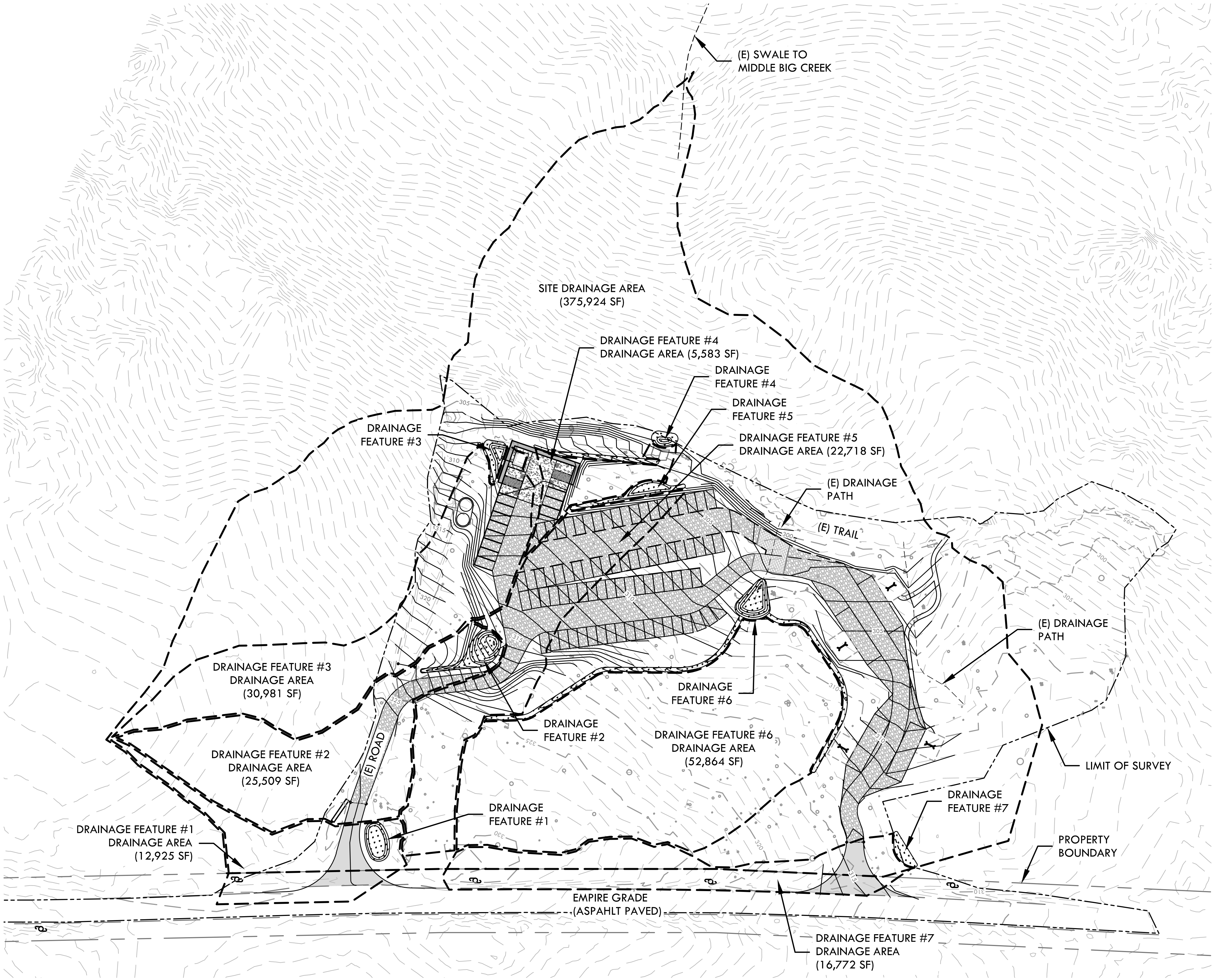
FALL CREEK ENGINEERING, INC.
Consulting Engineers
Civil • Environmental • Water Resources
1525 SEABRIGHT AVE.
SANTA CRUZ, CA 95062
TEL. (831) 426-9054

REGISTERED PROFESSIONAL ENGINEER — NO. 71041 — EXP. 12/31/18 — CIVIL — STATE OF CALIFORNIA
PROGRESS PRINT

DRAWN BY:	SLS
CHECKED BY:	RLC
DATE:	AUGUST 2018
JOB NO:	21514
SCALE:	AS SHOWN
SHEET:	

ATTACHMENT 2

San Vicente Redwoods Staging Area – Drainage Areas

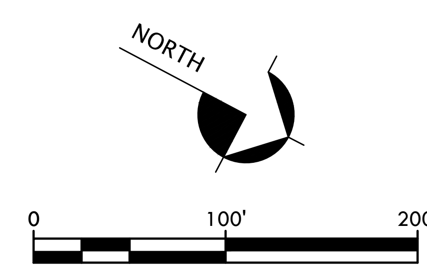


LEGEND:

- (E) CONTOUR
- (E) DIRT ROAD/TRAIL EDGE
- (E) ASPHALT ROAD EDGE
- (E) DRAINAGE PATH
- DRAINAGE AREA
- CONTOUR
- EDGE OF ROADWAY
- (E) TREE
- (E) TREE TO BE REMOVED
- BUILDING
- CONCRETE ROAD SURFACING
- AGGREGATE BASE ROAD SURFACING
- ASPHALT CONCRETE ROAD SURFACING
- STABILIZED DG SURFACING
- ARTICULATED CONCRETE BLOCK
- HORSE HITCH POST
- SURFACE FLOW ARROW

NOTES:

1. TOPOGRAPHIC SURVEY BY MICHAEL F. GOODHUE CIVIL ENGINEERS & LAND SURVEYORS, DATED AUGUST 2015.
2. ELEVATION DATUM IS ASSUMED, BENCH MARK IS A NAIL AND SHINER SET IN EMPIRE GRADE, ELEVATION = 329.2'.
3. CONTOURS SHOWN OUTSIDE THE LIMIT OF SURVEY WERE EXTRACTED FROM LIDAR DATA, ACQUIRED IN 2010 FOR THE CENTRAL COAST REGION OF CALIFORNIA.



SCALE: 1" = 100' @ 11" X 17"

1 SAN VICENTE REDWOODS STAGING AREA - DRAINAGE AREAS

SCALE: 1" = 100' @ 11" X 17"

SAN VICENTE REDWOODS STAGING AREA
DRAINAGE AREAS

FALL CREEK ENGINEERING, INC.
Civil•Environmental•Water Resources Engineering

ATTACHMENT 3

San Vicente Redwoods Staging Area Basin Parameters

Drainage Feature #1		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	692	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	349	AutoCAD
Volume (CF)	1,041	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	1,301	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
1,695	Asphalt	0.86
1,851	Asphalt	0.86
9,379	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.86	
New Impervious and Semi-Impervious Area	1,851	
Total Drainage Area	12,925	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	272	
Volume with soil (CF)	299	
Sizing for Detention		
Stored Volume (CF)	141	
Volume with soil (CF)	155	

Drainage Feature #2		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	1,069	AutoCAD
Depth (FT)	3	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	326	AutoCAD
Volume (CF)	2,093	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	2,441	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	94%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
3,350	Aggregate Base	0.50
22,159	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.50	
New Impervious and Semi-Impervious Area	3,350	
Total Drainage Area	25,509	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	48	
Volume with soil (CF)	51	
Sizing for Detention		
Stored Volume (CF)	27	
Volume with soil (CF)	29	

Drainage Feature #3		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	480	AutoCAD
Depth (FT)	2.5	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	134	AutoCAD
Volume (CF)	769	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	922	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	93%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
1,039	Concrete/Roof	0.88
144	Stabilized DG	0.80
3,323	Aggregate Base	0.50
26,475	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.60	
New Impervious and Semi-Impervious Area	4,506	
Total Drainage Area	30,981	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	113	
Volume with soil (CF)	121	
Sizing for Detention		
Stored Volume (CF)	62	
Volume with soil (CF)	67	

Drainage Feature #4		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	294	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	85	AutoCAD
Volume (CF)	379	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	474	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
886	Concrete/Roof	0.88
246	Stabilized DG	0.80
1,006	Aggregate Base	0.50
3,445	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.69	
New Impervious and Semi-Impervious Area	2,138	
Total Drainage Area	5,583	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	86	
Volume with soil (CF)	102	
Sizing for Detention		
Stored Volume (CF)	45	
Volume with soil (CF)	52	

Drainage Feature #5		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	598	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	110	AutoCAD
Volume (CF)	707	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	884	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
11,374	Aggregate Base	0.50
11,344	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.50	
New Impervious and Semi-Impervious Area	11,374	
Total Drainage Area	22,718	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	157	
Volume with soil (CF)	173	
Sizing for Detention		
Stored Volume (CF)	91	
Volume with soil (CF)	100	

Drainage Feature #6		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	864	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	304	AutoCAD
Volume (CF)	1,168	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	1,460	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
52,864	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.45	
New Impervious and Semi-Impervious Area	0	
Total Drainage Area	52,864	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	512	
Volume with soil (CF)	551	
Sizing for Detention		
Stored Volume (CF)	313	
Volume with soil (CF)	337	

Drainage Feature #7		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	349	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	66	AutoCAD
Volume (CF)	415	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	519	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
594	Asphalt	0.86
1,732	Asphalt	0.86
14,446	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.86	
New Impervious and Semi-Impervious Area	1,732	
Total Drainage Area	16,772	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	185	
Volume with soil (CF)	203	
Sizing for Detention		
Stored Volume (CF)	93	
Volume with soil (CF)	102	

Drainage Feature #1		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	692	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	349	AutoCAD
Volume (CF)	1,041	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	1,301	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
1,695	Asphalt	0.86
1,851	Asphalt	0.86
9,379	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.86	
New Impervious and Semi-Impervious Area	1,851	
Total Drainage Area	12,925	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	272	
Volume with soil (CF)	299	
Sizing for Detention		
Stored Volume (CF)	141	
Volume with soil (CF)	155	

Drainage Feature #2		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	1,069	AutoCAD
Depth (FT)	3	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	326	AutoCAD
Volume (CF)	2,093	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	2,441	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	94%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
3,350	Aggregate Base	0.50
22,159	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.50	
New Impervious and Semi-Impervious Area	3,350	
Total Drainage Area	25,509	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	48	
Volume with soil (CF)	51	
Sizing for Detention		
Stored Volume (CF)	27	
Volume with soil (CF)	29	

Drainage Feature #3		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	480	AutoCAD
Depth (FT)	2.5	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	134	AutoCAD
Volume (CF)	769	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	922	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	93%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
1,039	Concrete/Roof	0.88
144	Stabilized DG	0.80
3,323	Aggregate Base	0.50
26,475	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.60	
New Impervious and Semi-Impervious Area	4,506	
Total Drainage Area	30,981	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	113	
Volume with soil (CF)	121	
Sizing for Detention		
Stored Volume (CF)	62	
Volume with soil (CF)	67	

Drainage Feature #4		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	294	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	85	AutoCAD
Volume (CF)	379	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	474	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
886	Concrete/Roof	0.88
246	Stabilized DG	0.80
1,006	Aggregate Base	0.50
3,445	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.69	
New Impervious and Semi-Impervious Area	2,138	
Total Drainage Area	5,583	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	86	
Volume with soil (CF)	102	
Sizing for Detention		
Stored Volume (CF)	45	
Volume with soil (CF)	52	

Drainage Feature #5		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	598	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	110	AutoCAD
Volume (CF)	707	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	884	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
11,374	Aggregate Base	0.50
11,344	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.50	
New Impervious and Semi-Impervious Area	11,374	
Total Drainage Area	22,718	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	157	
Volume with soil (CF)	173	
Sizing for Detention		
Stored Volume (CF)	91	
Volume with soil (CF)	100	

Drainage Feature #6		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	864	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	304	AutoCAD
Volume (CF)	1,168	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	1,460	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
52,864	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.45	
New Impervious and Semi-Impervious Area	0	
Total Drainage Area	52,864	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	512	
Volume with soil (CF)	551	
Sizing for Detention		
Stored Volume (CF)	313	
Volume with soil (CF)	337	

Drainage Feature #7		
Basin Characteristics		
Parameter	Value	Source
Area (SF)	349	AutoCAD
Depth (FT)	2	AutoCAD
Side Slopes (H:V)	2	Design Criteria
Inner Area	66	AutoCAD
Volume (CF)	415	Calculated
Available water storage in soil (FT)	0.5	From Web Soil Survey
Volume with available soil volume (CF)	519	Calculated
Open Void Space	100%	
Soil Void Space	55%	USGS Water Supply Paper 2220 - Porosity of Soil
Weighted Void Space	91%	
Drainage Area Characteristics		
Drainage Area (SF)	Type	Runoff Coefficient
594	Asphalt	0.86
1,732	Asphalt	0.86
14,446	Undeveloped	0.45
Cpre	0.45	
Cpost (weighted)	0.86	
New Impervious and Semi-Impervious Area	1,732	
Total Drainage Area	16,772	
SWM24 - Results		
Sizing for Retention		
Stored Volume (CF)	185	
Volume with soil (CF)	203	
Sizing for Detention		
Stored Volume (CF)	93	
Volume with soil (CF)	102	

ATTACHMENT 4

Figure SWM-24 Runoff Retention by Storage Percolation Method

PROJECT: San Vicente Redwoods Staging Area (APN 080-011-42) - Drainage Feature #1 **Calc by:** SLS **Date:** 8/14/2018

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES

Notes & Limitations on Use:

SS Ver:1.0

Site Location P60 Isopleth:	2.40	Fig. SWM-2
Rational Coefficients Cpre:	0.45	
Cpost:	0.86	
Impervious Area:	3546	ft^2
Saturated Soil Permeability:	0.03	in/hr

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.

Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.

Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.

Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.

Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.35	0.013	0.025	-0.006	-321	-0.014	-1176
1200	0.38	0.014	0.027	-0.004	-144	-0.012	-865
960	0.41	0.015	0.029	-0.002	15	-0.010	-571
720	0.45	0.017	0.032	0.001	149	-0.007	-301
480	0.51	0.019	0.036	0.006	244	-0.002	-66
360	0.57	0.021	0.040	0.010	270	0.001	31
240	0.65	0.024	0.046	0.015	**272**	0.007	106
180	0.72	0.026	0.051	0.020	259	0.012	131
120	0.82	**0.030**	0.058	0.028	231	0.020	**141**
90	0.91	0.034	0.064	0.034	208	0.026	138
60	1.04	**0.039**	0.074	0.043	176	0.035	126
45	1.15	0.042	0.081	0.051	154	0.043	115
30	1.32	0.049	0.093	0.063	126	0.055	99
20	1.52	0.056	0.107	0.077	102	0.069	82
15	1.67	0.062	0.118	0.088	87	0.080	72
10	1.92	0.071	0.136	0.105	69	0.097	58
5	2.43	0.090	**0.172**	0.141	46	0.133	40

STRUCTURE DIMENSIONS FOR RETENTION

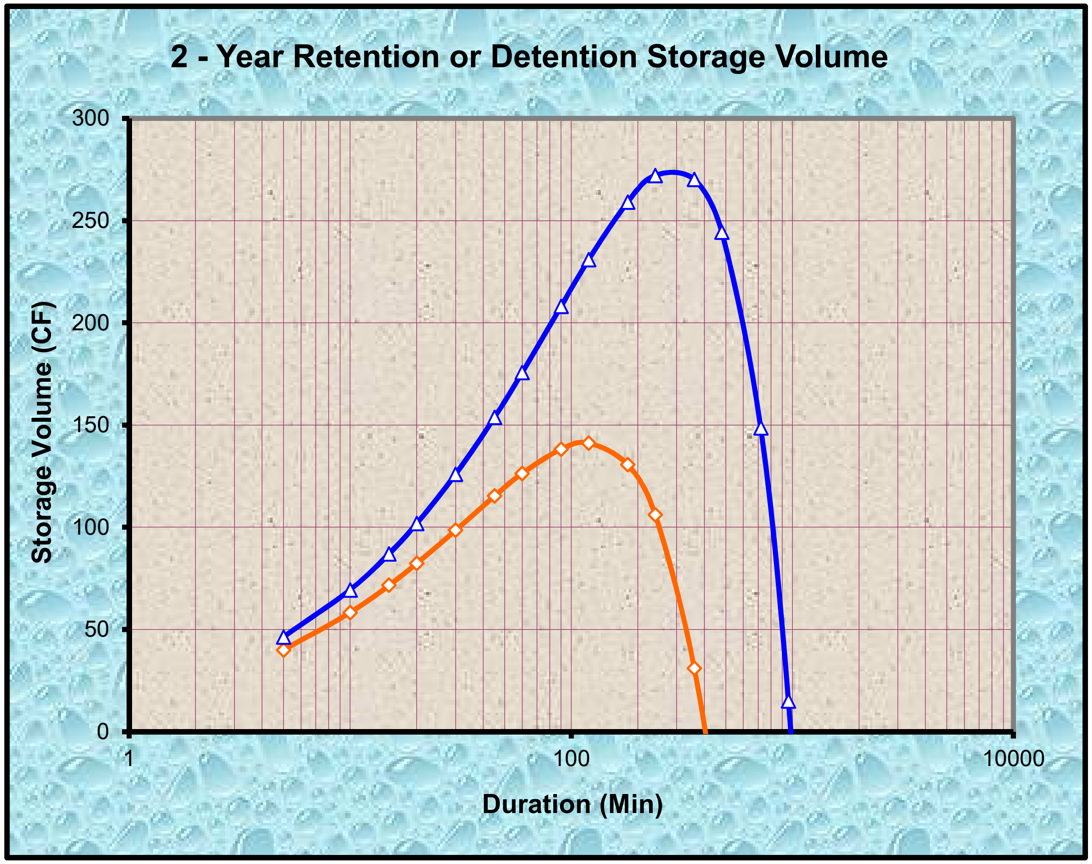
272	ft^3 storage volume calculated		
91	% void space assumed		
299	ft^3 excavated volume needed		
Structure	Length	Width*	Depth* #
Ratios	15.00	10.00	1.00
Dimen. (ft)	**18.88**	**12.59**	**1.26**
317	ft^2 internal surface area		
222	ft^2 effective surface area		
490.8	hrs estimated structure drainage time		

* For pipe, use the square root of the sectional area.

\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

141	ft^3 storage volume calculated		
91	% void space assumed		
155	ft^3 excavated volume needed		
Structure	Length	Width*	Depth*
Ratios	15.00	10.00	1.00
Dimen. (ft)	**15.17**	**10.11**	**1.01**



2 - Year Retention or Detention Storage Volume
Storage Volume (CF)
300
250
200
150
100
50
0
1
100
10000
Duration (Min)

PROJECT: San Vicente Redwoods Staging Area (APN 080-011-42) - Drainage Feature #2 **Calc by:** SLS **Date:** 8/14/2018

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES

Notes & Limitations on Use:

SS Ver:1.0

Site Location P60 Isopleth:	2.40	Fig. SWM-2
Rational Coefficients Cpre:	0.45	
Cpost:	0.50	
Impervious Area:	3350	ft^2
Saturated Soil Permeability:	0.03	in/hr

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.
Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.
Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.
Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.35	0.012	0.014	-0.015	-1253	-0.023	-1962
1200	0.38	0.013	0.015	-0.014	-978	-0.022	-1572
960	0.41	0.014	0.016	-0.013	-713	-0.021	-1191
720	0.45	0.016	0.017	-0.011	-462	-0.019	-824
480	0.51	0.018	0.020	-0.009	-231	-0.016	-475
360	0.57	0.020	0.022	-0.007	-127	-0.014	-312
240	0.65	0.023	0.025	-0.004	-36	-0.011	-161
180	0.72	0.025	0.028	-0.001	3	-0.009	-93
120	0.82	**0.029**	0.032	0.003	33	-0.004	-32
90	0.91	0.032	0.035	0.006	43	-0.001	-6
60	1.04	**0.036**	0.040	0.012	**48**	0.004	15
45	1.15	0.040	0.045	0.016	48	0.008	22
30	1.32	0.046	0.051	0.022	44	0.015	27
20	1.52	0.053	0.059	0.030	39	0.022	**27**
15	1.67	0.058	0.065	0.036	35	0.028	26
10	1.92	0.067	0.074	0.046	29	0.038	23
5	2.43	0.085	**0.094**	0.066	21	0.058	17

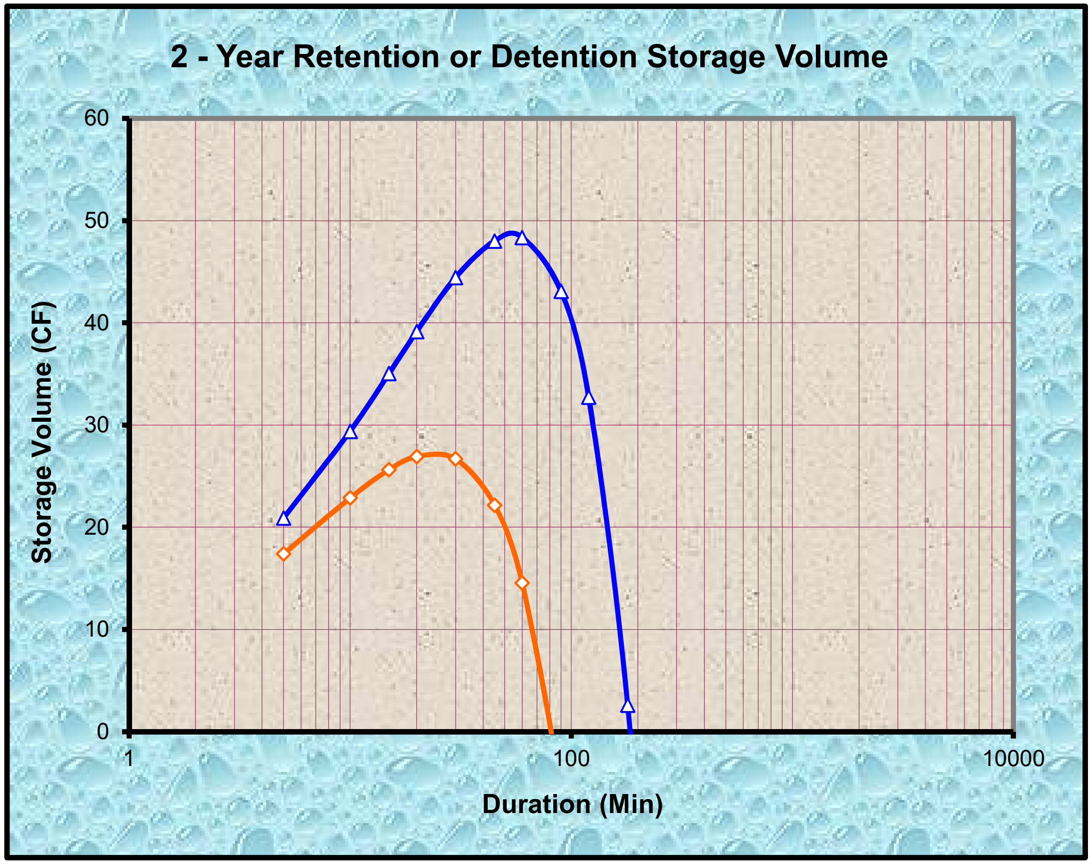
STRUCTURE DIMENSIONS FOR RETENTION

48	ft^3 storage volume calculated		
94	% void space assumed		
51	ft^3 excavated volume needed		
Structure	Length	Width*	Depth* #
Ratios	15.00	10.00	1.00
Dimen. (ft)	**10.50**	**7.00**	**0.70**
98	ft^2 internal surface area		
69	ft^2 effective surface area		
282.0	hrs estimated structure drainage time		

* For pipe, use the square root of the sectional area.
\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

27	ft^3 storage volume calculated		
94	% void space assumed		
29	ft^3 excavated volume needed		
Structure	Length	Width*	Depth*
Ratios	15.00	10.00	1.00
Dimen. (ft)	**8.64**	**5.76**	**0.58**



2 - Year Retention or Detention Storage Volume
Storage Volume (CF)
60
50
40
30
20
10
0
1
100
10000
Duration (Min)

PROJECT: San Vicente Redwoods Staging Area (APN 080-011-42) - Drainage Feature #3 **Calc by:** SLS **Date:** 8/14/2018

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES

SS Ver:1.0

Site Location P60 Isopleth:	2.40	Fig. SWM-2
Rational Coefficients Cpre:	0.45	
Cpost:	0.60	
Impervious Area:	4506	ft^2
Saturated Soil Permeability:	0.03	in/hr

Notes & Limitations on Use:

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.
Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.
Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.
Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.35	0.017	0.022	-0.017	-1347	-0.027	-2321
1200	0.38	0.018	0.023	-0.015	-1015	-0.025	-1833
960	0.41	0.019	0.025	-0.013	-700	-0.024	-1359
720	0.45	0.021	0.028	-0.011	-407	-0.021	-906
480	0.51	0.024	0.032	-0.007	-146	-0.017	-485
360	0.57	0.027	0.035	-0.003	-35	-0.014	-292
240	0.65	0.031	0.041	0.002	56	-0.008	-119
180	0.72	0.034	0.045	0.006	90	-0.004	-44
120	0.82	**0.039**	0.052	0.013	110	0.003	19
90	0.91	0.043	0.057	0.018	113	0.008	43
60	1.04	0.049	0.065	0.027	107	0.016	59
45	1.15	0.054	0.072	0.033	99	0.023	62
30	1.32	0.062	0.083	0.044	86	0.034	61
20	1.52	0.071	0.095	0.056	73	0.046	55
15	1.67	0.079	0.105	0.066	64	0.056	50
10	1.92	0.090	0.120	0.082	52	0.071	43
5	2.43	0.114	**0.152**	0.114	36	0.103	31

STRUCTURE DIMENSIONS FOR RETENTION

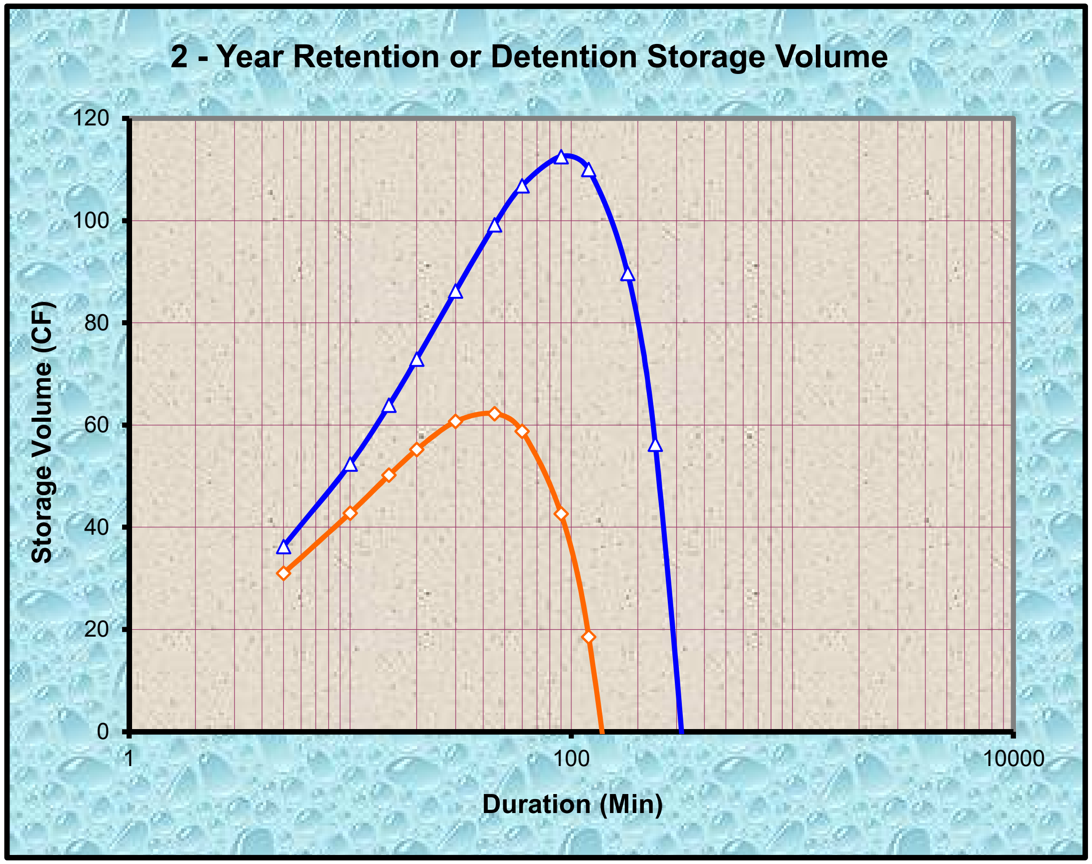
113	ft^3 storage volume calculated		
93	% void space assumed		
121	ft^3 excavated volume needed		
Structure	Length	Width*	Depth* #
Ratios	15.00	10.00	1.00
Dimen. (ft)	**13.96**	**9.31**	**0.93**
173	ft^2 internal surface area		
121	ft^2 effective surface area		
371.0	hrs estimated structure drainage time		

* For pipe, use the square root of the sectional area.

\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

62	ft^3 storage volume calculated		
93	% void space assumed		
67	ft^3 excavated volume needed		
Structure	Length	Width*	Depth*
Ratios	15.00	10.00	1.00
Dimen. (ft)	**11.46**	**7.64**	**0.76**


2 - Year Retention or Detention Storage Volume
Storage Volume (CF)
120
100
80
60
40
20
0
1
100
10000
Duration (Min)

PROJECT: San Vicente Redwoods Staging Area (APN 080-011-42) - Drainage Feature #4 **Calc by:** SLS **Date:** 8/14/2018

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES

SS Ver:1.0

Site Location P60 Isopleth:	2.40	Fig. SWM-2
Rational Coefficients Cpre:	0.45	
Cpost:	0.69	
Impervious Area:	2138	ft^2
Saturated Soil Permeability:	0.03	in/hr

Notes & Limitations on Use:

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.

Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.

Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.

Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.

Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.35	0.008	0.012	-0.006	-468	-0.011	-966
1200	0.38	0.008	0.013	-0.006	-330	-0.010	-749
960	0.41	0.009	0.014	-0.005	-201	-0.009	-541
720	0.45	0.010	0.015	-0.003	-84	-0.008	-344
480	0.51	0.011	0.018	-0.001	14	-0.006	-164
360	0.57	0.013	0.019	0.001	53	-0.004	-84
240	0.65	0.014	0.022	0.004	80	-0.001	-15
180	0.72	0.016	0.024	0.006	86	0.001	14
120	0.82	**0.018**	0.028	0.010	86	0.005	35
90	0.91	0.020	0.031	0.013	81	0.008	42
60	1.04	**0.023**	0.036	0.017	72	0.012	**45**
45	1.15	0.026	0.039	0.021	65	0.016	43
30	1.32	0.029	0.045	0.027	54	0.022	39
20	1.52	0.034	0.052	0.033	45	0.029	34
15	1.67	0.037	0.057	0.039	39	0.034	31
10	1.92	0.043	0.066	0.047	31	0.042	25
5	2.43	0.054	**0.083**	0.065	21	0.060	18

STRUCTURE DIMENSIONS FOR RETENTION

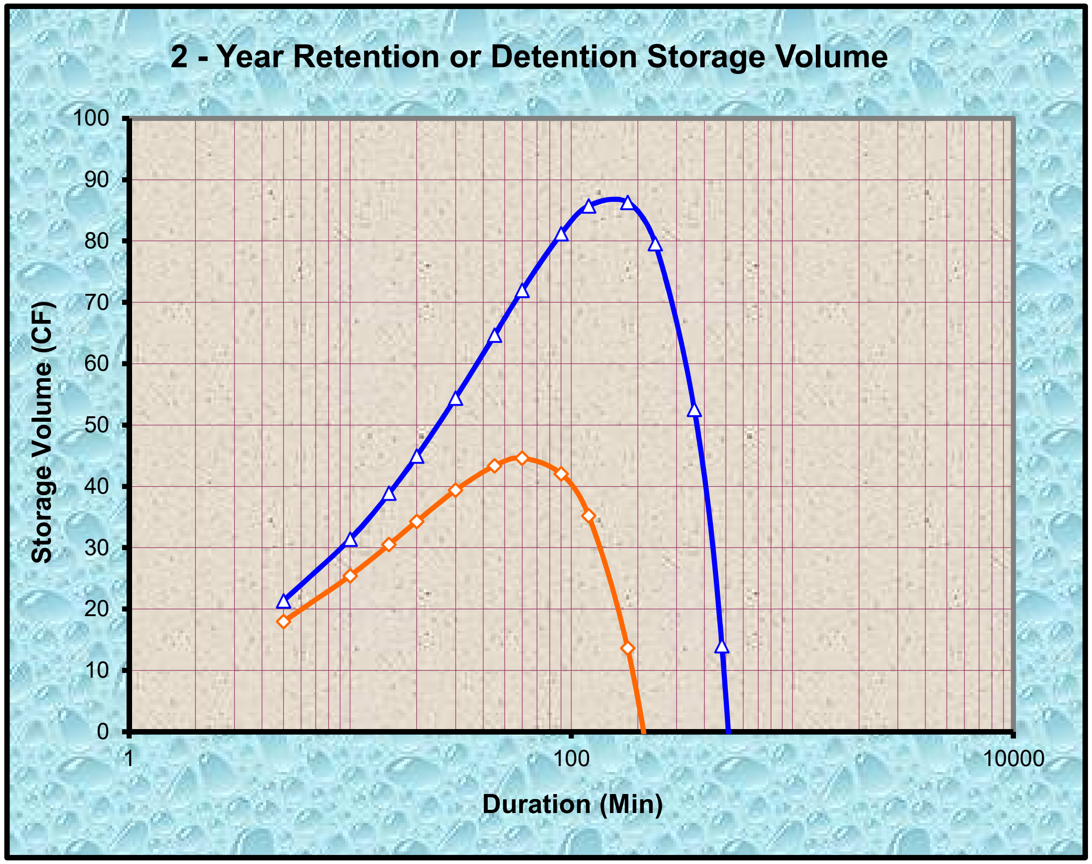
86	ft^3 storage volume calculated		
85	% void space assumed		
102	ft^3 excavated volume needed		
Structure	Length	Width*	Depth* #
Ratios	15.00	10.00	1.00
Dimen. (ft)	**13.17**	**8.78**	**0.88**
154	ft^2 internal surface area		
108	ft^2 effective surface area		
319.9	hrs estimated structure drainage time		

* For pipe, use the square root of the sectional area.

\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

45	ft^3 storage volume calculated		
85	% void space assumed		
52	ft^3 excavated volume needed		
Structure	Length	Width*	Depth*
Ratios	15.00	10.00	1.00
Dimen. (ft)	**10.57**	**7.05**	**0.70**



2 - Year Retention or Detention Storage Volume
Storage Volume (CF)
100
90
80
70
60
50
40
30
20
10
0
1
100
10000
Duration (Min)

PROJECT: San Vicente Redwoods Staging Area (APN 080-011-42) - Drainage Feature #5 **Calc by:** SLS **Date:** 8/14/2018

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES

Notes & Limitations on Use:

SS Ver:1.0

Site Location P60 Isopleth:	2.40	Fig. SWM-2
Rational Coefficients Cpre:	0.45	
Cpost:	0.50	
Impervious Area:	11374	ft^2
Saturated Soil Permeability:	0.03	in/hr

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.
Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.
Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.
Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.35	0.042	0.046	-0.051	-4308	-0.077	-6663
1200	0.38	0.044	0.049	-0.048	-3369	-0.074	-5338
960	0.41	0.048	0.053	-0.044	-2464	-0.070	-4045
720	0.45	0.053	0.059	-0.039	-1604	-0.065	-2796
480	0.51	0.061	0.068	-0.030	-810	-0.056	-1613
360	0.57	0.067	0.075	-0.023	-453	-0.049	-1059
240	0.65	0.077	0.086	-0.012	-138	-0.038	-547
180	0.72	0.085	0.094	-0.003	-6	-0.029	-315
120	0.82	**0.098**	0.108	0.011	100	-0.015	-109
90	0.91	0.108	0.120	0.022	137	-0.004	-22
60	1.04	**0.124**	0.137	0.040	157	0.014	49
45	1.15	0.136	0.151	0.054	**157**	0.028	75
30	1.32	0.157	0.174	0.076	146	0.050	91
20	1.52	0.180	0.200	0.102	129	0.076	**91**
15	1.67	0.198	0.220	0.123	116	0.097	87
10	1.92	0.228	0.253	0.155	98	0.129	78
5	2.43	0.288	**0.320**	0.223	70	0.197	59

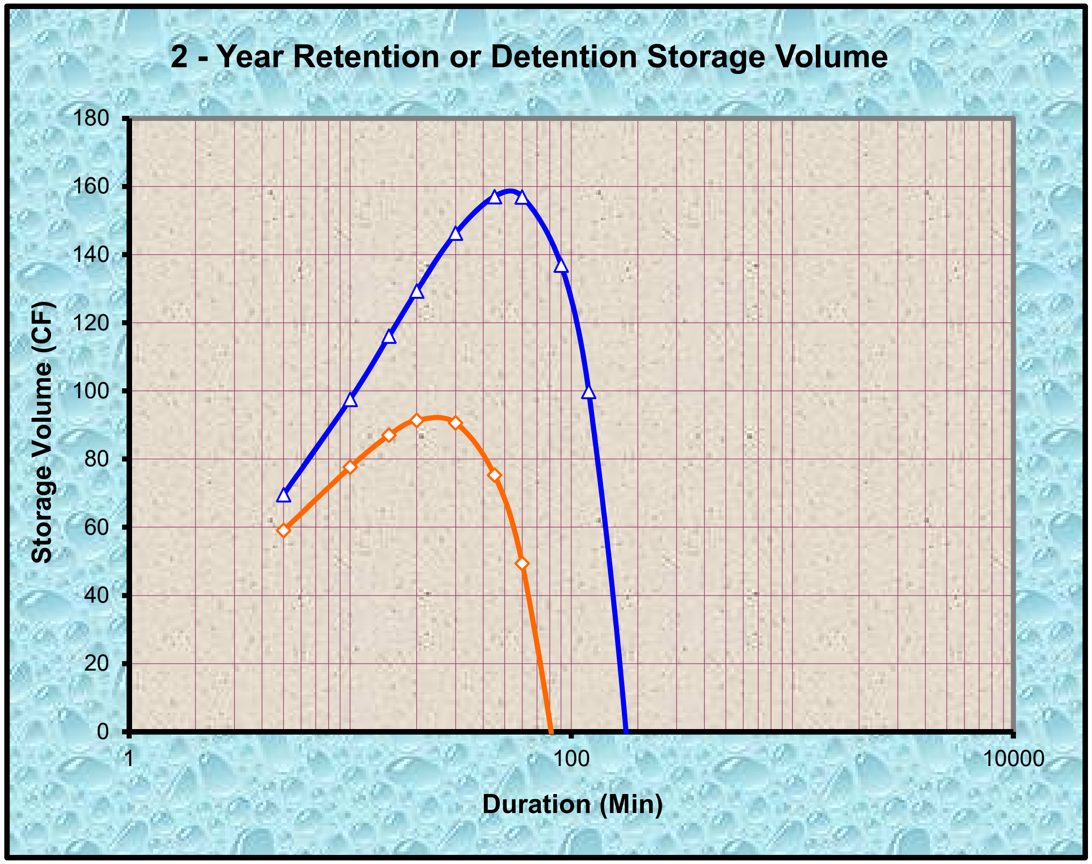
STRUCTURE DIMENSIONS FOR RETENTION

157	ft^3 storage volume calculated		
91	% void space assumed		
173	ft^3 excavated volume needed		
Structure	Length	Width*	Depth* #
Ratios	15.00	10.00	1.00
Dimen. (ft)	**15.72**	**10.48**	**1.05**
220	ft^2 internal surface area		
154	ft^2 effective surface area		
408.7	hrs estimated structure drainage time		

* For pipe, use the square root of the sectional area.
\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

91	ft^3 storage volume calculated		
91	% void space assumed		
100	ft^3 excavated volume needed		
Structure	Length	Width*	Depth*
Ratios	15.00	10.00	1.00
Dimen. (ft)	**13.12**	**8.75**	**0.87**



2 - Year Retention or Detention Storage Volume
Storage Volume (CF)
180
160
140
120
100
80
60
40
20
0
1
100
10000
Duration (Min)

PROJECT: San Vicente Redwoods Staging Area (APN 080-011-42) - Drainage Feature #6 **Calc by:** SLS **Date:** 8/14/2018

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES

Notes & Limitations on Use:

SS Ver:1.0

Site Location P60 Isopleth:	2.40	Fig. SWM-2
Rational Coefficients Cpre:	0.45	
Cpost:	0.45	
Impervious Area:	52864	ft^2
Saturated Soil Permeability:	0.03	in/hr

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.

Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.

Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.

Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.

Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.35	0.194	0.194	-0.259	-22154	-0.380	-32831
1200	0.38	0.207	0.207	-0.247	-17551	-0.368	-26462
960	0.41	0.223	0.223	-0.230	-13085	-0.351	-20228
720	0.45	0.246	0.246	-0.207	-8805	-0.328	-14178
480	0.51	0.283	0.283	-0.171	-4803	-0.292	-8401
360	0.57	0.312	0.312	-0.142	-2964	-0.263	-5671
240	0.65	0.358	0.358	-0.095	-1300	-0.216	-3115
180	0.72	0.395	0.395	-0.059	-571	-0.179	-1938
120	0.82	**0.453**	0.453	0.000	47	-0.121	-870
90	0.91	0.500	0.500	0.047	292	-0.074	-400
60	1.04	**0.574**	0.574	0.121	465	0.000	0
45	1.15	0.633	0.633	0.180	511	0.059	160
30	1.32	0.727	0.727	0.274	**512**	0.153	276
20	1.52	0.835	0.835	0.382	473	0.261	**313**
15	1.67	0.921	0.921	0.468	433	0.347	312
10	1.92	1.058	1.058	0.605	372	0.484	290
5	2.43	1.340	**1.340**	0.887	272	0.766	230

STRUCTURE DIMENSIONS FOR RETENTION

512 ft^3 storage volume calculated

93 % void space assumed

551 ft^3 excavated volume needed

Structure	Length	Width*	Depth* #
Ratios	15.00	10.00	1.00
Dimen. (ft)	**23.15**	**15.43**	**1.54**

476 ft^2 internal surface area

333 ft^2 effective surface area

615.0 hrs estimated structure drainage time

* For pipe, use the square root of the sectional area.

\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

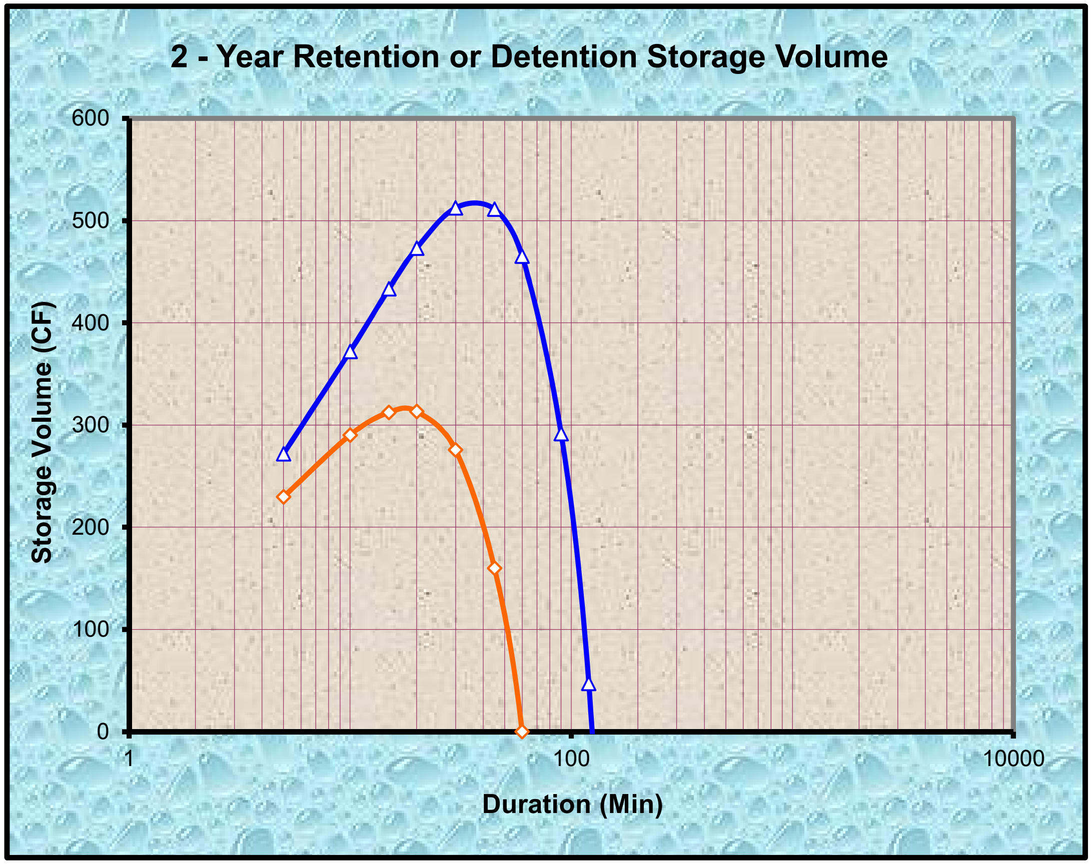
STRUCTURE DIMENSIONS FOR DETENTION

313 ft^3 storage volume calculated

93 % void space assumed

337 ft^3 excavated volume needed

Structure	Length	Width*	Depth*
Ratios	15.00	10.00	1.00
Dimen. (ft)	**19.64**	**13.09**	**1.31**


2 - Year Retention or Detention Storage Volume
Storage Volume (CF)
600
500
400
300
200
100
0
1
100
10000
Duration (Min)

PROJECT: San Vicente Redwoods Staging Area (APN 080-011-42) - Drainage Feature #1 **Calc by:** SLS **Date:** 8/14/2018

RUNOFF RETENTION BY THE STORAGE PERCOLATION METHOD

Data Entry: PRESS TAB KEY & ENTER DESIGN VALUES

Site Location P60 Isopleth:	2.40	Fig. SWM-2
Rational Coefficients Cpre:	0.45	
Cpost:	0.86	
Impervious Area:	2326	ft^2
Saturated Soil Permeability:	0.03	in/hr

Notes & Limitations on Use:

SS Ver:1.0

Saturated soil permeability values may be used conservatively from the USDA-NRCS soil survey, or use actual test values.
Site selection and design shall give proper consideration to the path for excess flows downstream of the designated retention area.
Retention site location on, or immediately above, slopes exceeding 15% will require consulting a geotechnical engineer.
Gravel packed structures shall use washed, angular, uniformly graded aggregate providing not less than 35% void space.
Refer to the County of Santa Cruz Design Criteria, Stormwater Management - Section H, for complete method criteria.

2 - YEAR DESIGN STORM				RETENTION @ 120 MIN.		DETENTION @ 60 MIN.	
Storm Duration (min)	2 - Year Intensity (in/hr)	Qpre (cfs)	Qpost (cfs)	Retention Rate To Storage (cfs)	Specified Retained Volume (cf)	Detention Rate To Storage (cfs)	Specified Detained Volume (cf)
1440	0.35	0.009	0.016	-0.004	-193	-0.009	-772
1200	0.38	0.009	0.017	-0.003	-78	-0.008	-568
960	0.41	0.010	0.019	-0.001	24	-0.007	-375
720	0.45	0.011	0.021	0.001	109	-0.005	-198
480	0.51	0.012	0.024	0.004	169	-0.002	-43
360	0.57	0.014	0.026	0.006	**185**	0.001	20
240	0.65	0.016	0.030	0.010	184	0.005	70
180	0.72	0.017	0.033	0.013	175	0.008	86
120	0.82	**0.020**	0.038	0.018	155	0.013	**93**
90	0.91	0.022	0.042	0.022	140	0.017	91
60	1.04	**0.025**	0.048	0.028	118	0.023	83
45	1.15	0.028	0.053	0.033	103	0.028	76
30	1.32	0.032	0.061	0.041	84	0.036	65
20	1.52	0.037	0.070	0.050	68	0.045	54
15	1.67	0.041	0.077	0.058	58	0.052	47
10	1.92	0.047	0.089	0.069	46	0.064	38
5	2.43	0.059	**0.113**	0.093	31	0.087	26

STRUCTURE DIMENSIONS FOR RETENTION

185 ft^3 storage volume calculated
91 % void space assumed
203 ft^3 excavated volume needed

Structure	Length	Width*	Depth* #
Ratios	15.00	10.00	1.00
Dimen. (ft)	**16.59**	**11.06**	**1.11**

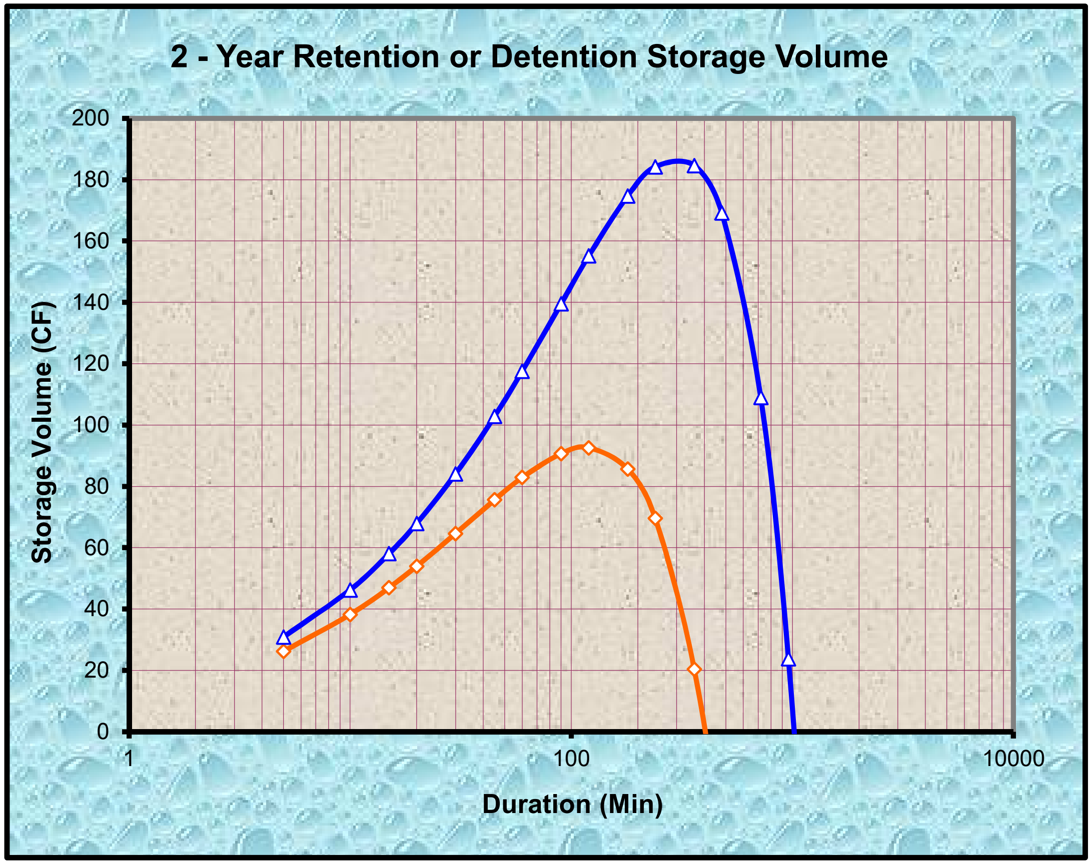
245 ft^2 internal surface area
171 ft^2 effective surface area
431.3 hrs estimated structure drainage time

* For pipe, use the square root of the sectional area.
\# If cell values displayed are corrupted, enter zero for depth, then re-enter a positive numeric value within allowed range.

STRUCTURE DIMENSIONS FOR DETENTION

93 ft^3 storage volume calculated
91 % void space assumed
102 ft^3 excavated volume needed

Structure	Length	Width*	Depth*
Ratios	15.00	10.00	1.00
Dimen. (ft)	**13.18**	**8.79**	**0.88**


2 - Year Retention or Detention Storage Volume
Storage Volume (CF)
200
180
160
140
120
100
80
60
40
20
0
1
100
10000
Duration (Min)

ATTACHMENT 5

Rational Method Calculations for Overall Site and Drainage Features

DRAINAGE FEATURES

Rational Method as outlined in the County of Santa Cruz Design Criteria Manual February 2017

Q = Ca * C * i * A

	Items that are selected from spreadsheet
	items that are to be entered into the spreadsheet

Project Size (p. 60)

Size	Return Period Used	
0-100 acres	25	year
101-400 acres	50	year
over 400 acres	100	year
Cross Culverts on publicly maintained roads	100	year
Bridge Structures	100	year

Ca for return period storm event (p. 56)

Return Period	Ca
2 to 10	1
25	1.1
50	1.2
100	1.25

C Runoff Coefficient (from Chow, Applied Hydrology)

	Return Period (yrs)						
Character of Surface	**2**	**5**	**10**	**25**	**50**	**100**	**500**
DEVELOPED							
Asphalt	0.73	0.77	0.81	0.86	0.90	0.95	1.00
Concrete/roof	0.75	0.80	0.83	0.88	0.92	0.97	1.00
Grass Areas (lawns, park, etc.)							
Poor Condition (grass cover less than 50% of area)							
Flat (0-2%)	0.32	0.34	0.37	0.40	0.44	0.47	0.58
Average (2-7%)	0.37	0.40	0.43	0.46	0.49	0.53	0.61
Steep (over 7%)	0.40	0.43	0.45	0.49	0.52	0.55	0.62
Fair Condition (grass cover on 50-75% of area)							
Flat (0-2%)	0.25	0.28	0.30	0.34	0.37	0.41	0.53
Average (2-7%)	0.33	0.36	0.38	0.42	0.45	0.49	0.58
Steep (over 7%)	0.37	0.40	0.42	0.46	0.49	0.53	0.60
Good Condition (grass cover over 75% of area)							
Flat (0-2%)	0.21	0.23	0.25	0.29	0.32	0.36	0.49
Average (2-7%)	0.29	0.32	0.35	0.39	0.42	0.46	0.56
Steep (over 7%)	0.34	0.37	0.40	0.44	0.47	0.51	0.58
UNDEVELOPED							
Cultivate Land							
Flat (0-2%)	0.31	0.34	0.36	0.40	0.43	0.47	0.57
Average (2-7%)	0.35	0.38	0.41	0.44	0.48	0.51	0.60
Steep (over 7%)	0.39	0.42	0.44	0.48	0.51	0.54	0.61
Pasture/Range							
Flat (0-2%)	0.25	0.28	0.30	0.34	0.37	0.41	0.53
Average (2-7%)	0.33	0.36	0.38	0.42	0.45	0.49	0.58
Steep (over 7%)	0.37	0.40	0.42	0.46	0.49	0.53	0.60
Forrest/Woodlands							
Flat (0-2%)	0.22	0.25	0.28	0.31	0.35	0.39	0.48
Average (2-7%)	0.31	0.34	0.36	0.40	0.43	0.47	0.56
Steep (over 7%)	0.35	0.39	0.41	0.45	0.48	0.52	0.58

Weighted Runoff Coefficient (more than one area)

Drainage Feature #1

	Description	Area (sf or acre)	C	2 Area Weighted	3 Area Weighted
Area 1	AC	1695	0.86		
Area 2	AC	1851	0.86	0.860	
Area 3	Undeveloped	9379	0.45		0.562

Drainage Feature #2

	Description	Area (sf or acre)	C	2 Area Weighted
Area 1	AB	3350	0.50	
Area 2	Undeveloped	22159	0.45	0.457

*Assumed 0.5 runoff coefficient for AB

Drainage Feature #3

	Description	Area (sf or acre)	C	2 Area Weighted	3 Area Weighted	4 Area Weighted
Area 1	Concrete/Roof	1039	0.88			
Area 2	Stabilized DG	144	0.80	0.870		
Area 3	AB	3323	0.50		0.60	
Area 4	Undeveloped	26427	0.45			0.471

*Assumed 0.8 runoff coefficient for stabilized DG
*Assumed 0.5 runoff coefficient for AB

Drainage Feature #4

	Description	Area (sf or acre)	C	2 Area Weighted	3 Area Weighted	4 Area Weighted
Area 1	Concrete/Roof	886	0.88			
Area 2	Stabilized DG	246	0.80	0.863		
Area 3	AB	1006	0.50		0.69	
Area 4	Undeveloped	3445	0.45			0.543

*Assumed 0.8 runoff coefficient for stabilized DG
*Assumed 0.5 runoff coefficient for AB

Drainage Feature #5

	Description	Area (sf or acre)	C	2 Area Weighted
Area 1	AB	11374	0.50	
Area 2	Undeveloped	11344	0.45	0.475

*Assumed 0.5 runoff coefficient for AB

Drainage Feature #6

	Description	Area (sf or acre)	C
Area 1	Undeveloped	52864	0.45

Drainage Feature $7

	Description	Area (sf or acre)	C	2 Area Weighted	3 Area Weighted
Area 1	AC	594	0.86		
Area 2	AC	1732	0.86	0.860	
Area 3	Undeveloped	14446	0.45		0.507

Isopleth (Figure SWM-2 p.57) 2.4
Rainfall (Figure SWM-3 p.58)

		Rainfall Intensity (in/hr)						
Duration (hr)	**Duration (min)**	**2-year**	**5-year**	**10-year**	**15-year**	**25-year**	**50-year**	**100-year**
	10	1.92	2.55	3.00	3.27	3.60	4.05	4.50
	15	1.67	2.22	2.61	2.85	3.14	3.53	3.92
	30	1.32	1.75	2.06	2.25	2.48	2.79	3.10
1	60	1.04	1.38	1.63	1.78	1.95	2.20	2.44
2	120	0.82	1.09	1.29	1.40	1.54	1.74	1.93
4	240	0.65	0.86	1.02	1.11	1.22	1.37	1.52
6	360	0.57	0.75	0.88	0.96	1.06	1.19	1.33
12	720	0.45	0.59	0.70	0.76	0.84	0.94	1.05
24	1440	0.35	0.47	0.55	0.60	0.66	0.74	0.83

Flow Calculations

Drainage Feature #1

C*Ca=	0.62		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	0.30	acres	*Determine from CAD*

Q=	0.48	cfs

Drainage Feature #2

C*Ca=	0.50		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	0.59	acres	*Determine from CAD*

Q=	0.77	cfs

Drainage Feature #3

C*Ca=	0.52		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	0.71	acres	*Determine from CAD*

Q=	0.96	cfs

Drainage Feature #4

C*Ca=	0.60		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	0.13	acres	*Determine from CAD*

Q=	0.20	cfs

Drainage Feature #5

C*Ca=	0.52		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	0.52	acres	*Determine from CAD*

Q=	0.71	cfs

Drainage Feature #6

C*Ca=	0.50		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	1.21	acres	*Determine from CAD*

Q=	1.57	cfs

Drainage Feature #7

C*Ca=	0.56		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	0.39	acres	*Determine from CAD*

Q=	0.56	cfs

OVERALL SITE
Rational Method as outlined in the County of Santa Cruz Design Criteria Manual February 2017
Q = Ca * C * i * A

	Items that are selected from spreadsheet
	items that are to be entered into the spreadsheet

Project Size (p. 60)

Size	Return Period Used	
0-100 acres	25	year
101-400 acres	50	year
over 400 acres	100	year
Cross Culverts on publicly maintained roads	100	year
Bridge Structures	100	year

Ca for return period storm event (p. 56)

Return Period	Ca
2 to 10	1
25	1.1
50	1.2
100	1.25

C Runoff Coefficient (from Chow, Applied Hydrology)

	Return Period (yrs)						
Character of Surface	**2**	**5**	**10**	**25**	**50**	**100**	**500**
DEVELOPED							
Asphalt	0.73	0.77	0.81	0.86	0.90	0.95	1.00
Concrete/roof	0.75	0.80	0.83	0.88	0.92	0.97	1.00
Grass Areas (lawns, park, etc.)							
Poor Condition (grass cover less than 50% of area)							
Flat (0-2%)	0.32	0.34	0.37	0.40	0.44	0.47	0.58
Average (2-7%)	0.37	0.40	0.43	0.46	0.49	0.53	0.61
Steep (over 7%)	0.40	0.43	0.45	0.49	0.52	0.55	0.62
Fair Condition (grass cover on 50-75% of area)							
Flat (0-2%)	0.25	0.28	0.30	0.34	0.37	0.41	0.53
Average (2-7%)	0.33	0.36	0.38	0.42	0.45	0.49	0.58
Steep (over 7%)	0.37	0.40	0.42	0.46	0.49	0.53	0.60
Good Condition (grass cover over 75% of area)							
Flat (0-2%)	0.21	0.23	0.25	0.29	0.32	0.36	0.49
Average (2-7%)	0.29	0.32	0.35	0.39	0.42	0.46	0.56
Steep (over 7%)	0.34	0.37	0.40	0.44	0.47	0.51	0.58
UNDEVELOPED							
Cultivate Land							
Flat (0-2%)	0.31	0.34	0.36	0.40	0.43	0.47	0.57
Average (2-7%)	0.35	0.38	0.41	0.44	0.48	0.51	0.60
Steep (over 7%)	0.39	0.42	0.44	0.48	0.51	0.54	0.61
Pasture/Range							
Flat (0-2%)	0.25	0.28	0.30	0.34	0.37	0.41	0.53
Average (2-7%)	0.33	0.36	0.38	0.42	0.45	0.49	0.58
Steep (over 7%)	0.37	0.40	0.42	0.46	0.49	0.53	0.60
Forrest/Woodlands							
Flat (0-2%)	0.22	0.25	0.28	0.31	0.35	0.39	0.48
Average (2-7%)	0.31	0.34	0.36	0.40	0.43	0.47	0.56
Steep (over 7%)	0.35	0.39	0.41	0.45	0.48	0.52	0.58

Site Pre-development
Runoff Coefficient 0.45

Weighted Runoff Coefficient (more than one area)

Site Post-development

	Description	Area (sf or acre)	C	2 Area Weighted	3 Area Weighted	4 Area Weighted	5 Area Weighted	6 Area Weighted
Area 1	AB*	44,196	0.50					
Area 2	Roof/Concrete	2,640	0.88	0.521				
Area 3	Stabilized DG*	489	0.80		0.524			
Area 4	AC	4,029	0.86			0.551		
Area 5	Articulated Concrete Mat*	1,003	0.80				0.555	
Area 6	Undeveloped	323,567	0.45					0.465

*Assumed 0.5 runoff coefficient for AB, 0.8 runoff coefficient for stabilized DG, and 0.8 runoff coefficient for articulated concrete mat

Isopleth (Figure SWM-2 p.57) 2.4

Rainfall (Figure SWM-3 p.58)

		Rainfall Intensity (in/hr)						
Duration (hr)	Duration (min)	2-year	5-year	10-year	15-year	25-year	50-year	100-year
	10	1.92	2.55	3.00	3.27	3.60	4.05	4.50
	15	1.67	2.22	2.61	2.85	3.14	3.53	3.92
	30	1.32	1.75	2.06	2.25	2.48	2.79	3.10
1	60	1.04	1.38	1.63	1.78	1.95	2.20	2.44
2	120	0.82	1.09	1.29	1.40	1.54	1.74	1.93
4	240	0.65	0.86	1.02	1.11	1.22	1.37	1.52
6	360	0.57	0.75	0.88	0.96	1.06	1.19	1.33
12	720	0.45	0.59	0.70	0.76	0.84	0.94	1.05
24	1440	0.35	0.47	0.55	0.60	0.66	0.74	0.83

Flow Calculations

Site Pre-development Runoff

C*Ca=	0.50		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	8.63	acres	*Determine from CAD*

Q=	11.17	cfs

Site Post-development Runoff

C*Ca=	0.51		
i=	2.61	in/hr	*10 year, 15 min storm*
A=	8.63	acres	*Determine from CAD*

Q=	11.53	cfs

Runoff Managed by Drainage Features (from DRAINAGE FEATURES Rational Method Calculations spreadsheet)

Drainage Feature #1, Q=	0.48	cfs
Drainage Feature #2, Q=	0.77	cfs
Drainage Feature #3, Q=	0.96	cfs
Drainage Feature #4, Q=	0.20	cfs
Drainage Feature #5, Q=	0.71	cfs
Drainage Feature #6, Q=	1.57	cfs
Drainage Feature #7, Q=	0.56	cfs

Total, Q=	5.25	cfs

Site Post-development Runoff with Drainage Features

Q=	6.28	cfs

ATTACHMENT 6

USDA NRCS Soil Survey Report for San Vicente Redwoods Staging Area

United States Department of Agriculture

NRCS

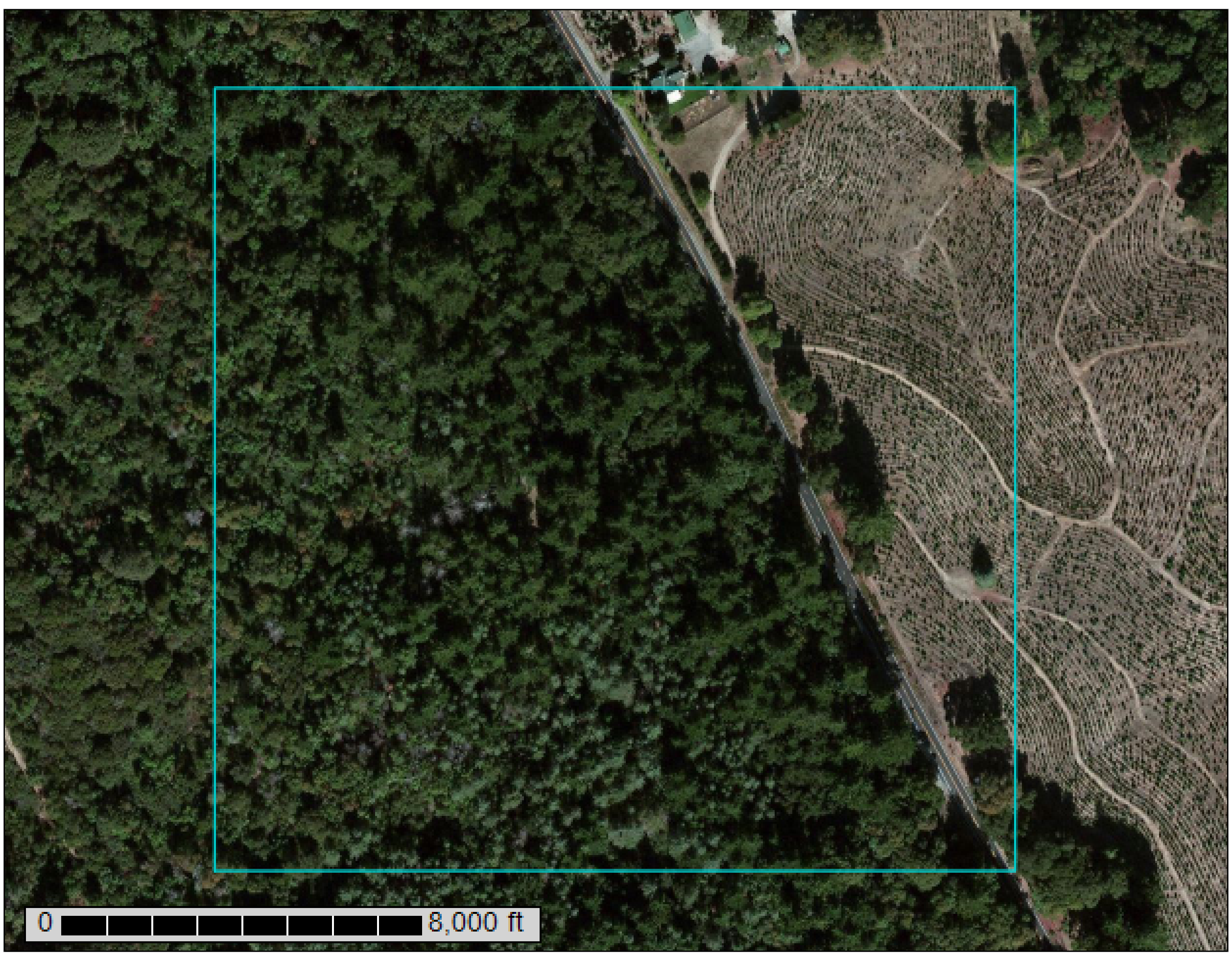
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Santa Cruz County, California

San Vicente Redwoods Staging Area



September 26, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

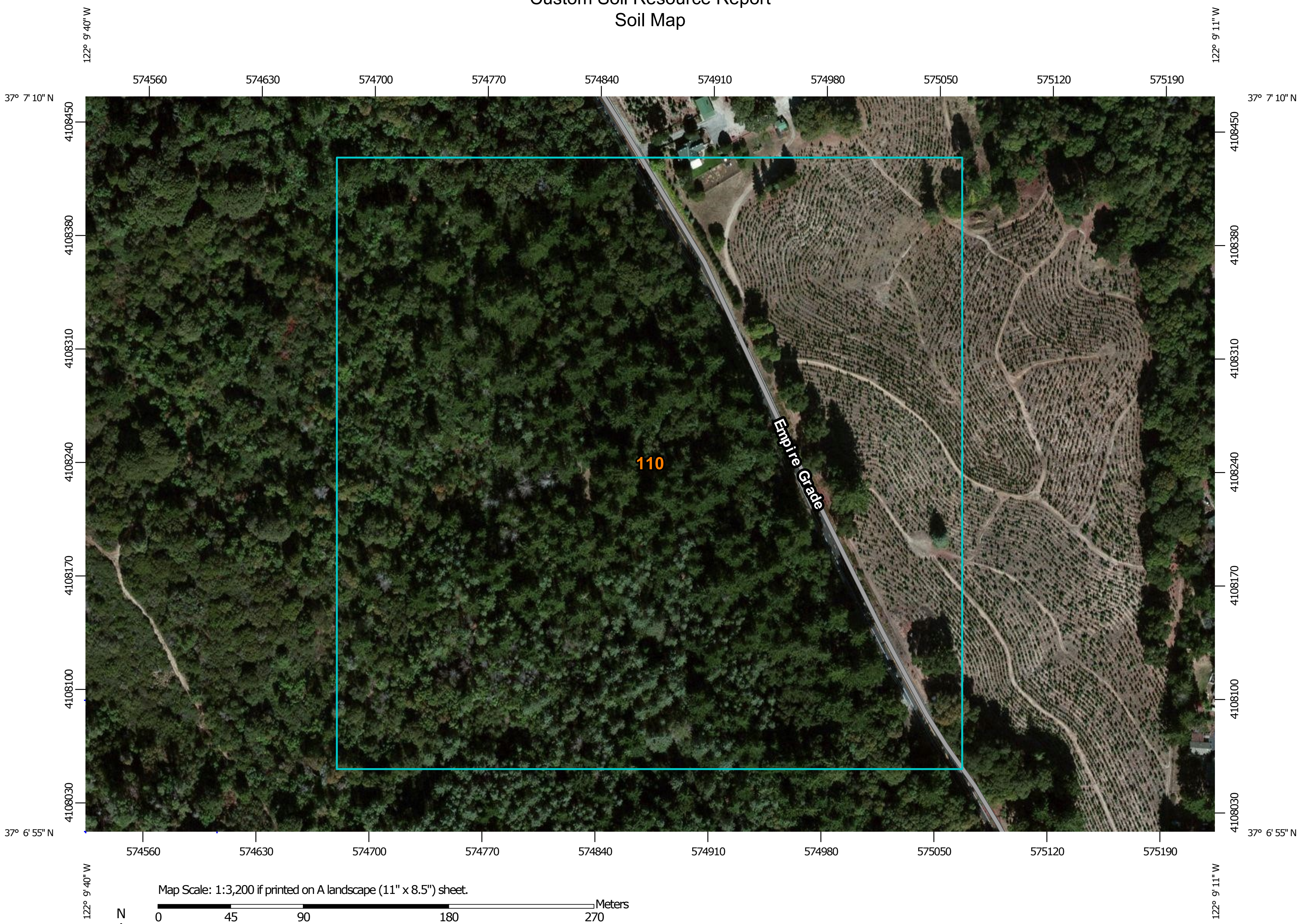
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:3,200 if printed on A landscape (11" x 8.5") sheet.

N

0 45 90 180 270 Meters

0 150 300 600 900 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Cruz County, California
Survey Area Data: Version 9, Sep 3, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 26, 2010—Sep 17, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Santa Cruz County, California (CA087)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
110	Ben Lomond sandy loam, 5 to 15 percent slopes	36.3	100.0%
Totals for Area of Interest		**36.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Santa Cruz County, California

110—Ben Lomond sandy loam, 5 to 15 percent slopes

Map Unit Setting

National map unit symbol: h9d0
Elevation: 400 to 3,000 feet
Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 54 to 57 degrees F
Frost-free period: 220 to 230 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Ben lomond and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ben Lomond

Setting

Landform: Ridges, mountain slopes
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, mountainflank
Down-slope shape: Convex, concave
Across-slope shape: Linear, convex
Parent material: Residuum weathered from sandstone and/or residuum weathered from granite

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A1 - 2 to 7 inches: sandy loam
A2 - 7 to 19 inches: sandy loam
B - 19 to 30 inches: sandy loam
C - 30 to 46 inches: sandy loam
Cr - 46 to 50 inches: bedrock

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.03 to 0.28 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Catelli

Percent of map unit: 4 percent
Landform: Mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Hydric soil rating: No

Nisene

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Hydric soil rating: No

Aptos

Percent of map unit: 2 percent
Landform: Ridges, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountaintop, side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Felton

Percent of map unit: 2 percent
Landform: Ridges, mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountaintop, mountainflank
Down-slope shape: Convex, concave
Across-slope shape: Linear, convex
Hydric soil rating: No

Lompico

Percent of map unit: 2 percent
Landform: Ridges, mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountaintop, mountainflank
Down-slope shape: Convex, concave
Across-slope shape: Linear, convex
Hydric soil rating: No

Sur

Percent of map unit: 1 percent
Landform: Mountainsides
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Hydric soil rating: No

Zayante

Percent of map unit: 1 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountainflank, side slope
Down-slope shape: Convex, concave
Across-slope shape: Convex
Hydric soil rating: No

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ATTACHMENT 7

Goetechnical Investigation – San Vicente Redwoods Staging Area

Note Attachment 7 of the drainage analysis is the same *Geotechnical Investigation* that is included as Attachment 4 of this Initial Study. It has not been included here to eliminate redundancy.

Attachment 9

Noise Modeling Data

Noise and Vibration Basics

TERMINOLOGY AND NOISE DESCRIPTORS

The following are brief definitions of noise terminology:

- **Sound.** A vibratory disturbance that, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.

- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.

- **Decibel** (**dB**). A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micropascals.

- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels which approximates the frequency response of the human ear.

- **Equivalent Continuous Noise Level (L_{eq}).** The mean of the noise level averaged over the measurement period, regarded as an average level.

- **Day-Night Level (L_{dn}).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10 PM to 7 AM. The L_{dn} and the CNEL are similar noise descriptors and rarely differ by more than 1 dBA.

- **Community Noise Equivalent Level (CNEL)**. The energy average of the A-weighted sound levels occurring during a 24-hour period, with 5 dB added to the A-weighted sound levels occurring during the period from 7 to 10 PM and 10 dB added to the A-weighted sound levels occurring during the period from 10 PM to 7 AM.

  Note that L_{dn} and CNEL values rarely differ by more than 1 dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent and are treated as such in this assessment.

- **Sensitive Receptor.** Certain land uses are particularly sensitive to noise and vibration. Noise- and vibration-sensitive receptors include land uses where quiet environments are necessary for enjoyment and public health and safety. Residences, schools, guest lodging (motels and hotels), libraries, religious institutions, hospitals, nursing homes, and passive recreation areas are generally more sensitive to noise than are commercial and industrial land uses.

CHARACTERISTICS OF SOUND

Sound is a pressure wave transmitted through the air. When an object vibrates, it radiates part of its energy as acoustical pressure in the form of a sound wave. Sound can be described in terms of amplitude (loudness), frequency (pitch), or duration (time). The standard unit of measurement of the loudness of sound is the decibel (dB). The human hearing system is not equally sensitive to sound at all frequencies. Sound waves below 16 Hz are not heard at all and are "felt" more as a vibration. Similarly, while people with extremely sensitive hearing can hear sounds as high as 20,000 Hz, most people cannot hear above 15,000 Hz. In all cases, hearing acuity falls off rapidly above about 10,000 Hz and below about 200 Hz. Since the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale is usually used to relate noise to human sensitivity. The A-weighted decibel scale (dBA) performs this compensation by discriminating against frequencies in a manner approximating the sensitivity of the human ear.

Because of the physical characteristics of noise transmission and noise perception, the relative loudness of sound does not closely match the actual amounts of sound energy. Table 1, Change in Sound Pressure Level, dB, presents the subjective effect of changes in sound pressure levels. Typical human hearing can detect changes of approximately 3 dBA or greater under normal conditions. Changes of 1 to 3 dBA are detectable under quiet, controlled conditions and changes of less than 1 dBA are usually indiscernible. A change of 5 dBA or greater is typically noticeable to most people in an exterior environment and a change of 10 dBA is perceived as a doubling (or halving) of the noise.

Table 1 Change in Sound Pressure Level, dB

Change in Apparent Loudness	
± 3 dB	Threshold of human perceptibility
± 5 dB	Clearly noticeable change in noise level
± 10 dB	Half or twice as loud
± 20 dB	Much quieter or louder

Source: Bies and Hansen 2009.

Point and Line Sources

Noise may be generated from a point source, such as a piece of construction equipment, or from a line source, such as a road containing moving vehicles. Because noise spreads in an ever-widening pattern, the given amount of noise striking an object, such as an eardrum, is reduced with distance from the source. This is known as "spreading loss." The typical spreading loss for point source noise is 6 dBA per doubling of the distance from the noise source.

A line source of noise, such as vehicles proceeding down a roadway, would also be reduced with distance, but the rate of reduction is affected by of both distance and the type of terrain over which the noise passes. Hard sites, such as developed areas with paving, reduce noise at a rate of 3 dBA per doubling of the distance while soft sites, such as undeveloped areas, open space and vegetated areas reduce noise at a rate of 4.5 dBA per doubling of the distance. These represent the extremes and most areas would actually contain a combination of hard and soft elements with the noise reduction placed somewhere in between these two factors. Unfortunately the only way to actually determine the absolute amount of attenuation that an area provides is through field measurement under operating conditions with subsequent noise level measurements conducted at varying distances from a constant noise source.

Objects that block the line of sight attenuate the noise source if the receptor is located within the "shadow" of the blockage (such as behind a sound wall). If a receptor is located behind the wall, but has a view of the source, the wall would do little to reduce the noise. Additionally, a receptor located on the same side of the wall as the noise source may experience an increase in the perceived noise level, as the wall would reflect noise back to the receptor compounding the noise.

Noise Metrics

Several rating scales (or noise "metrics") exist to analyze adverse effects of noise, including traffic-generated noise, on a community. These scales include the equivalent noise level (Leq), the community noise equivalent level (CNEL) and the day/night noise level (Ldn). Leq is a measurement of the sound energy level averaged over a specified time period.

The CNEL noise metric is based on 24 hours of measurement. CNEL differs from Leq in that it applies a time-weighted factor designed to emphasize noise events that occur during the evening and nighttime hours (when quiet time and sleep disturbance is of particular concern). Noise occurring during the daytime period (7:00 AM to 7:00 PM) receives no penalty. Noise produced during the evening time period (7:00 to 10:00 PM) is penalized by 5 dB, while nighttime (10:00 PM to 7:00 AM) noise is penalized by 10 dB. The Ldn noise metric is similar to the CNEL metric except that the period from 7:00 to 10:00 PM receives no penalty. Both the CNEL and Ldn metrics yield approximately the same 24-hour value (within 1 dB) with the CNEL being the more restrictive (i.e., higher) of the two.

Psychological and Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to noise levels higher than 85 dBA. Exposure to high noise levels affects the entire system, with prolonged noise exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of noise exposure above 90 dBA would result in permanent cell damage. When the noise level reaches 120 dBA, a tickling sensation occurs in the human ear even with short-term exposure. This level of noise is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by the feeling of pain in the ear. This is called the threshold of pain. A sound level of 160 to 165 dBA will result in dizziness or loss of equilibrium. A sound level of 190 dBA will rupture the eardrum and permanently damage the inner ear. Table 2 shows typical noise levels from various noise sources.

Table 2 Typical Noise Levels from Noise Sources

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock Band
Jet Flyover at 1,000 feet		
	100	
Gas Lawn Mower at three feet		
	90	
Diesel Truck at 50 feet, at 50 mph		Food Blender at 3 feet
	80	Garbage Disposal at 3 feet
Noisy Urban Area, Daytime		
	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal speech at 3 feet
Heavy Traffic at 300 feet	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Theater, Large Conference Room (background)
Quiet Suburban Nighttime		
	30	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (background)
	20	
		Broadcast/Recording Studio
	10	
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

Source: Caltrans 1998, Table N-2136.2.

CHARACTERISTICS OF VIBRATION

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration is normally associated with activities such as railroads or vibration-intensive stationary sources, but can also be associated with construction equipment, such as jackhammers, pile drivers, and hydraulic hammers. Vibration displacement is the distance that a point on a surface moves away from its original static position. The instantaneous speed that a point on a surface moves is described as the velocity, and the rate of change of the speed is described as the acceleration. Each of these descriptors can be used to correlate vibration to human response, building damage, and acceptable equipment vibration levels. During the construction of a building, the operation of construction equipment could cause groundborne vibration. The three main wave types of concern in the propagation of groundborne vibrations are surface or Rayleigh waves, compression or P-waves, and shear or S-waves.

- Surface or Rayleigh waves travel along the ground surface. They carry most of their energy along an expanding cylindrical wave front, similar to the ripples produced by throwing a rock into a lake. The particle motion is more or less perpendicular to the direction of propagation (known as retrograde elliptical).

- Compression or P-waves are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal, in a push-pull motion. P-waves are analogous to airborne sound waves.

- Shear or S-waves are also body waves, carrying their energy along an expanding spherical wave front. Unlike P-waves, however, the particle motion is transverse, or perpendicular to the direction of propagation.

The peak particle velocity (PPV) or the root mean square (RMS) velocity is usually used to describe vibration amplitudes. PPV is defined as the maximum instantaneous peak of the vibration signal and RMS is defined as the square root of the average of the squared amplitude of the signal. PPV is more appropriate for evaluating potential building damage, whereas RMS is typically more suitable for evaluating human response.

The units for PPV and RMS velocity are normally inches per second (in/sec). Often, vibration is presented and discussed in dB units to compress the range of numbers required to describe the vibration. All PPV and RMS velocity are in in/sec and all vibration levels in this study are in dB relative to 1 micro-inch per second (abbreviated as VdB). The threshold of perception is approximately 65 VdB. Typically groundborne vibration generated by manmade activities attenuates rapidly with distance from the source of the vibration. Manmade vibration problems are usually confined to short distances (500 feet or less) from the source.

Construction generally includes a wide range of activities that can generate groundborne vibration. In general, demolition of structures generates the highest vibrations. Vibratory compactors or rollers, pile drivers, and pavement breakers can generate perceptible amounts of vibration at distances within 200 feet of the vibration sources. Heavy trucks can also generate groundborne vibrations that vary, depending on vehicle type, weight, and pavement conditions. Potholes, pavement joints, discontinuities, differential settlement of pavement, etc., all increase the vibration levels from vehicles passing over a road surface. Construction vibration is normally of greater concern than vibration of normal traffic on streets and freeways with smooth pavement conditions. Trains generate substantial quantities of vibration due to their engines, steel wheels, and heavy loads.

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Noise Regulatory Environment

To limit exposure of people to intrusive and physically and/or psychologically damaging noise levels, the federal government, the State of California, some county governments, and most municipalities in the state have established standards and ordinances to control noise. The proposed project site is in the Santa Cruz Mountains within unincorporated Santa Cruz County. The pertinent federal and local regulations regarding noise and vibration are discussed below.

FEDERAL

Noise

The federal government regulates occupational noise exposure common in the workplace through the Occupational Health and Safety Administration (OSHA) under the U.S. Environmental Protection Agency (EPA). Noise exposure of this type is dependent on work conditions and is addressed through a facility's Health and Safety Plan. The construction of the project would be subject to these OSHA limitations and all workers would receive appropriate training, hearing protection, and breaks, accordingly, ensuring that they are not exposed to harmful noise levels. Similarly, once operational, noise in the workplace would be subject to OSHA limitations.

The U.S. Department of Housing and Urban Development (HUD) has set a goal of 45 dBA Ldn as a desirable maximum interior standard for residential units developed under HUD funding. This level is also generally accepted within the State of California. While HUD does not specify acceptable exterior noise levels, standard construction of residential dwellings constructed under Code of Federal Regulations, Title 24 standards typically provide 20 dBA of attenuation with the windows closed. Based on this premise, the exterior Ldn should not exceed 65 dBA.

Vibration

The human reaction to various levels of vibration varies from person to persons and is highly subjective. Table 3 shows the level at which vibration becomes perceptible based on various types of land uses that are sensitive to vibration.

Table 3 Vibration Perceptibility

Land Use Category	Max L_v (VdB)[1]	Description
Workshop	90	Distinctly felt vibration. Appropriate to workshops and non-sensitive areas
Office	84	Felt vibration. Appropriate to offices and non-sensitive areas.
Residential – Daytime	78	Barely felt vibration. Adequate for computer equipment.
Residential – Nighttime	72	Vibration not felt, but groundborne noise may be audible inside quiet rooms.

Source: FTA 2006.
[1] As measured in 1/3 octave bands of frequency over the frequency ranges of 8 to 80 Hz.

In addition to the vibration standards for human annoyance, the FTA also has vibration standards for architectural damage, as shown in Table 4. Architectural damage is possible when the peak particle velocity (PPV) exceeds 0.2 inch per second. This criterion is the threshold at which there is a risk of damage to residential buildings. For structures of reinforced concrete, steel, or timber, architectural damage is possible when the PPV exceeds 0.5 inch per second.

Table 4 Groundborne Vibration Impact Criteria, Architectural Damage

Building Category	PPV (inches per second)[1]	VdB
I. Reinforced concrete, steel, or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Source: FTA 2006.
[1] RMS velocity calculated from vibration level (VdB) using the reference of one micro-inch per second.

STATE OF CALIFORNIA

The California Office of Noise Control has set acceptable noise limits for sensitive uses. Sensitive-type land uses, such as homes and schools, are "normally acceptable" in exterior noise environments up to 65 dBA CNEL and "conditionally acceptable" in areas up to 70 dBA CNEL. A "conditionally acceptable" designation implies that new construction or development should be undertaken only after a detailed analysis of the noise reduction requirements for each land use type is made and needed noise insulation features are incorporated in the design. By comparison, a "normally acceptable" designation indicates that standard construction can occur with no special noise reduction requirements.

Applicable interior standards for new multi-family dwellings are governed by Title 24 of the California Code of Regulations (California Building Standards Code). These standards require that acoustical studies be performed prior to construction in areas that exceed 60 dBA L_{dn}. Such studies are required to establish measures that will limit interior noise to no more than 45 dBA L_{dn} and this level has been applied to many communities in California.

LOCAL

County of Santa Cruz Standards

County of Santa Cruz County Code

The County of Santa Cruz regulates noise through the County Code, Title 8, Chapter 8.30 (Noise). Pursuant to the County Code, the county restricts noise levels generated at a property from exceeding certain noise levels for extended periods of time.

Offensive Noise

The County of Santa Cruz noise regulation is provided within Title 8, Chapter 8.30, of the County Code. Section 8.30.010 defines and regulates for offensive noise as follows. Under Section 8.30.010(A), no person shall make, cause, suffer, or permit to be made any offensive noise. Offensive noise is defined under Section 8.30.010(B) as follows:

> "Offensive noise" means any noise which is loud, boisterous, irritating, penetrating, or unusual, or that is unreasonably distracting in any other manner such that it is likely to disturb people of ordinary sensitivities in the vicinity of such noise, and includes, but is not limited to, noise made by an individual alone or by a group of people engaged in any business, activity, meeting, gathering, game, dance, or amusement, or by any appliance, contrivance, device, tool, structure, construction, vehicle, ride, machine, implement, or instrument.

As provided under Section 8.30.010(C), the following factors shall be considered when determining whether a violation exists:

1) Loudness (Intensity) of the Sound.

    a. Day and Evening Hours. For purposes of this factor, a noise shall be automatically considered offensive if it occurs between the hours of 8:00 a.m. and 10:00 p.m. and it is:

        i. Clearly discernible at a distance of 150 feet from the property line of the property from which it is broadcast; or

        ii. In excess of 75 decibels at the edge of the property line of the property from which the sound is broadcast, as registered on a sound measuring instrument meeting the American National Standard Institute's Standard S1.4-1971 (or more recent revision thereof) for Type 1 or Type 2 sound level meters, or an instrument which provides equivalent data.

A noise not reaching this intensity of volume may still be found to be offensive depending on consideration of the other factors outlined below.

    b. Night Hours. For purposes of this factor, a noise shall be automatically considered offensive if it occurs between the hours of 10:00 p.m. and 8:00 a.m. and it is:

i. Made within 100 feet of any building or place regularly used for sleeping purposes; or

ii. Clearly discernible at a distance of 100 feet from the property line of the property from which it is broadcast; or

iii. In excess of 60 decibels at the edge of the property line of the property from which the sound is broadcast, as registered on a sound measuring instrument meeting the American National Standard Institute's Standard S1.4-1971 (or more recent revision thereof) for Type 1 or Type 2 sound level meters, or an instrument which provides equivalent data.

A noise not reaching this intensity of volume may still be found to be offensive depending on consideration of the other factors outlined below.

2) Pitch (frequency) of the sound, e.g., very low bass or high screech;

3) Duration of the sound;

4) Time of day or night;

5) Necessity of the noise, e.g., garbage collecting, street repair, permitted construction activities;

6) The level of customary background noise, e.g., residential neighborhood, commercial zoning district, etc.; and

7) The proximity to any building regularly used for sleeping purposes.

County of Santa Cruz General Plan

Stationary Noise Standards

Policy 6.9.4, establishes the following noise standards as shown in Table 5 for commercial and industrial development.

Table 5 Maximum Allowable Noise Exposure – Stationary Sources[1]

	Daytime[2] (7 PM to 10 PM)	Nighttime[2,3] (10 PM to 7 AM)
Hourly L_{eq} – average hourly noise level, dB[4]	50	45
Maximum level, dB[4]	70	65
Maximum Level dB – Impulsive Noise[5]	65	60

Source: Santa Cruz County 1994.
1 As determined at the property line of the receiving land use. When determining the effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property line noise mitigation measures.
2 Allowable levels shall be raised to the ambient noise levels where the ambient levels exceed the allowable levels. Allowable levels shall be reduced 5 dB if the ambient hour L_{eq} is at least 10 dB lower than the allowable limit.
3 Applies only where the receiving land use operates or is occupied or is occupied during nighttime hours.
4 Sound level measurements shall be made with "slow" meter response.
5 Sound level measurements shall be made with "fast" meter response.

Ground Transportation

Policy 6.10.1 requires the evaluation of mitigation measures for any project that would cause significant degradation of the noise environment by:

a. Cause the L_{dn} in existing residential areas to increase by 5 dB or more and remain below 60 dB;
b. Causing the L_{dn} in existing residential areas to increase by 3 dB or more and, thereby, exceed an L_{dn} of 60 dB; or
c. Causing the L_{dn} in existing residential areas to increase by 3 dB or more if the L_{dn} currently exceeds 60 dB.

Construction Noise

Policy 6.9.7 requires mitigation of construction noise as a condition of future project approvals.

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Average Construction Generated Noise - LTSC-01

		hard or soft
Construction Noise at 50 Feet (dBA Leq)	50	0

Construction Phase	All Applicable Equipment in Use[1]	Minimum Required Equipment in Use[1]
Ground Clearing/Demolition	84	84
Excavation	89	79
Foundation Construction	78	78
Building Construction	87	75
Finishing and Site Cleanup	89	75

Construction Noise at Existing Residences 950

Construction Phase	All Applicable Equipment in Use[1]	Minimum Required Equipment in Use[1]
Ground Clearing/Grading	58	58
Excavation	63	53
Foundation Construction	52	52
Building Construction	61	49
Finishing and Site Cleanup	63	49

Construction Noise at Project Site Boundary 310

Construction Phase	All Applicable Equipment in Use[1]	Minimum Required Equipment in Use[1]
Ground Clearing/Grading	68	68
Excavation	73	63
Foundation Construction	62	62
Building Construction	71	59
Finishing and Site Cleanup	73	59

[1] Source: Bolt, Beranek and Newman, "Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances," prepared for the USEPA, December 31, 1971. Based on analysis for Office Building, Hotel, Hospital, School, Public Works.

Construction Generated Vibration - LTSC-01

Vibration Annoyance Criteria

Receptor:	Maximum Vibration Levels - Existing Structure	Closest Distance (feet):	980
Equipment	**Approximate Velocity Level at 25 ft, VdB**	**Approximate Velocity Level, VdB**	
Caisson Drill	87	55	
Vibratory Roller	94	62	
Large bulldozer	87	55	
Small bulldozer	58	26	
Jackhammer	79	47	
Loaded trucks	86	54	
	Criteria	**78**	

Structural Damage Criteria

Receptor:	Maximum Vibration Levels - Existing Structure	Closest Distance (feet):	540
Equipment	**Approximate RMS a Velocity at 25 ft, inch/second**	**Approximate RMS Velocity Level, inch/second**	
Caisson Drill	0.089	0.001	
Vibratory Roller	0.210	0.002	
Large bulldozer	0.089	0.001	
Small bulldozer	0.003	0.000	
Jackhammer	0.035	0.000	
Loaded trucks	0.076	0.001	
	Criteria	**0.200**	

Notes: RMS velocity calculated from vibration level (VdB) using the reference of one microinch/second.

Source: Based on methodology from the United States Department of Transportation Federal Transit Administration, *Transit Noise and Vibration Impact Assessment* (2006).

PROJECT NAME		: Construction Noise Calculations		
	Receptor	**Spatially AVG Distance(ft)**	**Minimum Distance (ft)**	**Land Use Type**
1	Receptor 1	890	540	Residential
2	Receptor 2	0	0	Residential
3	Receptor 3	0	0	Residential
4	Receptor 4	0	0	Residential
5	Receptor 5	0	0	Residential
6	Receptor 6	0	0	Residential
7	Receptor 7	0	0	Residential
8	Receptor 8	0	0	Residential

PROJECT NAME	: Construction Vibration Calculations											Red Cell indicates level exceeds FTA criteria
Vibration Annoyance	VdB (re. 1 µ-in/sec) at 25 ft	Distance to (feet)		Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Receptor 6	Receptor 7	Receptor 8	
Equipment Item		78 VdB	84 VdB	890 feet	0 feet	0 feet	0 feet	0 feet	0 feet	0 feet	0 feet	
Pile Driver (impact)(typ)	104	183.9	116.0	57.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Pile Driver (sonic)(typ)	93	79.1	49.9	46.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Clam Shovel drop (slurry wall)	94	85.4	53.9	47.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Hydromill (slurry wall)(soil)	66	10.0	6.3	19.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Vibratory Roller	94	85.4	53.9	47.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Hoe Ram	87	49.9	31.5	40.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Large Bulldozer	87	49.9	31.5	40.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Caisson Drilling	87	49.9	31.5	40.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Loaded Trucks	86	46.2	29.1	39.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Jackhammer	79	27.0	17.0	32.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Small Bulldozer	58	5.4	3.4	11.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Vibration Damage	PPV (in/sec) at 25 ft	Distance to (feet)		Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Receptor 6	Receptor 7	Receptor 8	
Equipment Item		0.2 PPV	0.3 PPV	540 feet	0 feet	0 feet	0 feet	0 feet	0 feet	0 feet	0 feet	
Pile Driver (impact)(typ)	0.664	55.6	42.5	0.007	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Pile Driver (sonic)(typ)	0.17	22.4	17.1	0.002	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Clam Shovel drop (slurry wall)	0.202	25.2	19.2	0.002	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Hydromill (slurry wall)(soil)	0.008	2.9	2.2	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Vibratory Roller	0.21	25.8	19.7	0.002	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Hoe Ram	0.089	14.6	11.1	0.001	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Large Bulldozer	0.089	14.6	11.1	0.001	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Caisson Drilling	0.089	14.6	11.1	0.001	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Loaded Trucks	0.076	13.1	10.0	0.001	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Jackhammer	0.035	7.8	6.0	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Small Bulldozer	0.003	1.5	1.2	0.000	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Parking Lot Noise

Site	Leq	SEL	Lmax	Lmin	Peak	Uwpk	L(2)	L(8)	L(16)	L(25)	L(50)	L(90)	Measurement Distance
UCIParkingStructure	61.7	92.5	79.1	50.5	93.1	97.6	70.9	64.4	61.3	59.8	57.5	54.1	42

Source: Noise monitoring of noise sources common in parking lots and parking structures obtained from noise monitoring conducted at the University of California, Irvine.

Nearest Existing Residences (Woodbury Village)

	Distance to Property Line	Leq	SEL	Lmax	Lmin	Peak	Uwpk	L(2)	L(8)	L(16)	L(25)	L(50)	L(90)
Parking Lot	950	34.6	65.4	52.0	23.4	66.0	70.5	43.8	37.3	34.2	32.7	30.4	27.0

Noise Measurements of Sports Activities and the Parking Garage			
Monitoring Site	**Lmax**	**Leq**	**Lmin**
Boys Football Practice[1]	72.7	57.0	46.3
Tennis Court Activity[1]	73.3	59.5	51.0
Basketball Activity[2]	77.1	63.6	53.9
Parking Garage[3]	79.1	61.7	50.5

1 Noise monitoring of boys football practice and tennis court activity was conducted on October 10, 2005 between the hours of 5:00 p.m. and 6:1700 p.m. at Miles Square Park sports fields.
2 Noise monitoring of Sunday basketball activity was conducted on October 16, 2005 between the hours of 10:30 a.m. and 11:00 a.m. at Miles Square Park sports fields
3 Noise monitoring of the parking garage was conducted on October 10, 2005 between the hours of 3:10 and 3:30 p.m. at the University of California, Irvine, Social Sciences Parking Garage.
All noise measurements were 20 minutes in duration.

Boys Football Practice

Noise monitoring was conducted at 5:00 p.m. on October 10, 2005 approximately 50 feet from a boys football team practice at the southwest end of the playfield in Mile Square Park. The boys football team consisted of 17 players. Football practice took place in a large area with 2 baseballs fields. There were a total of three football teams, and 2 cheerleading squads located in this area. The two other football teams were practicing at the far east end of the playfield. The girls cheerleading squad was practicing at the far north end of the playfield. These other teams were located over 100 feet from monitoring activity. Primary noise during noise monitoring was football players screaming plays and exercises. Secondary noise included parking lot noise and other sports activities occurring farther from the practice field.

Tennis Court Activity

Noise Monitoring was conducted at 5:30 p.m. on October 10, 2005 at the tennis court area of Mile Square Park. Noise monitoring was conducted in the center isle between two tennis court activity areas. The noise meter was placed 20 feet from the single-player tennis court area and 22 feet from the multiple player tennis court area. There were 2 single player tennis courts and 3 multiple player tennis courts within a 50-foot radius of noise monitoring, although this area is part of a much larger tennis court complex of Mile Square Park, which includes 12 multiple-player tennis courts and 2 single player tennis courts.. There were 4 tennis players within the single court tennis area (2 to a court) and 6 tennis players within the team tennis court area located within the general vicinity of the noise monitoring location. Primary noise from tennis court activities was tennis balls hitting the hardcourt, wall and tennis racket. Secondary noise included noise from children playing on the playfields to the east of the tennis court complex area and noise from Brookhurst Street, located to the west of the tennis court complex.

Basketball Court

Noise monitoring was conducted at 10:30 a.m. on October 16, 2005, 5 feet from the central courts and eight feet from the southern courts. The noise meter was placed on the southwest side of the basketball court area. The basketball court area consists of 6 full basketball courts; or 12 half-court basketball courts. Primary noise during monitoring was basketball activity on the courts. Noise from basketball games and practice include sound of the basketball hitting the backboard and hardcourt area, noise from the hoop chain, and noise from players talking. The loudest single event noise from basketball activity is the basketball hitting the backboard. The noise meter was approximately 27 feet from two basketball hoops/ backboards that were in use. A 2 player half-court game was in progress approximately 5 feet from the noise monitoring location. A 10-player full-court basketball game was in progress 8 feet from the noise monitoring location. Other activity on the courts included a basketball game with 10 people and single player to the east (approximately 59 feet away). In addition, a 3 player game was in progress in the southeastern corner. Secondary noise included traffic from Brookhurst Street, which borders the western side of the basketball court area and small craft airplane overflights from the John Wayne International Airport.

Parking Garage	Noise monitoring was conducted at 3:10 p.m. on October 10, 2005 at the University of California, Irvine, Social Sciences Parking Structure. Noise monitoring was conducted approximately 10 feet from Pereira Drive and 42 feet from the parking structure. The Social Science Parking Lot accommodates 1,824 vehicles and is a seven story structure. The Social Sciences Parking Structure has two entrances/exits, one on the lower level, which provides ingress/egress to Campus Drive, and one on the second level, which provides ingress/egress to Pereira Drive. Noise measurements were taken near the Pereira Drive entrance, approximately 100 feet west of the entrance/exit. The meter was located southeast and one story above the Campus Drive entrance/exit. Monitoring was conducted at the end of the 2:00 pm to 3:20 pm. Monday/ Wednesday class period, and was apparent as large increases in pedestrian activity to the parking structure occurred during noise monitoring. Primary noise environment at the Social Sciences Parking Structure was noise from Pereira Drive and construction equipment noise from campus renovations further to the west. While the Social Sciences Parking Structure added to the noise environment, it was not the primary noise source. Noise sources during noise monitoring from the parking structure included car horns, car engines, brakes and tires, automatic lock beeps, car alarms, and car radios. Secondary noise environment in the vicinity of noise monitoring included students talking on their way to/back-from class. Although Campus Drive was located directly north of the noise monitoring, noise from traffic on this roadway was blocked by the placement of the Social Sciences Parking Structure between the roadway and the noise monitoring location. During noise monitoring, there were 35 light duty autos that entered/exited the parking structure through the Pereira Drive entrance/exit. Traffic volume on Pereira Drive during noise monitoring included 95 light duty autos, 1 medium duty truck, and 8 campus shuttle busses (heavy duty truck).


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Attachment 10

Projected Visitor Counts and Parking Needs

MEMORANDUM

DATE	January 12, 2016
TO	Bryan Largay Land Trust of Santa Cruz
FROM	Isabelle Minn and Isby Fleischmann, PlaceWorks
RE	Projected Visitor Counts and Parking Needs

This memorandum addresses future visitor use at the San Vicente Redwoods property. Visitors will access the property for various passive recreational activities, including dog walking, hiking, mountain biking, horseback riding, and picnicking. The number of visitors may affect traffic, parking needs, enforcement, and financial considerations, such as revenue generated from parking fees and the impact to the maintenance budget. Therefore, estimating visitor use is key to the planning, design, and environmental review processes.

METHODOLOGY

Visitor use was estimated for the San Vicente Redwoods property based primarily on comparisons with current visitor use at comparable parks and open spaces in the region, as well as our experience with open space and public access planning. Tracking visitation at existing open space preserves and parks is important to management and planning efforts. Visitor use at comparable parks and open spaces presented in this memorandum is based on both quantitative data and qualitative accounts and estimates from the users and managers of the properties. Information provided by managers of other open space preserves and parks are based on the best data available or observations, and represents best estimates rather than precise data. In order to compare information and estimates from different agencies, estimates were used to calculate annual, weekly, and daily visitation. When visitor use estimates were separated by type of use, analysis focused on use types that were consistent with uses planned for San Vicente Redwoods.

The ratio of trail users per mile of trail was also considered when comparing properties. While the National Recreation and Park Association (NRPA) standards for typical visitor counts is 90 users per day per mile on urban trails and 40 users per day per mile on rural trails, the average number of visitors on the comparable properties in Santa Cruz County was 8.3 visitors per mile of trail. Therefore, the NRPA standards were not assumed to be applicable for San Vicente Redwoods.

Key considerations for estimating visitor use include open space characteristics and facilities that will draw visitors, as well as the ease with which these facilities can be reached. Therefore, the attributes considered for comparable parks and open spaces included property size, unique features, facilities, trail connections, allowable uses, and accessibility to nearby urban areas.

VISITATION AT COMPARABLE PARKS AND OPEN SPACES

To estimate expected visitor use for San Vicente Redwoods, three open space properties located within Santa Cruz County were considered. These were selected due to their similarity to San Vicente Redwoods in either size, miles of trail, allowed uses, and accessibility from nearby the urban areas of Santa Cruz and San Jose. Several properties managed by Santa Clara County Parks and Midpeninsula Regional Open Space District (MROSD) were also reviewed in order to provide greater context. An overview of these properties is provided below and summarized in Table 1, emphasizing relevance to future use at San Vicente Redwoods. In addition to these comparable properties, projected future visitation at the Bureau of Land Management's Coast Dairies property and its implications to San Vicente Redwoods is discussed.

THE FOREST OF NISENE MARKS STATE PARK

Characteristics

The Forest of Nisene Marks State Park is a 10,257 acre property with approximately 30 miles of trails. Running, hiking, mountain biking, picnicking, backpacking, and camping (although negligible) are all uses allowed in the park. Similarly to San Vicente Redwoods, dogs are allowed on the entrance road only and the only restroom facility is located at the park entrance. Nisene Marks has three parking lots with a combined capacity of 60-85 cars and 3 trailers.

Accessibility

The Forest of Nisene Marks is 10.7 miles (a 22-minute drive) from Santa Cruz, 12.8 miles (a 26-minute drive) from Watsonville, and 40.4 miles (a 55-minute drive) from San Jose. There is one primary access point for the Park. In addition, there are numerous neighborhood trailheads around the Nisene Marks that support walk-in access from the rural residential communities that border the property, as well as from the more urban communities of Soquel and Aptos to the south. Many people live, work, and/or shop in the Cabrillo College and Aptos Village areas, which are within a quarter- to half-mile distance from Nisene Marks.

Estimated Existing Use

Estimates presented in this memorandum for visitation at both Nisene Marks and Wilder Ranch are based on California State Parks' monthly tracking, which considers actual counts and estimates of visitors that are not captured by the counts.

An estimated 106,094 people visit Nisene Marks annually, based on 2013 data provided by California State Parks, Santa Cruz District.[1] This is equivalent to 10 visitors per day per mile of trail. For both Nisene Marks and Wilder Ranch, typical peak use is estimated to be from 11am to 3pm on weekends and 4pm to 5pm on weekdays.

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[1] E-mail from Alaina Boys, CSP, Santa Cruz District, on January 30, 2015

Implications for San Vicente Redwoods

The Forest of Nisene Marks State Park provides slightly less trail mileage than San Vicente Redwoods would provide for at buildout, but offers additional uses including camping and backpacking. Additionally, Nisene Marks is connected to the trail network of Soquel Demonstration State Forest, just as San Vicente Redwoods is envisioned as connecting to the future trails on the Coast Dairies property. While many characteristics of Nisene Marks parallel those anticipated for San Vicente Redwoods, its annual visitation is likely somewhat greater than the future visitation at San Vicente Redwoods due to high level of walk-in use.

WILDER RANCH STATE PARK

Characteristics

Wilder Ranch State Park is a 7,000 acre property with approximately 34 miles of trails, including roads and singletrack for hiking, mountain biking, and horseback riding. In addition to trail use, camping is allowed and living history demonstrations and tours are provided. The park includes coastal terraces, valleys, and views of historical ranch buildings and gardens.

Accessibility

Wilder Ranch is less than 2.0 miles north of the City of Santa Cruz limits (a 5-minute drive) from Santa Cruz, 21.6 miles (a 34-minute drive) from Watsonville, and 36.0 miles (a 48-minute drive) from San Jose. Wilder Ranch has four parking lots, one paved and three unpaved. The paved parking lot has 74 vehicle spaces and 3 trailer/bus spaces, and the unpaved parking areas fit a combined 150-160 vehicles.

Estimated Existing Use

An estimated 472,809 people visit Wilder Ranch annually, based on 2013 data provided by California State Parks, Santa Cruz District. This is equivalent to 38 visitors per day per mile of trail.

Four annual special events are held at the park in April, July, October, and December. The events in April and December attract approximately 2,500 visitors, October’s event attracts approximately 3,000 visitors, and July’s attracts approximately 5,000 people. Visitation is equivalent to 38 users per day per mile of trail, however, this includes all visitation including visitors including non-trail users.

Implications for San Vicente Redwoods

Wilder Ranch has significantly higher use than other parks referenced in this memorandum. It is assumed that the high use is due largely to the proximity to Santa Cruz as well as the diversity of user experiences available, including different use types and natural and cultural resources. San Vicente Redwoods is slightly further from Santa Cruz and San Jose than Wilder Ranch, and will have fewer attractions and facilities. However, the high volume of use at Wilder Ranch does indicate high demand for trail use in the Santa Cruz area.

SOQUEL DEMONSTRATION STATE FOREST

Characteristics

The Soquel Demonstration State Forest (SDSF) is a 2,681 acre property with approximately 24 miles of trails. As with San Vicente Redwoods, allowable uses at SDSF include hiking, mountain biking, horseback riding, and picnicking, and not camping. Located on the San Andreas and Zayante faults, SDSF is only two miles north of the 1989 Loma Prieta earthquake epicenter. Geological activity has created steep slopes on the property, which are an attraction for mountain bikers. There are no restrooms or developed water sources on the property.

Accessibility

Soquel Demonstration State Forest is 22.2 miles (a 40-minute drive) from Santa Cruz, 17.5 miles (a 43-minute drive) from Watsonville, 28.0 miles (a 43-minute drive) from San Jose, and 56.1 miles (a 71-minute drive) from Half Moon Bay. The road to SDSF is narrow and often closed making it difficult to access.

Estimated Existing Use

Based on a combination of quantitative data and qualitative accounts, SDSF staff estimates that there are an estimated 20,000 visitors annually, including 2,700 hikers, 300 mushroom collectors, and 17,000 mountain bikers.[2] Over 60 percent of these visitors come on the weekend versus during the week. On any given weekend day, there are at least 75 vehicles located at the main entrance in the parking area and along Highland Way.

Implications for San Vicente Redwoods

SDSF is more challenging to access than San Vicente Redwoods will be given distance from urban areas. However, the property provides similar attractions (trails in forested environment) and receives a high volume of mountain bike use. It is assumed that San Vicente Redwoods will also receive a high percentage of mountain bike use, and that overall use will be higher than estimated for SDSF.

COMPARABLE OPEN SPACE AND PARKS IN NEIGHBORING COUNTIES

The properties described above are anticipated to provide the greatest insight into future use of San Vicente Redwoods. In order to provide a greater sample size, visitation estimates from Santa Clara County Parks and MROSD were also reviewed. Both agencies own and manage large parks and/or open space preserves within the region.

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[2] Conversation with Angela Bernheisel at CALFIRE, on January 29, 2015. Note: new trail counters were recently installed on all major trails in SDSF in order to more accurately estimate recreation user numbers. However, the trail counters have not provided complete or accurate information thus far because they are not located on every trail, some are missing or damaged, and they can over count visitors who walk past them multiple times.

Santa Clara County Parks: Upper Stevens Creek

The Santa Clara County Department of Parks and Recreation Weekly Activity Report Summary for 2013 estimates that individual parks receive between 3,500 and 617,000 annual users. Upper Stevens Creek Park was identified as having similar attractions as San Vicente Redwoods.

Upper Stevens Creek Park is a 92-acre property that includes a non-power boating reservoir, picnic areas, and over 11 miles of single-track and multi-use trails for hiking, biking, and horseback riding. While Stevens Creek has only 11 miles of trail, it is connected to the Bay Area Ridge Trail and other open space areas, which provides for longer rides than planned for San Vicente Redwood. Upper Stevens Creek is 6.0 miles (15 minute drive) from the closest city (Saratoga), and 15.7 miles (a 23-minute drive) from San Jose, the closest major urban area. Based on the County of Santa Clara Parks and Recreation Department's 2013 Full Activity Report, there were 15,968 visitors in 2013. Of these visitors, all were trail users and 9,443 (59%) were mountain bikers. This is equivalent to 4 users per day per mile of trail.

Midpeninsula Regional Open Space District: El Corte Madera Creek Open Space Preserve

Midpeninsula Regional Open Space District owns and manages numerous open space preserves that provide trail opportunities to the public. El Corte Madera Creek Open Space Preserve was identified as having similar attributes as envisioned for San Vicente Redwoods. El Corte Madera Creek Open Space Preserve is a 2,817 acre preserve offering 28 miles of trails for hiking, biking and equestrian use. The Preserve is located 7 miles from the Town of Woodside, and therefore in closer proximity to the City of San Francisco and surrounding urban areas than San Vicente Redwoods. Based on the District's Visitor Estimate Survey project which collected data between 2007 and 2010, El Corte Madera Creek Open Space Preserve receives an estimated 89,435 visitors per year. This is equivalent to 8 users per day per mile of trail.

COAST DAIRIES

Projected Visitation

The Bureau of Land Management's Coast Dairies property borders the San Vicente Redwoods property to the southwest and is connected to San Vicente Redwoods by several roads including Warrenella Road. While the property is not currently open for public access, the deed restrictions state that the property will provide public access. Efforts are currently underway to have the property designated as a National Monument, which would elevate the visibility and status of the property.

Based on conversations with staff and the Interim Access Plan that was developed in 2013, it is anticipated that the Interim Access Stage (0-5 years) would include two hiking trails, property tours, and/or volunteer opportunities on management projects, and that the "Long-Term Access Stage" (5-10 years) would potentially include over 50 miles of trails and specific projects, such as a visitor center. BLM staff estimate that annual visitation will range between 50,000 and 150,000 during Interim Access, and between 100,000 and 300,000 at full buildout, with the potential for higher visitation should the property be designated as a National Monument.[3] For instance, visitation at Ford Ord National Monument increased substantially since its designation (from approximately 250,000 or 300,000 before designation in 2012 to approximately 450,000 in 2014; representing a 50-percent increase).[4] BLM staff projects that National Monument Status designation for Coast Dairies could increase local use, but much of the additional use would be generated by tour buses, individuals collecting National Park and Monument stamps, sight-seers that conduct brief visits and do not utilize the extended trail network, and other non-local users. The amount of increase would depend on the type of designation, but is not expected to reach visitation levels at Ford Ord, where there is significant highway/road access, a variety of historical and natural attractions, and accessibility to southern, central and northern California populations.

Total annual visitation is generally higher at nationally recognized parks and open spaces in the region than the regional properties discussed above, based on review of visitation counts at Point Reyes National Seashore, Pinnacles National Park, and Fort Ord National Monument. Visitation at Wilder Ranch State Park, however, is comparable to that at nationally recognized sites. As discussed above, visitation at Ford Ord National Monument increased substantially following designation.

Annual visitation for Point Reyes National Seashore, Pinnacles National Park, and Fort Ord National Monument ranges between 244,943 and 2,711,090, as indicated in Table 2. However, the size, features, and attractions also vary dramatically. In order to provide a more meaningful comparison, annual use per trail mile and per acre of land were also reviewed, as shown in Table 2. While there are many features that could be compared, acreage and trail miles were selected as they allow for comparison with other properties discussed in this memorandum. Based on this analysis, if Coast Dairies were to reach 300,000 annual visitors per year, it would be within the low-range of use at the comparable National Monuments in terms of visitors per trail mile or visitors per acre. This analysis provides some insight into future use at Coast Dairies, but is not assumed to be comprehensive or definitive; further research would be necessary to confirm these preliminary findings.

Implications for San Vicente Redwoods

Future trail connection(s) between San Vicente Redwoods and the Coast Dairies property would result in visitors utilizing both properties during one recreational experience, and enable visitors to

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[3] PlaceWorks Conversation with David Moore, Outdoor Recreation Planner, US Bureau of Land Management, April 2, 2015.

[4] PlaceWorks Conversation with David Moore, Outdoor Recreation Planner, US Bureau of Land Management, April 2, 2015, and email communication on 4/14/2015.

use staging areas at either property to access the connected trail system. Given the integration of these properties, it is anticipated that the visitation levels at one property will have direct implications to visitation and parking demand at the other property.

Visitation at Coast Dairies is projected to range between 100,000 and 300,000 at full buildout, with the potential for higher visitation should the property be designated as a National Monument. However, the increase in visitation related to National Monument designation is not likely to result in a substantial increase in visitors to the San Vicente Redwoods' Empire Grade staging area. This is because many of the visitors are likely to be short-stay visitors of the immediate Monument area that will not use the trail network to access adjacent San Vicente Redwoods, and because the San Vicente Redwoods staging area will be more difficult to access from major highways. Coast Dairies staging areas are assumed to provide adequate capacity to accommodate future visitor use of that destination with consideration to a national designation and to trail users that will park at Coast Dairies and connect to San Vicente Redwoods trails. However, given the potential for designation to increase use, the design of the San Vicente Redwoods staging area should consider the potential for future expansion.

ESTIMATED VISITOR USE AT SAN VICENTE REDWOODS

ESTIMATED USE FOR PHASE 1

During Phase 1, it is estimated that 13,140-14,600 people will visit San Vicente Redwoods annually. This is based on the following understanding and assumptions:

- **Characteristics and Facilities.** Under the Draft Master Plan, Phase 1 includes 4 miles of multi-use trails for hiking, mountain biking, and horseback riding. These trails are located on existing fire roads in the northern portion of the 8,500 acre property. Dog-walking is allowed on the 1.5-mile trail that runs parallel to Empire Grade Road. Phase 1 trails would be located within forested habitat with minimal variation, although several viewpoints into Devil's Gulch may attract visitors.
- **Accessibility.** Under Phase 1, the only access point for the recreational trails would be a staging area on Empire Grade Road. This location is 40.3 miles (a 57-minute drive) from San Jose, 15.0 miles (a 28-minute drive) from Santa Cruz, 32.5 miles (a 50-minute drive) from Watsonville, and 49.7 miles (a 66-minute drive) from Half Moon Bay.
- **Visitors per mile of trail.** This estimate assumes 9-10 visitors per mile of trail. It is assumed that Phase 1 visitation will be initially higher per mile of trail than most comparable properties given the novelty of a new open space. However, given limited facilities and attractions as well as the distance to Santa Cruz and other urban areas, it is assumed that use will be significantly lower than experienced at Wilder Ranch State Park.

ESTIMATED USE FOR BUILDOUT

For Buildout, it is estimated that 83,220-97,090 people will visit San Vicente Redwoods annually. This is based on the following understanding and assumptions:

- **Characteristics.** At buildout, there would be approximately 38 miles of trails, including existing roads and new singletrack trails. Trails would be primarily separate use, and dog-walking would continue to be limited to the trail running parallel to Empire Grade Road. Through-trails would be established for all use types from Empire Grade to the Coast Dairies property, constituting a skyline-to-sea trail experience, and several internal loop-trails would be established. Trails would generally be within forested habitat. Key features visible from the trail network would generally be limited to include working forest, established forest, and the old railroad grade, as well as the potential skyline-to-sea trail. Limited picnic tables (no group sites) and benches would be provided, and camping would not be allowed.

- **Accessibility.** There are no additional parking lots planned for Buildout, however an overflow parking area in proximity to the main parking lot may be considered. However, an additional access point will be the connection to the Coast Dairies property and its future trail networks. This access point would be approximately 12 miles north of the City of Santa Cruz. It is anticipated that visitation would be notably higher at buildout, yet given the limited access points and distance to many of the new trails it is anticipated that the increase in visitation will not reflect the increase in trails (buildout=9.5X the trail mileage of phase 1).

- **Visitors per mile of trail.** This estimate assumes 6-7 visitors per mile of trail, which is lower than the assumption for Phase 1 as the visitation is not expected to increase at the same rate as trail mileage due to limited accessibility, as described above. This estimate is slightly lower than estimates for the Forest of Nisene Marks State Park and El Corte Madera Creek Open Space Preserve which is appropriate given that both these properties provide for more uses than San Vicente Redwoods and that Nisene Marks State Parks has a greater number of neighbors with walk-in access.

IMPLICATIONS FOR PARKING DEMAND

Visitation has a direct relationship to parking demand, and therefore projected visitation is a critical tool when planning parking and staging areas. Parking areas that do not accommodate actual use will lead to illegal parking, congestion, and negative visitor experience. Parking areas that are oversized for actual use can cause unnecessary impacts to resources and can be experienced as scars on the landscape. Appropriately sized parking areas will be designed for the optimal footprint needed to accommodate demand on average high-use days.

ESTIMATED DEMAND

Parking demand was estimated for San Vicente Redwoods based on the assumptions identified below, which were developed with consideration to existing parking supply/demand at the comparable parks and open space preserves discussed above as well as PlaceWorks' experience with similar projects. Parking estimates are based on the high end of the range of expected annual visitors.

Phase 1

It is anticipated that 12 parking spaces and 1-2 equestrian trailer spaces would accommodate demand during Phase 1 based on the following assumptions:

- Visitation projections of 14,600 at Phase 1
- 75-percent of visitation will take place on the weekend, equally distributed between Saturday and Sunday (equivalent to 105 visitors/ day on a weekend day)
- 85-percent of visitors will drive-in (others will walk, hike, bike or ride-in; there will be no access from Coast Dairies property)
- Of visitors that drive-in, there will be an average of 2.5 visitors/vehicle
- Vehicles will stay an average of 3 hours, therefore 3 vehicles can occupy one parking space each (3 vehicles/parking space/day)
- Equestrian trailer demand will be lower than Forest of Nisene Marks State Park (3 trailer spaces) given lower trail mileage

Buildout

It is anticipated that 47 parking spaces and 3-5 equestrian trailer spaces would accommodate demand at the Empire Grade Staging Area at Buildout based on the following assumptions:

- Visitation projections of 97,090 at Buildout
- 75-percent of visitation will take place on the weekend, equally distributed between Saturday and Sunday (Equivalent to 698 visitors/ day on a weekend day)
- Staging areas at Coast Dairies will be have adequate capacity to accommodate Coast Dairies' visitors
- 50-percent of visitors will drive-in (others will walk, hike, bike or ride-in; it is anticipated that many will access the property via trail connections to the Coast Dairies property)
- Of visitors that drive-in, there will be an average of 2.5 visitors/vehicle
- Vehicles will stay an average of 3 hours, therefore 3 vehicles can occupy one parking space each (3 vehicles/parking space/day)
- Equestrian trailer demand will be comparable to demand at the Forest of Nisene Marks State Park (3 trailer spaces)
- The Coast Dairies property is opened for public access and trail connections between San Vicente Redwoods and Coast Dairies staging areas will be completed (if this is not the case, visitation projections will remain at Phase 1 levels)

RECOMMENDATIONS FOR EMPIRE GRADE STAGING AREA

It is recommended that the staging area be designed to accommodate 50-60 vehicles and 3-5 trailers at Buildout, and 12 vehicles and 2 trailers during Phase 1. To maximize parking space and flexibility, it is recommended that the trailer spaces be designed as flexible parking space that can accommodate vehicles when necessary. Should Coast Dairies be designated as a National Monument, there is potential for a limited increase in parking to demand. To achieve the goal of minimizing the impacts from overflow parking on the surrounding neighborhoods and to accommodate the potential for future parking demand increase due to high, it is recommended that the staging area be designed to accommodate an additional 40 spaces that would be constructed only if use demonstrates they are necessary.

As previously discussed, this recommendation for parking at buildout assumes that many visitors will access San Vicente Redwoods through the Coast Dairies property, and that staging areas at Coast Dairies will accommodate this use. If the Coast Dairies property and trail connections from Coast Dairies to San Vicente Redwoods are not opened to the public, San Vicente Redwoods visitation is projected to remain at Phase 1 levels. While the environmental review process for the San Vicente Redwoods Public Access Plan will be considerate of the relationship between San Vicente Redwoods and Coast Dairies, the Coast Dairies project and any proposed access features for the property will be reviewed under a separate environmental process.

TABLE 1 **Comparison of Open Space Destinations in Santa Cruz County**

	Owner	Size (acres)	Allowable Use	Trail Length (miles)	Driving Time from Nearby Cities (minutes)	Driving Distance from Nearby Cities (miles)	Parking Capacity	Annual Visitation (% by User Type)	Annual Visitation	Weekly Visitation (Annual/52 Weeks)	Daily Visitation (Annual/365 Days)	Weekday Visitation (25%)	Weekend Visitation (75%)	Users/Day/ Trail Miles
The Forest of Nisene Marks State Park	**California State Parks**	10,257	hiking, jogging, mountain biking, picnicking/bbq, camping	30	22 to Santa Cruz, 55 to San Jose,	11 to Santa Cruz, 40 to San Jose	3 parking lots with capacity for a total of 65-75 cars and/or 3 trailers	40% hikers, 50% bikers, 10% equestrians	106,094	2,040	291	102	763	10
Wilder Ranch State Park	**California State Parks**	7,000	hiking, mountain biking, equestrians, camping	34	10 to Santa Cruz, 48 to San Jose	2 to Santa Cruz, 36 to San Jose	74 vehicle spaces and 3 trailer/bus spaces in the main parking lot, 150-160 spaces in the overflow parking lot	35% hikers, 40% bikers, 15% equestrians, 10% visitor center based	472,809	9,092	1,295	453	3,400	38
Soquel Demonstration State Forest	**CalFIRE**	2,681	mountain biking, hiking, mushroom gathering (permit), events (special use permit)	24	43 to San Jose, 40 to Santa Cruz	28 to San Jose, 22 to Santa Cruz	60 parking spaces in main lot; roadside parking for 15+ vehicles on Highland Way	13.5% hikers, 85% bikers, 1.5% mushroom collectors	20,000	385	55	19	144	2
Upper Stevens Creek County Park	**County of Santa Clara**	1,077	hiking/running, mountain biking	11	15 to Saratoga, 23 to San Jose, 46 to Santa Cruz	6 to Saratoga, 16 to San Jose, 30 to Santa Cruz	Northern and southern park entrances; public transit available; Upper Stevens Creek by foot/horse/bike from Stevens Creek or Bay Area Ridge Trail	39% hikers, 59% bikers, 2% equestrians	15,968	307	44	15	115	4
El Corte de Madera Creek	**MROSD**	2,817	hiking, mountain biking, equestrians, picnicking	28	N/A	N/A	N/A	N/A	85,593	1,646	235	82	616	8
San Vicente Redwoods (PHASE 1)	**POST, LTSC, Save the Redwoods League, Sempervires Fund**	8,500	hiking, mountain biking, equestrians, picnicking	4	28 to Santa Cruz, 57 to San Jose	15 to Santa Cruz, 40 to San Jose	TBD	N/A	13,140	252	36	13	95	9
San Vicente Redwoods (BUILDOUT)	*(same as above)*	*(same as above)*	*(same as above)*	38	*(same as above)*	*(same as above)*	TBD	N/A	83,220	1,596	228	80	599	6

Attachment 11

Traffic Impact Analysis

San Vicente Redwoods Public Access Plan

Draft Report

September 20, 2017

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373145

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San Vicente Redwoods Public Access Plan

Draft Report

September 20, 2017

PlaceWorks
373145

Issue and revision record

Revision	Date	Originator	Checkout	Approver	Descriptor
0	07/27/2016	Jeffrey Waller	Julie Oates	Keith Higgins	Original Report
1	08/15/2016	Jeffrey Waller	Julie Oates	Keith Higgins	Revised Report
2	12/16/2016	Jeffrey Waller	Julie Oates	Keith Higgins	Additional Revised Report
3	08/28/2017	Jeffrey Waller	Julie Oates	Leo Trujillo	Additional Revised Report (2)
4	09/20/2017	Jeffrey Waller	Julie Oates	Leo Trujillo	Additional Revised Report (3)

Information class: Standard

Contents

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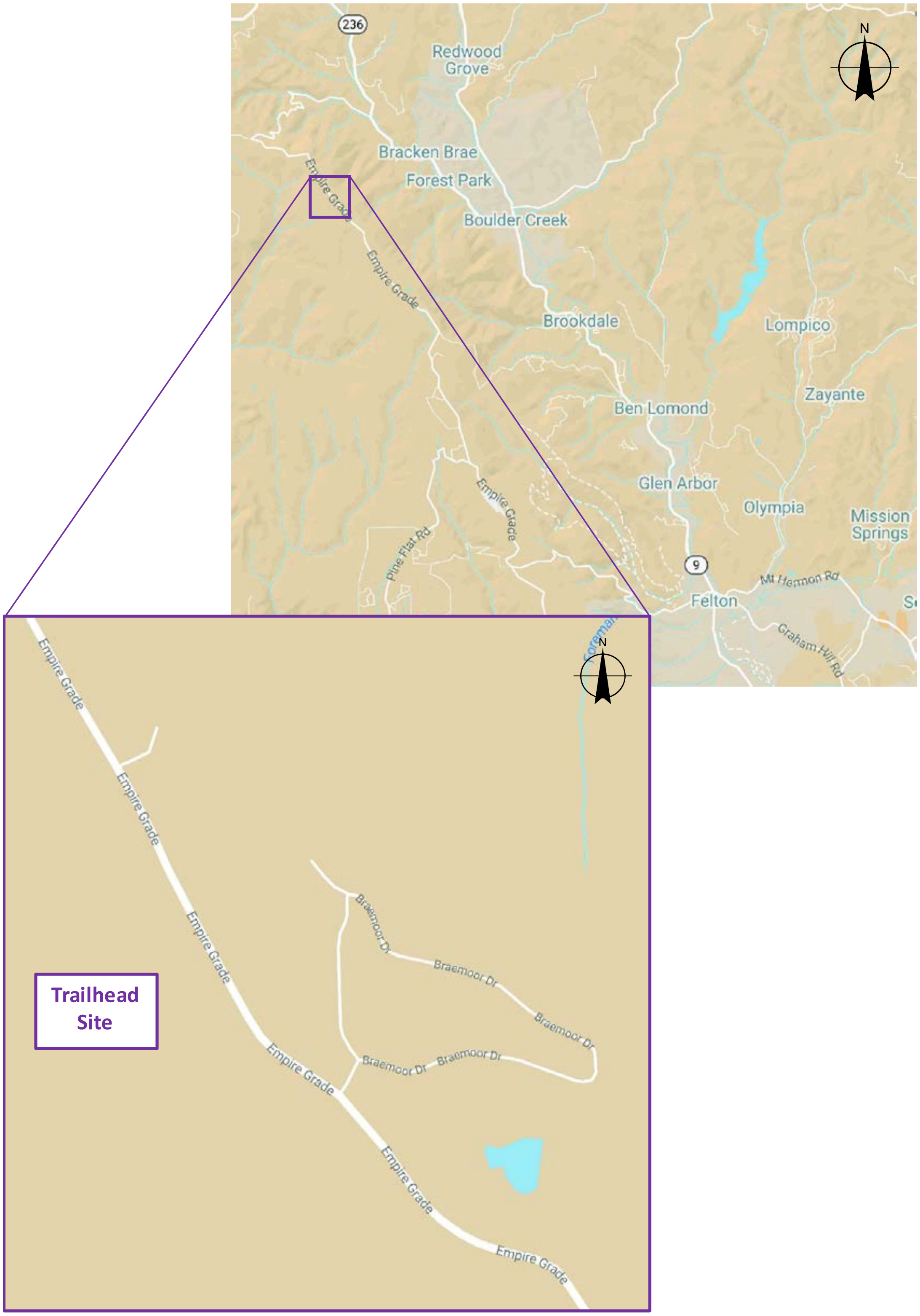
Appendix

1 Introduction

This Traffic Impact Analysis (TIA) analyzes the potential traffic impacts of the proposed adoption and implementation of the proposed San Vicente Redwoods Public Access Plan project in Santa Cruz County, California. The public open space preserve area is located in the Santa Cruz Mountains above Davenport, north of State Route 1 and west of Empire Grade. The focus of this study is a trailhead (including a bathroom and parking area) for the public open space, to be located on Empire Grade approximately 1.25 miles north of Alba Road, opposite the Crest Ranch Choose and Cut Christmas Tree Farm. **Figure 1** depicts the location of the trailhead, and **Figure 2** depicts the trailhead staging plan.

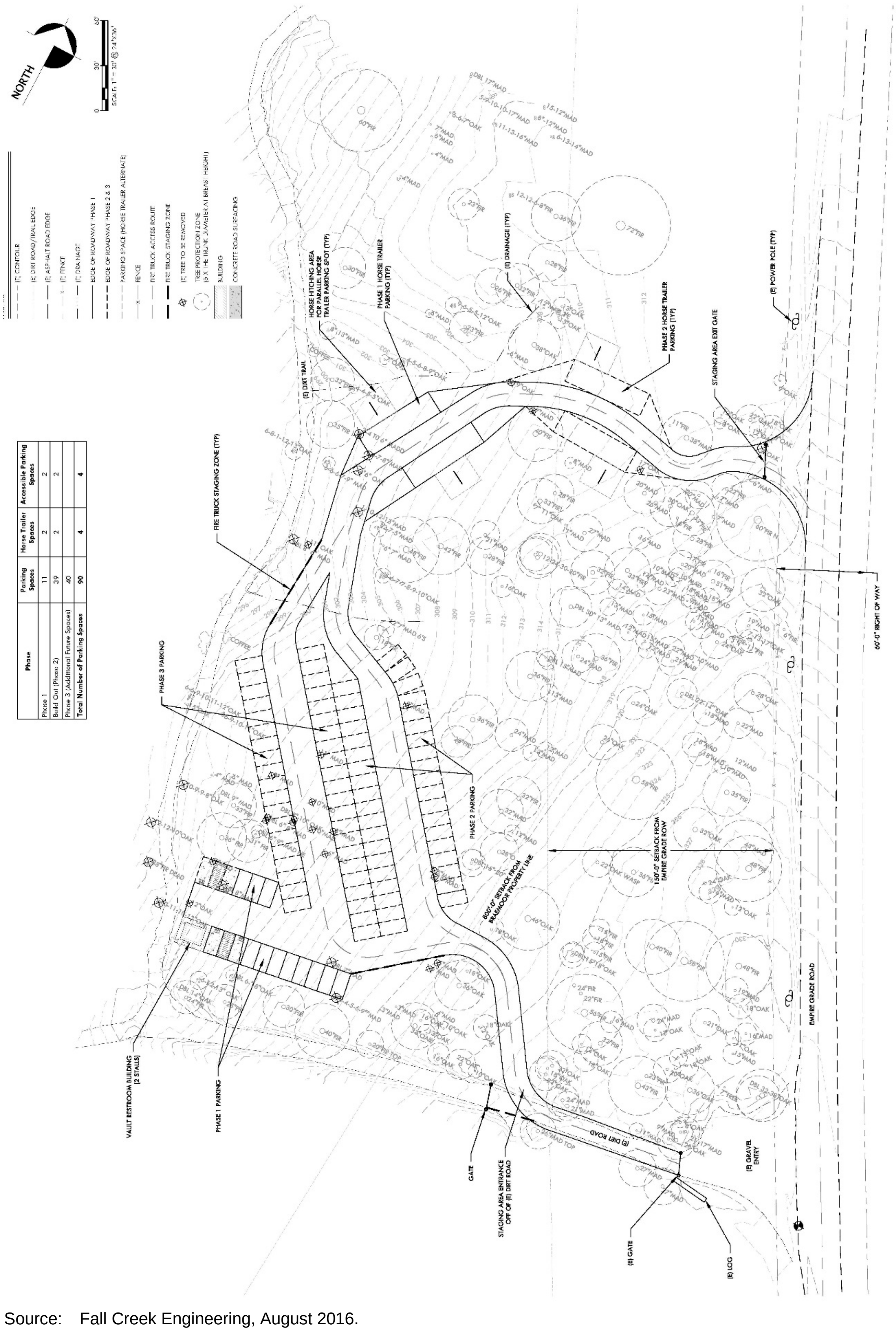
This report identifies both the on-site and off-site traffic impacts associated with the study trailhead. The off-site review focuses on impacts to the adjacent street, trailhead access issues and a sight distance evaluation at the driveways. The onsite review includes onsite circulation and parking supply. Finally, comparisons and interactions with the Twin Gates trailhead/staging area, located on Empire Grade north of Santa Cruz, are addressed.

Figure 1: Trailhead Location Map



Basemap Source: Google Maps, 2017.

Figure 2: Trailhead Staging Plan



Source: Fall Creek Engineering, August 2016.

2 Existing Conditions

This chapter evaluates Existing conditions and includes a description of the trailhead setting.

2.1 Existing Road Network

Empire Grade is a two-lane rural roadway in Santa Cruz County. It extends from the outskirts of Santa Cruz – adjacent to the University of California at Santa Cruz (UCSC) – to the Lockheed Martin facility northwest of Boulder Creek. Empire Grade provides access to various rural residential properties and neighborhoods in the Santa Cruz Mountains west of the San Lorenzo River, including a CalFire station at Felton Empire Road. Empire Grade traverses moderately steep terrain with few sharp turns. The speed limit on Empire Grade is 40 miles per hour (mph).

At the trailhead site, Empire Grade is 24 feet wide, with 10-foot through lanes and two-foot paved shoulders in each direction. There are dirt shoulders on either side of the street, although near the proposed trailhead driveways, the shoulder along the southbound frontage of the roadway changes to an approximately two-foot deep drainage channel. Utility poles line the southbound frontage of the roadway, located approximately six feet off of the edge of pavement.

Felton Empire Road is a two-lane rural roadway in Santa Cruz County. Although it extends between Empire Road and State Route 9 in Felton, it also provides connections to other regional roadways. At its eastern end, it connects to Graham Hill Road, which provides access to Santa Cruz, and, indirectly, Scotts Valley and State Route 17. At its western end, it connects to Ice Cream Grade, which provides access to Bonny Doon. Overall, Felton Empire Road traverses very mountainous terrain with multiple sharp turns. The speed limit on Felton Empire Road is 35 mph.

2.2 Existing Pedestrian Network

There is no sidewalk in the vicinity of the trailhead site – pedestrians must walk on the paved shoulder, dirt shoulder, or roadway. Observations in June 2016 found no pedestrian traffic on Empire Grade near the trailhead site, which is consistent with the rural setting of the roadway.

2.3 Existing Bicycle Network

There are no Class I (bike path) or Class II (bike lanes) facilities on Empire Grade, Felton Empire Road or any other roadways in the area. Despite this, Santa Cruz County designates Empire Grade – from Jamison Creek Road to the city limits of Santa Cruz – as a “bikeway,” noting its overall importance in the countywide bicycle transportation network.

Santa Cruz County, in its bicycle plan, proposes to add Class II bicycle lanes in both directions of Empire Grade between Santa Cruz and Pine Flat Road. (Pine Flat Road intersects Empire Grade approximately three miles south of the trailhead.) There are no planned bicycle improvements on Felton Empire Road.

Observations in June 2016 found no bicycle activity on Empire Grade near the trailhead, although a small amount of bicycle activity likely occurs on weekends.

2.4 Existing Conditions Traffic Operations

Roadway segment levels of service are based on the threshold volumes in **Appendix A**. These thresholds are based on the *2010 Highway Capacity Manual* methodologies. However, to be conservative, the threshold volumes have been reduced 50% (Empire Grade) and 75% (Felton Empire Road) to better reflect the mountainous terrain traversed by both roadways.

New roadway segment counts were collected for seven consecutive days on Empire Grade near the trailhead driveways in June 2016 (Monday, June 20 through Sunday, June 26, 2016) and on Felton Empire Road just east of Empire Grade in July and August 2017 (Thursday, July 27 through Wednesday, August 2, 2017) – these counts can be found in **Appendix B**. These volumes were used to derive an average daily traffic (ADT) for both roadways.

Table 1 depicts the volumes and levels of service at the two study roadway segments.

The ADT on Empire Grade is 550 vehicles per day, or Level of Service (LOS) "A". On Saturdays, ADT volumes are 630 vehicles per day, also LOS A.

The ADT on Felton Empire Road is 2,350 vehicles per day, or LOS C. On Saturdays, ADT volumes are 2,340 vehicles per day, also LOS C.

Table 1: Roadway Segment Volumes and Levels of Service – Existing Conditions

Roadway Segment			Type	Direction	LOS Std.	Peak Hour	Existing Conditions	
							Volume	LOS
1	Empire Grade	North of Pine Flat Road	2-Lane Rural (Mountainous)	Two-Way	C	Weekday Saturday	550 630	A A
2	Felton Empire Road	East of Empire Grade	2-Lane Rural (Very Mountainous)	Two-Way	C	Weekday Saturday	2,350 2,340	C C

Note: Level of service are based on the threshold volumes in **Appendix A.**

3 Existing Plus Project Conditions

This chapter describes the proposed trailhead and assesses its potential impacts on the surrounding roadways.

3.1 Project Description

The proposed project is the Public Access Plan for the San Vicente Redwoods open space preserve. The focus of this study is on the proposed trailhead on Empire Grade. This trailhead would serve the hikers, bicyclists and equestrians using the trails within the Public Access Plan Area. The trailhead would have parking (for both vehicles and trailers) and a bathroom.

Access to the trailhead would be via two driveways off of Empire Grade – one entry and one exit. The two driveways would be approximately 500 feet apart.

3.2 Project Trip Generation

This trip generation estimate is based on *Projected Visitor Counts and Parking Needs,* PlaceWorks, January 12, 2016 (see **Appendix C**). Mott MacDonald concurs with the analysis and conclusions of this estimate based on review of the document as well as supplemental analysis of the implications of visitation at Twin Gates trailhead on the project site, as further described in Section 7. Mott MacDonald has also estimated hourly traffic levels for the trailhead based on these daily estimates.

The PlaceWorks attendee and parking demand estimates are based on attendee levels at comparable parks and open spaces in the area, including The Forest of Nisene Marks State Park, Wilder Ranch State Park, and Soquel Demonstration State Forest. As stated above, Mott MacDonald has also compared visitation estimates with existing visitation at Twin Gates trailhead.

The study trailhead is estimated to attract 13,140 – 14,600 people per year at initial opening, and 83,220 – 97,090 people per year in the future. On an average weekday during the year, this would equate to 23 visitors/day (initial) and 149 visitors/day (future), or approximately 8 vehicles/day (initial) and 30 vehicles/day (future).

Higher activity levels are anticipated on weekends during the spring, summer and fall months, where as many as 105 visitors/day (initial) and 698 visitors/day (future) could visit the trailhead, or 36 vehicles/day (initial) and 140 vehicles/day (future). Assuming visitors begin and end their activities roughly during daylight hours (10 hours of the day), Mott MacDonald estimates an average of approximately 4 vehicles/hour (initial) and 14 vehicles/hour (future). During peak periods (mid-morning and mid-afternoon), activity could increase to 6 vehicles/hour (initial) and 18 vehicles/hour (future).

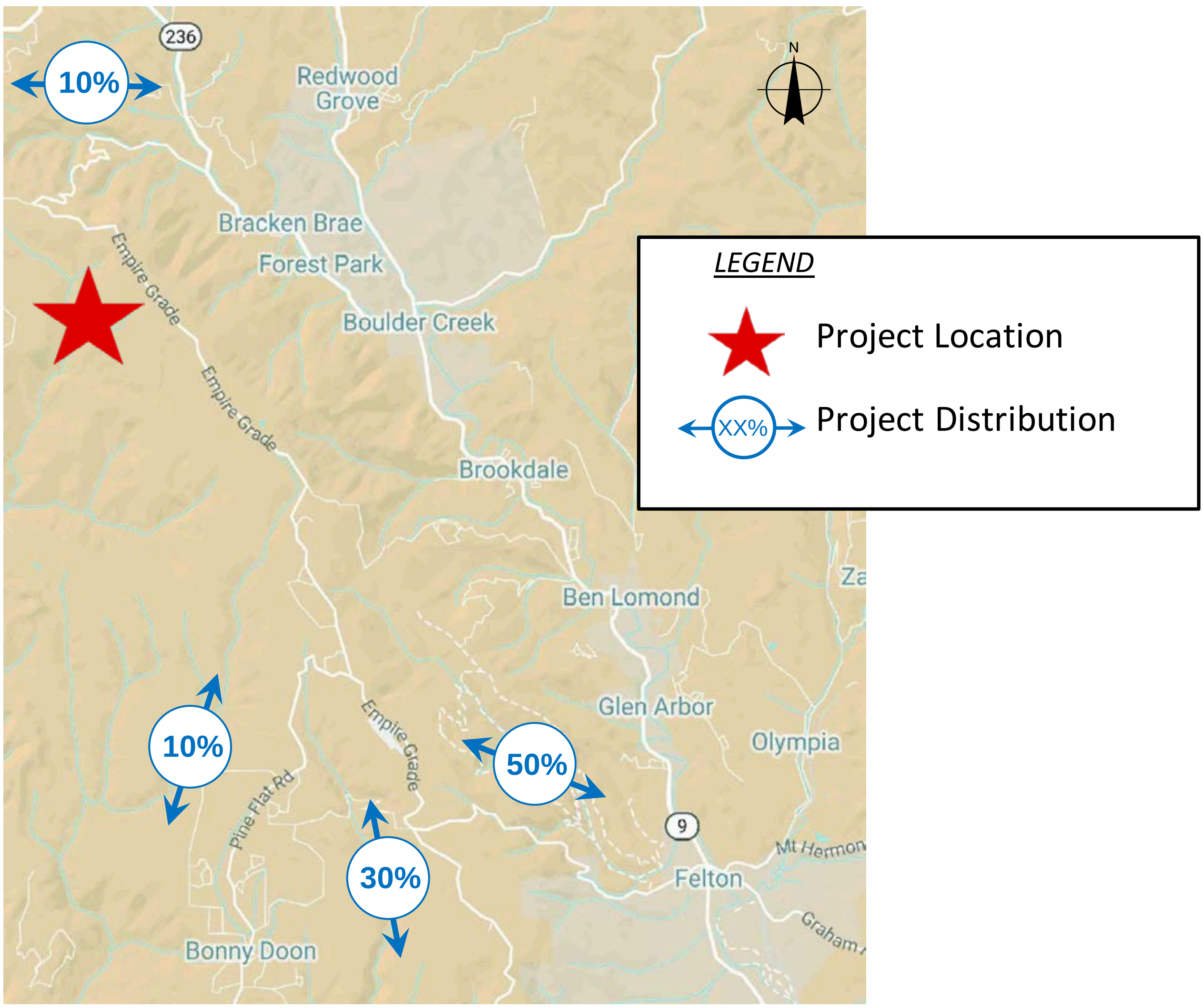
The vehicle rates noted above represent attendance at the trailhead, i.e., trips entering the facility. As all entering vehicles would also have to depart the trailhead during the same day, the total vehicle trip generation of the trailhead (inbound and outbound vehicles) would be double these rates, or 16 vehicles/day (initial) and 60 vehicles/day (future) during an average weekday and 64 vehicles/day (initial) and 280 vehicles/day (future) on weekends.

Note: These vehicle rates assume that the planned future connection of the project trail system to the Cotoni-Coast Dairies National Monument near Davenport will reduce the overall percentage of attendees that use the Empire Grade trailhead to access the overall trailhead site in the future.

3.3 Project Trip Distribution

Figure 3 depicts the anticipated project trip distribution. Due to the remoteness of the trailhead and the limited street network in the vicinity of the trailhead, it is estimated that 10% of the project traffic would travel to/from the north of the site and 90% would travel to/from the south. Using this distribution, the project trips were assigned to the two study roadway segments and combined with the existing volumes to create the Existing Plus Project conditions volumes in **Table 2**.

Figure 3: Project Trip Distribution



Basemap Source: Google Maps, 2017.

Table 2: Roadway Segment Volumes and Levels of Service – Existing and Existing Plus Project Conditions

Roadway Segment			Type	Direction	LOS Std.	Peak Hour	Existing Conditions		Existing Plus Project Conditions			
									Intial		Future	
							Volume	LOS	Volume	LOS	Volume	LOS
1	Empire Grade	North of Pine Flat Road	2-Lane Rural (Mountainous)	Two-Way	C	Weekday Saturday	550 630	A A	566 694	A A	610 910	A A
2	Felton Empire Road	East of Empire Grade	2-Lane Rural (Very Mountainous)	Two-Way	C	Weekday Saturday	2,350 2,340	C C	2,358 2,372	C C	2,380 2,480	C C

Note: Level of service are based on the threshold volumes in **Appendix A.**

3.4 Existing Plus Project Conditions Traffic Operations

The levels of service at the study roadway segments under Existing Plus Project conditions are shown in **Table 2**.

Adding the trailhead traffic to the existing volumes, the Existing Plus Project condition average volume on Empire Grade would rise to 566 vehicles/day (initial) and 610 vehicles/day (future). On Saturdays, daily volumes on Empire Grade would rise to 694 vehicles/day (initial) and 910 (future). All of these daily volumes would continue to represent LOS A conditions. As the Santa Cruz County level of service standard is LOS C, operations on Empire Grade would continue to be acceptable.

Average volumes on Felton Empire Road would rise under Existing Plus Project conditions to 2,358 vehicles/day (initial) and 2,380 vehicles/day (future). On Saturdays, volumes would be 2,372 vehicles/ day (initial) and 2,480 vehicles/day. All of these daily volumes would continue to represent LOS C conditions. As the Santa Cruz County level of service standard is LOS C, operations on Felton Empire Road would continue to be acceptable.

Note: The traffic volumes on Empire Grade used in this analysis were collected in June 2016, presumably a high-volume month for study project traffic due to the consistently good weather during that time of the year. However, as noted in Chapter 1, the trailhead site is located opposite the Crest Ranch Choose and Cut Christmas Tree Farm, which has its driveway approximately 800 feet north of the exit driveway for the study project. Visitor activity as Crest Ranch causes traffic volumes on Empire Grade to increase between roughly Thanksgiving Day and Christmas Day. However, activity levels at the trailhead site would be lower during this period, due to colder weather and possible rain. Therefore, operations of Empire Grade would remain at or better than its LOS C standard throughout the year.

3.5 Existing Plus Project Conditions Pedestrian Circulation

Due to the rural setting of the trailhead and the relative remoteness of the area from major population centers, few pedestrians are anticipated to travel to and from the trailhead along the county roadway network. Pedestrians that do visit the trailhead are likely to be some of the small number of residents that live in the vicinity of the trailhead. Therefore, the project would not have an impact on pedestrian circulation. No improvements are required.

3.6 Existing Plus Project Conditions Bicycle Circulation

Due to the relative remoteness of the area from major population centers, relatively few bicyclists are anticipated to travel on the county roadway network to the trailhead, although a few bicyclists per month during the summer weekends may use the bathroom facility while passing through the area on Empire Grade. Therefore, the project would not have an impact on bicycle circulation. No improvements are required.

Although no bicycle improvements are required, it is suggested that Santa Cruz County consider modifying its bicycle plan to extend the proposed Class II bicycle lanes on Empire Grade from Pine Flat Road to the trailhead. This addition would improve the connectivity of the county bicycle network.

To access the project site trailhead via the area road network, visitors (whether driving or bicycling) will use various roadways with connections to Empire Grade and Felton Empire Road, including Jamison Creek Road, Pine Flat Road, and Bonny Doon Road. These roadways are relatively narrow and have little to no shoulders. However, when the trailhead traffic is dispersed over these roadways, the project would be adding relatively little traffic on any one roadway. In addition, the time periods of highest activity level at the trailhead on a weekday will likely be mid-morning to late afternoon, and thus would be outside of the peak weekday morning and evening commute periods on these roadways (7:00 – 9:00 AM and 4:00 – 6:00 PM). Therefore, the project would not impact the operations of these roadways.

4 Cumulative Without Project and Cumulative Plus Project Conditions

This chapter summarizes future traffic conditions and assesses the potential of the project to impact those conditions on the surrounding roadways.

4.1 Derivation of Cumulative Traffic Volumes

According to the Santa Cruz County Public Works Department, no future traffic volume projections exist for Empire Grade near the trailhead. There are also too few historical traffic volumes available for Empire Grade or any of the surrounding roadways to be able to derive a historical growth rate for traffic volumes in this area. Therefore, an assumed growth rate of 0.5% per year for 20 years – an overall growth rate of 10% -- was applied to the existing volumes on Empire Grade and Felton Empire Road to approximate Cumulative Without Project condition volumes. This level of growth is reflective of the rural nature of the surrounding area and the anticipated very low level of potential future development in the study area. It is also slightly higher than the projected yearly population growth projection (0.42% per year between 2010 and 2035) for unincorporated Santa Cruz County forecasted by the Association of Monterey Bay Area Governments (AMBAG) in its *2014 Regional Growth Forecast,* which was adopted on June 11, 2014.

4.2 Cumulative Without Project and Cumulative Plus Project Conditions Traffic Operations

The volumes and levels of service at the study roadway segments under Cumulative Without Project and Cumulative Plus Project conditions are shown in **Table 3**.

The Cumulative Without Project condition average daily volume on Empire Grade would be 605 vehicles/day, or LOS A. On Saturdays, daily volumes would be 693 vehicles per day, also LOS A.

Traffic volumes on Felton Empire Road under Cumulative Without Project conditions would be 2,585 vehicles/day, or LOS C. On Saturdays, daily volumes would be 2,574 vehicles/day, also LOS C.

Cumulative Plus Project volumes are the Cumulative Without Project volumes plus the trailhead trips. Under Cumulative Plus Project conditions, the average volume on Empire Grade would rise to 621 vehicles/day (initial) and 665 vehicles/day (future). On Saturdays, daily volumes would rise to 757 vehicles/day (initial) and 973 (future). All of these daily volumes would continue to represent LOS A conditions.

The average volume on Felton Empire Road under Cumulative Plus Project conditions would rise to 2,593 vehicles/day (initial) and 2,615 vehicles/day (future). On Saturdays, daily volumes would rise to 2,610 vehicles/day (initial) and 2,714 (future). All of these daily volumes would continue to represent LOS C conditions.

As the Santa Cruz County level of service standard is LOS C, operations on Empire Grade and Felton Empire Road would continue to be acceptable.

Table 3: Roadway Segment Volumes and Levels of Service – Cumulative and Cumulative Plus Project Conditions

Roadway Segment			Type	Direction	LOS Std.	Peak Hour	Cumulative Without Project Conditions		Cumulative Plus Project Conditions			
									Intial		Future	
							Volume	LOS	Volume	LOS	Volume	LOS
1	Empire Grade	North of Pine Flat Road	2-Lane Rural (Mountainous)	Two-Way	C	Weekday Saturday	605 693	A A	621 757	A A	665 973	A A
2	Felton Empire Road	East of Empire Grade	2-Lane Rural (Very Mountainous)	Two-Way	C	Weekday Saturday	2,585 2,574	C C	2,593 2,610	C C	2,615 2,714	C C

Note: Level of service are based on the threshold volumes in **Appendix A.**

5 Project Access and Internal Circulation

This chapter summarizes the project access and internal circulation issues associated with the trailhead.

5.1 Driveway Location

The driveway locations are on a continuously straight segment of Empire Grade. There is a relatively short vertical curve (i.e., downgrade) as one travels north on Empire Grade between the driveways, such that the elevation of the exit driveway is below that of the entry driveway.

5.2 Driveway Operations

The trailhead entry and exit driveways are anticipated to operate within acceptable levels of service, due to relatively low through volumes on Empire Grade. This minimizes the number of conflicting vehicles when entering or exiting the trailhead.

The entry and exit driveways are flared out at their intersection with Empire Grade. This will allow for left and right turning vehicles out of the exit driveway to turn onto Empire Grade independently of each other. It also allows vehicles pulling trailers (such as horse trailers) to turn onto Empire Grade without the trailers off-tracking off of the pavement.

There is no need for left or right turn lanes on Empire Grade into the trailhead staging area, nor any acceleration lanes for vehicles turning onto Empire Grade, again due to the relatively low through volumes on Empire Grade.

5.3 Sight Distance

Santa Cruz County standards require a minimum of 250 feet of sight distance on either side of a driveway. This is based on a driver location approximately 6 feet behind the edge of pavement of a roadway.

5.3.1 Exit Driveway

Field measurements in June 2016 found that the amount of sight distance available at the exit driveway exceeds the county sight distance requirement in both directions of Empire Grade. Trees and utility poles would not obstruct sight lines at the exit driveway. No improvements are required.

The County standard (250 feet of sight distance) is based on a speed limit of 35 mph. However, as the speed limit on Empire Grade is 40 mph, the sight distance was also compared to Caltrans sight distance requirements. For 40 mph, Caltrans requires a sight distance for private driveways of 300 feet. Field measurements in June 2016 found available sight distance to/from the north of over 500 feet, and available sight distance to/from the south of 440 feet. As both of these measurements exceed 300 feet, the available sight distance at the exit driveway also exceeds Caltrans standards.

5.3.2 Entry Driveway

At the entry driveway, no traffic would be exiting the driveway. Instead, vehicles would be turning off of Empire Grade itself, either slowing as they are turning off of the roadway or stopping while awaiting an adequate gap in traffic to make their turn. Therefore, the critical sight distance is the view of slowing, stopped or turning downstream vehicles on Empire Grade at the entry driveway.

Field measurements in June 2016 found that the amount of sight distance at the entry driveway exceeds the county sight distance requirements in both directions of Empire Grade. Available sight distance is 385 feet to/from the north and over 400 feet to/from the south; therefore, available sight distance also exceeds Caltrans requirements. No improvements are required.

5.4 Internal Circulation

The trailhead entry and exit are a minimum of 14 feet wide – more than adequate for one-way roadways. These roadways widen to 24 feet in the parking areas where two-way travel is allowed, which meets minimum standards for parking lot aisles.

As the entry roadway, exit roadway, and some of the parking aisles only allow one-way traffic, it is recommended that “ONE WAY” (R6-1 or equivalent) and “DO NOT ENTER” (R5-1 or equivalent) signs be placed throughout the parking area. Such signs are also recommended at the entry and exit driveways, in locations that would not obstruct the available sight distance.

As the horse trailer parking area would be located near the exit to the trailhead staging area, it is recommended that signs be added near the general parking area that direct visitors with trailers to the designated horse trailer parking area. This will help prevent visitors with horse trailers from mistakenly parking in either the general parking aisles or along the edge of the access roadway.

It is also suggested that a pathway from the parking area to the trails be added. Such a pathway would help to channel users of the trails to a centralized access point, concentrating foot/bicycle/equestrian traffic in a certain area. This will minimize impacts to native plants and trees farther away from this pathway.

6 Parking

This chapter summarizes the parking issues associated with the project.

6.1 Parking Supply

The trailhead staging plan on **Figure 2** indicates that in Phase 1 the trailhead would have 15 parking spaces, composed of 13 general parking spaces (2 of which are accessible parking spaces) and 2 horse trailer parking spaces. The parking area would be expanded in Phase 2 (Buildout) to 58 total spaces in the future, including 4 accessible spaces and 4 horse trailer parking spaces. Ultimately, as demand requires, the parking area can be expanded to a maximum of 98 total spaces.

The aforementioned PlaceWorks memorandum (**Appendix C**) estimates that the parking demand for the trailhead is 12 general vehicles and 1 - 2 horse trailers at initial opening, increasing to 47 standard vehicles and 3 - 5 horse trailers under future conditions. These demand estimates are based on parking demand at other similar facilities in the Santa Cruz Mountains. Mott MacDonald has reviewed and agrees with these estimates.

Although the number of initial vehicle parking spaces shown on **Figure 2** does exceed the projected demand, the fact that two of those spaces are accessible spaces may lead to a parking shortage on busier days at the trailhead. It is recommended that the project applicant address the potential for shortage during Phase 1 by either (1) constructing at least two of the future general vehicle spaces , thereby increasing the total initial number of vehicle spaces under Phase 1 to at least 17 spaces, (2) simply grading (i.e., unfinished grading) some of the Phase 2 or Phase 3 spaces to be used as overflow if all of the other spaces are filled, or (3) utilizing an adaptive management approach to monitor parking capacity and to expand the capacity as needed.

The number of future horse trailer parking spaces shown on **Figure 2** is 4 trailer spaces, which is in between the projected parking demand range of 3-5 trailer spaces. This could lead to a parking shortage for horse trailer spaces on busier days at the trailhead. It is recommended that either one additional horse trailer space be constructed in the area designated for Phase 3 (Additional Future Spaces), or that horse trailer parking be allowed to use these spaces when other horse trailer spaces are filled. Although this recommendation could reduce the overall number of general vehicle parking spaces, the resulting number of general spaces would still be more than adequate to meet future demand at the project trailhead.

If the recommended parking area modifications are incorporated into the trailhead site plan, the proposed parking supply can adequately accommodate parking demand under initial conditions, and can be expanded in the future to accommodate future increased demand.

6.2 Overflow Parking

As noted previously, the trailhead staging plan indicates that the onsite parking supply can be increased to as many as 98 total spaces, or nearly double the anticipated demand under future conditions. These additional spaces will provide adequate supply for any needed overflow parking demand, even if they are reduced to allow for an additional horse trail parking space as recommended above. Some of these spaces could also be simply graded (i.e., unfinished) under Phase 1 conditions, to serve as an unmarked overflow parking area until formal spaces are necessary in the future.

7 Comparison to Twin Gates

This chapter compares the study project trailhead to the Twin Gates trailhead/staging area at the northern end of the University of California Santa Cruz campus.

There is currently another trailhead/staging area on Empire Grade, approximately 11 miles south of the project trailhead. The Twin Gates trailhead/staging area, located on Empire Grade at the northern end of the University of California Santa Cruz (UCSC) campus, provides access to various recreation trails on the university campus in that area. Members of the public have raised various concerns regarding the similarities and interactions between the two trailheads, specifically:

1. How does visitor activity at the Twin Gates compare with the trip activity projected at the project site; and
2. If potential visitors to the Twin Gates area are unable to find parking near the trailhead/staging area and instead choose to continue to the project site, can the project site accommodate the additional activity.

Addressing the first concern, the trip activity for the Twin Gates area is approximately 50 visitors per day. This is about double the number of anticipated attendees at the project trailhead under interim conditions and about one-third of the number of attendees projected under future conditions. However, a key difference between the study trailhead and Twin Gates is its location. As Twin Gates is located just north of Santa Cruz, it is easily accessible from the city and surrounding areas. This proximity to urbanized areas is more akin to The Forest of Nisene Marks State Park, which gets many shorter day trips due to its location near Aptos. Conversely, the study trailhead is located in a remote area of the Santa Cruz Mountains northwest of Felton, with relatively few nearby residents. Due to the additional travel time required to reach it and the length of the trails accessible from it, visitors to the study trailhead will likely be present there for multiple hours, rather than a quick trip.

As to the second concern, due to its distance from the Twin Gates trailhead and the difference in typical attendee dwell times at each trailhead, few, if any visitors are anticipated to travel to the study trailhead if there is insufficient parking available at the Twin Gates trailhead. As stated in Section 3, Mott MacDonald does not believe that any modification to the visitation estimates presented in the *Projected Visitor Counts and Parking Needs,* PlaceWorks, January 12, 2016 (see **Appendix C**) is necessary in light of Twin Gates visitation. Projected operations on the study roadway segments and proposed trailhead driveways would remain adequate with the small amount of overflow traffic from the Twin Gates trailhead. However, as previously noted, there is potential that the Phase 1 parking supply at the project trailhead may not be sufficient on peak days. The recommended parking improvements at the project trailhead staging area would also be more than adequate to accommodate the minimal amount of potential demand from overflow traffic from the Twin Gates trailhead. Long-term, as the staging area can be expanded to as many as 98 spaces, there is more than adequate parking supply to accommodate any overflow demand from the Twin Gates trailhead.

Note: As diversion of visitors from the Twin Gates trailhead to the project trailhead would be relatively infrequent, it would not affect the projected overall attendance rates or trip generation estimate for the project trailhead.

8 Recommendations

This chapter summarizes the recommendations discussed earlier in this document.

8.1 Existing Conditions

No improvements recommended under this scenario.

8.2 Existing plus Project Conditions

1. Add “ONE WAY” (R6-1 or equivalent) and “DO NOT ENTER” (R5-1 or equivalent) signs throughout the parking area on one-way roadways. Such signs and pavement markings are also recommended at the entry and exit driveways, in locations that would not obstruct the available sight distance. (Responsibility: Project Applicant)
2. Add signs near the general parking area that direct visitors with trailers to the designated horse trailer parking area. (Responsibility: Project Applicant)
3. Consider adding a pathway from the parking area to the trails. (Responsibility: Project Applicant)
4. Increase Phase 1 overflow capacity be either: (1) constructing at least two of the future general vehicle spaces, thereby increasing the total initial number of vehicle spaces under Phase 1 to at least 17 spaces, (2) simply grading (i.e., unfinished grading) some of the Phase 2 or Phase 3 spaces to be used as overflow if all of the other spaces are filled, or (3) utilizing an adaptive management approach to monitor parking capacity and to expand the capacity as needed. (Responsibility: Project Applicant)
5. Construct at least one additional horse trailer space in the overflow parking area under future conditions, or allow horse trailer parking in these spaces when other horse trailer spaces are filled. (Responsibility: Project Applicant)
6. Santa Cruz County should consider modifying its bicycle plan to extend the proposed Class II bicycle lanes on Empire Grade from Pine Flat Road to the trailhead. (Responsibility: County of Santa Cruz)

8.3 Cumulative Conditions

No additional improvements recommended under this scenario.

9 References

9.1 List of References

1. *Santa Cruz County Bicycle Plan,* Santa Cruz County Public Works Department, March 2011.
2. "Projected Visitor Counts and Parking Needs," PlaceWorks, January 12, 2016.
3. *2014 Regional Growth Forecast,* Association of Monterey Bay Area Governments (AMBAG), Adopted June 11, 2014.
4. *Highway Design Manual,* 6th Edition, California Department of Transportation (Caltrans), updated March 7, 2014.
5. *California Manual on Uniform Traffic Control Devices,* California Department of Transportation (Caltrans), Updated November 7, 2014.

9.2 List of Contacts

1. Isby Fleischmann, PlaceWorks, Berkeley, California.
2. Terri McCracken, PlaceWorks, Berkeley, California.
3. Brian Largay, Land Trust of Santa Cruz County, Santa Cruz, California.
4. Jack Sohriakoff, Santa Cruz Public Works Department (formerly), Santa Cruz, California.
5. Rodolfo Rivas, Santa Cruz Public Works Department, Santa Cruz, California.

Appendix A

Level of Service
Descriptions

APPENDIX
LEVEL OF SERVICE THRESHOLD VOLUMES FOR VARIOUS ROADWAY TYPES
TOTAL DAILY VOLUMES IN BOTH DIRECTIONS (ADT)
(Rural Highway)

ROADWAY TYPE	CODE	LOS A	LOS B	LOS C	LOS D	LOS E
2-Lane Rural Highway (level terrain)	2R-L	4,000	8,000	12,000	17,000	25,000
2-Lane Rural Highway (rolling terrain)	2R-R	3,000	6,000	9,000	12,750	18,750
2-Lane Rural Highway (mountainous)	2R-M	2,000	4,000	6,000	8,500	12,500
2-Lane Rural Highway (very mountainous)	2R-VM	1,000	2,000	3,000	4,250	6,250

Notes:

1. The above threshold volumes for preliminary planning purposes only. If available, the results of detailed level of service analyses will typically have priority over the levels of service derived from this table. In that case this table can be used by the analyst for providing additional considerations for recommending the appropriate general roadway type for the specific condition being analyzed.
2. All above facilities assume a 60%/40% peak hour directional split. All above facilities assume peak hour representing approximately 10% of the Average Daily Traffic (ADT), except for mainline freeway facilities, which assume peak hour representing 9% of the Average Daily Traffic (ADT).
3. Based on *Highway Capacity Manual*, Transportation Research Board, 2010.
4. Rural highway (level terrain) is generally consistent with the *2010 Highway Capacity Manual* rural highway, assuming 8% trucks, 4% RV's, 20% no-passing, and level terrain. The greatest difference is that it assumes a maximum capacity (upper end of LOS E) of 25,000 rather than the 28,000 calculated using the new *Highway Capacity Manual*.
5. Rural Highway (rolling terrain) thresholds are estimated at 15% of Rural Highway (level terrain).
6. Rural Highway (mountainous) thresholds are estimated at 25% of Rural Highway (level terrain).
7. Rural Highway (very mountainous) thresholds are estimated as 50% of Rural Highway (level terrain).

Appendix B

Traffic
Counts

Location: Empire Grade S/O Crest Ranch driveway
Date Range: 6/20/2016 - 6/26/2016
Site Code: 01

	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday					
	6/20/2016			6/21/2016			6/22/2016			6/23/2016			6/24/2016			6/25/2016			6/26/2016			Mid-Week Average		
Time	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	1	0	1	2	5	7	1	3	4	1	3	4	1	4	5	3	1	4	1	1	2	1	4	5
1:00 AM	0	0	0	0	0	0	1	0	1	0	1	1	1	0	1	1	1	2	1	5	6	0	0	1
2:00 AM	1	1	2	0	0	0	1	1	2	0	0	0	0	0	0	2	0	2	1	0	1	0	0	1
3:00 AM	1	0	1	2	0	2	2	0	2	0	0	0	1	0	1	1	1	2	1	0	1	1	0	1
4:00 AM	2	1	3	1	3	4	1	3	4	3	2	5	2	1	3	1	1	2	0	0	0	2	3	4
5:00 AM	13	2	15	10	2	12	14	0	14	13	1	14	11	1	12	0	0	0	1	1	2	12	1	13
6:00 AM	49	3	52	44	5	49	44	5	49	52	5	57	53	2	55	10	2	12	7	1	8	47	5	52
7:00 AM	25	9	34	34	7	41	18	12	30	13	10	23	11	5	16	5	4	9	5	1	6	22	10	31
8:00 AM	30	9	39	29	11	40	16	9	25	16	10	26	18	17	35	17	8	25	9	7	16	20	10	30
9:00 AM	33	12	45	22	17	39	22	15	37	11	12	23	19	18	37	12	12	24	16	10	26	18	15	33
10:00 AM	13	12	25	12	9	21	8	20	28	16	15	31	25	12	37	28	12	40	19	11	30	12	15	27
11:00 AM	22	16	38	19	19	38	17	10	27	20	23	43	12	24	36	28	23	51	26	24	50	19	17	36
12:00 PM	19	13	32	17	8	25	14	13	27	19	12	31	15	17	32	34	56	90	25	16	41	17	11	28
1:00 PM	16	16	32	15	25	40	13	14	27	17	11	28	15	19	34	39	40	79	37	14	51	15	17	32
2:00 PM	8	17	25	12	16	28	12	13	25	16	14	30	13	20	33	19	27	46	50	30	80	13	14	28
3:00 PM	13	13	26	16	23	39	11	23	34	11	18	29	15	44	59	21	20	41	31	26	57	13	21	34
4:00 PM	9	50	59	19	63	82	16	47	63	11	49	60	20	22	42	24	21	45	9	20	29	15	53	68
5:00 PM	19	31	50	12	17	29	16	17	33	20	15	35	18	18	36	22	13	35	13	7	20	16	16	32
6:00 PM	18	13	31	8	13	21	7	14	21	12	9	21	14	14	28	17	9	26	15	10	25	9	12	21
7:00 PM	9	4	13	4	8	12	11	7	18	8	9	17	11	12	23	15	18	33	10	7	17	8	8	16
8:00 PM	7	6	13	7	7	14	5	6	11	5	5	10	7	6	13	8	9	17	4	3	7	6	6	12
9:00 PM	4	4	8	10	3	13	4	5	9	4	6	10	2	10	12	13	13	26	9	3	12	6	5	11
10:00 PM	4	3	7	3	3	6	0	4	4	7	7	14	10	15	25	5	8	13	2	2	4	3	5	8
11:00 PM	4	1	5	4	1	5	1	3	4	4	7	11	4	3	7	3	3	6	3	2	5	3	4	7
Total	**320**	**236**	**556**	**302**	**265**	**567**	**255**	**244**	**499**	**279**	**244**	**523**	**298**	**284**	**582**	**328**	**302**	**630**	**295**	**201**	**496**	**279**	**251**	**530**
Percent	**58%**	**42%**	-	**53%**	**47%**	-	**51%**	**49%**	-	**53%**	**47%**	-	**51%**	**49%**	-	**52%**	**48%**	-	**59%**	**41%**	-	**53%**	**47%**	-

1. Mid-week average includes data between Tuesday and Thursday.

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Location: Felton Empire Rd Btwn Empire Grade and Maverick Ct
Date Range: 7/27/2017 - 8/2/2017
Site Code: 01

	Thursday			Friday			Saturday			Sunday			Monday			Tuesday			Wednesday					
	7/27/2017			7/28/2017			7/29/2017			7/30/2017			7/31/2017			8/1/2017			8/2/2017			Mid-Week Average		
Time	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total
12:00 AM	7	10	17	1	14	15	4	15	19	8	20	28	4	12	16	7	9	16	3	9	12	6	9	15
1:00 AM	5	7	12	5	9	14	2	11	13	2	8	10	1	4	5	2	6	8	0	3	3	2	5	8
2:00 AM	3	1	4	4	0	4	2	4	6	4	4	8	4	2	6	4	2	6	3	1	4	3	1	5
3:00 AM	1	1	2	1	1	2	1	1	2	2	2	4	4	2	6	5	2	7	3	2	5	3	2	5
4:00 AM	12	2	14	9	0	9	4	2	6	2	1	3	12	0	12	11	1	12	16	0	16	13	1	14
5:00 AM	33	15	48	26	4	30	9	1	10	7	1	8	37	10	47	27	13	40	41	13	54	34	14	47
6:00 AM	39	35	74	47	27	74	17	7	24	21	5	26	50	24	74	51	30	81	51	30	81	47	32	79
7:00 AM	83	23	106	85	26	111	30	28	58	37	11	48	79	28	107	85	27	112	84	37	121	84	29	113
8:00 AM	107	47	154	104	43	147	80	37	117	46	22	68	113	48	161	89	48	137	96	42	138	97	46	143
9:00 AM	100	43	143	83	45	128	94	49	143	58	64	122	81	51	132	97	44	141	84	66	150	94	51	145
10:00 AM	63	54	117	65	45	110	86	63	149	79	56	135	81	55	136	72	46	118	72	48	120	69	49	118
11:00 AM	73	56	129	84	77	161	82	94	176	75	81	156	67	54	121	88	51	139	99	66	165	87	58	144
12:00 PM	99	76	175	60	84	144	87	96	183	82	95	177	82	66	148	72	53	125	92	72	164	88	67	155
1:00 PM	88	69	157	72	73	145	102	81	183	97	100	197	64	78	142	82	64	146	71	94	165	80	76	156
2:00 PM	93	83	176	83	86	169	106	105	211	94	80	174	72	85	157	81	83	164	71	78	149	82	81	163
3:00 PM	67	97	164	75	86	161	90	90	180	60	73	133	81	96	177	74	99	173	72	74	146	71	90	161
4:00 PM	107	91	198	88	83	171	90	97	187	80	75	155	100	80	180	94	102	196	77	101	178	93	98	191
5:00 PM	62	116	178	72	92	164	88	80	168	73	80	153	66	130	196	91	107	198	84	97	181	79	107	186
6:00 PM	60	103	163	54	103	157	56	80	136	78	69	147	53	105	158	51	108	159	59	108	167	57	106	163
7:00 PM	27	84	111	45	80	125	47	49	96	39	48	87	39	83	122	37	82	119	45	72	117	36	79	116
8:00 PM	29	43	72	30	53	83	44	63	107	27	54	81	26	49	75	35	46	81	27	65	92	30	51	82
9:00 PM	14	65	79	22	55	77	17	50	67	23	38	61	16	43	59	22	54	76	15	38	53	17	52	69
10:00 PM	16	35	51	14	31	45	16	41	57	6	17	23	9	33	42	12	29	41	11	26	37	13	30	43
11:00 PM	7	12	19	7	18	25	10	31	41	4	21	25	8	20	28	11	27	38	8	15	23	9	18	27
Total	**1,195**	**1,168**	**2,363**	**1,136**	**1,135**	**2,271**	**1,164**	**1,175**	**2,339**	**1,004**	**1,025**	**2,029**	**1,149**	**1,158**	**2,307**	**1,200**	**1,133**	**2,333**	**1,184**	**1,157**	**2,341**	**1,193**	**1,153**	**2,346**
Percent	**51%**	**49%**	-	**50%**	**50%**	-	**50%**	**50%**	-	**49%**	**51%**	-	**50%**	**50%**	-	**51%**	**49%**	-	**51%**	**49%**	-	**51%**	**49%**	-

1. Mid-week average includes data between Tuesday and Thursday.

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Appendix C

Projected Visitor Counts
and Parking Needs,
Placeworks,
January 12, 2016

MEMORANDUM

DATE	January 12, 2016
TO	Bryan Largay Land Trust of Santa Cruz
FROM	Isabelle Minn and Isby Fleischmann, PlaceWorks
RE	Projected Visitor Counts and Parking Needs

This memorandum addresses future visitor use at the San Vicente Redwoods property. Visitors will access the property for various passive recreational activities, including dog walking, hiking, mountain biking, horseback riding, and picnicking. The number of visitors may affect traffic, parking needs, enforcement, and financial considerations, such as revenue generated from parking fees and the impact to the maintenance budget. Therefore, estimating visitor use is key to the planning, design, and environmental review processes.

METHODOLOGY

Visitor use was estimated for the San Vicente Redwoods property based primarily on comparisons with current visitor use at comparable parks and open spaces in the region, as well as our experience with open space and public access planning. Tracking visitation at existing open space preserves and parks is important to management and planning efforts. Visitor use at comparable parks and open spaces presented in this memorandum is based on both quantitative data and qualitative accounts and estimates from the users and managers of the properties. Information provided by managers of other open space preserves and parks are based on the best data available or observations, and represents best estimates rather than precise data. In order to compare information and estimates from different agencies, estimates were used to calculate annual, weekly, and daily visitation. When visitor use estimates were separated by type of use, analysis focused on use types that were consistent with uses planned for San Vicente Redwoods.

The ratio of trail users per mile of trail was also considered when comparing properties. While the National Recreation and Park Association (NRPA) standards for typical visitor counts is 90 users per day per mile on urban trails and 40 users per day per mile on rural trails, the average number of visitors on the comparable properties in Santa Cruz County was 8.3 visitors per mile of trail. Therefore, the NRPA standards were not assumed to be applicable for San Vicente Redwoods.

Key considerations for estimating visitor use include open space characteristics and facilities that will draw visitors, as well as the ease with which these facilities can be reached. Therefore, the attributes considered for comparable parks and open spaces included property size, unique features, facilities, trail connections, allowable uses, and accessibility to nearby urban areas.

VISITATION AT COMPARABLE PARKS AND OPEN SPACES

To estimate expected visitor use for San Vicente Redwoods, three open space properties located within Santa Cruz County were considered. These were selected due to their similarity to San Vicente Redwoods in either size, miles of trail, allowed uses, and accessibility from nearby the urban areas of Santa Cruz and San Jose. Several properties managed by Santa Clara County Parks and Midpeninsula Regional Open Space District (MROSD) were also reviewed in order to provide greater context. An overview of these properties is provided below and summarized in Table 1, emphasizing relevance to future use at San Vicente Redwoods. In addition to these comparable properties, projected future visitation at the Bureau of Land Management's Coast Dairies property and its implications to San Vicente Redwoods is discussed.

THE FOREST OF NISENE MARKS STATE PARK

Characteristics

The Forest of Nisene Marks State Park is a 10,257 acre property with approximately 30 miles of trails. Running, hiking, mountain biking, picnicking, backpacking, and camping (although negligible) are all uses allowed in the park. Similarly to San Vicente Redwoods, dogs are allowed on the entrance road only and the only restroom facility is located at the park entrance. Nisene Marks has three parking lots with a combined capacity of 60-85 cars and 3 trailers.

Accessibility

The Forest of Nisene Marks is 10.7 miles (a 22-minute drive) from Santa Cruz, 12.8 miles (a 26-minute drive) from Watsonville, and 40.4 miles (a 55-minute drive) from San Jose. There is one primary access point for the Park. In addition, there are numerous neighborhood trailheads around the Nisene Marks that support walk-in access from the rural residential communities that border the property, as well as from the more urban communities of Soquel and Aptos to the south. Many people live, work, and/or shop in the Cabrillo College and Aptos Village areas, which are within a quarter- to half-mile distance from Nisene Marks.

Estimated Existing Use

Estimates presented in this memorandum for visitation at both Nisene Marks and Wilder Ranch are based on California State Parks' monthly tracking, which considers actual counts and estimates of visitors that are not captured by the counts.

An estimated 106,094 people visit Nisene Marks annually, based on 2013 data provided by California State Parks, Santa Cruz District.[1] This is equivalent to 10 visitors per day per mile of trail. For both Nisene Marks and Wilder Ranch, typical peak use is estimated to be from 11am to 3pm on weekends and 4pm to 5pm on weekdays.

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[1] E-mail from Alaina Boys, CSP, Santa Cruz District, on January 30, 2015

Implications for San Vicente Redwoods

The Forest of Nisene Marks State Park provides slightly less trail mileage than San Vicente Redwoods would provide for at buildout, but offers additional uses including camping and backpacking. Additionally, Nisene Marks is connected to the trail network of Soquel Demonstration State Forest, just as San Vicente Redwoods is envisioned as connecting to the future trails on the Coast Dairies property. While many characteristics of Nisene Marks parallel those anticipated for San Vicente Redwoods, its annual visitation is likely somewhat greater than the future visitation at San Vicente Redwoods due to high level of walk-in use.

WILDER RANCH STATE PARK

Characteristics

Wilder Ranch State Park is a 7,000 acre property with approximately 34 miles of trails, including roads and singletrack for hiking, mountain biking, and horseback riding. In addition to trail use, camping is allowed and living history demonstrations and tours are provided. The park includes coastal terraces, valleys, and views of historical ranch buildings and gardens.

Accessibility

Wilder Ranch is less than 2.0 miles north of the City of Santa Cruz limits (a 5-minute drive) from Santa Cruz, 21.6 miles (a 34-minute drive) from Watsonville, and 36.0 miles (a 48-minute drive) from San Jose. Wilder Ranch has four parking lots, one paved and three unpaved. The paved parking lot has 74 vehicle spaces and 3 trailer/bus spaces, and the unpaved parking areas fit a combined 150-160 vehicles.

Estimated Existing Use

An estimated 472,809 people visit Wilder Ranch annually, based on 2013 data provided by California State Parks, Santa Cruz District. This is equivalent to 38 visitors per day per mile of trail.

Four annual special events are held at the park in April, July, October, and December. The events in April and December attract approximately 2,500 visitors, October's event attracts approximately 3,000 visitors, and July's attracts approximately 5,000 people. Visitation is equivalent to 38 users per day per mile of trail, however, this includes all visitation including visitors including non-trail users.

Implications for San Vicente Redwoods

Wilder Ranch has significantly higher use than other parks referenced in this memorandum. It is assumed that the high use is due largely to the proximity to Santa Cruz as well as the diversity of user experiences available, including different use types and natural and cultural resources. San Vicente Redwoods is slightly further from Santa Cruz and San Jose than Wilder Ranch, and will have fewer attractions and facilities. However, the high volume of use at Wilder Ranch does indicate high demand for trail use in the Santa Cruz area.

SOQUEL DEMONSTRATION STATE FOREST

Characteristics

The Soquel Demonstration State Forest (SDSF) is a 2,681 acre property with approximately 24 miles of trails. As with San Vicente Redwoods, allowable uses at SDSF include hiking, mountain biking, horseback riding, and picnicking, and not camping. Located on the San Andreas and Zayante faults, SDSF is only two miles north of the 1989 Loma Prieta earthquake epicenter. Geological activity has created steep slopes on the property, which are an attraction for mountain bikers. There are no restrooms or developed water sources on the property.

Accessibility

Soquel Demonstration State Forest is 22.2 miles (a 40-minute drive) from Santa Cruz, 17.5 miles (a 43-minute drive) from Watsonville, 28.0 miles (a 43-minute drive) from San Jose, and 56.1 miles (a 71-minute drive) from Half Moon Bay. The road to SDSF is narrow and often closed making it difficult to access.

Estimated Existing Use

Based on a combination of quantitative data and qualitative accounts, SDSF staff estimates that there are an estimated 20,000 visitors annually, including 2,700 hikers, 300 mushroom collectors, and 17,000 mountain bikers.[2] Over 60 percent of these visitors come on the weekend versus during the week. On any given weekend day, there are at least 75 vehicles located at the main entrance in the parking area and along Highland Way.

Implications for San Vicente Redwoods

SDSF is more challenging to access than San Vicente Redwoods will be given distance from urban areas. However, the property provides similar attractions (trails in forested environment) and receives a high volume of mountain bike use. It is assumed that San Vicente Redwoods will also receive a high percentage of mountain bike use, and that overall use will be higher than estimated for SDSF.

COMPARABLE OPEN SPACE AND PARKS IN NEIGHBORING COUNTIES

The properties described above are anticipated to provide the greatest insight into future use of San Vicente Redwoods. In order to provide a greater sample size, visitation estimates from Santa Clara County Parks and MROSD were also reviewed. Both agencies own and manage large parks and/or open space preserves within the region.

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[2] Conversation with Angela Bernheisel at CALFIRE, on January 29, 2015. Note: new trail counters were recently installed on all major trails in SDSF in order to more accurately estimate recreation user numbers. However, the trail counters have not provided complete or accurate information thus far because they are not located on every trail, some are missing or damaged, and they can over count visitors who walk past them multiple times.

Santa Clara County Parks: Upper Stevens Creek

The Santa Clara County Department of Parks and Recreation Weekly Activity Report Summary for 2013 estimates that individual parks receive between 3,500 and 617,000 annual users. Upper Stevens Creek Park was identified as having similar attractions as San Vicente Redwoods.

Upper Stevens Creek Park is a 92-acre property that includes a non-power boating reservoir, picnic areas, and over 11 miles of single-track and multi-use trails for hiking, biking, and horseback riding. While Stevens Creek has only 11 miles of trail, it is connected to the Bay Area Ridge Trail and other open space areas, which provides for longer rides than planned for San Vicente Redwood. Upper Stevens Creek is 6.0 miles (15 minute drive) from the closest city (Saratoga), and 15.7 miles (a 23-minute drive) from San Jose, the closest major urban area. Based on the County of Santa Clara Parks and Recreation Department's 2013 Full Activity Report, there were 15,968 visitors in 2013. Of these visitors, all were trail users and 9,443 (59%) were mountain bikers. This is equivalent to 4 users per day per mile of trail.

Midpeninsula Regional Open Space District: El Corte Madera Creek Open Space Preserve

Midpeninsula Regional Open Space District owns and manages numerous open space preserves that provide trail opportunities to the public. El Corte Madera Creek Open Space Preserve was identified as having similar attributes as envisioned for San Vicente Redwoods. El Corte Madera Creek Open Space Preserve is a 2,817 acre preserve offering 28 miles of trails for hiking, biking and equestrian use. The Preserve is located 7 miles from the Town of Woodside, and therefore in closer proximity to the City of San Francisco and surrounding urban areas than San Vicente Redwoods. Based on the District's Visitor Estimate Survey project which collected data between 2007 and 2010, El Corte Madera Creek Open Space Preserve receives an estimated 89,435 visitors per year. This is equivalent to 8 users per day per mile of trail.

COAST DAIRIES

Projected Visitation

The Bureau of Land Management's Coast Dairies property borders the San Vicente Redwoods property to the southwest and is connected to San Vicente Redwoods by several roads including Warrenella Road. While the property is not currently open for public access, the deed restrictions state that the property will provide public access. Efforts are currently underway to have the property designated as a National Monument, which would elevate the visibility and status of the property.

Based on conversations with staff and the Interim Access Plan that was developed in 2013, it is anticipated that the Interim Access Stage (0-5 years) would include two hiking trails, property tours, and/or volunteer opportunities on management projects, and that the "Long-Term Access Stage" (5-10 years) would potentially include over 50 miles of trails and specific projects, such as a visitor center. BLM staff estimate that annual visitation will range between 50,000 and 150,000 during Interim Access, and between 100,000 and 300,000 at full buildout, with the potential for higher visitation should the property be designated as a National Monument.[3] For instance, visitation at Ford Ord National Monument increased substantially since its designation (from approximately 250,000 or 300,000 before designation in 2012 to approximately 450,000 in 2014; representing a 50-percent increase).[4] BLM staff projects that National Monument Status designation for Coast Dairies could increase local use, but much of the additional use would be generated by tour buses, individuals collecting National Park and Monument stamps, sight-seers that conduct brief visits and do not utilize the extended trail network, and other non-local users. The amount of increase would depend on the type of designation, but is not expected to reach visitation levels at Ford Ord, where there is significant highway/road access, a variety of historical and natural attractions, and accessibility to southern, central and northern California populations.

Total annual visitation is generally higher at nationally recognized parks and open spaces in the region than the regional properties discussed above, based on review of visitation counts at Point Reyes National Seashore, Pinnacles National Park, and Fort Ord National Monument. Visitation at Wilder Ranch State Park, however, is comparable to that at nationally recognized sites. As discussed above, visitation at Ford Ord National Monument increased substantially following designation.

Annual visitation for Point Reyes National Seashore, Pinnacles National Park, and Fort Ord National Monument ranges between 244,943 and 2,711,090, as indicated in Table 2. However, the size, features, and attractions also vary dramatically. In order to provide a more meaningful comparison, annual use per trail mile and per acre of land were also reviewed, as shown in Table 2. While there are many features that could be compared, acreage and trail miles were selected as they allow for comparison with other properties discussed in this memorandum. Based on this analysis, if Coast Dairies were to reach 300,000 annual visitors per year, it would be within the low-range of use at the comparable National Monuments in terms of visitors per trail mile or visitors per acre. This analysis provides some insight into future use at Coast Dairies, but is not assumed to be comprehensive or definitive; further research would be necessary to confirm these preliminary findings.

Implications for San Vicente Redwoods

Future trail connection(s) between San Vicente Redwoods and the Coast Dairies property would result in visitors utilizing both properties during one recreational experience, and enable visitors to

[3] PlaceWorks Conversation with David Moore, Outdoor Recreation Planner, US Bureau of Land Management, April 2, 2015.

[4] PlaceWorks Conversation with David Moore, Outdoor Recreation Planner, US Bureau of Land Management, April 2, 2015, and email communication on 4/14/2015.

use staging areas at either property to access the connected trail system. Given the integration of these properties, it is anticipated that the visitation levels at one property will have direct implications to visitation and parking demand at the other property.

Visitation at Coast Dairies is projected to range between 100,000 and 300,000 at full buildout, with the potential for higher visitation should the property be designated as a National Monument. However, the increase in visitation related to National Monument designation is not likely to result in a substantial increase in visitors to the San Vicente Redwoods' Empire Grade staging area. This is because many of the visitors are likely to be short-stay visitors of the immediate Monument area that will not use the trail network to access adjacent San Vicente Redwoods, and because the San Vicente Redwoods staging area will be more difficult to access from major highways. Coast Dairies staging areas are assumed to provide adequate capacity to accommodate future visitor use of that destination with consideration to a national designation and to trail users that will park at Coast Dairies and connect to San Vicente Redwoods trails. However, given the potential for designation to increase use, the design of the San Vicente Redwoods staging area should consider the potential for future expansion.

ESTIMATED VISITOR USE AT SAN VICENTE REDWOODS

ESTIMATED USE FOR PHASE 1

During Phase 1, it is estimated that 13,140-14,600 people will visit San Vicente Redwoods annually. This is based on the following understanding and assumptions:

- **Characteristics and Facilities.** Under the Draft Master Plan, Phase 1 includes 4 miles of multi-use trails for hiking, mountain biking, and horseback riding. These trails are located on existing fire roads in the northern portion of the 8,500 acre property. Dog-walking is allowed on the 1.5-mile trail that runs parallel to Empire Grade Road. Phase 1 trails would be located within forested habitat with minimal variation, although several viewpoints into Devil's Gulch may attract visitors.
- **Accessibility.** Under Phase 1, the only access point for the recreational trails would be a staging area on Empire Grade Road. This location is 40.3 miles (a 57-minute drive) from San Jose, 15.0 miles (a 28-minute drive) from Santa Cruz, 32.5 miles (a 50-minute drive) from Watsonville, and 49.7 miles (a 66-minute drive) from Half Moon Bay.
- **Visitors per mile of trail.** This estimate assumes 9-10 visitors per mile of trail. It is assumed that Phase 1 visitation will be initially higher per mile of trail than most comparable properties given the novelty of a new open space. However, given limited facilities and attractions as well as the distance to Santa Cruz and other urban areas, it is assumed that use will be significantly lower than experienced at Wilder Ranch State Park.

ESTIMATED USE FOR BUILDOUT

For Buildout, it is estimated that 83,220-97,090 people will visit San Vicente Redwoods annually. This is based on the following understanding and assumptions:

- **Characteristics.** At buildout, there would be approximately 38 miles of trails, including existing roads and new singletrack trails. Trails would be primarily separate use, and dog-walking would continue to be limited to the trail running parallel to Empire Grade Road. Through-trails would be established for all use types from Empire Grade to the Coast Dairies property, constituting a skyline-to-sea trail experience, and several internal loop-trails would be established. Trails would generally be within forested habitat. Key features visible from the trail network would generally be limited to include working forest, established forest, and the old railroad grade, as well as the potential skyline-to-sea trail. Limited picnic tables (no group sites) and benches would be provided, and camping would not be allowed.

- **Accessibility.** There are no additional parking lots planned for Buildout, however an overflow parking area in proximity to the main parking lot may be considered. However, an additional access point will be the connection to the Coast Dairies property and its future trail networks. This access point would be approximately 12 miles north of the City of Santa Cruz. It is anticipated that visitation would be notably higher at buildout, yet given the limited access points and distance to many of the new trails it is anticipated that the increase in visitation will not reflect the increase in trails (buildout=9.5X the trail mileage of phase 1).
- **Visitors per mile of trail.** This estimate assumes 6-7 visitors per mile of trail, which is lower than the assumption for Phase 1 as the visitation is not expected to increase at the same rate as trail mileage due to limited accessibility, as described above. This estimate is slightly lower than estimates for the Forest of Nisene Marks State Park and El Corte Madera Creek Open Space Preserve which is appropriate given that both these properties provide for more uses than San Vicente Redwoods and that Nisene Marks State Parks has a greater number of neighbors with walk-in access.

IMPLICATIONS FOR PARKING DEMAND

Visitation has a direct relationship to parking demand, and therefore projected visitation is a critical tool when planning parking and staging areas. Parking areas that do not accommodate actual use will lead to illegal parking, congestion, and negative visitor experience. Parking areas that are oversized for actual use can cause unnecessary impacts to resources and can be experienced as scars on the landscape. Appropriately sized parking areas will be designed for the optimal footprint needed to accommodate demand on average high-use days.

ESTIMATED DEMAND

Parking demand was estimated for San Vicente Redwoods based on the assumptions identified below, which were developed with consideration to existing parking supply/demand at the comparable parks and open space preserves discussed above as well as PlaceWorks' experience with similar projects. Parking estimates are based on the high end of the range of expected annual visitors.

PLACEWORKS

Phase 1

It is anticipated that 12 parking spaces and 1-2 equestrian trailer spaces would accommodate demand during Phase 1 based on the following assumptions:

- Visitation projections of 14,600 at Phase 1
- 75-percent of visitation will take place on the weekend, equally distributed between Saturday and Sunday (equivalent to 105 visitors/ day on a weekend day)
- 85-percent of visitors will drive-in (others will walk, hike, bike or ride-in; there will be no access from Coast Dairies property)
- Of visitors that drive-in, there will be an average of 2.5 visitors/vehicle
- Vehicles will stay an average of 3 hours, therefore 3 vehicles can occupy one parking space each (3 vehicles/parking space/day)
- Equestrian trailer demand will be lower than Forest of Nisene Marks State Park (3 trailer spaces) given lower trail mileage

Buildout

It is anticipated that 47 parking spaces and 3-5 equestrian trailer spaces would accommodate demand at the Empire Grade Staging Area at Buildout based on the following assumptions:

- Visitation projections of 97,090 at Buildout
- 75-percent of visitation will take place on the weekend, equally distributed between Saturday and Sunday (Equivalent to 698 visitors/ day on a weekend day)
- Staging areas at Coast Dairies will be have adequate capacity to accommodate Coast Dairies' visitors
- 50-percent of visitors will drive-in (others will walk, hike, bike or ride-in; it is anticipated that many will access the property via trail connections to the Coast Dairies property)
- Of visitors that drive-in, there will be an average of 2.5 visitors/vehicle
- Vehicles will stay an average of 3 hours, therefore 3 vehicles can occupy one parking space each (3 vehicles/parking space/day)
- Equestrian trailer demand will be comparable to demand at the Forest of Nisene Marks State Park (3 trailer spaces)
- The Coast Dairies property is opened for public access and trail connections between San Vicente Redwoods and Coast Dairies staging areas will be completed (if this is not the case, visitation projections will remain at Phase 1 levels)

RECOMMENDATIONS FOR EMPIRE GRADE STAGING AREA

It is recommended that the staging area be designed to accommodate 50-60 vehicles and 3-5 trailers at Buildout, and 12 vehicles and 2 trailers during Phase 1. To maximize parking space and flexibility, it is recommended that the trailer spaces be designed as flexible parking space that can accommodate vehicles when necessary. Should Coast Dairies be designated as a National Monument, there is potential for a limited increase in parking to demand. To achieve the goal of minimizing the impacts from overflow parking on the surrounding neighborhoods and to accommodate the potential for future parking demand increase due to high, it is recommended that the staging area be designed to accommodate an additional 40 spaces that would be constructed only if use demonstrates they are necessary.

As previously discussed, this recommendation for parking at buildout assumes that many visitors will access San Vicente Redwoods through the Coast Dairies property, and that staging areas at Coast Dairies will accommodate this use. If the Coast Dairies property and trail connections from Coast Dairies to San Vicente Redwoods are not opened to the public, San Vicente Redwoods visitation is projected to remain at Phase 1 levels. While the environmental review process for the San Vicente Redwoods Public Access Plan will be considerate of the relationship between San Vicente Redwoods and Coast Dairies, the Coast Dairies project and any proposed access features for the property will be reviewed under a separate environmental process.

TABLE 1 **Comparison of Open Space Destinations in Santa Cruz County**

	Owner	Size (acres)	Allowable Use	Trail Length (miles)	Driving Time from Nearby Cities (minutes)	Driving Distance from Nearby Cities (miles)	Parking Capacity	Annual Visitation (% by User Type)	Annual Visitation	Weekly Visitation (Annual/52 Weeks)	Daily Visitation (Annual/365 Days)	Weekday Visitation (25%)	Weekend Visitation (75%)	Users/Day/ Trail Miles
The Forest of Nisene Marks State Park	**California State Parks**	10,257	hiking, jogging, mountain biking, picnicking/bbq, camping	30	22 to Santa Cruz, 55 to San Jose,	11 to Santa Cruz, 40 to San Jose	3 parking lots with capacity for a total of 65-75 cars and/or 3 trailers	40% hikers, 50% bikers, 10% equestrians	106,094	2,040	291	102	763	10
Wilder Ranch State Park	**California State Parks**	7,000	hiking, mountain biking, equestrians, camping	34	10 to Santa Cruz, 48 to San Jose	2 to Santa Cruz, 36 to San Jose	74 vehicle spaces and 3 trailer/bus spaces in the main parking lot, 150-160 spaces in the overflow parking lot	35% hikers, 40% bikers, 15% equestrians, 10% visitor center based	472,809	9,092	1,295	453	3,400	38
Soquel Demonstration State Forest	**CalFIRE**	2,681	mountain biking, hiking, mushroom gathering (permit), events (special use permit)	24	43 to San Jose, 40 to Santa Cruz	28 to San Jose, 22 to Santa Cruz	60 parking spaces in main lot; roadside parking for 15+ vehicles on Highland Way	13.5% hikers, 85% bikers, 1.5% mushroom collectors	20,000	385	55	19	144	2
Upper Stevens Creek County Park	**County of Santa Clara**	1,077	hiking/running, mountain biking	11	15 to Saratoga, 23 to San Jose, 46 to Santa Cruz	6 to Saratoga, 16 to San Jose, 30 to Santa Cruz	Northern and southern park entrances; public transit available; Upper Stevens Creek by foot/horse/bike from Stevens Creek or Bay Area Ridge Trail	39% hikers, 59% bikers, 2% equestrians	15,968	307	44	15	115	4
El Corte de Madera Creek	**MROSD**	2,817	hiking, mountain biking, equestrians, picnicking	28	N/A	N/A	N/A	N/A	85,593	1,646	235	82	616	8
San Vicente Redwoods (PHASE 1)	**POST, LTSC, Save the Redwoods League, Sempervires Fund**	8,500	hiking, mountain biking, equestrians, picnicking	4	28 to Santa Cruz, 57 to San Jose	15 to Santa Cruz, 40 to San Jose	TBD	N/A	13,140	252	36	13	95	9
San Vicente Redwoods (BUILDOUT)	*(same as above)*	*(same as above)*	*(same as above)*	38	*(same as above)*	*(same as above)*	TBD	N/A	83,220	1,596	228	80	599	6

MOTT MACDONALD

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January 18, 2019

Terri McCraken
Placeworks
1625 Shattuck Avenue, Suite 300
Berkeley, CA 94709

RE: San Vicente (CEMEX) Redwoods Land Use Public Access Plan

Dear Terri,

Mott MacDonald prepared the Traffic Impact Analysis (TIA) for the adoption and implementation of the proposed San Vicente Redwoods Public Access Plan project in Santa Cruz County (*San Vicente Redwoods Public Access Plan, Draft Report*, Mott MacDonald, September 20, 2017). This letter provides an update to the cumulative condition analysis documented in the TIA.

The cumulative condition traffic volumes that were analyzed in the TIA were determined by applying an average growth rate of 0.5 percent for 20 years to the existing traffic volumes. The average annual growth rate of was based on population growth estimates published by the Association of Monterey Bay Area Governments (AMBAG) in the 2014 Regional Growth Forecast. The 2014 Regional Growth Forecast projects the population for the unincorporated areas of Santa Cruz County would increase from 129,739 people in 2010 to 144,227 people in 2035, an increase of 14,488 people, or an average increase of 0.45 percent per year for 25 years.[1]

The 2018 Regional Growth Forecast was adopted in 2018 and provides population growth estimates for 2040.[2] The 2018 Regional Growth Forecast projects the population for the unincorporated areas of Santa Cruz County would increase from 135,042 people in 2015 to 141,645 people in 2035, an increase of 6,603 people, or an average increase of 0.20 percent per year for 25 years.

1 *2014 Regional Growth Forecast, Technical Documentation*, Association of Monterey Bay Area Governments, Adopted June 11, 2014.
2 *2018 Regional Growth Forecast, Technical Documentation*, Association of Monterey Bay Area Governments, Adopted June 13, 2018.

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The more recent population growth estimates published by AMBAG show a slower rate of growth than the population growth estimates published in 2014 that were utilized as the basis for calculating the cumulative traffic volume forecasts for the San Vicente project TIA. Therefore, the cumulative volume forecasts documented in the San Vicente project TIA are conservatively high. Analyzing the cumulative conditions using the lower growth rate based on the 2018 Regional Growth Forecast would not change the results and conclusions of the San Vicente project TIA.

If you have any questions or need additional information, please contact me at your convenience at (925) 398-7274 or shruti.malik@mottmac.com.

Very truly yours,

Mott MacDonald

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