# FOCUSED FEASIBILITY STUDY

**Upper Jacques Gulch Remediation**
**Almaden Quicksilver County Park**
**San Jose, California**

***Prepared for:***
**Santa Clara County Parks**
**298 Garden Hill Drive**
**Los Gatos, California 95032**

**June 16, 2017**

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# 1.0 INTRODUCTION

On behalf of Santa Clara County Parks (SCCP), Roux Associates, Inc. (Roux Associates) and its expert team, H. T. Harvey & Associates (HTH), Murray Engineers, Inc. (MEI), and Aspen Environmental Group (Aspen) (collectively the Roux Team) have prepared this focused feasibility study (FFS) to evaluate the remediation/restoration options at the Upper Jacques Gulch, an approximately 3,000-foot long reach located in the upper watershed of Jacques Gulch (Upper Jacques Gulch; Site), identified in the *Almaden Quicksilver County Park and Santa Teresa County Park Mine Material Evaluation Final Report* dated December 31, 2010. This FFS is part of the development of a 25% Design Study to determine opportunities and constraints for remediation alternatives to address the potential discharges of mercury mining wastes (i.e., calcines) from Upper Jacques Gulch. Specifically, this FFS evaluates three potential options for remediation and restoration of the Site.

## 1.1 Remediation/Restoration Objective

The objectives of the remediation/restoration would be to:

- Decrease the mercury loading to San Francisco Bay by minimizing mercury transport and discharge from Upper Jacques Gulch; and
- Incorporate habitat mitigation/restoration in the selected alternative to minimize the need for off-site mitigation.

The alternatives would be developed based on these objectives. This FFS would also evaluate the alternatives based on effectiveness, implementability, cost, sustainability, and potential biological constraints as described in Section 1.3.

## 1.2 Focused Feasibility Study Objectives

The overall objectives of the FFS are to:

- Identify and evaluate potential remediation/restoration alternatives that meet the objectives;
- Select a cost-effective and sustainable alternative; and
- Achieve consensus among SCCP, San Francisco Bay Regional Water Quality Control Board (RWQCB), United States Environmental Protection Agency (USEPA), and San Francisco Estuary Partnership (SFEP), regarding the selected remediation/restoration alternative.

## 1.3 Focused Feasibility Study Methodology

In order to prepare the FFS, Roux Associates identified the general engineering design, permitting, construction, and maintenance activities to implement the remediation/restoration. Based on that information, the remediation/restoration alternatives are evaluated and compared based on effectiveness, implementability, cost, sustainability, and potential biological constraints and mitigation opportunities.

- Effectiveness: Effectiveness is evaluated based on the degree to which each of the alternatives meets the objectives outlined in Section 1.1, in the short and the long term; in particular, each alternative's effectiveness at minimizing mercury transport and discharge from Upper Jacques Gulch.

- Implementability: Implementability is evaluated based on the technical, practical, and administrative/regulatory feasibility of each alternative. For example, availability of trained personnel, specialized equipment, and unique material is examined as well as the difficulty and lead time required for regulatory approvals. Consideration of geotechnical measures (e.g., access road, slope stability, retaining walls) and biological constraints (e.g., habitat impacts and mitigation requirements) is also included in the analysis.

- Cost: Rough order-of-magnitude cost estimates for conceptual-level engineering design, permitting, construction, restoration, and maintenance are developed. The cost estimate for each alternative is based on a conceptual level of design and thus is subject to revision based on future regulatory agency discussions, actual permitting requirements, engineering design, and field conditions encountered during construction. A component of the cost evaluation is to ascertain the level of effectiveness and implementability for the cost expended. Alternatives providing equal or less effectiveness and implementability for a greater cost than another alternative that provides equal or greater effectiveness may be eliminated from further consideration.

- Sustainability: In 2009, the California Department of Toxic Substances Control (DTSC) issued an Interim Advisory for Green Remediation (DTSC, 2009) to provide guidance on how sustainability and green remediation concepts can be incorporated into projects, including option selection and design. The advisory presents a simple tool called the Green Remediation Evaluation Matrix (GREM) that can be used to perform qualitative comparisons of remediation options. As part of the FFS, a GREM is prepared for each alternative to show the relative impact to environmental stressors.

- Potential Biological Constraints/Restoration Opportunities: Biological constraints typically take the form of sensitive and/or regulated habitats such as riparian, aquatic (e.g., creek channel), and wetland habitats and special-status plant and animal species. Roux Associates' ecological consultant HTH reviewed available information from various resources and conducted a site reconnaissance. HTH then identified the primary biotic constraints that may occur in the vicinity of the Site. In addition, HTH also identified preliminary on-site habitat mitigation opportunities that may be available to compensate for project impacts to regulated habitats (e.g., riparian woodland) that would be considered significant under the California Environmental Quality Act (CEQA), or further required as mitigation by local, state and federal regulatory agencies. These opportunities would help the design team incorporate compensatory mitigation into the design, such that the selected alternative is ideally self-mitigating. HTH's preliminary findings are presented in the Technical Memorandum – Summary of Field Surveys for Conceptual 25% Design Plan for Jacques Gulch Remediation, dated February 22, 2017 (Appendix A).

## 2.0 BACKGROUND

From around 1845 to the 1970s, mining and processing of mercury-bearing ores (cinnabar) were conducted on land now within the Almaden Quicksilver County Park (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[1]. 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.

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[1]. 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 width variation from approximately 10 to 50 feet. Figure 2 shows the Project Area within the Site 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 Site, extensive removal and stabilization work was undertaken on the face of Mine Hill above Upper 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.

Roux Associates performed three field surveys in July, August, and October 2016. The findings were summarized in a Technical Memorandum, included in Appendix A.

[1] Santa Clara Valley Water District, 2008. *Jacques Gulch Restoration Project Final Engineer's Report*.

# 3.0 REMEDIATION/RESTORATION ALTERNATIVES

The primary purpose of this FFS is to evaluate proposed approaches for remediation/restoration of the Site, and from these to select an environmentally sensitive, sustainable, streamlined, and cost-effective approach that meets the objectives. Therefore, the detailed evaluation would focus on alternatives that would avoid or reduce impacts to the existing environmental resources. For example, the use of exposed riprap and other hardscape materials in stream restoration would be avoided to the extent practicable, and bioengineering methods would be emphasized and utilized for potential erosion control and restoration as much as possible. The following alternatives have been identified with consideration across the disciplines of environmental/civil/geotechnical engineering, ecology, and environmental planning.

## 3.1 Alternative 1 – Calcine Removal, Off-site Disposal, and Restoration

This alternative involves the removal, transportation, and disposal of calcine and mercury-impacted soil to off-site facilities for disposal. The extent of excavation is estimated based on the field survey results. The excavated area would be subsequently backfilled with imported clean fill.

Excavation would be highly effective in eliminating the transport and discharge of mercury from Upper Jacques Gulch because calcine and impacted soil would be physically removed and transported off-site to appropriate disposal facilities. However, excavation would be very difficult to implement due to the steep slopes at the Site. As observed by Roux Associates' geotechnical consultant MEI, the need for near-continuous excavation along the base and side slopes of the gulch would require significant removal of woody vegetation (primarily native trees and shrubs) that presently provide stability to the slopes at the Site. Such grading would have significant impacts on temporary and long-term slope stability, which would need to be adequately addressed through geotechnical stabilization measures.

In addition, a relatively long access road (approximately 1,200 feet long to reach the southern boundary of the Project Area and approximately 3,000 feet long through the reach) would need to be constructed for vehicle and heavy equipment access to the Project Area. Furthermore, SCCP expects the DTSC-approved Consolidation Area on the Mine Hill would not have adequate capacity for on-site calcine/soil disposal; therefore, excavated calcine and soil would have to be transported to off-site hazardous waste disposal facilities, (e.g., Waste Management Kettleman Hills Landfill, approximately 200 miles from the Site). Also, the project impacts to regulated habitats (i.e., creek channel and riparian habitats) would be considered significant under CEQA and would require habitat mitigation. Moreover, habitat mitigation would be required to obtain permits from multiple state and federal resource agencies. Mitigation would likely require both on-site and off-site locations to fully compensate for the impacts. Figure 4 shows the Project Area for calcine removal, access road, and the haul route.

Although the implementation of excavation/disposal would be relatively difficult and the cost would be relatively high, this alternative has been retained for further consideration (in the below Screening of Alternatives Section) due to its effectiveness to eliminate the transport and discharge of mercury from Upper Jacques Gulch.

## 3.2 Alternative 2 – Solidification/Stabilization of Calcine and Soil

This alternative would solidify the calcine and mercury-impacted soils by applying a binding agent (e.g., Portland cement, fly ash, or cement kiln dust) to form a solid material to restrict migration of mercury. Also, areas where potential erosion could occur would be stabilized with geotechnical and bioengineered methods (e.g., retaining wall, energy dissipater, biodegradable wattles, geotextile tubes, etc.).

A topographic survey would be performed to establish baseline contours at one-foot intervals within the Project Area. Solidification would be applied to limited areas in the upper portion of the Project Area and stabilization measures would be installed downstream of the solidification areas. Stabilization measures would include energy dissipating structures placed along the gulch to reduce stream velocity and erosion. In addition, geotextile dewatering tubes and biodegradable wattles would be used to filter the sediments at the bottom of the Project Area. The monitoring and maintenance of this alternative would be significant. An annual topographic survey would be conducted after the storm season to evaluate if additional erosion control measures would be required. In addition, the geotextile tubes would need to be replaced and disposed of at appropriate off-site disposal facilities every year. Additional biodegradable wattles would be placed when and where necessary.

This alternative would be an effective technology for restricting migration and discharge of mercury from Upper Jacques Gulch. However, similar to Alternative 1, implementability would be difficult due to the steep slopes in the Project Area. An access road would need to be constructed for vehicle and heavy equipment access to the Project Area. Similar to Alternative 1, approximately 1,200 feet long access road would need to be constructed to reach the bottom of the reach. In addition, the road has to be extended within the reach to conduct geotechnical and biological stabilization. Furthermore, the project impacts to regulated habitats could be considered significant under CEQA as well as require mitigation from multiple state and federal agencies. Mitigation would likely require both on-site and off-site locations to fully compensate for the impacts. Figure 5 shows the Project Area for this alternative.

Although the implementation would be relatively difficult and the cost would be relatively high, this alternative has been retained for further consideration (in the below Screening of Alternatives Section) due to its effectiveness to eliminate the transport and discharge of mercury from Upper Jacques Gulch.

## 3.3 Alternative 3 – Detention Basin South of Project Area

This alternative involves constructing a detention basin to intercept the stormwater runoff and sediments from Upper Jacques Gulch. As shown in Figure 6, the proposed detention basin is located immediately south of the Project Area. The dimension of the basin is designed to capture the majority of the runoff from Upper Jacques Gulch and provide adequate hydraulic retention time for sediment settlement. Figure 7 shows the preliminary plan and profile views of the detention basin. The basin would be divided by weirs into three sub-basins. Stormwater and sediments would enter Sub-Basin 1 via a vegetated 2:1 slope. Energy dissipation would be provided with rip rap at the bottom of the slope. The overflow from Sub-Basin 1 would enter Sub-Basin 2, and subsequently, Sub-Basin 3. In addition, to avoid altering downstream baseflow or groundwater levels, remotely-controlled (via satellite) valves would be installed between the basins. The turbidity of the water in the detention basin would be monitored via a turbidity gauge and the water would be released via the remotely-controlled valve once the turbidity is decreased to an acceptable level.

This alternative would be an effective technology for restricting migration and discharge of mercury from Upper Jacques Gulch because the majority of the sediments would be detained in the detention basin. However, an access road (approximately 1,200 feet long) would need to be constructed for vehicle and heavy equipment access to the proposed location of the Detention Basin for both construction and future maintenance of the basin. The project impacts to regulated habitats could potentially be mitigated on-site and within the Almaden Quicksilver Park.

## 3.4 Alternative 4 – Hand Removal of Visible Calcines

A Hand Removal of Visible Calcines alternative was developed due to accessibility issues for heavy equipment for Alternatives 1, 2, and 3 discussed above. This proposed alternative entails the manual remove of visible calcines from the Project Area. However, after a field visit on March 28, 2017 this alternative is not retained for further evaluation for the following reasons:

- Powered tools (e.g., hand-held jack hammers) would be required to remove the calcines embedded in the streambed, which would generate significant health and safety concerns for workers carrying the equipment through the extremely steep, rugged terrain;
- Removed calcines would have to be carried out on foot, which would generate significant health and safety concerns for workers traversing through the extremely steep, rugged terrain; and
- Contractors are unlikely to bid on this project due to the hazards for workers and if they did, it would be very expensive.

# 4.0 ACTIVITIES REQUIRED FOR IMPLEMENTATION

The following sections provide a description of conceptual engineering design, permitting, construction, monitoring, and maintenance activities to implement the selected alternative. All three retained alternatives described in Section 3.0 include varying degrees of excavation, grading, off-site disposal, and habitat mitigation. As such, the engineering design, permitting, construction, and maintenance activities vary in the level of effort, cost, and types of regulatory approval required.

## 4.1 Engineering Design

The engineering design for the selected alternative would be based on the field surveys performed in 2016. These surveys provided some of the key elements for the engineering design including horizontal limits of calcine and mercury-impacted soil, and potential biological resources in the Project Area. The engineering design would include additional activities as outlined below.

### 4.1.1 Pre-Design Investigation and Surveying

Limited pre-design activities potentially include surveying and material testing. A California-licensed surveyor and/or photogrammetry would be employed to supplement the existing survey with one-foot elevation contours, limits of vegetation, stream channel, and other significant Project Area features. This survey would be used as the base map for the engineering drawings and grading design.

Limited testing of Site materials (both native and non-native materials) may be required to determine geotechnical and agronomic characteristics. These data would be used to support the engineering design. An example of potential geotechnical characteristics may include subsurface exploration and testing to evaluate foundation support conditions for slope stabilization structures. Another example may include agronomic testing to determine the most appropriate vegetation to plant at the Site or whether soil amendments are required.

### 4.1.2 Earthwork

One of the key engineering design components for all three alternatives is significant earthwork. Earthwork design would generally include excavation, grading, and final cover plans.

Horizontal and vertical limits of excavation would be determined based on the locations of visually observed calcines and XRF results.

As part of the engineering design, quantities of potential hazardous materials (excavated calcine and mercury-impacted soils) generated by the selected alternative would be estimated. An appropriate disposal facility would be identified and necessary characterization sampling established.

The final excavation plan would inform the grading plan for the Site. The grading plan would consider: balancing of graded materials to minimize import or export of materials; establishment of

sufficient cover to minimize potential exposure of calcine and mercury-impacted soils; slope stability; reducing erosive forces; appropriate draining; and habitat mitigation.

### 4.1.3 Hydrology/Hydraulics/Geomorphic Evaluation

The degree of hydrologic and hydraulic analysis required for the remediation/restoration would depend on the alternative selected. Significant hydrologic and hydraulic analysis would be required to develop the final Site grading plans and design slope protection for Alternative 1. In particular, extensive fluvial geomorphic evaluation would be necessary to restore the stream bed in Upper Jacques Gulch after calcine removal.

### 4.1.4 Project Site Restoration and Habitat Mitigation Design

Once reference conditions and project goals are established, a restoration plan would be prepared that may incorporate the following elements:

- Slope recontouring;
- Slope stabilization/erosion control measures;
- Creek channel reconstruction and stabilization;
- Soil amendments, if necessary;
- Native planting and seeding;
- Plant protection from herbivory (e.g., by enclosing plants in foliage protection cages); and
- Vegetation maintenance (3 years of irrigation and weed control).

### 4.1.5 Construction Controls

The engineering design would also include required temporary controls and best practices that would be employed during the remediation/restoration construction including:

- Access and traffic controls;
- Soil erosion and sedimentation controls;
- Dust control;
- Temporary staging and stockpiling requirements and locations;
- Health and safety considerations;
- Quality control procedures and documentation;
- Temporary facilities and utilities; and
- Protection of certain features (e.g., vegetation that should not be disturbed, previously remediated areas, special-status species).

### 4.1.6 Engineering Design Package

The engineering design elements outlined in this section would be compiled in a package that would generally include the following components:

- Cover letter or memorandum providing an overview of the project;
- Design drawings that would generally include:
    - Cover Sheet;
    - Existing Conditions;
    - Soil Erosion and Sediment Controls;
    - Excavation Plan;
    - Grading Plan;
    - Creek Channel Re-construction and Stabilization Plan;
    - Habitat Mitigation Plan (Soil Preparation, Irrigation Plan, Planting, Seeding, Maintenance); and
    - Sections and Details.

Technical Specifications that would generally include:

- Health and Safety Requirements;
- Summary of Work;
- Submittals;
- Regulatory Requirements;
- Quality Control;
- Mobilization and Temporary Construction Facilities and Utilities;
- Temporary Controls, Staging and Storage;
- Clearing and Grubbing;
- Excavation and Grading;
- Material Processing, Recycling, and Disposal;
- Site Revegetation (Soil Preparation, Irrigation Plan, Planting, Seeding, Maintenance);
- Surveys and As-Built Drawings; and
- Operation and Maintenance Procedures.

## 4.2 Permitting and Regulatory Approvals

All three retained alternatives would require permitting and regulatory approvals from various agencies. Extensive communication would be required between the various agencies to ensure that

permit requirements are identified and coordinated, and that agencies do not have conflicting requests, and to avoid a protracted project schedule. Permitting requirements and coordination would be a key topic at a future coordination meeting for the involved agencies. This subsection includes a summary of the possible permits and regulatory approvals. It is anticipated that some permit requirements may not be described below.

### 4.2.1 California Environmental Quality Act

CEQA (Public Resources Code, § 21000, et seq.) requires California governmental agencies to consider the potential environmental impacts of a project that is subject to discretionary approval(s). The remediation/restoration project (any of the three retained alternatives) would be subject to CEQA and the Lead Agency for the project would be the Santa Clara County Parks and Recreation Department. Other state or local agencies with discretionary approval authority over aspects of the project (e.g., plan approvals, permits) could rely on the CEQA document during their decision-making as well.

### 4.2.2 Federal Clean Water Act Section 404 (U.S. Army Corps of Engineers)

The U.S. Army Corps of Engineers (USACE) has jurisdiction over "Waters of the United States" (jurisdictional waters) under provisions of Section 404 of the Federal Clean Water Act (1972). These waters may include all waters used, or potentially used, for interstate commerce, including all waters subject to the ebb and flow of the tide, all interstate waters, all other waters (intrastate lakes, rivers, streams, mudflats, sand flats, playa lakes, natural ponds, etc.), all impoundments of waters otherwise defined as "Waters of the U.S.," tributaries of waters otherwise defined as "Waters of the U. S." and wetlands adjacent to "Waters of the U.S." (33 CFR, Part 328, Section 328.3). Construction activities within jurisdictional waters are regulated by the USACE and the placement of fill material into such waters must be in compliance with permit requirements of the USACE. No USACE permit would be effective in the absence of state water quality certification pursuant to Section 401 of the Clean Water Act.

The creek channel within Upper Jacques Gulch, below the ordinary high water mark, is likely within USACE jurisdiction under Section 404 of the federal Clean Water Act (1972). All three alternatives include disturbance below the ordinary high water mark of Upper Jacques Gulch. It is anticipated that all three alternatives could be permitted under Nationwide Permit (NWP) 38 – *Cleanup of Hazardous and Toxic Waste*, NWP 33 – *Temporary Construction Access and Dewatering*, and NWP 27 – *Aquatic Restoration, Establishment, and Enhancement Activities*.

### 4.2.3 Federal Endangered Species Act Section 7 (U.S. Fish and Wildlife Service)

Provisions of the federal Endangered Species Act (FESA), as amended (16 USC 1531) protect federally listed threatened and endangered species and their habitats from unlawful take. "Take" under FESA includes activities such as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The U.S. Fish and Wildlife Service's (USFWS) regulations define harm to include some types of "significant habitat modification or

degradation." The U.S. Supreme Court ruled on June 29, 1995, that "harm" may include habitat modification "...where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."

The Project Area provides potential habitat for the federally threatened California red-legged frog (*Rana draytonii*) and California tiger salamander (*Ambystoma californiense*). All three alternatives could result in take (e.g., injury or mortality of individuals, or modification of habitat that would result in injury or mortality) of these species, which would require incidental take approval from the USFWS (for both species) under the FESA. FESA approval would likely take the form of a Section 7 consultation between the USACE and USFWS given that a USACE Section 404 permit would likely be required. The Section 7 consultation would require the SCCP to prepare a Biological Assessment technical document in accordance with USFWS requirements to characterize the Project's effects on the California red-legged frog and California tiger salamander.

### 4.2.4 Water Quality Certification (RWQCB)

All three alternatives include disturbance to the riparian corridor of Upper Jacques Gulch, which is within RWQCB jurisdiction. The RWQCB's jurisdiction generally extends to the "hinge points" on the top-of-bank of opposing channel banks and/or the full lateral extent of riparian vegetation beyond the top-of-bank, when riparian tree canopy extending beyond the banks provides allochthonous organic matter inputs to the stream channel. Prior to issuance of the Section 404 permit, the USACE would require state water quality certification pursuant to Section 401 of the Clean Water Act. The State Water Resources Control Board is the state agency charged with implementing water quality certification in California. Therefore, a Clean Water Act Section 401 Water Quality Certification (401 WQC) from the RWQCB would likely be required for any of the three alternatives. A 401 WQC is required for projects that involve fill, dredging, bank stabilization, or installation of structures within a stream. The 401 WQC application package generally includes basic applicant information, project description, avoidance and minimization measures, waterbody impacts, an analysis of alternatives for the project, a dewatering plan, and a discussion of low impact management techniques and mitigation measures.

### 4.2.5 Notification of Lake or Streambed Alteration and Agreement (CDFW)

All three alternatives include disturbance to the riparian corridor of Upper Jacques Gulch, which is within the jurisdiction of the California Department of Fish and Wildlife (CDFW). CDFW jurisdiction generally extends to the "hinge points" on the top-of-bank of opposing channel banks and/or the full lateral extent of riparian vegetation beyond the top-of-bank. Definitions used in the identification of CDFW jurisdiction are contained in various documents including the Fish and Game Code, Title 14 of the California Code of Regulations (Hernandez 1999), and *A Field Guide to Lake and Streambed Alteration Agreements, Sections 1600-1607, California Fish and Game Code* (1994). These areas generally include rivers, streams, creeks, or lakes. In addition, canals, aqueducts, irrigation ditches, and other means of water conveyance can also be considered streams if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife.

It is anticipated that all three alternatives would require a Notification of Lake or Streambed Alteration (LSA) and LSA Agreement. An LSA Notification and LSA Agreement are required when streamflow is going to be obstructed or diverted, material would be deposited in the stream channel, CDFW jurisdictional riparian habitat would be removed, and/or there would be a change in the use of the stream material. Dependent on the nature of the activity and the affected stream, CDFW would determine whether an LSA Agreement is required. The LSA notification package would generally include basic applicant information, description of the affected stream, project description, construction information, impacts to vegetation and special status species, and measures to mitigate adverse impacts. Depending on the stream activity, CDFW may also require biologic and hydrologic studies as part of the notification package.

### 4.2.6 California Endangered Species Act (CDFW)

Provisions of California's Endangered Species Act (CESA) (Fish and Game Code of California, Chapter 1.5, Sections 2050-2116) protect state-listed threatened and endangered species. The CDFG regulates activities that may result in "take" of individuals. Take is defined as, "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill".

The Project Area provides potential habitat for the state threatened California tiger salamander. All three alternatives could result in take (e.g., injury or mortality of individuals, or modification of habitat that would result in injury or mortality) of the California tiger salamander, which would require incidental take approval from the CDFW (for the California tiger salamander only) to comply with CESA. The SCCP would need to prepare an Incidental Take Permit application in accordance with CDFW requirements.

### 4.2.7 2009-0009-DWQ Construction General Permit (Santa Clara County)

As all three alternatives for the Project would result in the disturbance of more than one acre, a 2009-0009-DWQ Construction General Permit (CGP) may be required from the Santa Clara County Development Services Office. The CGP authorizes the discharge of construction-related stormwater. The CGP application would generally include basic applicant information, Stormwater Pollution Prevention Plan (SWPPP), Erosion Control Plan, and engineering plans.

### 4.2.8 Grading Permit (Santa Clara County Public Works)

A Grading Permit would be required for Alternatives 1 and 3. The Grading Permit application would generally include basic applicant information, engineer information, contractor information, engineering plans and calculations, and a soils report. In addition, it is anticipated that a geotechnical report would be required for the application.

### 4.2.9 Dust Control Plan (AQMD)

A Dust Control Plan (DCP) would be required as the remediation/restoration construction would be considered an "Active Operation." The DCP would be submitted to the Bay Area Air Quality

Management District (AQMD) for approval and would generally include basic owner and responsible party information, description of the project activities that may generate dust, best management practices that would be employed to control dust, and a contingency plan.

## 4.3 Pre-Construction Activities

Once the engineering design is complete and permits/regulatory approvals are secured, pre-construction activities would be completed for implementation of the remediation/restoration. These would likely include various avoidance and minimization measures for the protection of sensitive environmental resources, to be determined by the project's CEQA document and permits. This would likely include pre-construction surveys for various environmental resources (e.g., nesting birds and other sensitive species) and the potential use of construction buffers from identified sensitive resources. A pre-construction meeting would be conducted with the remediation/restoration contractor to identify roles and responsibilities of key project personnel, review procedures for submittals, health and safety, schedule, payment requisitions, agency communications, and other general administrative issues. Key submittals would also be obtained from the contractor prior to mobilization such as the health and safety plan, staging plan, traffic control plan, list of subcontractors and material suppliers, quality control procedures, and schedule.

The contractor would mobilize personnel, equipment, and materials to the Site. Mobilization would also include establishment of health and safety monitoring/protocols and temporary controls, facilities, and utilities. The work would be laid out by a surveyor including limits of work, excavation limits and grade stakes.

## 4.4 Construction Activities

Once the mobilization and establishment of temporary controls are complete, remediation/restoration would be implemented.

### 4.4.1 Excavation and Material Management

It is anticipated that the first activity would include excavation of the various materials that need to be managed at the Site using backhoes/loaders. The excavated materials would be staged in designated locations based on whether the material is destined for off-site recycling or disposal, or on-site processing and reuse. Inert materials, such as concrete, may be resized as necessary so that it can be re-integrated on-site consistent with the selected option. It is anticipated that rebar may be separated from the concrete and recycled. This may be performed using track-mounted equipment fitted with pulverizing attachment or a portable impact crusher. The various excavated materials would be staged and protected consistent with the engineering design, approved contractor submittals, and regulatory requirements for soil erosion and sedimentation controls and other best management practices (e.g., staging impacted materials on plastic and covering stockpiles when not in use). Materials being disposed or recycled off-Site would be shipped using appropriately licensed transporters and documented via manifests or bills of lading, as required.

### 4.4.2 Backfill and Grading

Following excavation, backfill and grading would be implemented to reconstruct the channel and recontour the slopes. Backfill and grading would be performed using traditional earthmoving equipment such as backhoes, loaders, bulldozers, scrapers, and/or blades. Compaction would be conducted as necessary for stability of the slopes and stream channel.

### 4.4.3 Restoration

Once all rough grading is complete the Project Site would be restored as follows:

- Natural channel reconstruction and stabilization;
- Soil preparation, as needed, to support revegetation;
- Erosion control Best Management Practices (BMPs); and
- Revegetation including provision for irrigation, as well as seeding, planting, and foliage protection.

## 4.5 Post-Construction Activities

Upon completion of the remedial construction, equipment, materials, and personnel would be demobilized. A final as-built survey would be prepared to document the Site conditions including limits of work, final grades/slopes, and planting areas. Certain controls such as silt fence may remain in place after demobilization until critical portions of the Site are stabilized.

It is anticipated that the reconstructed channel or detention basin (depending on which alternative is implemented), as well as all planted vegetation would require maintenance. The channel or detention basin would require maintenance on an as needed basis to ensure channel stability or basin capacity. All planted vegetation would require maintenance for a 3-5 year plant establishment period that would be focused on irrigation, weed control, and foliage protection cage repair.

Biological monitoring would be performed following restoration for up to 10 years for all three alternatives, in accordance with the Project's Habitat Mitigation and Monitoring Plan (HMMP) and permit conditions. The HMMP would include quantitative success criteria for habitat function and vegetation establishment. If these criteria are not met, remedial measures and additional monitoring may be required. In addition, stormwater and geotechnical monitoring would be performed following remediation construction until the Project Area is stabilized for Alternative 1. For Alternatives 1, 2, and 3, post-construction biological monitoring would need to be performed annually until the quantitative habitat success criteria are met (generally 10 years for riparian habitat mitigation).

# 5.0 SCREENING OF ALTERNATIVES

The following sections discuss the comparative effectiveness, implementability, cost, sustainability, and potential biological constraints and mitigation opportunities for the remediation/restoration alternatives.

## 5.1 Effectiveness

Both long-term and short-term effectiveness are evaluated for this criterion. Long-term effectiveness considers the ability of the option to achieve the objectives outlined in Section 1.1:

- Decrease the mercury loading to San Francisco Bay by minimizing mercury transport and discharge from Upper Jacques Gulch; and
- Incorporate habitat mitigation/restoration in the selected alternative to minimize off-site mitigation.

Since Alternative 1 involves excavation and removal of calcine and mercury-impacted soil, it provides the highest degree of long-term effectiveness because the impacted material is removed from the Project Area. Alternatives 2 and 3 would provide adequate long-term effectiveness when post-construction monitoring and maintenance is performed regularly.

Short-term effectiveness evaluates the period of time needed to complete the remediation/restoration, and negative impacts that may be posed during construction and implementation, including habitat impacts and other environmental impacts.

Potential adverse short-term impacts from all three alternatives include truck traffic, noise, dust, habitat impacts, slope stability and erosion of excavated materials stockpiled on-site. Alternative 3 would have the least short-term impacts (and the greatest short-term effectiveness) because the construction would be shortest in duration and the least intrusive. Alternatives 1 and 2 would have significant short-term impacts, including destruction of existing habitat conditions, further deterioration of public roadways due to increased traffic during construction, and potential of short-term exposure of calcine within the stream channel that could be subject to erosion until the channel is sufficiently stabilized.

## 5.2 Implementability

This criterion refers to the practical, technical, and administrative feasibility of implementation of an alternative, including the availability of materials and services required. Technically, all three alternatives can be designed and constructed; however, the engineering design would be significantly more complex for Alternative 1 because the excavation and removal of calcine involves additional earth moving, grading design, slope stability considerations, and hydrologic/hydraulic analyses. From a practical perspective, Alternatives 2 and 3 are implementable with standard construction techniques and equipment while Alternative 1 would require more complex and specialized construction

techniques. Both Alternatives 1 and 2 would require the construction of an access route that goes through the Project Area. In addition, all three alternatives would be subject to substantial permitting and regulatory approvals as they all involve disturbance to the stream channel, significant earth work, and vegetation removal. Alternatives 1 and 2 result in significantly more disturbance than Alternative 3 and could have substantially greater permitting and mitigation requirements and a lengthier regulatory approval process. Unfortunately, Alternative 3 would encounter significant permitting challenges also as the RWQCB has indicated that they will not permit "in-stream" basins.

## 5.3 Cost

This criterion considers the rough order-of-magnitude cost range of each option. Some of the reasons for this range are the level of design detail at the FFS stage, variability of construction materials, variability in construction costs over time, the complexity of developing Site-specific design factors, and the sensitivity of construction costs to economic factors such as interest rates, inflation, and materials costs.

Comparative order-of-magnitude cost ranges for conceptual-level engineering design, permitting, construction, and maintenance were considered. Because the restoration cost ranges were assigned based on a conceptual level of design, they are subject to revision based on future regulatory agency input, permitting requirements, engineering design, and actual field conditions encountered during construction. The costs are presented as ranges to reflect some of these uncertainties. Key cost drivers include the actual volume of material excavated, actual volume of materials that must be disposed off-site in a Class I landfill, and the associated permitting.

The preliminary opinion of probable cost for each alternative is included in Tables 1 through 3. The remediation costs range from $3,160,000 (Alternative 3) to $10,507,500 (Alternative 1). The post-remediation operation and maintenance costs range from $2,102,000 (Alternative 1) to $2,950,000 (Alternative 2). The total costs range from to $4,830,000 (Alternative 3) to $11,458,000 (Alternative 1).

## 5.4 Sustainability

### 5.4.1 Definition and Purpose of Green Remediation

The USEPA defines "green remediation" as "the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprints of cleanup actions." Based on the definition, in December 2009 the California DTSC issued "Interim Advisory for Green Remediation" to introduce green remediation principles of sustainability and life-cycle thinking and offer an assessment tool, GREM, for evaluating remedial alternatives under consideration at cleanup sites.

Green remediation is a holistic approach to address the environmental, social, and economic footprints of a remediation activity. Cleaning up sites can often be viewed as "green" from the

perspective of the cleanup improving environmental and public health conditions. However, cleanup activities use energy, water, and resources to achieve cleanup objectives; therefore, the process of cleanup creates impacts that exceed the cleanup site's physical boundary.

The purpose of DTSC's assessment tool GREM is to identify potential impacts that may have been discounted, or not included, in traditional assessments such as the three criteria evaluated in the previous sections. It is important to note that the effectiveness criteria for protectiveness and site-specific cleanup objectives should not be compromised while implementing green remediation. The goal of green remediation is to achieve cleanup objectives by ensuring protectiveness while decreasing the environmental footprint of the cleanup activity itself.

### 5.4.2 Green Remediation Evaluation Matrix

The GREM displays potential environmental stressors and their associated impacts and allows a ranking or rating of the severity or significance of those impacts. The four categories for stressors are substance release/production, thermal releases, physical disturbances/disruptions, and resource depletion/gain (recycling).

For example, the implementation of excavation would result in:

**Substance release production**

- Dust generated from earthwork;
- Emissions of diesel particulate matter (DPM); and
- Greenhouse gases from construction and haul equipment and vehicle exhaust.

**Resource depletion**

- Use of fossil fuels;
- Use of backfill soil and construction materials; and
- Filling the available capacity of landfills.

**Physical disturbances**

- Soil structure disruption from excavation and grading;
- Noise and traffic from construction equipment and haul trucks;
- Restricted Site access during construction; and
- Removal of soil from borrow sources.

As part of the option evaluation process, GREM was prepared for each option considered in this FFS and is included in Appendix B.

Based on the GREM analysis, Alternative 3 ranks higher than Alternatives 1 and 2 because it is the least intrusive effective option, using the least resources. Implementation of Alternatives 1 and 2 would result in more significant traffic, noise, dust, and increased risk of traffic-related injury or death from the trucks transporting and disposing of the excavated soil.

## 5.5 Potential Biological Constraints and Mitigation Opportunities

Each of the three alternatives would face a number of biotic constraints associated with disturbance to sensitive and regulated habitats, as well as potential impacts to special-status animal, and potentially plant, species. The type of activity proposed and the footprint of disturbance associated with each alternative would result in a range of impact(s) that would require mitigation. The following matrix provides a simple summary comparing the relative degree of constraints and mitigation needed for each alternative.

| Alternative | Riparian Habitat Impacts | Aquatic/Stream Channel Habitat Impacts | Endangered/Threatened Animal Species Habitat Impacts (i.e., red-legged frog, tiger salamander) | Riparian/Stream Channel Habitat Mitigation Surface Area |
|---|---|---|---|---|
| 1 (Calcine Removal/ Off-site Disposal) | high | high | high | High- would require both on-site and off-site habitat mitigation |
| 2 (Solidification/ Stabilization) | moderate | moderate | moderate | Moderate- would likely require both on-site and off-site habitat mitigation |
| 3 (Detention Basin) | low | low | low | Low- habitat impacts may be able to be mitigated on-site. |

### 5.5.1 Biological Constraints

*Sensitive and Regulated Habitats* – The following sensitive and regulated habitats under the jurisdiction of local, state, and federal regulatory agencies 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 is dominated by a dense cover of the mixed oak woodland vegetation community. Mitigation typically includes restoring the specific habitat at a ratio from 1:1 (replacement surface area: impact surface area) to up to 3:1. Alternatives 1 and 2 would require substantial mitigation that would likely require identification/acquisition of an off-site area(s) to be restored in order to fully compensate for the impacts. Alternative 3 has a significantly smaller footprint of disturbance and could potentially be fully mitigated on-site. However, Alternative 3 does include the creation of a detention basin along Upper Jacques Gulch to retain mercury-laden sediments/alluvium. The basin would need to be designed to ensure that it does not impact the downstream channel and riparian habitats by allowing a significant percentage of detained water to discharge back to the channel, as well as allowing baseflow to pass directly through the basin. The

basin would also need to be designed to avoid impacts to existing native California sycamore trees in the vicinity.

*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 Site. However, due to lack of suitable habitat only a subset of these species (likely 10-20 species) could potentially occur within the Site. At least 3 special-status plant species are known at the Site and several others occur in the Site vicinity. In accordance with CEQA, protocol-level surveys would need to be conducted for any species determined to potentially be present. If presence is confirmed, avoidance and minimization measures would 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. Alternatives 1 and 2 have a much higher likelihood of impacting special status plants as compared to Alternative 1 due to the larger footprints of disturbance.

*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, which is federally listed as threatened and a California species of special concern, and the California tiger salamander, which is federally and state listed as threatened. The potential presence of the California tiger salamander, California red-legged frog, and their habitats may 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. Alternatively, mitigation may take the form of the purchase of credits in an agency-approved conservation bank. Alternatives 1 and 2 would require substantially more mitigation than Alternative 3 due to the larger footprints of disturbance.

However, Alternative 3 does include the creation of a detention basin along Upper Jacques Gulch to retain mercury-laden sediments/alluvium. Because various forms of mercury, especially methylmercury, are toxic to amphibians, the detention basin would need to be designed to avoid the creation of habitat that California tiger salamanders and California red-legged frogs may use to attempt breeding. Therefore, the basin would be designed to only hold water for short durations

following storm events and otherwise allow through flow to ensure it does not provide breeding habitat for California red-legged frog or California tiger salamander.

*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 other 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 April and May, and nesting activity substantially subsides by July and August. Alternatives 1 and 2 are more likely to be constrained by the presence of common and special-status nesting birds due to the large areas of disturbance, including removal of trees, within the dense riparian corridor. Alternative 3 is much less likely to be constrained due to the significantly smaller footprint and less direct tree removal.

*Restricted Construction Work Windows*. 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 through August 31. Thus, work may be further restricted to the period between September 1 and the start of the rainy season (typically, mid-October). At least three construction seasons would be required to complete Alternatives 1 and 2 due to the larger footprints and time required for construction, as compared to one construction season for Alternative 3.

### 5.5.2 Habitat Mitigation Opportunities

The remediation project would impact jurisdictional high quality riparian and creek channel habitats. The regulatory agencies (USACE, RWQCB, CDFW) typically require mitigation ratios greater than 1:1 (surface area of habitat impacted: surface area of on-site mitigation) to compensate for temporal loss of jurisdictional, high quality riparian habitat (i.e., woody riparian habitat dominated by native trees and shrubs). However, the preferred alternative would provide substantial water quality benefits and specifically contribute toward meeting the RWQCB's Total Maximum Daily Load (TMDL) goal for

mercury in the Guadalupe River watershed. Therefore, there is an ecological justification that on-site mitigation at a 1:1 ratio (i.e., restoration of impacted channel and riparian habitat, in place at the location of the impacts) could be considered sufficient mitigation for this project due to the watershed-wide ecosystem benefits associated with calcine remediation. However, there is no guarantee the regulatory agencies would accept 1:1 on-site mitigation as sufficient and they may 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, lack of sufficient light to support vigorous growth of woody riparian vegetation, and difficulty providing adequate and safe access to conduct required maintenance activities. Due to the substantial surface area of impacts associated with Alternatives 1 and 2 both on-site and off-site mitigation would likely be required, while the much smaller footprint of disturbance associated with Alternative 3 could potentially be mitigated on-site. HTH's restoration ecologists have identified opportunities to establish and/or enhance riparian and oak woodland habitat surface area and functions within the Upper Jacques Gulch watershed. The following on-site restoration opportunities could be packaged with revegetation of riparian vegetation removal areas along the remediated reach of Upper Jacques Gulch, to mitigate for impacts to jurisdictional habitats. 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 on-site.
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 would 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 No. 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 mature 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. However, a restoration ecologist would need to further assess soil and geomorphic conditions at the Site to determine whether the existing Site conditions are suitable for sycamore establishment.

If regulatory agencies require additional off-site mitigation, suitable locations would need to be identified and would require substantial resources to acquire, design, implement, maintain, and monitor.

# 6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the field surveys, 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.

Based on our findings, we anticipate removal of the calcines in the Project Area under Alternative 1 would involve near-continuous excavation along the base and side slopes of the gulch, which would require significant removal of vegetation presently providing stability to these slopes. Such grading would have significant impacts on temporary and long-term slope stability and on jurisdictional, high quality riparian and creek channel habitat. In addition, as described in Section 3.1, a relatively long access route would need to be constructed so that heavy equipment (e.g., backhoes, excavators, bulldozers, dump trucks) could be used for calcine removal. The access route would further impact a substantial surface area of riparian and oak woodland habitat. Therefore, we do not recommend Alternative 1.

In addition, Alternative 2 would involve building a long access route for access to the bottom of the reach and through the reach. The geotechnical and biological stabilization would have significant impacts on jurisdictional, high quality riparian and creek channel habitat. The post-remediation monitoring and maintenance would be required after each storm events and would not be cost-effective as a long-term solution. Therefore, we do not recommend Alternative 2.

Alternative 3 could potentially address the project objectives; however, the RWQCB has indicated that they would not permit an in-stream basin at the bottom of Jacques Gulch. Therefore, this alternative is also eliminated.

In conclusion, we recommend no action at this time until innovative technologies are identified in the future that could resolve the technical challenges for calcine removal at the Project Area.

# TABLES

1. Conceptual Design Preliminary Opinion of Probable Cost – Alternative 1 – Calcine Removal, Offsite Disposal, and Restoration
2. Conceptual Design Preliminary Opinion of Probable Cost – Alternative 2 – Solidification and Biological-Geotechnical Stabilization
3. Conceptual Design Preliminary Opinion of Probable Cost – Alternative 3 – Detention Basin South of Project Area Soil XRF Measurements

## TABLE 1. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 1 - Calcine Removal, Offsite Disposal, and Restoration

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| **1** | **Mobilization** | 1 | LS | $ 250,000 | $ 250,000 | Unit price based on past project experience. |
| | | | | Sub-total* | **$ 250,000** | |
| **2** | **Site Preparation** | | | | | |
| 2.1 | Clear & Grub | 0.96 | AC | $ 25,270 | $ 24,365 | Assume a 10 foot wide access road has to be built for the whole project area. Access road from Hicks Road to Upper Jacques Gulch starting point is approximately 1,200 feet, and the access road along the Upper Jacques Gulch is approximately 3,000 feet Assume the access route will be cleared and grubbed. Unit price from RSMeans: "Clear and Grub, dense brush, includes stumps; Clear and Grub, heavy trees, to 24" diameter" |
| 2.2 | Boulder Removal | 1,556 | BCY | $ 50 | $ 77,778 | Unit price based on past project experience. |
| 2.3 | Access Road | 4,667 | SY | $ 16 | $ 76,113 | Unit price from RSMeans: "Temporary, roads, gravel fill 8" depth, excluding surfacing". |
| 2.4 | Asphalt Cement Pavement | 4,667 | SY | $ 22 | $ 101,360 | Unit price from RSMeans: "Asphalt paving, plant mixed asphaltic base courses for roadways and large paved areas, bituminous concrete, 4" thick" |
| 2.5 | Slope Stabilization | 8,400 | LF | $ 100 | $ 840,000 | Unit price based on past project experience. |
| 2.6 | Traffic control | 3 | LS | $ 25,000 | $ 75,000 | Assume project will occur over 3 years. Unit price based on past project experience. |
| 2.7 | Hazardous Waste Transportation and Offsite Disposal (Assume 30% hazardous) | 152 | TON | $ 350 | $ 53,083 | Assume 6" for volume estimate. Assume Kettleman Landfill for hazardous waste disposal. Assume density of 1 CY to 1.5 tons. Assume expansion factor of 1.3. Unit price based on past project experience. |
| 2.8 | Non-Hazardous Waste Transportation and Offsite Disposal | 354 | TON | $ 250 | $ 88,472 | Assume 6" for volume estimate. Assume density of 1 CY to 1.5 tons. Assume expansion factor of 1.3. Unit price based on past project experience. |
| | | | | Sub-total* | **$ 1,337,000** | |
| **3** | **Calcine removal** | | | | | |
| 3.1 | Excavation | 3,050 | TON | $ 100 | $ 305,000 | Assume in-place volume. Assume 3 feet for depth of excavation. Assume density of 1 CY to 1.5 tons. Unit price based on past project experience |
| 3.2 | Transportation and Offsite Disposal | 3,965 | TON | $ 350 | $ 1,387,750 | Assume expansion factor of 1.3. Unit price based on past project experience |
| | | | | Sub-total* | **$ 1,693,000** | |

## TABLE 1. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 1 - Calcine Removal, Offsite Disposal, and Restoration

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| **4** | **Road repair** | | | | | |
| 4.1 | Alamitos Road | | | | | |
| 4.1.1 | Asphalt Cement Pavement | 38,667 | SY | $ 22 | $ 839,840 | Assume the road is 24 feet wide and the length is approximately 14,500 feet. Unit price for RSMeans: "Asphalt paving, plant mixed asphaltic base courses for roadways and large paved areas, bituminous concrete, 4" thick". |
| 4.1.2 | Class III Aggregate Base (including compaction) | 38,667 | SY | $ 6 | $ 229,293 | Unit price from RSMeans: "Base course drainage layers, aggregate base course for roadways and large paved areas, bank run gravel, spread and compacted, 6" deep". |
| 4.1.3 | Shoulder | 20,300 | SF | $ 5 | $ 101,500 | Assuming total width for both sides of the road is 14 feet. Assume 10% of shoulder needs to be repaired/replaced. Unit price based on past project experience. |
| 4.1.4 | Curb | 2,900 | LF | $ 15 | $ 42,833 | Assume 10% of curb needs to be replaced. Unit price from RSMeans: "Cast-in place concrete curbs and gutters, concrete, wood forms, straight, 6"x18", includes concrete". |
| 4.1.5 | Guard rail | 1,600 | LF | $ 56 | $ 90,032 | Assume guard rail is needed only by the 1,600 feet of steep slope on Alamitos road. Unit price from RSMeans: "Vehicle guide rails, corrugated steel, galvanized steel posts, install metal guide/guard rail, double face, wood posts 6"-3" O.C., 6"x8" posts". |
| 4.2 | Lane striping | 14,500 | LF | $ 1 | $ 7,250 | Unit price from RSMeans: "Painted Pavement Markings, acrylic waterborne, white or yellow, 6" wide, 3,000-16,000 LF". |
| | | | | Sub-total* | **$ 1,311,000** | |
| **5** | **Restoration and Revegetation** | | | | | |
| 5.1 | Earthwork | | | | | |
| 5.1.1 | Import and backfill clean soil | 2,643 | LCY | $ 100 | $ 264,333 | Assume expansion factor of 1.3. Unit price from RSMeans: "Backfill, light soil, by hand, no compaction". Price increased due to the ecological concerns in the area |

## TABLE 1. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 1 - Calcine Removal, Offsite Disposal, and Restoration

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| 5.2 | Revegetation | | | | | |
| 5.2.1 | Permitting and Design | 1 | LS | $ 450,000 | $ 450,000 | Unit price and assumptions from H.T. Harvey & Associates Cost Estimate:<br>1. Permits and supporting technical documents covering both on-site and offsite mitigation locations will be required from the following agencies: USFWS, USACE, RWQCB, CDFW.<br>2. Permitting could take 2-3 years and the cost estimate includes time for agency coordination throughout permit processing<br>3. A total of 3 acres of riparian habitat will be permanently impacted (i.e., the riparian forest will be removed).<br>4. Riparian impacts will be mitigated to a 3:1 ratio (mitigation surface area: impact surface area) with 3 acres of riparian forest designed and restored onsite and 6 acres designed and restored offsite.<br>5. Design work only includes planting and irrigation design. |
| 5.2.2 | Revegetation Construction and Maintenance | 1 | LS | $ 3,100,000 | $ 3,100,000 | Unit price and assumptions from H.T. Harvey & Associates Cost Estimate:<br>1. On-site mitigation cost estimate does not include the cost of earthwork; earthwork design and construction costs will be provided by Roux Associates.<br>2. Offsite mitigation site(s) will be easily accessible and construction will only include planting and irrigation.<br>3. Offsite mitigation will be required and will be available on land owned by County Parks.<br>4. Both on-site and offsite mitigation sites will be require temporary irrigations systems that are services by water tanks to be installed and filled as needed.<br>5. Vegetation maintenance will occur for 3 years following plant installation. |
| | | | | Sub-total* | **$ 3,815,000** | |
| **6** | **Total Capital Cost for Remediation Construction** | | | | **$ 8,406,000** | |
| **7** | **Engineering** | | | | | |
| 8.1 | Planning, Survey, Engineering Design | | | 20% | $ 1,681,200 | Assume 20% of Total Construction Cost (Item 6) |
| 8.2 | Engineering During Construction | | | 5% | $ 420,300 | Assume 5% of Total Construction Cost (Item 6) |
| | | | | Sub-total* | **$ 2,102,000** | |
| **8** | **Total Remediation Cost** | | | | **$ 10,508,000** | |

## TABLE 1. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 1 - Calcine Removal, Offsite Disposal, and Restoration

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **Post-Construction Monitoring** | | | | | |
| 9.1 | Post-Construction Ecological Monitoring | 7 | EA | $ 64,286 | $ 450,000 | Cost from H.T. Harvey & Associates Cost Estimate. Annual monitoring and reporting will occur in 7 years of a 10 year monitoring period |
| 9.2 | Stormwater Monitoring | 10 | EA | $ 25,000 | $ 250,000 | Stormwater monitoring will occur annually for 10 years |
| 9.3 | Geotechnical Monitoring | 10 | EA | $ 25,000 | $ 250,000 | Geotechnical monitoring will occur annually for 10 years |
| | | | | Sub-total* | **$ 950,000** | |
| | | | | Sub-total* | **$ 2,102,000** | |
| **10** | **Grand Total** | | | | **$ 11,458,000** | |

**Notes**

*Rounded up to nearest 1,000's.
AC = acres
BCY = bank cubic yards
EA = each
LCY = loose cubic yards
LS = lump sum
LF = linear feet
SF = square feet
SY = square yards

## TABLE 2. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 2 - Solidification/Stabilization of Calcine and Soil

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| **1** | **Mobilization** | 1 | LS | $ 150,000 | $ 150,000 | Unit price based on past project experience |
| | | | | Sub-total* | **$ 150,000** | |
| **2** | **Site Preparation** | | | | | |
| 2.1 | Clear & Grub | 0.96 | AC | $ 25,270 | $ 24,365 | Assume a 10 foot wide access road has to be built for the whole project area. Access road from Hicks Road to Upper Jacques Gulch starting point is approximately 1,200 feet, and the access road along the Upper Jacques Gulch is approximately 3,000 feet. Assume the access route will be cleared and grubbed. Unit price from RSMeans: "Clear and Grub, dense brush, includes stumps; Clear and Grub, heavy trees, to 24" diameter". |
| 2.2 | Boulder Removal | 1,556 | BCY | $ 50 | $ 77,778 | Unit price based on past project experience. |
| 2.3 | Access Road | 4,667 | SY | $ 16 | $ 76,113 | Unit price from RSMeans: "Temporary, roads, gravel fill 8" depth, excluding surfacing". |
| 2.4 | AC Pavement for Access Road | 4,667 | SY | $ 22 | $ 101,360 | Unit price from RSMeans: "Asphalt paving, plant mixed asphaltic base courses for roadways and large paved areas, bituminous concrete, 4" thick." |
| 2.5 | Slope Stabilization | 8,400 | LF | $ 100 | $ 840,000 | Unit price based on past project experience. |
| 2.6 | Traffic control | 1 | LS | $ 25,000 | $ 25,000 | Assume project will occur in 1 year. Unit price based on past project experience. |
| | Hazardous Waste Transportation and Offsite Disposal (Assume 30% hazardous) | 152 | TON | $ 350 | $ 53,083 | Assume 6" for volume estimate. Assume Kettleman Landfill for hazardous waste disposal. Assume density of 1 CY to 1.5 tons. Assume expansion factor of 1.3. Unit price based on past project experience. |
| 2.7 | Non-Hazardous Waste Transportation and Offsite Disposal | 354 | TON | $ 250 | $ 88,472 | Assume 6" for volume estimate. Assume density of 1 CY to 1.5 tons. Assume expansion factor of 1.3. Unit price based on past project experience. |
| | | | | Sub-total* | **$ 1,287,000** | |
| **3** | **Solidification and Biological/Geotechnical Stabilization** | | | | | |
| 3.1 | Solidification | 508 | SY | $ 125 | $ 63,542 | Assume the top 25% of project area will be solidified. Unit price from RSMeans: "Cement soil stabilization, 12% mix, by volume, 12" deep, includes scarifying and compaction". Unit price adjusted due to Project difficulties. |
| 3.2 | GeoGrid for Revegetation | 13,725 | SF | $ 50 | $ 686,250 | Unit price from RSMeans: "Synthetic erosion control, revegetation mat, webbed". Unit price adjusted due to Project difficulties and past project experience. |
| 3.3 | Hay Bales | 6,000 | LF | $ 25 | $ 150,000 | Unit price from RSMeans: "Synthetic erosion control, hay bales, staked". Unit price adjusted due to past project experience and Project difficulties. |

## TABLE 2. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 2 - Solidification/Stabilization of Calcine and Soil

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| 3.4 | Rip-Rap | 110 | LCY | $ 150 | $ 16,521 | Unit price from RSMeans: "Rip-rap and rock lining, random, broken stone, machine placed for slope protection". Unit price adjusted due to Project difficulties and past project experience. Assume an expansion factor of 1.3. Assume a rip-rap depth of 6". |
| | | | | Sub-total* | **$ 917,000** | |
| **4** | **Road repair** | | | | | |
| 4.1 | Alamitos Road | | | | | |
| 4.1.1 | AC Pavement | 38,667 | SY | $ 22 | $ 839,840 | Assume the road is 24 feet wide and the length is approximately 14,500 feet. Unit price for RSMeans: "Asphalt paving, plant mixed asphaltic base courses for roadways and large paved areas, bituminous concrete, 4" thick." |
| 4.1.2 | Class III AB (including compaction) | 38,667 | SY | $ 6 | $ 229,293 | Unit price from RSMeans: "Base course drainage layers, aggregate base course for roadways and large paved areas, bank run gravel, spread and compacted, 6" deep". |
| 4.1.3 | Shoulder | 20,300 | SF | $ 5 | $ 101,500 | Assuming total width for both sides of the road is 14 feet. Assume 10% of shoulder needs to be repaired/replaced. Unit price based on past project experience. |
| 4.1.4 | Curb | 2,900 | LF | $ 15 | $ 42,833 | Assume 10% of curb needs to be replaced. Unit price from RSMeans: " Cast-in place concrete curbs and gutters, concrete, wood forms, straight, 6"x18", includes concrete." |
| 4.1.5 | Guard rail | 1,600 | LF | $ 56 | $ 90,032 | Assume guard rail is needed only by the 1,600 feet of steep slope on Alamitos road. Unit price from RSMeans: "Vehicle guide rails, corrugated steel, galvanized steel posts, install metal guide/guard rail, double face, wood posts 6"-3" O.C., 6"x8" posts." |
| 4.2 | Lane striping | 14,500 | LF | $ 1 | $ 7,250 | Unit price from RSMeans: "Painted Pavement Markings, acrylic waterborne, white or yellow, 6" wide, 3,000-16,000 LF." |
| | | | | Sub-total* | **$ 1,311,000** | |
| **5** | **Restoration Elements** | | | | | |
| 5.1 | Earthwork | | | | | |
| 5.1.1 | Import and backfill clean soil | 441 | LCY | $ 100 | $ 44,056 | Assume expansion factor of 1.3. Unit price from RSMeans: "Backfill, light soil, by hand, no compaction." Unit price increased due to the ecological concerns in the area |
| 5.2 | Revegetation | | | | | |

## TABLE 2. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 2 - Solidification/Stabilization of Calcine and Soil

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| 5.2.1 | Permitting and Design | 1 | LS | $ 450,000 | $ 450,000 | Unit price and assumptions from H.T. Harvey & Associates Cost Estimate.<br><br>1. Permits and supporting technical documents covering both onsite and offsite mitigation locations will be required from the following agencies: USFWS, USACE, RWQCB, CDFW.<br>2. Permitting could take 2-3 years and the cost estimate includes time for agency coordination throughout permit processing<br>3. A total of 3 acres of riparian habitat will be permanently impacted (i.e., the riparian forest will be removed).<br>4. Riparian impacts will be mitigated to a 3:1 ratio (mitigation surface area: impact surface area) with 3 acres of riparian forest designed and restored onsite and 6 acres designed and restored offsite.<br>5. Design work only includes planting and irrigation design. |
| 5.2.2 | Revegetation Construction and Maintenance | 1 | LS | $ 3,100,000 | $ 3,100,000 | Unit price and assumptions from H.T. Harvey & Associates Cost Estimate.<br><br>1. On-site mitigation cost estimate does not include the cost of earthwork; earthwork design and construction costs will be provided by Roux Associates.<br>2. Offsite mitigation site(s) will be easily accessible and construction will only include planting and irrigation.<br>3. Offsite mitigation will be required and will be available on land owned by County Parks.<br>4. Both on-site and offsite mitigation sites will be require temporary irrigations systems that are services by water tanks to be installed and filled as needed.<br>5. Vegetation maintenance will occur for 3 years following plant installation. |
| | | | | Sub-total* | **$ 3,595,000** | |
| **6** | **Total Capital Cost for Remediation Construction** | | | | **$ 7,260,000** | |
| | | | | | | |
| **7** | **Engineering** | | | | | |
| 8.1 | Planning, Survey, Engineering Design | | | 20% | $ 1,452,000 | Assume 20% of Total Construction Cost (Item 6) |
| 8.2 | Engineering During Construction | | | 5% | $ 363,000 | Assume 5% of Total Construction Cost (Item 6) |
| | | | | Sub-total* | **$ 1,815,000** | |
| | | | | | | |

## TABLE 2. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 2 - Solidification/Stabilization of Calcine and Soil

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| **8** | **Total Remediation Cost** | | | | **$ 9,075,000** | |
| | | | | | | |
| **9** | **Post-Construction Costs** | | | | | |
| 9.1 | Post-Construction Ecological Monitoring | 7 | EA | $ 64,286 | $ 450,000 | Cost from H.T. Harvey & Associates Cost Estimate. Annual monitoring and reporting will occur in 7 years of a 10 year monitoring period |
| 9.2 | Stormwater Monitoring | 50 | EA | $ 25,000 | $ 1,250,000 | Stormwater monitoring will occur annually for 50 years |
| 9.3 | Geotechnical Monitoring | 50 | EA | $ 25,000 | $ 1,250,000 | Geotechnical monitoring will occur annually for 50 years |
| | | | | Sub-total* | **$ 2,950,000** | |
| **10** | **Grand Total** | | | | **$ 10,210,000** | |

**Notes**

*Rounded up to nearest 1,000's.
AC = acres
BCY = bank cubic yards
EA = each
LCY = loose cubic yards
LS = lump sum
LF = linear feet
SF = square feet
SY = square yards

## TABLE 3. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 3 - Detention Basin South of Project Area

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| **1** | **Mobilization** | 1 | LS | $ 150,000 | $ 150,000 | Past Project Experience |
| | | | | Sub-total* | **$ 150,000** | |
| **2** | **Site Preparation** | | | | | |
| 2.1 | Clear & Grub | 0.37 | AC | $ 25,270 | $ 9,224 | Assume a 10 foot wide access road has to be built to the Project Site. Access road from Hicks Road to Upper Jacques Gulch starting point is approximately 1,200 feet. Assume the access route will be cleared and grubbed. Unit price from RSMeans: "Clear and Grub, dense brush, includes stumps; Clear and Grub, heavy trees, to 24" diameter" |
| 2.2 | Access Road | 211 | SY | $ 16 | $ 3,443 | Unit price from RSMeans: "Temporary, roads, gravel fill 8" depth, excluding surfacing." |
| 2.3 | AC Pavement | 211 | SY | $ 22 | $ 4,585 | Unit price from RSMeans: "Asphalt paving, plant mixed asphaltic base courses for roadways and large paved areas, bituminous concrete, 4" thick." |
| 2.4 | Traffic control | 1 | LS | $ 25,000 | $ 25,000 | Assume project will occur in 1 year. Unit price based on past project experience. |
| 2.5 | Non-Hazardous Waste Transportation and Offsite Disposal | 574 | TON | $ 50 | $ 28,708 | Assume 6" for volume estimate. Assume density of 1 CY to 1.5 tons. Assume expansion factor of 1.3. Unit price based on past project experience. |
| | | | | Sub-total* | **$ 71,000** | |
| **3** | **Detention Basin** | | | | | |
| 3.1 | Detention Basin | | | | | |
| 3.1.1 | Excavation | 3,715 | TON | $ 25 | $ 92,878 | Assume in-place volume. Assume 6 feet depth of excavation. Assume density of 1 CY to 1.5 tons. Unit price based on past project experience. |
| 3.1.2 | Non-Hazardous Waste Transportation and Offsite Disposal | 4,830 | TON | $ 150 | $ 724,447 | Assume 6" for volume estimate. Assume density of 1 CY to 1.5 tons. Assume expansion factor of 1.3. Unit price based on past project experience. |
| 3.1.3 | Weir | 511 | LF | $ 24 | $ 12,284 | Unit price from RSMeans: "C.I.P. concrete forms, wall, box out for opening, to 16" thick, over 10 SF (use perimeter), includes erecting, bracing, stripping and clearing." |

## TABLE 3. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 3 - Detention Basin South of Project Area

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| 3.2 | Continuous Monitoring and Adaptive Control (OptiRTC) | | | | | |
| 3.2.1 | Design Support and Hardware Specifications | 1 | LS | $ 10,000 | $ 10,000 | Unit price based on OptiRTC cost estimate |
| 3.2.2 | Installation Services | 1 | LS | $ 67,500 | $ 67,500 | |
| 3.2.3 | Opti Control Panel | 1 | LS | $ 5,000 | $ 5,000 | |
| 3.2.4 | Solar and Battery System | 2 | EA | $ 5,000 | $ 10,000 | |
| 3.2.5 | 36 inch Sluice Gate | 2 | EA | $ 20,000 | $ 40,000 | |
| 3.2.6 | Level Sensor | 3 | EA | $ 1,000 | $ 3,000 | |
| 3.2.7 | Rain Gauge | 1 | EA | $ 698 | $ 698 | |
| 3.2.8 | Turbidity Sensor | 2 | EA | $ 3,983 | $ 7,966 | |
| 3.2.9 | Provisioning | 1 | LS | $ 40,000 | $ 40,000 | |
| 3.2.10 | Site Commissioning | 1 | LS | $ 5,000 | $ 5,000 | |
| 3.2.11 | Shipping of Equipment | 1 | LS | $ 2,000 | $ 2,000 | |
| 3.2.12 | Satellite Connection | 1 | LS | $ 50,000 | $ 50,000 | |
| | | | | Sub-total* | **$ 1,071,000** | |
| **4** | **Road repair** | | | | | |
| 4.1 | Alamitos Road (25% of the whole length) | | | | | |
| 4.1.1 | AC Pavement | 9,667 | SY | $ 22 | $ 209,960 | Assume the road is 24 feet wide and the length is approximately 14,500 feet. Assume 25% of the road needs to be repaired/replaced. Unit price for RSMeans: "Asphalt paving, plant mixed asphaltic base courses for roadways and large paved areas, bituminous concrete, 4" thick." |
| 4.1.2 | Class III AB (including compaction) | 9,667 | SY | $ 6 | $ 57,323 | Assume 25% of the road needs to be repaired/replaced. Unit price from RSMeans: "Base course drainage layers, aggregate base course for roadways and large paved areas, bank run gravel, spread and compacted, 6" deep". |
| 4.1.3 | Shoulder | 20,300 | SF | $ 5 | $ 101,500 | Assuming total width for both sides of the road is 14 feet. Assume 10% of shoulder needs to be repaired/replaced. Unit price based on past project experience. |
| 4.1.4 | Curb | 2,900 | LF | $ 15 | $ 42,833 | Assume 10% of curb needs to be replaced. Unit price from RSMeans: "Cast-in place concrete curbs and gutters, concrete, wood forms, straight, 6"x18", includes concrete." |

## TABLE 3. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 3 - Detention Basin South of Project Area

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| 4.1.5 | Guard rail | 400 | LF | $ 56 | $ 22,508 | Assume guard rail is needed only by the 1,600 feet of steep slope on Alamitos road. Assume 25% of guard rail needs to be replaced. Unit price from RSMeans: "Vehicle guide rails, corrugated steel, galvanized steel posts, install metal guide/guard rail, double face, wood posts 6"-3" O.C., 6"x8" posts." |
| 4.2 | Lane striping | 3,625 | LF | $ 1 | $ 1,813 | Assume 25% of the road needs to be repaired/replaced. Unit price from RSMeans: "Painted Pavement Markings, acrylic waterborne, white or yellow, 6" wide, 3,000-16,000 LF." |
| | | | | Sub-total* | **$ 436,000** | |
| **5** | **Restoration and Revegetation** | | | | | |
| 5.1 | Revegetation | | | | | |
| 5.1.1 | Permitting and Design | 1 | LS | $ 250,000 | $ 250,000 | Unit price and assumptions from H.T. Harvey & Associates Cost Estimate.<br><br>1. Permits and supporting technical documents covering both on-site and offsite mitigation locations will be required from the following agencies: USFWS, USACE, RWQCB, CDFW.<br>2. Permitting could take 2-3 years and the cost estimate includes time for agency coordination throughout permit processing<br>3. A total of 3 acres of riparian habitat will be permanently impacted (i.e., the riparian forest will be removed).<br>4. Riparian impacts will be mitigated to a 3:1 ratio (mitigation surface area: impact surface area) with 3 acres of riparian forest designed and restored onsite and 6 acres designed and restored offsite.<br>5. Design work only includes planting and irrigation design. |

## TABLE 3. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 3 - Detention Basin South of Project Area

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| 5.1.2 | Revegetation Construction and Maintenance | 1 | LS | $ 550,000 | $ 550,000 | Unit price and assumptions from H.T. Harvey & Associates Cost Estimate.<br><br>1. On-site mitigation cost estimate does not include the cost of earthwork; earthwork design and construction costs will be provided by Roux Associates.<br>2. Offsite mitigation site(s) will be easily accessible and construction will only include planting and irrigation.<br>3. Offsite mitigation will be required and will be available on land owned by County Parks.<br>4. Both on-site and offsite mitigation sites will be require temporary irrigations systems that are services by water tanks to be installed and filled as needed.<br>5. Vegetation maintenance will occur for 3 years following plant installation. |
| | | | | Sub-total* | $ 800,000 | |
| **6** | **Total Construction Cost** | | | | **$ 2,528,000** | |
| | | | | | | |
| **7** | **Engineering** | | | | | |
| 8.1 | Planning, Survey, Engineering Design | | | 20% | $ 505,600 | |
| 8,2 | Engineering During Construction | | | 5% | $ 126,400 | |
| | | | | Sub-total* | **$ 632,000** | |

## TABLE 3. CONCEPTUAL DESIGN PRELIMINARY OPINION OF PROBABLE COST

### Alternative 3 - Detention Basin South of Project Area

Project: Upper Jacques Gulch Restoration, Santa Clara County Parks
Santa Clara County, California

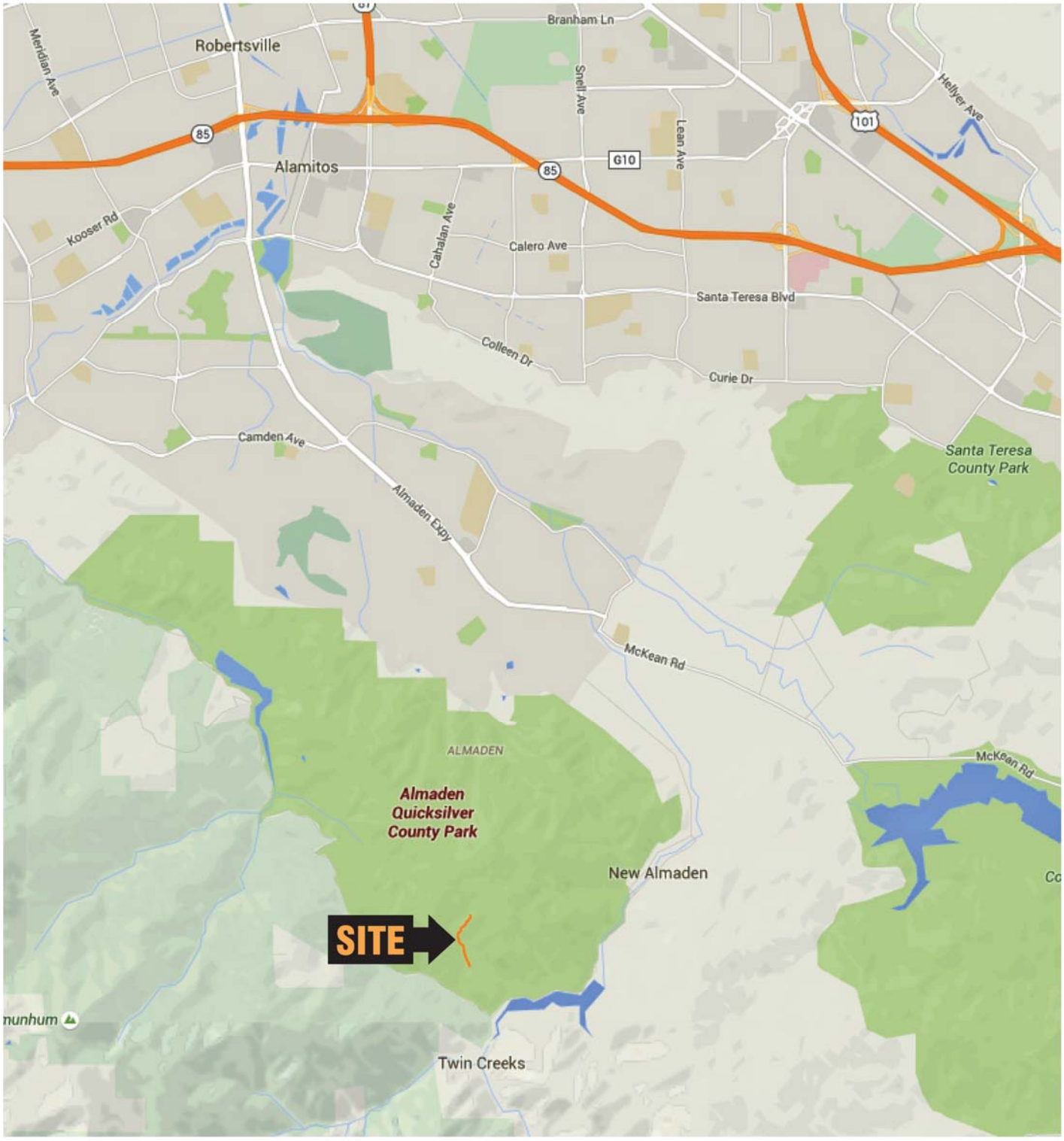
| No. | Item | Quantity | Unit | Unit Price | Amount ($) | Source and Assumptions |
|---|---|---|---|---|---|---|
| **8** | **Total Remediation Cost** | | | | **$ 3,160,000** | |
| | | | | | | |
| **9** | **Post-Construction Monitoring for 30 Years** | | | | | |
| 9.1 | Post-Construction Ecological Monitoring (7 years) | 7 | EA | $ 28,571 | $ 200,000 | Cost from H.T. Harvey & Associates Cost Estimate. Annual monitoring and reporting will occur in 7 years of a 10 year monitoring period |
| 9.2 | Continuous Monitoring and Adaptive Control (CMAC) Maintenance | 30 | EA | $ 5,000 | $ 150,000 | Unit price from OptiRTC cost estimate |
| 9.3 | Hardware Maintenance | 30 | EA | $ 2,500 | $ 75,000 | Unit price from OptiRTC cost estimate |
| 9.4 | Basin Dredging | | | | | |
| 9.4.1 | Excavation | 6 | EA | $ 50,000 | $ 300,000 | Assume in-place volume. Assume density of 1.5 tons to 1 CY. Assume dredging will occur once every 5 years for 30 years. Assume 300 CY will be excavated every 5 years. Unit price based on past project experience. |
| 9.4.2 | Hazardous Waste Transportation and Offsite Disposal | 6 | EA | $ 157,500 | $ 945,000 | Assume 300 CY will be removed every 5 years for 30 years. Assume expansion factor if 1.3. Unit price based on past project experience. |
| | | | | Sub-total* | **$ 1,670,000** | |
| **10** | **Grand Total** | | | | **$ 4,830,000** | |

**Notes**

*Rounded up to nearest 1,000's.
AC = acres
BCY = bank cubic yards
EA = each
LCY = loose cubic yards
LS = lump sum
LF = linear feet
SF = square feet
SY = square yards

# FIGURES

1. Site Location Map
2. Project Area
3. Project Vicinity and Key Features
4. Alternative 1: Calcine Removal, Offsite Disposal, and Restoration
5. Alternative 2: Solidification/Stabilization of Calcine and Soil
6. Alternative 3: Detention Basin South of Project Area
7. Detention Basin Profile and Plan Views
8. Alternative 4: Constructed Treatment Wetland




LOCATION OF DETAIL


N

0 1 Mile

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

ROUX ASSOCIATES, INC.
*Environmental Consulting & Management*

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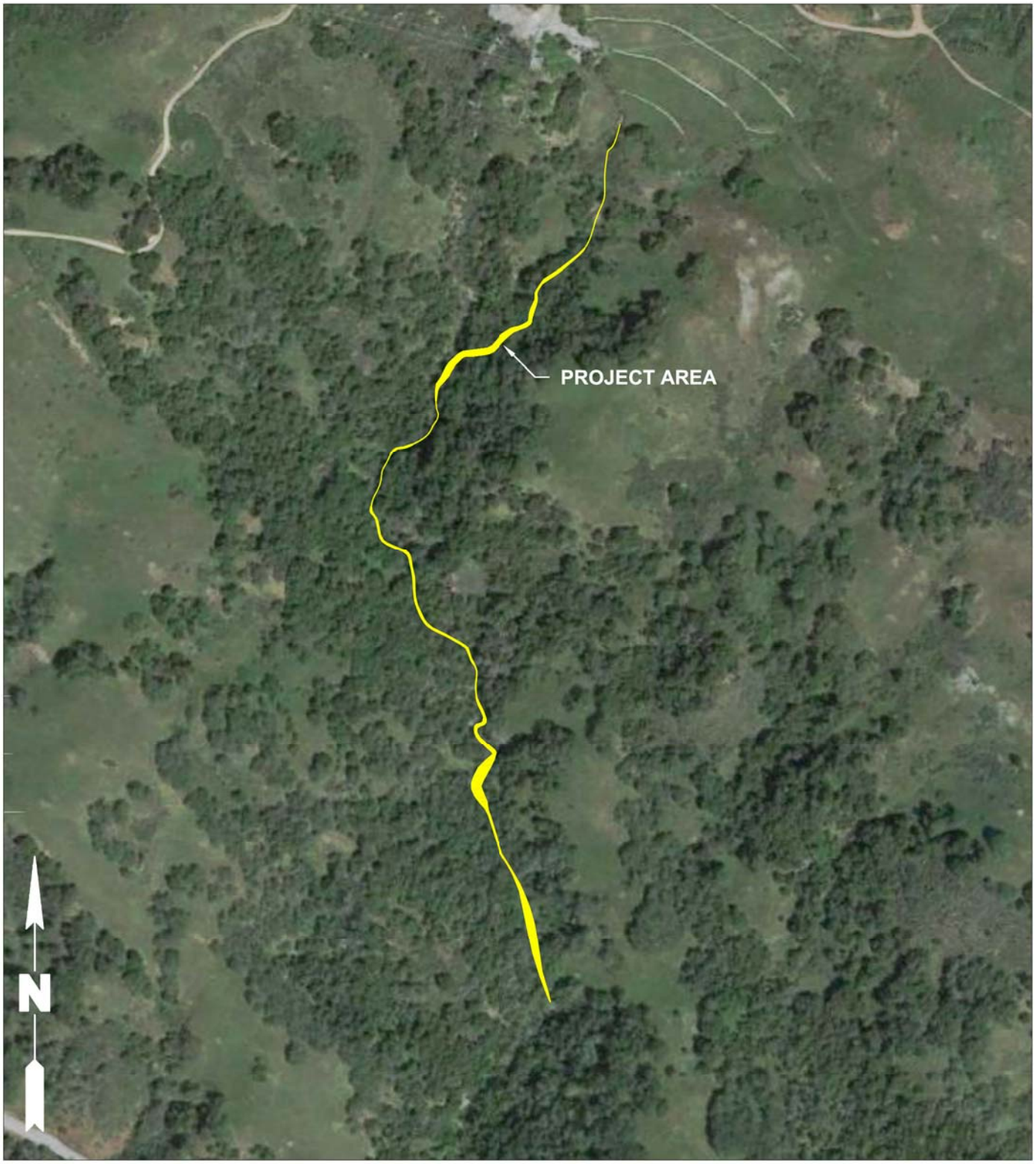


LEGEND

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*

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| Compiled by: ALC | Date: 10NOV16 | FIGURE |
| Prepared by: AMO | Scale: AS SHOWN | |
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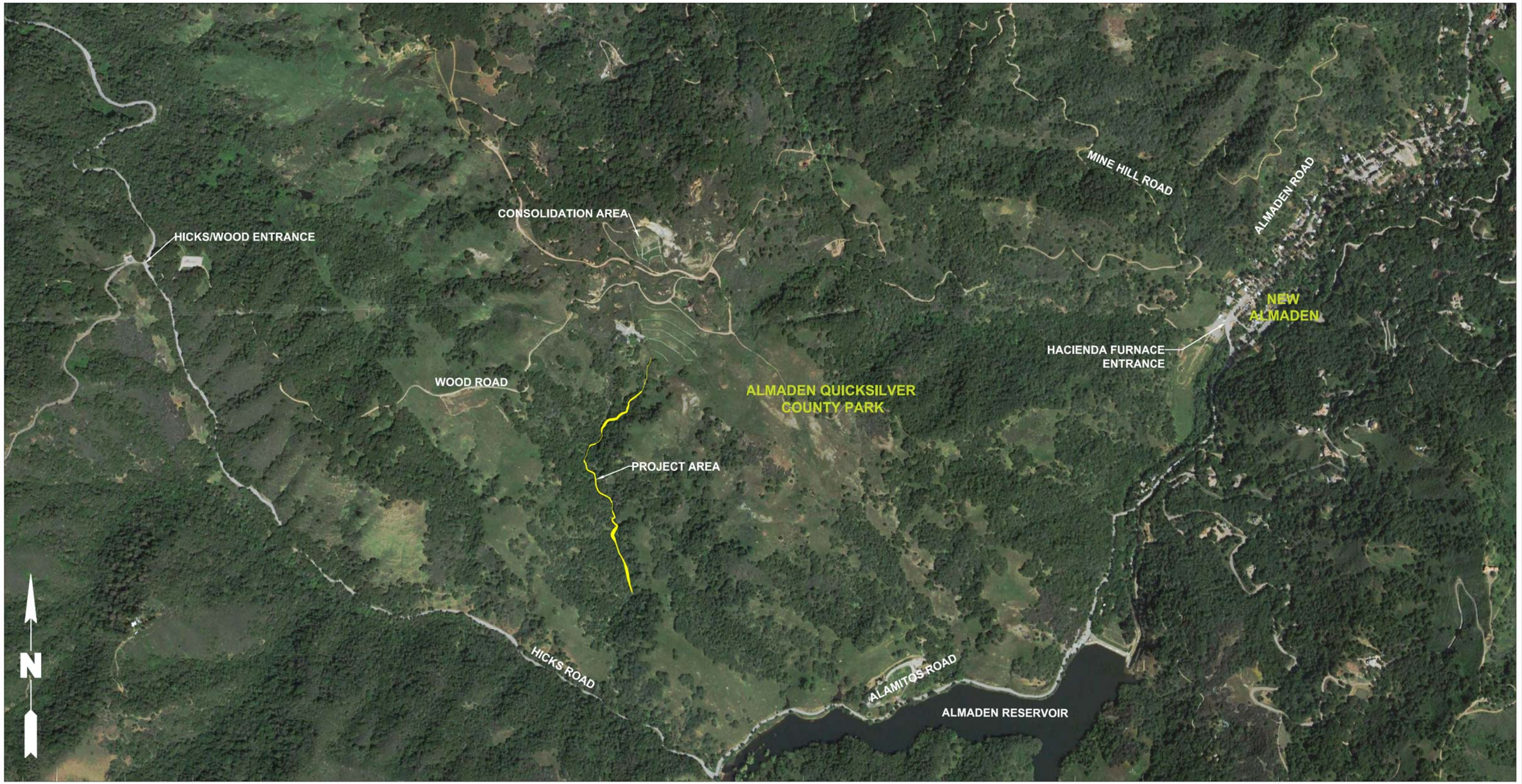


LEGEND

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*

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| Compiled by: ALC | Date: 10NOV16 | FIGURE |
| Prepared by: AO | Scale: AS SHOWN | 3 |
| Project Mgr: RM | Project: 2755.0001S000 | |
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LEGEND

- ESTIMATED PROJECT AREA
- ALAMITOS ROAD/MINE HILL ROAD HAUL ROUTE
- ACCESS ROUTE

1000' 0 1000'

Title:

# ALTERNATIVE 1: CALCINE REMOVAL, OFFSITE DISPOSAL, AND RESTORATION

UPPER JACQUES GULCH REMEDIATION
SAN JOSE, CALIFORNIA

Prepared For:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
*Environmental Consulting & Management*

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| Compiled by: ALC | Date: 25OCT16 | FIGURE |
| Prepared by: AO | Scale: AS SHOWN | 4 |
| Project Mgr: RM | Project: 2755.0001S000 | |
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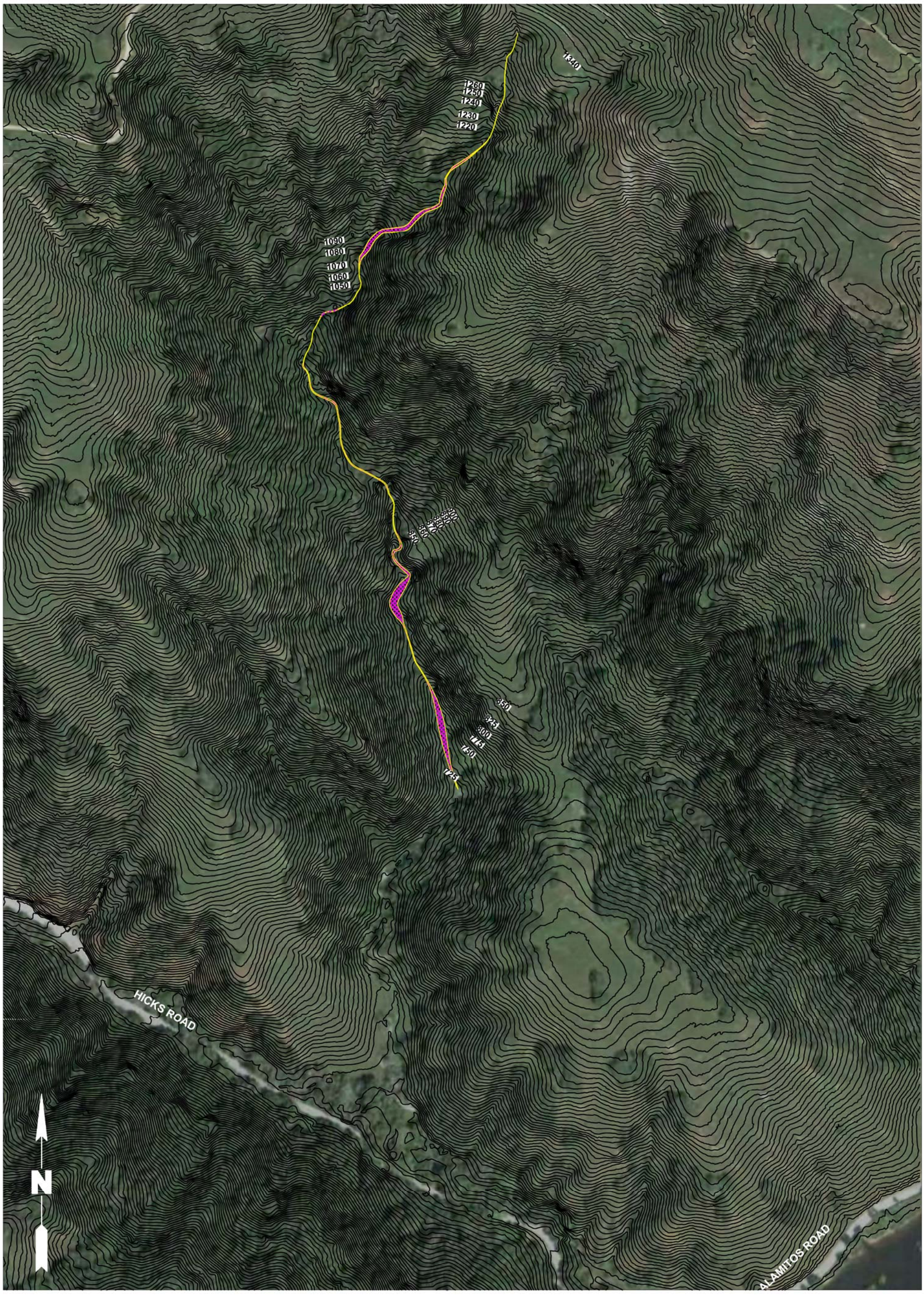


LEGEND

ESTIMATED PROJECT BOUNDARY

SOLIDIFICATION/STABILIZATION AREA

300' 0 300'

Title:

# ALTERNATIVE 2: SOLIDIFICATION/STABILIZATION OF CALCINE AND SOIL

UPPER JACQUES GULCH REMEDIATION
SAN JOSE, CALIFORNIA

Prepared For:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
*Environmental Consulting & Management*

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|---|---|---|
| Compiled by: | Date: 25OCT16 | FIGURE |
| Prepared by: AMO | Scale: AS SHOWN | 5 |
| Project Mgr: RM | Project: 2755.0001S000 | |
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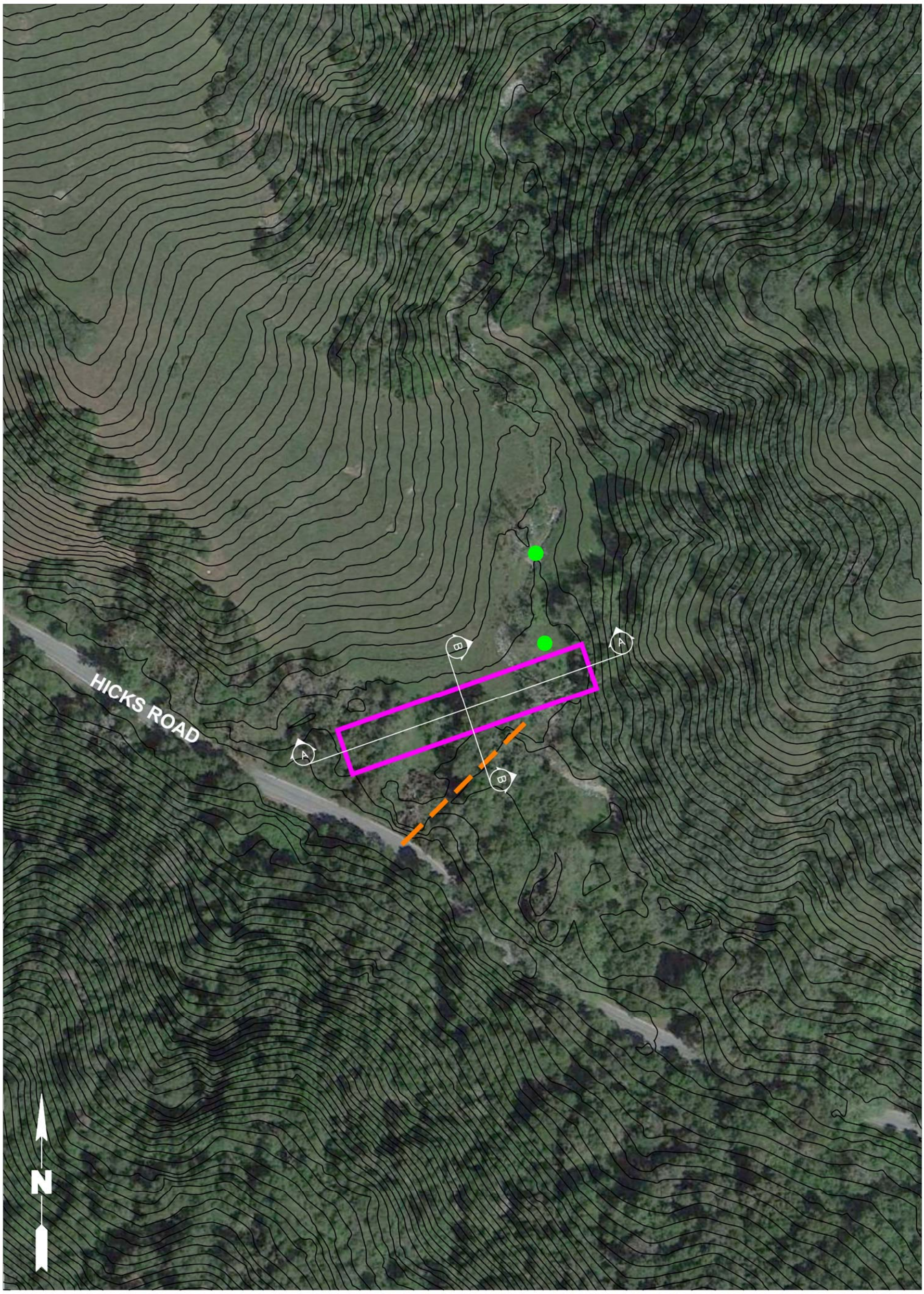


LEGEND

- PROPOSED DETENTION BASIN
- PROPOSED ACCESS ROUTE
- CALIFORNIA SYCAMORE

100' 0 100'

Title:

**ALTERNATIVE 3:**
**DETENTION BASIN**
**SOUTH OF PROJECT AREA**

UPPER JACQUES GULCH REMEDIATION
SAN JOSE, CALIFORNIA

Prepared For:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
*Environmental Consulting & Management*

| | | |
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| Compiled by: ALC | Date: 15NOV16 | FIGURE |
| Prepared by: AMO | Scale: AS SHOWN | 6 |
| Project Mgr: RM | Project: 2755.0001S000 | |
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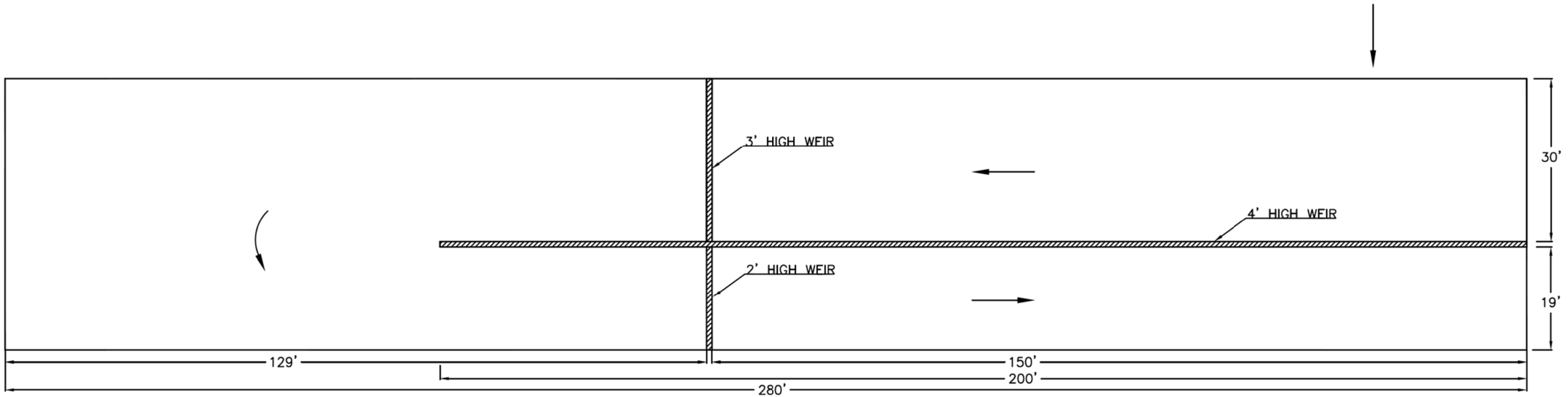
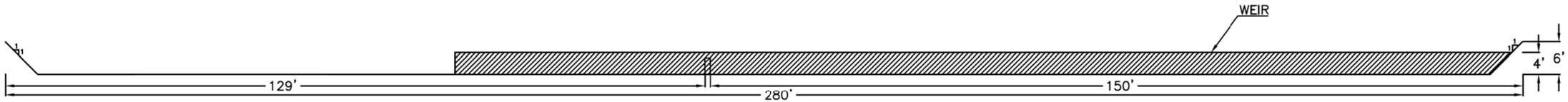
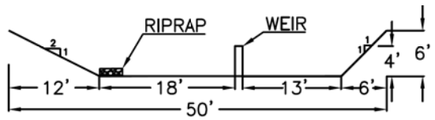



PLAN VIEW




SECTION A




SECTION B

20' 0 20'

Title:

**DETENTION BASIN**
**PROFILE AND PLAN VIEWS**

UPPER JACQUES GULCH REMEDIATION
SAN JOSE, CALIFORNIA

Prepared For:

SANTA CLARA CLOUNTY PARKS

ROUX ASSOCIATES, INC.
*Environmental Consulting & Management*

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| Compiled by: ALC | Date: 15NOV16 | FIGURE |
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| Project Mgr: RM | Project: 2755.0001S000 | |
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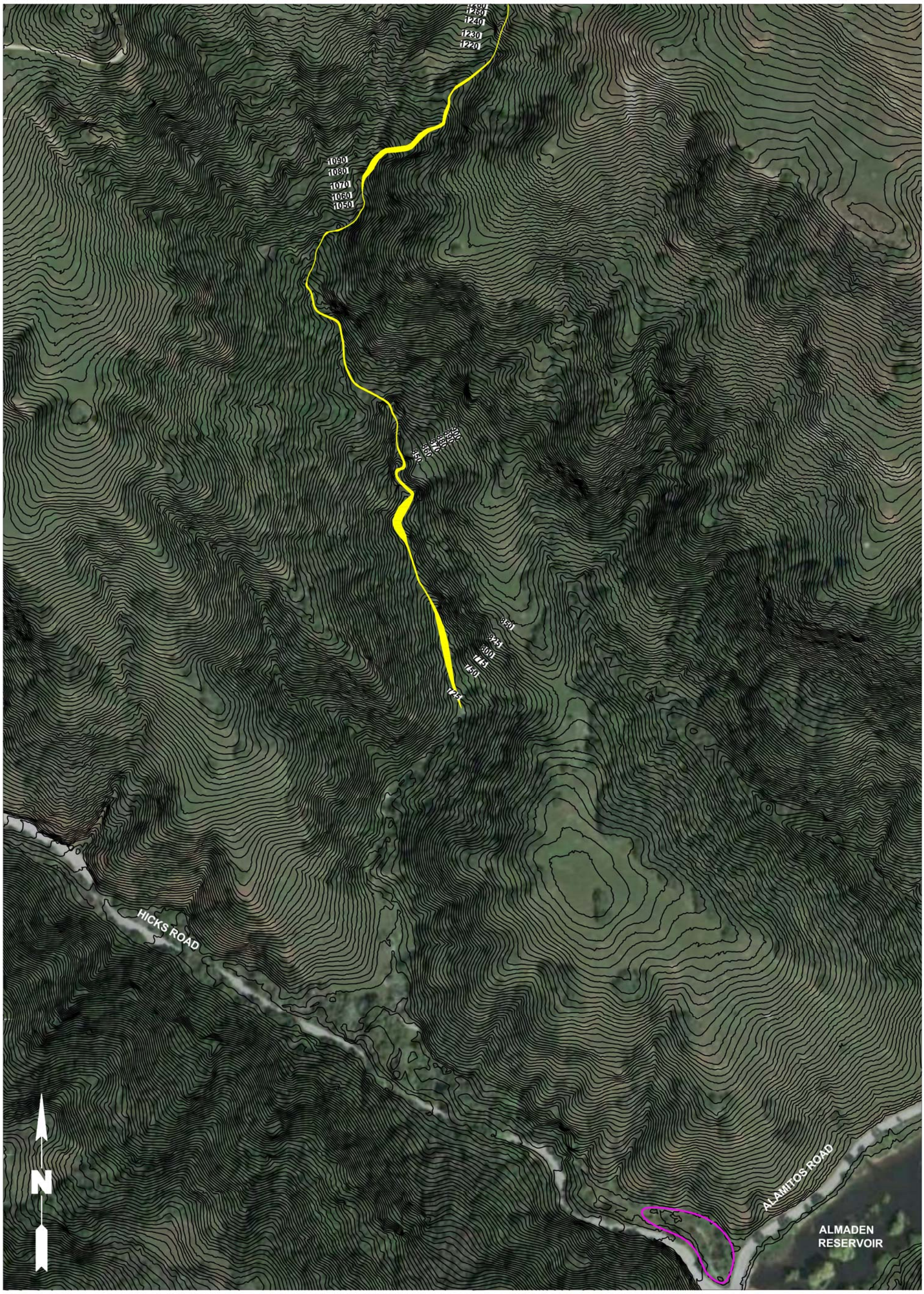


LEGEND

- ESTIMATED PROJECT AREA
- PROPOSED CONSTRUCTED TREATMENT WETLAND

300' 0 300'

Title:

# ALTERNATIVE 4: CONSTRUCTED TREATMENT WETLAND

UPPER JACQUES GULCH REMEDIATION
SAN JOSE, CALIFORNIA

Prepared For:

SANTA CLARA COUNTY PARKS

ROUX ASSOCIATES, INC.
*Environmental Consulting & Management*

| | | |
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| Compiled by: ALC | Date: 25OCT2016 | FIGURE |
| Prepared by: AMO | Scale: AS SHOWN | 8 |
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| File: ALTERNATIVE FIGURES.DWG | | |

# APPENDIX A

Technical Memorandum – Summary of Field Surveys for Conceptual 25% Design Plan for Jacques Gulch Remediation

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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-20$^{th}$ 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

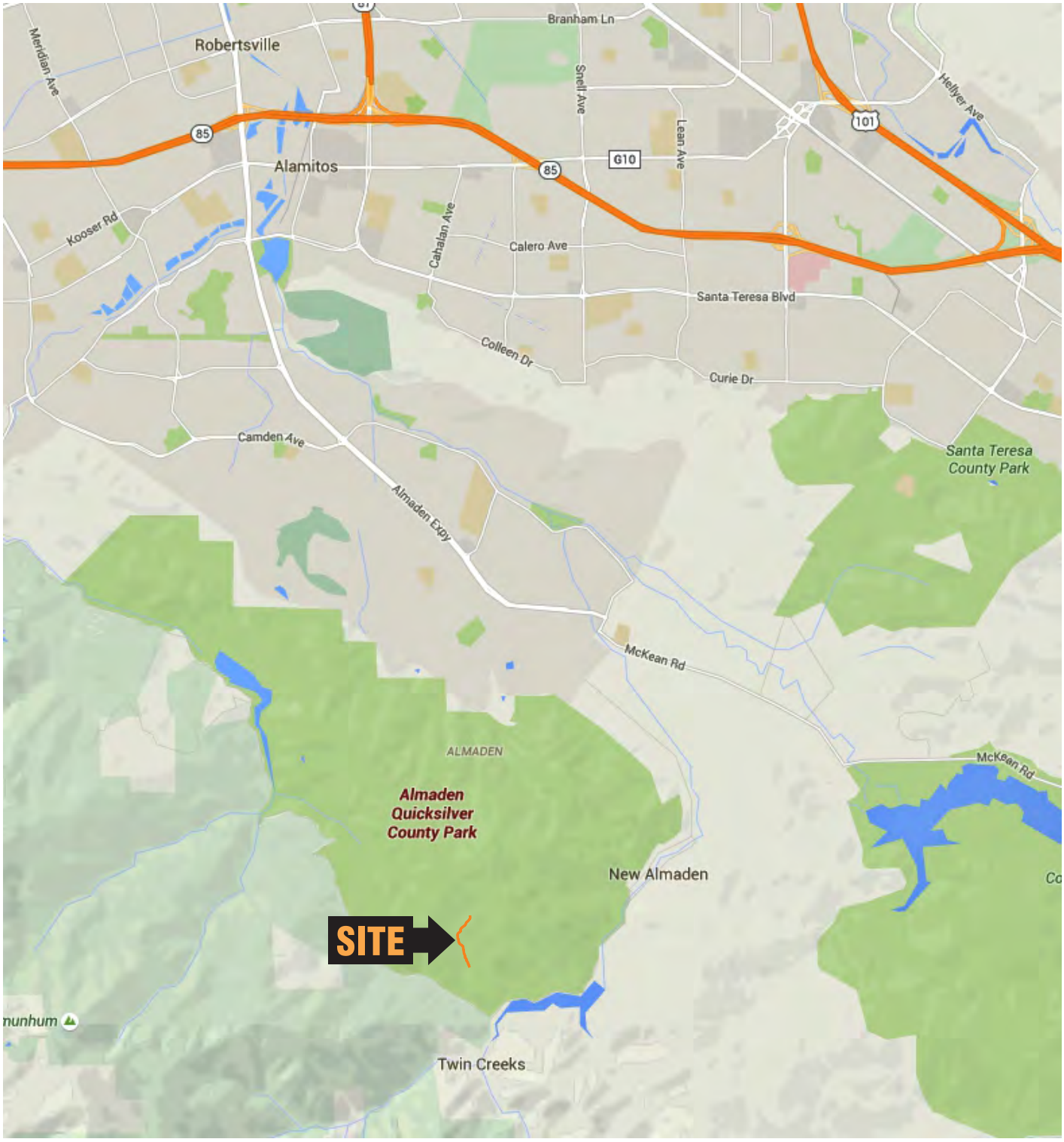
-- : information not avaliable

N: North

W: West

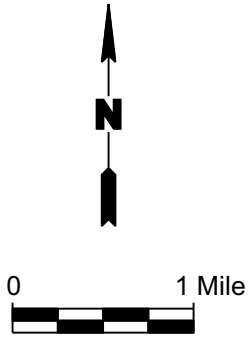
# FIGURES

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*

| | | |
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| Compiled by: ALC | Date: 10NOV2016 | FIGURE |
| Prepared by: AMO | Scale: AS SHOWN | 2 |
| Project Mgr: RM | Project: 2755.0001S000 | |
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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 | |
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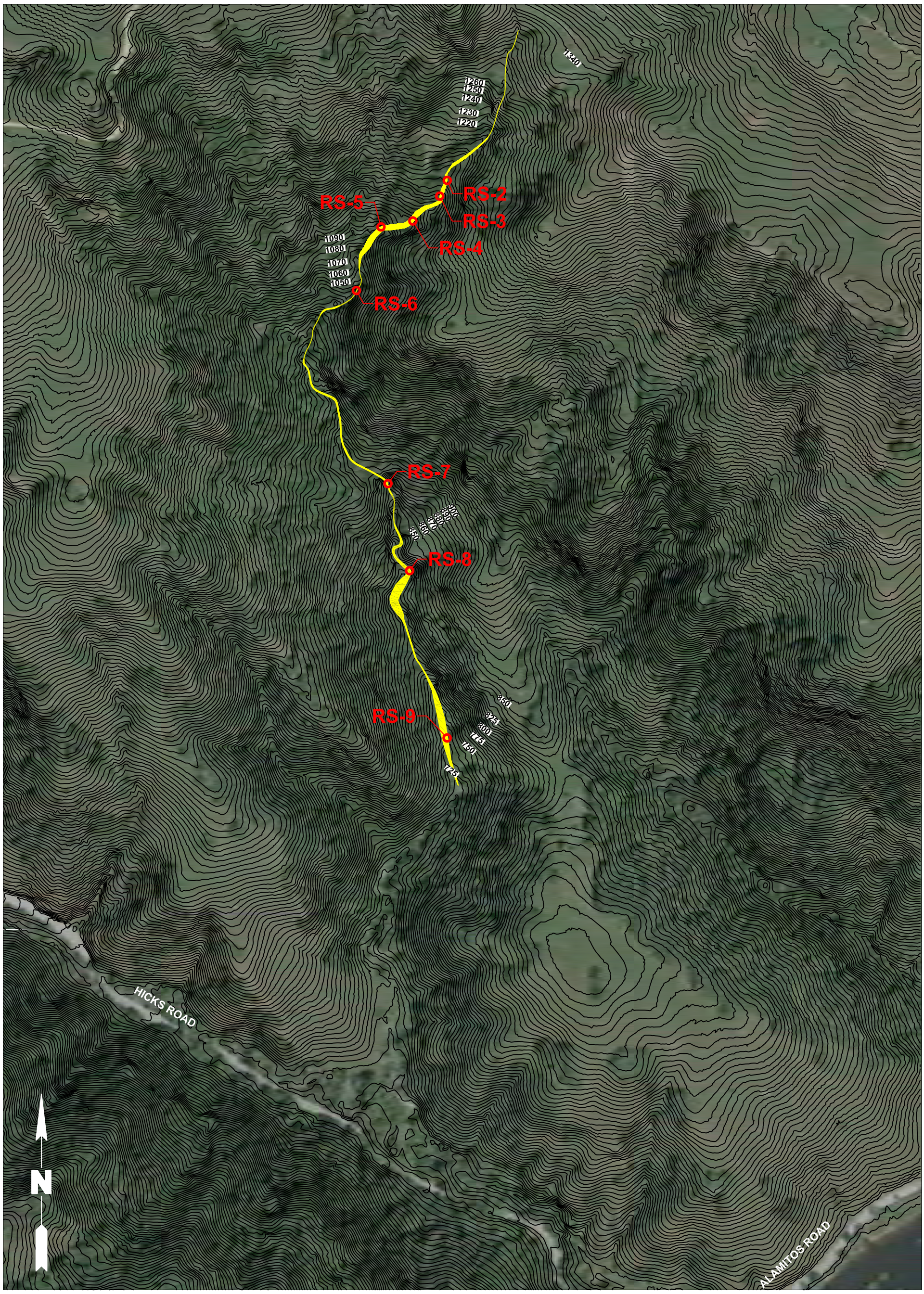


LEGEND

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 |
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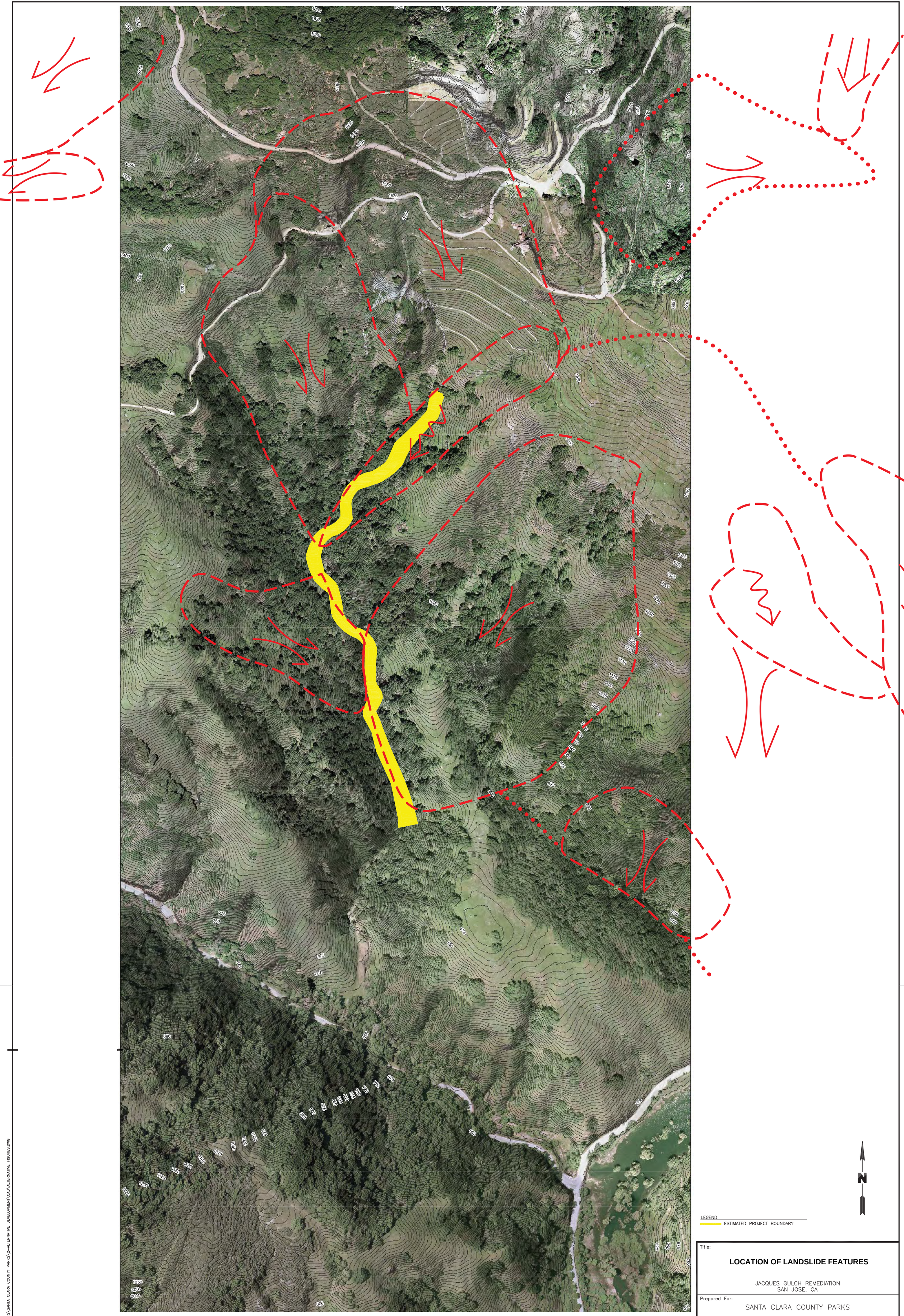


Title:

## 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 | 6 |
| 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

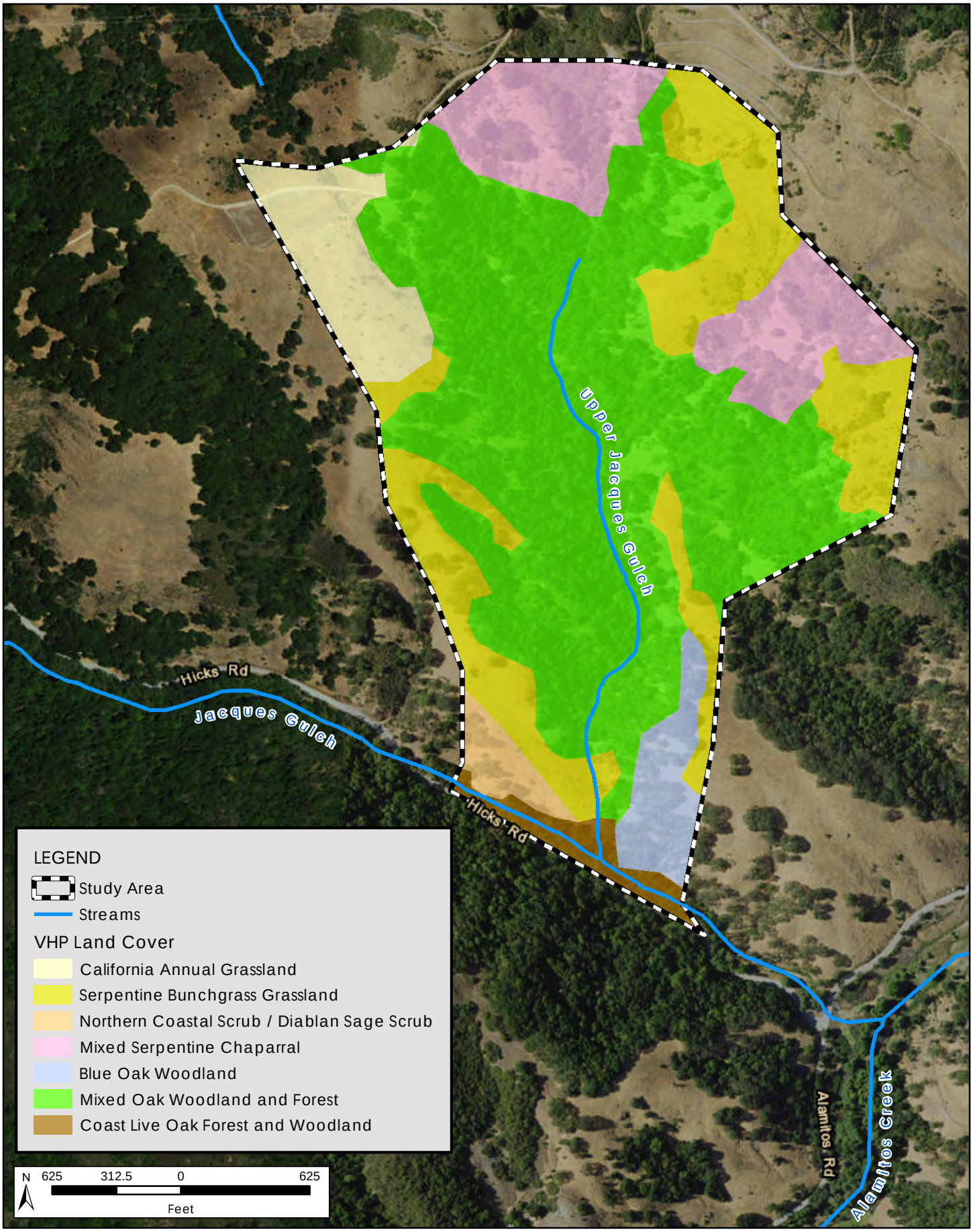
Biological constraints typically take the form of sensitive and/or regulated habitats such as wetlands; special-status species; or particularly large, important, or exemplary occurrences of more common plant or animal species or vegetation communities. Examples of sensitive biological resources that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

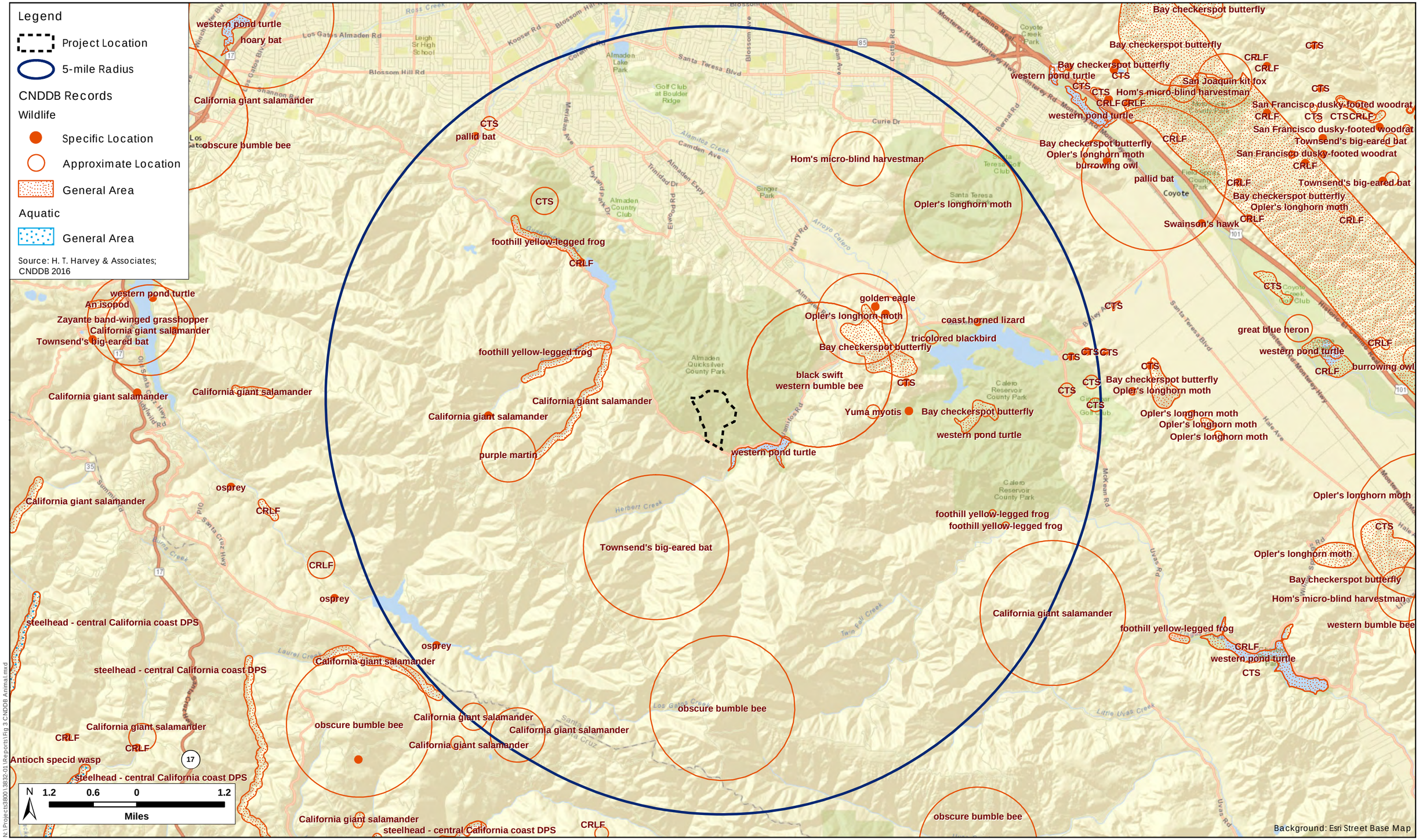
N:\Projects3800\3832-01\Reports\Fig 2 CNDDB Plants.mxd

H. T. HARVEY & ASSOCIATES
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

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Figure 3. CNDDB Animal Records

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

February 2017

*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

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# APPENDIX B

Green Remediation Evaluation Matrix (GREM) Alternatives

# Appendix B Table B-1

## Green Remediation Evaluation Matrix (GREM) - Alternative 1: Calcine Removal, Offsite Disposal, and Restoration

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Substance Release/Production** | | | | |
| Airborne NOx & SOx | Air | Acid rain & photochemical smog | Y | Engine exhaust from construction equipment and transport vehicles used during remediation/restoration implementation would result in emissions that may increase airborne NOx and SOx concentrations. Emissions would be associated with vehicles and equipment used for excavation, transport, onsite processing, and limited offsite disposal of approximately 2,981 cubic yards (cy) of soil and debris. Emissions would also be associated with vehicles and equipment used to grade and compact approximately 0.96 acres of soil. |
| Chloro-fluorocarbon vapors | Air | Ozone depletion | N | Implementation of this remediation/restoration option would not result in generation of substantial quantities of chloro-fluorocarbon vapors. |
| Greenhouse gas emissions | Air | Atmospheric warming | Y | Engine exhaust from equipment and vehicles used during construction and for transportation of material would result in an increase in greenhouse gas emissions. Emissions would be associated with vehicles and equipment used for excavation, transport, onsite processing, and limited offsite disposal of approximately 2,981 cy of soil and debris. Emissions would also be associated with vehicles and equipment used to grade and compact approximately 0.96 acres of soil. |
| Airborne particulates/toxic vapors/gases/water vapor | Air | General air pollution/toxic air/humidity increase | Y | The primary airborne particulate emissions from this remediation/restoration option are expected to be diesel particulate matter (DPM) and fugitive dust from soil and debris handling. This remediation/restoration option entails onsite processing, and limited offsite disposal of approximately 2,981 cy of soil and debris. DPM and fugitive dust would also be generated from grading and compaction of approximately 0.96 acres of soil. |
| Liquid waste production | Water | Water toxicity/sediment toxicity/sediment | Y | Liquid waste potentially generated would be water from decontamination rinsate. It is not anticipated that substantial quantities of liquid waste would be generated during implementation of this remediation/restoration option due to implementation of Best Management Practices (BMPs) during construction. A Stormwater Pollution Protection Plan (SWPPP) would be developed to minimize construction impacts to stormwater runoff. Additionally, construction activities would be scheduled to take place in the dry season to minimize or eliminate construction impacts to stormwater runoff. |
| Solid waste production | Land | Land use/toxicity | Y | The primary solid waste that would be produced during implementation of this remediation/restoration option is approximately 2,981 cy of materials requiring offsite disposal. |

## Appendix B Table B-1

## Green Remediation Evaluation Matrix (GREM) - Alternative 1: Calcine Removal, Offsite Disposal, and Restoration

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Thermal Releases** | | | | |
| Warm water | Water | Habitat warming | N | No significant quantities of warm water are expected to be generated during implementation of this remediation/restoration option. |
| Warm vapor | Air | Atmospheric humidity | Y | The primary warm vapor expected to be released during implementation of this remediation/restoration option is related to engine exhaust from vehicles and equipment used during construction. This remediation/restoration option entails excavation, transport, onsite processing, and limited offsite disposal of approximately 2,981 cy of soil and debris. This remediation/restoration option also includes grading and compaction of approximately 0.96 acres of soil. |
| **Physical Disturbances/Disruptions** | | | | |
| Soil structure disruption | Land | Habitat destruction/ soil infertility | Y | This remedial remediation/restoration option would involve moderate soil structure disruption because earth-moving equipment would be mobilized to the site and approximately 2,981 cy of soil/debris would be excavated, fill placed, and an approximate 0.96 acre area graded to return the Site to a more natural setting. |
| Noise/Odor/Vibration/Aesthetics | General environment | Nuisance & safety | Y | The primary aesthetic disruption from implementation of this remediation/restoration option would be related to noise, odor, vibration, and visual impact of construction activities associated with excavation and processing of approximately 2,981 cy of soil and debris, and grading/compaction of approximately 0.96 acres. This remediation/restoration option is expected to entail approximately a total of 9 months of active construction through 3 years. Following construction activities and site restoration, it is anticipated that the aesthetics of the Site would be maintained because surface debris would be removed and the Site restored to native plant habitat. |
| Traffic | Land; general environment | Nuisance & safety | Y | Traffic disruption during implementation of this remediation/restoration option would be associated with trucks used to haul approximately 2,981 cubic yards of excavated soil and debris to offsite disposal/recycling facilities. Traffic disruption associated with construction work would occur in approximately 9 months over 3 years. |
| Land Stagnation | Land; general environment | Remediation time; cleanup efficiency; re-development | N | No land stagnation is associated with implementation of this remediation/restoration option because the project area is currently not utilized for recreational use. However, after construction completion, there would be full access to the Site for potential recreational purposes and the Site would be restored as native plant habitat. |

## Appendix B Table B-1

## Green Remediation Evaluation Matrix (GREM) - Alternative 1: Calcine Removal, Offsite Disposal, and Restoration

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Resource Depletion/Gain (Recycling)** | | | | |
| Petroleum (energy) | Subsurface | Consumption | Y | The primary petroleum energy resource depletion during this remediation/restoration implementation is due to engine fuel demands of construction equipment and trucks used for material transport. This remediation/restoration option entails excavation, transport, onsite processing, and limited offsite disposal of approximately 2,981 cy of soil and debris. This remediation/restoration option also entails grading and compaction of approximately 0.96 acres of soil. |
| Mineral | Subsurface | Consumption | N | This remediation/restoration option would not be a source of substantial mineral depletion or gain. |
| Construction materials (soil/concrete/plastic) | Land | Consumption/reuse | Y | The primary construction material that would be depleted during implementation of this remediation/restoration option is approximately 0.96 acres of soil that would be generated onsite to the extent practicable. |
| Land & space | Land | Impoundment/reuse | Y | The project area is currently not utilized for recreational use. However, after construction completion, there would be full access to the Site for potential recreational purposes and the Site would be restored as native plant habitat. In addition, this remediation/restoration option entails excavation and transport of approximately 2,981 cy of soil and debris to a disposal facility which would fill up landfill capacity/space. |
| Surface water & groundwater | Water, land (subsidence) | Impoundment/ sequester/reuse | N | Implementation of this remediation/restoration option would not result in substantial water resource depletion or gain because no dewatering is expected during construction. However, surface water quality downstream from the project area will be improved because the project area will not serve as a continuous source after remediation/restoration. |
| Biology resources (plants/trees/animals/ microorganisms) | Air, water, land/forest, subsurface | Species disappearance/ diversity reduction regenerative ability reduction | Y | There would be significant impact to biological resources during construction. Potential offsite biological mitigation may be necessary. |

Notes:
Template provided by DTSC's "Interim Advisory for Green Remediation" (December 2009).

## Appendix B Table B-2

## Green Remediation Evaluation Matrix (GREM) - Alternative 2: Solidification and Biological/Geotechnical Stabilization

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Substance Release/Production** | | | | |
| Airborne NOx & SOx | Air | Acid rain & photochemical smog | Y | Engine exhaust from construction equipment and transport vehicles used during remediation/restoration implementation would result in emissions that may increase airborne NOx and SOx concentrations. Emissions would be associated with vehicles and equipment used for excavation, transport, onsite processing, and limited offsite disposal of approximately 337 cubic yards (cy) of soil and debris. Emissions would also be associated with vehicles and equipment used to grade and compact approximately 0.96 acres of soil. |
| Chloro-fluorocarbon vapors | Air | Ozone depletion | N | Implementation of this remediation/restoration option would not result in generation of substantial quantities of chloro-fluorocarbon vapors. |
| Greenhouse gas emissions | Air | Atmospheric warming | Y | Engine exhaust from equipment and vehicles used during construction and for transportation of material would result in an increase in greenhouse gas emissions. Emissions would be associated with vehicles and equipment used for excavation, transport, onsite processing, and limited offsite disposal of approximately 337 cy of soil and debris. Emissions would also be associated with vehicles and equipment used to grade and compact approximately 0.96 acres of soil. |
| Airborne particulates/toxic vapors/gases/water vapor | Air | General air pollution/toxic air/humidity increase | Y | The primary airborne particulate emissions from this remediation/restoration option are expected to be diesel particulate matter (DPM) and fugitive dust from soil and debris handling. This remediation/restoration option entails onsite processing, and limited offsite disposal of approximately 337 cy of soil and debris. DPM and fugitive dust would also be generated from grading and compaction of approximately 0.96 acres of soil. |
| Liquid waste production | Water | Water toxicity/sediment toxicity/sediment | Y | Liquid waste potentially generated would be water from decontamination rinsate. It is not anticipated that substantial quantities of liquid waste would be generated during implementation of this remediation/restoration option due to implementation of Best Management Practices (BMPs) during construction. A Stormwater Pollution Protection Plan (SWPPP) would be developed to minimize construction impacts to stormwater runoff. Additionally, construction activities would be scheduled to take place in the dry season to minimize or eliminate construction impacts to stormwater runoff. |
| Solid waste production | Land | Land use/toxicity | Y | The primary solid waste that would be produced during implementation of this remediation/restoration option is approximately 337 cy of materials requiring offsite disposal. |

## Appendix B Table B-2

## Green Remediation Evaluation Matrix (GREM) - Alternative 2: Solidification and Biological/Geotechnical Stabilization

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Thermal Releases** | | | | |
| Warm water | Water | Habitat warming | N | No significant quantities of warm water are expected to be generated during implementation of this remediation/restoration option. |
| Warm vapor | Air | Atmospheric humidity | Y | The primary warm vapor expected to be released during implementation of this remediation/restoration option is related to engine exhaust from vehicles and equipment used during construction. This remediation/restoration option entails excavation, transport, onsite processing, and limited offsite disposal of approximately 337 cy of soil and debris. This remediation/restoration option also includes grading and compaction of approximately 0.96 acres of soil. |
| **Physical Disturbances/Disruptions** | | | | |
| Soil structure disruption | Land | Habitat destruction/ soil Infertility | Y | This remedial remediation/restoration option would involve moderate soil structure disruption because earth-moving equipment would be mobilized to the site and approximately 337 cy of soil/debris would be excavated, fill placed, and an approximate 0.96 acre area graded to return the Site to a more natural setting. |
| Noise/Odor/Vibration/Aesthetics | General environment | Nuisance & safety | Y | The primary aesthetic disruption from implementation of this remediation/restoration option would be related to noise, odor, vibration, and visual impact of construction activities associated with excavation and processing of approximately 337 cy of soil and debris, and grading/compaction of approximately 0.96 acres. This remediation/restoration option is expected to entail approximately a total of 3 months of active construction. Following construction activities and site restoration, it is anticipated that the aesthetics of the Site would be maintained because surface debris would be removed and the Site restored to native plant habitat. |
| Traffic | Land; general environment | Nuisance & safety | Y | Traffic disruption during implementation of this remediation/restoration option would be associated with trucks used to haul approximately 337 cubic yards of excavated soil and debris to offsite disposal/recycling facilities. Traffic disruption associated with construction work would occur in approximately 3 months. |
| Land Stagnation | Land; general environment | Remediation time; cleanup efficiency; re-development | N | No land stagnation is associated with implementation of this remediation/restoration option because the project area is currently not utilized for recreational use. However, after construction completion, there would be full access to the Site for potential recreational purposes and the Site would be restored as native plant habitat. |

## Appendix B Table B-2

## Green Remediation Evaluation Matrix (GREM) - Alternative 2: Solidification and Biological/Geotechnical Stabilization

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Resource Depletion/Gain (Recycling)** | | | | |
| Petroleum (energy) | Subsurface | Consumption | Y | The primary petroleum energy resource depletion during this remediation/restoration implementation is due to engine fuel demands of construction equipment and trucks used for material transport. This remediation/restoration option entails excavation, transport, onsite processing, and limited offsite disposal of approximately 337 cy of soil and debris. This remediation/restoration option also entails grading and compaction of approximately 0.96 acres of soil. |
| Mineral | Subsurface | Consumption | N | This remediation/restoration option would not be a source of substantial mineral depletion or gain. |
| Construction materials (soil/concrete/plastic) | Land | Consumption/reuse | Y | The primary construction material that would be depleted during implementation of this remediation/restoration option is approximately 0.96 acres of soil that would be generated onsite to the extent practicable. |
| Land & space | Land | Impoundment/reuse | Y | The project area is currently not utilized for recreational use. However, after construction completion, there would be full access to the Site for potential recreational purposes and the Site would be restored as native plant habitat. In addition, this remediation/restoration option entails excavation and transport of approximately 337 cy of soil and debris to a disposal facility which would fill up landfill capacity/space. |
| Surface water & groundwater | Water, land (subsidence) | Impoundment/ sequester/reuse | N | Implementation of this remediation/restoration option would not result in substantial water resource depletion or gain because no dewatering is expected during construction. However, surface water quality downstream from the project area will be improved because the project area will not serve as a continuous source after remediation/restoration. |
| Biology resources (plants/trees/animals/ microorganisms) | Air, water, land/forest, subsurface | Species disappearance/ diversity reduction regenerative ability reduction | Y | There would be significant impact to biological resources during construction. Potential offsite biological mitigation may be necessary. |

Notes:
Template provided by DTSC's "Interim Advisory for Green Remediation" (December 2009).

## Appendix B Table B-3

## Green Remediation Evaluation Matrix (GREM) - Option 3: Detention Basin South of Project Area

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Substance Release/Production** | | | | |
| Airborne NOx & SOx | Air | Acid rain & photochemical smog | Y | Engine exhaust from construction equipment and transport vehicles used during remediation/restoration implementation would result in emissions that may increase airborne NOx and SOx concentrations. Emissions would be associated with vehicles and equipment used for excavation, transport, onsite processing, and limited offsite disposal of approximately 6,868 cubic yards (cy) of soil and debris. Emissions would also be associated with vehicles and equipment used to grade and compact approximately 0.69 acres of soil. |
| Chloro-fluorocarbon vapors | Air | Ozone depletion | N | Implementation of this remediation/restoration option would not result in generation of substantial quantities of chloro-fluorocarbon vapors. |
| Greenhouse gas emissions | Air | Atmospheric warming | Y | Engine exhaust from equipment and vehicles used during construction and for transportation of material would result in an increase in greenhouse gas emissions. Emissions would be associated with vehicles and equipment used for excavation, transport, onsite processing, and limited offsite disposal of approximately 6,868 cy of soil and debris. Emissions would also be associated with vehicles and equipment used to grade and compact approximately 0.69 acres of soil. |
| Airborne particulates/toxic vapors/gases/water vapor | Air | General air pollution/toxic air/humidity increase | Y | The primary airborne particulate emissions from this remediation/restoration option are expected to be diesel particulate matter (DPM) and fugitive dust from soil and debris handling. This remediation/restoration option entails onsite processing, and limited offsite disposal of approximately 6,868 cy of soil and debris. DPM and fugitive dust would also be generated from grading and compaction of approximately 0.69 acres of soil. |
| Liquid waste production | Water | Water toxicity/ sediment toxicity/sediment | Y | Liquid waste potentially generated would be water from decontamination rinsate. It is not anticipated that substantial quantities of liquid waste would be generated during implementation of this remediation/restoration option due to implementation of Best Management Practices (BMPs) during construction. A Stormwater Pollution Protection Plan (SWPPP) would be developed to minimize construction impacts to storm water runoff. Additionally, construction activities would be scheduled to take place in the dry season to minimize or eliminate construction impacts to stormwater runoff. |
| Solid waste production | Land | Land use/toxicity | Y | The primary solid waste that would be produced during implementation of this remediation/restoration option is approximately 6,868 cy of materials requiring offsite disposal. |

## Appendix B Table B-3

## Green Remediation Evaluation Matrix (GREM) - Option 3: Detention Basin South of Project Area

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Thermal Releases** | | | | |
| Warm water | Water | Habitat warming | N | No significant quantities of warm water are expected to be generated during implementation of this remediation/restoration option. |
| Warm vapor | Air | Atmospheric humidity | Y | The primary warm vapor expected to be released during implementation of this remediation/restoration option is related to engine exhaust from vehicles and equipment used during construction. This remediation/restoration option entails excavation, transport, onsite processing, and limited offsite disposal of approximately 6,868 cy of soil and debris. This remediation/restoration option also includes grading and compaction of approximately 0.69 acres of soil. |
| **Physical Disturbances/Disruptions** | | | | |
| Soil structure disruption | Land | Habitat destruction/ soil Infertility | Y | This remedial remediation/restoration option would involve moderate soil structure disruption because earth-moving equipment would be mobilized to the site and approximately 6,868 cy of soil/debris would be excavated, fill placed, and an approximate 0.69 acre area graded to return the Site to a more natural setting. |
| Noise/Odor/Vibration/ Aesthetics | General environment | Nuisance & safety | Y | The primary aesthetic disruption from implementation of this remediation/restoration option would be related to noise, odor, vibration, and visual impact of construction activities associated with excavation and processing of approximately 6,868 cy of soil and debris, and grading/compaction of approximately 0.69 acres. This remediation/restoration option is expected to entail approximately a total of 3 months of active construction. Following construction activities and site restoration, it is anticipated that the aesthetics of the Site would be maintained because surface debris would be removed and the Site restored to native plant habitat. |
| Traffic | Land; general environment | Nuisance & safety | Y | Traffic disruption during implementation of this remediation/restoration option would be associated with trucks used to haul approximately 6,868 cubic yards of excavated soil and debris to offsite disposal/recycling facilities. Traffic disruption associated with construction work would occur in approximately 3 months. |
| Land Stagnation | Land; general environment | Remediation time; cleanup efficiency; re-development | N | No land stagnation is associated with implementation of this remediation/restoration option because the project area is currently not utilized for recreational use. |

## Appendix B Table B-3

## Green Remediation Evaluation Matrix (GREM) - Option 3: Detention Basin South of Project Area

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Resource Depletion/Gain (Recycling)** | | | | |
| Petroleum (energy) | Subsurface | Consumption | Y | The primary petroleum energy resource depletion during this remediation/restoration implementation is due to engine fuel demands of construction equipment and trucks used for material transport. This remediation/restoration option entails excavation, transport, onsite processing, and limited offsite disposal of approximately 6,868 cy of soil and debris. This remediation/restoration option also entails grading and compaction of approximately 0.69 acres of soil. |
| Mineral | Subsurface | Consumption | N | This remediation/restoration option would not be a source of substantial mineral depletion or gain. |
| Construction materials (soil/concrete/plastic) | Land | Consumption/reuse | Y | The primary construction material that would be depleted during implementation of this remediation/restoration option is approximately 0.69 acres of soil that would be generated onsite to the extent practicable. |
| Land & space | Land | Impoundment/reuse | Y | The project area is currently not utilized for recreational use. This remediation/restoration option entails excavation and transport of approximately 6,868 cy of soil and debris to a disposal facility which would fill up landfill capacity/space. |
| Surface water & groundwater | Water, land (subsidence) | Impoundment/ sequester/reuse | N | Implementation of this remediation/restoration option would not result in substantial water resource depletion or gain because no dewatering is expected during construction. However, surface water quality downstream from the project area will be improved because the project area will not serve as a continuous source after remediation/restoration. |
| Biology resources (plants/trees/animals/ microorganisms) | Air, water, land/forest, subsurface | Species disappearance/ diversity reduction regenerative ability reduction | Y | There would be significant impact to biological resources during construction. Potential offsite biological mitigation may be necessary. |

Notes:
Template provided by DTSC's "Interim Advisory for Green Remediation" (December 2009).

## Appendix B Table B-3

## Green Remediation Evaluation Matrix (GREM) - Alternative 3: Detention Basin South of Project Area

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Substance Release/Production** | | | | |
| Airborne NOx & SOx | Air | Acid rain & photochemical smog | Y | Engine exhaust from construction equipment and transport vehicles used during remediation/restoration implementation would result in emissions that may increase airborne NOx and SOx concentrations. Emissions would be associated with vehicles and equipment used for excavation, transport, onsite processing, and limited offsite disposal of approximately 6,868 cubic yards (cy) of soil and debris. Emissions would also be associated with vehicles and equipment used to grade and compact approximately 0.69 acres of soil. |
| Chloro-fluorocarbon vapors | Air | Ozone depletion | N | Implementation of this remediation/restoration option would not result in generation of substantial quantities of chloro-fluorocarbon vapors. |
| Greenhouse gas emissions | Air | Atmospheric warming | Y | Engine exhaust from equipment and vehicles used during construction and for transportation of material would result in an increase in greenhouse gas emissions. Emissions would be associated with vehicles and equipment used for excavation, transport, onsite processing, and limited offsite disposal of approximately 6,868 cy of soil and debris. Emissions would also be associated with vehicles and equipment used to grade and compact approximately 0.69 acres of soil. |
| Airborne particulates/toxic vapors/gases/water vapor | Air | General air pollution/toxic air/humidity increase | Y | The primary airborne particulate emissions from this remediation/restoration option are expected to be diesel particulate matter (DPM) and fugitive dust from soil and debris handling. This remediation/restoration option entails onsite processing, and limited offsite disposal of approximately 6,868 cy of soil and debris. DPM and fugitive dust would also be generated from grading and compaction of approximately 0.69 acres of soil. |
| Liquid waste production | Water | Water toxicity/ sediment toxicity/sediment | Y | Liquid waste potentially generated would be water from decontamination rinsate. It is not anticipated that substantial quantities of liquid waste would be generated during implementation of this remediation/restoration option due to implementation of Best Management Practices (BMPs) during construction. A Stormwater Pollution Protection Plan (SWPPP) would be developed to minimize construction impacts to storm water runoff. Additionally, construction activities would be scheduled to take place in the dry season to minimize or eliminate construction impacts to stormwater runoff. |
| Solid waste production | Land | Land use/toxicity | Y | The primary solid waste that would be produced during implementation of this remediation/restoration option is approximately 6,868 cy of materials requiring offsite disposal. |

## Appendix B Table B-3

## Green Remediation Evaluation Matrix (GREM) - Alternative 3: Detention Basin South of Project Area

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Thermal Releases** | | | | |
| Warm water | Water | Habitat warming | N | No significant quantities of warm water are expected to be generated during implementation of this remediation/restoration option. |
| Warm vapor | Air | Atmospheric humidity | Y | The primary warm vapor expected to be released during implementation of this remediation/restoration option is related to engine exhaust from vehicles and equipment used during construction. This remediation/restoration option entails excavation, transport, onsite processing, and limited offsite disposal of approximately 6,868 cy of soil and debris. This remediation/restoration option also includes grading and compaction of approximately 0.69 acres of soil. |
| **Physical Disturbances/Disruptions** | | | | |
| Soil structure disruption | Land | Habitat destruction/ soil Infertility | Y | This remedial remediation/restoration option would involve moderate soil structure disruption because earth-moving equipment would be mobilized to the site and approximately 6,868 cy of soil/debris would be excavated, fill placed, and an approximate 0.69 acre area graded to return the Site to a more natural setting. |
| Noise/Odor/Vibration/ Aesthetics | General environment | Nuisance & safety | Y | The primary aesthetic disruption from implementation of this remediation/restoration option would be related to noise, odor, vibration, and visual impact of construction activities associated with excavation and processing of approximately 6,868 cy of soil and debris, and grading/compaction of approximately 0.69 acres. This remediation/restoration option is expected to entail approximately a total of 3 months of active construction. Following construction activities and site restoration, it is anticipated that the aesthetics of the Site would be maintained because surface debris would be removed and the Site restored to native plant habitat. |
| Traffic | Land; general environment | Nuisance & safety | Y | Traffic disruption during implementation of this remediation/restoration option would be associated with trucks used to haul approximately 6,868 cubic yards of excavated soil and debris to offsite disposal/recycling facilities. Traffic disruption associated with construction work would occur in approximately 3 months. |
| Land Stagnation | Land; general environment | Remediation time; cleanup efficiency; re-development | N | No land stagnation is associated with implementation of this remediation/restoration option because the project area is currently not utilized for recreational use. |

## Appendix B Table B-3

## Green Remediation Evaluation Matrix (GREM) - Alternative 3: Detention Basin South of Project Area

## Upper Jacques Gulch Restoration, Santa Clara County Parks, California

| Stressors | Affected Media | Mechanism/ Effect | Y/N | Score * |
|---|---|---|---|---|
| **Resource Depletion/Gain (Recycling)** | | | | |
| Petroleum (energy) | Subsurface | Consumption | Y | The primary petroleum energy resource depletion during this remediation/restoration implementation is due to engine fuel demands of construction equipment and trucks used for material transport. This remediation/restoration option entails excavation, transport, onsite processing, and limited offsite disposal of approximately 6,868 cy of soil and debris. This remediation/restoration option also entails grading and compaction of approximately 0.69 acres of soil. |
| Mineral | Subsurface | Consumption | N | This remediation/restoration option would not be a source of substantial mineral depletion or gain. |
| Construction materials (soil/concrete/plastic) | Land | Consumption/reuse | Y | The primary construction material that would be depleted during implementation of this remediation/restoration option is approximately 0.69 acres of soil that would be generated onsite to the extent practicable. |
| Land & space | Land | Impoundment/reuse | Y | The project area is currently not utilized for recreational use. This remediation/restoration option entails excavation and transport of approximately 6,868 cy of soil and debris to a disposal facility which would fill up landfill capacity/space. |
| Surface water & groundwater | Water, land (subsidence) | Impoundment/ sequester/reuse | N | Implementation of this remediation/restoration option would not result in substantial water resource depletion or gain because no dewatering is expected during construction. However, surface water quality downstream from the project area will be improved because the project area will not serve as a continuous source after remediation/restoration. |
| Biology resources (plants/trees/animals/ microorganisms) | Air, water, land/forest, subsurface | Species disappearance/ diversity reduction regenerative ability reduction | Y | There would be significant impact to biological resources during construction. Potential offsite biological mitigation may be necessary. |

Notes:
Template provided by DTSC's "Interim Advisory for Green Remediation" (December 2009).