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ROUX MEMORANDUM

TO: Mark Frederick (Santa Clara County Parks)

FROM: Angela Liang Cutting and Rachel Maxwell (Roux Associates, Inc.)

DATE: February 22, 2017

RE: Summary of Field Surveys for Conceptual 25% Design Plan for Jacques Gulch Remediation, Almaden Quicksilver County Park, San Jose, California

Roux Associates, Inc. (Roux Associates) has prepared this technical memorandum (Memo) to provide Santa Clara County Parks (SCCP) with a summary of the field survey activities conducted at Upper Jacques Gulch, Almaden Quicksilver County Park (Park), San Jose, California (Site). In addition, three potential remedial alternatives for addressing the issue of mercury transport and discharge from Upper Jacques Gulch have been developed based on the findings from the field surveys.

PROJECT BACKGROUND

From around 1845 to the 1970s, mining and processing of mercury-bearing ores (cinnabar) were conducted on land now within the Park. The regional location of the Park is shown on Figure 1. The central mining and processing area during the mid-20th century was atop Mine Hill. Calcine, the waste material left after processing the cinnabar, was typically dumped near the processing area (rotary furnace), including on the hill slopes above Jacques Gulch. During infrequent large rainstorms, water and gravity transported the calcine downhill from Mine Hill in the form of debris flows. The calcine was transported down an unnamed tributary to Jacques Gulch and the main stem of Jacques Gulch, coming to rest in these drainages. Subsequent channel incision and erosion has reworked the calcine, providing an ongoing source of sediment downstream.

The purpose of the Jacques Gulch Remediation Project (Project) is to decrease the mercury loading to San Francisco Bay by minimizing mercury transport and discharge from Upper Jacques Gulch.

SITE DESCRIPTION

Jacques Gulch is located in southern Santa Clara County above Almaden Reservoir, in the headwaters of Alamitos Creek, which is a tributary to Guadalupe River. Jacques Gulch drains about 1.4 square miles bounded by Mine Hill to the northeast, Jacques Ridge to the northwest, and Bald Mountain to the southwest (Aspen Environmental Group, 2008). The Jacques Gulch drainage is immediately upstream of Almaden Reservoir, which it enters via a culvert under Alamitos Road at Hicks Road. The Project Site, Upper Jacques Gulch, is a steep, narrow, and densely vegetated drainage approximately 3,000 feet long with elevation change of over 600 feet and varies in width from approximately 10 to 50 feet. Figure 2 shows the Project Area where calcine was observed and detected during the field surveys.

As shown in Figure 3, the Site is bounded by Wood Road to the north, Hicks Road to the southwest, and Alamitos Road to the southeast. Immediately above the Project Area, extensive removal and stabilization work was undertaken on the face of Mine Hill above Jacques Gulch, in accordance to a Remedial Action Plan (RAP) approved by The Department of Toxic Substances Control (DTSC) in 1994. This was the location from which calcine had migrated downhill into Jacques Gulch several decades ago. Some material was removed from the slope, which was then regraded and extensive surface drainage control installed. In addition, remediation was conducted in and around the Hacienda Furnace entrance to the Park, near the west end of the community of New Almaden. Material excavated from this and other sites on Park property was hauled to a DTSC-approved Consolidation Area (Figure 3) on Mine Hill, and placed in a previously mined open pit area, consolidated, and capped.

FIELD SURVEYS

In order to identify potential sources of mercury in the 3,000-foot long reach of Upper Jacques Gulch and assess the potential for these mercury sources to act as a loading source to the Guadalupe River Watershed, a total of three field surveys were conducted:

1. A preliminary site survey reconnaissance to identify features for follow-up field surveys and sample collection;
2. A field survey to map geologic and hydrologic features and collect soil samples for mercury characterization; and
3. A field survey to map calcines and other mercury mining wastes with visual observation and X-ray fluorescence (XRF).

Details for each field event are summarized below.

Preliminary Field Survey

Roux Associates, Aspen Environmental Group (Aspen), and H.T. Harvey & Associates (HTH) conducted a preliminary field survey on July 26, 2016. The team entered the Project Area from the top of the Site and explored the entire reach of Upper Jacques Gulch. During the field survey, Roux Associates identified potential locations to collect soil samples, documented the extent of visible calcine deposits, and observed erosion features as well as stream water pathways. HTH evaluated the Project Area for biological resources that could pose potential biotic constraints, including the following:

- Habitats regulated by U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW).
- Presence of likely occupied or suitable habitat for Federal or State listed threatened or endangered plant and wildlife species (e.g., California red-legged frog [*Rana aurora draytonii*])
- Likelihood of presence of California plant and wildlife species of special concern, and California Native Plant Society plant species ranked 1A to 4.

HTH also assessed the Project Area for restoration opportunities. The potential biotic constraints and restoration opportunities are presented in Attachment A.

Aspen offered insights into potential California Environmental Quality Act (CEQA) impact issues with regard to potential remediation approaches. In addition to impacts on biota, these included access and haul routes, dust control, and long-term visual scarring.

The access to the Project Area was challenging even exploring by foot. There were no visible trails/pathways through Upper Jacques Gulch. The thick vegetation made access by vehicles highly unlikely. Pictures 1-3 below illustrate the descent to the Project Area.

Picture 1

Picture 2

Picture 3

Along the descent, much of the upper reaches of the gulch were populated with riparian zone vegetation, like reeds and tall grasses. At times, this vegetation had to be crossed to continue down along the Project Area.

Picture 4

Once in the thickly forested portions of the Project Area, both bedrock and tree roots were observed along the streambed. Pictures 4-6 illustrate the extent of visible bedrock and vegetation.

Picture 5

Picture 6

In addition to bedrock and tree roots, calcines were also observed (Picture 7).


Picture 7

These calcines were interbedded in both bedrock and tree roots and at various elevations along the exposed steep side slopes. Removal of these calcines will involve significant slope destabilization due to the removal of bedrock and trees and excavations into the steep slope slopes on either side of the gulch. Pictures 8 and 9 display the interbedded calcines along the Project Area.


Picture 8


Picture 9

One of the reasons that Upper Jacques Gulch is difficult to navigate is due to the steep slope of the narrow drainage course and adjacent hillsides in the Project Area (Picture 10). An access route will have to be constructed so that heavy equipment (e.g., backhoes, excavators, bulldozers, dump trucks) could be utilized for calcine removal.


Picture 10

Geologic and Hydrologic Field Surveys

Roux Associates and Murray Engineers Inc. (MEI) conducted the first and second geologic and hydrologic field survey on August 16 and October 20, 2016, respectively. During both surveys, the team entered the Project Area from the intersection of Alamitos Road and Hicks Road (the bottom of the Site) and explored the entire reach of Upper Jacques Gulch. The team performed geologic mapping to document the nature and extent of mining-related tailings and fill, soil and rock units, seeps (if any), existing erosion control measures, and the limits of landslides and other potential slope instability within the Project Area. The team also collected soil samples and performed XRF soil measurements to refine the distribution and classification of contaminated soil and mine wastes. A Global Positioning System (GPS) surveying equipment was utilized to document the sampling locations.

Summary of Soil Sampling and XRF Measurements

During the August 2016 field survey, Roux Associates collected eight soil samples, RS-2 through RS-9[1], and recorded the GPS coordinates at each sampling location, as shown in Figure 4. The soil samples were submitted under chain of custody to Curtis & Thompkins, a California-certified Laboratory. Before analysis, Curtis & Thompkins composited the following samples: RS-2 through RS-4, RS-5 through RS-7, and RS-8 and RS-9. These three composite samples were renamed JG Composite 1, JG Composite 2, and JG Composite 3, respectively.

The soil samples were analyzed for total mercury (THg) with United States Environmental Protection Agency (EPA) Method 7471A and total organic carbon with the Walkley-Black procedure. In addition, a selective chemical extraction technique was utilized to approximate "bioavailable" mercury. Specifically, an extraction in a weak (0.5%) hydrochloric acid (HCl) solution at room temperature and analysis of the extract for THg (THgHCl) was performed. The extraction method desorbs divalent mercury from the surface of most particulates and dissolves iron compounds that may be accessible by reductive dissolution of iron oxide phases by iron-reducing bacteria. The results from the soil sampling are provided in Table 1.

Soil samples JG Composite 1, JG Composite 2, and JG Composite 3 all had detections of total mercury, bioavailable mercury, and total organic carbon. The total mercury concentrations ranged from 8.8 to 77 milligrams per kilogram (mg/kg), the bioavailable mercury concentrations ranged from 0.014 t0 12 mg/kg, and the TOC percentages ranged from 0.93 to 3.1 percent. The heterogeneity of the soil samples were apparent as bioavailable mercury concentration in JC-2 was higher than the total mercury in JG Composite 2. In addition, there is no clear correlation between bioavailable mercury and TOC, indicating that bioavailable mercury may not be dependent on the amount of organic matter present in the soil.

[1] No sample was collected at location RS-1.

After the composite samples were analyzed, the discrete soil sample at each soil sampling location was analyzed for total mercury. All eight samples had detections of total mercury ranging from 0.62 to 120 mg/kg.

During the October 2016 field survey, Roux Associates measured a total of 86 soil measurements from 28 locations with an XRF and documented the GPS coordinates at each XRF location. At each of the 28 locations, the XRF measurements were started by taking a reading the middle of the gulch and then moving out laterally until a value below the equipment detection limit was obtained. Approximately, three to five XRF measurements were collected at each location. The locations of the XRF measurements are included in Figure 5. XRF is a non-destructive analytical technique used to identify the elemental composition of materials. An XRF unit can determine the chemistry of a sample by measuring the fluorescent (or secondary) X-ray emitted from a sample when it is excited by a primary X-ray source. Each of the elements present in a sample produces a set of characteristic fluorescent X-rays ("a fingerprint") that is unique for that specific element.

Mercury concentration in the soil was measured by placing the XRF analyzer in direct contact with the surface to be tested. However, because the XRF analyzer window is relatively small (less than one square centimeter) variations in the physical character of the sample (e.g., heterogeneity, particle size, surface condition, moisture content) may lead to inconsistent readings. The XRF can only measure the mercury concentrations in surficial samples; therefore, vertical delineation of the calcine in Upper Jacques Gulch was not achieved via XRF measurements. Additionally, the approximate detection limit of the XRF per manufacturer calibration and guidance is approximately 10 to 15 milligrams per kilogram (mg/kg) for a 60 second per filter reading.

Prior to collection of in situ XRF sample readings, the surface was cleared of debris and compacted to increase the smoothness and density of the surface. This method helped further delineate the extent and magnitude of calcines and mining related waste in the Project Area. The results from the XRF measurements are provided in Table 2. The measurements ranged from below the equipment detection limit to 256 mg/kg. The Project Area was revised based on the detections/non-detect of XRF measurements.

Geotechnical Evaluation

Prior to their site visits, MEI researched available geotechnical and geologic documents, including published mapping of landslide features in the vicinity of this Gulch. These features are approximately shown on the attached Figure 6 Lidar/Topo base map. Based on this review, a large majority of the gulch lies along the toe margins of these landsides. Our findings suggest these features are not actively moving as an entire unit, but there is a potential concern for partial reactivation along the toe areas of these landsides. This slope movement could be triggered by natural erosion from rainfall or debris flow scour along the gulch margins or from significant cut excavations during removal

of calcine deposits in this area. Future slope stabilization measures associated with calcine removal will need to take into account global stability of these landslide features.

During these two site visits, MEI noted several relatively small erosional features and shallow landslides along the steep slope margins of the gulch. However, the majority of the slopes observed appear relatively stable. We believe a primary reason is the presence of trees and low lying brush whose well-established root systems add substantial stability to these slopes over time. Picture 11 shows the root system of a Bay Tree that provides significant support to the slope.

Other important reasons adding to the stability of these slopes are the presence of several man-made rock drop structures which reduces stream velocity and erosion, and presence of exposed highly resistant bedrock along portions of the channel. Picture 12 shows one of the man-made rock drop structures.

Picture 12

As previously discussed, calcine deposits were observed embedded in bedrock deposits and sporadically along portions of the side slopes. From a geologic viewpoint, the upper steep heavily vegetated section of the gulch appears to be within an eroded segment of the channel with the majority of the deposition occurring in the lower reaches of the gulch. However, within this steeper zone there appears to be some localized deposition along bends and at different elevations in the channel. Such natural geologic processes make removal of calcine deposits complex and a significant challenge. Based on our field findings, we anticipate the need for near-continuous excavation along the base and side slopes of the gulch which will require significant removal of vegetation presently providing stability to these slopes. Such grading will have significant impacts on temporary and long-term slope stability which will need to be adequately addressed.

Picture 13 shows a portion of the gulch with tree roots and rocks along the bottom of the gulch.

MEI took audio video tapes during their site visits to help visually describe the slope stability and geologic processes occurring along various sections of the channel gulch margins. These videos emphasize 1) the importance of well-established tree roots systems to stability of the channel slopes, 2) the difficult access constraints, and 3) the slope stability concerns/challenges associated with removal of calcine deposits along this segment of the gulch.

Picture 13

During the geologic and hydrologic filed surveys, calcines were detected in the lower reaches of Jacques Gulch (Site B). Picture 14 shows imbedded calcines along the lower reaches of the previously remediated portion of Jacques Gulch.

Picture 14

REFERENCES

Aspen Environmental Group (AEG), 2008. Final Engineer's Report, Jacques Gulch Restoration Project, Prepared for Santa Clara Valley Water District. August 2008.

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), 2007. *Waste Discharge Requirements (WDR) No. R2-2007-005301 for Dublin San Ramon Services District Dedicated Land Disposal Site Class II Land Treatment Unit, Pleasanton, Alameda County*. August 8, 2007.

CH2MHill, 2009. *Dublin San Ramon Services District: 2008 Update to WWTP Odor Control Focus Areas*. July.

Dublin San Ramon Services District (DSRSD), 2015. *2015 Semi-annual Monitoring and Maintenance Report for the Dedicated Land Disposal (DLD) Site, Pleasanton, California*. July.

TABLES

1. Soil Sampling Results
2. Soil XRF Measurements

FIGURES

1. Site Location Map
2. Project Area
3. Project Vicinity and Key Features
4. Soil Sample Locations
5. XRF Locations
6. Location of Landslide Features

ATTACHMENT

A. Upper Jacques Gulch Remediation Project – Preliminary Biotic Constraints and Restoration Opportunities

TABLES

1. Soil Sampling Results
2. Soil XRF Measurements

Table 1: Soil Sampling Results
Upper Jacques Gulch

Location	GPS X (Latitude)	GPS Y (Longitude)	Total Mercury (mg/kg)	Bioavailable Mercury (mg/kg)	Total Organic Carbon (%)
JG Composite 1	--	--	77	12	0.93
JG Composite 2	--	--	8.8	12	2.3
JG Composite 3	--	--	41	0.014	3.1
RS-2	37° 10' 17.513"" N	121° 50' 46.004"" W	71	NA	NA
RS-3	37° 10' 17.005"" N	121° 50' 46.295"" W	23	NA	NA
RS-4	37° 10' 16.196"" N	121° 50' 47.358"" W	120	NA	NA
RS-5	37° 10' 15.991"" N	121° 50' 48.631"" W	40	NA	NA
RS-6	37° 10' 13.939"" N	121° 50' 49.583"" W	7.8	NA	NA
RS-7	37° 10' 7.754"" N	121° 50' 48.204"" W	0.62	NA	NA
RS-8	37° 10' 4.969"" N	121° 50' 47.286"" W	16	NA	NA
RS-9	37° 9' 59.617"" N	121° 50' 45.686"" W	9.1	NA	NA

Notes:
NA: Not analyzed
-- : information not avaliable
N: North
W: West

Table 2: XRF Locations and Results
Upper Jacques Gulch

Location	Mercury (mg/kg)	GPS X (Latitude)	GPS Y (Longitude)	GNSS Height	Time	Width of Observed Calcine (feet)
#1	29 ± 5	37° 9' 52.385" N	121° 50' 48.870" W	208.68	0842	--
#2A	14 ± 4	37° 9' 55.751" N	121° 50' 47.369" W	211.73	0852	4'
#2B	ND < 10	37° 9' 55.774" N	121° 50' 47.344" W	214.73	0858	
#2C	ND < 8	37° 9' 55.725" N	121° 50' 47.370" W	211.85	0859	
#2D	ND < 9	37° 9' 55.774" N	121° 50' 47.397" W	211.68	0912	
#2E	24 ± 5	--	--	--	0913	
#3A	ND < 12	37° 9' 56.253" N	121° 50' 47.046" W	216.20	0917	--
#4A	ND < 13	37° 9' 56.799" N	121° 50' 46.199" W	230.95	0920	--
#5A	21 ± 5	37° 9' 57.091" N	121° 50' 45.981" W	214.71	0923	--
#6A	ND < 10	37° 9' 57.403" N	121° 50' 45.605" W	216.57	0926	--
#7A	31 ± 6	37° 9' 58.076" N	121° 50' 45.232" W	218.98	0933	3'
#7B	ND < 13	37° 9' 58.041" N	121° 50' 45.278" W	219.65	0931	
#7C	19 ± 5	37° 9' 58.086" N	121° 50' 45.203" W	221.40	0934	
#7D	ND < 11	37° 9' 58.061" N	121° 50' 45.151" W	218.78	0936	
#8A	12 ± 4	37° 9' 59.008" N	121° 50' 45.680" W	224.53	0942	6'
#8B	ND < 11	37° 9' 58.940" N	121° 50' 45.804" W	224.25	0945	
#8C	ND < 12	37° 9' 58.960" N	121° 50' 45.730" W	233.51	0948	
#8D	24 ± 5	37° 9' 58.985" N	121° 50' 45.585" W	227.50	0949	
#8E	17 ± 5	37° 9' 58.998" N	121° 50' 45.610" W	224.82	0951	
#8F	ND < 8	37° 9' 59.024" N	121° 50' 45.527" W	222.18	0945	
#9A	ND < 11	37° 10' 0.182" N	121° 50' 45.942" W	227.04	1000	~30'
#9B	17 ± 5	37° 10' 0.174" N	121° 50' 46.022" W	227.23	1002	
#9C	25 ± 4	37° 10' 0.191" N	121° 50' 46.054" W	225.84	1004	
#9D	ND < 10	37° 10' 0.193" N	121° 50' 45.888" W	226.94	1007	
#9E	20 ± 6	37° 10' 0.260" N	121° 50' 45.899" W	221.45	1008	
#9F	ND < 10	37° 10' 0.241" N	121° 50' 45.766" W	227.21	1010	
#10A	ND < 20	37° 10' 1.341" N	121° 50' 46.319" W	227.03	1016	0'
#10B	ND < 13	37° 10' 1.322" N	121° 50' 46.339" W	234.73	1018	
#10C	ND < 11	37° 10' 1.317" N	121° 50' 46.338" W	228.99	1020	
#11A	ND < 11	37° 10' 2.156" N	121° 50' 47.032" W	249.76	1029	0'
#11B	ND < 8	37° 10' 2.238" N	121° 50' 47.306" W	233.84	1031	
#11C	ND < 9	37° 10' 2.260" N	121° 50' 47.111" W	233.36	1032	

Table 2: XRF Locations and Results
Upper Jacques Gulch

Location	Mercury (mg/kg)	GPS X (Latitude)	GPS Y (Longitude)	GNSS Height	Time	Width of Observed Calcine (feet)
#12A	256 ± 12	37° 10' 3.580" N	121° 50' 47.592" W	241.01	1042	~15'
#12B	ND < 11	37° 10' 3.520" N	121° 50' 47.801" W	239.47	1044	
#12C	ND < 11	37° 10' 3.590" N	121° 50' 47.725" W	244.70	1046	
#12D	25 ± 5	37° 10' 3.570" N	121° 50' 47.743" W	241.56	1048	
#12E	ND < 11	37° 10' 3.626" N	121° 50' 47.635" W	242.81	1050	
#13A	19 ± 5	37° 10' 4.492" N	121° 50' 47.577" W	244.93	1109	~30'
#13B	12 ± 4	37° 10' 4.523" N	121° 50' 47.636" W	243.18	1111	
#13C	ND < 10	37° 10' 4.497" N	121° 50' 47.738" W	245.11	1113	
#13D	ND < 10	37° 10' 4.431" N	121° 50' 47.549" W	247.00	1116	
#14A	ND < 11	37° 10' 5.777" N	121° 50' 47.718" W	251.37	1125	6'
#14B	ND < 10	37° 10' 5.874" N	121° 50' 47.662" W	250.83	1126	
#14C	ND < 10	37° 10' 5.855" N	121° 50' 47.631" W	253.25	1128	
#15A	ND < 11	37° 10' 7.533" N	121° 50' 48.181" W	264.84	1135	3'
#15B	ND < 12	37° 10' 7.548" N	121° 50' 48.271" W	264.52	1137	
#15C	15 ± 4	37° 10' 7.421" N	121° 50' 48.187" W	268.76	1139	
#15D	ND < 11	37° 10' 7.566" N	121° 50' 48.083" W	262.87	1141	
#16A	ND < 8	37° 10' 8.408" N	121° 50' 49.597" W	275.51	1150	3'
#16B	17 ± 5	37° 10' 8.328" N	121° 50' 49.694" W	277.47	1152	
#16C	ND < 7	37° 10' 8.452" N	121° 50' 49.605" W	274.78	1154	
#17A	ND < 11	37° 10' 10.466" N	121° 50' 50.411" W	283.03	1200	3'
#17B	ND < 11	37° 10' 10.547" N	121° 50' 50.422" W	287.02	1202	
#17C	ND < 14	37° 10' 10.381" N	121° 50' 50.497" W	296.56	1204	
#17D	22 ± 5	--	--	--	1206	
#18A	20 ± 5	37° 10' 11.594" N	121° 50' 51.723" W	297.03	1214	4'
#19A	ND < 11	37° 10' 13.327" N	121° 50' 50.924" W	308.19	1224	--
#20A	23 ± 4	37° 10' 13.380" N	121° 50' 50.616" W	310.51	1227	4'
#21A	ND < 11	37° 10' 15.064" N	121° 50' 49.425" W	326.16	1236	0'
#21B	ND < 12	37° 10' 15.007" N	121° 50' 49.363" W	342.38	1238	
#21C	ND < 13	37° 10' 15.117" N	121° 50' 49.472" W	328.14	1239	
#22A	40 ± 6	37° 10' 15.827" N	121° 50' 48.900" W	328.39	1248	15'
#22B	ND < 12	37° 10' 15.828" N	121° 50' 48.998" W	329.05	1251	
#22C	28 ± 4	37° 10' 15.779" N	121° 50' 48.911" W	328.66	1253	
#22D	22 ± 5	37° 10' 15.800" N	121° 50' 48.911" W	328.60	1255	
#22E	43 ± 8	37° 10' 15.778" N	121° 50' 48.891" W	330.02	1257	

Table 2: XRF Locations and Results
Upper Jacques Gulch

Location	Mercury (mg/kg)	GPS X (Latitude)	GPS Y (Longitude)	GNSS Height	Time	Width of Observed Calcine (feet)
#23A	ND < 15	37° 10' 16.078" N	121° 50' 47.599" W	335.21	1317	15'
#23B	26 ± 5	37° 10' 16.194" N	121° 50' 47.605" W	336.54	1319	
#23C	ND < 11	37° 10' 16.164" N	121° 50' 47.529" W	340.17	1322	
#23D	ND < 13	37° 10' 16.073" N	121° 50' 47.574" W	341.83	1325	
#24A	21 ± 4	37° 10' 16.720" N	121° 50' 46.620" W	351.42	1335	6'
#24B	ND < 8	37° 10' 16.723" N	121° 50' 46.661" W	352.17	1337	
#24C	25 ± 5	37° 10' 16.589" N	121° 50' 46.516" W	355.21	1339	
#24D	ND < 9	37° 10' 16.614" N	121° 50' 46.486" W	347.94	1340	
#24E	ND < 11	37° 10' 16.573" N	121° 50' 46.499" W	352.09	1343	
#25A	ND < 12	37° 10' 17.276" N	121° 50' 46.219" W	350.86	1349	10'
#25B	98 ± 7	37° 10' 17.330" N	121° 50' 46.290" W	357.56	1351	
#25C	79 ± 8	37° 10' 17.299" N	121° 50' 46.183" W	354.45	1353	
#25D	47 ± 6	37° 10' 17.320" N	121° 50' 46.062" W	358.17	1356	
#26A	ND < 9	37° 10' 17.936" N	121° 50' 45.922" W	361.56	1358	2'
#26B	ND < 9	37° 10' 17.947" N	121° 50' 45.895" W	357.40	1400	
#27A	23 ± 6	37° 10' 18.199" N	121° 50' 45.465" W	358.60	1411	6'-7'
#27B	23 ± 7	37° 10' 18.191" N	121° 50' 45.398" W	365.23	1413	
#28A	ND < 13	37° 10' 22.385" N	121° 50' 43.283" W	398.88	1430	--
#28B	23 ± 7	--	--	--	1431	--
#29A	ND < 12	37° 10' 25.145" N	121° 50' 44.807" W	432.59	1442	--

Notes:

ND: Not detected above laboratory reporting limits

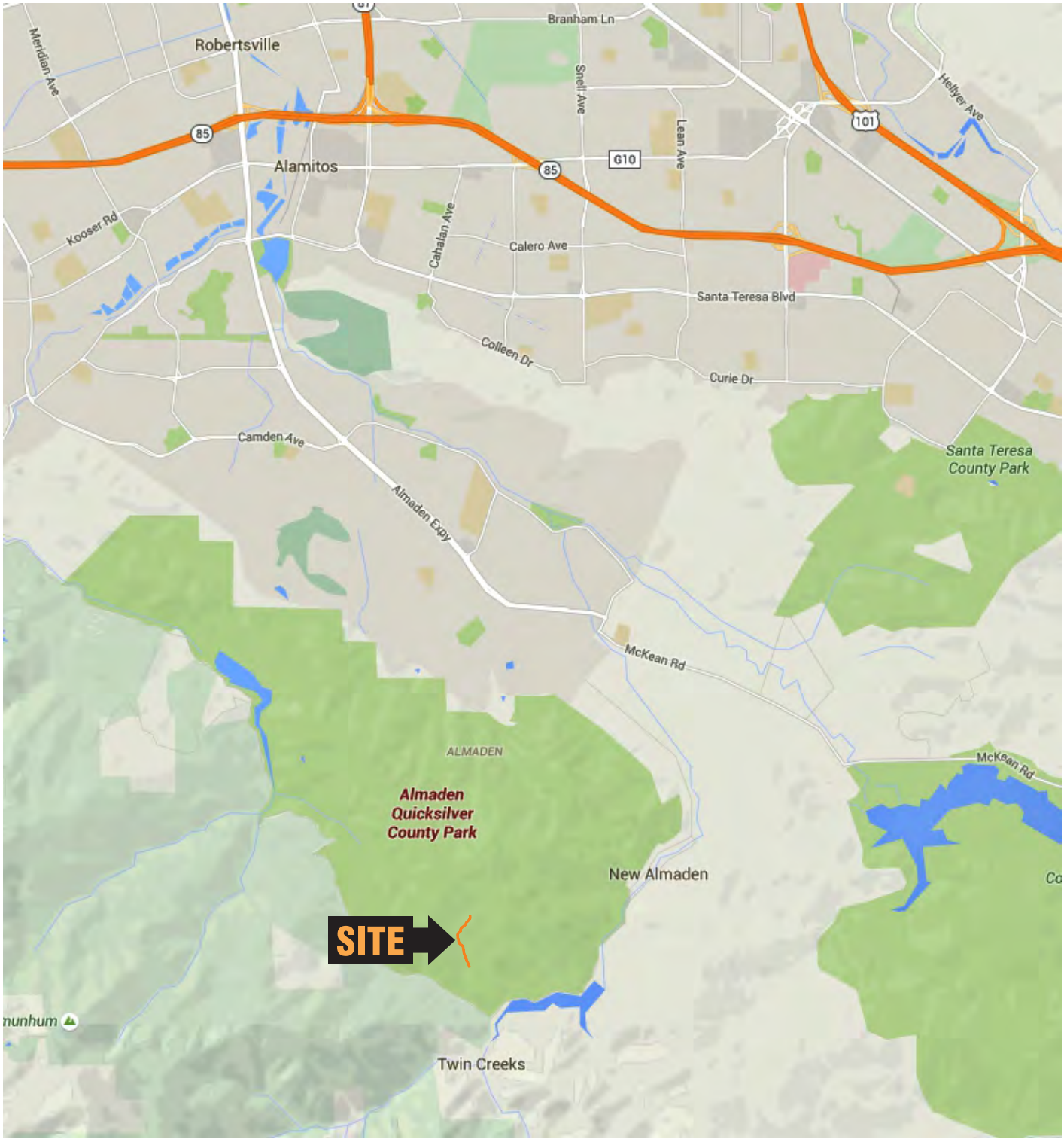
-- : information not avaliable

N: North

W: West

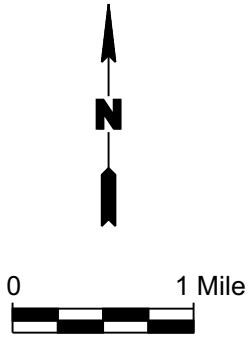
FIGURES

1. Site Location Map
2. Project Area
3. Project Vicinity and Key Features
4. Soil Sample Locations
5. XRF Locations
6. Location of Landslide Features



LOCATION OF DETAIL

SOURCE: Google Maps 2016 data



Title:

SITE LOCATION MAP

JACQUES GULCH REMEDIATION
ALMADEN QUICKSILVER COUNTY PARK
SAN JOSE, CALIFORNIA

Prepared for:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: A.O.	Date: 15SEP16	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	1
Project Mgr.: R.M.	Project No.: 2755.0001S000	
File: 2755.0001S101.01.CDR		

\2755\0001S\101\2755.0001S101.01.CDR

LEGEND

ESTIMATED PROJECT AREA

400' 0 400'

Title:

PROJECT AREA

UPPER JACQUES GULCH REMEDIATION
SAN JOSE, CALIFORNIA

Prepared For:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: ALC	Date: 10NOV2016	FIGURE
Prepared by: AMO	Scale: AS SHOWN	2
Project Mgr: RM	Project: 2755.0001S000	
File: ALTERNATIVE FIGURES.DWG		

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LEGEND

ESTIMATED PROJECT AREA

1000' 0 1000'

Title:

PROJECT VICINITY AND KEY FEATURES

UPPER JACQUES GULCH REMEDIATION
SAN JOSE, CALIFORNIA

Prepared For:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: ALC	Date: 10NOV16	FIGURE
Prepared by: AO	Scale: AS SHOWN	3
Project Mgr: RM	Project: 2755.0001S000	
File: ALTERNATIVE FIGURES.DWG		

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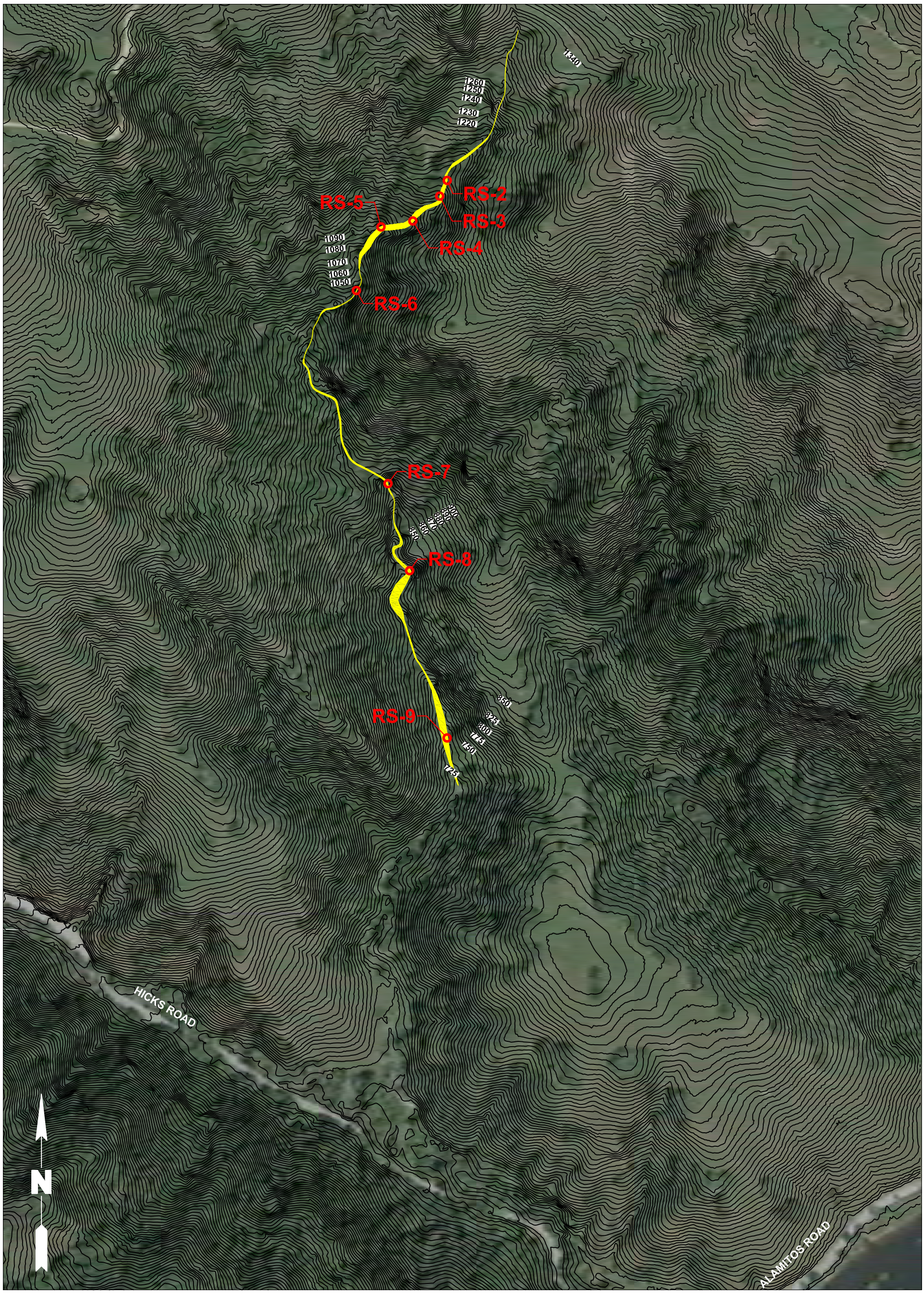

LEGEND

ESTIMATED PROJECT AREA

SOIL SAMPLE LOCATION

NOTES

1. SAMPLE IDENTIFICATION BEGINS AT RS-2.

300' 0 300'

Title:

SOIL SAMPLE LOCATIONS

UPPER JACQUES GULCH REMEDIATION
SAN JOSE, CALIFORNIA

Prepared For:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: ALC	Date: 25OCT16	FIGURE
Prepared by: AMO	Scale: AS SHOWN	4
Project Mgr: RM	Project: 2755.0001S000	
File: ALTERNATIVE FIGURES.DWG		

Title:

XRF LOCATIONS

JACQUES GULCH REMEDIATION
SAN JOSE, CA

Prepared For:
SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: ALC	Date: 09FEB2016	FIGURE
Prepared by: AMO	Scale: AS SHOWN	
Project Mgr: RM	Project: 2755.0001S000	5
File: ALTERNATIVE FIGURES.DWG		

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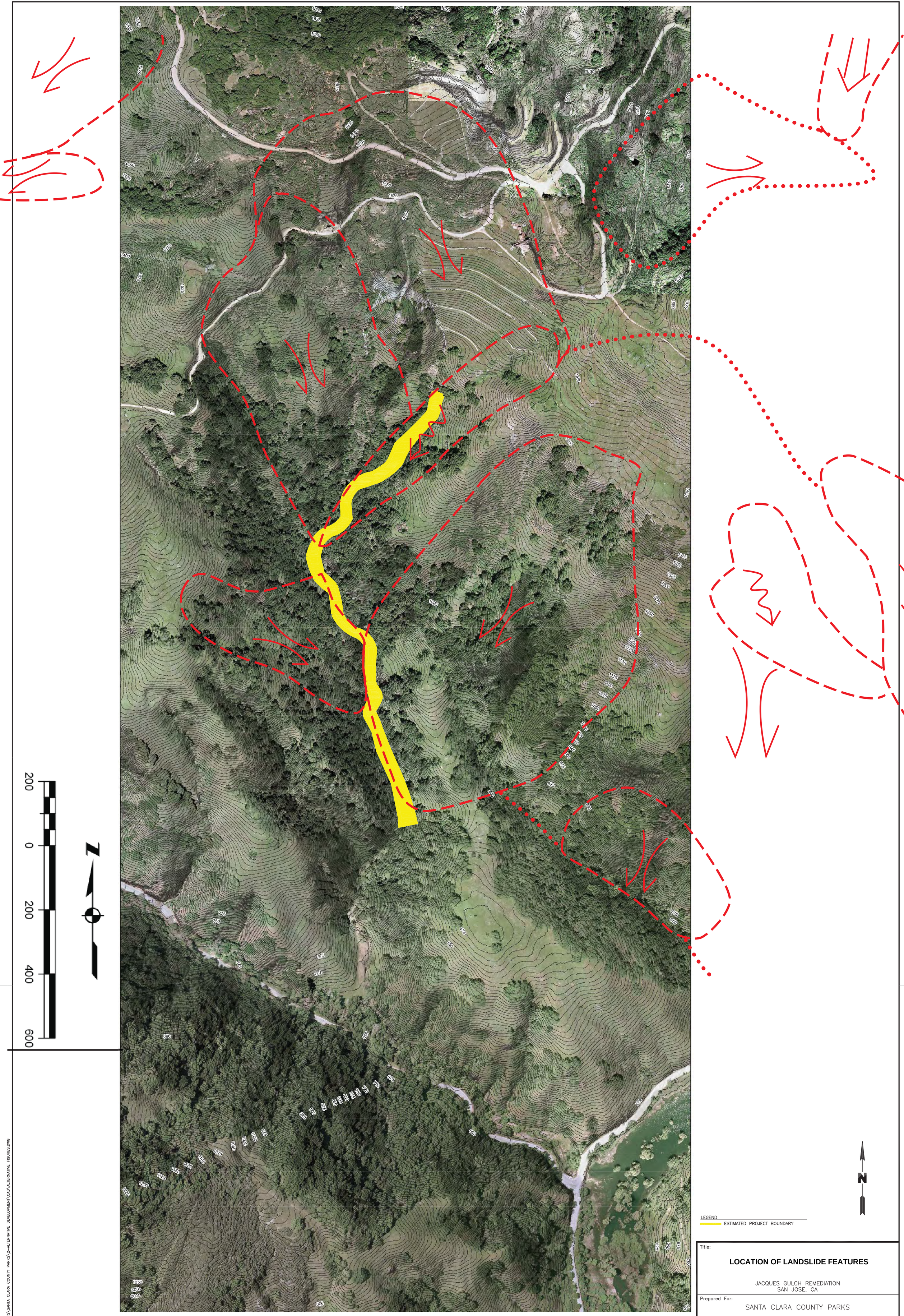

Title:

LOCATION OF LANDSLIDE FEATURES

JACQUES GULCH REMEDIATION
SAN JOSE, CA

Prepared For:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC. *Environmental Consulting & Management*	Compiled by: ALC	Date: 03OCT2016	FIGURE
	Prepared by: AMO	Scale: AS SHOWN	
	Project Mgr: RM	Project: 2755.0001S000	
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ATTACHMENT A

Upper Jacques Gulch Remediation Project
Preliminary Biotic Constraints and Restoration Opportunities

H. T. HARVEY & ASSOCIATES
Ecological Consultants

February 7, 2017

Angela Liang Cutting, Ph.D., P.E.
Principal Engineer
ROUX ASSOCIATES, INC.
555 12th Street, Suite 1725
Oakland, California 94607

Subject: Upper Jacques Gulch Remediation Project – Preliminary Biotic Constraints and Restoration Opportunities

Introduction

The Upper Jacques Gulch Remediation Project includes developing a 25% Design Study that selects a preferred alternative to reduce discharges from mercury mining wastes (e.g., calcines) in an approximately 3,000-foot long reach located in the Upper Jacques Gulch watershed. The Upper Jacques Gulch reach was identified as a priority for mercury waste remediation in the Almaden Quicksilver County Park and Santa Teresa County Park Mine Material Evaluation Final Report (URS 2011). The main objective of the 25% Design Study is to determine opportunities and constraints for remediation, to propose alternatives for consideration by the San Francisco Bay Regional Water Quality Control Board (RWQCB), and to obtain County of Santa Clara/RWQCB concurrence on the direction to follow for addressing the issue of mercury transport and discharge. One of the first requirements is identification of potential biological constraints and restoration/mitigation opportunities to inform development of design alternatives.

The purpose of this assessment is to identify biological constraints that may need to be addressed during project planning, California Environmental Quality Act (CEQA) review, permitting, and implementation. This preliminary analysis also includes identification of habitat mitigation/restoration opportunities that may be available to compensate for project impacts; the design team should strive to incorporate ample habitat mitigation/restoration into the selected alternative, to develop a self-mitigating project from the perspective of regulated habitats.

Biological Constraints

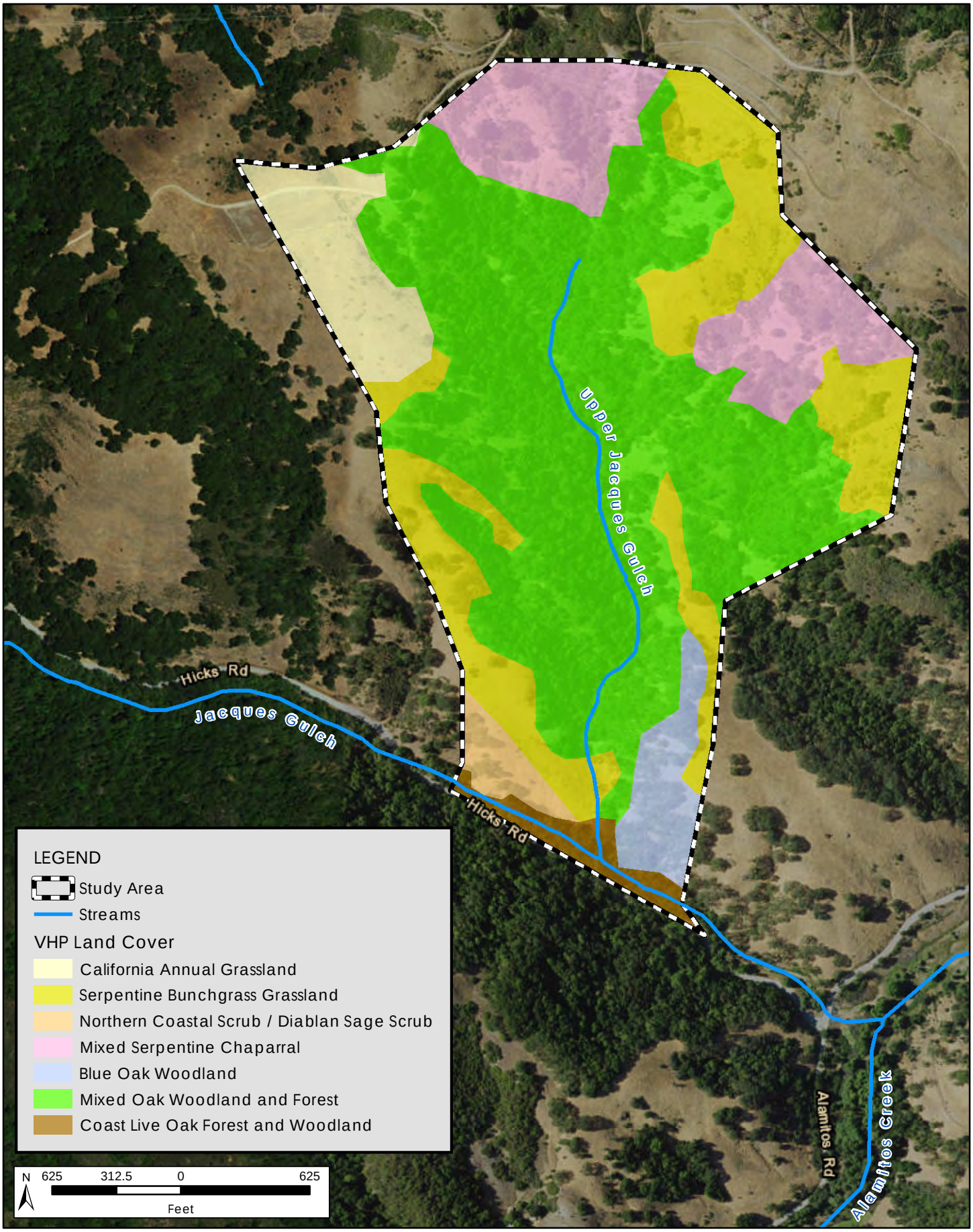
Biological constraints typically take the form of sensitive and/or regulated habitats such as wetlands; special-status species; or particularly large, important, or exemplary occurrences of more common plant or animal species or vegetation communities. Examples of sensitive biological resources that are considered herein include:

- Plant and wildlife species listed as threatened or endangered under the Federal Endangered Species Act (FESA); "take" of individuals of these species, which would include modification of their habitat, would require approval from the U.S. Fish and Wildlife Service (USFWS).
- Plant and wildlife species listed as threatened or endangered under the California Endangered Species Act (CESA); "take" of individuals of these species would require approval from the California Department of Fish and Wildlife (CDFW).
- California species of special concern or species ranked by the California Native Plant Society (CNPS) as 1A to 4; impacts on these species would be considered during the CEQA review process.
- Migratory birds and other non-special-status species that could be impacted by the project, and for which impacts would be considered during the CEQA review process.
- Wetlands or other waters of the U.S.; fill of these features would require a permit from the U.S. Army Corps of Engineers (USACE) under Section 404 of the Federal Clean Water Act and a water quality certification from the Regional Water Quality Control Board (RWQCB) under Section 401 of the Federal Clean Water Act.
- Wetlands or other waters of the state; fill of these features would require would require Waste Discharge Requirements from the RWQCB under the state's Porter-Cologne Water Quality Control Act if the USACE does not claim jurisdiction over these features, or would require a water quality certification from the RWQCB under Section 401 of the Federal Clean Water Act if these features are also considered waters of the U.S. by the USACE (as noted above)
- Linear waterways such as creeks or canals that could potentially be regulated by the CDFW under Section 1600 of the California Fish and Game Code; impacts to these features would require a Lake and Streambed Alteration Agreement from the CDFW.

The following assessment provides a summary of our preliminary findings with respect to biological resources that represent potential constraints to the proposed project in the context of applicable laws and regulations. Following completion of the project design alternatives, a more detailed assessment will be provided for each design alternative. We have also included a summary of habitat restoration/mitigation opportunities that may be available to compensate for project impacts to regulated habitats (e.g., riparian woodland) that would be considered significant under CEQA, or further required as mitigation by local, state and federal regulatory agencies. These opportunities will help the design team incorporate compensatory mitigation into each design alternative, such that the selected alternative is ideally self-mitigating.

Preliminary Assessment Methodology

The project's impact areas are not yet known and will vary based on specifics of each design alternative. Therefore, the Upper Jacques Gulch and all surrounding areas to the top of slope were included within the study area for this assessment (Figure 1). This study area is conservatively large in order to ensure that it



N:\Projects3800\3832-01\Reports\Fig 1 Jacques Gulch VHP Land Cover Map.mxd

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 1. Jacques Gulch VHP Land Cover Map
Upper Jacques Gulch Biotic Constraints and Restoration Opportunities Memo (3832-01)
February 2017

encompasses all potential biological resources that may be affected by the proposed project. For the purpose of future analyses, this study area will be refined to encompass the project-specific impact areas and access routes for the proposed alternatives.

Although the project is not expected to be a covered project under the Santa Clara Valley Habitat Plan (VHP) (ICF International 2012), the study area is located within the VHP permit area and land cover mapping of the site was completed for the VHP. Thus, we used VHP land cover mapping to provide an overview of the habitat types for this preliminary assessment (Figure 1).

H. T. Harvey & Associates restoration ecologists Max Busnardo, M.S., and Matt Quinn, M.S., conducted a reconnaissance-level survey of the study area on July 26, 2016 to assess general site conditions, potential biological resources present, and restoration/mitigation opportunities. Due to the inherent difficulties of site access, H. T. Harvey & Associates plant/wetland and wildlife ecologists have not yet visited the site, but rather will visit the site once the designs for the project alternatives are complete and a more focused survey can be performed. Observations and photographs from the July 26 reconnaissance-level survey were reviewed by H. T. Harvey & Associates permitting, plant/wetland, and wildlife specialists to provide a general understanding of existing conditions and serve as the basis for preparation of this preliminary analysis.

To develop a preliminary list of special-status species and natural communities of special concern that may occur in the project vicinity, H. T. Harvey & Associates biologists collected and reviewed information from several sources. The reviewed sources included environmental documents for the nearby Jacques Gulch Restoration Project (WRA Environmental Consultants 2008); the VHP; aerial photos and topographic maps; the CDFW's California Natural Diversity Database (CNDDB) (2016); Calflora (2016); the Consortium of California Herbaria (2016); the CNPS Inventory of Rare Plants (2016); and other relevant scientific literature and technical databases in order to assess the current distribution of special-status plants and animals in the project vicinity. In addition, for plants, we reviewed all species currently ranked by the CNPS as rank 1A, 1B, 2, or 3 that occur in the *Santa Teresa Hills, California* 7.5-minute U.S. Geological Survey (USGS) quadrangle in which the study area is located, as well as the eight surrounding quadrangles (*San Jose West*, *San Jose East*, *Lick Observatory*, *Los Gatos*, *Morgan Hill*, *Laurel*, *Loma Prieta*, and *Mount Madonna*). We also considered the CNPS plant list for Santa Clara County, as the CNPS does not maintain quadrangle-level records for all Rank 3 or 4 species. CNDDB-mapped records of special-status plants/natural communities of concern and special-status animals are shown on Figures 2 and 3, respectively.

Preliminary Results

Existing Vegetation Communities - The VHP maps seven land cover types within the study area that include the following vegetation communities: California annual grassland, serpentine bunchgrass grassland, northern coastal scrub/Diablan sage scrub, mixed serpentine chaparral, blue oak woodland, mixed oak woodland and forest, and coast live oak forest and woodland (Figure 1).

Legend

Project Location

5-mile Radius

CNDDB Records

Plants

Specific Location

Approximate Location

General Area

Terrestrial Communities

General Area

Source: H. T. Harvey & Associates; CNDDB 2016

Congdon's tarplant

hairless popcornflower

arcuate bush-mallow

Loma Prieta hoita
woodland woollythreads
Loma Prieta hoita
Loma Prieta hoita
Loma Prieta hoita

smooth lessingia
Santa Clara Valley dudleya
fragrant fritillary

fragrant fritillary

Mt. Hamilton fountain thistle
smooth lessingia
most beautiful jewelflower
Loma Prieta hoita
smooth lessingia
Santa Clara Valley dudleya
Loma Prieta hoita
most beautiful jewelflower
San Francisco collinsia
Santa Clara Valley dudleya
woodland woollythreads
Loma Prieta hoita
Mt. Hamilton fountain thistle
most beautiful jewelflower
smooth lessingia
Loma Prieta hoita
Santa Clara red ribbons
Loma Prieta hoita
Santa Clara Valley dudleya
woodland woollythreads
Santa Clara red ribbons
most beautiful jewelflower
woodland woollythreads
most beautiful jewelflower
woodland woollythreads
Mt. Hamilton fountain thistle

Santa Clara red ribbons

Santa Clara Valley dudleya
Mt. Hamilton fountain thistle
Hall's bush-mallow
Santa Clara Valley dudleya
Metcalf Canyon jewelflower
Santa Clara Valley dudleya
Metcalf Canyon jewelflower
Serpentine Bunchgrass

Santa Clara Valley dudleya
most beautiful jewelflower
Santa Clara Valley dudleya
smooth lessingia
Hall's bush-mallow
Santa Clara Valley dudleya
Santa Clara Valley dudleya
Santa Clara Valley dudleya
Santa Clara Valley dudleya
most beautiful jewelflower
Loma Prieta hoita
smooth lessingia
Mt. Hamilton fountain thistle
Santa Clara Valley dudleya
most beautiful jewelflower
Mt. Hamilton fountain thistle
Santa Clara Valley dudleya
Hall's bush-mallow
smooth lessingia
Mt. Hamilton fountain thistle
arcuate bush-mallow
Santa Clara Valley dudleya
most beautiful jewelflower
arcuate bush-mallow
most beautiful jewelflower
Santa Clara Valley dudleya
Serpentine Bunchgrass
Santa Clara Valley dudleya
most beautiful jewelflower
Santa Clara Valley dudleya
arcuate bush-mallow
Santa Clara Valley dudleya
Santa Clara Valley dudleya
smooth lessingia
woodland woollythreads
Santa Clara Valley dudleya
smooth lessingia

Santa Clara Valley dudleya
Mt. Hamilton fountain thistle
Serpentine Bunchgrass
Metcalf Canyon jewelflower
Mt. Hamilton fountain thistle
most beautiful jewelflower
fragrant fritillary
most beautiful jewelflower
Loma Prieta hoita
most beautiful jewelflower
most beautiful jewelflower
smooth lessingia
most beautiful jewelflower
smooth lessingia
most beautiful jewelflower
Mt. Hamilton fountain thistle
woodland woollythreads
Tiburon paintbrush
smooth lessingia
most beautiful jewelflower
Santa Clara Valley dudleya
Mt. Hamilton fountain thistle
smooth lessingia
most beautiful jewelflower
Serpentine Bunchgrass
Serpentine Bunchgrass
Coyote ceanothus
most beautiful jewelflower
Santa Clara Valley dudleya
smooth lessingia
arcuate bush-mallow
most beautiful jewelflower
arcuate bush-mallow
Santa Clara Valley dudleya

Ben Lomond spineflower
Santa Cruz wallflower
Bonny Doon manzanita

Northern Maritime Chaparral

arcuate bush-mallow
woodland woollythreads

Santa Cruz Mountains pussypaws
arcuate bush-mallow
Santa Clara red ribbons
Santa Cruz Mountains beardtongue
woodland woollythreads
smooth lessingia

Anderson's manzanita
Anderson's manzanita
Santa Cruz Mountains beardtongue
Anderson's manzanita
Loma Prieta hoita
Coyote ceanothus
Northern Maritime Chaparral

N 1.2 0.6 0 1.2
Miles

Background: Esri Street Base Map

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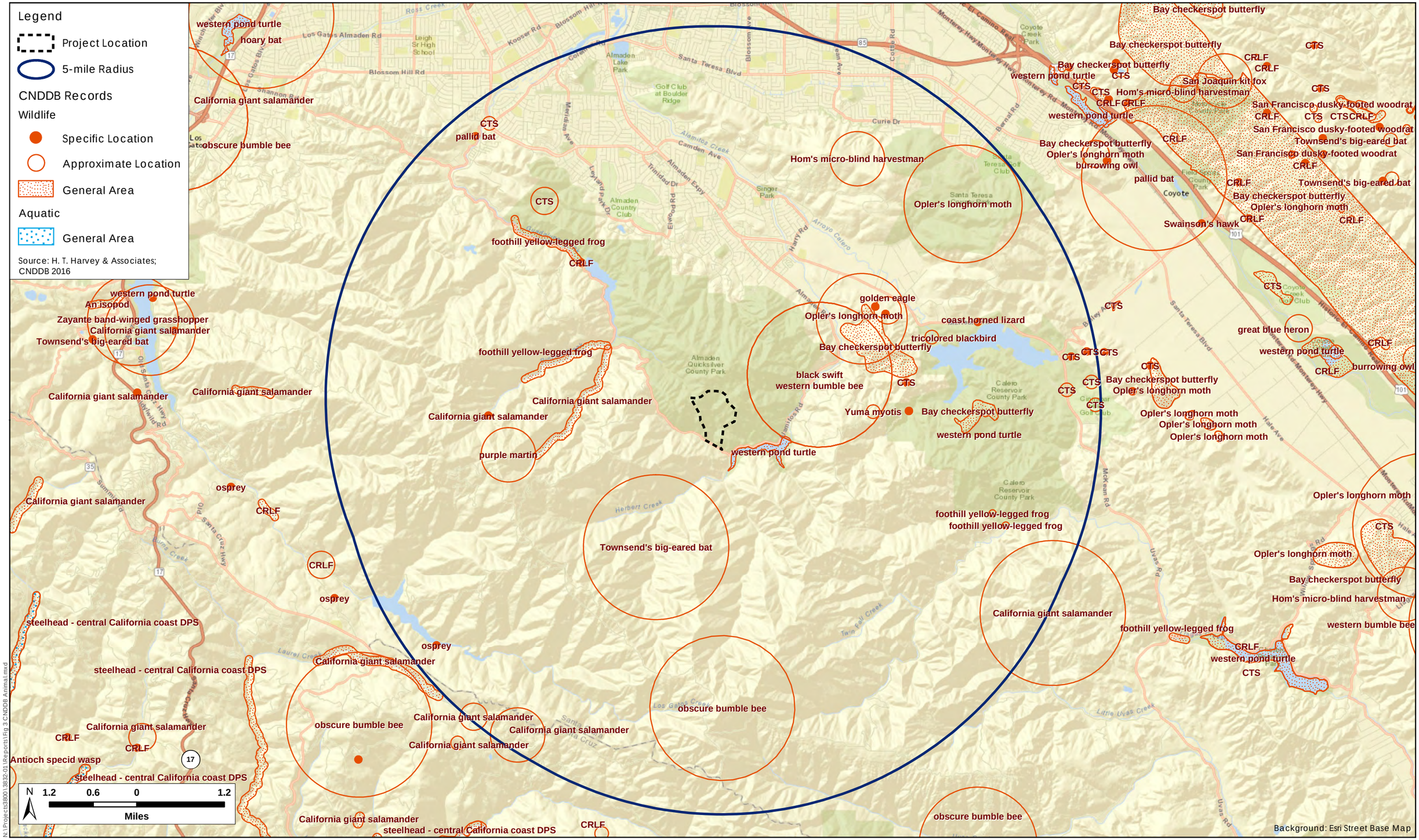
Ecological Consultants

Figure 2. CNDDB Plant Records

Upper Jacques Gulch Biotic Constraints and Restoration Opportunities Memo (3832-01)

February 2017



N:\Projects\3800\3832-01\Reports\Fig 3 CNDDB Animal.mxd

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Ecological Consultants

Figure 3. CNDDB Animal Records

Upper Jacques Gulch Biotic Constraints and Restoration Opportunities Memo (3832-01)

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Sensitive and Regulated Habitats – The following sensitive and regulated habitats under the jurisdiction of local, state and federal regulatory agencies (including habitats of particular concern per the VHP) occur within the vicinity of the project area: wetlands and other waters of the U.S./state (i.e., the creek channel bed up to the ordinary high water mark), riparian habitat, serpentine bunchgrass grassland, serpentine chaparral, and oak woodlands. Riparian habitat is among the primary regulated habitat constraints; this habitat occurs along the banks of Upper Jacques Gulch throughout the project reach, and consists of dense cover of the mixed oak woodland vegetation community. Once the alternatives are developed, H. T. Harvey & Associates will map the approximate extent of these habitats within the footprint of each design alternative. This will allow an assessment of regulated habitat impacts and determination of suitable mitigation for each alternative. Mitigation typically includes restoring the specific habitat at a ratio from 1:1 (replacement surface area: impact surface area) to up to 3:1.

Special-Status Plant Species - The CNPS (2016) and CNDDB (2016) identify 82 special-status plant species as potentially occurring in at least one of the nine USGS 7.5-minute quadrangles containing or surrounding the study area. However, due to lack of suitable habitat only a subset of these species (likely 10-20 species) could potentially occur within the study area. Once the project alternatives are developed, H. T. Harvey & Associates will identify the particular species that could potentially occur within the footprint of each alternative. Figure 2 depicts the CNDDB-mapped locations of special-status plants in the project vicinity. At least 3 special-status plant species are known from the study area and several others occur in the project vicinity. In accordance with CEQA, protocol-level surveys will need to be conducted for any species determined to potentially be present. If presence is confirmed, avoidance and minimization measures will need to be implemented to the extent feasible, and additional mitigation may be required if avoidance is not feasible (e.g., as a CEQA mitigation measure) depending on the particular species and level of impact.

Special-Status Animal Species - Suitable habitat for a number of special-status animal species occurs in the study area and surrounding vicinity. These include the California red-legged frog (*Rana draytonii*), which is federally listed as threatened and a California species of special concern and the California tiger salamander (*Ambystoma californiense*), which is federally and state listed as threatened. H. T. Harvey & Associates will provide a complete list of special-status animal species with potential to occur in the study area and recommended impact avoidance and mitigation measures in our forthcoming assessment of impacts for each design alternative. However, the potential presence of the California tiger salamander, California red-legged frog, and their habitats has the potential to result in the most substantial wildlife-related constraints to the project. If take (e.g., injury or mortality of individuals, or modification of habitat that would result in injury or mortality) of the California tiger salamander or California red-legged frog would occur as a result of project implementation, incidental take approval from the USFWS (for both species) and from the CDFW (for the California tiger salamander only) would be needed. Consultation with these agencies could potentially take 6-9 months (and sometimes more) to complete. It is possible that compensatory mitigation for impacts to these species could be required, particularly by the CDFW if take of the California tiger salamander could occur. Typically, such mitigation takes the form of protection and management of habitat occupied by these species. Typical mitigation ratios may be 2:1 to 3:1 (in terms of the numbers of acres to be protected and managed vs. the number of acres impacted). Mitigation

generally requires lands to be preserved via a conservation easement, with an endowment provided to pay for management of the mitigation site in perpetuity; the endowment principal is calculated based on the interest necessary to fund average annual management activities.

It is our understanding that the design alternatives may include the creation of one or more detention basins along Upper Jacques Gulch to retain mercury-laden sediments/alluvium. Because various forms of mercury, especially methylmercury, are toxic to amphibians, detention basins should be designed to avoid the creation of breeding habitat for California tiger salamanders and California red-legged frogs. These types of features could potentially create suitable breeding habitat for California tiger salamanders if they hold water for at least 10 weeks (typically into mid or late May in Santa Clara County), and for California red-legged frogs if they hold water through July. Therefore, we recommend that these features be designed to dry before May each year so that they do not create suitable breeding habitat for these species.

Common and Special-Status Nesting Birds - All native migratory birds, including common and special-status species, are protected under the federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code, which prohibit take of individuals. Measures to ensure compliance with the MBTA and California Fish and Game Code may result in seasonal constraints on project activities, including avoidance of the nesting season (i.e., February 1 through August 31), to the extent feasible; the removal of potential nesting substrate (i.e., trees and shrubs) outside the nesting season; a preconstruction survey; and the implementation of non-disturbance buffers (typically 300 feet for raptors and 100 feet for other birds) around active nests to ensure that nests are not disturbed by project activities. If an active nest of the bald eagle (*Haliaeetus leucocephalus*), a state endangered and state fully protected species, or golden eagle (*Aquila chrysaetos*), a state fully protected species, is detected on or in the vicinity of the project impact area, a non-disturbance buffer up to 0.5 mile in radius may be required around the active nest. Due to the high quality of the nesting habitat for various bird species present within the study area, the project is likely to experience delays due to the presence of active nests if activities are initiated during the nesting season (i.e., February 1–August 31). The length of the delay may extend from a few weeks to several months, depending on the species. In Santa Clara County, the bird nesting season typically peaks in May, and nesting activity substantially subsides by July and August.

The presence of protected wildlife species on the site has the potential to result in restricted work windows. The USFWS and CDFW may require the avoidance of grading and other earthwork during the wet season (typically mid-October through mid-April) to avoid and minimize impacts on the California tiger salamander and/or California red-legged frog, and the USACE and RWQCB may require such restrictions for water-quality reasons. In addition, the presence of active bird nests has the potential to delay project activities during the period from February 1–August 31. Thus, the project team should consider the possibility that work may be restricted to the period between September 1 and the start of the rainy season (typically, mid-October).

Potential Mitigation/Restoration Opportunities

Depending on the types and extent of regulated habitat impacts (e.g., creek channel and riparian habitat) associated with the preferred design alternative, it is possible that the RWQCB could consider the project to be

self-mitigating (i.e., requiring only 1:1 mitigation ratio), as it provides substantial water quality benefits and specifically addresses meeting the RWQCB's Total Maximum Daily Load (TMDL) goal for mercury in the Guadalupe River watershed. However, there is no guarantee the RWQCB will consider it self-mitigating and other agencies may also require more than a 1:1 habitat mitigation ratio to account for temporal habitat loss. Another potential complicating factor is that if tree canopy is removed as part of the project from locations deep within the Upper Jacques Gulch canyon, the site conditions may not be conducive to successful replanting. Replanting in these locations could be hindered by soil conditions, following calcine removal, and lack of sufficient light to support vigorous growth of woody riparian vegetation. Therefore, we have identified additional opportunities to establish and/or enhance overall habitat value within the watershed. Depending on the impact magnitude, these opportunities could potentially be packaged with replanting in areas of vegetation removal, to provide mitigation suitable to compensate for project impacts to all regulatory agency jurisdictions. The following are brief summaries of these opportunities.

1. **Invasive species removal and control**. There are moderately sized stands of Spanish broom (*Spartium junceum*) and pampas grass (*Cortedaria selloana*) or jubata grass (*Cortaderia jubata*) located in the upper reach of the watershed. The majority of these stands are rooted within or immediately adjacent to the active channel and removal would provide an ecological benefit to the instream habitat through this reach. Removal would likely include a mix of mechanical and chemical treatments as well as follow up chemical treatments to ensure resprouts or seedbank resources do not re-establish onsite.

2. **Revegetation in areas of invasive species removal with native species**. In areas where Spanish broom and pampas/jubata grass are removed, a mix of native riparian and oak woodland species could be planted to enhance the habitat functions and values. These native plantings would also provide surface soil erosion control as they establish root systems that will help stabilize the steep slopes, immediately adjacent to the channel, that comprise the upper watershed. Revegetation is a process that begins with evaluating and preparing the soil, as necessary, to ensure the highest likelihood of successful plant establishment. This is followed by either seeding or installing plants from cuttings or rooted container stock, which are then typically maintained for at least 3 years. The plantings often require some degree of supplemental irrigation and protection from browse damage as they adapt to site conditions and begin to mature. On-going monitoring (typically a 10-year period) of plant growth and general health metrics is used to evaluate how the plantings are establishing and dictate appropriate maintenance activities or adaptive management actions.

3. **Active planting of native riparian and oak woodland species in upper watershed.** There are a few limited areas of canopy gaps and narrow zones of riparian habitat that could be filled or expanded through actively planting native species. Most of these opportunities exist within the upper watershed and would likely support expansion of the existing oak woodland canopy. However, there is one location that currently supports a single willow tree and the channel supports perennial or near-perennial flow. Much of this area currently supports pampas/jubata grass that could be removed and replanted with willow riparian habitat as part of #1 above, but the actual extent of willow planting could potentially be expanded based on more

detailed investigation of the area. Maximizing willow riparian habitat would provide increased habitat diversity to the area that is currently nearly devoid of this habitat type.

4. **Active planting of blue oak woodland.** Blue oak woodland is a limited habitat type and known to have low natural regeneration in the region. There are some existing individual blue oaks in the upper watershed and some larger stands in the general vicinity. Specific areas within the upper watershed could be dedicated for planting blue oaks to provide more diversity for this regionally limited habitat.

5. **Active planting of sycamore alluvial woodland in lower watershed.** There is a relatively large open space/floodplain area in the lower reach of Upper Jacques Gulch that currently supports a few old native sycamore trees in a mixed riparian habitat. This reach could be further enhanced through actively planting additional sycamores and possibly other appropriate native riparian species. Sycamore-dominated riparian ecosystems (i.e., sycamore alluvial woodland) are regionally rare and are quickly disappearing from the regional landscape. There are currently a number of local, ongoing research efforts (partially funded by the CDFW, Santa Clara Valley Habitat Agency, and the Santa Clara Valley Water District) that are focused on sycamore regeneration, propagation and management and this area could be used to complement those efforts. There are some potential constraints that could limit this opportunity. For example, some of this area is within the project boundary of the previous Santa Clara Valley Water District's Lower Jacques Gulch Remediation project. It is unclear at this time whether there were any soil manipulations associated with that project that could have an effect to the establishment of sycamore alluvial woodland in this reach. Also, it is assumed the Upper Jacques Gulch Remediation project will likely include an alternative that incorporates a detention basin within this reach to capture mercury laden sediments. Depending on the design of this basin, this opportunity may or may not be feasible. It should also be noted that any detention basin within this reach would need to be designed to not create suitable breeding habitat for any special-status wildlife species, nor impact the existing sycamore trees.

Sincerely,

Matt Quinn, M.S.
Project Manager, Associate Restoration Ecologist

Literature Cited

Calflora. 2016. Website: Accessed August 2016. http://www.calflora.org/index.html.

[CNDDB] California Natural Diversity Data Base. 2016. Rarefind. California Department of Fish and Wildlife.

[CNPS] California Native Plant Society. 2016. Inventory of Rare and Endangered Plants of California (7th and 8th editions). Rare Plant Scientific Advisory Committee.

Consortium of California Herbaria. 2016. Data provided by the participants of the Consortium of California Herbaria (ucjeps.berkeley.edu/consortium/); August 2016.

ICF International. 2012. Final Santa Clara Valley Habitat Plan, Santa Clara County, California. Prepared for the County of Santa Clara, City of San José, City of Morgan Hill, City of Gilroy, Santa Clara Valley Water District, and Santa Clara Valley Transportation Authority.

URS. 2011. Almaden Quicksilver County Park and Santa Teresa County Park Mine Material Evaluation Final Report. Dated May 16, 2011.

WRA Environmental Consultants. 2008. Vegetation Restoration and Monitoring Plan for the Jacques Gulch Restoration Project. Santa Clara County, California. Prepared for the Santa Clara Valley Water District.