2014-100

NOTICE OF DETERMINATION

NAPA COUNTY DEPARTMENT OF PUBLIC WORKS
1195 THIRD STREET; SUITE 101 NAPA CA 94559

(Filed in compliance with Section 21108 or 21152 of the Public Resources Code)

ENDORSED
NOV 21 2014
JOHN TUTEUR
Napa County Recorder - County Clerk
By N. TURNER
DEPUTY RECORDER - CLERK

To: ☒ Office of Planning and Research
P.O. Box 3044
Sacramento, CA 95812-3044

☒ Napa County Clerk
900 Coombs St
Napa, CA 94559

LEAD AGENCY: Napa County Department of Public Works

CONTACT PERSON: Mallika Ramachandran, Engineering Supervisor **PHONE:** 707-259-8194

STATE CLEARING HOUSE NUMBER: 2014102037

PROJECT TITLE: Greenwood Culvert Replacement Project

PROJECT LOCATION: The Proposed Project is on Greenwood Avenue at its intersection with the Napa River north of the City limits of Calistoga, CA. The subject project area is within an Agricultural Preserve (AP) zoning district, Napa County, California (adjacent to Assessor's Parcel No 017-210-014).

PROJECT LOCATION – CITY (NEAREST): Calistoga **PROJECT LOCATION - COUNTY:** Napa

PROJECT DESCRIPTION: The proposed project would involve removing the 60-foot-long, 15-foot-diameter circular corrugated steel culvert and replacing it with a 70-foot-long, 22-foot-wide bridge. The project would involve working in a 300-foot reach of the channel bed that is approximately 30 to 50 feet wide. The project footprint would be approximately 21,100 square feet or 0.48 acres and including the temporary access road, the site impact total is 0.79 acres, 34,400 square feet. In addition to the removal and replacement of the culvert, the design includes the construction of a natural channel stabilized with native vegetation, boulders, and log structures. These features are designed to provide endangered species habitat as well fish passage for the project. The project would include construction of a temporary road that would provide access to the site and the immediate surroundings.

APPLICANT/REPRESENTATIVE: Napa County Department of Public Works
ADDRESS: 1195 Third Street, Suite 101 Napa, CA 94559 **PHONE:** 707-259-8194

This is to advise that the Napa County Department of Public Works as ☒ Lead Agency ☐ Responsible Agency has approved the above-described project on November 19, 2014 and made the following determinations:

1. The project ☐ will ☒ will not have a significant effect on the environment.
2. ☐ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☒ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☒ were ☐ were not made a condition of the approval of this project.
4. A mitigation reporting or monitoring plan ☒ was ☐ was not adopted for this project.
5. A statement of Overriding Considerations ☐ was ☒ was not adopted for this project.
6. Findings ☐ were ☒ were not made pursuant to the provisions of CEQA.

This is to certify that the Mitigated Negative Declaration is available to the general public at the above address

SIGNATURE: DATE: 11/19/14 TITLE: DIRECTOR OF PUBLIC WORKS

Date received for filing and posting at OPR:

State of California—Natural Resources Agency

RECEIPT #28-2014-135

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

2014 ENVIRONMENTAL FILING FEE CASH RECEIPT

STATE CLEARING HOUSE # 2014102037
(If applicable)

TYPE OR PRINT CLEARLY

LEAD AGENCY NAPA COUNTY PUBLIC WORKS		DATE 11/21/2014	
COUNTY/STATE AGENCY OF FILING **NAPA COUNTY CLERK**		DOCUMENT # 2014-135	
PROJECT TITLE GREENWOOD CULVERT REPLACEMENT PROJECT			
PROJECT APPLICANT NAME NAPA CO DEPT OF PUBLIC WORKS		PHONE NUMBER (707) 259 -8194	
PROJECT APPLICANT ADDRESS 1195 THIRD ST STE 101	CITY NAPA	STATE CA	ZIP CODE 94559

PROJECT APPLICANT *(Check appropriate box)*:

☒ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☐ Private Entity

CHECK APPLICABLE FEES:

☐ Environmental Impact Report	$3,029.75	$ ____
☒ Negative Declaration	$2,181.25	$ 2181.25
☐ Application Fee Water Diversion *(State Water Resources Control Board Only)*	$850.00	$ ____
☐ Projects Subject to Certified Regulatory Programs	$1018.50	$ ____
☐ County Administrative Fee	$50.00	$ ____
☐ Project that is exempt from fees		
☐ Notice of Exemption		
☐ CDFW No Effect Determination (Form Attached)		
☐ Other CO. PROJECT		$____

TRANSACTION #2014-112100004

PAYMENT METHOD:

TOTAL RECEIVED $ 2181.25

☐ Cash ☐ Credit ☒ Check ☐ Journal/Dep. ID ____

SIGNATURE
X R. Turner

TITLE: **DEPUTY COUNTY CLERK**

ORIGINAL - PROJECT APPLICANT COPY - DFW/ASB COPY - LEAD AGENCY COPY – COUNTY CLERK

Napa Recorder-County Clerk's Office
County of
Napa
JOHN TUTEUR
Assessor-Recorder-County Clerk

1 FISH/GAME NEGATIVE DECLARA 2181.25

TOTAL 2181.25
CHECK 597166 2181.25
CHANGE 0.00

11/21/2014 8:21AM 201411210004
NT C7026

Thank You
VISIT US ONLINE www.countyofnapa.org

Requested By:
COUNTY OF NAPA

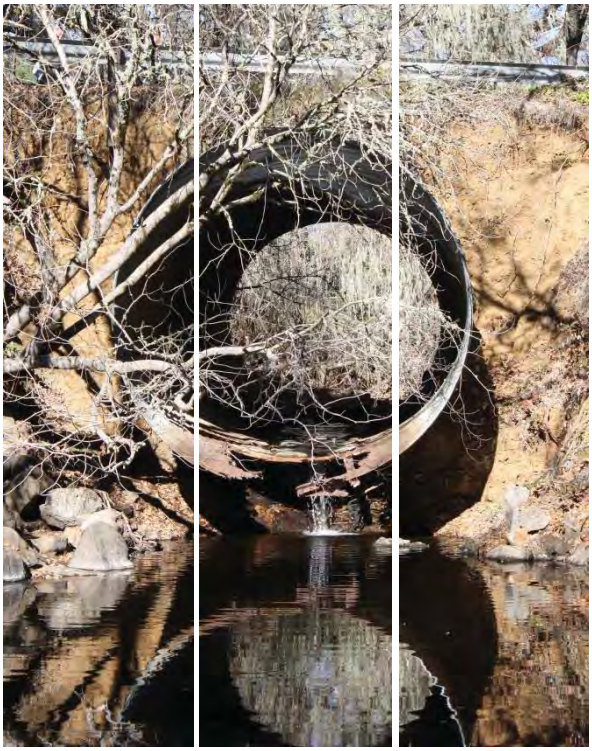
INITIAL STUDY

GREENWOOD AVENUE CULVERT REPLACEMENT PROJECT
INITIAL STUDY/MITIGATED NEGATIVE DECLARATION

Prepared for

Napa County Public Works Department

October 2014



Prepared by

Amy Skewes-Cox, AICP

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GREENWOOD AVENUE CULVERT REPLACEMENT PROJECT
INITIAL STUDY/MITIGATED NEGATIVE DECLARATION

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October 2014

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In conjunction with

QUESTA ENGINEERING CORPORATION
ILLINGWORTH & RODKIN
NATALIE MACRIS

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CHAPTER I
PROJECT DESCRIPTION

1. **Project Title:** Greenwood Avenue Culvert Replacement Project

2. **Lead Agency Name and Address:**
   Napa County Public Works Department
   1195 Third Street, Suite 101
   Napa, CA 94559

3. **Contact Person and Phone Number:** Mallika Ramachandran, P.E., LEED A.P., QSD/QSP
   Supervising Civil Engineer
   707-259-8194
   Mallika.Ramachandran@countyofnapa.org

4. **Project Location:** Greenwood Avenue intersection with Napa River, north of Calistoga; adjacent to Assessor's Parcel Number (APN) 017-210-014

5. **Project Sponsor's Name:** Napa County Public Works Department

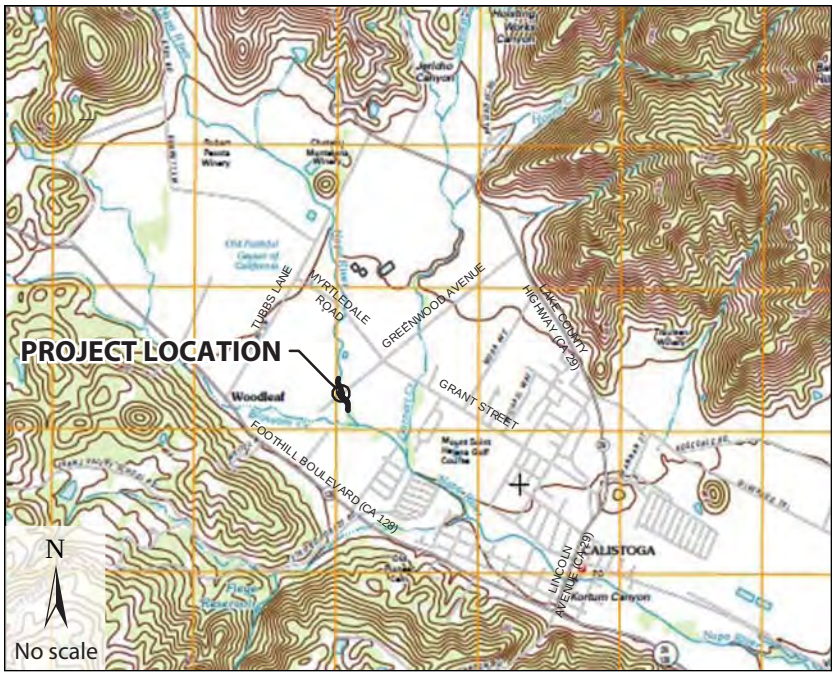
6. **General Plan Designation:** Agricultural Resource (Agricultural Preserve) in Napa County General Plan and Rural Residential in City of Calistoga General Plan

7. **Zoning:** No zoning specifically applies to the project site since it is within the roadway alignment. The area south of site is within the City of Calistoga and the City's zoning of this area is Rural Residential. The area north of the site is within Napa County, and the County's zoning is Agricultural Preserve (AP) for 12 residences and 13 lots in the project site vicinity.

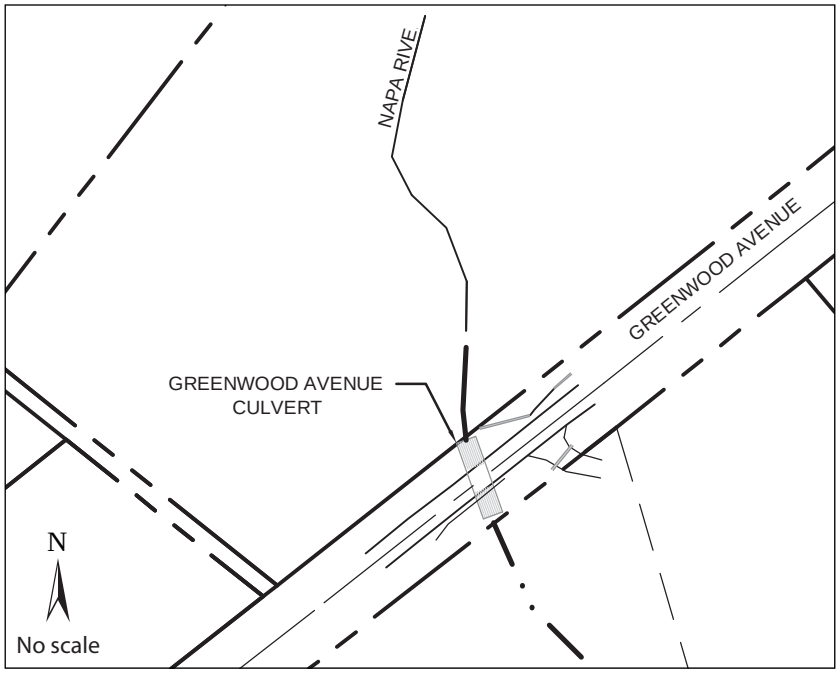
8. **Description of Project:**

Project Location

The Greenwood Avenue Culvert Replacement Project (the project) is located about 2,000 feet north of the city limits of Calistoga. Calistoga is located in the northern part of the Napa Valley, about 400 feet above sea level. To the south, a ridge of mountains separates Calistoga from the Santa Rosa and Sonoma valleys. To the north, a tall ridge known as the Palisades rises over 2,000 feet up from the valley floor. At the north of the Palisades is Mt. St. Helena, whose highest peak is 4,340 feet above mean sea level (msl). **Figure 1** shows the regional context of the project site. The project site is located where Greenwood Avenue crosses over the Napa River and includes an approximately 300-foot reach of the Napa River as well as the Greenwood Avenue culvert.



Area Map



Vicinity Map

Figure 1

PROJECT LOCATION

SOURCE: Questa Engineering, 2014

Project Purpose

The project would involve the removal of a 15-foot-diameter circular culvert that was installed circa 1940 for the construction of Greenwood Avenue over the Napa River. This culvert is now showing signs of rusting and deterioration. The culvert is corroding at the outlet invert. The backup of runoff above the culvert during large events causes flow over the roadway which has resulted in a sharp drop from the southwest side of the road to the channel bottom, posing a potential hazard to vehicles and pedestrians. In addition, the culvert is a significant barrier to upstream fish migration due to the 3.5-foot drop in grade that has formed directly beneath the outlet.

The project would replace the existing culvert with an open bottom arched bridge that would maintain current floodplain conditions and allow passage of fish in accordance with California Department of Fish and Wildlife and National Marine Fisheries Service (NMFS) guidelines.

Project Site Characteristics

The project site extends approximately 100 feet upstream of the culvert and 200 feet downstream of the culvert. In the river reach, the river banks are 15 to 21 feet tall. The channel bottom is significantly wider downstream of the culvert. The slope along the reach is approximately 1 percent, with a 3.5-foot drop at the outlet of the culvert.

The existing channel and culvert restricts high storm flows. This restriction causes storm flows to back up and flood the adjacent properties. The channel and culvert capacity restriction results in regular (i.e., 10-year-event) floodplain inundation upstream of Greenwood Avenue. This area is a significant and important section of the regionally active upper Napa River floodplain.

Greenwood Avenue is a “no outlet” road at this location and is used primarily by local residents and service vehicles. Land uses surrounding the project site consist of single-family homes and agricultural fields. **Figure 1** depicts the project site and its immediate surroundings.

Project Implementation

Project implementation would involve removing the 60-foot-long, 15-foot-diameter circular corrugated steel culvert and replacing it with a 70-foot-long, 22-foot-wide bridge. The project would involve working in a 300-foot reach of the channel bed that is approximately 30 to 50 feet wide. The project footprint would be approximately 21,100 square feet or 0.48 acres and including the temporary access road, the site impact total is 0.79 acres, 34,400 square feet.

In addition to the removal and replacement of the culvert, the design includes the construction of a natural channel stabilized with native vegetation, boulders, and log structures. These features are designed to provide endangered species habitat as well fish passage for the project.

The project would include construction of a temporary road that would provide access to the site and the immediate surroundings. **Figure 2** shows the location of the proposed temporary access road, and **Figure 3** shows the detailed cross-section and drainage detail for this road.

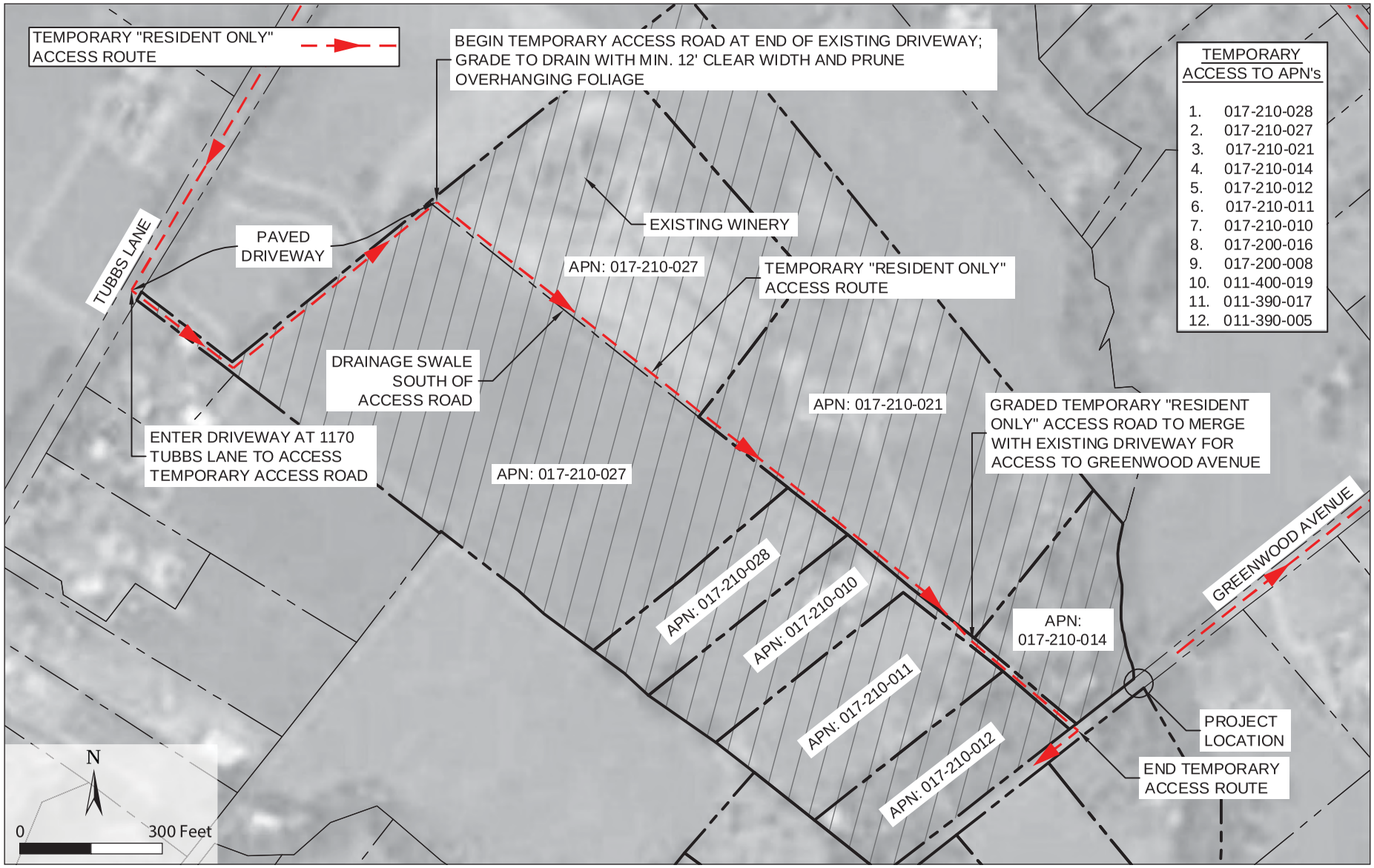


Figure 2

TEMPORARY ACCESS ROUTE

SOURCE: Questa Engineering, 2014

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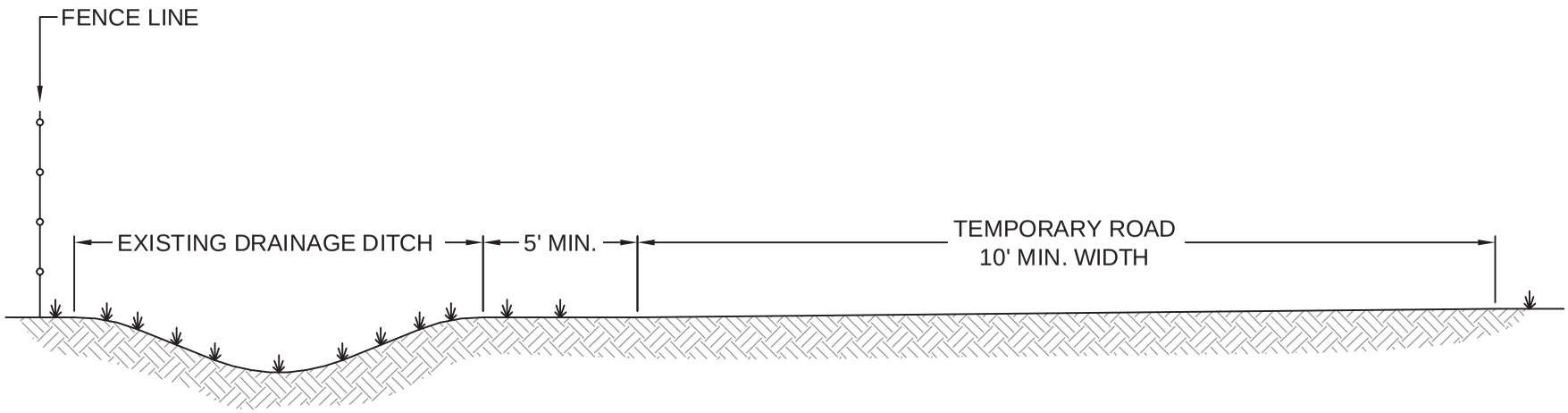

NOTES

1. CLEAR AND GRUB 10'-WIDE TEMPORARY ACCESS ROAD BEGINNING AT WESTERN CORNER OF PARCEL #017-210-027 AND ENDING AT SOUTHERN SIDE OF PARCEL #017-210-021.
2. WATER TWICE DAILY WITH WATER TRUCKS FOR DUST SUPPRESSION M-F WHILE IN USE
3. ROAD WILL BE REMOVED AND THE ALIGNMENT RETURNED TO EXISTING CONDITIONS AFTER CONSTRUCTION

Figure 3

TEMPORARY ROAD AND DRAINAGE DETAIL

SOURCE: Questa Engineering, 2014

More detailed information regarding the various phases of the proposed project is provided below.

Construction Timeline

Construction activities in the creek would commence after June 1, 2015, and be completed before October 31, 2015.

Demolition

As part of the proposed project, the existing culvert and asphalt road above the culvert would be demolished and the rubble would be hauled off-site to an appropriate refuse disposal facility. Demolition of the affected portion of the road would generate approximately 200 cubic yards of asphalt waste. The culvert is a 60-foot-long, 15-foot-diameter circular steel culvert that would be demolished and hauled off-site. Dirt from the culvert fill would be temporarily stored within the allocated staging area or hauled away immediately from the site. Some suitable soil (about 200 cubic yards) would be salvaged and later be used as backfill fill for the new bridge. The excess soil would be hauled off the site. While construction would generally avoid significant trees on the site, the project would entail the removal of three trees: two white oaks (with 10- and 12-inch-diameter trunks) and one buckeye (with a 12-inch diameter trunk). **Figure 4** shows the proposed demolition, staging, and access plan.

Staging

Once the culvert, fill, and road are removed from the site, a temporary dirt access road to the channel bed would be constructed from Greenwood Avenue on the eastern side of the Napa River. A portion of Greenwood Avenue would be used as a materials and equipment staging area. See Figure 4 for a map of the staging area.

Dewatering

Dewatering and flow bypass would be required during the majority of construction activities. The proposed dewatering and flow bypass system would collect all of the creek flow from upstream of the project site and deliver it to the stream just downstream of the project site. The anticipated length of channel dewatering is approximately 190 linear feet. The project contractor would develop a dewatering plan and ensure that all materials and equipment would be available for the water diversion and dewatering system prior to the commencement of work. The water bypass and dewatering system would include the following components:

- Screened pump intake.
- Pumping equipment (i.e., submersible pump, generator, fuel supply, and spill containment system).
- Impoundment structure.
- Bypass piping/pipeline.
- Point of discharge protection.

Temporary Access Road

Greenwood Avenue west of the culvert is a “no outlet” road that serves 13 parcels. Residents and service vehicles that need to reach Greenwood Avenue on the west side of the Napa River would need an alternative route during project construction because the normal river crossing would be disrupted due to the proposed project. A temporary access road would be constructed from Tubbs Lane through

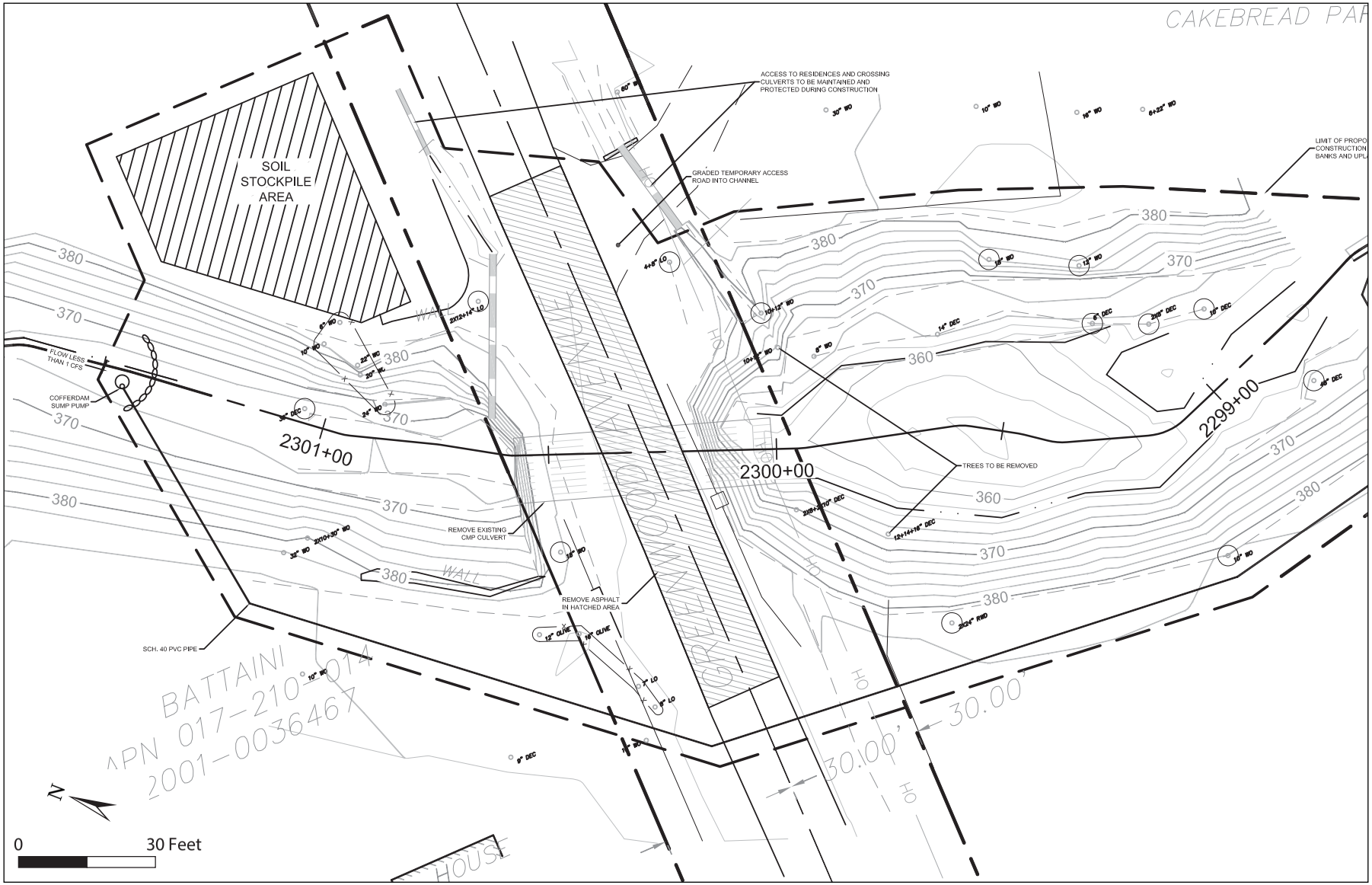

Figure 4

SOURCE: Questa Engineering, 2014

DEMOLITION, STAGING, AND ACCESS PLAN

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an agricultural field and enter Greenwood Avenue using an existing driveway whose entrance from Greenwood Avenue is approximately 100 feet west of the river crossing (see **Figure 2**).

There is a paved driveway that serves some wineries located at 1170 Tubbs Lane and that ends on Parcel 017-210-027. A graded temporary access road would begin at the end of this driveway and end at the driveway that serves Parcels 017-210-021, 017-210-010, and other parcels and that connects to Greenwood Avenue. No bridges or other crossings along the route would be required. The project contractor would construct a temporary fence that would extend along the temporary access road for 1,200 feet along Parcels 017-210-027, 017-210-028, 017-210-010, and 017-210-021. A water truck would provide dust suppression two to three times per day to keep the dust down. The temporary road would be posted with speed limits and caution messages. The road would be used only by residents and community service vehicles (mail, garbage, recycling). The temporary access road is expected to be needed for 4 months and at completion would be returned to its prior state at the end of construction. A construction easement for this temporary road has been obtained by the County.

Channel and Bridge Construction

Once removal of the culvert and road crossing is complete, the creek channel and new bridge would be constructed. A new channel bottom would be constructed into a series of pools and riffles. These pools and riffles are designed to comply with state and federal fish passage guidelines. The channel would be configured into a series of four step pools and a downstream riffle with rock weirs constructed throughout the sequences to ensure that the channel features are stable over time. Incorporated into the channel reconstruction would be a series of habitat features designed to mitigate the loss of existing stream and pool habitat that would occur. Also incorporated into the channel reconstruction would be a series of buried rock grade controls to stabilize the vertical and lateral movement of the channel in and around the new structure.

Vertical and denuded banks downstream of the culvert would be stabilized and replanted using locally harvested willow and alder stakes in combination with biodegradable erosion control products. The new bridge would be founded on two new lateral foundations. The bridge structure itself would be 70 feet long and 22 feet wide. Once the concrete foundation is completed, the bridge would be trucked to the site, assembled and craned into place on the new foundations. Drainage would be installed along the sides and new headwalls would be constructed. Backfill would be placed and compacted; road base and asphalt would then be installed in the last 18 inches of depth. The bridge deck would be a 6-inch reinforced concrete slab. All disturbed areas would be seeded and/or planted. Impacted bank slopes would be seeded and covered with erosion control blankets.

Erosion Control

Channel erosion potential would change over time as the planted vegetation matures. Typically, the erosion potential of the channel and banks decreases as a project ages and as mature, stable vegetation is established. Approaches that integrate vegetation and biodegradable products such as fiber blankets, bio-blocks, and coir[1] products would be used. The biodegradable products would be

[1] Coir products are made using bio-degradable Coconut husk fibers.

used to provide temporary erosion protection and allow for the vegetation to mature and provide the primary erosion control within 3 to 5 years, giving revegetation plantings time to establish. The channel banks along the riffles and grade control structures would be planted with willow stakes to ensure that vegetation cover becomes part of the overall channel structure. Willow would be planted in the deep trenches associated with the weir and keyway construction. The trenches would be of sufficient depth so that willow planting could have access to underflow and groundwater resources. Additional riparian planting would be completed on the floodplains and channel banks to ensure long-term stability of the channel. Anchored logs would be incorporated into the pools and grade control structures to dissipate erosive energy and create habitat complexity. These logs would be anchored using large stone counter weights.

In order to provide short-term erosion control without having to construct an entirely riprap-lined channel, the project design combines rock placement with other “softer” erosion control and habitat features. Floodplain features would be covered with erosion control blankets that would be made of biodegradable coir fiber. Typically, the fiber begins to degrade within 2 to 3 years but takes up to 6+ years to fully disintegrate.

Construction Equipment

During construction, an excavator and front loader would be used to move dirt and to remove the existing culvert and replace it with the new bridge. A pump would be placed at the site for dewatering that will be needed. In addition, a diesel-powered generator would be placed at the site for the construction period and would be placed approximately 200 to 300 feet from the nearest residence. This generator would operate 24 hours per day, 7 days per week during the construction period. Soundproofing would be placed around the generator to minimize noise intrusion.

Preliminary Planting Plan

To allow for site-specific native species selection, planting for the project site would be divided into three different planting zones: a) riparian, b) riparian canopy, and c) upland scrub. Willow staking of the rock weirs, rock revetment, and coir bio-blocks has been previously discussed. **Figure 5** shows the proposed planting and irrigation plan.

Earthmoving Quantities (Description = Unit, Quantity)

1. Remove Culvert = CY 600
2. Structural Excavation= CY 660
3. Structural Backfill = CY 20
4. Class 2 Aggregate Base = CY 10
5. Structural Concrete = CY 40
6. Steel piles = 12 each x 35 feet
7. 6-inch Perforated Plastic Pipe Underdrain = LF 120
8. 12-inch HDPE Storm Drains = LF 80
9. Reconstructed channel (rock) = CY 1400
10. Habitat features (Lunkers, bioblocks) = CY 20
11. Embankment Fill = CY 200

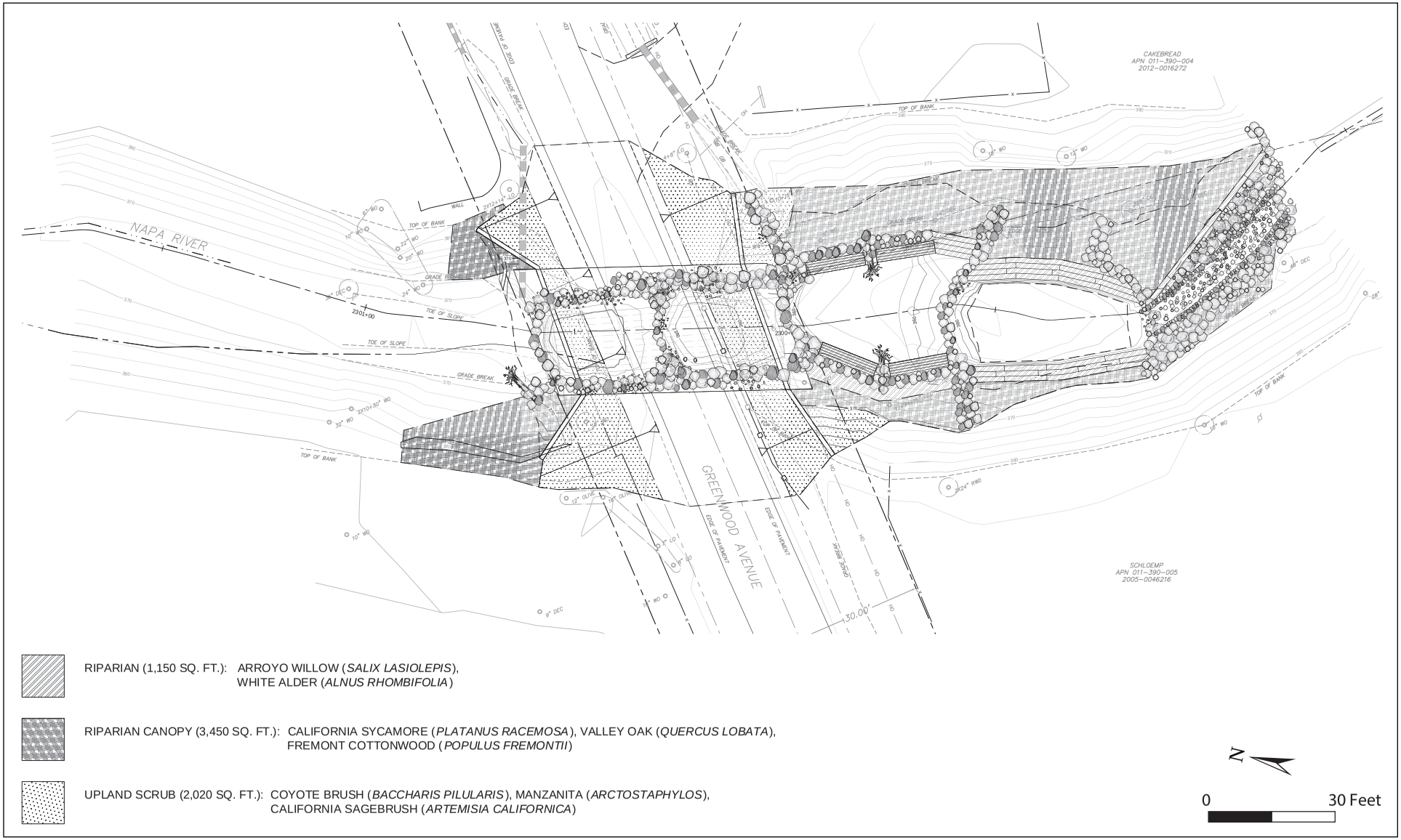

Figure 5

LANDSCAPE PLAN

SOURCE: Questa Engineering, 2014

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Construction Sequence

Construction tasks would occur in the following sequence:

1. Project site mobilization
2. Biologic surveys, education, and monitoring
3. Signage installation, grading, and establishment of temporary access road
4. Construction of dewatering/diversion system
5. Project site dewatering and biological monitoring and fish/shrimp relocation
6. Culvert demolition, roadway demolition, and fill excavation
7. Channel access road grading
8. Channel reconstruction, starting at downstream end
9. Bridge foundation construction
10. Complete channel reconstruction
11. Assemble and install bridge
12. Placement of backfill and headwalls
13. Construction of roadway
14. Removal of detour, decommissioning of temporary access road, and completion of erosion control
15. Final site planting and punchlist
16. Site cleanup and demobilization

9. Surrounding Land Uses and Setting:

Land uses surrounding the project site consist of single-family houses and agricultural fields. A winery is located to the northwest of the project site, east of Tubbs Lane.

10. Other Public Agencies Whose Approval is Required (e.g., Permits, Financing Approval, or Participation Agreement):

The lead agency for this project is the Napa County Department of Public Works. **Table 1** shows environmental commitments made by the lead agency. In addition, the project would require approvals from the following other public agencies:

- California Department of Fish and Wildlife
- Regional Water Quality Control Board (San Francisco Bay Region)
- U.S. Fish and Wildlife Service
- U.S. Army Corps of Engineers
- City of Calistoga (floodplain permit)

TABLE 1 ENVIRONMENTAL COMMITMENTS

Number	Title	Environmental Commitment Description
General Environmental Commitments These Environmental Commitments will be implemented by the County and its Contractors, as appropriate, for all activities associated with the Proposed Project. The majority of these Environmental Commitments are implemented prior to and during construction.		
EC-1GEN	Work Windows	A. Ground-disturbing activities will occur between June 1 through November 15. B. All in-stream activities (e.g., dewatering, pier, RC) would take place between June 15 and October 15 in construction.
EC-2GEN	Minimize the Area of Disturbance	To minimize impacts to natural resources, soil disturbance will be kept to the minimum footprint necessary to complete project construction.
EC-3GEN	Erosion and Sediment Control Measures	A. Implement erosion and sediment control measures identified in the SWPPP. B. Implement erosion and sediment control measures identified in the Caltrans Standard Specifications Manual (available online: http://www.dot.ca.gov/hq/esc/oe/construction_standards.html). C. Implement erosion control and sediment control measures identified in the USFWS and NMFS Biological Opinions.
EC-4GEN	Non-Stormwater Controls and Waste and Materials Management	Implement non-stormwater controls and waste and materials management measures identified in the SWPPP in Appendix B.
EC-5GEN	Dewatering Measures	A. Implement dewatering measures identified in the On sheet 3 of 13 and prescribed in the applicable state and federal permits. B. Implement Measure EC-11BIO.
EC-6GEN	Planning for Pedestrians, Traffic Flow, and Safety Measures	A. Work will be staged and conducted in a manner that prevents utilizing Greenwood Avenue to access residential properties on the west of the Napa River. A temporary access road will be constructed and maintained. B. Vehicle speed will be limited to ten (10) miles per hour on temporary access road. C. Vehicular traffic will be confined to existing roads and the designated Proposed Project area. D. Adequate parking will be provided or designated public parking areas will be used for maintenance-related vehicles not in use during the maintenance period. E. Access to driveways and private roads will be maintained. If brief periods of maintenance would temporarily block access, property owners will be notified prior to maintenance activities.
EC-7GEN	Public Safety Measures	The County will implement public safety measures during construction as follows: A. Signs will be posted at job sites warning the public of construction work and to exercise caution. B. In areas accessible to the public, fencing, either the orange safety type or chainlink, will be installed around the perimeter of Proposed Project Areas. C. When necessary, County or contracted staff will provide traffic control and site security.
EC-8GEN	Minimize Noise Disturbances to Residential Areas	The County will implement practices that minimize disturbances to residences and commercial winery facilities surrounding work sites. A. With the exception of emergencies, work will be conducted between the hours of 7:00 AM and 7:00 PM, in accordance to Napa County Code Chapter 8.16. If Proposed Project terrain or access road conditions require construction equipment to be staged, loaded, or unloaded off the Proposed Project Area (such as on a neighboring road or at the base of a hill), such activities shall only occur between the hours of 8:00 AM to 5:00 PM. Construction activities in residential areas and near commercial winery facilities will not occur on Saturdays, Sundays, or County observed holidays except during emergencies, or with approval by the local jurisdiction and advance notification of surrounding residents. B. Advanced notification will be provided one week prior to the start of construction to properties that have residences and/or commercial winery facilities (i.e., tasting room, sales room, restaurant, etc.) within 400 feet of a proposed construction site where heavy equipment will be used. C. Powered equipment (vehicles, heavy equipment, and hand equipment such as chainsaws) will be equipped with adequate mufflers. D. Excessive idling of vehicles will be prohibited beyond 5 minutes. E. Non-power hand tools will be maximized and noisy equipment will be minimized to the extent feasible. F. Noise complaints will be responded to within 48 hours of receipt, and the County will make a good faith effort to resolve a noise sensitivity issue by constructing noise attenuation shielding or by another acceptable method, where appropriate.

TABLE 1 ENVIRONMENTAL COMMITMENTS

Number	Title	Environmental Commitment Description
EC-9GEN	Work Site Housekeeping	A. County employees and contractors will maintain the work site in neat and orderly conditions on a daily basis, and will leave the site in a neat, clean, and orderly condition when work is complete. Slash, sawdust, cuttings, etc. will be removed to clear the site of vegetation debris. As needed, paved access roads and trails will be swept and cleared of any residual vegetation or dirt resulting from the construction activity. All lunch trash will be properly disposed of. B. Materials or equipment left on the site overnight will be stored as inconspicuously as possible, and will be neatly arranged.
EC-10GEN	Utility Disruption Measures	A. Prior to the start of work, the contractor will locate and mark all active surface and subsurface utilities in the Project Area B. If relocation or temporary disruption of utility services is necessary, the County or its contractors will coordinate with utility providers prior to the start of construction. C. Utility poles will be relocated prior to the start of construction. D. The County or its contractors will coordinate with the utility providers to notify affected potentially affected customers of the potential for service disruption.
Biological Resource Environmental Commitments These measures will be implemented as appropriate to avoid and minimize impacts on special-status species and other biological resources.		
EC-11BIO	Protection of Fish and Other Aquatic Species during Channel Dewatering	Before a work area is dewatered (as identified in EC-5GEN above) or instream construction activities commence, the following measures will be implemented: A. Per NOAA Fisheries requirements included in the pending Project Biological Opinion, channel dewatering is restricted to: June 15 and October 31. B. All cofferdams, pumps, pipes and sheet plastic will be removed from the stream upon Project completion; any clean native gravel used for the cofferdams will be left in the channel to augment available spawning habitat. C. All pumps used to divert live stream flow, outside the dewatered work area, will be screened and maintained throughout the construction period to comply with NMFS' Fish Screening Criteria for Anadromous Salmonids. See: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5366394.pdf. Pump intakes will be covered by 2.28 mm (3/32-inch) mesh and placed inside a 4x4x4-foot box covered with 6.3 mm (1/4-inch) screen to prevent entrainment of fish, amphibians, and invertebrates. Pump intakes will be checked periodically to ensure impingement of fish, amphibians, and invertebrates is not occurring. D. For sites that will be dewatered, the channel will be blocked by placing fine-meshed nets or screens above and below the work area to prevent federal or state listed fish, amphibians, and aquatic invertebrates from reentering the work area. To minimize entanglement, mesh diameter will not exceed 1/8 inch. The bottom edge of the net or screen will be secured to the channel bed to prevent fish from passing under the screen. Exclusion screening will be placed in low velocity areas to minimize impingement. Screens will be checked periodically and cleaned of debris to permit free flow of water. E. Fish Protection Measures: a. Fish relocation activities must be performed only by qualified fisheries biologists (as approved by USFWS and CDFW) with experience with fish capture and handling. The County shall retain a qualified biologist with expertise in the areas of anadromous salmonid biology, including handling, collecting, and relocating salmonids; salmonid/habitat relationships; and biological monitoring of salmonids. The County shall ensure that all biologists working on this Project be qualified to conduct fish collections in a manner which minimizes all potential risks to CCC steelhead. Electrofishing, if used, shall be performed by a qualified biologist and conducted according to the NMFS Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act. [Available at: www.westcoast.fisheries.noaa.gov/publications/reference_documents/esa_refs/section4d/electro2000.pdf] b. A qualified biologist shall monitor the construction site during placement and removal of channel diversions, cofferdams, and pile driving to ensure that any harm or loss of salmonids is minimized and documented. The biologist shall be on site during all dewatering events to ensure that all ESA- and CESA-listed species are captured, handled, and relocated safely. During pile driving, behavior of any fish present upstream or downstream of the dewatered area shall be monitored and recorded.

TABLE 1 ENVIRONMENTAL COMMITMENTS

Number	Title	Environmental Commitment Description
		c. Captured fish shall be handled with extreme care and kept in water to the maximum extent possible during relocation activities. All captured fish shall be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream and fish shall not be removed from this water except when released. To avoid predation, the biologist shall have at least two containers and segregate young-of-year fish from larger age-classes and other potential aquatic predators. Captured salmonids will be relocated, as soon as possible, to a suitable instream location in which habitat conditions are present to allow for survival of transported fish and fish already present. d. If any salmonids are found dead or injured, the biologist shall contact the NOAA Fisheries North Central Coast Office at (707) 575-6050. The purpose of the contact is to review the activities resulting in take and to determine if additional protective measures are required. All salmonid mortalities shall be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location of collection, fork length measured, and be frozen as soon as possible. Frozen samples shall be retained by the biologist until specific instructions are provided by NOAA Fisheries. The biologist may not transfer biological samples to anyone other than the NOAA Fisheries North Central Coast Office without obtaining prior written approval from the North Central Coast Office, Supervisor of the Protected Resources Division. Any such transfer will be subject to such conditions as NOAA Fisheries deems appropriate. e. The County shall provide a written report to NOAA Fisheries by January 15, following completion of the respective construction season. The report shall contain, at a minimum, the following information: i. Fish Relocation – The report shall include a description of the location from which fish were removed and the release site including photographs; the date and time of the relocation effort; a description of the equipment and methods used to collect, hold, and transport salmonids; if an electroshocker was used for fish collection, a copy of the logbook must be included; the number of fish relocated by species; the number of fish injured or killed by species; and a brief narrative of the circumstances surrounding ESA listed fish injuries or mortalities. F. Site Management Measures: a. Prevent any construction debris from falling into the stream channel. Any material that does fall into a stream during construction shall be immediately removed in a manner that has minimal impact to the streambed and water quality. b. Where feasible, the construction shall occur from the bank, or on a temporary pad underlain with filter fabric. c. Temporary fill will be removed in its entirety prior to close of work seasons. d. A supply of erosion control materials will be maintained onsite to facilitate a quick response to unanticipated storm events or emergencies. e. Temporary stockpiling of excavated material will be minimized. f. Excavated material will be stockpiled in areas where it cannot enter the stream channel.
EC-12BIO	Protection of Special-Status Amphibian and Reptile Species	A. At least fifteen (15) calendar days prior to the onset of activities, the applicant shall submit the name(s) and credentials of biologists to the USFWS and/or CDFW, depending on the listing status of the species in question, who would conduct activities specified in the following measures. No earthmoving or other Proposed Project activities will begin until proponents have received written approval from the CDFW or the USFWS that the biologist(s) is qualified to conduct the work. A USFWS-or-CDFW-approved biologist(s) will conduct all biological surveys, monitoring, and minimization activities. The USFWS-or CDFW-approved biologist(s) will be experienced in their respective field of specialization, have permits as required to perform the required work and have the authority to stop construction activities if situations arise that could be detrimental to listed species. B. At least fifteen (15) calendar days prior to the onset of activities, and no more than 48 hours prior to the start of construction, a USFWS-or-CDFW-approved biologist(s) will conduct pre-construction surveys for special status amphibians and reptile species. If special status species are found, the USFWS or CDFW will be contacted and the USFWS-or-CDFW-approved biologist will be allowed sufficient time to move any special status amphibians and reptile species from the work site before work activities begin. Only USFWS-or-CDFW-approved biologists will participate in activities associated with the capture, handling, and monitoring of special status amphibians and reptile species. All biologists involved with the surveying/handling of the special status amphibians and reptile species will employ sterilization techniques appropriate to avoid the transmission of

TABLE 1 ENVIRONMENTAL COMMITMENTS

Number	Title	Environmental Commitment Description
		chytrid fungus to or from the site. C. To avoid transferring disease or pathogens between aquatic habitats during the course of surveys or handling of red-legged frogs, USFWS-approved biologists will follow the Declining Amphibian Populations Task Force's "Code of Practice." The USFWS-approved biologists will limit the duration of handling and captivity of red-legged frogs. While in captivity, individuals of these species shall be kept in a cool, moist, aerated environment, such as a bucket containing a damp sponge. Containers used for holding or transporting adults of these species shall not contain any standing water. D. Prior to the start of construction activities, the USFWS-or-CDFW-approved biologist will conduct a training session for all construction personnel. Training will include a description of special status amphibians and reptile species, their habitats and behavior, and proper procedures for staff if any individuals are detected within the Proposed Project Area. E. A USFWS-or-CDFW-approved biologist will be present at the work site until all special status amphibians and reptile species removal, work instruction, and habitat disturbance has been completed. After this time, the applicant or contractor will designate a person to monitor on-site compliance with all minimization measures. The USFWS-or-CDFW-approved biologist will ensure that this individual receives the training outlined in measure E above and in the identification of the special status amphibians and reptile species. The USFWS-or-CDFW-approved biologist and on-site monitor will have the authority to and shall halt any action that might result in effects that exceed the levels anticipated by the USFWS or CDFW during review of the proposed action. If work is stopped, the USFWS or CDFW will be notified within one (1) working day of the incident by the approved biologist or on-site biological monitor. F. If an active western pond turtle nest is detected within the activity area, a 100-ft buffer around the nest will be established and maintained. The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist. G. At the time of inspection, all instream exclosures and adjacent cover along isolated banks will be surveyed for the presence of special status amphibian and reptile species. A qualified biologist will implement measures under Item B (above) as necessary. H. To prevent inadvertent entrapment of listed species, all excavated steep-walled holes or trenches should be covered at the end of each workday with plywood or similar materials. If this is not possible, one or more escape ramps constructed of earth fill or wooden planks should be established in the hole. Before such holes or trenches are filled, they will be thoroughly inspected for animals. I. Avoid storage of any pipes measuring four (4) inches or greater in diameter at the site, or seal the ends of any such pipes with tape as they are brought to the site, to prevent any special status species from entering and becoming trapped in pipes.
EC-13BIO	Minimize Impacts to Nesting Birds via Site Assessments, Surveys, and Avoidance Measures	A. For activities occurring between February 15 and August 15, Proposed Project Areas will be surveyed by a qualified biologist for nesting birds within 2 weeks prior to starting work. If a lapse in Project-related work of 2 weeks or longer occurs, another focused survey will be conducted before Project work can be reinitiated. B. If nesting birds are found, a buffer will be established around the nest and maintained until the young have fledged. Appropriate buffer widths are 0.25 miles for Swainson's hawks and white-tailed kite, 300 feet for non-listed raptors, 500 feet for listed passerines, and 150 feet for other birds nesting in trees, shrubs and structures. Monitoring of active nests may be required to ensure work activities are not adversely affecting nesting birds. A qualified biologist may identify an alternative buffer based on a site specific-evaluation and in consultation with CDFW. Work will not commence within the buffer until fledglings are fully mobile and no longer reliant upon the nest or parental care for survival. C. If a tree with an active Swainson's hawk or white-tailed kite nest is slated for removal, the County will implement Mitigation Measure BIO-2 which requires an assessment of the nest tree and development of a mitigation plan if removal is proposed.
EC-14BIO	Protection of Bat Colonies	A. Within two weeks prior to the onset of work activities a qualified biologist will survey the Proposed Project Area to look for evidence of a bat use, including roost trees or structures. If evidence is observed, or if potential roost sites are present in areas where evidence of bat use might not be detectable (such as a tree cavity), an evening survey and/or nocturnal acoustic survey may be used to determine if the bat colony is active and to identify the specific location of the bat colony. B. If an active bat maternity colony is present then the qualified biologist will make the following determinations:

TABLE 1 ENVIRONMENTAL COMMITMENTS

Number	Title	Environmental Commitment Description
		a. Work can proceed without unduly disturbing the bat colony. b. There is a need for a buffer zone to prevent disturbance to the bat colony, and implementation of the buffer zone will reduce or eliminate the disturbance to an acceptable level. c. Work cannot proceed without unduly disturbing the bat colony; thus, the work will be postponed until after July 31. C. If a non-breeding bat hibernaculum is found in a tree or structure that must be removed or physically disturbed, the qualified biologist will notify CDFW prior to initiating any removal or exclusion activities. D. If roosts are determined to be present and must be removed, the bats will be excluded from the roosting site before the facility is removed. A mitigation program addressing compensation, exclusion methods, and roost removal procedures will be developed prior to implementation. Exclusion methods may include use of one-way doors at roost entrances (bats may leave, but not re-enter), or sealing roost entrances when the site can be confirmed to contain no bats. Exclusion efforts may be restricted during periods of sensitive activity (e.g., during hibernation or while females in maternity colonies are nursing young). E. If roosts cannot be avoided or it is determined that construction activities may cause roost abandonment, such activities may not commence until permanent, elevated bat houses have been installed outside of, but near the construction area. Placement and height will be determined by a qualified wildlife biologist, but the height of bat house will be at least 15 feet. Bat houses will be multi-chambered and be purchased or constructed in accordance with CDFW standards. The number of bat houses required will be dependent upon the size and number of colonies found, but at least one bat house will be installed for each pair of bats (if occurring individually), or of sufficient number to accommodate each colony of bats to be relocated.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

- ☐ Aesthetics
- ■ Biological Resources
- ☐ Greenhouse Gas Emissions
- ☐ Land Use & Land Use Planning
- ☐ Population & Housing
- ☐ Transportation & Traffic
- ☐ Agriculture & Forestry Resources
- ■ Cultural Resources
- ■ Hazards & Hazardous Materials
- ☐ Mineral Resources
- ☐ Public Services
- ☐ Utilities & Service Systems
- ■ Air Quality
- ☐ ■ Geology, Soils & Seismicity
- ☐ Hydrology & Water Quality
- ■ Noise
- ☐ Recreation
- ☐ Mandatory Findings of Significance

Determination.

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

■ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Mallika Ramachandran — 10/7/14
Signature — Date

Mallika Ramachandran —
Printed Name — For

CHAPTER II
ENVIRONMENTAL CHECKLIST

INTRODUCTION

This chapter addresses the environmental topics as outlined in Appendix G of the state's CEQA Guidelines. A brief overview of the existing conditions is provided for each topic, followed by explanatory text of the impacts, using the checklist questions outlined in Appendix G of the CEQA Guidelines. A box is checked to identify the level of significance of each impact. When mitigation measures are required, these are numbered and identified. **Appendix A** includes the Mitigation Monitoring and Reporting Program for each of the recommended mitigation measures and **Appendix B** lists the mitigation measures with a signature by Napa County indicating that these will be implemented.

The information for this Initial Study has come from both the City of Calistoga General Plan and the Napa County 2008 General Plan and the 2005 Napa County Baseline Data Report (BDR). The Napa County BDR provides existing condition information for a range of environmental topics as related to Napa County. The County documents are available for review at the Napa County Public Works Department's office. The City of Calistoga General Plan can be found online.

In addition to these primary sources, other sources of information are included and cited throughout this document, as applicable.

Mitigation measures are recommended for any identified potentially significant impacts. At the end of each mitigation measure, the initials "LTS" are in parens (LTS) to signify that the mitigation measure would reduce the impact to a less-than-significant level.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	❒	❒	■	❒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?	❒	❒	❒	■
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	❒	❒	■	❒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	❒	❒	❒	■

Environmental Setting

Surrounding Land Uses and Views

The project site is in a rural agricultural area with low-density residential development in the vicinity. The river corridor is heavily vegetated with riparian vegetation. Some of the surrounding agricultural land is fallow and some lands are actively in agricultural production for grapes and other crops. Greenwood Avenue is a two-lane road that terminates just south of the project site, and that connects to State Highway 29 to the north. In the immediate vicinity of the project site, there are about three single-family residences to the south and one single-family residence to the north. The terrain is level, thus limiting long distance views from the site. **Figures 6** through **10** show views of the site and the location of the proposed temporary access road.

California Scenic Highway Program

Many state highways are located in areas of outstanding natural beauty. California's Scenic Highway Program was created by the Legislature in 1963 to preserve and protect scenic highway corridors from change that would diminish the aesthetic value of lands adjacent to highways. The state laws governing the Scenic Highway Program are found in the Streets and Highways Code, Section 260 et seq. Section 263 of the Streets and Highways Code identifies highways that are either eligible for designation as scenic highways or are currently designated.

A highway may be designated scenic depending upon how much of the natural landscape can be seen by travelers, the scenic quality of the landscape, and the extent to which development intrudes upon the traveler's enjoyment of the view. When a city or county nominates an eligible scenic highway for official designation, it must identify and define the scenic corridor of the highway. Because a scenic corridor is the land generally adjacent to and visible from the highway, it is identified using a motorist's line of vision. A reasonable boundary is selected when the view extends to the distant horizon. The corridor protection program does not preclude development, but seeks to encourage high-quality development that does not degrade the scenic value of the corridor. Jurisdictional boundaries of the nominating agency are also considered. The agency must also adopt ordinances to preserve the scenic quality of the corridor or document such regulations that already exist in various portions of local codes. These ordinances make up the scenic corridor protection program.

No designated scenic highways are located in the vicinity of the project site.

a) Would the project have a substantial adverse effect on a scenic vista?

The project would not have a substantial adverse effect on a scenic vista as the views of the site are limited to the immediate surroundings and the project would entail short-term construction before restoring the site to an improved condition. The project would only take 4 to 5 months to complete and any visual impacts during construction would be very short term. After the project is complete, the project site would include new vegetation that would improve the overall scenic quality of this stretch of the Napa River. A landscape replanting plan is shown in Figure 5.

a) Culvert looking upstream

b) Channel looking upstream from culvert

Figure 6

SOURCE: Questa Engineering, 2014

VIEWS OF SITE (SHEET 1)

a) Channel - looking downstream of culvert

b) Greenwood Ave looking west

Figure 7

VIEWS OF SITE (SHEET 2)

SOURCE: Questa Engineering, 2014

AMY SKEWES~COX
ENVIRONMENTAL PLANNING

a) Greenwood Ave looking east

b) Temporary access road - turn off of Tubbs Lane

Figure 8

SOURCE: Questa Engineering, 2014

VIEWS OF SITE (SHEET 3)

a) Temporary access road -alignment along vineyard

b) Turn off of existing driveway

Figure 9

VIEWS OF SITE (SHEET 4)

SOURCE: Questa Engineering, 2014

Temporary access road - southern end of route

Figure 10

SOURCE: Questa Engineering, 2014

VIEWS OF SITE (SHEET 5)

b) Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?

The project site is not in the vicinity of any state scenic highway. Therefore, the project would not have any impacts related to this significance criterion. Greenwood Avenue is not designated as a scenic route in the Calistoga General Plan (City of Calistoga, 2003). Napa County does not have any Scenic Highways designated by the State of California. While segments of State Highway 29 are eligible for state designation, these segments have not been formally designated. In addition, the project site is not visible from State Highway 29.

c) Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

Any visual quality or visual character impacts of the project would be very short term during the construction period. During construction, heavy equipment would be operating at the project site and there would be temporary stockpiles of rock and earth. In addition, the staging area may include worker vehicles and other equipment. In the long run, the project would improve the overall visual quality of this stretch of the Napa River due to the introduction of new, native vegetation.

d) Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

No new lighting would be added to the project site. During construction, there may be some lighting added temporarily if any work is needed at night, but this is not anticipated and would only exist for a 3 to 4 months at the most.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
II. AGRICULTURAL AND FORESTY RESOURCES**.** In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to a non-agricultural use?	❒	❒	■	❒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	❒	❒	■	❒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	❒	❒	❒	■
d) Result in the loss of forest land or conversion of forest land to non-forest use?	❒	❒	❒	■
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland of Statewide Importance to non-agricultural use or conversion of forest land to non-forest use?	❒	❒	■	❒

Environmental Setting

The project site is located within a rural residential and agricultural area just north of Calistoga in the unincorporated area of Napa County. Napa County has extensive acreage in agricultural production, and many acres are designated as prime agricultural lands where the soils are considered among the best for growing grapes and other crops. Prime farmland is within the immediate vicinity of the project site (City of Calistoga, 2003). Williamson Act contract lands exist for only one parcel (APN 017-210-027 as shown in Figure 2) in the project vicinity. This is the parcel farthest from the site where the temporary access road would be begun.

Under the provisions of the Williamson Act (California Land Conservation Act of 1965, Section 51200), landowners contract with the County to maintain agricultural or open space use of their lands in return for reduced property tax assessment. The contract is self-renewing; however, the landowner may notify the County at any time of the intent to withdraw the land from its preserve status. Land withdrawal involves a 10-year period of tax adjustment to full market value before protected open space can be converted to urban uses. Consequently, land under a Williamson Act contract can be in either a renewal status or a non-renewal status. Lands with a non-renewal status indicate the owner has withdrawn from the Williamson Act contract and is waiting for a period of tax adjustment for the land to reach its full market value.

a) Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to a non-agricultural use?

While the project site is within an area of Prime Farmland (City of Calistoga, 2003), the project would only temporarily disrupt agricultural operations and would not convert Prime Farmland to a non-agricultural use. The temporary access road would be the only temporary intrusion into such farmlands, and the road would be operated for an estimated 12 to 14 weeks during construction. This land is currently fallow; thus, no agricultural use would be interrupted for the temporary access road. Project construction for the new bridge would be concentrated in the immediate vicinity of the new bridge and would not disrupt agricultural operations in this area.

b) Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

See discussion under Item (a) above. The area north of the project site is zoned Agricultural Preserve by Napa County, and one parcel in the project site vicinity is under Williamson Act contract. However, the project would not disrupt agricultural operations in the area. The project therefore would not conflict with existing agricultural zoning or a Williamson Act contract.

c) Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

See discussion under Item (a) above. The area north of the site is zoned Agricultural Preserve by Napa County and the area south of the site is zoned Rural Residential by the City of Calistoga. The project therefore would not conflict with existing forest land or timberland zoning. No conflicts with zoning would occur as no rezoning would be required and the project would be a short-term construction project.

d) Would the project result in the loss of forest land or conversion of forest land to non-forest use?

No major forest land would be lost due to the project. Riparian impacts are addressed in Section IV, Biological Resources, below.

e) Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

See discussion under Item (a) above. No significant impact on agricultural or forest land would occur with the project.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	❒	❒	■	❒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	❒	❒	■	❒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	❒	❒	■	❒
d) Expose sensitive receptors to substantial pollutant concentrations?	❒	■	❒	❒
e) Create objectionable odors affecting a substantial number of people?	❒	❒	■	❒

Environmental Setting

The project site is located in the northern portion of the Napa County, which is in the San Francisco Bay Area Air Basin. Ambient air quality standards have been established at both the state and federal levels. The Bay Area meets all ambient air quality standards with the exception of ground-level ozone, respirable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).

High ozone levels are caused by the cumulative emissions of reactive organic gases (ROGs) and nitrogen oxides (NOx). These precursor pollutants react under certain meteorological conditions to form high ozone levels. Controlling the emissions of these precursor pollutants is the focus of the Bay Area's attempts to reduce ozone levels. The highest ozone levels in the Bay Area occur in the eastern and southern inland valleys that are downwind of air pollutant sources. High ozone levels aggravate respiratory and cardiovascular diseases, reduced lung function, and increase coughing and chest discomfort.

Particulate matter is another problematic air pollutant in the Bay Area. Particulate matter is assessed and measured in terms of respirable particulate matter or particles that have a diameter of 10 micrometers or less (PM_{10}) and fine particulate matter where particles have a diameter of 2.5 micrometers or less ($PM_{2.5}$). Elevated concentrations of PM_{10} and $PM_{2.5}$ are the result of both region-wide (or cumulative) emissions and localized emissions. High particulate matter levels aggravate respiratory and cardiovascular diseases, reduce lung function, increase mortality (e.g., lung cancer), and result in reduced lung function growth in children.

Toxic air contaminants (TACs) are a broad class of compounds known to cause morbidity or mortality (usually because they cause cancer) and include, but are not limited to, the criteria air pollutants listed above. TACs are found in ambient air, especially in urban areas, and are caused by industry, agriculture, fuel combustion, and commercial operations (e.g., dry cleaners). TACs are typically found in low concentrations, even near their source (e.g., diesel particulate matter near a freeway). Because chronic exposure can result in adverse health effects, TACs are regulated at the regional, state, and federal levels.

Diesel exhaust, described as diesel particulate matter or DPM, is the predominant TAC in urban air and is estimated to represent about three-quarters of the cancer risk from TACs (based on the Bay Area average). According to the California Air Resources Board (CARB), diesel exhaust is a complex mixture of gases, vapors, and fine particles. This complexity makes the evaluation of health effects of diesel exhaust a complex scientific issue. Some of the chemicals in diesel exhaust, such as benzene and formaldehyde, have been previously identified as TACs by the CARB and are listed as carcinogens either under the state's Proposition 65 or under the Federal Hazardous Air Pollutants programs.

The CARB has adopted and implemented a number of regulations for stationary and mobile sources to reduce emissions of DPM. Several of these regulatory programs affect medium- and heavy-duty diesel trucks that represent the bulk of DPM emissions from California highways. These regulations include the solid waste collection vehicle (SWCV) rule, in-use public and utility fleets, and the heavy-duty diesel truck and bus regulations. In 2008, the CARB approved a new regulation to reduce emissions of DPM and nitrogen oxides from existing on-road heavy-duty diesel fueled vehicles. The regulation requires affected vehicles to meet specific performance requirements between 2014 and 2023, with all affected diesel vehicles required to have 2010 model-year engines or equivalent by 2023. These requirements are phased in over the compliance period and depend on the model year of the vehicle. A similar program applies to construction equipment fleets.
The Bay Area Air Quality Management District (BAAQMD) is the regional agency tasked with managing air quality in the region. At the state level, the CARB (a part of the California Environmental Protection Agency) oversees regional air district activities and regulates air quality. The BAAQMD has recently published CEQA Air Quality Guidelines that are used in this assessment to evaluate air quality impacts of projects.

The project's effects on air quality would be limited to temporary construction impacts. Air pollutants would be generated from construction equipment operations and fugitive dust caused by ground disturbance during project construction. After construction of the project, there would be no air pollutant emission associated with the project.

a) Would the project conflict with or obstruct implementation of the applicable air quality plan?

The proposed project would not result in population or employment growth that would exceed growth estimates of the Bay Area 2010 Clean Air Plan (BAAQMD, 2010). Thus, the project would not generate emissions that have not been accounted for in the applicable air quality plan. The most recent clean air plan is the Bay Area 2010 Clean Air Plan that was adopted by the BAAQMD in September 2010. The project would be required to use equipment that meets United States Environmental Protection Agency and state standards. The BAAQMD does not have regulations that affect construction of this project.

However, the BAAQMD does recommend mitigation measures to control emissions of dust (i.e., PM_{10} and $PM_{2.5}$) as well as reduce construction equipment exhaust emissions. These measures are addressed under Item (d) below.

b) Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation?

The project would not result in any significant air emissions during the short construction period, which is estimated to be about 80 days during the summer of 2015. During construction, some amount of dust would be generated, both in relation to the construction and use of the temporary access road and during grading for project construction. The temporary access road would be watered up to three times per day to reduce emissions.

In its latest update to the CEQA Air Quality Guidelines, the BAAQMD identifies screening criteria for the sizes of land use projects that could result in significant air pollutant emissions. For construction impacts, the BAAQMD identifies a screening size of 114 single-family dwelling units as having less-than-significant emissions during construction. This project would involve considerably less construction than a project of 114 residences; therefore, the emissions would be less than significant.

c) Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

As discussed in "b" above, construction-period and operational-period air emissions would be below the BAAQMD significance thresholds for emissions of ozone precursor pollutants, $PM_{10,}$ and $PM_{2.5}$. As a result, the project would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard. Also, the project would not cause or contribute to violations of a carbon monoxide standard. Therefore, the project's contribution to cumulative air pollution in the region would be less than significant.

d) Would the project expose sensitive receptors to substantial pollutant concentrations?

Construction activities could temporarily expose nearby sensitive receptors (located adjacent to the project site) to substantial pollutant concentrations, principally PM_{10} and $PM_{2.5}$, from fugitive dust sources. This is a potentially significant impact. However, implementation of Mitigation Measure AIR-1, which would ensure compliance with BAAQMD best management practices (BMPs) for fugitive dust control, would reduce the impact to a less-than-significant level.

The nearest sensitive receptors are residences in the low-density residential neighborhoods near the site. The 3-month construction period for the proposed project is not expected to result in any health risks to nearby residents or sensitive receptors. Mitigation Measure AIR-1 would also reduce construction-period exhaust emissions.

Mitigation Measure AIR-1: The construction contractor shall institute a dust control program, which shall be submitted to the Napa County Public Works Department and approved prior to any construction activity. Elements of the dust control program shall include, but not necessarily be limited to, the following:

- *All exposed surfaces (i.e., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.*
- *All haul trucks transporting soil, sand, or other loose material off-site shall have such loads covered.*
- *All visible mud or dirt tracked out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping shall be prohibited.*
- *All vehicle speeds on unpaved roads shall be limited to 15 miles per hour.*
- *Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.*
- *All construction equipment shall be maintained and properly tuned in accordance with the manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.*
- *A publicly visible sign shall be posted listing the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Bay Area Air Quality Management District (BAAQMD) phone number shall also be visible to ensure compliance with applicable regulations.*

Implementation of Mitigation Measure AIR-1 would reduce the potential impact of construction-period fugitive dust to a less-than-significant level and also reduce construction-period emissions. (LTS)

With implementation of Mitigation Measure AIR-1, project construction would not be expected to expose sensitive receptors to substantial pollutant concentrations, violate any air quality standard, or contribute to an existing or projected air quality violation. Therefore, construction impacts would be considered less than significant with mitigation.

e) Would the project create objectionable odors affecting a substantial number of people?

Odors resulting from the combustion of diesel during construction could create localized objectionable odors. The odors would be localized to the construction site. These odors would subside once project construction is concluded. Therefore, the project would not create objectionable odors that would affect a substantial number of people. The project would have a less-than-significant impact in relation to this criterion.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	❒	■	❒	❒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	❒	■	❒	❒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	❒	■	❒	❒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	❒	■		❒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	❒	❒	■	❒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan or other approved local, regional, or State habitat conservation plan?	❒	❒	❒	■

Environmental Setting

The project site is located on the upper Napa River just upstream of the city limits of Calistoga. The riparian corridor along the Napa River in this area is dominated by native species and has a well-developed tree canopy and understory layer. Vegetative communities in the project site vicinity include mixed riparian forest, vineyards, residential landscaping, and agricultural fields.

The following analysis is summarized from the Biological Assessment (BA) (GANDA, 2014) and freshwater shrimp habitat evaluation (Cressey, 2014). Figures 1 and 2 show the project site location and the proposed temporary access road.

Vegetation in Project Site Vicinity

Native tree and shrub species in the mixed riparian forest community include valley oak (*Quercus lobata*), coast live oak (*Quercus agrifolia* var. *agrifolia*), arroyo willow (*Salix lasiolepis*), buckeye (*Aesculus californica*), and white alder (*Alnus rhombifolia*).

Understory vegetation in the project site vicinity includes greater periwinkle (*Vinca major*), ripgut grass (*Bromus diandrus*), cranesbill (*Geranium dissectum*), and vetch (*Vicia* sp). Invasive plant species in the project site vicinity include fennel (*Foeniculum vulgare*), Himalayan blackberry (*Rubus discolor*), black mustard (*Brassica nigra*), Harding grass (*Phalaris aquatic*), and greater periwinkle *(Vina major)*. In the river channel, woody vegetation grows from the edge of the low flow channel to the top of the banks. The west bank downstream of the culvert consists of rock revetment with lightly vegetated banks. The western bank consists of shrubby understory of ripgut grass and Himalayan blackberry in the lower zones and valley oaks at the bank top and sides. The banks upstream of the existing culvert are dominated by an understory of greater periwinkle interspersed with coast live and valley oaks on the upper banks with scattered arroyo willow near the bank toe.

Special-Status Species

For the purposes of this assessment, special-status species are those that are listed as rare, species of concern, candidate, threatened, or endangered by the U.S. Fish and Wildlife Service (USFWS), NMFS, California Department of Fish and Wildlife (CDFW), or local experts as documented in the Napa County Baseline Data Report (Napa County, 2005). Special-status plant and animal species with the potential to occur in the project site vicinity were identified through a review of the following resources:

- USFWS list of federal endangered and threatened species that occur in or may be found at the site.
- California Natural Diversity Database query within a 5-mile radius.
- California Native Plant Society Rare Plant Inventory Database query within a nine-quadrangle area for the Calistoga United States Geological Survey (USGS) quadrangle for California rare plant rank 1B and 2B species known to occur within Napa County. Habitat communities queried include those present in the project site vicinity: meadows and seeps, riparian forest, riparian scrub, riparian woodland, and valley and foothill grassland.
- Napa County Baseline Data Report (BDR) (Napa County, 2005).

The potential for special-status species to occur in areas affected by proposed project activities was evaluated according to the following criteria:

- **No Potential:** Proposed project activities would not occur in habitat that supports the species. Species are considered to have no potential to be affected by proposed project.
- **Low Potential:** Few of the habitat components meeting the species requirements are present in areas that may be affected by proposed project activities. In these instances, the species is not likely to be affected.
- **Moderate Potential:** Some of the habitat components meeting the species requirements are present in areas that may be affected by proposed project activities.
- **High Potential:** All of the habitat components meeting the species requirements are present in areas that may be affected by proposed project activities.

Based on a review of the best available scientific data and commercial information, coupled with field verification, the following six species are identified to have the potential to be affected by the proposed action:

- California freshwater shrimp (*Syncaris pacifica*) **Endangered (high potential)**
- California red-legged frog (*Rana draytonii*) **Threatened (low potential)**
- Burke's goldfields (*Lasthenia burkei*) **Endangered (low potential)**
- Clara Hunt's milk-vetch (*Astragalus claranus*) **Endangered (low potential)**
- Steelhead – Central California Coast Distinct Population Segment (DPS) (*Oncorhynchus mykiss*) **Threatened (high potential)**
- Chinook salmon – Central Valley fall/late fall run Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha*) **Candidate (moderate potential)** and
- Western Pond Turtle (*Actinemys marmorata*)

These species are discussed in more detail below. **Table 2** provides additional information on these species, along with other special-status plant and animal species known to occur in the project site vicinity.

Potentially Affected Special-Status Plants

Special-status plant species known to occur in the vicinity of the project site are listed in Table 2 below. All of the plant species in the table are considered to have low to no potential to occur in the project site vicinity. These species are either associated with habitats that do not occur in the project site vicinity or the project site vicinity is outside the species' documented range. The project is not expected to result in any impacts on special-status plants.

Potentially Affected Special-Status Reptiles and Amphibians

Special-status reptiles and amphibians known to occur in the vicinity of the project site are listed in Table 2. These species are discussed in more detail in the impact analysis under Item (a) below.

Potentially Affected Special-Status Invertebrates

Special-status invertebrates known to occur in the vicinity of the project site are listed in Table 2. Most of the special-status invertebrates listed the table are considered to have no potential to occur in the project site vicinity because suitable habitat is not present or the project site vicinity is not within the species' documented range. The following is a description of those invertebrates that have potential to be found on or near the site.

California freshwater shrimp (CFS) are found in low-elevation, low-gradient, freshwater, perennial streams in Marin, Napa, and Sonoma counties. Winter habitat includes shallow margins of stream pools containing undercut banks and exposed living fine-root material that provide shelter and refuge from high water velocities associated with storm events. Summer habitat includes submerged leafy branches. It is believed both winter and summer habitat components need to be found in close proximity in order for this species to persist for prolonged periods.

The assessment of the quality of the existing freshwater shrimp habitat used the "poor," "fair," "good," and "excellent" categories. The description of habitat classification and definitions of these four categories of habitat quality is reproduced below.

TABLE 2 SPECIAL-STATUS PLANT AND WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN PROJECT SITE VICINITY

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Invertebrates					
California freshwater shrimp	*Syncaris pacifica*	FE/SE	Endemic to Marin, Napa, and Sonoma counties. Low elevation; low gradient stream pools where riparian cover is moderate. Shallow pools away from main stream pool.	**HP**	**High.** Presence confirmed in the project site vicinity by CDFW. Suitable habitat exists at this location (Stillwater Sciences and Dietrich, 2002). The nearest CNDDB record is 0.23 mile from the project site within the Napa River from 1990.
Fish					
Chinook salmon-California coastal ESU	*Oncorhynchus tshawytscha*	FT, ST	Anadromous; coastal rivers, streams and creeks from Klamath River to the Russian River basin. Adults need access to natal streams; eggs and fry need cool water with adequate dissolved oxygen and clean gravel; juveniles migrate out to the ocean. Life-history information, especially in southern distribution of ESU, is extremely limited.	**HP**	**None.** This run of chinook salmon is found in coastal rivers from the Klamath to the Russian River basins and is not expected in the San Francisco Bay or its tributaries (CDFW, 2014b). There is only one CNDDB record for this ESU in the Van Duzen River watershed, 150 miles from the project site. The project site is located outside of the designated critical habitat for this species.
Chinook salmon Central Valley fall, late fall run ESU	*Oncorhynchus tshawytscha*	FSC	Anadromous; migrates through San Francisco Bay and Delta; spawns in upper Sacramento River and tributaries. Adults need access to natal streams; eggs; fry need cool water with adequate dissolved oxygen; clean gravel; juveniles migrate out to the ocean after a few months to a year in the river.	**HP**	**Moderate.** This run of chinook salmon migrates through the Central and North Bay to reach spawning grounds in the Central Valley. The Napa River Chinook population is not formally assigned to any Chinook ESU, but recent genetic analysis has found that the majority of Napa River Chinook sampled belongs to the Central Valley fall, late fall run ESU (Garza and Crandall, 2013). Chinook salmon are known to spawn in the Napa River between Yountville and Calistoga (Napa RCD, 2005). There are no CNDDB records for this ESU.

TABLE 2 SPECIAL-STATUS PLANT AND WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN PROJECT SITE VICINITY

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Chinook salmon – Central Valley spring run ESU	*Oncorhynchus tshawytscha*	FT, ST	Anadromous; migrates through San Francisco Bay and Delta; spawns in upper Sacramento River and tributaries. Adults need access to natal streams; eggs; fry need cool water with adequate dissolved oxygen; clean gravel; juveniles migrate out to the ocean after only a few months in the river.	**HP**	**None.** This run of chinook salmon migrates through the Central and North Bay to reach spawning grounds in the Central Valley. Chinook salmon Central Valley spring run ESU are not expected to migrate up the Napa River or its tributaries. The closest CNDDB record is from the Sacramento River watershed 58 miles from the project site. The project site is located outside of the designated critical habitat.
Chinook salmon – Sacramento River winter run ESU	*Oncorhynchus tshawytscha*	FE, SE	Anadromous; migrates through San Francisco Bay and Delta; spawns in upper Sacramento River and its tributaries. Adults need access to natal streams; eggs and fry need cool water with adequate dissolved oxygen; clean gravel; juveniles migrate out to the ocean after only a few months in the river.	**HP**	**None.** This run of chinook salmon migrates through the Central and North Bay to reach spawning grounds in the Central Valley. Chinook salmon Sacramento River winter run ESU are not expected to migrate up the Napa River or its tributaries. The closest CNDDB record is from the Sacramento River watershed 58 miles from the project site. The project site is located outside of the designated critical habitat.
Coho salmon – Central California coast ESU	*Oncorhynchus kisutch*	FE, SE	Migrates through and spawns in coastal rivers and streams from Santa Cruz to Mendocino County. Anadromous. Needs cool clear water and gravel beds free of excessive silt for spawning.	**HP**	**None.** Coho salmon were last documented from the San Francisco Bay estuary streams in the early to mid-1980s. The latest documentation from the vicinity of the project site is from San Lorenzo Creek pre-1960s (Leidy et al., 2005). The closest CNDDB record is from the Russian River watershed 14 miles from the project site. The project site is located outside of the designated critical habitat.

TABLE 2 SPECIAL-STATUS PLANT AND WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN PROJECT SITE VICINITY

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Delta smelt	*Hypomesus transpacificus*	FT, SE	Endemic to California; occurs only in the brackish and freshwaters of the Sacramento-San Joaquin River Delta. Exhibits seasonal migration within the estuary (Suisun Bay, Carquinez Strait and San Pablo Bay), moving upstream before spawning.	**A**	**None.** The estuarine habitat preferred by this species is not present in the upper Napa River watershed. They are known to use estuarine habitat in the Sacramento-San Joaquin Delta, which is designated as critical habitat for this species. Delta smelt have been recently documented is in the lower Napa River estuary in 1996 (Leidy, 2007). There are no CNDDB records within 2 miles of the project site.
Steelhead – Central California Coast DPS	*Oncorhynchus mykiss*	FT	Anadromous; all naturally spawned anadromous populations are known from below natural and manmade impassable barriers in California streams from the Russian River to Aptos Creek and the drainages of San Francisco, San Pablo, and Suisun bays and at the confluence of the Sacramento and San Joaquin rivers	**CH**	**High.** This DPS is known to occur in the upper Napa River (T. Koehler, 2002 and Napa RCD, 2012). The Napa River is designated critical habitat for this species. The closest CNDDB record is from York Creek in the Napa River watershed 7 miles from the project site in 2004. The project site is in designated critical habitat.
Steelhead – Central Valley DPS	*Oncorhynchus mykiss*	FT	Anadromous; Sacramento and San Joaquin rivers and their tributaries; does not include steelhead from San Francisco Bay drainages; but it migrates through the San Francisco Bay and Sacramento-San Joaquin delta.	**A**	**None.** This DPS migrates through the Central and North Bay to reach spawning grounds in the Central Valley. San Francisco Bay is considered Critical Habitat for this species, but the tributaries to the bay outside of the Delta are not. The closest CNDDB record is from the Sacramento-San Joaquin Delta 53 miles from the project site.

TABLE 2 SPECIAL-STATUS PLANT AND WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN PROJECT SITE VICINITY

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Amphibians					
California red-legged frog	*Rana draytonii*	FT, SSC	Requires slow-moving or still water for egg laying and larval development. Occurs in freshwater marshes, stock ponds, and riparian habitats. May aestivate in rodent burrows or cracks during dry periods.	**HP**	**Low.** Although the nearest CNDDB record is 9 miles to the west of the project site, outside of the Napa River watershed, the Napa River provides suitable habitat for CRLF. This species was included in a Biological Opinion for a project located downstream from the project site. In addition, the project site is surrounded by grassland habitat and there are multiple stock ponds and seasonal wetlands located nearby.
Reptiles					
Western Pond Turtle	*Actinemys marmorata*	SSC	Requires slow-moving or still water for egg laying and larval development. Occurs in freshwater marshes, stock ponds, and riparian habitats.	**HP**	**Low.** Although the nearest CNDDB record is within the Napa River watershed, the Napa River provides suitable habitat for western pond turtle. This species was included in a Biological Opinion for a project located downstream from the project site. In addition, the project site is surrounded by multiple stock ponds.
Birds					
Northern spotted owl	*Strix occidentalis caurina*	FT, SSC, SC	Older forested habitat with moderate to high canopy closure. Nests in cavities or on platforms in large trees and will use abandoned nests of other species.	**HP**	**None.** The project site vicinity lacks the suitable old-growth forests that are used for nesting. There is one designated SPOW territory almost 2 miles from the project site.
Mammals					
n/a					

TABLE 2 SPECIAL-STATUS PLANT AND WILDLIFE SPECIES WITH POTENTIAL TO OCCUR IN PROJECT SITE VICINITY

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Plants					
Burke's goldfields	*Lasthenia burkei*	FE, SE, CRPR 1B.1	Meadows and seeps (mesic) and vernal pools and swales. Blooms April-June. 50-1,980 feet.	**HP**	**Low.** Suitable vernally mesic grassland habitat and wetland drainage occur within the project site vicinity at the proposed access path. However, the species is only currently known from southern portions of Lake and Mendocino counties and from the Cotati Valley (i.e., Santa Rosa Plain) in Sonoma County (USFWS, 2008). The nearest CNDDB record is from 1929 and is within 1 mile of the project site.
Calistoga popcornflower	*Plagiobothrys strictus*	FE,ST, CRPR 1B.2	Alkaline areas near thermal springs. Meadows and seeps; valley and foothill grassland; and vernal pools. Blooms March-June. 300-530 feet.	**A**	**None.** No suitable alkaline habitat within the project site vicinity.
Clara Hunt's milk-vetch	*Astragalus claranus*	FE,ST, CRPR 1B.1	Serpentinite or volcanic, rocky, clay. Chaparral (openings); cismontane woodland; and valley and foothill grassland. Blooms March-May. 250-910 feet.	**HP**	**Low.** No suitable serpentinite or clay habitat is located within the project site vicinity. Woodland and grassland with volcanic soil are present in the project site vicinity. The species is known from only five occurrences. The nearest CNDDB record is approximately 5.5 miles southeast of the project site at Bale Grist Mill State Historic Park, one of the four known extant populations of the species within Napa County (USFWS, 2009a).

Notes:
FE = Federally Endangered
FT = Federally Threatened
SE = State Endangered
ST = State Threatened
SSC = State Species of Special Concern
SC = State Candidate
FSC = Federal Species of Special Concern
HP = Habitat Present
A = Habitat Absent
CH = Critical Habitat
CRPR 1B.1 = State Rare Plant Ranking

Habitat quality was rated by a combination of features known to be important to the shrimp, including water depth, presence or absence of undercut banks, current speed, and the quality and quantity of tree roots and herbaceous vegetation hanging into the water. The following criteria were used to make this determination for each of the four categories:

Poor Habitat:

1. Water usually less than 6 inches deep, but could be much deeper if there is a sheer bank of earth or rock.
2. Very little or no roots, twigs, branches, or vegetation hanging into the water.

Fair Habitat:

1. Water usually more than 6 inches deep, but could be shallower if the habitat was otherwise well developed.
2. At least one of the following features also present: some herbaceous vegetation, hair-like fine roots, coarse roots (> 0.5 centimeter diameter), twigs or branches in the water, or an undercut bank extending inward away from the stream for more than 6 inches.

Good Habitat:

1. Water 1 to 4 feet deep.
2. Usually at least two of the following features also need to be present: hair-like fine roots, coarse roots (>0.5 centimeter diameter), blackberries or dogwood or shrubs or ferns with roots in water, grass on the water, undercut banks (> 6 inches away from stream), or abundant herbaceous vegetation. A well-developed section of fine roots, or blackberries with adventitious roots, would qualify for good habitat by itself, even without the complementary presence of one of the other features noted.

Excellent Habitat:

1. Water 1 to 3 feet deep.
2. Usually at least two of the following features are also required to be present, better developed than above: hair-like fine roots, coarse roots (>0.5 centimeter diameter), blackberries or dogwood or shrubs or ferns with roots in water, grass on the water, undercut banks that extend >6 inches away from the stream. Only one of the above would be needed if it was exceptionally well developed. If the current was excessive, or there was too much silt or algae, the habitat quality was reduced by a rank. An otherwise "excellent" habitat then became a "good" habitat.

Potential Shrimp Habitat Downstream of Greenwood Avenue. The pool immediately downstream of the Greenwood Avenue culvert has no potential shrimp habitat on the right bank (looking downstream), which is covered with rip rap. However, the pool's left bank has 29 feet of "fair" habitat and 13.5 feet of "good" habitat during the summer. In winter, the 13.5 feet of "good" habitat remains, but the other 29 feet of potential shrimp habitat is rated as "poor" (see **Figure 11**).

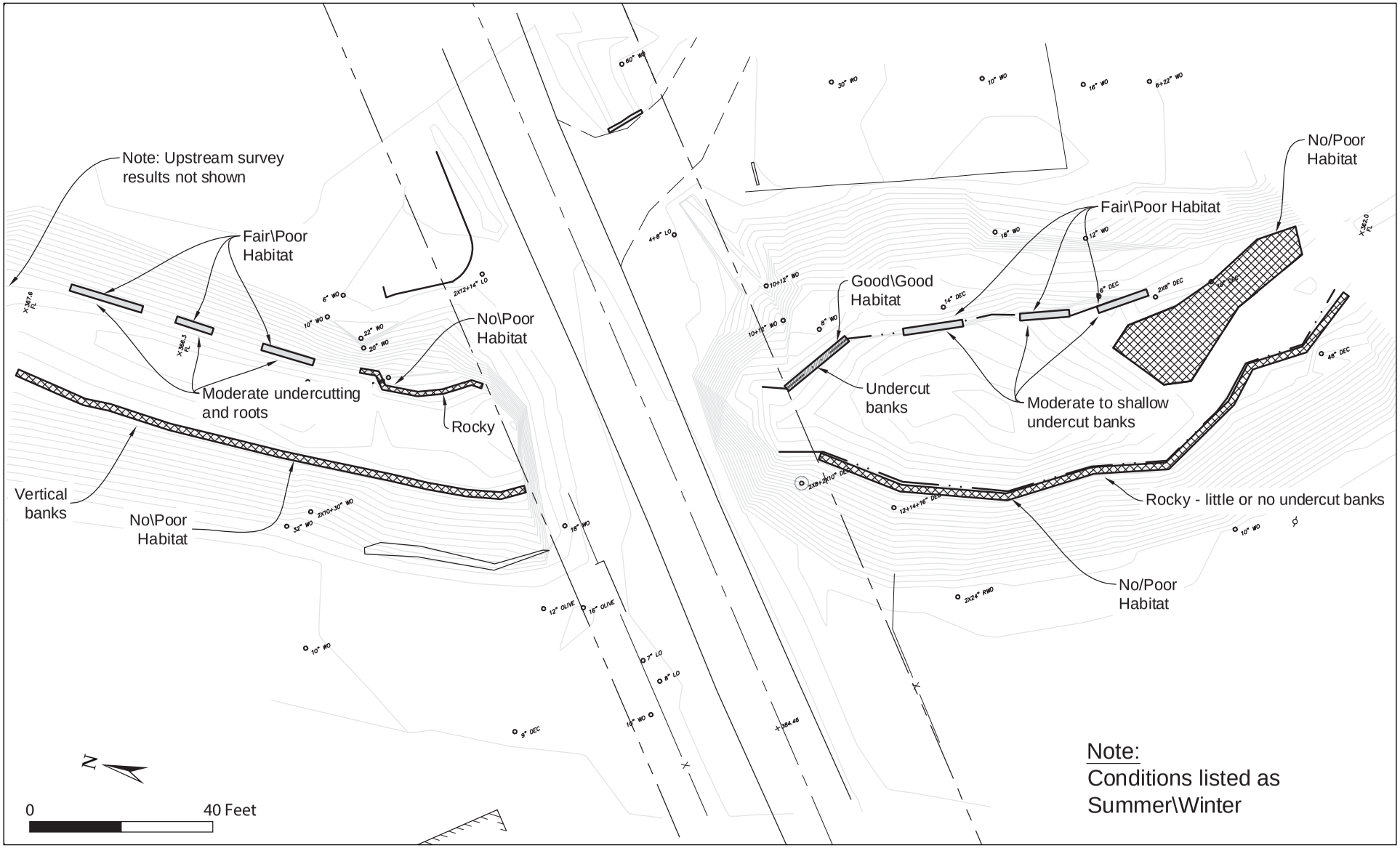

Figure 11

EXISTING SUMMER AND WINTER FRESHWATER SHRIMP HABITAT

SOURCE: Questa Engineering, 2014

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Potential Shrimp Habitat Upstream of Greenwood Avenue. The first 250 feet of the Napa River upstream of Greenwood Avenue contains two pool habitats (US-2 and US-4) with potential pool habitat ending in the middle of unit US-4. The linear feet of potential freshwater shrimp summer habitat within these two pools are as follows: 17.9 feet of "fair" habitat, 2.3 feet of "good" habitat, and no "excellent" habitat. These same two pools provide the following lengths of winter habitat: 17.9 feet of "poor" habitat, 2.3 feet of "fair" habitat, no "good" habitat, and no "excellent" habitat.

Total Potential Shrimp Habitat Affected by Project. Total linear habitat affected by the proposed project would be as follows:

Summer Habitat	Winter Habitat
Poor = 0	Poor = 209 feet
Fair = 34 feet	Fair = 0
Good = 17 feet	Good = 17 feet

Critical Habitat and Essential Fish Habitat

The project site falls within Critical Habitat for Steelhead. The Napa River where the project site is located includes waters and substrate necessary for fish spawning, breeding, feeding, and growth to maturity for Pacific salmon that are protected under the Magnuson-Stevens Fishery Conservation and Management Act as Essential Fish Habitat. As such, the proposed project would have to comply with state and federal fish passage guidelines. The project would need to comply with fish passage criteria so that fish may pass through flows as low as 3 cubic feet per second (cfs) and as high as 400 cfs.

The *project area* is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). For the purposes of this project, the project area (also referred to as the project site) encompasses all work areas, temporary access paths, and equipment staging areas. The project would temporarily affect 90 feet within the road right-of-way, 190 feet of streambed and banks of the Napa River, and 1,325 feet of area needed to create the overland access road, for a total of approximately 0.79 acres of temporary impacts.

a) Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

California Freshwater Shrimp

The proposed project was designed to avoid California freshwater shrimp (CFS) habitat to the greatest extent feasible and to provide fish passage. However, it was not possible to avoid all CFS habitat while also providing fish passage. Construction of the proposed project, including placement of a reconstructed channel bed and potential CFS relocation for channel dewatering, may adversely affect CFS and their summer habitat. Approximately 17 linear feet of good habitat and 34 feet of fair to poor habitat located on the left bank of the Napa River would be directly affected by the proposed project. The amount of fair to good summer habitat in this reach of the Napa River greatly exceeds the amount of winter habitat and is not considered a limiting factor for the CFS population in the Napa River. While the loss of summer habitat is not likely to result in significant effects on CFS, this impact would be

mitigated by creating summer and winter habitat in the proposed pools downstream of the new bridge (Mitigation Measures BIO-1a and BIO-1b).

Temporary dewatering may harm CFS by preventing movement upstream and downstream in the river channel. Operation of dewatering pumps may harm CFS if they become entrained on pumps or impinged on pump screens. This is expected to be minimized by installing fine mesh (3/32 of an inch) screening over water intakes (EC-5GEN and EC-11BIO in Table 1). In addition, Mitigation Measure BIO-1b would implement measures to protect CFS from dewatering. These measures include procedures to relocate CFS prior to dewatering. With implementation of this mitigation measure, along with Mitigation Measures BIO-1a and BIO-1b and the environmental commitments listed above, impacts on CFS from temporary dewatering would be less than significant.

Disturbance to the channel would temporarily mobilize sediment and may result in higher levels of turbidity downstream for a short period when flow is restored to the site. Excessive sedimentation could alter the quality of the habitat. However, this condition is not anticipated to persist after the project is completed. Implementing best management practices (BMPs) for erosion control would decrease the amount of sediment transported downstream as a result of proposed project activities to a less-than-significant level.

CFS may also experience reduced health or mortality as a result of degraded water quality following an unintended release of toxic substances from construction equipment, such as hydraulic fluid or fuel. Implementation of hazardous spill prevention and response measures and water quality and erosion control measures would be detailed in the required Stormwater Pollution Prevention Plan (SWPPP) and is expected to reduce this effect to less than significant.

CFS outside of the dewatered area could be harassed by noise and ground vibration from heavy equipment operation. However, the magnitude of impact in areas outside the dewatered constriction zone is expected to be discountable.

Mitigation Measures BIO-1a and BIO-1b would minimize direct impacts from in-channel construction work, degradation of water quality, and loss or disturbance of riparian vegetation and impacts on aquatic habitat and species during dewatering to less-than-significant levels. Avoidance and Conservation Measures as well as Reasonable and Prudent Measures from the USFWS and NOAA Fisheries Biological Opinions that would be included in the permits for the proposed project would be incorporated into these measures.

> *<u>Mitigation Measure BIO-1a</u>: Restoration of California Freshwater Shrimp Habitat On-Site. The County shall provide compensatory mitigation for the loss of 17 linear feet of good California freshwater shrimp (CFS) summer habitat by establishing a total of 60 linear feet of undercut bank and 90 feet of overhanging vegetation habitat. These habitat features would be created in the two proposed pools downstream of the new bridge. The first pool would be used to recreate undercut bank habitat by using a series of constructed wooden lunker structures. These structures are designed to provide both good summer and moderate to good winter habitat. The objective of these structures is to create cover and spaces that would provide summer cover and high flow refuge for CFS. The structures may also provide a resting area for up-migrating adult salmonids negotiating the channel and high flow refuge for juvenile salmonids.*

Overhanging bank vegetation would be created in the next downstream pool. In this pool, vertical banks would be created using a series of stacked coir blocks. These coir blocks would be interplanted with large-diameter (approximately 2- to 3-inch) willow and alder pole cuttings placed horizontally into the stacked blocks. The blocks are designed to degrade within 3 to 6 years leaving behind a dense network of overhanging roots and riparian vegetation. The willow and alder poles would be planted randomly at 18-inch spacing, at elevations ranging from 1 to 4 feet above the mean summer water level. Willow species would include sandbar willow, arroyo willow, and red willow (Salix exigua, S.lasiolepis, and S. laevigata, respectively). Santa Barbara sedge (Carex barbarae) and California blackberry (Rubus ursinus) would also be planted in this area. Each of these species has a different growth form; planting a range of species would increase the likelihood of successful establishment of summer CFS habitat.

The objective of this planting technique is to establish dense vegetation over the banks and into the river channel. Within a few years after planting, the willows would develop shoots and stems that provide CFS summer habitat at water levels, and targeted at the summer mean flow level. The willow roots would form a dense, organic matrix in the bank.

CFS habitat mitigation features shall be monitored for a period of 5 years to assess the mitigation's effectiveness. The performance criterion is reestablishment of a minimum of 60 linear feet of CFS summer habitat with overhanging vegetation (willows, sedge, herbs, vines, etc.) in contact with or extending below the water surface during mean summer flow conditions. The County shall submit annual monitoring reports to the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) documenting the progress toward meeting the mitigation success criteria. This report shall detail (1) the area of CFS habitat affected during construction; (2) the amount of habitat created; (3) comparison to vegetation performance criteria and an explanation of failure to meet such criteria, if any; and (4) other pertinent information.

If criteria are not met within 5 years after construction of the habitat features, USFWS and CDFW shall be contacted to discuss if monitoring should continue. If monitoring continues but criteria are not met within 10 years, then the mitigation shall be determined a failure and the County would develop and implement an alternative mitigation plan. (LTS)

<u>Mitigation Measure BIO-1b</u>: Protection of California Freshwater Shrimp during Channel Dewatering.

a. *All construction personnel shall attend an environmental education program delivered by a USFWS or CDFW- approved biologist prior to working on the project site. The program shall include an explanation of how to best avoid harm to CFS. The approved biologist(s) shall conduct a training session that would be scheduled as a mandatory informational field meeting for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of project maps showing areas where minimization and avoidance measures are being implemented.*

b. *Only a USFWS or CDFW-approved biologist with experience in CFS capture and handling shall participate in the capture, handling, and monitoring of CFS. Following installation of any water diversion structures, and prior to the placement of fill, an approved biologist shall perform surveys for any CFS trapped in the project site vicinity, and collect and transfer them to the nearest suitable habitat downstream of the work area. During holding and transportation, CFS shall be held in stream water collected from the site.*

c. *Before removal and relocation begins, the biologist would identify the most appropriate release location(s). Release locations should offer ample habitat for CFS and should be selected to minimize the likelihood of reentering the work area. Suitable habitat is defined as creek sections that shall remain wet over the summer and where banks are structurally diverse with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation.*

d. *Relocation activities would be performed during the morning when temperatures are coolest. Air and water temperatures shall be periodically measured and dewatering activities would cease when water temperatures exceed those allowed by CDFW and USFWS.*

e. *If CFS are relocated from the project site vicinity in the Napa River, the following procedure shall be used:*

   i. *Handling of shrimp would be minimized. However, when handling is necessary, hands and nets shall be wetted prior to handling.*

   ii. *Any captured CFS would be immediately placed in an aerated container with a lid in cool, shaded water. Aeration shall be provided with a battery powered external bubbler. A thermometer shall be placed in each holding container and partial water changes shall be conducted as necessary to maintain a stable water temperature following CDFW and National Marine Fisheries Service (NMFS) Guidelines. CFS shall not be held more than 30 minutes.*

   iii. *All captured CFS shall be moved directly to the nearest suitable habitat in the same reach of the creek, as identified in Item (d) above.*

   iv. *The County shall report the number of captures, releases, injuries, and mortalities to USFWS and CDFW within 24 hours. (LTS)*

Fish

Construction activities such as removing riparian vegetation, reconstructing the channel bed and banks, and temporarily dewatering the proposed project site could result in permanent and temporary impacts on special-status fish species and their habitat.

The proposed project incorporates several measures to minimize potential short-term adverse impacts on special-status fish species, including avoiding the spawning season for salmonid species and dewatering the work area to minimize disturbance to the channel and avoid direct mortality of special-status fish.

Mitigation Measure BIO-2a: Fish Passage. The existing project site exhibits a barrier to fish passage in low and moderate flow conditions. After the project is constructed, fish passage within the Napa River channel shall be substantially improved by the construction of four step pools and one entrance riffle. The project shall be designed to comply with all state and federal fish passage guidelines. Permit applications and approvals shall be obtained from the National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (CDFW). (LTS)

Mitigation Measure BIO-2b: Protection of Fish during Channel Dewatering.

a. *All construction personnel shall attend an environmental education program delivered by a USFWS or CDFW-approved biologist prior to working on the project site. The program shall include an explanation as how to best avoid harm to salmonid species. The approved biologist(s) shall conduct a training session that would be scheduled as a mandatory informational field meeting for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of project maps showing areas where minimization and avoidance measures are being implemented.*

b. *Only a USFWS or CDFW-approved biologist with experience in salmonid fish capture and handling shall participate in the capture, handling, and monitoring. Following installation of any water diversion structures, and prior to the placement of fill, a CDFW-approved biologist shall perform surveys for any fish in the project site vicinity, collect, and transfer them to the nearest suitable habitat downstream of the work area. During holding and transportation, fish would be held in stream water collected from the site.*

c. *Before removal and relocation begins, the biologist shall identify the most appropriate release location(s). Release locations should offer ample habitat for salmonids and should be selected to minimize the likelihood of reentering the work area. Suitable habitat is defined as creek sections that would remain wet over the summer and where banks are structurally diverse with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation.*

d. *Relocation activities shall be performed during the morning when temperatures are coolest. Air and water temperatures would be periodically measured and dewatering activities would cease when water temperatures exceed those allowed by CDFW and USFWS.*

e. *If salmonids are relocated from the project site vicinity in the Napa River, the following procedure shall be used:*

    i. *Handling of fish would be minimized. However, when handling is necessary, hands and nets would be wetted prior to handling.*

    ii. *Any captured fish would be immediately placed in an aerated container with a lid in cool, shaded water. Aeration would be provided with a battery powered external bubbler. A thermometer would be placed in each holding container and partial water changes would*

be conducted as necessary to maintain a stable water temperature following CDFW and NMFS guidelines. Fish would not be held more than 30 minutes.

iii. *All captured fish would be moved directly to the nearest suitable habitat in the same reach of the creek, as identified in (d) above.*

iv. *The County shall report the number of captures, releases, injuries, and mortalities to the and CDFW within 24 hours. (LTS)*

Reptiles and Amphibians

Special-status reptiles and amphibians known to occur in the vicinity of the project site are listed in Table 2.

Western pond turtle (WPT) is known to occur along the Napa River and has a high potential to occur in the project site vicinity. Western pond turtles are likely to use the aquatic habitats in the project site vicinity for foraging, basking, and mating. Female WPT tend to seek out open areas with sparse, low vegetation (annual grasses and herbs), low slope angle, and dry hard soil for nest sites (USFS, 2009). Construction activities in the river channel and banks could result in adverse impacts to WPT, if present. The following mitigation measures are recommended to avoid and minimize impacts on WPT.

Mitigation Measure BIO-3: Pre-Construction Surveys for Adult Western Pond Turtle (WPT) and Nests. Surveys for WPT and their nests shall be conducted before construction begins. If WPT nests are found, a 100-foot buffer shall be established around the location of the nests until the young have left the nest, as determined by a qualified biologist. While nests are often difficult to find, the surveys would minimize the potential for nest sites to be disturbed. With these measures in place, impacts would be reduced to the extent feasible and are expected to be less than significant.

In the long term, the proposed project is not expected to have substantial negative or beneficial effects on WPT because proposed project activities are not anticipated to substantially improve habitat for this species. This mitigation measure would reduce impacts on WPT to less-than-significant levels. (LTS)

California red-legged frog (CRLF) has not been observed in the Napa Valley within the past 100 years. The most recent known records of CRLF are from the early 20th century. Specimens were collected in Calistoga, "Suscol" (now part of the eastern edge of the City of Napa), as well as in southwestern areas of the County.

Aquatic habitat in the project site vicinity provides only marginally suitable breeding habitat for CRLF. The Napa River is not likely to support breeding of CRLF because flow in the river is highly variable during the breeding season. As a result, they are considered unlikely to be present at this time. At best, aquatic and riparian habitat associated with the Napa River would function as dispersal habitat for CRLF in the unlikely event the species is present in the project site vicinity. However, if this species were to occur, construction activities such as vegetation removal, grading, and dewatering could result in adverse impacts on this species.

Mitigation Measure BIO-4: Pre-Construction Surveys for Special-Status Amphibians including California Red-Legged Frog (CRLF). Surveys for CRLF and other special-status amphibians shall be conducted before construction begins. In the unlikely event CRLF eggs or tadpoles are found, a 100-foot buffer shall be established around the location until juveniles disperse from the breeding site, as determined by a qualified biologist. If adults are present in the construction area, work shall be stopped until individuals are allowed to disperse on their own volition or the species is relocated by a qualified biologist with permission to handle CRLF. With these measures in place, the impact for CRLF would be reduced to a less-than-significant level. (LTS)

Mitigation Measure BIO-5: Project Compliance with All State and Federal Permits. The project would affect a number of species that fall under the jurisdiction of CDFW, USFWS, and NMFS. Each of these permits would be reviewed by agency experts in conservation of these sensitive species. The federal permits granted under Section 404 of the Clean Water Act would be required for the construction of the project. The State of California would also have to issue a streambed alteration and agreement for the project. The project shall attain and comply with all state and federal permits for the project. Implementation of this mitigation would reduce the impacts on candidate, sensitive, or special-status species to less-than-significant levels. (LTS)

b) Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

The project is located primarily within the riparian zone of the Napa River. The project would have a temporary impact on approximately 18,500 square feet or 0.42-acre of riparian zone as measured from bank top to bank top. There would be no net loss in riparian area; however, some minor trees would be removed and the channel bed and banks would be reconstructed to provide CFS and fish passage. Trees to be removed include one volunteer buckeye (12 inches) and two oaks (8 to 18 inches).

Mitigation Measure BIO-6: Restoration of Riparian Habitat On-Site. The County shall restore 0.42 acre of riparian habitat on-site. This would include planting within the rock slope protection placed on the channel banks and planting the channel terraces. Planting within the site shall occur in three general planting zones: riparian, riparian canopy, and upland. Riparian zone is the zone nearest to the channel flow and represents the planting that shall be completed around the pools, habitat structures, and riffle edges. This zone is comprised of willow and alder species with sedges and California blackberry mixed in. The second zone, riparian canopy, is comprised of larger canopy type trees like valley oak, sycamore, Fremont cottonwood, and buckeye. Lost trees will be replaced at a 3:1 ratio with 5 gallon trees so that a minimum of 3 buckeyes and 6 oaks will be planted as mitigation for the lost trees. The third zone is upland species that shall be planted along the roadway edge and on the fill slopes. This zone shall consist of grass seeding as well as the seeding of upland species such as coyote brush and California sage plants that are drought-resistant and expected to need minor irrigation low/overhanging bank area and transitional bank area.

The low/overhanging bank area shall extend in a 6-foot-wide band along the full extent of both banks where Rock Slope Protection (RSP) would be installed. Planting in this zone shall consist of large-diameter (approximately 2- to 3-inch) willow pole cuttings placed horizontally into the bank,

between the rocks installed for the RSP. Willow stakes shall be planted in conjunction with the placement of RSP, not after RSP has already been placed. The willow poles shall be planted randomly at 18-inch spacing, at elevations ranging from 1 to 3 feet above the mean summer water level. Willow species shall include sandbar willow, arroyo willow, and red willow (Salix exigua, S. lasiolepis, and S. laevigata, respectively). Santa Barbara sedge and California blackberry shall also be planted in this area. Transitional, mid-slope revegetation on both channel banks shall include native trees, shrubs, and understory vegetation including California blackberry, snowberry, California wild rose, and Santa Barbara sedge.

Within 5 years, the restored areas shall contain a minimum absolute coverage of 60 percent in the tree stratum and 30 percent cover in the shrub stratum. The restored habitat shall contain a minimum of three native woody vines, shrubs, or trees species that individually account for at least 10 percent cover. Remedial actions, such as replanting, shall be implemented to ensure that the cover objectives are met. The County shall submit annual reports for 5 years to CDFW documenting the extent of riparian habitat restored. This mitigation measure would reduce impacts on riparian habitats to less-than-significant levels. (LTS)

c) Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Construction of the new bridge would result in excavation and placement of fill in jurisdictional waters of the U.S. and removal of vegetation within areas that are potentially jurisdictional wetlands. Approximately 0.27-acre of bank habitat along the Napa River would be affected, and 0.21-acre of channel bed would be filled and replaced by the new structures below the ordinary high water mark (OHWM). Proposed project activities are not expected to result in substantial loss of waters or wetlands, nor conversion of wetland type. With implementation of Mitigation Measure BIO-5, vegetation would be planted to restore riparian corridor functioning of the channel banks.

The purpose of the reconstructed bed is to alleviate existing channel bed scour and improve fish passage in the project site vicinity. There would be no permanent loss of jurisdictional and federally protected wetlands. Potential impacts on waters of the U.S. are less than significant.

To mitigate for impacts on federally protected wetlands, Mitigation Measure BIO-6 would be implemented. This mitigation measure would reduce impacts to wetland habitats to less than significant by requiring the area to be revegetated with native grasses and other herbaceous perennial wetland species.

d) Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

The channel bed would be dewatered and reconstructed during the construction of the project; as such there would be a temporary loss of fish movement. The implementation of Mitigation Measures BIO-1c, BIO-2a, and BIO-2b would reduce this temporary impact to a less-than-significant level.

e) Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

The Napa County General Plan contains numerous goals, policies, and action items to protect biological resources, including Policy CON-13. Policy CON-13 requires that all discretionary residential, commercial, industrial, recreational, agricultural, and water development projects consider and address impacts to wildlife habitat and avoid impacts to fisheries and habitat supporting special-status species to the extent feasible. The proposed project incorporates a variety of measures to avoid or minimize adverse effects on sensitive habitats, wildlife, and fisheries resources and would not conflict with any General Plan policies.

f) Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan or other approved local, regional, or State habitat conservation plan?

The project site is not subject to any adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan. Consequently, there would be no impact related to potential conflicts with the provisions of any such plan, and no mitigation is required.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	❒	❒	■	❒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	❒	■	❒	❒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	❒	❒	■	❒
d) Disturb any human remains, including those interred outside of formal cemeteries?	❒	■	❒	❒

Environmental Setting

The following was excerpted from an extensive cultural resource investigation by GANDA in May 2014. This report can be viewed at Napa County Public Works. As per the requirements of Section 106 of the National Historic Preservation Act (NHPA), 36 CFR 800.4, and CEQA, the report presents the results of an cultural resources investigation of the Area of Project Effect (APE) for the Greenwood Avenue Culvert Replacement Project in Calistoga, Napa County, California.

Summary of Report Findings

The investigation resulted in the identification of one newly identified, historic period cultural resource within the APE, GANDA- 650-01 (culvert), which has been recorded on DPR 523 forms and recommended as ineligible for listing in the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR). No prehistoric or historic period archaeological resources were identified within the APE. Therefore, the investigation concludes that the APE does not contain any historic properties as defined by Section 106 of the NHPA or any historical resources as defined by CEQA that would be affected by the proposed project.

Summary of Archaeological Sensitivity

The APE, including the access road, staging area, and creek banks, was surveyed intensively. While vegetation was dense and ground visibility was relatively poor within the area where the temporary access road would be installed within the APE, the area has been extensively cultivated and subject to agricultural activity that generally facilitates the identification of cultural materials due to the churning of the soil. Also important to note is that the vertical extent of ground disturbance associated with this access road would not exceed 12 inches beneath the ground surface, and there is no ground disturbance expected within the staging area. Thus, the relative construction impacts for the access road and for the staging area are limited in depth. In addition, the GANDA archaeologist was able to examine the cut bank within the Napa River carefully around the existing culvert and was able to verify that there is no evidence of prehistoric archaeological materials or soils in the cut bank around the culvert. As described in the report, the prehistoric archaeological sites documented in close proximity to the APE are generally comprised of midden soils, which were not identified during the field survey in the river bank or within the access road area.

While the APE is considered sensitive for prehistoric deposits due to the proximity to the Napa Glass obsidian source, the Napa River, and the density of previously recorded sites located between 0.25- and 0.5-mile of the APE, no prehistoric archaeological deposits or materials were identified during the investigation. Therefore, subsurface testing does not appear to be warranted and is not recommended to complete the identification of historic properties within the APE. There is the possibility that the APE may contain sparse deposits and cultural materials that are obscured by vegetation or alluvium, but it does not appear that there is a potentially significant prehistoric site within the APE that would constitute a historic property.

a) Would the project cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?

The project would not cause a substantial change in the significance of any known historic resource. The existing culvert is approximately 71 years old and is not classified as a historic resource. This is considered a less-than-significant impact.

b) Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?

The project would not cause a substantial change in a significant archaeological resource. There are several archaeological resources in the vicinity, but the field investigation completed by GANDA

confirmed that there is low potential to uncover unknown archaeological resources at the site. Because no actual subsurface investigation was conducted, however, this potential cannot be completely ruled out. The following measure is recommended to mitigate the low potential of encountering archaeological resources.

> *Mitigation Measure CULT-1: Due to the archaeological sensitivity of the Area of Project Effect (APE) for the presence of archaeological resources and because the May 2014 GANDA investigation did not involve subsurface investigations, there remains some potential that archaeological resources may be encountered during construction. As such, an archaeological monitor shall be present during initial ground disturbance to train workers to be aware of the remote possibility of encountering archaeological artifacts and/or human remains. If there is an unanticipated discovery of archaeological deposits or remains during project implementation, construction crews shall stop all work within 100 feet of the discovery until a qualified archaeologist can assess the discovery and provide recommendations. This mitigation would reduce any potential impacts on archaeological resources to a less-than-significant level. (LTS)*

c) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

There are no known unique paleontological resources or sites within the APE. There would be no direct or indirect impacts on any known sites in the area. This is considered a less-than-significant impact.

d) Would the project disturb any human remains, including those interred outside of formal cemeteries?

The cultural resources study did not indicate that there was a significant potential to disturb any human remains on the site. No subsurface excavations were completed, however, and therefore the impact cannot be completely ruled out. Mitigation Measure CULT-1 would reduce this potential impact to a less-than-significant level.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VI. GEOLOGY AND SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	❒	❒	❒	■

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
ii) Strong seismic ground shaking?	❒	❒	■	❒
iii) Seismic-related ground failure, including liquefaction?	❒	■	❒	❒
iv) Landslides?	❒	❒	■	❒
b) Result in substantial soil erosion or the loss of topsoil?	❒	❒	■	❒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	❒	■	❒	❒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	❒	❒	■	❒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	❒	❒	❒	■

Environmental Setting

Seismicity

The project site is located within the Coast Ranges Geomorphic Province of northern California, a region of northwest-trending ridges and valleys that stretches along much of the California coast and is dissected by only a few structural depressions, the largest of which are San Francisco and San Pablo Bays. The ridges and valleys trend northwest to southeast due to fault geometry along the transform plate boundary between the North American and Pacific Plates. Scientists estimate as much as 5 to 6 centimeters of strain accumulates annually along the margin between the Pacific and North American Tectonic Plates. This strain is periodically released by fault slip that generates earthquakes along the San Andreas Fault System. For this reason the Bay Area is among the most seismically active regions in the United States and there exists an approximately 63 percent chance of a major earthquake in the area within the next 30 years (Questa, 2014).

No active earthquake faults are located on the project site and the risk of fault rupture is considered low. The project site is not located within an Alquist-Priolo Earthquake Fault Zone boundary. The nearest active earthquake fault trace in relation to the project site is the Maacama Fault, located approximately 6 miles to the west. Other nearby active faults include the Healdsburg-Rodgers Creek Fault 9.5 miles west, the Hunting Creek Fault 14 miles east, the West Napa Fault 15 miles southeast, the Green Valley Fault 24 miles east, the San Andreas Fault 30 miles west, and the Hayward Fault 38 miles south. **Table 3** presents a summary of the regional active faults that could affect the site (Questa, 2014).

TABLE 3 REGIONAL EARTHQUAKE FAULTS AND ACTIVITY

Fault Name	Distance from Site (miles)	Direction from Site	Activity	Mean Characteristic Moment Magnitude	Modified Mercalli Intensity
Maacama	6	West	Active	7.4	VIII
Healdsburg-Rodgers Creek	9.5	West	Active	7.1	VII
Hunting Creek-Berryessa	14	East	Active	7.1	VII
West Napa	15	Southeast	Active	6.7	VI
Collayomi	16	Northwest	Potentially Active	6.7	----
Green Valley	24	East	Active	6.8	V
Bartlett Springs	25	North	Active	7.3	----
Great Valley	28	East	Active	7.1	V
San Andreas-North Coast	30	West	Active	7.5	VI
Hayward	38	South	Active	7.3	V

Source: Questa, 2014.

Table 4 presents a summary of the major historic earthquakes in Central California with the date of occurrence, magnitude, and the approximate distance and direction to the epicenter relative to the site location.

Geology and Slope Instability

Geology of the project site as presented on geologic maps of the area is characterized as consisting of active stream channel deposits that include sand, silt, and gravel and alluvial deposits that include sand, silt, gravel and clay deposits and combinations of these materials of Holocene age. These sediments are characterized as poorly to moderately sorted and form smooth surfaces with little or no dissection. The nearest bedrock to the project site consist of deposits of the Sonoma Volcanics (Pliocene age) to the east, north, and west consisting of andesite and various varieties of rhyolite tuff including agglomerate, tuff breccia, and welded tuff. These rock types are all present in gravels collected from the stream channel and as components of the alluvial deposits underlying the site (Questa, 2014) (see Appendix D).

Site soils encountered in the subsurface investigation include fill soils adjacent to the existing culvert under Greenwood Avenue consisting of clayey sand, sandy clay, and well-graded gravels. At depth, the stream channel and alluvial deposits underlying Greenwood Avenue include well-graded silty sand with gravel, well-graded silty gravel, well-graded sand with gravel, clayey sand with gravel, silty sand with gravel, sandy lean clay and fat clay and other poorly-sorted, well-graded sediments.

TABLE 4 LIST OF MAJOR HISTORIC EARTHQUAKES

Location	Date of Earthquake	Magnitude (Richter)	Distance from Site (miles)	Direction to Epicenter
San Francisco	June 21, 1808	5.5	54.5	South
Santa Cruz	September 1825	5.5	104.2	South
San Francisco	April 3, 1827	5.5	58.2	South
San Francisco to San Juan Bautista	June 1838	7.4	92.4	South
Petaluma-San Francisco	August 27, 1855	5.5	34.2	South
SW San Francisco Peninsula	January 2, 1856	5.7	89.2	South
San Francisco Peninsula	February 15, 1856	5.9	77.0	South
Hayward Fault	October 21, 1868	7.0	67.1	Southeast
Hayward Fault	April 2, 1870	5.8	50.3	Southeast
Hayward Fault	July 31, 1889	5.6	58.7	Southeast
Napa	October 12, 1891	5.6	22.7	Southeast
Santa Rosa	August 9, 1893	5.6	14.2	Southwest
Mare Island	March 31, 1898	6.4	27.4	South
San Francisco Area	June 2, 1899	5.6	61.7	South
Great 1906 Earthquake	April 18, 1906	7.8	61.7	South
Monterey Bay	October 24, 1926	5.8	110.5	South
Santa Rosa	October 2 1969	5.6	9.6	Southwest
Santa Rosa	October 2 1969	5.7	10.2	Southwest
Loma Prieta	October 17, 1989	6.9	108.0	South
American Canyon	August 24, 2014	6.0	40	South

Source: Questa, 2014.

Expansive clay soils are present, especially in old river bank and alluvial deposits encountered in the bore holes. The expansive soils include sandy lean clay with low to moderate expansion potential and sandy fat clay with moderate expansion potential.

The site is located in the Napa River basin. The primary areas of potential slope instabilities are associated with the banks of the Napa River and other creeks in the area. Existing unstable slopes are present along the Napa River banks and associated with erosion of the fill exposed adjacent to the existing culvert at the edge of Greenwood Avenue. Modification of the existing river banks and culvert backfill materials would require stabilization of the exposed fill and native soils.

Stream channel deposits in the Napa River basin are generally considered to have a very high potential susceptibility to liquefaction. Associated alluvial fan deposits can vary from a low to high potential susceptibility to liquefaction depending on the composition of the soils. Liquefaction susceptibility is related to several factors including the type of soil or sediment, density of the materials, gradation of materials, groundwater depth, and other factors. Liquefaction occurs when pore pressures build up in sand and silty sandy soils during strong seismic ground shaking and causes a loss of soil strength. This loss of soil strength can lead to settlement of structures at the ground surface or settlement of piles or foundations in or above the liquefiable sediments (Questa, 2014).

a) Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving: i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42; ii) Strong seismic ground shaking; iii) Seismic-related ground failure, including liquefaction; iv) Landslides?

i) The site is not located in an Alquist-Priolo Earthquake Fault Zone boundary. Surface fault rupture is not expected to occur at the site.

ii) The hazard of strong seismic ground shaking would be mitigated by designing structures in accordance with the California Building Code and using Seismic Design Criteria developed for the site. The hazard of strong seismic ground shaking is considered less than significant with incorporation of all applicable regulations for design and construction.

iii) The soils that are most susceptible to liquefaction consist of clean sands and silty sands, which were not found in the bore holes to the deepest depth of drilling at 51 feet below ground surface (BGS). Groundwater was present in each of the bore holes at depths of approximately 25 feet BGS. The predominance of the soils consisted of well-graded poorly-sorted sandy gravel, silty gravel, clayey sand with gravel and cohesive soils such as sandy lean clay and fat clay with significant concentrations of fines (silt + clay). However, there are clayey sand and silty sandy soils that are medium dense in the area that was penetrated by the bore holes that would underlie the replacement bridge. These clayey sand and silty sandy soils located below the groundwater depth of 25 feet BGS have a low to moderate likelihood of liquefaction during earthquake-induced strong to violent ground motions (Questa, 2014). Liquefaction settlement analysis indicates that liquefaction-induced settlements of 3.0 inches max could occur in the vicinity of the replacement bridge. However, based on the well-graded nature of site sediments and the considerable distance to seismic sources, these are considered to be conservative estimates. This amount of liquefaction settlement could only occur if a maximum moment magnitude earthquake were to occur near the site on the Maacama Fault or the Rodgers Creek Fault (Questa, 2014).

<u>Mitigation Measure GEO-1:</u> Mitigation measures for liquefaction shall include construction of stiffened concrete and steel rebar foundations capable of resisting deformation due to underlying liquefiable materials, or construction of a deep pile foundation that would penetrate through potentially liquefiable sediments with the inclusion of a stiffened concrete and steel rebar pile cap. Inclusion of these mitigation measures would reduce the impact of seismic-related ground failure to a less-than-significant level. (LTS)

iv) Existing unstable slopes are present along the Napa River banks and are associated with erosion of the fill exposed adjacent to the existing culvert at the edge of Greenwood Avenue. Modification of the existing river banks and culvert backfill materials would require stabilization of the exposed fill and native soils. The potential for seismic-related ground failure due to landslides of the existing fill soils would be mitigated by construction of the bridge and the installation of engineered fill materials and erosion control stabilization in the area of the engineered fill soils. The hazard of seismic-related ground failure due to landslides is considered less than significant.

b) Would the project result in substantial soil erosion or the loss of topsoil?

The construction work would be completed in the area of the existing culvert and in the river channel. No new areas of topsoil are anticipated to be required for removal. If topsoil is removed during the project, it would be replaced during final stabilization activities. The impact of the loss of topsoil is considered less than significant.

c) Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

The fill soils adjacent to the existing culvert and the soils adjacent to the project site include materials that may be prone to landslides in the form of stream bank instabilities. The proposed project includes erosion control measures to reduce the potential for slope instability or erosion. The soils along the existing bank adjacent to the project site would also be stabilized by appropriate best management practices (BMPs) and erosion control measures. These measures would include installation of erosion control blankets on exposed stream banks, planting of native plant species, the use of silt fences and straw wattles, and other measures as identified during design of the project.

Lateral spreading is another secondary effect of seismically induced ground shaking wherein pore-pressure buildup during liquefaction can result in the movement of gently sloping ground toward a free face or downslope direction. Liquefaction in the stream banks would likely only occur during high ground water events such as in times of flooding. Soils encountered in the test bore holes included sandy lean clay and fat clay native soils that were likely the former river bank slopes. Sandy and silty gravels were also found in the upper 20 feet of the bore holes that would only be exposed during replacement of the culvert. These materials are unlikely to undergo significant liquefaction, reducing the likelihood of lateral spreading of the river banks. There is a low to very low probability of liquefaction accompanied by lateral spreading of the river banks at the site. The hazard would be mitigated in the vicinity of the new bridge by the construction of the new bridge and the erosion control measures that would be installed at the project site and the adjacent river banks.

> *<u>Mitigation Measure GEO-2</u>: The County shall install erosion control blankets on exposed stream banks, plant native plant species, and use silt fences, straw wattles, and other erosion control measures and best management practices (BMPs) as identified during design of the project. The design and construction of a new bridge and engineered fill soils would mitigate hazards associated with failure of the existing culvert and associated fill soils. (LTS)*

The hazard of the project being located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse is considered less than significant with incorporation of Mitigation Measure GEO-2.

d) Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Site soils encountered in the subsurface investigation included fill soils adjacent to the existing culvert under Greenwood Avenue consisting of clayey sand, sandy clay, and well-graded gravels. At depth, the stream channel and alluvial deposits underlying Greenwood Avenue include well-graded silty sand with gravel, well-graded silty gravel, well-graded sand with gravel, clayey sand with gravel, silty sand with gravel, sandy lean clay and fat clay and other poorly-sorted, well-graded sediments. Expansive clay soils are present, especially in old riverbank and alluvial deposits encountered in the bore holes. The expansive soils include sandy lean clay with low to moderate expansion potential and sandy fat clay with moderate expansion potential.

The potential effects of expansive clay soils would be mitigated by designing structures in accordance with the California Building Code. The hazard of expansive soils is considered less than significant with incorporation of all applicable regulations for design and construction.

e) Would the project have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

The project does not include septic systems and therefore would have no impact in relation to this criterion.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VII. GREENHOUSE GAS EMISSIONS. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	❒	❒	■	❒
b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	❒	❒	■	❒

Environmental Setting

Global temperatures are affected by naturally occurring and anthropogenic-generated (generated by humankind) atmospheric gases, such as water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (Intergovernmental Panel on Climate Change, 2007). Gases that trap heat in the atmosphere are called greenhouse gases (GHGs). Solar radiation enters the earth's atmosphere from

space, and a portion of the radiation is absorbed at the surface. The earth emits this radiation back toward space as infrared radiation. GHGs, which are mostly transparent to incoming solar radiation, are effective in absorbing infrared radiation and redirecting some of this back to the earth's surface. As a result, this radiation that otherwise would have escaped back into space is now retained, resulting in a warming of the atmosphere. This is known as the "greenhouse effect." The greenhouse effect helps maintain a habitable climate. Emissions of GHGs from human activities, such as electricity production, motor vehicle use, and agriculture, are elevating the concentration of GHGs in the atmosphere and are reported to have led to a trend of unnatural warming of the earth's natural climate, known as global warming or global climate change. The term "global climate change" is often used interchangeably with the term "global warming," but "global climate change" is preferred because it implies that there are other consequences to the global climate in addition to rising temperatures. Other than water vapor, the primary GHGs contributing to global climate change include the following gases:

- CO_2, primarily a byproduct of fuel combustion;
- Nitrous oxide (N_2O), a byproduct of fuel combustion that is also associated with agricultural operations such as the fertilization of crops;
- CH_4, commonly created by off-gassing from agricultural practices (e.g. livestock), wastewater treatment, and landfill operations;
- Chlorofluorocarbons (CFCs), which were used as refrigerants, propellants, and cleaning solvents, although their production has been mostly prohibited by international treaty;
- Hydrofluorocarbons (HFCs), which are now widely used as a substitute for chlorofluorocarbons in refrigeration and cooling; and
- Perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6), emissions of which are commonly created by industries such as aluminum production and semiconductor manufacturing.

These gases vary considerably in terms of Global Warming Potential (GWP), a term developed to compare the propensity of each GHG to trap heat in the atmosphere relative to another GHG. GWP is based on several factors, including the relative effectiveness of a gas to absorb infrared radiation and the length of time of gas remains in the atmosphere. The GWP of each GHG is measured relative to CO_2. Accordingly, GHG emissions are typically measured and reported in terms of CO2 equivalent (CO_2e). For instance, sulfur hexafluoride (SF_6) is 22,800 times more intense in terms of global climate change contribution than CO_2.

In 2011, BAAQMD published CEQA Air Quality Guidelines that included recommended thresholds for GHG emissions. BAAQMD developed these emission thresholds as a basis for meeting the overall goals adopted by California to reduce GHG emissions to 1990 levels by 2020 (per Assembly Bill 32 – Global Warming Solutions Act). A description of the justification for these thresholds was published by BAAQMD on June 2, 2010, titled BAAQMD California Environmental Quality Act Guidelines Update – Thresholds of Significance. In this document, BAAQMD recommended that land use projects with emissions exceeding 1,100 metric tons per year of equivalent carbon dioxide emissions (CO_2e) should be considered significant if they have per capita emissions that exceed 4.6 metric tons of CO_2e per capita. These are the only quantitative thresholds that we are aware of that are used in the Bay Area, including Calistoga. These thresholds only apply to project operation. BAAQMD does not have GHG

emission thresholds for construction activities. The temporary construction would result in short-term emissions that would certainly be below any threshold used for evaluating operational impacts.
The Calistoga Climate Action Plan was adopted by the City Council on April 1, 2014 and includes more than 40 actions intended to help the City attain its GHG reduction target. The City has adopted a GHG reduction target of 15 percent below 2005 emission levels by 2020.

a) Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

The project would result in temporary GHG emissions as a result of construction activities. The Roadway Construction Emissions Model, Version 7.1.5.1, was used to predict these emissions. Assuming bridge/overpass construction of 0.05 miles (and 0.2 acres) for 5 months, the model predicts emissions of 459 tons throughout the entire project. These emissions are not anticipated to contribute considerably to significant GHG emissions that contribute to the adverse effects of climate change. Significance thresholds, in terms of emissions, have not been identified for construction emissions.

b) Would the project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

The project would be subject to new requirements under rule making developed at the State and local level regarding greenhouse gas emissions and be subject to local policies that may further regulate emissions of GHGs. No conflicts are anticipated.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
VIII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	❒	❒	■	❒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	❒	❒	■	❒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	❒	❒	❒	■
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	❒	❒	❒	■

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	❒	❒	❒	■
f) For a project located within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	❒	❒	❒	■
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	❒	■	❒	❒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	❒	❒	■	❒

Environmental Setting

Hazardous materials include hazardous non-radioactive chemicals and products that may be harmful if improperly released to the environment or improperly handled by people. These include a broad spectrum of products, including pesticides, petroleum fuel products, paints and other coatings, and common household materials such as cleansers and other cleaning products that might be used for maintenance. Facilities maintenance activities require various common hazardous materials, including cleaners (which may include solvents and corrosives, in addition to soaps and detergents); paints; pesticides and herbicides; fuels (e.g., diesel); and oils and lubricants.

The project site is not listed on any regulatory database that tracks generation of hazardous material over certain volumes. The Geotracker database of known contaminated sites maintained by the State Water Resources Control Board and county agencies shows no known contamination sites that would pose any potential risk to the project site. According to the June 4, 2014 database, no known contaminated sites are within 1,000 feet of the project site. There are various permitted underground storage tanks at a greater distance from the site, but no contaminated sites exist on or in the immediate vicinity of the site (Geotracker, 2014).

In addition, a Phase I Environmental Site Assessment was done by Questa to determine if there was any potential contamination at the site. This study concluded that there are no sites within one-half mile of the project site that are currently undergoing active cleanup and/or site assessment to address hazardous materials on-site. In addition, there are no records that indicate the project site has any outstanding issues with regulatory agencies associated with hazardous materials and hazardous wastes. There are no cleanup and abatement orders or other pending environmental enforcement actions at the site (Questa, 2014).

a) Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

While some amount of hazardous materials (diesel fuel, oils) may be transported to or from the project site during the construction period, these fuels would be handled in compliance with regulations and no significant hazard to the public or the environment would be created by the project.

b) Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Refer to Item (a) above.

c) Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

All schools are more than one-quarter mile from the project site. The Calistoga Elementary School is 1.7 miles from the site; the Calistoga Junior/Senior High School is 1.1 miles from the site; and the Palisades Continuation High School is 1.2 miles from the project site. The project would therefore have no impact in relation to this criterion.

d) Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No contamination exists at the project site, based on a database search using Geotracker which is maintained by the State Water Resources Control Board (Geotracker, 2014). The project would therefore have no impact in relation to this criterion.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

No public airport or public use airport is within 2 miles of the project site. The nearest airport is the Angwin-Parrett Field Airport located near Pacific Union College. This airport is about 16 miles from the project site. The project would therefore have no impact in relation to this criterion.

f) For a project located within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

Based on a review of aerial photographs, no private airstrips are within the vicinity of the project site. Thus, no related safety hazard would be created by the project.

g) Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

The use of Greenwood Avenue would be interrupted during construction and would require the construction of a temporary access road for residents whose access would be restricted. The following mitigation measures are recommended to prevent impairment of emergency evacuation from these nearby residences in case of fire or other hazard.

Mitigation Measure HAZARDS-1: The County shall notify affected residents at least 2 months prior to construction about the timing and duration of required use of the temporary access road. All residents shall be given the name and contact information (24-hour) of a contact person should any access problems occur during required use of this road. (LTS)

Mitigation Measure HAZARDS-2: The County shall notify the Calistoga Police and Fire Departments and the County Sheriff about the construction of the temporary access road so that they know about it in case of the need for any emergency response. The notification shall occur at least 2 weeks prior to implementation of the temporary access road. (LTS)

h) Would the project expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

Based on a review of the County's Fire Hazard Severity Map, the project site is not within an area subject to wildland fires (Napa County BDR, 2014, Map 7-3). The valley floor is generally mapped as low or moderate fire hazard, while the nearby hillsides are mapped as high or very high fire hazard risk. The project therefore would not create significant risks involving wildland fires.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
IX. HYDROLOGY AND WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	❒	❒	■	❒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	❒	❒	❒	■

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	❒	❒	■	❒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	❒	❒	■	❒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	❒	❒	■	❒
f) Otherwise substantially degrade water quality?	❒	❒	■	❒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	❒	❒	■	❒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	❒	❒	■	❒
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding of as a result of the failure of a levee or dam?	❒	❒	■	❒
j) Expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow?	❒	❒	❒	■

Environmental Setting

The project site is located in the upper Napa River watershed. The Napa River watershed is located in the California Coast Ranges north of San Pablo Bay, covering an area of approximately 426 square miles (1,103 square kilometers). The watershed above the site is 5.4 square miles or 3,456 acres. The main stem of the Napa River flows approximately 50 miles in a southeasterly direction from the site though the Napa Valley before discharging to San Pablo Bay. Numerous tributaries enter the main stem from the mountains that rise abruptly on both sides of the valley.

Average annual rainfall ranges from 25 to 38 inches in the Napa Valley. Precipitation tends to be somewhat higher in the Mayacanas Mountains to the west of the valley, and lower in the eastern mountains. The large majority of rainfall occurs from November through April, with heaviest rainfall occurring from December through February.

Stream flows in the Napa River and its tributaries generally peak in January and February and are lowest from August through November. The river at the project site is perennial in normal to wet years, but can be intermittent in the driest years.

The southern portion of the Napa Valley is very flat, with elevations ranging from near sea level on the valley floor to 400 feet along the valley flanks. The elevation of the proposed project site ranges from 360 to 385 feet. The higher mountains that ring the Napa River watershed provide the headwater source areas for runoff and sediment that accumulate in the tributary and valley floor streams below.

Water Quality

Surface water quality in the Napa River and its tributaries varies seasonally. During the winter months, runoff from urban and agricultural brings associated pollutants (e.g., fine sediments, fertilizer residue, pesticides, pathogens, metals, and nutrients) into the river. Pollutant concentrations are typically low during this period, however, because of high flows and the resulting dilution. Turbidity can be elevated by high sediment loading during and immediately after storm events but generally decreases within 24 to 48 hours of the storm passing.

During the summer months when stream flow is low, inflows are reduced, but pollutants are more concentrated, water temperatures are higher, and oxygen levels are reduced, resulting in decreased water quality. Because of concerns about degraded water quality, the Napa River was placed on the 303(d) list of “impaired” water bodies that do not meet water quality standards for sediment and pathogens by the San Francisco Bay Regional Water Quality Control Board (RWQCB). As a result of this listing and concerns about adverse impacts on aquatic habitat and associated species, the RWQCB has developed Total Maximum Daily Load (TMDL) programs that established pollutant budgets and control plans in the Napa River. The Napa River Sediment TMDL identified streambank erosion as a primary source of fine sediments in the Napa River and recommends implementation of projects to stabilize actively eroding streambanks, control channel incision, and restore aquatic habitat (SFBRWQCB, 2005). The proposed project meets several of the goals of the TMDL by providing a more stable stream bed and banks that are less erosive and over the longer term would contribute fewer eroding bank sediments to the river downstream.

The project site vicinity is rural, with homes, vineyards, and associated infrastructure adjacent to the project site. There are two 12-inch storm drains associated with the roadway immediately adjacent to the culvert on the eastern side. These culverts collect local drainage off the roadway and local driveways and convey it down the bank slopes into the culvert on the upstream and downstream eastern bank.

Groundwater

The major aquifers in Napa County are the North Napa Valley and Milliken-Sarco-Tulucay groundwater basins. The North Napa Valley groundwater basin is the largest and most productive groundwater basin in the county and is found beneath the project site (Napa County, 2005). This basin extends from just north of the City of Napa up the valley floor to the northwestern end of the valley just north of the City of Calistoga, covering an area of approximately 60 square miles. In general, groundwater flow in the North Napa Valley groundwater basin is from the valley edges inward toward the center and

southwest toward San Pablo Bay. The depth to groundwater in the Napa Valley ranges from about 20 to 50 feet below ground surface during the spring.

Groundwater quality in the basin is primarily affected by pollutants (e.g., pesticide and/or fertilizer residues) that are leached out of surface soils by rainfall and conveyed into the aquifer through percolation. Surface water contaminants also have the potential to affect groundwater quality (Napa County, 2005).

Flooding

The project site portion of Napa River is included in the Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for the unincorporated portions of Napa County (FEMA, 2008). The project site is just upstream of the City of Calistoga limits and is referenced in the FIS as "upstream corporate limits" (FEMA, 2008, page 12).

TABLE 5 FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) PEAK DISCHARGES AT GREENWOOD AVENUE

Recurrence Interval	Peak Discharge (cfs)
2-year	1,900
10-year	3,300
25-year	3,900
100-year	5,100
500-year	6,400

Note: cfs = cubic feet per second
Source: FEMA. 2008.

Table 5 shows peak (10-year, 100-year, and 500-year) discharge values for Napa River at this site from the FEMA study. Using a graphical regression using logarithmic probability scales of these numbers, a 2-year recurrent flow is estimated be about 1,900 cubic feet per second (cfs), as shown in Table 5. This is the typical winter high flow with a 50 percent chance of occurring any given year. A 25-year recurrent flow (4 percent probability) would be approximately 3,900 cfs, as shown in Table 5.

The hydrologic conditions at the site were restudied in August of 2014 (Schaaf and Wheeler, 2014). It was determined that the FEMA flow numbers stated above may have included Blossom Creek flows which join the Napa River downstream of the project site. In this case the numbers stated by FEMA would overstate the flows going through the Greenwood Avenue culvert. A new hydrologic study was performed to determine the actual flows at the Greenwood Avenue crossing and to determine if the published floodplain above the culvert was applicable to the project. Another important aspect that was investigated was the influence of the floodplain above Greenwood Avenue and its effect on peak flows downstream. The study compiled a new hydrologic model and examined the timing and floodplain dynamics of the site. This study is appended to this IS/MND in Appendix E (Schaaf & Wheeler, 2014). The newly determined flow numbers are shown in **Table 5A**. As can be seen in the table the discharges have dropped by approximately 30 percent when Blossom Creek is not included in the flows.

TABLE 5A PEAK FLOWS AT GREENWOOD AVENUE – SCHAAF AND WHEELER RESTUDY

Recurrence Interval	Peak Discharge (cfs)
2-year*	1,400
10-year	2,380
25-year*	2,800
100-year	3,540
500-year*	4,500

*Determined through probability graphical analysis.

The existing culvert was thought to serve as a significant flow constriction during high flows based the applicable Flood Insurance Rate Map (FIRM). The effective FEMA study indicates a significant 100- and 500-year floodplain upstream of Greenwood culvert. It was believed that this floodplain had significant effects on peak flow in the City of Calistoga. **Figure 12** shows the FEMA plan view extent of the 100-year flood. The FEMA effective 100-year floodplain extends from 1,000 to 1,500 feet wide and is 1 to 2 feet deep.

The 2014 Schaaf & Wheeler study determined that the effect of the Greenwood Avenue culvert design on downstream peak flows was negligible. Any proposed structure at Greenwood Avenue would not have any significant floodplain impacts downstream of the project site in the City of Calistoga (**Figure 13**).

a) Would the project violate any water quality standards or waste discharge requirements?

Ground-disturbing construction activities that would occur in-channel could cause soil erosion and sedimentation and reduce water quality in the Napa River. These activities would include removing the existing riparian vegetation and installing foundations for the new bridge. Additionally, hazardous materials (e.g., gasoline, oils, grease, lubricants) from construction equipment could be accidently released during construction. Accidental discharge of these materials to adjacent surface waters could adversely affect water quality, endanger aquatic life, and/or result in a violation of water quality standards. Potential impacts on water quality during proposed project construction would be addressed by the construction Environmental Commitments incorporated into the proposed project (Table 1) which include provisions to avoid and/or minimize work in the active/wetted stream channel and control erosion and sedimentation, as well as a Spill Prevention and Response Plan to avoid and, if necessary, clean up accidental releases of hazardous materials. As the proposed project proponent, the County would be responsible for ensuring compliance with all conditions of these commitments. Out-of-channel construction activities such as roadway reconstruction could result in some erosion and increase sedimentation through runoff into adjacent surface waterways. However, the Environmental Commitments mentioned previously, which include using the roadway access, staging in adjacent open areas, and erosion control measures, would avoid and minimize the potential impacts on water quality.

For both in-channel and out-of-channel areas, during the period following construction, before vegetation is fully established, there is some potential for erosion and potential increases in sediment loading to the Napa River. However, all disturbed areas would be seeded (hydroseeded) and various erosion control features would be installed in erosion-prone areas to prevent erosion and sedimentation. Additionally, all constructed features would be monitored annually, and any necessary remedial actions (e.g., additional planting and/or erosion blanket and other control installation) would be implemented by the County. With these commitments, and County oversight, adverse construction-related effects on water quality would be avoided and minimized to the extent feasible, and no violation of water quality standards or waste discharge requirements is anticipated. Impacts are considered less than significant, and no mitigation is required.

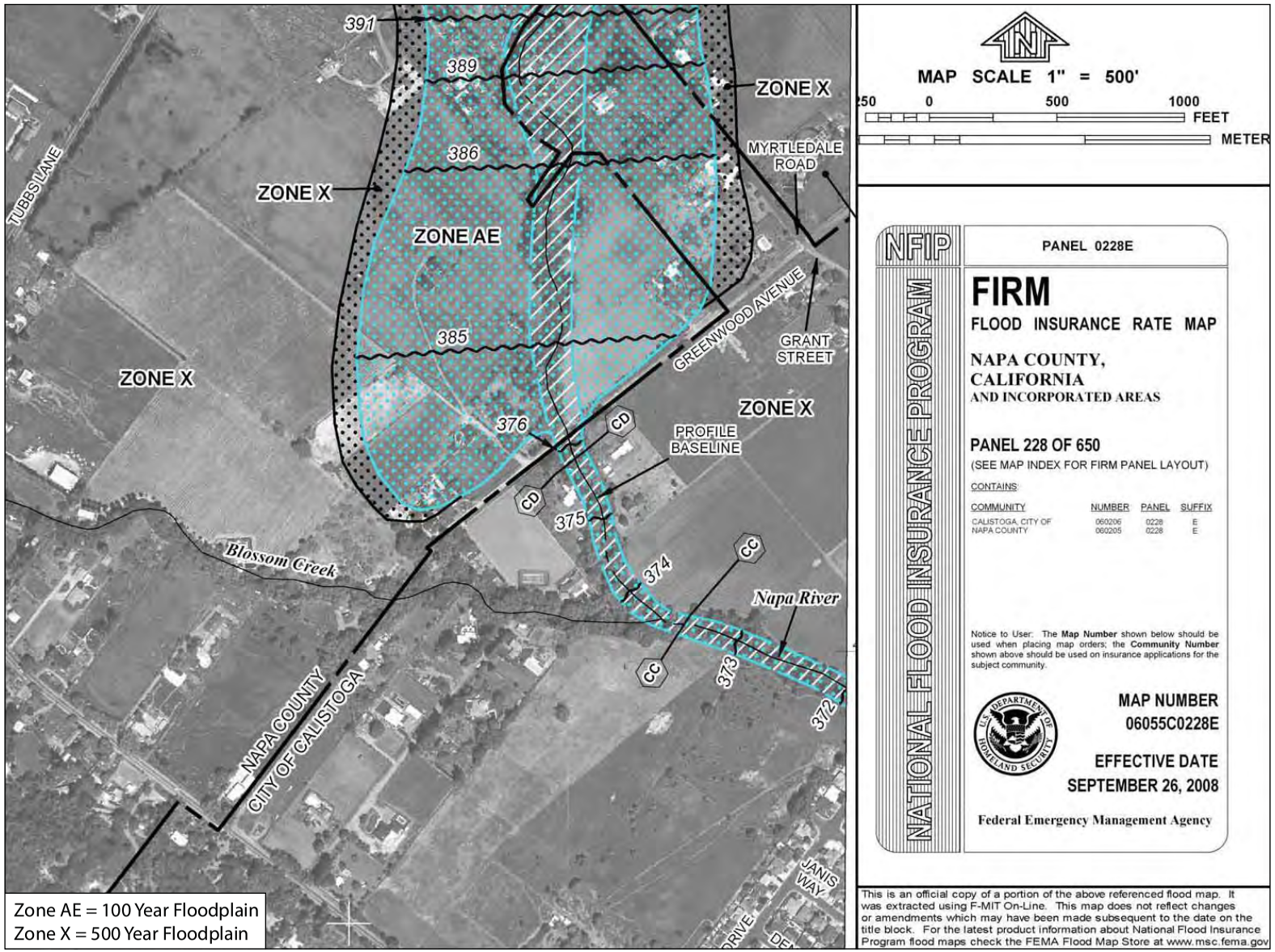

Figure 12

FEMA 100-YEAR FLOODPLAIN AT PROJECT SITE

SOURCE: FEMA, 9/26/2008

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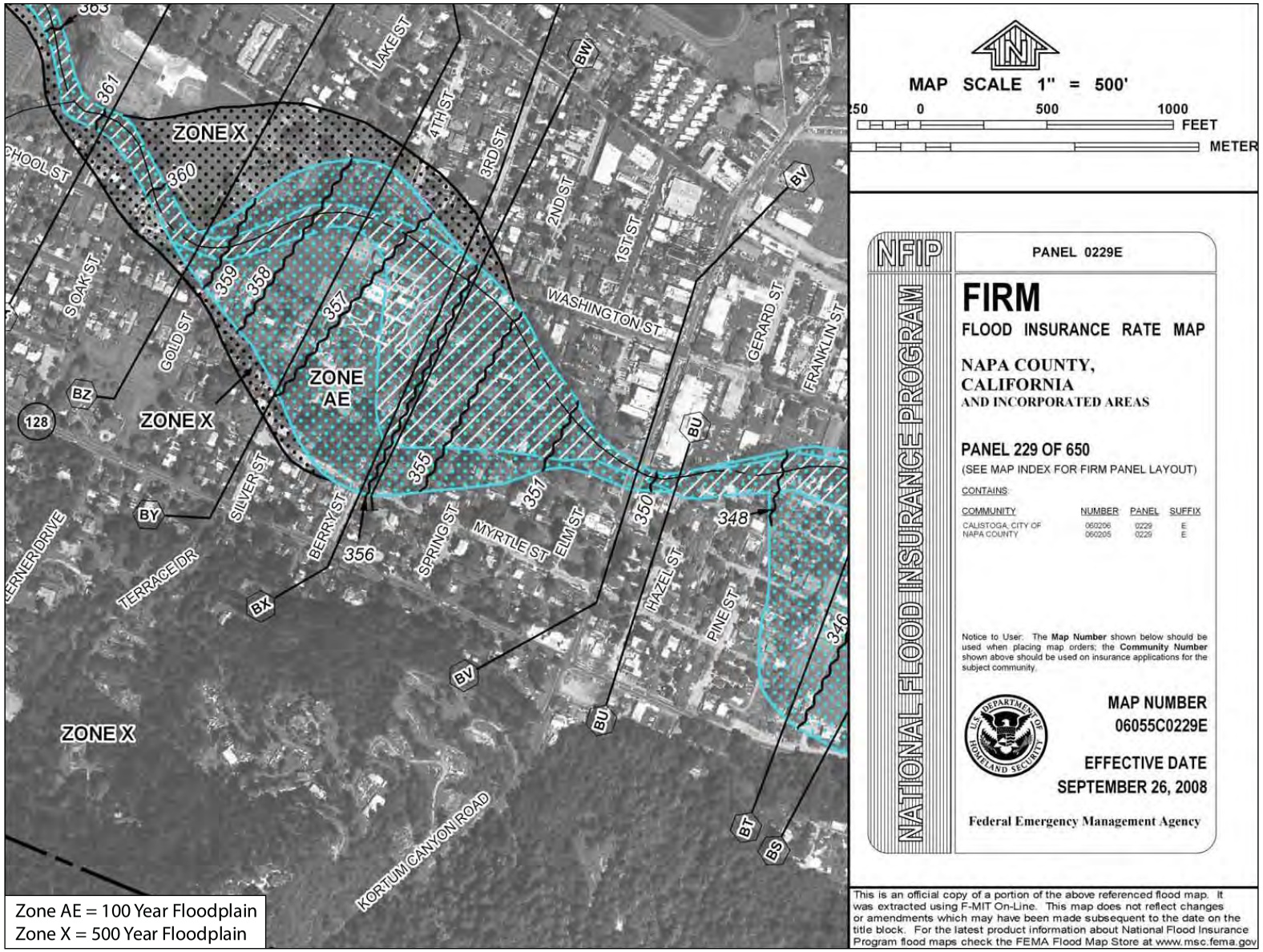

Figure 13

FEMA 100-YEAR FLOODPLAINS, CALISTOGA, CA.

SOURCE: FEMA, 9/26/2014

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b) Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Under existing conditions, runoff from the site discharges directly into the Napa River and runoff from the roadway generally sheet flows to adjacent vegetated areas or concentrates in roadside swales. The roadside swales discharge into the Napa River immediately upstream and downstream of the existing and proposed new bridge. The proposed project would not result in any significant increase (350 square feet) in impervious area. The proposed project is designed to direct all runoff from the roadway into vegetated swales on the north and south sides of the roadway before it reaches the Napa River. Therefore, the project would have no effect on groundwater recharge or on groundwater supply, and no mitigation is required.

c) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?

The project would not significantly alter the drainage pattern of the site. The project would, however, significantly alter the channel bed and lower banks in and around the new bridge. In order to provide freshwater shrimp habitat and provide fish passage through the new structure, the channel bed would be reconfigured into a series of four pools and a short riffle section. The major bed features would be constructed of large immobile 2- and 3-ton boulders. The channel bed would be lined with a mixture of cobles, gravels, and sands. The banks would be reinforced with bio-degradable coir blocks and lankets. The banks would also be planted extensively using willow and alder stakes and plantings. All of these features would substantially reduce the erosion potential of the site and would reestablish native riparian vegetation mosaic to stabilize the bank in the long term. The project is therefore considered to have a less-than-significant impact in relation to this criterion.

d) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

The discussion under “Environmental Setting” above describes the existing culvert and regulatory floodplain upstream of the culvert. The existing Greenwood culvert configuration was found not to reduce flood flows downstream in Calistoga. Increasing 100-year flow capacity of the crossing would reduce the water surface elevations upstream of Greenwood Avenue and would modify how that floodplain storage is used but will not increase peak flows in Calistoga.

The new replacement bridge has no adverse impacts to flood conditions up or downstream of Greenwood Avenue. The effects of the culvert are described in more detail in the hydraulics report (Schaaf and Wheeler, 2014). The project would not alter the 100-year floodplain in Calistoga and would not increase the rate or amount of runoff on or downstream of the site. The project is therefore considered to have a less-than-significant impact in relation to this criterion.

e) Would the project create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

As previously stated under Item (d) above, the project is designed to pass the 100-year peak flow and not increase the existing 100- and 500-year floodplain upstream of Greenwood Avenue. The project is being coordinated with the City of Calistoga so as not to affect any of the ongoing and planned bridge projects within the City limits. The project would not increase impervious roadway area and would not provide any substantial additional sources of polluted runoff. The project is therefore considered to have a less-than-significant impact in relation to this criterion.

f) Would the project otherwise substantially degrade water quality?

Please see discussion under Items (c) and (e) above.

g) Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

The project would not increase the amount of private property and housing within the FEMA-defined 100-year floodplain and is specifically designed to reduce the 100-year water surface elevations upstream of Greenwood Avenue. The project is therefore considered to have a less-than-significant impact in relation to this criterion.

h) Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

As discussed above, the project would replace a failing corrugated metal culvert that is currently located within the 100-year flood zone. The project is a replacement structure that is designed to handle these flows and provide fish passage as well as freshwater shrimp habitat. This project is therefore considered to have a less-than-significant impact in relation to this criterion.

i) Would the project expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding of as a result of the failure of a levee or dam?

See discussion under Item (h) above.

j) Would the project expose people or structures to a significant risk of loss, injury, or death involving inundation by seiche, tsunami, or mudflow?

The project would be located in flat lowlands of the upper Napa River and would not expose people or structures to seiche, tsunami, or mudflows. No impact would occur, and no mitigation is required.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
X. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?	❒	❒	❒	■
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	❒	❒	■	❒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	❒	❒	❒	■

Environmental Setting

The project site is a two-lane road and bridge surrounded by low-density residential and agricultural uses in the unincorporated portion of Napa County. The City of Calistoga adjoins the project site to the southeast. The immediate vicinity of the project site includes the Napa River edged by thick tree cover and riparian vegetation. Some of the agricultural land in the site vicinity is fallow and other land is actively farmed. The zoning of the parcels within Napa County in the vicinity of the site is entirely Agricultural Preserve (AP). Within Calistoga to the south of the site, the zoning is Rural Residential. The AP zone applies to fertile valley and foothill areas of Napa County in which agriculture is the predominant land use (Napa County, 2014).

Policy CON-6 of the Conservation Element of the Napa County General Plan requires the County to "impose conditions on discretionary proposed projects which limit development in ecologically sensitive areas such as those adjacent to rivers or streamside areas." Other General Plan goals and policies also identify the need to protect and preserve riparian and instream habitat values and to support the County's fisheries, particularly native anadromous fish species (Chinook salmon and steelhead). These include:

Policy CON-10: The County shall conserve and improve fisheries and wildlife habitat in cooperation with governmental agencies, private associations and individuals in Napa County.

Policy CON-11: The County shall maintain and improve fisheries habitat through a variety of appropriate measures, including the following as well as best management practices developed over time:

(d) Encourage and support programs and efforts related to fishery habitat restoration and improvement including steelhead presence surveys, development and utilization of hydraulic modeling, and removal of fish barriers.

(e) Manage the removal of invasive vegetation and the retention of other riparian vegetation to reduce the potential for increased water temperatures and siltation and to improve fishery habitat.

Policy CON-46: Napa County's past, present, and future are intertwined with that of the Napa River; therefore, the County is committed to improving and sustaining the health of the river, through attaining water quality and habitat enhancement goals … and completing federal, state, and local flood control proposed projects that are consistent with 'living rivers' principles.

The proposed project would be entirely located on County right-of-way. Because some construction would occur adjacent to the site and because of the need for a temporary access road, the County has acquired temporary construction easements on private parcels (APNs 017-210-027, 017-210-021, 017-210-010, 017-210-011) to allow the proposed construction.

a) Would the project physically divide an established community?

The project would not divide an established community. It would be a relatively short-term construction project and the site would be returned to an improved condition at completion. No residences or commercial/industrial businesses would be interrupted or directly affected due to construction. The temporary access road would be located on land that is currently fallow. Thus, agricultural operations would not be affected.

b) Would the project conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

A large component of the project is to improve fish habitat. Once removal of the culvert and road crossing is complete, the creek channel would be rebuilt and a new bridge would be constructed. A new channel bottom would be constructed into a series of pools and riffles. These pools and riffles are designed to comply with state and federal fish passage guidelines. The channel would be configured into a series of four step pools and a downstream riffle with rock weirs constructed throughout the sequences to ensure that the channel features are stable over time. Incorporated into the channel reconstruction would be a series of habitat features designed to mitigate the loss of existing stream and pool habitat that would occur during replacement. Also incorporated into the channel reconstruction would be a series of buried rock grade controls to stabilize the vertical and lateral movement of the channel in and around the new structure. Vertical and denuded banks downstream of the culvert would be stabilized and replanted using locally harvested willow and alder stakes in combination with biodegradable erosion control products.

The above measures would ensure that the project is compatible with the County's General Plan policies related to protecting and improving fish habitat and that are consistent with "living rivers" principles as mentioned in the policies addressed under "Environmental Setting" above. The project therefore would not conflict with applicable policies adopted to avoid or mitigate environmental effects.

c) Would the project conflict with any applicable habitat conservation plan or natural community conservation plan?

The project site is not the site of a habitat conservation plan and thus no impacts would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XI. MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?	❒	❒	■	❒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	❒	❒	■	❒

Environmental Setting

Napa County has three active mines: the Napa Quarry, the Pope Creek Quarry, and the American Canyon Quarry. None of these is located in the vicinity of the project site. The Napa Quarry is the most significant quarry operation, generating approximately 500,000 tons of basal rock per year that is used as concrete aggregate (Napa County, 2008). In addition to building stone and aggregate operations, Napa County also has other mineral products such as asbestos, chromite, clay, copper, gold, lead, limestone, magnesite, manganese, onyx, pavings blocks, and petroleum (Napa County, 2005. No river gravel mining occurs in the project site vicinity.

a) Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?

The proposed project would not affect known or mapped mineral resources in Napa County. Construction of the new bridge and adjoining stream improvements would require 1,000 tons of rock boulders purchased from nearby producers, the closest of which is 7 miles from the project site. The amount required for the project would not be significant and would not result in the loss of availability of a known mineral resource.

b) Would the project result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

Refer to Item (a) above.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XII. NOISE. Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	❒	■	❒	❒
b) Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?	❒	❒	■	❒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	❒	❒	❒	■
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	❒	■	❒	❒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	❒	❒	❒	■
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	❒	❒	❒	■

Environmental Setting

The study area includes approximately 10 noise-sensitive residential land uses located in the vicinity of the proposed project site that have the potential to be adversely affected by noise and/or vibration attributable to project construction activities. Noise-sensitive land uses can be defined as those areas that benefit from a lowered sound level, consistent with areas of primary human activities, such as sleeping or learning. Noise-sensitive land uses include, but are not limited to, residences, schools, daycare facilities, hospitals, places of worship, parks, and libraries. Noise-sensitive land uses in the immediate project site vicinity are primarily residential.

The project site is a rural area with the main sources of noise being traffic along local roadways; the occasional planes that may fly overhead; and agricultural operations that may entail the use of tractors and other equipment. No airports are located in the vicinity; thus, this noise source is intermittent and associated with planes that may be flying in the larger area. Noise measurements were not taken at the project site. However, the area is predominantly agricultural and rural residential where ambient noise levels are generally less than 60 dBA.

Characteristics of Noise

Sound is a phenomenon occurring in a medium (such as air or water) that results from pressure waves caused by a vibrating object and is the objective cause of hearing. The manner in which sound travels through this medium is influenced by the physical properties of the medium. The amount of energy in the sound is proportional to the pressure generated in the medium. The sound pressure level has become the most common descriptor used to characterize the loudness of a sound; the decibel (dB) scale is used to quantify sound intensity. Since sound can vary in intensity over one million times within the range of human hearing, a logarithmic scale is used to keep sound pressure numbers at a convenient and manageable range. The human ear is not equally sensitive to all sound frequencies within the entire spectrum; for this reason, human response is factored into sound descriptions in a process called “A-weighting,” expressed as “dBA.” The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Each 10-decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. All sound levels discussed in this report utilize the A-weighting scale.

Planning for acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity for a generalized land use type. Some general guidelines are as follows: sleep disturbance may occur at levels above 35 dBA, interference with human speech begins at around 60 dBA, and hearing damage may result from prolonged exposure to noise levels in excess of 85 to 90 dBA (U.S. EPA, 1974).

Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called L_{eq}) that represents the acoustical energy of a given measurement. $L_{eq}(24)$ is the steady-state energy level measured over a 24-hour period. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration. Since the sensitivity to noise increases during the evening and at night, due to the fact that excessive noise interferes with the ability to sleep, 24-hour descriptors were developed that incorporate artificial noise penalties added to quiet-time noise events. The Community Noise Equivalent Level (CNEL) is a measure of the cumulative noise exposure in a community, with a 5 dBA penalty added to noise levels during evening hours (i.e., 7:00 PM to 10:00 PM) and a 10 dBA penalty addition to noise levels during nighttime hours (i.e., 10:00 PM to 7:00 AM). Another 24-hour noise descriptor, called the day-night noise level (L_{dn}), is similar to CNEL. While both add a 10-dBA penalty to all nighttime noise events between 10:00 PM and 7:00 AM, L_{dn} does not add the evening 5-dBA penalty. In practice, the L_{dn} and CNEL usually differ by less than 1 dBA at any given location for transportation noise sources.

For a sound source that produces a constant sound, the L_{eq} will equal L_{max}. A sound source that varies over time will have an L_{min} value and L_{max} value over a given period of time. The L_{eq} value for that given period of time will not be a mathematical mean or average, but will be greater than the L_{min} value and less than the L_{max} value. The actual L_{eq} value will depend on the nature of the source.

Since decibels are logarithmic units, sound pressure levels cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces a noise level of 70 dBA when it passes an

observer, two cars passing simultaneously would not produce 140 dBA. Rather, they would combine to produce 73 dBA (Caltrans, 2009).

Characteristics of Groundborne Vibration

Operation of heavy construction equipment, particularly pile driving and other impact devices (e.g., pavement breakers), causes groundborne vibration. Vibration from the operation of this type of equipment can result in effects ranging from annoyance of people to damage of structures. Vibration amplitudes will decrease with increasing distance as the energy dissipates. The rate of dissipation varies depending upon the soil composition.

If great enough, the energy transmitted through the ground as vibration can result in damage ranging from small noticeable cracks that do not affect the soundness of structures to damage that affects the structural integrity of the building. To assess the potential for structural damage associated with vibration, the vibratory ground motion in the vicinity of the affected structure is measured in terms of peak particle velocity (PPV) in the vertical and horizontal directions (vector sum), typically in units of inches per second (in/sec). A freight train passing at 100 feet can cause vibrations of 0.1 in/sec PPV, while a strong earthquake can produce vibrations in the range of 10 in/sec PPV.

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. **Table 6** summarizes typical vibration levels measured at a distance of 25 feet from various pieces of construction equipment. The following equation can be used to estimate the vibration level at a given distance for typical soil conditions. PPV_{ref} is the reference PPV from Table 6.

$$PPV = PPV_{ref} \times (25/distance)^{1.1}$$

Perceptible groundborne vibration is generally limited to areas within a few hundred feet of construction activities. With the exception of pile driving, damage caused by construction vibration is unusual because vibration levels are below the damage thresholds at a distance of approximately 25 feet from the equipment. Human response to construction vibration is considered barely perceptible when maximum PPV ranges from 0.01 in/sec for continuous/frequently intermittent sources (i.e., pogo-stick compactors, crack-and-seat equipment, vibratory compaction equipment, etc.) to 0.04 in/sec for transient sources (i.e., blasting, single, isolated vibration events). For older residential structures, potential vibration-induced damage thresholds would range from 0.3 in/sec for continuous/frequently intermittent sources to 0.5 in/sec for transient sources; new residential structures would range from 0.5 in/sec for continuous/frequently intermittent sources to 1.0 in/sec for transient sources (Caltrans 2004).

Groundborne noise occurs when groundborne vibration causes the ground surface and structures to radiate audible acoustical energy. It is primarily an issue for underground rail systems.

Regulatory Framework

No federal standards related to noise and vibration would be applicable to the project.

TABLE 6 VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment		PPV at 25 ft. (in/sec)
Pile driver (impact)	upper range	1.158
	typical	0.644
Pile driver (sonic)	upper range	0.734
	typical	0.170
Clam shovel drop		0.202
Hydromill (slurry wall)	in soil	0.008
	in rock	0.017
Vibratory roller		0.210
Hoe ram		0.089
Large bulldozer		0.089
Caisson drilling		0.089
Loaded trucks		0.076
Jackhammer		0.035
Small bulldozer		0.003

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Federal Transit Agency, Office of Planning and Environment, May 2006.

No state standards related to noise and vibration would be applicable to the project. However, the California Department of Transportation (Caltrans) has published guidelines for evaluating the potential vibration impact from construction (Caltrans, 2013).

The Napa County Code of Ordinances, Chapter 8.16, Noise Control Regulations, identifies allowable noise levels from construction. Section 8.16.080 states, "Where technically and economically feasible, construction activities shall be conducted in such a manner that the maximum noise levels at affected properties will not exceed 75 dBA at residential land uses between the hours of 7:00 AM and 7:00 PM or 60 dBA between the hours of 7:00 PM and 7:00 AM."

a) Would the project result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Noise generated by project-related construction activities would be a function of the noise levels generated by individual pieces of construction equipment, the type and amount of equipment operating at any given time, the timing and duration of construction activities, the proximity of nearby sensitive

land uses, and the presence or lack of shielding at these sensitive land uses. Construction noise levels would vary on a day-to-day basis during each phase of construction, depending on the specific task being completed. Each construction phase would require a different combination of construction equipment necessary to complete the task and differing usage factors for such equipment. Construction noise would primarily result from the operation of heavy construction equipment and the arrival and departure of heavy-duty trucks.

Federal Highway Administration's (FHWA's) Roadway Construction Noise Model (RCNM) was used to calculate the maximum and average noise levels anticipated during the construction period (FHWA, 2006). This construction noise model includes representative sound levels for the most common types of construction equipment and the approximate usage factors of such equipment that were developed based on an extensive database of information gathered during the construction of the Central Artery/Tunnel Project in Boston, Massachusetts (CA/T Project of "Big Dig"). The usage factors represent the percentage of time that the equipment would be operating at full power. Vehicles and equipment anticipated during the construction period for this project were input into RCNM to calculate noise levels at a distance of 110 feet, which is the approximate distance from the construction site to the nearest residence to the northwest. Other sensitive receptors in the project vicinity include residences to the west, southwest, south, and east located approximately 135 to 1,290 feet from the project site.

Construction activities for this project would commence after June 1, 2015 and be completed before October 31, 2015. Construction would only occur during daytime hours between 7:00 AM and 7:00 PM, however, a diesel-powered generator would be located on the site and would operate 24 hours per day, 7 days per week for the entire duration of the construction period. This generator would be placed approximately 200 to 300 feet from the nearest residence. The hourly average noise levels for the generator would be 66 dBA L_{eq} at a distance of 200 feet, and the maximum instantaneous noise levels would reach 68 dBA L_{max} at 200 feet.

Activities associated with the demolition, earthwork, and structures phases of the project would generate hourly average noise levels of 75 dBA L_{eq} at a distance of 110 feet. Maximum instantaneous noise levels would reach 75 dBA L_{max} at 110 feet. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor; therefore, the noise levels calculated at 110 feet would be about 2 dBA less at 135 feet and 21 dBA less at 1,290 feet. Shielding provided by buildings or terrain would result in even lower construction noise levels at distant receptors.

Construction-related vehicles traveling to and from the project site would generate worst-hour noise levels of approximately 57 dBA L_{eq} at a distance of 50 feet from the center of Greenwood Avenue, assuming that the peak number of trucks expected on any one day would be approximately eight one-way truck trips per hour and that up to 20 one-way vehicle trips would occur per hour for the construction crew.

As stated in the project description, construction activities for the proposed project would be limited to daytime hours only, except for the diesel-powered generator, which would operate continuously during daytime and nighttime hours. The generator would result in maximum instantaneous noise levels of 68 dBA L_{max} at the nearest residence. While the levels would meet the daytime limit of 75 dBA, the

nighttime threshold of 60 dBA would be exceeded. This is potentially a significant impact. The noise levels due to the demolition, earthwork, and structures phases of the project would be a maximum of 75 dBA at the nearest residence, which approaches but does not exceed the 75 dBA noise limit established in the County's Noise Ordinance. This impact would potentially be significant unless mitigation measures are implemented.

Mitigation Measure NOISE-1: To reduce the potential for noise impacts resulting from project construction, the following measures should be implemented during project construction:

- *Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment.*
- *Prohibit all unnecessary idling of internal combustion engines.*
- *Locate stationary noise-generating equipment as far as possible from adjacent residential land uses.*
- *Locate staging areas and construction material areas as far away as possible from adjacent residential land uses.*
- *Use "quiet" models of air compressors and other stationary noise sources (i.e., generator) where technology exists.*
- *Acoustically shield stationary equipment from adjacent residential land uses. Noise barriers or acoustical enclosures shall be constructed to reduce nighttime generator noise to less than 60 dBA L_{max} at adjacent residential land uses.*
- *The contractor should prepare a detailed construction plan identifying the schedule for major noise-generating construction activities and distribute this plan to adjacent noise-sensitive receptors. The construction plan should also list the construction noise reduction measures identified in this study. The construction contractor shall designate a "construction liaison" who would be responsible for responding to any local complaints about construction noise. The liaison shall determine the cause of the noise complaints (e.g., starting too early, bad muffler, etc.) and shall institute reasonable measures to correct the problem. The construction contractor shall conspicuously post a telephone number for the liaison at the construction site.*
- *The construction contractor shall hold a preconstruction meeting with the job inspectors and the general contractor/on-site project manager to confirm that noise mitigation and practices (including construction hours, construction schedule, and construction liaison) are completed.*

All of the above measures shall be included in the contract specifications that shall be reviewed and approved by the Napa County Department of Public Works prior to the start of construction. The above measures would reduce noise generated by the construction of the project to the extent feasible for the project's size.

Implementation of Mitigation Measure NOISE-1 would reduce the project-generated noise impact to a less-than-significant level.

b) Would the project result in exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?

For structural damage, the California Department of Transportation uses a vibration limit of 0.5 in/sec, PPV for buildings structurally sound and designed to modern engineering standards, 0.3 in/sec, PPV for older residential buildings, 0.25 in/sec, PPV for historic and some old buildings, and a conservative limit of 0.08 in/sec, PPV for ancient buildings or buildings that are documented to be structurally weakened. All buildings in the project vicinity are assumed to be structurally sound, but these buildings may or may not have been designed to modern engineering standards. No ancient buildings or buildings that are documented to be structurally weakened are known to exist in the area.

Substantial sources of ground vibration, such as vibratory or impact pile driving, are not proposed as part of the project. Table 6 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. A review of the vibration source level data indicates that vibration levels expected from project construction would typically range from 0.003 to 0.210 in/sec, PPV at a distance of 25 feet for the vast majority of the proposed construction activities.

Vibration levels are highest close to the source, and then attenuate with increasing distance at a rate of $(D_{ref}/D)^{1.1}$, where D is the distance from the source in feet and D_{ref} is the reference distance of 25 feet. Using this attenuation rate in the formula discussed above, the use of a vibratory roller is calculated to result in levels of 0.041 in/sec, PPV at the nearest residence, which is approximately 110 feet from the construction site. Vibration levels would not exceed the 0.3 in/sec PPV threshold and would not be expected to cause cosmetic damage at the nearest residence.

c) Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

No permanent increase in ambient noise levels would result from the project, as the project would be a short-term construction project, lasting approximately 3 to 4 months.

d) Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

As discussed above in Impact (a), temporary construction work could result in noise levels of up to 75 dBA L_{max} at the nearest residence during the demolition, earthwork, and structures phases of the project. Since it is assumed that daytime ambient noise levels are below 60 dBA, an increase of 15 dBA or more would be a substantial temporary increase in noise levels in the project vicinity.

Given the relatively short construction period and limited scope of the project, construction activities would result in a less-than-significant, short-term noise impact provided that the construction best practices mentioned in *Mitigation Measure NOISE-1* are implemented during the entire construction phase. There may still be short-term noise increases due to construction activities even with implementation of the identified mitigation measures, but these increases would occur over a brief duration and, with implementation of the identified mitigation measures, would be considered less-than-significant.

Mitigation Measure NOISE-2: See Mitigation Measure NOISE-1. All of the above measures discussed in Mitigation Measure NOISE-1 shall be included in the contract specifications that shall be reviewed and approved by the Napa County Department of Public Works prior to the start of construction. The above measures would reduce noise generated by the construction of the project to the extent feasible for the project's size.

Implementation of Mitigation Measure NOISE-2 would reduce the project's temporary construction noise impact to a less-than-significant level.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The project is not located within 2 miles of a public airport or public use airport, or within an airport land use plan area. No impacts related to noise from airports would apply to the project.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No private airstrips are located in the vicinity of the project. Thus, no impacts related to use of a private airstrip would apply to the project.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	❒	❒	❒	■
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	❒	❒	❒	■
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	❒	❒	❒	■

Environmental Setting

The project site is located in an agricultural and rural residential area of Napa County near the northern boundary of the City of Calistoga. No residential units are located within the area that would be affected by the project; some residences are in the immediate vicinity of the proposed temporary access road (see Figure 2).

a) *Would the project induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?*

The project would not induce any growth into the area, as it is a replacement of an existing culvert. No new roads or infrastructure would be associated with the project. No new housing or commercial uses would be associated with the project.

b) *Would the project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?*

No housing would be displaced by the project.

c) *Would the project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?*

No people would be displaced by the project.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV. PUBLIC SERVICES.				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	❒	❒	❒	■
Police protection?	❒	❒	❒	■
Schools?	❒	❒	❒	■
Parks?	❒	❒	❒	■
Other public facilities?	❒	❒	❒	■

Environmental Setting

Fire Protection

For fire protection service, the County of Napa contracts with the California Department of Forestry (CAL FIRE) as the Napa County Fire Department. CAL FIRE provides administrative support and coordination with six full-time paid stations and nine volunteer fire companies operating under a County

Fire Plan, which is approved by the County Board of Supervisors. The Napa County Fire Chief is responsible for the direction and coordination of fire protection services by these organizations on a countywide basis (Horizon, 2014).

Police

The primary responsibility for law enforcement and police services in Napa County rests with the Napa County Sheriff's Department, which operates five stations, located in Napa, Yountville, St. Helena, Angwin, and Lake Berryessa. The Napa County Sheriff's Department also has mutual aid agreements with several other law enforcement agencies, including the St. Helena Police Department, City of Calistoga Police Department, City of Napa Police Department, Vallejo Police Department, and California Highway Patrol (Horizon, 2014).

In 2011, the Napa County Sheriff's Department received 46,357 calls for service. The average response time for all types of calls was 17 minutes. First-priority emergency/in-progress calls generally received service within 5 minutes. Second- and third-priority calls had response times of 10 to 15 minutes, and lower priority calls may have had response times of up to 30 to 40 minutes (Horizon, 2014).

Schools

There are five main school districts in Napa County: Napa Valley Unified School District, St. Helena Unified School District, Calistoga Joint Unified School District, Howell Mountain Elementary School District, and Pope Valley Union Elementary School District. School facilities are currently considered adequate to meet the existing demand (Horizon, 2014).

Parks

Napa County has a number of federal, state, and local public parks and recreational facilities. These include the federal (Bureau of Reclamation) Lake Berryessa and Knoxville Off-Highway Vehicle and Recreational Area; Bothe-Napa Valley State Park, Robert Louis Stevenson State Park, and Bale Grist Mill State Historic Park; and the County-run Berryessa Vista Wilderness Park, Cuttings Wharf Boat Launch (Napa River), Napa River Ecological Reserve, Skyline Wilderness Park, and Solano Avenue Bike Rest Stop (Horizon, 2014).

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services: Fire protection, police protection, schools, parks, other public facilities?

The project would be located mainly within a road alignment and would be limited to replacement of the existing culvert with a bridge, along with associated activities. The project would not increase or alter the distribution of population in the project site vicinity, either temporarily or permanently. Therefore, it would not increase the demand for fire protection services, police services, schools, or parks over either the short term or the long term. No new or physically altered governmental facilities would be needed to serve the project.

The project would involve construction of a temporary road and therefore could affect emergency access for fire (CAL FIRE) and police (Napa County Sheriff's Department) vehicles. The project would include an environmental commitment (EC-6GEN) that would provide for (1) advance warning signage, a detour route, and flaggers in both directions when lanes are closed; and (2) coordination with local emergency service providers when work is conducted on public roads and could affect traffic. This measure would help reduce any impacts on emergency access. The project's impact on emergency access is addressed in Section VIII, Hazards and Hazardous Materials (see Mitigation Measure HAZARDS-1 and Mitigation Measure HAZARDS-2) and in Section XVI, Transportation/Traffic.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XV. RECREATION.				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	❒	❒	❒	■
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	❒	❒	❒	■

Environmental Setting

See Section XIV, Public Services, for discussion of public parks and recreational facilities in the project site vicinity.

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

The project would be located mainly within a road alignment and would be limited to replacement of the existing culvert with a bridge, along with associated activities. The project would not increase or alter the distribution of population in the project site vicinity, either temporarily or permanently. Therefore, it would not increase the use of existing parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

The project does not include recreational facilities and would not require the construction or expansion or any such facilities.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. TRANSPORTATION/TRAFFIC. Would the project:				
a) Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	❒	❒	❒	■
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	❒	❒	❒	■
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	❒	❒	❒	■
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	❒	❒	■	❒
e) Result in inadequate emergency access?	❒	❒	■	❒
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	❒	❒	❒	■

Environmental Setting

Regional access to the project site is available from State Highway 29 which is located east of and connects to Greenwood Avenue. Greenwood Avenue is the location of the project site. State Highway 29 is a major north-south highway in Napa County. Another major north-south corridor is State Highway 128 (also referred to as Foothill Boulevard), which is located on the west side of Napa Valley. Greenwood Avenue does not connect to State Highway 128, but terminates in a dead-end slightly east of State Highway 128 (see Figure 1).

Transportation Terminology

Level of service (LOS) refers to traffic operational conditions based on roadway capacity and traffic volumes. LOS ranges from A to F, with A and B representing the best operations, C and D representing intermediate operations, and E and F representing high degrees of congestion.

Napa County Standards

The Napa County General Plan identifies the standards for County roadways and intersections as the following:

- LOS D or better on all County arterial roadways, except where maintaining LOS D would require the installation of more travel lanes than shown on the County's Circulation Map; and
- LOS D or better at all signalized intersections, except where the existing LOS is E or F and it is not feasible to increase intersection capacity without acquiring substantial additional right-of-way.

Existing Traffic Conditions

Local traffic conditions in the vicinity of the project site vary by time of day, day of the week, and seasonally. Due to tourist traffic, conditions can often be more congested during weekends as well as during summer and fall months. During harvest activities in fall months, truck traffic can be quite heavy.

State Highway 29 continues north from its intersection with Silverado Trail. This intersection is about 1 mile south of the project site. This intersection of Silverado Trail and State Highway 29 operates at LOS A in the AM peak hour, PM peak hour, and weekend midday peak hour (Michael Brandman & Associates, 2012).

Public Transit

The Napa County Transportation and Planning Agency oversees public transit service in Napa County. The agency operates VINE, which is a fixed route bus system. VINE Route 10 provides bus service along the State Highway 29 corridor between Calistoga and the Vallejo Ferry to the south, with stops in St. Helena, Yountville, Napa, American Canyon, and Vallejo. Service hours are approximately 6:00 AM to 9:00 PM, Monday through Friday; 6:30 AM to 8:30 PM on Saturdays; and 8:30 AM to 7:00 PM on Sundays.

a) Would the project conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

Construction of the proposed project would entail traffic associated with construction workers, construction equipment, and delivery of supplies. The traffic associated with the project is expected to be during weekdays only and during the AM and PM peak hours as well as during the middle of the day when hauling activities occur. Some off-haul would be expected for construction debris. Ongoing maintenance of the new bridge would not entail significant traffic; thus, traffic would primarily be associated with construction only.

Construction would occur over an approximately 4-month period and would entail about 5 to 7 workers at the site at one time. Over the construction period, it is estimated that construction workers would generate no more than 250 round trips on area roadways.

A small number of trips would be associated with bringing construction equipment to the site. This equipment would remain at the site during construction. During delivery of supplies, a small number of additional trips would be generated by the project.

Greenwood Avenue serves approximately 12 residences after its intersection with Grant Street and Myrtledale Road. During project construction, access to these residences would be restricted. Therefore, the project includes a temporary access road from the termination of a driveway that connects to Tubbs Lane. All necessary easements would be acquired for this temporary access road and residents would be informed of the temporary closure.

The project would not conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system. It would be a short-term construction project and no significant traffic impacts are anticipated. Public transit would be available on the VINE Route 10; however, it is anticipated that construction workers would either carpool or drive individual vehicles due to the relative isolation of the project site.

b) Would the project conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?

The project would not conflict with the Napa County Congestion Management Program. The trips associated with the project would not significantly affect levels of service at local intersections, as so few trips would be associated with the project and they would only occur during the 3-month construction period.

c) Would the project result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

No air traffic patterns would be affected by the project.

d) Would the project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

A temporary access road (see Figure 2) would be constructed to provide access to homes in the project vicinity due to the required closure of a portion of Greenwood Avenue for project construction. All residents who would be required to use this temporary road would be notified ahead of the construction period. This access road would connect to an existing paved driveway that connects to Tubbs Lane to the northwest of the site. The access road would be graded and would provide a 10-foot minimum width, with a 5-foot minimum area separating the travel lane from an existing drainage ditch at the edge of the road (see Figure 3). No substantial hazards would be created by the use of this temporary access road.

e) Would the project result in inadequate emergency access?

The temporary access road would be available for emergency access to serve the residences that would require use of the temporary access road. Refer to Mitigation Measures HAZARDS-1 and HAZARDS-2 regarding emergency access notifications.

f) Would the project conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

The project would not conflict with policies related to programs for public transit or bicycle/pedestrian facilities. Limited trips would be generated during the 3-month construction period. Public transit service would not be affected, and no heavily used pedestrian or bicycle facilities would be affected during the 3-month period.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	❒	❒	❒	■
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	❒	❒	❒	■
c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	❒	❒	❒	■
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	❒	❒	❒	■
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	❒	❒	❒	■
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	❒	❒	■	❒
g) Comply with federal, State, and local statutes and regulations related to solid waste?	❒	❒	❒	■

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
h) Have sufficient local or regional energy supplies available to serve peak and base period energy demands, or is additional capacity required?	❒	❒	❒	■
i) Comply with existing energy standards?	❒	❒	❒	■
j) Result in adverse effects on energy resources?	❒	❒	❒	■
k) Result in a wasteful, inefficient, or unnecessary consumption of energy during project construction, operation, maintenance, and/or removal?	❒	❒	❒	■

Environmental Setting

Water Supply and Water and Wastewater Facilities

Unincorporated areas of Napa County mainly rely on septic tanks for wastewater disposal and on groundwater resources and surface water collection for potable water. Based on current and future water demands, the County has adopted policies supporting the use of recycled water as a means to meet future water supply demands (Horizon, 2014).

Solid Waste Disposal

Most of Napa County's solid waste is delivered to the Devlin Road Recycling and Transfer Facility in American Canyon, where the waste is sorted and routed for disposal elsewhere. The facility receives an average of 560 tons of waste daily and has permitted capacity to handle up to 1,440 tons of solid waste per day (Napa County, 2008). The facility includes a mixed construction and demolition processing area, where staff sort mixed loads of construction and demolition materials to capture recyclable material (Napa Recycling and Waste Services, 2014).

Remaining material is sent to Potrero Hills Landfill in Suisun City (Solano County) (Napa Recycling and Waste Services, 2014). Potrero Hills Landfill is permitted to accept up to 4,300 tons of material per day. As of 2006, the landfill had 13,872,000 cubic yards of remaining capacity. The landfill is expected to close in 2048 (CalRecycle, 2014).

Energy

California's total energy consumption across all sectors in 2011 was 7,858 trillion British thermal units. The state consumed over 27 billion gallons of petroleum products, with motor vehicle gasoline comprising over 14 billion gallons and diesel fuel oil comprising over 4 billion gallons (Horizon, 2014).

California is the most populous state in the country, and its total energy demand is second only to Texas. The state has one of the lowest per-capita energy consumption rates in the U.S. The State of California's energy efficiency programs have contributed to the low per-capita energy consumption. The transportation sector is the state's largest energy consumer, driven by high demand from

California's motorists, major airports, and military bases. More motor vehicles are registered in California than in any other state, and working commute times are among the longest in the country (Horizon, 2014).
Most California motorists are required to use a special motor gasoline blend called California Clean Burning Gasoline. California has numerous energy efficiency regulations that require motor vehicles and off-road vehicles to improve fuel efficiency over time. In addition, other regulations limit vehicle idling time by off-road vehicles. These regulations and others reduce overall energy use by vehicles (Horizon, 2014).

a) Would the project exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

The project would be located mainly within a road alignment and would be limited to replacement of the existing culvert with a bridge, along with associated activities. The project would not increase or alter the distribution of population in the project site vicinity, either temporarily or permanently. It would not increase wastewater generation or have the potential to exceed wastewater treatment requirements. See Section IX, Hydrology and Water Quality, for discussion of project impacts on stormwater generation and water quality.

b) Would the project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

The project would not increase or alter the distribution of population in the project site vicinity, either temporarily or permanently. Therefore, it would not create any new demand for water or wastewater treatment and would not require the construction or expansion of water or wastewater treatment facilities.

The only water used by the project would be by the truck that would provide dust suppression during construction. This use would be temporary and would not be expected to affect water supplies or facilities. The truck would likely obtain a permit to use water from a local fire hydrant.

The project would not affect any existing water or sewer lines because there are no such utilities in the affected roadway or the vicinity.

The project would include an environmental commitment (EC-10GEN) that would require (1) the contractor to locate and mark all active surface and subsurface utilities in the vicinity before start of work; (2) the County and its contractors to notify utilities of the construction schedule, coordinate relocation of utility poles if necessary, and protect all utilities that are to remain in and surrounding the site during construction activities; and (3) the County or its contractors to coordinate with utility providers to notify the community of the potential for service disruption. This measure would ensure that the project avoids any impact on existing utilities.

c) Would the project require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

See Section IX, Hydrology and Water Quality, for discussion of project impacts on stormwater drainage facilities.

d) Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

The project would not involve the construction of any structures or facilities that would require additional water supplies. The project would also not increase or alter the distribution of population in the project site vicinity, either temporarily or permanently. Therefore, the project would not create a need for new or expanded water entitlements or resources. See also Item (b) above.

e) Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

The project would not create any new demand for wastewater treatment and would not affect wastewater treatment capacity. See Item (b) above.

f) Would the project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Construction of the project would generate solid waste, but the landfill serving the project would have sufficient permitted capacity to accommodate the project's solid waste disposal needs. The project would not generate solid waste during operation. For these reasons, the project's impact on landfill capacity would be less than significant.

The project would generate solid waste during demolition of the existing culvert and construction of the new bridge. The existing 60-foot-long, 15-foot-diameter steel culvert would be demolished and hauled off-site. In addition, the asphalt road above the culvert would be demolished, generating approximately 200 cubic yards of asphalt waste that would be hauled off-site. These demolition materials would require disposal, as would some material used for construction.

Solid waste generated by project demolition and construction would likely be taken to the Devlin Road Recycling and Transfer Facility in American Canyon. As noted under "Environmental Setting" above, the facility receives an average of 560 tons of waste daily and has permitted capacity to handle up to 1,440 tons of solid waste per day (Napa County, 2008). The facility therefore would have capacity to handle solid waste from the project.

After the recyclable material is removed, the remaining material would be sent to Potrero Hills Landfill. As noted under "Environmental Setting" above, the landfill is permitted to accept up to 4,300 tons of material per day, had 13,872,000 cubic yards of remaining capacity as of 2006, and is expected to close in 2048 (CalRecycle, 2014). The landfill is expected to have adequate capacity to accommodate

the project's solid waste, which would represent a small and temporary source of waste compared to other sources served by the landfill.

g) Would the project comply with federal, State, and local statutes and regulations related to solid waste?

By law, the project must comply with all federal, state, and local statutes and regulations related to solid waste. The project therefore is not expected to cause any conflicts with such statutes or regulations.

h) Would the project have sufficient local or regional energy supplies available to serve peak and base period energy demands, or is additional capacity required?

The project would not require additional energy supplies or capacity. Equipment operating during construction would be powered by fuel or mobile generators. The project would not include any structures or facilities that would consume energy and would not require energy during operation. The project would not result in population growth, either temporarily or permanently.

Project construction would consume motor vehicle gasoline and diesel fuel during activities that require the use of equipment such as bulldozers, excavators, generators, or cranes. Construction workers traveling in vehicles to and from the project site also would use primarily motor vehicle gasoline and diesel fuel. This fuel consumption would be temporary and minor compared to the amount of fuel and energy used in Napa County and elsewhere in California daily.

i) Would the project comply with existing energy standards?

The project would not include any structures or facilities that would consume operation-related energy and therefore would not have the potential to violate energy standards.

j) Would the project result in adverse effects on energy resources?

The project would not result in adverse effects on energy resources. See Item (h) above. The project would not affect the existing overhead power line on the road. No underground energy utilities (e.g., gas lines) have been identified in the road or elsewhere the vicinity.

The project would include an environmental commitment (EC-10GEN in Table 1) that would require (1) the contractor to locate and mark all active surface and subsurface utilities in the vicinity before start of work; (2) the County and its contractors to notify utilities of the construction schedule, coordinate relocation of utility poles if necessary, and protect all utilities that are to remain in and surrounding the site during construction activities; and (3) the County or its contractors to coordinate with utility providers to notify the community of the potential for service disruption. This measure would ensure that the project avoids any impact on existing utilities.

k) Would the project result in a wasteful, inefficient, or unnecessary consumption of energy during project construction, operation, maintenance, and/or removal?

The project would not wastefully, inefficiently, or unnecessarily consume energy. As discussed in Item (h) above, the project would use energy only during construction; operation of the project would not use any energy.

The project would include an environmental commitment (EC-8GEN in Table 1) that would prohibit excessive idling of vehicles beyond 5 minutes and require maximum use of non-power hand tools over power tools to the extent feasible at sites close to housing and commercial winery facilities. This measure is designed to mitigate noise but would also help limit energy consumption.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. MANDATORY FINDINGS OF SIGNIFICANCE.				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	❒	■	❒	❒
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	❒	❒	■	❒
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	❒	❒	■	❒

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?

Refer to the mitigation measures identified for biological resource impacts.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)

No other projects are proposed in the immediate vicinity of the proposed project. Therefore, there would not be relevant cumulative impacts. Any mitigation measures recommended for the project would serve to reduce cumulative impacts to a less-than-significant level.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

The project would not cause substantial adverse effects on human beings, either directly or indirectly. Mitigation measures have been recommended to reduce impacts to less than significant levels.

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APPENDIX A
Mitigation Monitoring and Reporting Program (MMRP)

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
Air Quality						
AIR-1: The construction contractor shall institute a dust control program, which shall be submitted to the Napa County Public Works Department and approved prior to any construction activity. Elements of the dust control program shall include, but not necessarily be limited to, the following: ▪ All exposed surfaces (i.e., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. ▪ All haul trucks transporting soil, sand, or other loose material off-site shall have such loads covered. ▪ All visible mud or dirt tracked out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping shall be prohibited. ▪ All vehicle speeds on unpaved roads shall be limited to 15 miles per hour. ▪ Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points. ▪ All construction equipment shall be maintained and properly tuned in accordance with the manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. ▪ A publicly visible sign shall be posted listing the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Bay Area Air Quality Management District (BAAQMD) phone number shall also be visible to ensure compliance with applicable regulations. Implementation of Mitigation Measure AIR-1 would reduce the potential impact of construction-period fugitive dust to a less-than-significant level and also reduce construction-period emissions.	Napa County Public Works Department	Napa County Public Works Department	During construction			
Biological Resources						
BIO-1a: Restoration of California Freshwater Shrimp Habitat On-Site. The County shall provide compensatory mitigation for the loss of 17 linear feet of good California freshwater shrimp (CFS) summer habitat by establishing a total of 60 feet of undercut bank and 90	Napa County Public Works Department	Napa County Public Works Department	5-years post-construction			

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
feet of overhanging vegetation habitat. These habitat features would be created in the two proposed pools downstream of the new bridge. The first pool would be used to recreate undercut bank habitat by using a series of constructed wooden lunker structures. These structures are designed to provide both good summer and moderate to good winter habitat. The objective of these structures is to create cover and spaces that would provide summer cover and high flow refuge for CFS. The structures may also provide a resting area for up-migrating adult salmonids negotiating the channel and high flow refuge for juvenile salmonids.						
Overhanging bank vegetation would be created in the next downstream pool. In this pool, vertical banks would be created using a series of stacked coir. These coir blocks would be interplanted with large-diameter (approximately 2- to 3-inch) willow and alder pole cuttings placed horizontally into the stacked blocks. The blocks are designed to degrade within 3 to 6 years leaving behind a dense network of overhanging roots and riparian vegetation. The willow and alder poles would be planted randomly at 18-inch spacing, at elevations ranging from 1 to 4 feet above the mean summer water level. Willow species would include sandbar willow, arroyo willow, and red willow (Salix exigua, S.lasiolepis, and S. laevigata, respectively). Santa Barbara sedge (Carex barbarae) and California blackberry (Rubus ursinus) would also be planted in this area. Each of these species has a different growth form; planting a range of species would increase the likelihood of successful establishment of summer CFS habitat.						
The objective of this planting technique is to establish dense vegetation over the banks and into the river channel. Within a few years after planting, the willows would develop shoots and stems that provide CFS summer habitat at water levels, and targeted at the summer mean flow level. The willow roots would form a dense, organic matrix in the bank.						
CFS habitat mitigation features shall be monitored for a period of 5 years to assess the mitigation's effectiveness. The performance criterion is reestablishment of a minimum of 60 linear feet of CFS summer habitat with overhanging vegetation (willows, sedge, herbs, vines, etc.) in contact with or extending below the water surface during mean summer flow conditions. The County shall submit annual monitoring reports to the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) documenting the progress toward meeting the mitigation success criteria. This report shall detail (1) the area of CFS habitat affected during construction; (2) the amount of habitat created; (3) comparison to vegetation performance criteria and an explanation of failure to meet such criteria, if any; and (4) other pertinent information.						
If criteria are not met within 5 years after construction of the habitat features, USFWS and CDFW shall be contacted to discuss if monitoring should continue. If monitoring continues						

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
but criteria are not met within 10 years, then the mitigation shall be determined a failure and the County would develop and implement an alternative mitigation plan.						
BIO-1b: Protection of California Freshwater Shrimp during Channel Dewatering. a. All construction personnel shall attend an environmental education program delivered by a *USFWS or* CDFW- approved biologist prior to working on the project site. The program shall include an explanation of how to best avoid harm to CFS. The - approved biologist(s) shall conduct a training session that would be scheduled as a mandatory informational field meeting for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of project maps showing areas where minimization and avoidance measures are being implemented. b. Only a USFWS or CDFW-approved biologist with experience in CFS capture and handling shall participate in the capture, handling, and monitoring of CFS. Following installation of any water diversion structures, and prior to the placement of fill, an approved biologist shall perform surveys for any CFS trapped in the project site vicinity, and collect and transfer them to the nearest suitable habitat downstream of the work area. During holding and transportation, CFS shall be held in stream water collected from the site. c. Before removal and relocation begins, the biologist would identify the most appropriate release location(s). Release locations should offer ample habitat for CFS and should be selected to minimize the likelihood of reentering the work area. Suitable habitat is defined as creek sections that shall remain wet over the summer and where banks are structurally diverse with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation. d. Relocation activities would be performed during the morning when temperatures are coolest. Air and water temperatures shall be periodically measured and dewatering activities would cease when water temperatures exceed those allowed by CDFW and USFWS. e. If CFS are relocated from the project site vicinity in the Napa River, the following procedure shall be used: i. Handling of shrimp would be minimized. However, when handling is necessary, hands and nets shall be wetted prior to handling. ii. Any captured CFS would be immediately placed in an aerated container with a lid						

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
in cool, shaded water. Aeration shall be provided with a battery powered external bubbler. A thermometer shall be placed in each holding container and partial water changes shall be conducted as necessary to maintain a stable water temperature following CDFW and National Marine Fisheries Service (NMFS) Guidelines. CFS shall not be held more than 30 minutes. iii. All captured CFS shall be moved directly to the nearest suitable habitat in the same reach of the creek, as identified in Item (d) above. iv. The County shall report the number of captures, releases, injuries, and mortalities to USFWS and CDFW within 24 hours.						
BIO-2a: Fish Passage. The existing project site exhibits a barrier to fish passage in low and moderate flow conditions. After the project is constructed, fish passage within the Napa River channel shall be substantially improved by the construction of four step pools and one entrance riffle. The project shall be designed to comply with all state and federal fish passage guidelines. Permit applications and approvals shall be obtained from the National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (CDFW).	Napa County Public Works Department	Napa County Public Works Department	Pre-construction			
BIO-2b: Protection of Fish during Channel Dewatering. a. All construction personnel shall attend an environmental education program delivered by a USFWS or CDFW-approved biologist prior to working on the project site. The program shall include an explanation as how to best avoid harm to salmonid species. The approved biologist(s) shall conduct a training session that would be scheduled as a mandatory informational field meeting for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of project maps showing areas where minimization and avoidance measures are being implemented. b. Only a USFWS *or* CDFW-approved biologist with experience in salmonid fish capture and handling shall participate in the capture, handling, and monitoring. Following installation of any water diversion structures, and prior to the placement of fill, a CDFW-approved biologist shall perform surveys for any fish in the project site vicinity, collect, and transfer them to the nearest suitable habitat downstream of the work area. During holding and transportation, fish would be held in stream water collected from the site. c. Before removal and relocation begins, the biologist shall identify the most appropriate	Napa County Public Works Department	Napa County Public Works Department	Prior to and during construction activities			

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
release location(s). Release locations should offer ample habitat for salmonids and should be selected to minimize the likelihood of reentering the work area. Suitable habitat is defined as creek sections that would remain wet over the summer and where banks are structurally diverse with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation. d. Relocation activities shall be performed during the morning when temperatures are coolest. Air and water temperatures would be periodically measured and dewatering activities would cease when water temperatures exceed those allowed by CDFW and USFWS. e. If salmonids are relocated from the project site vicinity in the Napa River, the following procedure shall be used: i. Handling of fish would be minimized. However, when handling is necessary, hands and nets would be wetted prior to handling. ii. Any captured fish would be immediately placed in an aerated container with a lid in cool, shaded water. Aeration would be provided with a battery powered external bubbler. A thermometer would be placed in each holding container and partial water changes would be conducted as necessary to maintain a stable water temperature following CDFW and NMFS guidelines. Fish would not be held more than 30 minutes. iii. All captured fish would be moved directly to the nearest suitable habitat in the same reach of the creek, as identified in (d) above. iv. The County shall report the number of captures, releases, injuries, and mortalities to the and CDFW within 24 hours.						
BIO-3: Pre-Construction Surveys for Adult Western Pond Turtle (WPT) and Nests. Surveys for WPT and their nests shall be conducted before construction begins. If WPT nests are found, a 100-foot buffer shall be established around the location of the nests until the young have left the nest, as determined by a qualified biologist. While nests are often difficult to find, the surveys would minimize the potential for nest sites to be disturbed. With these measures in place, impacts would be reduced to the extent feasible and are expected to be less than significant. In the long term, the proposed project is not expected to have substantial negative or beneficial effects on WPT because proposed project activities are not anticipated to substantially improve habitat for this species. This mitigation measure would reduce impacts on WPT to less-than-significant levels.	Napa County Public Works Department	Napa County Public Works Department	Prior to construction			

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
BIO-4: Pre-Construction Surveys for Special-Status Amphibians including California Red-Legged Frog (CRLF). Surveys for CRLF and other special-status amphibians shall be conducted before construction begins. In the unlikely event CRLF eggs or tadpoles are found, a 100-foot buffer shall be established around the location until juveniles disperse from the breeding site, as determined by a qualified biologist. If adults are present in the construction area, work shall be stopped until individuals are allowed to disperse on their own volition or the species is relocated by a qualified biologist with permission to handle CRLF. With these measures in place, the impact for CRLF would be reduced to a less-than-significant level.	Napa County Public Works Department	Napa County Public Works Department	Prior to construction			
BIO-5: Project Compliance with All State and Federal Permits. The project would affect a number of species that fall under the jurisdiction of CDFW, USFWS, and NMFS. Each of these permits would be reviewed by agency experts in conservation of these sensitive species. The federal permits granted under Section 404 of the Clean Water Act would be required for the construction of the project. The State of California would also have to issue a streambed alteration and agreement for the project. The project shall attain and comply with all state and federal permits for the project. Implementation of this mitigation would reduce the impacts on candidate, sensitive, or special-status species to less-than-significant levels.	Napa County Public Works Department	Napa County Public Works Department	Prior to construction			
BIO-6: Restoration of Riparian Habitat On-Site. The County shall restore 0.42 acre of riparian habitat on-site. This would include planting within the rock slope protection placed on the channel banks and planting the channel terraces. Planting within the site shall occur in three general planting zones: riparian, riparian canopy, and upland. Riparian zone is the zone nearest to the channel flow and represents the planting that shall be completed around the pools, habitat structures, and riffle edges. This zone is comprised of willow and alder species with sedges and California blackberry mixed in. The second zone, riparian canopy, is comprised of larger canopy type trees like valley oak, sycamore, Fremont cottonwood, and buckeye. Lost trees will be replaced at a 3:1 ratio with 5 gallon trees so that a minimum of 9 buckeyes and 6 oaks will be planted as mitigation for the lost trees. The third zone is upland species that shall be planted along the roadway edge and on the fill slopes. This zone shall consist of grass seeding as well as the seeding of upland species such as coyote brush and California sage plants that are drought-resistant and expected to need minor irrigation low/overhanging bank area and transitional bank area. The low/overhanging bank area shall extend in a 6-foot-wide band along the full extent of both banks where Rock Slope Protection (RSP) would be installed. Planting in this zone shall consist of large-diameter (approximately 2- to 3-inch) willow pole cuttings placed horizontally into the bank, between the rocks installed for the RSP. Willow stakes shall be planted in conjunction with the placement of RSP, not after RSP has already been placed.	Napa County Public Works Department	Napa County Public Works Department	5-years post-construction			

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
The willow poles shall be planted randomly at 18-inch spacing, at elevations ranging from 1 to 3 feet above the mean summer water level. Willow species shall include sandbar willow, arroyo willow, and red willow (Salix exigua, S. lasiolepis, and S. laevigata, respectively). Santa Barbara sedge and California blackberry shall also be planted in this area. Transitional, mid-slope revegetation on both channel banks shall include native trees, shrubs, and understory vegetation including California blackberry, snowberry, California wild rose, and Santa Barbara sedge. Within 5 years, the restored areas shall contain a minimum absolute coverage of 60 percent in the tree stratum and 30 percent cover in the shrub stratum. The restored habitat shall contain a minimum of three native woody vines, shrubs, or trees species that individually account for at least 10 percent cover. Remedial actions, such as replanting, shall be implemented to ensure that the cover objectives are met. The County shall submit annual reports for 5 years to CDFW documenting the extent of riparian habitat restored. This mitigation measure would reduce impacts on riparian habitats to less-than-significant levels.						
Cultural Resources						
CULT-1: Due to the archaeological sensitivity of the Area of Project Effect (APE) for the presence of archaeological resources and because the May 2014 GANDA investigation did not involve subsurface investigations, there remains some potential that archaeological resources may be encountered during construction. As such, an archaeological monitor shall be present during initial ground disturbance to train workers to be aware of the remote possibility of encountering archaeological artifacts and/or human remains. If there is an unanticipated discovery of archaeological deposits or remains during project implementation, construction crews shall stop all work within 100 feet of the discovery until a qualified archaeologist can assess the discovery and provide recommendations. This mitigation would reduce any potential impacts on archaeological resources to a less-than-significant level.	Napa County Public Works Department	Napa County Public Works Department	During construction			
Geology and Soils						
GEO-1: Mitigation measures for liquefaction shall include construction of stiffened concrete and steel rebar foundations capable of resisting deformation due to underlying liquefiable materials, or construction of a deep pile foundation that would penetrate through potentially liquefiable sediments with the inclusion of a stiffened concrete and steel rebar pile cap. Inclusion of these mitigation measures would reduce the impact of seismic-related ground failure to a less-than-significant level.	Napa County Public Works Department	Napa County Public Works Department	Prior to Construction Plan approval			
GEO-2: The County shall install erosion control blankets on exposed stream banks, plant	Napa County Public	Napa County Public	During and post-			

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
native plant species, and use silt fences, straw wattles, and other erosion control measures and best management practices (BMPs) as identified during design of the project. The design and construction of a new bridge and engineered fill soils would mitigate hazards associated with failure of the existing culvert and associated fill soils.	Works Department	Works Department	construction			
Hazards and Hazardous Materials						
HAZARDS-1: The County shall notify affected residents at least 2 months prior to construction about the timing and duration of required use of the temporary access road. All residents shall be given the name and contact information (24-hour) of a contact person should any access problems occur during required use of this road.	Napa County Public Works Department	Napa County Public Works Department	Prior to construction			
HAZARDS-2: The County shall notify the Calistoga Police and Fire Departments and the County Sheriff about the construction of the temporary access road so that they know about it in case of the need for any emergency response. The notification shall occur at least 2 weeks prior to implementation of the temporary access road.	Napa County Public Works Department	Napa County Public Works Department	Prior to construction			
Noise						
NOISE-1: To reduce the potential for noise impacts resulting from project construction, the following measures should be implemented during project construction: ▪ Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment. ▪ Prohibit all unnecessary idling of internal combustion engines. ▪ Locate stationary noise-generating equipment as far as possible from adjacent residential land uses. ▪ Locate staging areas and construction material areas as far away as possible from adjacent residential land uses. ▪ Use "quiet" models of air compressors and other stationary noise sources (i.e., generator) where technology exists. ▪ Acoustically shield stationary equipment from adjacent residential land uses. Noise barriers or acoustical enclosures shall be constructed to reduce nighttime generator noise to less than 60 dBA Lmax at adjacent residential land uses. ▪ The contractor should prepare a detailed construction plan identifying the schedule for major noise-generating construction activities and distribute this plan to adjacent noise-sensitive receptors. The construction plan should also list the construction noise	Napa County Public Works Department	Napa County Public Works Department	During construction			

MITIGATION MONITORING AND REPORTING PROGRAM

Mitigation Measure	Party Responsible for Ensuring Implementation	Party Responsible for Monitoring	Monitoring Timing	Compliance Verification		
				Initial	Date	Project/ Comments
reduction measures identified in this study. The construction contractor shall designate a "construction liaison" who would be responsible for responding to any local complaints about construction noise. The liaison shall determine the cause of the noise complaints (e.g., starting too early, bad muffler, etc.) and shall institute reasonable measures to correct the problem. The construction contractor shall conspicuously post a telephone number for the liaison at the construction site. ▪ The construction contractor shall hold a preconstruction meeting with the job inspectors and the general contractor/on-site project manager to confirm that noise mitigation and practices (including construction hours, construction schedule, and construction liaison) are completed. All of the above measures shall be included in the contract specifications that shall be reviewed and approved by the Napa County Department of Public Works prior to the start of construction. The above measures would reduce noise generated by the construction of the project to the extent feasible for the project's size. Implementation of Mitigation Measure NOISE-1 would reduce the project-generated noise impact to a less-than-significant level.						
NOISE-2: See Mitigation Measure NOISE-1. All of the above measures discussed in Mitigation Measure NOISE-1 shall be included in the contract specifications that shall be reviewed and approved by the Napa County Department of Public Works prior to the start of construction. The above measures would reduce noise generated by the construction of the project to the extent feasible for the project's size. Implementation of Mitigation Measure NOISE-2 would reduce the project's temporary construction noise impact to a less-than-significant level.	Napa County Public Works Department	Napa County Public Works Department	During construction			

APPENDIX B
Applicant's Approval of Mitigation Measures

We agree to complete the following mitigation measures:

Mitigation Measure AIR-1: The construction contractor shall institute a dust control program, which shall be submitted to the Napa County Public Works Department and approved prior to any construction activity. Elements of the dust control program shall include, but not necessarily be limited to, the following:

- *All exposed surfaces (i.e., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.*
- *All haul trucks transporting soil, sand, or other loose material off-site shall have such loads covered.*
- *All visible mud or dirt tracked out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping shall be prohibited.*
- *All vehicle speeds on unpaved roads shall be limited to 15 miles per hour.*
- *Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.*
- *All construction equipment shall be maintained and properly tuned in accordance with the manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.*
- *A publicly visible sign shall be posted listing the telephone number and person to contact regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Bay Area Air Quality Management District (BAAQMD) phone number shall also be visible to ensure compliance with applicable regulations.*

Implementation of Mitigation Measure AIR-1 would reduce the potential impact of construction-period fugitive dust to a less-than-significant level and also reduce construction-period emissions.

Mitigation Measure BIO-1a: Restoration of California Freshwater Shrimp Habitat On-Site. The County shall provide compensatory mitigation for the loss of 17 linear feet of good California freshwater shrimp (CFS) summer habitat by establishing a total of 60 feet of undercut bank and 90 feet of overhanging vegetation habitat. These habitat features would be created in the two proposed pools downstream of the new bridge. The first pool would be used to recreate undercut bank habitat by using a series of constructed wooden lunker structures. These structures are designed to provide both good summer and moderate to good winter habitat. The objective of these structures is to create cover and spaces that would provide summer cover and high flow

refuge for CFS. The structures may also provide a resting area for up-migrating adult salmonids negotiating the channel and high flow refuge for juvenile salmonids.

Overhanging bank vegetation would be created in the next downstream pool. In this pool, vertical banks would be created using a series of stacked coir blocks. These coir blocks would be interplanted with large-diameter (approximately 2- to 3-inch) willow and alder pole cuttings placed horizontally into the stacked blocks. The blocks are designed to degrade within 3 to 6 years leaving behind a dense network of overhanging roots and riparian vegetation. The willow and alder poles would be planted randomly at 18-inch spacing, at elevations ranging from 1 to 4 feet above the mean summer water level. Willow species would include sandbar willow, arroyo willow, and red willow (Salix exigua, S.lasiolepis, and S. laevigata, respectively). Santa Barbara sedge (Carex barbarae) and California blackberry (Rubus ursinus) would also be planted in this area. Each of these species has a different growth form; planting a range of species would increase the likelihood of successful establishment of summer CFS habitat.

The objective of this planting technique is to establish dense vegetation over the banks and into the river channel. Within a few years after planting, the willows would develop shoots and stems that provide CFS summer habitat at water levels, and targeted at the summer mean flow level. The willow roots would form a dense, organic matrix in the bank.

CFS habitat mitigation features shall be monitored for a period of 5 years to assess the mitigation's effectiveness. The performance criterion is reestablishment of a minimum of 60 linear feet of CFS summer habitat with overhanging vegetation (willows, sedge, herbs, vines, etc.) in contact with or extending below the water surface during mean summer flow conditions. The County shall submit annual monitoring reports to the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) documenting the progress toward meeting the mitigation success criteria. This report shall detail (1) the area of CFS habitat affected during construction; (2) the amount of habitat created; (3) comparison to vegetation performance criteria and an explanation of failure to meet such criteria, if any; and (4) other pertinent information.

If criteria are not met within 5 years after construction of the habitat features, USFWS and CDFW shall be contacted to discuss if monitoring should continue. If monitoring continues but criteria are not met within 10 years, then the mitigation shall be determined a failure and the County would develop and implement an alternative mitigation plan.

<u>Mitigation Measure BIO-1b</u>: Protection of California Freshwater Shrimp during Channel Dewatering.

a. All construction personnel shall attend an environmental education program delivered by a USFWS or CDFW- approved biologist prior to working on the project site. The program shall include an explanation of how to best avoid harm to CFS. The CDFW-approved biologist(s) shall conduct a training session that would be scheduled as a mandatory informational field meeting for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements

within the context of project maps showing areas where minimization and avoidance measures are being implemented.

b. *Only a USFWS or CDFW-approved biologist with experience in CFS capture and handling shall participate in the capture, handling, and monitoring of CFS. Following installation of any water diversion structures, and prior to the placement of fill, an approved biologist shall perform surveys for any CFS trapped in the project site vicinity, and collect and transfer them to the nearest suitable habitat downstream of the work area. During holding and transportation, CFS shall be held in stream water collected from the site.*

c. *Before removal and relocation begins, the biologist would identify the most appropriate release location(s). Release locations should offer ample habitat for CFS and should be selected to minimize the likelihood of reentering the work area. Suitable habitat is defined as creek sections that shall remain wet over the summer and where banks are structurally diverse with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation.*

d. *Relocation activities would be performed during the morning when temperatures are coolest. Air and water temperatures shall be periodically measured and dewatering activities would cease when water temperatures exceed those allowed by CDFW and USFWS.*

e. *If CFS are relocated from the project site vicinity in the Napa River, the following procedure shall be used:*

    i. *Handling of shrimp would be minimized. However, when handling is necessary, hands and nets shall be wetted prior to handling.*

    ii. *Any captured CFS would be immediately placed in an aerated container with a lid in cool, shaded water. Aeration shall be provided with a battery powered external bubbler. A thermometer shall be placed in each holding container and partial water changes shall be conducted as necessary to maintain a stable water temperature following CDFW and National Marine Fisheries Service (NMFS) Guidelines. CFS shall not be held more than 30 minutes.*

    iii. *All captured CFS shall be moved directly to the nearest suitable habitat in the same reach of the creek, as identified in Item (d) above.*

    iv. *The County shall report the number of captures, releases, injuries, and mortalities to USFWS and CDFW within 24 hours.*

<u>Mitigation Measure BIO-2a</u>: Fish Passage. The existing project site exhibits a barrier to fish passage in low and moderate flow conditions. After the project is constructed, fish passage within the Napa River channel shall be substantially improved by the construction of four step pools and one entrance riffle. The project shall be designed to comply with all state and federal fish passage guidelines. Permit applications and approvals shall be obtained from the National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (CDFW).

Mitigation Measure BIO-2b: Protection of Fish during Channel Dewatering.

a. *All construction personnel shall attend an environmental education program delivered by a USFWS or CDFW-approved biologist prior to working on the project site. The program shall include an explanation as how to best avoid harm to salmonid species. The CDFW-approved biologist(s) shall conduct a training session that would be scheduled as a mandatory informational field meeting for contractors and all construction personnel. The field meeting shall include topics on species identification, life history, descriptions, and habitat requirements during various life stages. Emphasis shall be placed on the importance of the habitat and life stage requirements within the context of project maps showing areas where minimization and avoidance measures are being implemented.*

b. *Only a USFWS or CDFW-approved biologist with experience in salmonid fish capture and handling shall participate in the capture, handling, and monitoring. Following installation of any water diversion structures, and prior to the placement of fill, a CDFW-approved biologist shall perform surveys for any fish in the project site vicinity, collect, and transfer them to the nearest suitable habitat downstream of the work area. During holding and transportation, fish would be held in stream water collected from the site.*

c. *Before removal and relocation begins, the biologist shall identify the most appropriate release location(s). Release locations should offer ample habitat for salmonids and should be selected to minimize the likelihood of reentering the work area. Suitable habitat is defined as creek sections that would remain wet over the summer and where banks are structurally diverse with undercut banks, exposed fine root systems, overhanging woody debris, or overhanging vegetation.*

d. *Relocation activities shall be performed during the morning when temperatures are coolest. Air and water temperatures would be periodically measured and dewatering activities would cease when water temperatures exceed those allowed by CDFW and USFWS.*

e. *If salmonids are relocated from the project site vicinity in the Napa River, the following procedure shall be used:*

    i. *Handling of fish would be minimized. However, when handling is necessary, hands and nets would be wetted prior to handling.*

    ii. *Any captured fish would be immediately placed in an aerated container with a lid in cool, shaded water. Aeration would be provided with a battery powered external bubbler. A thermometer would be placed in each holding container and partial water changes would be conducted as necessary to maintain a stable water temperature following CDFW and NMFS guidelines. Fish would not be held more than 30 minutes.*

    iii. *All captured fish would be moved directly to the nearest suitable habitat in the same reach of the creek, as identified in (d) above.*

    iv. *The County shall report the number of captures, releases, injuries, and mortalities to the and CDFW within 24 hours.*

Mitigation Measure BIO-3: Pre-Construction Surveys for Adult Western Pond Turtle (WPT) and Nests. Surveys for WPT and their nests shall be conducted before construction begins. If WPT nests are found, a 100-foot buffer shall be established around the location of the nests until the young have left the nest, as determined by a qualified biologist. While nests are often difficult to find, the surveys would minimize the potential for nest sites to be disturbed. With these measures in place, impacts would be reduced to the extent feasible and are expected to be less than significant.

In the long term, the proposed project is not expected to have substantial negative or beneficial effects on WPT because proposed project activities are not anticipated to substantially improve habitat for this species. This mitigation measure would reduce impacts on WPT to less-than-significant levels.

Mitigation Measure BIO-4: Pre-Construction Surveys for Special-Status Amphibians including California Red-Legged Frog (CRLF). Surveys for CRLF and other special-status amphibians shall be conducted before construction begins. In the unlikely event CRLF eggs or tadpoles are found, a 100-foot buffer shall be established around the location until juveniles disperse from the breeding site, as determined by a qualified biologist. If adults are present in the construction area, work shall be stopped until individuals are allowed to disperse on their own volition or the species is relocated by a qualified biologist with permission to handle CRLF. With these measures in place, the impact for CRLF would be reduced to a less-than-significant level.

Mitigation Measure BIO-5: Project Compliance with All State and Federal Permits. The project would affect a number of species that fall under the jurisdiction of CDFW, USFWS, and NMFS. Each of these permits would be reviewed by agency experts in conservation of these sensitive species. The federal permits granted under Section 404 of the Clean Water Act would be required for the construction of the project. The State of California would also have to issue a streambed alteration and agreement for the project. The project shall attain and comply with all state and federal permits for the project. Implementation of this mitigation would reduce the impacts on candidate, sensitive, or special-status species to less-than-significant levels.

Mitigation Measure BIO-6: Restoration of Riparian Habitat On-Site. The County shall restore 0.42 acre of riparian habitat on-site. This would include planting within the rock slope protection placed on the channel banks and planting the channel terraces. Planting within the site shall occur in three general planting zones: riparian, riparian canopy, and upland. Riparian zone is the zone nearest to the channel flow and represents the planting that shall be completed around the pools, habitat structures, and riffle edges. This zone is comprised of willow and alder species with sedges and California blackberry mixed in. The second zone, riparian canopy, is comprised of larger canopy type trees like valley oak, sycamore, Fremont cottonwood, and buckeye. Lost trees will be replaced at a 3:1 ratio with 5 gallon trees so that a minimum of 9 buckeyes and 6 oaks will be planted as mitigation for the lost trees. The third zone is upland species that shall be planted along the roadway edge and on the fill slopes. This zone shall consist of grass seeding as well as the seeding of upland species such as coyote brush and California sage plants that are drought-resistant and expected to need minor irrigation low/overhanging bank area and transitional bank area.

The low/overhanging bank area shall extend in a 6-foot-wide band along the full extent of both banks where Rock Slope Protection (RSP) would be installed. Planting in this zone shall consist of large-diameter (approximately 2- to 3-inch) willow pole cuttings placed horizontally into the bank, between the rocks installed for the RSP. Willow stakes shall be planted in conjunction with the placement of RSP, not after RSP has already been placed. The willow poles shall be planted randomly at 18-inch spacing, at elevations ranging from 1 to 3 feet above the mean summer water level. Willow species shall include sandbar willow, arroyo willow, and red willow (Salix exigua, S. lasiolepis, and S. laevigata, respectively). Santa Barbara sedge and California blackberry shall also be planted in this area. Transitional, mid-slope revegetation on both channel banks shall include native trees, shrubs, and understory vegetation including California blackberry, snowberry, California wild rose, and Santa Barbara sedge.

Within 5 years, the restored areas shall contain a minimum absolute coverage of 60 percent in the tree stratum and 30 percent cover in the shrub stratum. The restored habitat shall contain a minimum of three native woody vines, shrubs, or trees species that individually account for at least 10 percent cover. Remedial actions, such as replanting, shall be implemented to ensure that the cover objectives are met. The County shall submit annual reports for 5 years to CDFW documenting the extent of riparian habitat restored. This mitigation measure would reduce impacts on riparian habitats to less-than-significant levels.

Mitigation Measure CULT-1: Due to the archaeological sensitivity of the Area of Project Effect (APE) for the presence of archaeological resources and because the May 2014 GANDA investigation did not involve subsurface investigations, there remains some potential that archaeological resources may be encountered during construction. As such, an archaeological monitor shall be present during initial ground disturbance to train workers to be aware of the remote possibility of encountering archaeological artifacts and/or human remains. If there is an unanticipated discovery of archaeological deposits or remains during project implementation, construction crews shall stop all work within 100 feet of the discovery until a qualified archaeologist can assess the discovery and provide recommendations. This mitigation would reduce any potential impacts on archaeological resources to a less-than-significant level.

Mitigation Measure GEO-1: Mitigation measures for liquefaction shall include construction of stiffened concrete and steel rebar foundations capable of resisting deformation due to underlying liquefiable materials, or construction of a deep pile foundation that would penetrate through potentially liquefiable sediments with the inclusion of a stiffened concrete and steel rebar pile cap. Inclusion of these mitigation measures would reduce the impact of seismic-related ground failure to a less-than-significant level.

Mitigation Measure GEO-2: The County shall install erosion control blankets on exposed stream banks, plant native plant species, and use silt fences, straw wattles, and other erosion control measures and best management practices (BMPs) as identified during design of the project. The design and construction of a new bridge and engineered fill soils would mitigate hazards associated with failure of the existing culvert and associated fill soils.

Mitigation Measure HAZARDS-1: The County shall notify affected residents at least 2 months prior to construction about the timing and duration of required use of the temporary access road. All residents shall be given the name and contact information (24-hour) of a contact person should any access problems occur during required use of this road.

Mitigation Measure HAZARDS-2: The County shall notify the Calistoga Police and Fire Departments and the County Sheriff about the construction of the temporary access road so that they know about it in case of the need for any emergency response. The notification shall occur at least 2 weeks prior to implementation of the temporary access road.

Mitigation Measure NOISE-1: To reduce the potential for noise impacts resulting from project construction, the following measures should be implemented during project construction:

- *Equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment.*
- *Prohibit all unnecessary idling of internal combustion engines.*
- *Locate stationary noise-generating equipment as far as possible from adjacent residential land uses.*
- *Locate staging areas and construction material areas as far away as possible from adjacent residential land uses.*
- *Use "quiet" models of air compressors and other stationary noise sources (i.e., generator) where technology exists.*
- *Acoustically shield stationary equipment from adjacent residential land uses. Noise barriers or acoustical enclosures shall be constructed to reduce nighttime generator noise to less than 60 dBA L_{max} at adjacent residential land uses.*
- *These requirements will be included in the constructions documents and County will monitor compliance.*
- *The construction contractor must attend the preconstruction meeting scheduled by the County project manager and inspector to confirm that noise mitigation and practices (including construction hours, construction schedule, and construction liaison) are .*

All of the above measures shall be included in the contract specifications that shall be reviewed and approved by the Napa County Department of Public Works prior to the start of construction. The above measures would reduce noise generated by the construction of the project to the extent feasible for the project's size.

Implementation of Mitigation Measure NOISE-1 would reduce the project-generated noise impact to a less-than-significant level.

Mitigation Measure NOISE-2: See Mitigation Measure NOISE-1. All of the above measures discussed in Mitigation Measure NOISE-1 shall be included in the contract specifications that shall be reviewed and approved by the Napa County Department of Public Works prior to the start of construction. The above measures would reduce noise generated by the construction of the project to the extent feasible for the project's size.

Implementation of Mitigation Measure NOISE-2 would reduce the project's temporary construction noise impact to a less-than-significant level.

Signature Mallika Ramachandran

Title: Supervising Civil Engineer

Date: 10/7/14.

APPENDIX C
Biological Data

BIOLOGICAL ASSESSMENT

for the

GREENWOOD AVENUE CULVERT REPLACEMENT PROJECT

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September 16, 2014

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INTRODUCTION

The purpose of this Biological Assessment is to review the proposed Greenwood Avenue Culvert Replacement Project in sufficient detail to determine to what extent the proposed action may affect federally listed species. In addition, the following information is provided to comply with statutory requirements to use the best scientific and commercial information available when assessing the risks posed from proposed federal actions to listed and/or proposed species, and designated and/or proposed critical habitat. This document is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (50 CFR 402; 16 U.S.C. 1536 (c)). The federal action agency is the U.S. Army Corps of Engineers (ACOE).

Threatened, Endangered, Proposed or Candidate Species

Based on a review of the best available scientific data and commercial information, coupled with field verification, the following six species are identified to have potential to be affected by the proposed action:

California freshwater shrimp *(Syncaris pacifica)* ***Endangered***

California red-legged frog (*Rana draytonii*) ***Threatened***

Burke's goldfields (*Lasthenia burkei*) ***Endangered***

Clara Hunt's milk-vetch (*Astragalus claranus*) ***Endangered***

Chinook salmon – Central Valley fall/late fall run Evolutionarily Significant Unit (ESU) (*Oncorhynchus tshawytscha)* ***Candidate***

Steelhead - Central California Coast Distinct Population Segment (DPS) (*Oncorhynchus mykiss*) ***Threatened***

Critical Habitat and Essential Fish Habitat

The action addressed within this document falls within Critical Habitat for Steelhead. The Napa River where the project is located includes waters and substrate necessary for fish spawning, breeding, feeding, and growth to maturity for Pacific salmon that are protected under the Magnuson-Stevens Fishery Conservation and Management Act as Essential Fish Habitat.

Other federally listed species were considered but determined to not have potential to occur. Those species and the analysis of potential occur are discussed in more detail in Table 1 below.

CONSULTATION TO DATE

Project proponents have begun communication with regulatory agencies prior to the submittal of this Biological Assessment.

PROJECT DESCRIPTION

Introduction

The Napa County Department of Public Works (County) proposes to replace an existing corrugated metal pipe culvert, which is located along the Napa River at Greenwood Avenue approximately 1214 feet (ft) west of Myrtledale Road in Calistoga, Napa County, California (Figures 1 and 2). The 15 ft diameter culvert was installed circa 1940 for the construction of Greenwood Avenue over the Napa River. Over time the downstream side of the culvert has eroded to create a 3.5 foot drop in grade. This drop has been determined to be a significant barrier to upstream fish migration. The culvert is also showing signs of rusting and deterioration and requires replacing.

The existing culvert restricts high storm flows. This restriction causes storm flows to back up and flood the adjacent properties. The downstream flow restriction results in regular (i.e. 10 year events) floodplain inundation upstream of Greenwood Avenue. This area is a significant and important section of regionally active upper Napa River floodplain. Frequent back up of flow waters above the culvert and over the roadway have resulted in a sharp drop from the southwest side of the road to the channel bottom, posing a potential hazard to vehicles and pedestrians. The project will replace the existing culvert with a 70-foot-long, 22-foot-wide bridge and performing grade correction of the streambed to improve current floodplain conditions and allow passage of fish in accordance with California Department of Fish and Wildlife (CDFW) guidelines.

This project is not part of a larger project or plan, although the Napa River Sediment Total Maximum Daily Load (TMDL) reduction plan was approved by Environmental Protection Agency (EPA) in 2011 to restore steelhead and Chinook salmon populations which have suffered declines as a result of high concentrations of fine sediment. The resulting grant from the EPA has funded several major restoration projects to improve fish habitat downstream from this project (USFWS 2009b).

Project Design

Implementation of the Greenwood Avenue Culvert Replacement Project (project) will involve removing the 60-ft long, 15-ft diameter corrugated metal culvert and replacing it with a 70-foot-long, 22-foot-wide bridge. Grade correction activities will extend along approximately 200 ft of the Napa River from 20 ft upstream of the culvert to 140 ft downstream of the culvert. The channel in this area is approximately 30- 50 ft wide, however the channel bottom is significantly wider downstream of the culvert. The river banks are 15-21 ft high. The slope along the reach is approximately 1%, with a 3.5 foot drop at the outlet of the culvert.

Greenwood Avenue is a two lane road which dead ends approximately 450 ft east of the project area. The project area is surrounded by rural residential properties and a winery. The existing culvert to be replaced is 15 ft in diameter by 60 ft long. The replacement

bridge will be located in the same footprint as the existing culvert and span approximately 35 ft to each side from the centerline of the existing crossing, for a total distance of 70 ft. Access to the site is limited, and a temporary access road will be required to divert residential traffic around the project area during construction (Figures 3 and 4).

Project construction activities would commence after June 15, 2015, and be completed before October 31, 2015. Construction activities within the Napa River are anticipated to take place between June 15th and October 15th, which corresponds to the time of year when there is little or no precipitation and stream flow is lowest.

Dewatering

As the Napa River is perennial, it is expected that water will be present in the channel and a dewatering plan will be implemented to divert the flow downstream of the project area Dewatering and flow bypass will be required during the majority of construction activities. The proposed dewatering and flow bypass system will collect all of the creek flow from upstream of the project site and deliver it through a pipe to the stream just downstream of the project site. The anticipated length of channel dewatering is approximately 200 linear feet. The pipe would be placed on the streambed at natural grade. The Contractor will develop a dewatering plan and ensure that all materials and equipment will be available for the water diversion and dewatering system prior to the commencement of work. The water bypass and dewatering system will include the following components:

- Screened pump intake with 0.20 inch screen
- Pumping equipment (i.e., submersible pump, generator, fuel supply, and spill containment system, with pump generator and fuel staged away from the creek)
- Impoundment structure (i.e. cofferdam constructed of sandbags lined with poly sheeting to prevent seepage)
- Bypass piping/pipeline
- Point of discharge protection

Once any upstream flow is diverted, any standing water within the construction area would be pumped out of the creek bed and discharged onto the ground away from the stream to allow for infiltration into the ground. Upon project completion, the diversion pipe and cofferdam material will be removed from the channel.

USGS 7.5' Quad:
Calistoga (1993)

Legal Description:
T9N, R7W Section 35

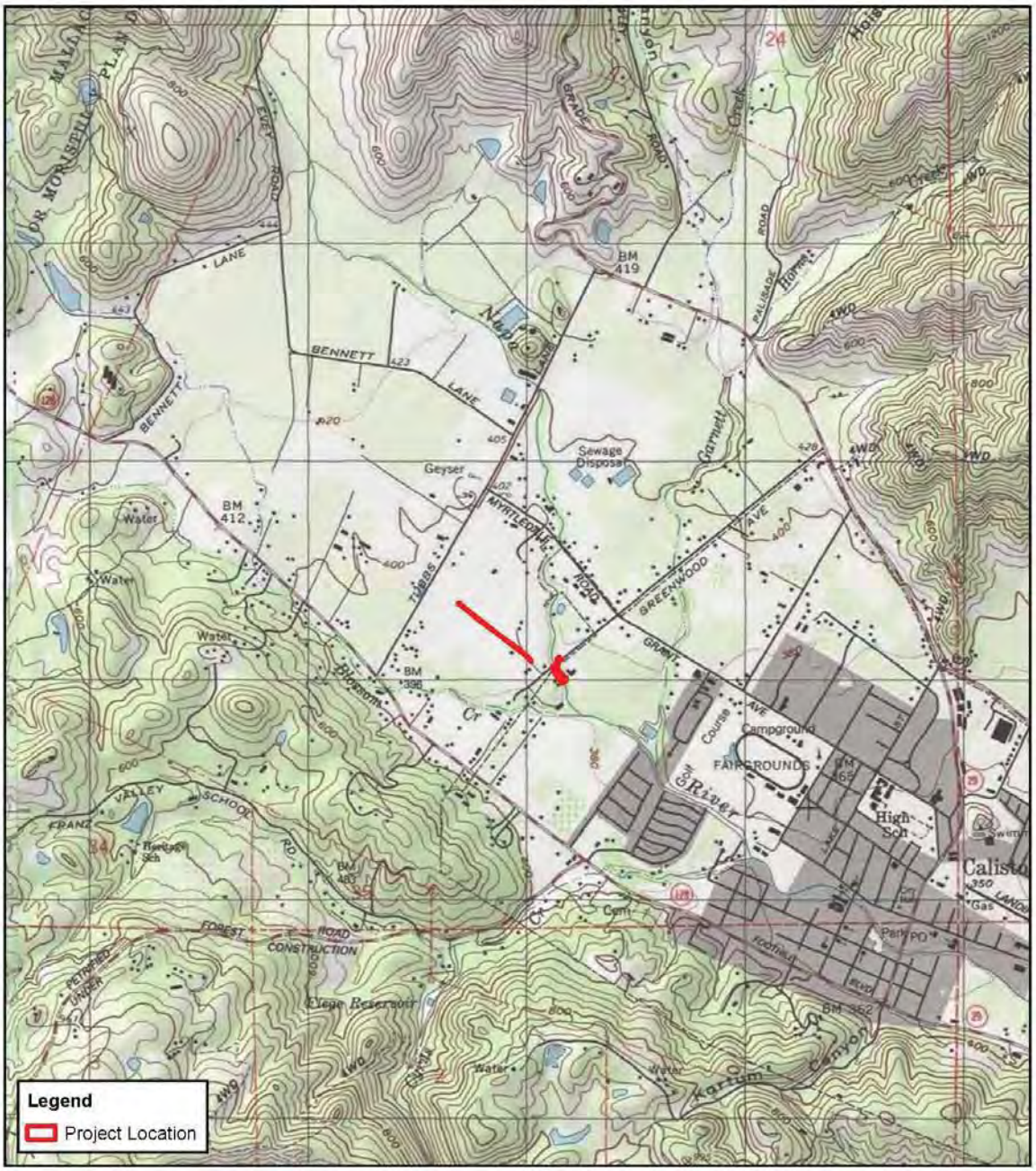
GANDA

Figure 1. Project Vicinity Map
Greenwood Avenue
Culvert Replacement

Napa County, CA

N

0 20,000 40,000 Feet



USGS 7.5' Quad:
Calistoga (1993)

Legal Description:
T9N, R7W Section 35

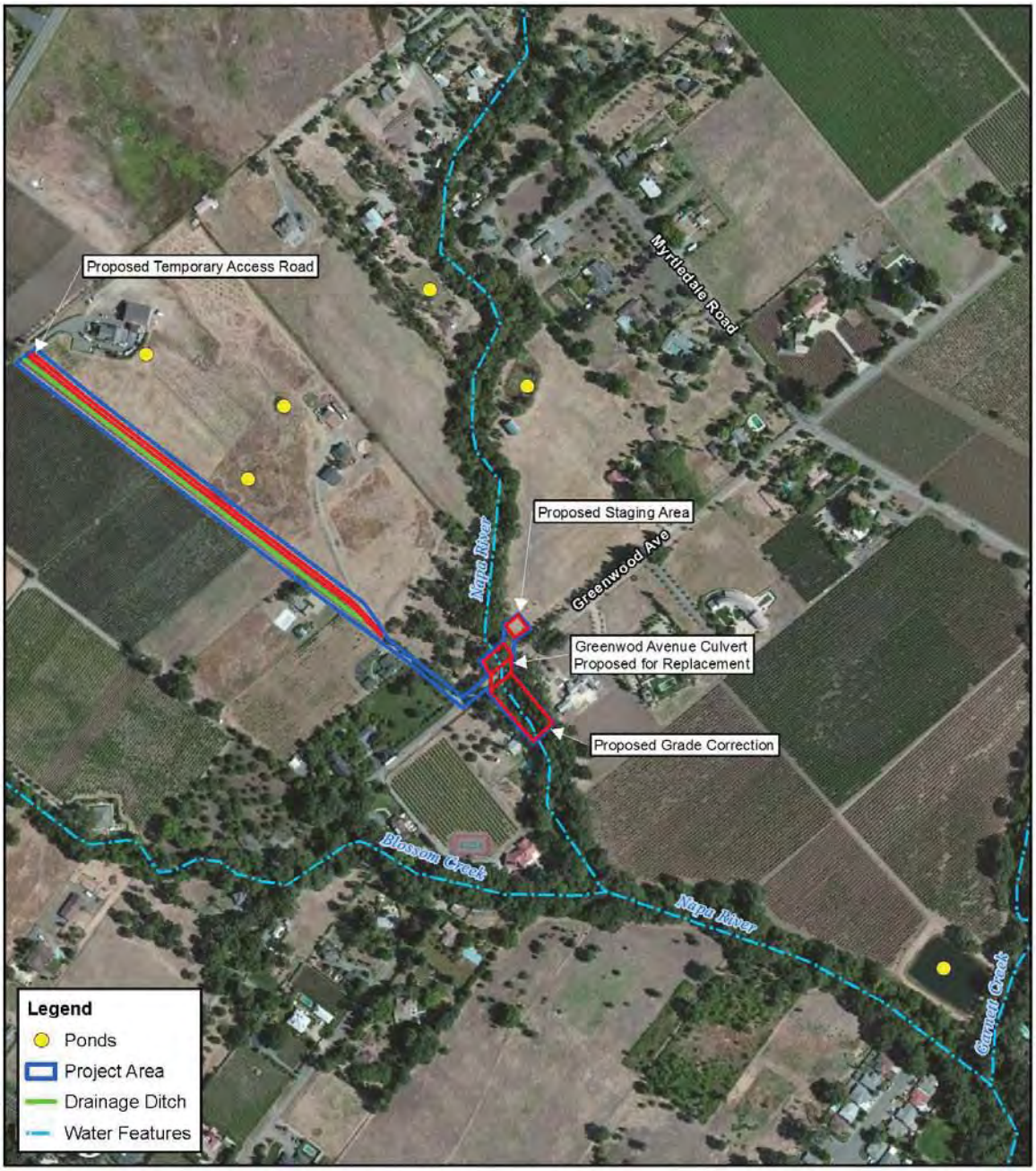
GANDA

Figure 2. Project Location Map
Greenwood Avenue
Culvert Replacement

Napa County, CA

N

0 1,000 2,000 Feet



USGS 7.5' Quad:
Calistoga (1993)

Legal Description:
T9N, R7W Section 35

GANDA

Figure 3. Project Area (Action Area)
Greenwood Avenue
Culvert Replacement

Napa County, CA

N

0 100 200
Feet

USGS 7.5' Quad:
Calistoga (1993)

Legal Description:
T9N, R7W Section 35

GANDA

Figure 4. Detour Routes
Greenwood Avenue
Culvert Replacement

Napa County, CA

N

0 100 200
Feet

Culvert Replacement and Streambed Grade Correction

The existing culvert and asphalt road above the culvert would be demolished and the rubble would be hauled off site to an appropriate refuse disposal facility. Demolition of the affected portion of the road would generate approximately 200 cubic yards of asphalt waste. The culvert would be demolished and hauled offsite. Dirt from the culvert fill would be temporarily stored on an adjacent property adjoining the project on the northeast side (Figure 3). Suitable soil would later be used as backfill fill for the new bridge (about 200 cubic yards). Equipment will be staged on the paved roadway and unpaved road shoulders near the project area. An additional staging area, approximately 30 feet by 30 feet, will be established to store equipment in the yard of the adjoining property to the northeast (Figure 3). Generally, large trees on the site are being avoided however the project will require the removal of three trees; 2 white oaks (*Quercus alba*) (10 and 12" diameter) and one California buckeye (*Aesculus californica*) (12' diameter).

Once the culvert, fill, and road are removed from the site, a temporary dirt access road/ramp to the channel bed will be constructed from Greenwood Avenue on the eastern side of the river. The ramp will be approximately 50 ft long and 20 ft wide.

The grade correction of the streambed will be accomplished from within the streambed. The design will follow fish passage guidelines consistent with the California Salmonid Stream Restoration Manual (CDFW 2003) and the National Marine Fisheries Service (NMFS) Anadramous Salmonid Passage Facility Design (NMFS 2008). The channel will be configured into a series of four step pools and a downstream riffle with rock weirs constructed throughout the sequences to ensure that the channel features are stable over time (Appendix A). Incorporated into the channel reconstruction will be a series of habitat features designed to mitigate the loss of existing stream and pool habitat that will occur during replacement.

The streambed grade correction will include grading the channel bank, installing boulders across the channel bed and banks, filling of voids between boulders with either engineered streambed material, coir log stuffing and/or native soil. Bio-degradable erosion control fabric, rock slope protection fabric, and rock rip-rap will be installed on the banks. Live willow cuttings will be placed in the interstitial space within the boulders at the appropriate lower bank elevations.

Installation of the new bridge will require pile driving to strengthen the foundation. It is anticipated that a series of steel H-piles will be installed in two rows within the footprint of the proposed bridge. No in-water pile driving is required. The anticipated duration of pile driving activities is eight hours per day for seven to ten work days.

Once the concrete foundation is completed the bridge will be assembled and craned into place. Drainage will be installed along the sides and new wingwalls constructed. Backfill will be placed and compacted and road base and asphalt installed at 18 inches depth.

Erosion Control

In order to provide short term erosion control but also not construct an entirely riprap-lined channel, the project design combines rock placement with other "softer" erosion control and habitat features. The project will integrate vegetation and biodegradable products such as fiber blankets, bio-blocks, and coir products. The biodegradable products are used to provide temporary erosion protection and allow for the vegetation to mature and provide the primary erosion control within 3 to 5 years, giving re-vegetation plantings time to establish.

Floodplain features and impacted bank slopes will be covered with biodegradable erosion control blankets made of coir fiber. Typically, the fiber begins to degrade within 2 to 3 years but takes up to 6+ years to fully disintegrate. Channel erosion potential would change over time as the planted vegetation matures. Typically, the erosion potential of the channel and banks decreases as the project ages, and mature, stable vegetation is established. The channel banks along the riffles and grade control structures will be planted with locally sourced willow stakes to ensure that vegetation cover becomes part of the overall channel structure. Willow stakes will also be planted in the deep trenches associated with the weir and keyway construction. The trenches will be of sufficient depth so that willow planting could have access to underflow and groundwater resources. Additional riparian planting will be completed on the flood plains and channel banks to insure long term stability of the channel. Anchored logs will be incorporated into the pools and grade control structures to dissipate erosive energy and create habitat complexity. These logs will be anchored using large stone counter weights.

Detour

Greenwood Avenue west of the culvert is a "no outlet" road that services 10 residential parcels. Construction activities will require closing Greenwood Road temporarily. The detour will follow the existing roads along Myrtledale Road, Tubbs Lane, and a private driveway where it will then head southeast overland through the Envy Wines Estate Winery property, paralleling a drainage ditch for approximately 1437 ft where it will connect with an existing gravel driveway and connect with Greenwood Avenue approximately 100 feet west of the closure (Figure 4; Appendix B). A temporary access road will need to be constructed for the portion of the detour which runs overland through the winery property. The temporary access road will parallel a drainage ditch on the grounds of the winery. The road will be graded a minimum of 10 ft across and will be located a minimum of 5 ft from the drainage ditch.

During the use of the road a water truck will be used for dust suppression, 2-3 times per day to keep the dust down. The temporary road will be posted with speed limits and caution messages. This road would be used only by residents and community service vehicles (mail, garbage, recycling).

ACTION AREA

The *Action Area* is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR §402.02). For the purposes of this project, the Action Area (also referred to as project area) encompasses all work areas, temporary access paths, and equipment staging areas. The temporary impacts of this project will affect 90 ft within the road right of way, 200 ft of impacts to the streambed and banks of the Napa River, and 1,437 ft to create the overland access road, for a total of approximately 3.15 acres of temporary impacts (Figure 3). The project will not expand the roadway crossing and will enhance the project area by improving fish passage crossing and steam habitat below the Greenwood Avenue Crossing. The temporary access road will be removed and the area restored upon completion of this project. Therefore no permanent impacts are anticipated from this project.

AVOIDANCE AND MINIMIZATION MEASURES

The following is a list of the Avoidance and Minimization Measures incorporated into the project to reduce and/or avoid impacts to federally listed species and their habitats:

1. At least 15 days prior to the commencement of any activities, The County will submit to USFWS and NMFS the names and credentials of biologists proposed to conduct preconstruction surveys and monitoring, in order to receive for written approval of those biologists from the agencies.

2. A USFWS-approved biologist will survey the project area within two weeks prior to the onset of work activities for California red-legged frog and California freshwater shrimp. This may require one survey prior to building the access road and a second survey prior to beginning work at the culvert. If any life stages of any of these species are found, the approved biologist will contact USFWS. Implementation of an approved rescue plan for these species as described in Measure 10 below will be implemented. The biologist will also report any observations of other special status species.

3. A USFWS-approved biologist will survey the area for the proposed access road and staging area during the blooming periods for Burke's goldfields (April to June) and Clara Hunt's milk-vetch (March to April). If either of these species is found, the approved biologist will contact USFWS to determine the appropriate course of action. If the Service approves moving plants, the approved biologist shall be allowed sufficient time to move individuals from the work areas before work activities begin. If any of these species are found nearby, but outside a proposed work area, it will not be disturbed and USFWS will be notified. The biologist will also report any observations of other special status species.

4. Wildlife exclusion fencing will be installed adjacent to the temporary access road in the vicinity of the ditch and ponds.

5. A NMFS-approved biologist will survey the project area within two weeks prior to the onset of work activities within the Napa River for Chinook salmon Central Valley fall/late fall run ESU and Steelhead Central California Coast DPS. If either of these species is discovered, the biologist will contact NMFS. Implementation of an approved rescue plan as described in Measure 10 below will be implemented. The biologist will also report any observations of other special status species.

6. The amount of construction related disturbance in natural areas including vegetated areas and the Napa River shall be limited to the extent practicable. The project footprint should be minimized to the extent practicable. The number of access routes, number and size of staging areas, and the total area of the activity will be limited to the minimum necessary to achieve the project goal. Routes and boundaries will be clearly demarcated, and these areas will be outside of riparian and wetland areas. Where impacts occur in staging areas and access routes, restoration will be performed.

7. Dust, erosion, and sedimentation control will follow the 2010 Caltrans Standard Specifications (http://www.dot.ca.gov/hq/esc/standards.php).

8. Before any work activities begin on the project, a USFWS and/or NMFS-approved biologist will conduct a training session for all construction personnel. The training will include a description of the listed species with potential to occur, their habitat, and the applicable regulations, species protection measures, fines and penalties, and procedures to be followed if these species are observed on-site. They will also describe the general measures that will be implemented to conserve the species as they relate to the project and the boundaries within which the project may be accomplished (i.e. work areas).

9. Work in Napa River channel shall be restricted to the period from June 15th to October 15th during times when stream flow would be the lowest.

10. A shrimp rescue plan, frog rescue plan and fish rescue plan will be developed by qualified biologists to implement during dewatering activities and any other construction activities which may cause potential take of these species. Individuals will be relocated the shortest distance possible to habitat unaffected by construction activities, if needed. Within occupied habitat, capture, handling, exclusion, and relocation activities will be completed no earlier than 48 hours before construction begins to minimize the probability that listed species will recolonize the affected areas. During in-water activities, the project biologist will continuously monitor all activities (e.g., installation and removal of the cofferdams and pipes for dewatering) for the purpose of removing and relocating

any listed species that were not detected or could not be removed and relocated prior to construction. The project biologist will be present at the work site until all listed species have been removed and relocated. The project biologist will maintain detailed records of the species, numbers, life stages, and size classes of listed species observed, collected, relocated, injured, and killed; as well as recording the date and time of each activity or observation and provide this information to USFWS and NMFS as necessary.

11. Construction of the temporary water diversion will proceed from the downstream to the upstream end of the channel. Flow will not be diverted from the stream channel until the temporary channel is complete and all applicable soil stabilization/control measures are in place. Any intake for pumps will be covered with 0.20 in mesh screen, perforated container, or other similar material, to prevent intake of aquatic life. The length of the pipe would be the minimum necessary to safely convey the flow through the construction site, and would be placed on the streambed at natural grade. Diverted flows would be returned to the stream channel immediately downstream of the work area. Once any upstream flow is diverted, any standing water within the construction area would be pumped out of the streambed and discharged to the ground away from the stream to allow for infiltration into the ground. Upon project completion, the diversion pipe and cofferdam material would be removed from the channel.

12. The extent of stream channel dewatering will be limited to the minimum necessary to support construction activities. Monitoring of the stream diversion will occur periodically each day such devices are in operation to ensure proper function.

13. Disturbance and removal of aquatic vegetation will be minimized to the extent practicable. Downed trees, stumps and other basking sites and refuges within these aquatic habitats should remain undisturbed as much as possible.

14. Immediately upon completion of in-channel work, temporary fills, diversion cofferdams, and other in-channel structures will be removed in a manner that minimizes disturbance to downstream flows and water quality.

15. A USFWS-approved biologist will be present until all listed species have been relocated. After this time, a biological monitor, will visit the site periodically will have the authority to halt any work activity that might result in impacts that exceed the levels anticipated by USFWS and NMFS during review of the proposed action. If work is stopped, the USFWS and/or NMFS will be notified immediately by an approved biologist or on-site monitor.

16. Re-grading design of the streambed should include features to provide suitable summer and/or or winter habitat for California freshwater shrimp. The

recommended features include providing areas with characteristics of suitable freshwater shrimp habitat including:

- Water depth of 1-4 feet deep;
- A streambank undercut greater than 6 inches and preferably at least 2 feet undercut for winter habitat;
- Fine and course plant roots penetrating into the wetted portion of the undercut bank;
- Streambank vegetation of dogwood, blackberry cane, ferns or other plants that tend to have branches lying submerged in the water adjacent to the undercut bank; and
- No perceivable current flowing through the undercut.

The preferred areas to include these features include immediately downstream and the first pool upstream of the Greenwood Avenue crossing (Cressey 2014).

17. During project activities, all trash will be properly contained, removed from the work areas, and disposed of regularly. Following construction, all trash and construction debris from work areas will be removed.

18. All fueling and maintenance of vehicles and other equipment will be located at least 50' from any riparian habitat, wetland or water body. The County will ensure contamination of habitat does not occur during such operations. If refueling or servicing of equipment within 50 ft of the Napa River is necessary, secondary containment and absorbent pads will be used. Prior to the start of construction a plan will be prepared to ensure a prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

19. Stationary equipment located within or adjacent to Napa River shall be positioned over secondary containment.

20. Hazardous materials will not be stored within 200 ft of the Napa River.

21. Project areas that are disturbed will be revegetated with an appropriate assemblage of native riparian, wetland and upland vegetation.

22. To control erosion during and after project implementation, the County will implement best management practices. Plastic mono-filament netting will not be used. Bio-degradable materials are preferred.

23. Nesting season will be considered February 1 – August 31. Tree removal and vegetation trimming will occur outside of the nesting season to the extent possible. For construction activities that occur during the nesting season, a nesting bird survey will be performed by a qualified biologist within five days prior to the start of construction activities. If there is a lapse in project related work, additional surveys will be conducted. If an active nest is found, the nest tree

will be flagged and a non-disturbance buffer zone will be established. An initial 250 ft buffer will be established for raptors and 50 ft buffer for non-raptors. The non-disturbance buffer zone will be visibly marked to prevent encroachment of construction activities. A qualified biologist may reduce the buffer size based on construction activities and observations of nesting behavior. Active nests will be monitored by the qualified biologist to determine when the nest is no longer active. Buffers will remain in place until the nest is no longer active, when the young have fledged the nest.

24. All steep-walled excavations (trenches and holes) will be covered at the end of the workday. If this is not possible, escape ramps will be established in the holes. Any excavations will be checked for wildlife in the mornings, and a project biologist will be notified if any wildlife is observed prior to resuming construction activities.

25. Any vehicles and equipment left at the project site overnight will be checked visually to ensure that no wildlife will be injured or killed when that equipment is used next. A project biologist will be notified if any wildlife is observed prior to resuming construction activities.

26. No smoking, fires, pets, or firearms are allowed on the job site. The construction zone shall be kept free from litter by providing suitable disposal containers for trash and all construction-generated material wastes.

METHODS

Garcia and Associates biologists conducted a desktop literature review and reconnaissance-level visits to the project site. The literature search included a review of the California Natural Diversity Database (CNDDB) for records of special status species within two miles of the project location (CDFW 2014a); USFWS designated critical habitat within two miles of the Project Area (USFWS 2014a); the official USFWS list of federally endangered, threatened, proposed, and candidate species that may occur within the Calistoga 7.5 minute quadrangle (USFWS 2014b); California Native Plant Society (CNPS) Online Inventory of Rare and Endangered Plants that may occur within the Calistoga 7.5 minute quadrangle (CNPS 2014); National Wetland Inventory (USFWS 2014c) maps; a Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2014); and current project aerial imagery. Vegetation communities were classified based on the descriptions in *A Manual of California Vegetation* (Sawyer et al. 2009).

Two programmatic Biological Opinions (BO) were reviewed: 1) the Programmatic Formal Endangered Species Act Consultation on Issuance of Permits under Section 404 of the Clean Water Act or Authorizations under the Nationwide Permit Program for Projects that May Affect the California Red-legged Frog (hereafter referred to as the CRLF PBO) (USFWS 1999) and 2) Caltrans Programmatic Biological Opinion No.

2013-9731 in October of 2013 from NMFS to cover routine maintenance and repair activities in creeks and rivers within Districts 1, 2, and 4 for federally listed species covered by NMFS (NMFS 2013). An additional Biological Opinion for a nearby project within the Napa River was also reviewed: Biological Opinion for the Proposed Restoration and Bank Stabilization of the Rutherford Reach of the Napa River Project, Napa County, California (Corps File Number 2009-00366N).

Two Recovery Plans produced by USFWS were also reviewed: 1) California freshwater shrimp (*Syncaris pacifica* Holmes 1895) Recovery Plan (USFWS 1998) and 2) Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*) (USFWS 2002).

Two site visits were conducted by GANDA biologists Constance Ganong, Marina Rivieccio, and Sumudu Welaratna on March 31, 2014 and May 1, 2014. The biologists surveyed the location of the culvert replacement, 200 ft downstream and 50 ft upstream of that location, the staging area, and the temporary access road.

RESULTS

Literature Review

The Napa River watershed encompasses 426 square miles of mountains and creeks draining into the broad Napa Valley and south into northern San Francisco Bay. The upper Napa River drains a watershed of approximately 44.3 square miles. Tributary creeks include: Jericho Canyon, Garrett, Blossom, Cyrus, Nash, Ritchie, Mill, Bell Canyon, Dutch Henry, and Selby. The upper Napa River is a fourth order stream and has approximately 11.94 miles of perennial stream according to the USGS Calistoga 7.5 minute quadrangle (USGS 2014).

In the last century, the Napa Valley has rapidly changed from a very rural landscape to a more agricultural landscape with vineyards emerging as the primary land use. The majority of vineyards have been planted along the Napa River, and all of its 48 tributaries creating both direct and indirect impacts to the aquatic and riparian environments. Accompanying roadways and residences have also brought development into previously undisturbed areas of the watershed (Koehler 2002). Although the abundance and distribution of plants and wildlife, especially aquatic species, are believed to have declined substantially, the Napa River and its tributaries support exceptionally diverse and abundant populations of native fish. During sampling efforts by the Napa County Resource Conservation District (Napa RCD) in the lower Napa River from 2009 to 2012, native fish species comprised 98.4% of the catch (Napa RCD 2012).

The Napa RCD has major restoration projects on the Napa River for flood control and habitat improvement, especially for aquatic species. Restoration of the Napa/Sonoma Marsh is underway, opening diked lands to tidal flow at the mouth of the Napa River. The Napa Flood Project located further upstream will restore more than 900 acres of high-value tidal wetlands of the San Francisco Bay Estuary. Upstream the Napa River Rutherford Reach Restoration and Oakville project together are restoring high quality habitat functions to 15 miles of the river (Koehler 2003). In 2011 a fish passage project was completed by eliminating a concrete apron under the Zinfandel Lane Bridge in St. Helena, approximately 7.5 miles downstream from the project area. There is also a coordinated effort to reduce the stormwater runoff from roads throughout the watershed to reduce the sediment loads into the tributaries and the Napa River (Napa RCD 2014).

There are dams on the Napa River mainstem. A survey of Napa River Fish barriers was performed by the Napa RCD in 2001, and there is mention of a footbridge in Calistoga which is downstream of the project as causing problems for fish passage (Koehler and Blank 2011). The Northern Napa River Watershed Plan from 2002 mentions presence of steelhead in the Upper Napa River watershed (Koehler 2002)

Occurrence potentials for plant species were informed by the results of the NRCS Web Soil Survey (NRCS 2014; Appendix C). The soil types within the project area are Bale Loam and Bale Clay Loam, which are typically deep, somewhat poorly drained soils.

Parent material is alluvium derived from rhyolite and/or alluvium derived from igneous rock. The elevation at the project area is approximately 395 feet.

The official species list provided by the Sacramento Office of the USFWS (USFWS 2014b) included 12 federally listed species that occur in or may be affected by projects in the Calistoga 7.5 minute quadrangles (Table 1; Appendix D). The CNDDB search (CDFW 2014) yielded 16 special status species with records of occurrence within two miles of the project area (Table 1; Appendix E). The project occurs within critical habitat for Central California Coast steelhead (*Oncorhynchus mykiss*). Species that have low or no potential to occur in the project area are not discussed further within this document. The potential for each species to occur within the project area was determined using the following criteria:

- *No* potential indicates the project area is outside of the known range of the species, and/or no suitable habitat is present within the project area.
- *Low* potential indicates that records exist from within two miles of the project, but limited suitable habitat is present within the project area.
- *Moderate* potential indicates suitable habitat is present, but the species has not been documented within the project area.
- *High* potential indicates that suitable habitat is present within the project area and occurrences have been documented within the project area or nearby.

Table 1. Special status species with potential to occur in the Greenwood Avenue Culvert Replacement Project Area.

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Invertebrates					
California freshwater shrimp	*Syncaris pacifica*	FE/SE	Endemic to Marin, Napa, and Sonoma counties. Low elevation; low gradient stream pools where riparian cover is moderate. Shallow pools away from main stream pool.	**HP**	**High.** Presence confirmed in the project area by CDFW. Suitable habitat exists at this location (Stillwater Sciences and Dietrich 2002). The nearest CNDDB record is 0.23 mi from the project area within the Napa River from 1990.
Fish					
Chinook salmon-California coastal ESU	*Oncorhynchus tshawytscha*	FT, ST	Anadromous; coastal rivers, streams and creeks from Klamath River to the Russian River basin. Adults need access to natal streams; eggs and fry need cool water with adequate dissolved oxygen and clean gravel; juveniles migrate out to the ocean. Life-history information, especially in southern distribution of ESU, is extremely limited.	**HP**	**None.** This run of chinook salmon is found in coastal rivers from the Klamath to the Russian River basins and is not expected in the San Francisco Bay or its tributaries (CDFW 2014b). There is only one CNDDB record for this ESU in the Van Duzen River watershed, 150 miles from the project areas. The project area is located outside of the designated critical habitat for this species.
Chinook salmon - Central Valley fall, late fall run ESU	*Oncorhynchus tshawytscha*	FSC	Anadromous; migrates through San Francisco Bay and Delta; spawns in upper Sacramento River and tributaries. Adults need access to natal streams; eggs; fry need cool water with adequate dissolved oxygen; clean gravel; juveniles migrate out to the ocean after a few months to a year in the river.	**HP**	**Moderate.** This run of chinook salmon migrates through the Central and North Bay to reach spawning grounds in the Central Valley. The Napa River Chinook population is not formally assigned to any Chinook ESU, however recent genetic analysis has identified the majority of Napa River Chinook sampled belongs to the Central Valley fall, late fall run ESU (Garza and Crandall 2013). Chinook salmon are known to spawn in the Napa River between Yountville and Calistoga (Napa RCD 2005). There are no CNDDB records for this ESU.

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Chinook salmon - Central Valley spring run ESU	*Oncorhynchus tshawytscha*	FT, ST	Anadromous; migrates through San Francisco Bay and Delta; spawns in upper Sacramento River and tributaries. Adults need access to natal streams; eggs; fry need cool water with adequate dissolved oxygen; clean gravel; juveniles migrate out to the ocean after only a few months in the river.	**HP**	**None.** This run of chinook salmon migrates through the Central and North Bay to reach spawning grounds in the Central Valley. Chinook salmon Central Valley spring run ESU are not expected to migrate up the Napa River or its tributaries. The closest CNDDB record is from the Sacramento River watershed 58 miles from the project area. The project area is located outside of the designated critical habitat.
Chinook salmon - Sacramento River winter run ESU	*Oncorhynchus tshawytscha*	FE, SE	Anadromous; migrates through SF Bay and Delta; spawns in upper Sacramento River and its tributaries. Adults need access to natal streams; eggs and fry need cool water with adequate dissolved oxygen; clean gravel; juveniles migrate out to the ocean after only a few months in the river.	**HP**	**None.** This run of chinook salmon migrates through the Central and North Bay to reach spawning grounds in the Central Valley. Chinook salmon Sacramento River winter run ESU are not expected to migrate up the Napa River or its tributaries. The closest CNDDB record is from the Sacramento River watershed 58 miles from the project area. The project area is located outside of the designated critical habitat.
Coho salmon - Central California coast ESU	*Oncorhynchus kisutch*	FE, SE	Migrates through and spawns in coastal rivers and streams from Santa Cruz to Mendocino County. Anadromous. Needs cool clear water and gravel beds free of excessive silt for spawning.	**HP**	**None.** Coho salmon were last documented from the San Francisco Bay estuary streams in the early-to-mid 1980s.The latest documentation from the vicinity of the project area is from San Lorenzo Creek pre-1960s (Leidy et al. 2005). The closest CNDDB record is from the Russian River watershed 14 miles from the project area. The project area is located outside of the designated critical habitat.

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Delta smelt	*Hypomesus transpacificus*	FT, SE	Endemic to California; occurs only in the brackish and freshwaters of the Sacramento-San Joaquin River Delta. Exhibits seasonal migration within the estuary (Suisun Bay, Carquinez Strait and San Pablo Bay), moving upstream before spawning.	**A**	**None.** The estuarine habitat preferred by this species is not present in the upper Napa River watershed. They are known to use estuarine habitat in the Sacramento-San Joaquin Delta, which is designated as critical habitat for this species. Delta smelt have been recently documented is in the lower Napa River estuary in 1996 (Leidy 2007). There are no CNDDB records within 2 mi of the project area.
Steelhead - Central California Coast DPS	*Oncorhynchus mykiss*	FT	Anadromous; all naturally spawned anadromous populations are known from below natural and manmade impassable barriers in California streams from the Russian River to Aptos Creek and the drainages of San Francisco, San Pablo, and Suisun bays and at the confluence of the Sacramento and San Joaquin rivers	**CH**	**High.** This DPS is known to occur in the upper Napa River (T. Koehler 2002 and Napa RCD 2012). The Napa River is designated critical habitat for this species. The closest CNDDB record is from York Creek in the Napa River watershed 7 miles from the project area in 2004. The project area is in designated critical habitat.
Steelhead - Central Valley DPS	*Oncorhynchus mykiss*	FT	Anadromous; Sacramento and San Joaquin rivers and their tributaries; does not include steelhead from San Francisco Bay drainages; but it migrates through the San Francisco Bay and Sacramento-San Joaquin delta.	**A**	**None.** This DPS migrates through the Central and North Bay to reach spawning grounds in the Central Valley. The SF Bay is considered Critical Habitat for this species but not the tributaries to the bay outside of the Delta. The closest CNDDB record is from the Sacramento-San Joaquin delta 53 miles from the project area.

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Amphibians					
California red-legged frog	*Rana draytonii*	FT, SSC	Requires slow moving or still water for egg laying and larval development. Occurs in freshwater marshes, stock ponds, and riparian habitats. May aestivate in rodent burrows or cracks during dry periods.	**HP**	**Low.** Although the nearest CNDDB record is 9 miles to the west of the project area, outside of the Napa River watershed, the Napa River provides suitable habitat for CRLF. This species was included in a Biological Opinion for a project located downstream from the project area. In addition, the project area is surrounded by grassland habitat and there are multiple stock ponds and seasonal wetlands located nearby.
Reptiles					
n/a					
Birds					
Northern spotted owl	*Strix occidentalis caurina*	FT, SSC, SC	Older forested habitat with moderate to high canopy closure. Nests in cavities or on platforms in large trees and will use abandoned nests of other species.	**HP**	**None.** Project area lacks the suitable old growth forests that are used for nesting. There is one designated SPOW territory almost 2 miles from the project area.
Mammals					
n/a					
Plants					
Burke's goldfields	*Lasthenia burkei*	FE, SE, CRPR 1B.1	Meadows and seeps (mesic) and vernal pools and swales. Blooms April-June. 50-1,980 ft	**HP**	**Low.** Suitable vernally mesic grassland habitat and wetland drainage within the project area at proposed access path. However, it's only currently known from southern portions of Lake and Mendocino Counties and from the Cotati Valley (i.e., Santa Rosa Plain) in Sonoma County (USFWS 2008). Nearest CNDDB record from 1929 is within 1 mile of project area.

Common Name	Scientific Name	Status	General Habitat Description	Habitat Present/Absent	Occurrence Potential
Calistoga popcornflower	*Plagiobothrys strictus*	FE,ST, CRPR 1B.2	Alkaline areas near thermal springs. Meadows and seeps; valley and foothill grassland; and vernal pools. Blooms March-June. 300-530 ft	**A**	**None.** No suitable alkaline habitat within the project area.
Clara Hunt's milk-vetch	*Astragalus claranus*	FE,ST, CRPR 1B.1	Serpentinite or volcanic, rocky, clay. Chaparral (openings); cismontane woodland; and valley and foothill grassland. Blooms March-May. 250-910 ft	**HP**	**Low.** No suitable serpentinite or clay habitat within the project area. Woodland and grassland with volcanic soil present at project area. Known from only five occurrences. Nearest CNDDB record approximately 5.5 miles southeast of the project area at Bale Grist Mill State Historic Park, one of the four known extant populations of the species within Napa County (USFWS 2009a).

Common Name Acronyms: Distinct Population Segment [DPS]; Evolutionarily Significant Unit [ESU]

Status Codes: Federal Endangered [FE]; Federal Threatened [FT]; Federal Species of Concern [FSC]; Federal Candidate [FC], State Endangered [SE]; State Threatened [ST]; State Species of Special Concern [SSC]; State Candidate [SC]; California Rare Plant Rank [CRPR] Plants Rare, Threatened, or Endangered in California and Elsewhere and Seriously Threatened in California [CRPR 1B.1]; CRPR Plants Rare, Threatened, or Endangered in California and Elsewhere and Fairly Threatened in California [CRPR 1B.2]; CRPR Plants Rare, Threatened, or Endangered in California and Elsewhere and Not Very Threatened in California [CRPR 1B.3]; CRPR Plants Fairly Rare, Threatened, or Endangered in California, But More Common Elsewhere [CRPR 2.2]; and CRPR Plants Not Very Rare, Threatened, or Endangered in California, But More Common Elsewhere [CRPR 2.3].

Habitat Codes: Absent - no habitat present and no further work needed [A]; Habitat Present - habitat is, or may be present, species may be present [HP]; Present - the species is present [P]; and Critical Habitat - project footprint is located within a designated critical habitat unit, but does not necessarily mean that appropriate habitat is present [CH].

Through review of the programmatic BO from USFWS for California Red-Legged Frog, it was determined that this project does not fall within the scope of covered projects. Review of the Caltrans Programmatic BO from NMFS for anadromous fish was also found not to cover this project specifically, as although this project is located in District 4, it is not a Caltrans facility. However, the activities required to replace the Greenwood Avenue Culvert are commensurate with the types of activities covered in the two Programmatic BOs reviewed. Therefore, these documents were used to inform the analysis of potential impacts from the project and to design the Avoidance and Minimization Measures program for this project.

Surveys

GANDA biologists surveyed all proposed work areas, access roads, and staging locations during site visits in March and May 2014. The project area is located in, and around the Napa River in Calistoga, California. At the existing culvert location extending both upstream and downstream, the riparian overstory is well developed with mature coast live oak (*Quercus agrifolia*), valley oak (*Quercus lobata*), red and arroyo willow (*Salix* sp.) and California buckeye. The site for the proposed access road which runs through Envy Winery Estate is located in grassland habitat. The drainage ditch located adjacent to the site of the proposed access road was holding water at the time of the site visits and supported emergent wetland vegetation including sedges (*Carex* sp. and *Eleocharis* sp.) and rushes (*Juncus* sp.). Two ponds not visible on maps were also identified on the winery property and are included on Figure 3.

FEDERALLY LISTED SPECIES WITH POTENTIAL TO OCCUR IN THE ACTION AREA

Terrestrial and Freshwater Species

California Freshwater Shrimp

Status of Species in the Action Area

California freshwater shrimp *(Syncaris pacifica*), federal and State endangered, is California's only native, stream-dwelling shrimp (CDFW 1999). Currently, the California freshwater shrimp is known from 23 stream segments in Napa, Marin and Sonoma counties (USFWS 2007a). California freshwater shrimp occur within the project area (Napa County 2013).

A California freshwater shrimp habitat assessment was conducted in the spring of 2014 by Scott Cressey, a fisheries biologist (Appendix F). The survey spanned 200 ft of the Napa River channel downstream of the Greenwood Avenue culvert, and 500 ft of channel upstream the culvert. The project length is expected to extend approximately 40 ft upstream and up to 200 ft downstream of the crossing structure. The first 250 ft upstream of Greenwood Avenue was found to contain two pool habitats. Within this stretch the total linear feet of habitat was assessed to contain 17.9 ft of fair habitat; 2.3 feet of good habitat; and no excellent habitat. The pool immediately downstream of the Greenwood Avenue culvert had no potential shrimp habitat on the right bank (looking downstream), which is covered with rip rap. The pool's left bank was assessed to contain 29 feet of fair to poor

habitat and 13.5 ft of good habitat during the summer. The most suitable potential habitat identified for freshwater shrimp is located approximately 386 ft upstream of Greenwood Avenue (Cressey 2014).

Biological Requirements
California freshwater shrimp are found in pools of low-elevation and low-gradient streams where they feed on decomposing plants and other detritus (USFWS 2007b). Habitat characteristics in the streams include live tree roots, undercut banks, overhanging woody debris, or overhanging vegetation (USFWS 2007b, CDFG 1999). California freshwater shrimp have different winter and summer habitat preferences. According to Eng (1981), the shrimp are found beneath undercut banks with dense root systems or dense, overhanging vegetation in the winter but are found under submerged leafy branches in the summer. The adults grow to about two inches long and reach sexual maturity by the end of their second summer (USFWS2007b) and breed once a year, in the fall, with the eggs remaining attached to the female throughout the winter. The young are released in May or early June and are approximately 0.24 inches in length (USFWS 2007a; Eng 1981).

California red-legged frog
Status of Species in the Action Area
The California red-legged frog (*Rana draytonii*) is federally threatened and California Species of Special Concern. There are no CNDDB occurrences within 2 mi of the project area. The nearest CNDDB occurrence is 9 mi east from 1979. This project is outside of designated critical habitat for this species (USFWS 2014a). Although the habitat in the project area is suitable for this species, no occurrences are documented near the project area. The Biological Opinion for the Napa River Rutherford Reach Restoration project includes this species (USFWS 2009a). That project was located approximately 13 miles downstream from the proposed culvert replacement. Although the project area is hydrologically connected to the Rutherford Reach of the Napa River, this species is not likely to move this far upstream. The project is located within the California red-legged frog Recovery Unit #2, although it does not occur within a core area (USFWS 2002).

The deep pool downstream of the culvert is potential California red-legged frog breeding habitat, albeit marginal as it lacks emergent vegetation along the banks and may not provide enough still water. The project area does provide suitable estivation and dispersal habitat. There are numerous ponds and wetlands near the project area that could provide breeding habitat, and they are surrounded by upland habitat that could act as a dispersal corridor between breeding ponds and the Napa River (Figure 3).

Biological Requirements
The California red-legged frog occurs primarily in ponds or still pools in streams that retain water long enough for breeding and development of tadpoles (about 15 weeks). Egg masses are usually present in the early spring. The adults which grow up to 5.5 inches in length prefer dense, emergent or shoreline riparian vegetation closely associated with deep, still or slow-moving water, although they may also be found in unvegetated streamside areas that provide shade and shelter (Jennings and Hayes 1994). Other key

habitat features include good water quality and absence of introduced predators such as bullfrogs and predatory fishes. California red-legged frogs can estivate in small mammal burrows and moist leaf litter within 200 ft of aquatic habitat, and they can disperse through upland habitats for distances of 1.7 miles or more at any time of year (USFWS 2002).

Burke's goldfields

Status of Species in the Action Area

Burke's goldfields (*Lasthenia burkei*) is a federally endangered plant and is known only from southern portions of Lake and Mendocino Counties and from the Cotati Valley (locally known as the Santa Rosa Plain) in Sonoma County (USFWS 1991, 2008). Historically, 39 sites were known from the Santa Rosa Plain in Sonoma County, two sites in Lake County and one site in Mendocino County. The type locality of Burke's goldfields is the only known occurrence in Mendocino County and is possibly extirpated. Both Lake County occurrences are presumed extant. Within Sonoma County, one occurrence is known from north of Healdsburg and the other populations are in the Santa Rosa Plain from the community of Windsor to east of the city of Sebastopol (USFWS 2008).

Biological Requirements

Burke's goldfields is a small, slender annual herb in the aster family (Asteraceae). It has narrow, opposite leaves and flowers from April until June. Both ray and disk flowers are yellow and the pappus usually consists of one long bristle and several short bristles. Burke's goldfields grow in vernal pools, vernally mesic grasslands and swales below 1,640 feet elevation.

Clara Hunt's milk-vetch

Status of Species in the Action Area

Clara Hunt's Milk-vetch (*Astragalus claranus*) is a federally endangered plant and is known only from Napa and Sonoma Counties (USFWS 2009a). Historically, Clara Hunt's milk-vetch was known from six occurrences in Sonoma and Napa Counties. By the time of listing in 1997, two of the six known occurrences had been extirpated. Since listing, there has been one additional population found at Spring Valley (Sonoma County). The four other known presumed extant occurrences are as follows: Lake Hennessey (Napa County, just two miles from the Spring Valley population, Bale Grist Mill State Historic Park (Napa County), Lewelling Lane (Napa County), and Saint Helena Road near Calistoga Road (Sonoma County). The nearest CNDDB occurrence record of Clara Hunt's milk-vetch is located approximately 5.5 miles south of the project at Bale Grist Mill State Historic Park, one of the five known populations of the species.

Biological Requirements

Clara Hunt's Milk-vetch is a low-growing annual herb in the pea family (*Fabaceae*). It is a slender sparsely leafed plant on which small flowers appear from March through April. The petals are bicolored, with the wings whitish and the banner and keel purple in the upper third. The species is found on thin, rocky clay soils derived from volcanic or serpentine substrates in grassland and openings in *Actostaphylos manzanita* (whiteleaf

manzanita) – *Quercus douglasii* (blue oak) woodlands across an elevation range of 250 – 740 feet.

Anadromous Species

Chinook salmon Central Valley fall/late fall run ESU

Status of Species in the Action Area

Chinook salmon Central Valley fall/late fall run ESU (*Oncorhynchus tshawytscha)* are a Candidate species for federal listing. Chinook salmon are known to be present in the Napa River from recent fish sampling efforts (Koehler 2003; Napa RCD 2012). In 2013 the results of a genetic analysis of Chinook salmon from the Napa River was published by Garza and Crandall. Chinook salmon populations crashed in the Napa River during the 1900s due to the rapid urbanization and sedimentation issues. In the last few decades Chinook have re-populated the river, but the run in the Napa River is not formally assigned to any one ESU. The mouth of the Napa River is located between the southern end of the California Coastal Chinook ESU and the western edge of the Central Valley fall/late fall run ESU. The recent study performed genetic analysis on fin tissue samples taken from Chinook during surveys from 2005 to 2011. The study found that all but four individuals were from the Central Valley fall/late fall run ESU (Garza and Crandall 2013).

The Napa County Resource Conservation District performed fish sampling on the Napa River and the results from the 2012 Napa River Steelhead and Salmon Monitoring Program survey efforts show that Chinook were not found at the sampling site closest to the project area, located approximately 7 miles downstream. However, the rainfall pattern of the 2011-2012 rainy season may have contributed to the absence of Chinook higher in the Napa Valley River system that year. A sampling site further downstream did yield Chinook juveniles (Napa RCD 2012).

Biological Requirements

Chinook salmon, also referred to as king salmon, are the largest of all the Pacific salmon species reaching typical lengths of 30 inches. They are anadromous and return to their natal streams to spawn. Fall-run Chinook migrate upstream from the ocean as adults from July through December and spawn from early October through late December. The timing of runs varies from stream to stream. Late fall-run Chinook migrate into the rivers from mid-October through December and spawn from January through mid-April (CDFW 2014b). They typically choose stream beds with large gravel substrate that may be near deep pools, where they build a series of nests or redds. When young Chinook salmon emerge as fry they are typically swept down to areas of slower water velocities. Juveniles feed primarily on drifting insects of different sizes and stages (NMFS 2007; University of California 2014). Chinook salmon migrate to the ocean where they remain for two to five years, tending to stay in the coastal waters of California and Oregon. When Chinook salmon reach the ocean, they focus on a diet of crustaceans and other fish, fueling rapid growth rates (NMFS 2007).

Steelhead Central California Coast DPS

Status of Species in the Action Area

Steelhead Central California Coast DPS (*Oncorhynchus mykiss*) are a federally threatened species. In contrast to the Chinook salmon, the population relationships of steelhead show that in tributaries of the San Francisco Bay they are related to the Central California Coast DPS rather than the Central Valley runs (Garza and Crandall 2011). The results from the Napa RCD's 2012 Napa River Steelhead and Salmon Monitoring Program survey efforts found juvenile steelhead were abundant at the sampling site closest to the project area, located approximately 7 miles downstream (Napa RCD 2012). The Upper Napa River Watershed Plan from 2002 mentions management for rainbow trout (*Onchorynchus mykiss*), both as resident fish and as anadromous steelhead, which migrate to and from the ocean are known in the Upper Napa River Watershed (Koehler 2002).

Biological Requirements

Adult steelhead typically reach lengths of 14 to 25 inches (University of California 2014). Steelhead return to their natal streams to spawn and have similar spawning requirements to those of the Chinook. Ocean-maturing steelhead typically spawn between December and April, with the peak between January and March, but migrating steelhead may be seen in the San Francisco Bay and Suisun Marsh and Bay as early as August (Leidy 2000). The young often spend two years in freshwater before out-migrating to the ocean. Steelhead may stay in saltwater for one to two years before returning to their native streams. Most anadromous salmonids die after spawning but steelhead may make numerous trips back and forth between fresh and salt water to breed. Steelhead may spawn up to four times per life span, though many do not survive between breeding cycles (University of California 2014). This DPS includes all naturally spawned anadromous populations from below natural and manmade impassable barriers in California streams from the Russian River to Aptos Creek and the drainages of San Francisco, San Pablo, and Suisun bays and at the confluence of the Sacramento and San Joaquin rivers (CDFW 2014b).

EFFECTS OF THE ACTION

Terrestrial and Freshwater Species

California Freshwater Shrimp

Direct and Indirect Effects

California freshwater shrimp occur in the Napa River within the project area. Shrimp will likely be directly affected during construction. These affects may include mortality, injury, temporary loss of habitat, and possible permanent modification of habitat. The project activities most likely to cause these affects include project dewatering activities which may strand shrimp, excavation and re-grading activities within the streambed which may crush or bury shrimp, and have potential to permanently alter the habitat within the re-graded area in such as a way as to be unfavorable for this species. Project pile-driving is not anticipated to affect this species due to piles being driven while the

river is de-watered which greatly reduces the possibility of hydroacoustic impacts causing injuries and mortality from this activity.

The implementation of the California freshwater shrimp rescue plan during dewatering activities and any other construction activities will reduce potential take of this species. By implementing this plan prior to in-water construction activities, individual shrimp will be relocated the shortest distance possible to habitat unaffected by construction activities as needed, no earlier than 48 hours before construction begins to minimize the probability that the species will recolonize the affected areas. During in-water activities, the project biologist will continuously monitor all activities (e.g., installation and removal of the cofferdams and pipes for dewatering) for the purpose to remove and relocate any further individuals detected.

The project will remove the existing pipe culvert and replace it with a 70-foot-long, 22-foot-wide bridge which will remove a migration barrier to California freshwater shrimp. In addition, the project will include design features, as described in the Avoidance and Minimization Measures above, to maintain or improve the current level of habitat in the area of the Napa River which will modified during grade-correction activities. Therefore the impacts to freshwater shrimp are anticipated to be temporary. The permanent habitat in the project area is expected to be improved from the current status through implementation of this project.

Potential indirect impacts from this project include affecting habitat within the project area and downstream of the project by potentially introducing sediments and/or pollutants into the Napa River. By de-watering the river and performing the work in a dry environment and by protecting the creek bed and ensuring that construction and post-construction BMPs are properly installed, these affects will be avoided.

Cumulative Effects

No other construction activities were identified to occur concurrently near this project. This project is not part of a larger activity. Therefore no cumulative effects to California freshwater shrimp are anticipated in association with this project.

California Red-Legged Frog

Direct and Indirect Effects

California red-legged frogs are unlikely to occur in the Napa River within the project area. However, if present, California red-legged frogs may be directly affected during construction of the new bridge, grading of the streambed and construction, and use of the temporary access road. Impacts may include crushing or injuring frogs with equipment or vehicles present in work areas, trapping and/or burying frogs during excavation work, and project dewatering activities which may strand individual frogs, tadpoles or egg masses. Dewatering will also result in temporary loss of available habitat for the California red-legged frog. Project pile-driving is not anticipated to affect this species due to piles being driven while the river is de-watered which greatly reduces the possibility of hydroacoustic impacts causing injuries and mortality from this activity.

In-water construction activities are limited to June 15th to October 15th. California red-legged frog egg masses are not expected at this time of year. In addition, this species is unlikely to breed in the Napa River as ponds are preferred breeding habitat; therefore the potential for presence of tadpoles is low. The implementation of the California red-legged frog rescue plan during dewatering activities and any other construction activities will reduce potential take of this species. By implementing this plan prior to in-water construction activities, individual frogs of all life stages will be relocated the shortest distance possible to habitat unaffected by construction activities as needed, no earlier than 48 hours before construction begins to minimize the probability that the species will recolonize the affected areas. During in-water activities, the project biologist will monitor all activities (e.g., installation and removal of the cofferdams and pipes for dewatering) to remove and relocate any further individuals detected. Implementation of project avoidance and minimization measures to inspect excavations and equipment that are left overnight for wildlife will also reduce the potential for take of this species.

The temporary access road will be constructed between the drainage ditch and two managed ponds on the Envy Winery Estate property. Avoidance and minimization measures to minimize potential for take during construction and use of this road include monitoring for frogs prior to construction of the road.

The project will remove the existing pipe culvert and replace it with a 70-foot-long, 22-foot-wide bridge which will improve migration passage. In addition, the project will include design features to stabilize and restore areas that will be graded with native vegetation. Therefore the impacts to frog habitat within the project area are anticipated to be temporary. The permanent habitat in the project area is expected to be improved from the current status through implementation of this project and removal of the pipe culvert.

Potential indirect impacts from this project also include affecting habitat within the project area and downstream of the project by potentially introducing sediments and/or pollutants into the Napa River. By de-watering the river and performing the work in a dry environment and by protecting the creek bed and ensuring that construction and post-construction BMPs are properly installed, these affects will be avoided.

Cumulative Effects

No other construction activities were identified to occur concurrently near this project. This project is not part of a larger activity. Therefore, no cumulative effects are anticipated to California red-legged frog in association with this project.

Burke's Goldfields

Direct and Indirect Effects

Burke's goldfields are unlikely to be present at the project site. Although Burke's goldfields is not historically known from Napa County, one CNDDB occurrence was recorded within the USGS Calistoga quadrangle. The only source of this record site is from a 1929 collection where the exact location is unknown. CNDDB mapped the location in the vicinity of Calistoga's Old Faithful Geyser. However, suitable habitat does exist within the vernally mesic swale in the area of the proposed access road.

Burke's goldfields may be directly affected during construction and use of the temporary access road. Direct effects to this species can be avoided by conducting a targeted rare plant survey for the species during its blooming time from April to June. If observed, creating an avoidance buffer around the plants and the proposed access road would avoid direct effects to Burke's goldfields. Therefore, no direct effects to the species are anticipated.

Indirect effects can be avoided by ensuring that the outside surfaces of work vehicles are clean and do not incidentally track in invasive plant species, which might out-compete native species. Because all impacts to the grassland will be temporary and the proposed access road will be removed when the project is completed, and disturbed areas will be restored, no other indirect effects are anticipated.

Cumulative Effects
No other construction activities were identified to occur concurrently near this project. This project is not part of a larger activity. Therefore, no cumulative effects are anticipated to Burke's goldfields in association with this project.

Clara Hunt's Milk-Vetch
Direct and Indirect Effects
Clara Hunt's Milk-vetch has low potential to occur within the action area because of the species extreme rarity, however, suitable grassland and woodland habitat exists within the action area, within the vernally mesic swale adjacent to the action area next to the proposed access road in the area of the proposed access road. Burke's goldfields may be directly affected during construction and use of the temporary access road. Direct effects can be avoided by conducting a targeted rare plant survey for the species during its blooming time from March to April. If observed, creating an avoidance buffer around the plants would avoid direct effects to Clara Hunt's milk-vetch. Therefore, no direct effects to the species are anticipated.

Indirect effects can be avoided by ensuring that the outside surfaces of work vehicles are clean and do not incidentally track in invasive plant species, which might out-compete native species. Because all impacts will be temporary and the proposed access road will be removed when the project is completed, and disturbed areas will be restored, no other indirect effects are anticipated.

Cumulative Effects
No cumulative effects are anticipated to Clara Hunt's milk-vetch in association with this project.

<u>Anadromous Species</u>

Chinook salmon Central Valley fall/late fall run ESU
Direct and Indirect Effects
Chinook salmon have low potential to occur in the Napa River within the project area. However, if present they could be directly affected during construction. These potential

effects may include mortality, injury, and temporary loss of habitat and possible permanent modification of habitat. The project activities most likely to cause these effects include project dewatering activities which may strand fish and excavation and re-grading activities within the streambed which have potential to permanently alter the habitat within the re-graded area in such as a way as to be unfavorable for this species.

In-water construction activities are limited to June 15th to October 15th. The fall run/late fall run ESU will have spawned by April, so juvenile age classes of this species may be present. The implementation of the fish rescue plan during dewatering activities and any other construction activities will avoid potential take of this species. By implementing this plan prior to in-water construction activities, individual fish will be relocated the shortest distance possible to habitat unaffected by construction activities as needed, no earlier than 48 hours before construction begins to minimize the probability that the species will recolonize the affected areas. During in-water activities, the project biologist will continuously monitor all activities (e.g., installation and removal of the cofferdams and pipes for dewatering) for the purpose to remove and relocate any further individuals detected.

Project pile-driving is not anticipated to affect Chinook salmon due to piles being driven while the river is de-watered which greatly reduces the possibility of hydroacoustic impacts causing injuries and mortality from this activity. Hydroacoustic impacts to aquatic species occur when underwater noise generated by pile driving is transmitted to the species through water at levels high enough to cause damage to tissues and organs. The piles proposed for this project will be driven while the creek is dewatered, therefore the energy created from pile driving is anticipated to dissipate as it travels through the soils to levels low enough to not cause damage to aquatic species prior to encountering any water upstream or downstream of the project activities.

The project will remove the existing pipe culvert and replace it with a 70-foot-long, 22-foot-wide bridge which will remove a migration barrier to Chinook salmon. In addition, the project includes design features consistent with fish passage guidelines described in the California Salmonid Stream Restoration Manual (CDFW 2003) and the National Marine Fisheries Service (NMFS) Anadromous Salmonid Passage Facility Design (NMFS 2008) to maintain or improve the current level of habitat in the area of the Napa River which will be modified during grade-correction activities. Therefore the impacts to Chinook salmon habitat are anticipated to be temporary. The permanent habitat in the project area is expected to be improved from the current status through implementation of this project.

Potential indirect impacts from this project include affecting habitat within the project area and downstream of the project by potentially introducing sediments and/or pollutants into the Napa River. By de-watering the river and performing the work in a dry environment, and by protecting the creek bed and ensuring that construction and post-construction BMPs are properly installed, these effects will be avoided.

Cumulative Effects
No other construction activities were identified to occur concurrently near this project. This project is not part of a larger activity. Therefore no cumulative effects Chinook salmon Central Valley fall/late fall run ESU are anticipated in association with this project.

Steelhead Central California Coast DPS
Direct and Indirect Effects
Steelhead have high potential to occur in the Napa River within the project area and may be directly affected during construction. The Napa River is designated as critical habitat for this species. Potential effects to steelhead and steelhead critical habitat may include mortality, injury, and temporary loss of habitat and possible permanent modification of habitat. The project activities most likely to cause these effects include project dewatering activities which may strand fish and excavation and re-grading activities within the streambed which have potential to permanently alter the habitat within the re-graded area in such as a way as to be unfavorable for this species.

In-water construction activities are limited to June 15th to October 15th. Steelhead are expected to have spawned earlier in the spring, and so juvenile age classes of this species may be present. The implementation of the fish rescue plan during dewatering activities and any other construction activities will avoid potential take of this species. By implementing this plan prior to in-water construction activities, individual fish will be relocated the shortest distance possible to habitat unaffected by construction activities as needed, no earlier than 48 hours before construction begins to minimize the probability that the species will recolonize the affected areas. During in-water activities, the project biologist will continuously monitor all activities (e.g., installation and removal of the cofferdams and pipes for dewatering) for the purpose to remove and relocate any further individuals detected.

Project pile-driving is not anticipated to affect steelhead due to piles being driven while the river is de-watered which greatly reduces the possibility of hydroacoustic impacts causing injuries and mortality from this activity. Hydroacoustic impacts to aquatic species occur when underwater noise generated by pile driving is transmitted to the species through water at levels high enough to cause damage to tissues and organs. The piles proposed for this project will be driven while the creek is dewatered, therefore the energy created from pile driving is anticipated to dissipate as it travels through the soils to levels low enough to not cause damage to aquatic species prior to encountering any water upstream or downstream of the project activities.

The project will remove the existing pipe culvert and replace it with a 70-foot-long, 22-foot-wide bridge which will remove a migration barrier to steelhead. In addition, the project includes design features consistent with fish passage guidelines described in the California Salmonid Stream Restoration Manual (CDFW 2003) and the National Marine Fisheries Service (NMFS) Anadromous Salmonid Passage Facility Design (NMFS 2008) to maintain or improve the current level of habitat in the area of the Napa River which will be modified during grade-correction activities. Therefore the impacts to steelhead

critical habitat are anticipated to be temporary. The permanent habitat in the project area is expected to be improved from the current status through implementation of this project.

Potential indirect impacts from this project include affecting habitat within the project area and downstream of the project by potentially introducing sediments and/or pollutants into the Napa River. By de-watering the river and performing the work in a dry environment and by protecting the creek bed and ensuring that construction and post-construction BMPs are properly installed, these effects will be avoided.

Cumulative Effects
No other construction activities were identified to occur concurrently near this project. This project is not part of a larger activity. Therefore no cumulative effects Steelhead Central California Coast DPS are anticipated in association with this project.

CONCLUSION AND DETERMINATION

Terrestrial and Freshwater Species

California Freshwater Shrimp
The proposed project will have temporary direct impacts to the California freshwater shrimp due to stranding, injury and mortality. Although the project avoidance and minimization measures include a California freshwater shrimp rescue plan, this species is small and aquatic and it is difficult to ensure that all individuals are moved prior to de-watering and construction. The project is unlikely to indirectly affect this species through implementation of construction best management practices. Although the temporary affects cannot be avoided, this project is expected to benefit this species in the long term by removing a migration barrier and by incorporating features to provide summer and winter- habitat in the areas of the Napa River which will be graded. Therefore, the Greenwood Avenue Culvert Replacement Project **may adversely affect individual California freshwater shrimp, however, it is not likely to jeopardize the continued existence of this species.**

California Red-legged Frog
The proposed project has potential to temporarily directly affect the California red-legged frog by causing injury or mortality. This species has low potential to occur at the project site. Project avoidance and minimization measures include a California red-legged frog rescue plan, however, this species can be difficult to detect especially in upland habitat. It is difficult to ensure that any individuals present are detected are moved prior to de-watering and construction. The project is unlikely to indirectly affect this species through implementation of construction best management practices. This project is expected to potentially benefit this species in the long term by enhancing areas of the Napa River which will be graded. Therefore, the Greenwood Avenue Culvert Replacement Project **may affect individual California red-legged frogs, however, it is not likely to jeopardize the continued existence of this species.**

Burke's Goldfields
Burke's goldfields are unlikely to occur within the project area. The only activity associated with the project in habitat which supports this species is the construction and use of the temporary access road. The project is unlikely affect this species by performing surveys during blooming periods to avoid impacts during construction of the proposed access road and by removing and restoring the road upon completion of the project. Therefore, the Greenwood Avenue Culvert Replacement Project **is not likely to adversely affect the federally endangered Burke's goldfields.**

Clara Hunt's Milk-Vetch
Clara Hunt's milk-vetch is unlikely to occur within the project area. The only activity associated with the project in habitat which supports this species is the construction and use of the temporary access road and use of off-pavement staging areas. The project is unlikely affect this species by performing surveys during blooming periods to avoid locating staging in the vicinity of this species, and to avoid impacts during construction of the proposed access road and by removing and restoring the road upon completion of the project. Therefore, the Greenwood Avenue Culvert Replacement Project **is not likely to adversely affect the federally endangered Clara Hunt's milk-vetch.**

<u>Anadromous Species</u>

Chinook salmon Central Valley fall/late fall run ESU
Chinook salmon have low potential to occur within the project area. Project dewatering will protect this species from construction impacts including project pile driving. Implementation of the fish rescue plan during dewatering is expected to rescue and protect all potentially occurring Chinook juveniles. The project will remove the pipe culvert which currently creates a migration barrier to this species. Additionally, inclusion of design features consistent with fish passage guidelines described in the California Salmonid Stream Restoration Manual (CDFW 2003) and the National Marine Fisheries Service (NMFS) Anadromous Salmonid Passage Facility Design (NMFS 2008) to maintain or improve the current level of habitat in the area of the Napa River which will be modified during grade-correction activities. Therefore, the Greenwood Avenue Culvert Replacement Project **is not likely to adversely affect this candidate species for federal listing the Chinook salmon Central Valley fall/late fall run ESU.**

Steelhead Central California Coast DPS
Steelhead have high potential to occur within the project area. Project dewatering will protect this species from construction impacts including project pile driving. Implementation of the fish rescue plan during dewatering is expected to rescue and protect all potentially occurring steelhead juveniles. The project will remove the pipe culvert which currently creates a migration barrier to this species. Additionally, inclusion of design features consistent with fish passage guidelines described in the California Salmonid Stream Restoration Manual (CDFW 2003) and the National Marine Fisheries Service (NMFS) Anadromous Salmonid Passage Facility Design (NMFS 2008) to maintain or improve the current level of habitat in the area of the Napa River which will be modified during grade-correction activities. Therefore, the Greenwood Avenue

Culvert Replacement Project **is not likely to adversely affect the federally threatened Steelhead Central California Coast DPS.**

Critical Habitat

Steelhead

The Action Area is located within designated critical habitat for steelhead. The project will remove the pipe culvert which currently creates a migration barrier to this species. Additionally, inclusion of design features consistent with fish passage guidelines described in the California Salmonid Stream Restoration Manual (CDFW 2003) and the National Marine Fisheries Service (NMFS) Anadromous Salmonid Passage Facility Design (NMFS 2008) to maintain or improve the current level of habitat in the area of the Napa River which will be modified during grade-correction activities. This project will observe construction windows that limit in-channel work to from June 15th to October 15th when flow is lowest. By implementing the avoidance and minimization measures, risk of adverse impacts from potential project-related erosion or pollution can be avoided. Therefore, the Greenwood Avenue Culvert Replacement Project **is not likely to adversely affect critical habitat for steelhead.**

Essential Fish Habitat

Essential Fish Habitat

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires federal agencies to consult with the National Marine Fisheries Service (NMFS) on activities that may adversely affect Essential Fish Habitat (EFH) for federally managed fish species. These species include commercial fishes with established Fisheries Management Plans (FMPs) as managed by regional fisheries management councils (Councils).

EFH includes those waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity. In the definition of EFH: “waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and the managed species contribution to a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species’ full life cycle (NMFS 2014).

The Pacific Fisheries Management Council (PFMC) manages one species of Pacific salmon which has potential to occur in the BSA: Chinook salmon (*Oncorhynchus tshawytscha*). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California. Hence, the Napa River provides EFH for Chinook salmon (NMFS 2014).

Potential adverse effects to freshwater EFH for Pacific salmon may include changes to local water quality, habitat quality, habitat access, channel structure, hydrology, and riparian conditions. By performing construction activities during the summer months when the Napa River has low flows, and by ensuring proper construction and post-construction BMPs, temporary changes in water and habitat quality through localized substrate disturbances and increases in turbidity and sedimentation can be avoided.

Permanent changes to EFH include the replacement of the pipe culvert with a 70-foot-long, 22-foot-wide bridge and the grade correction of approximately 200 linear ft of streambed. The replacement of the existing pipe culvert with culvert bridge will remove a barrier to migration for this species. The project design includes design features consistent with fish passage guidelines described in the California Salmonid Stream Restoration Manual (CDFW 2003) and the National Marine Fisheries Service (NMFS) Anadromous Salmonid Passage Facility Design (NMFS 2008) to maintain or improve the current level of habitat in the area of the Napa River which will be modified during grade-correction activities. Native plants including locally sourced willow cuttings will be used for re-vegetation. Once these permanent changes are complete, the Napa River is expected to provide improved EFH for salmonids and allow fish passage to increase the total EFH available along the Napa River and its tributaries north of the project. Therefore the Greenwood Avenue Culvert Replacement Project **is not likely to adversely affect Essential Fish Habitat.**

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Appendix A: Greenwood Avenue Culvert Replacement Preliminary Plans

Appendix B: Project Area Photos

Photo 1: Downstream of culvert, facing northwest.

Photo 2: Downstream of culvert, Napa River, facing southwest.

Photo 3: Pool downstream of culvert, facing southwest.

Photo 4: Upstream of culvert, facing east.

Photo 5: Upstream of culvert, Napa River, facing north.

Photo 6: Upstream of culvert, facing northeast.

Photo 7: Greenwood Avenue, facing southeast. Barrier rail is along the downstream side of the Napa River.

Photo 8: Greenwood Avenue, facing east, on the upstream side of the Napa River.

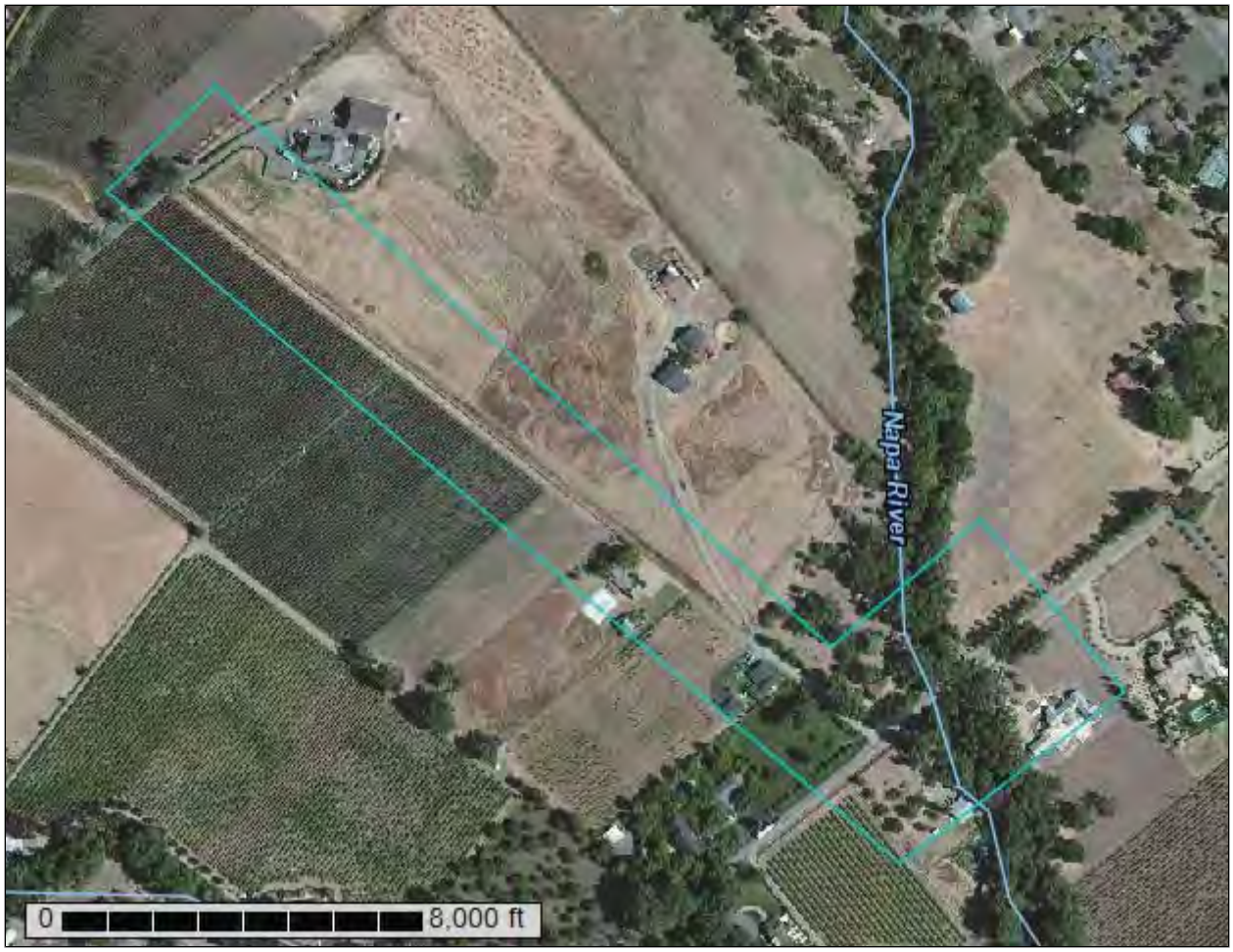
Appendix C: NRCS Soil Survey Report

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Napa County, California



April 28, 2014

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Napa County, California
Survey Area Data: Version 5, Nov 25, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 2, 2010—Feb 17, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Napa County, California (CA055)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
103	Bale loam, 0 to 2 percent slopes	6.5	41.1%
104	Bale clay loam, 0 to 2 percent slopes	9.3	58.9%
Totals for Area of Interest		**15.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Napa County, California

103—Bale loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 20 to 400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 270 days

Map Unit Composition

Bale and similar soils: 85 percent
Minor components: 3 percent

Description of Bale

Setting

Landform: Flood plains, alluvial fans
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from rhyolite and/or alluvium derived from igneous rock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 7.2 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2w
Land capability (nonirrigated): 3w
Hydrologic Soil Group: B

Typical profile

0 to 24 inches: Loam
24 to 60 inches: Stratified gravelly sandy loam to loam

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Alluvial fans

104—Bale clay loam, 0 to 2 percent slopes

Map Unit Setting

Elevation: 20 to 400 feet
Mean annual precipitation: 25 to 35 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 220 to 270 days

Map Unit Composition

Bale and similar soils: 85 percent
Minor components: 3 percent

Description of Bale

Setting

Landform: Alluvial fans, flood plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from rhyolite and/or alluvium derived from igneous rock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 7.2 inches)

Interpretive groups

Farmland classification: Prime farmland if irrigated
Land capability classification (irrigated): 2w
Land capability (nonirrigated): 3w
Hydrologic Soil Group: B

Typical profile

0 to 24 inches: Clay loam
24 to 60 inches: Stratified gravelly sandy loam to loam

Minor Components

Clear lake

Percent of map unit: 3 percent
Landform: Depressions

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Chemical Properties

This folder contains a collection of tabular reports that present soil chemical properties. The reports (tables) include all selected map units and components for each map unit. Soil chemical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil chemical properties include pH, cation exchange capacity, calcium carbonate, gypsum, and electrical conductivity.

Chemical Soil Properties (Greenwood Culvert Replacement)

This table shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Effective cation-exchange capacity refers to the sum of extractable cations plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

Soil reaction is a measure of acidity or alkalinity. It is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity and aeration, and a general degradation of soil structure.

Chemical Soil Properties–Napa County, California								
Map symbol and soil name	**Depth**	**Cation-exchange capacity**	**Effective cation-exchange capacity**	**Soil reaction**	**Calcium carbonate**	**Gypsum**	**Salinity**	**Sodium adsorption ratio**
	In	*meq/100g*	*meq/100g*	*pH*	*Pct*	*Pct*	*mmhos/cm*	
103—Bale loam, 0 to 2 percent slopes								
Bale	0-24	10-20	—	5.6-6.5	0	0	0.0-2.0	0
	24-60	5.0-20	—	5.6-6.5	0	0	0.0-2.0	0
104—Bale clay loam, 0 to 2 percent slopes								
Bale	0-24	5.0-20	—	5.6-6.5	0	0	0.0-2.0	0
	24-60	5.0-20	—	5.6-6.5	0	0	0.0-2.0	0

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Appendix D: USFWS Species List

U.S. Fish & Wildlife Service

Sacramento Fish & Wildlife Office

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 140228094239

Database Last Updated: September 18, 2011

Quad Lists

Listed Species

Invertebrates

Syncaris pacifica
California freshwater shrimp (E)

Fish

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus kisutch
coho salmon - central CA coast (E) (NMFS)

Oncorhynchus mykiss
Central California Coastal steelhead (T) (NMFS)
Central Valley steelhead (T) (NMFS)
Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha
California coastal chinook salmon (T) (NMFS)
Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Rana draytonii
California red-legged frog (T)

Birds

Strix occidentalis caurina
northern spotted owl (T)

Plants

Astragalus clarianus
Clara Hunt's milk-vetch (E)

Eryngium constancei
Loch Lomond coyote-thistle (=button-celery) (E)

Lasthenia burkei
Burke's goldfields (E)

Plagiobothrys strictus
Calistoga allocarya (popcorn-flower) (E)

Poa napensis
Napa bluegrass (E)

Quads Containing Listed, Proposed or Candidate Species:

CALISTOGA (517D)

County Lists

Listed Species

Invertebrates

Branchinecta conservatio
Conservancy fairy shrimp (E)
S

Branchinecta lynchi
Critical habitat, vernal pool fairy shrimp (X)
vernal pool fairy shrimp (T)
S

Desmocerus californicus dimorphus
valley elderberry longhorn beetle (T)
S

Elaphrus viridis
delta green ground beetle (T)
S

Lepidurus packardi
vernal pool tadpole shrimp (E)
S

Speyeria callippe callippe
callippe silverspot butterfly (E)
S

Speyeria zerene myrtleae
Myrtle's silverspot butterfly (E)
S

Syncaris pacifica
California freshwater shrimp (E)
S

Fish

Acipenser medirostris
green sturgeon (T) (NMFS)
S

Eucyclogobius newberryi
tidewater goby (E)
S

Hypomesus transpacificus
delta smelt (T)
S

Oncorhynchus kisutch
coho salmon - central CA coast (E) (NMFS)
S

Oncorhynchus mykiss
Central California Coastal steelhead (T) (NMFS)

Central Valley steelhead (T) (NMFS)
Critical habitat, Central California coastal steelhead (X) (NMFS)
S

Oncorhynchus tshawytscha
California coastal chinook salmon (T) (NMFS)
Central Valley spring-run chinook salmon (T) (NMFS)
Critical habitat, winter-run chinook salmon (X) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)
S

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)
S

Rana draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)
S

Reptiles

Thamnophis gigas
giant garter snake (T)
S

Birds

Charadrius alexandrinus nivosus
western snowy plover (T)
S

Pelecanus occidentalis californicus
California brown pelican (E)
S

Rallus longirostris obsoletus
California clapper rail (E)
S

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)
S

Strix occidentalis caurina
northern spotted owl (T)
S

Mammals

Reithrodontomys raviventris
salt marsh harvest mouse (E)
S

Plants

Alopecurus aequalis var. sonomensis
Sonoma alopecurus (E)
S

Astragalus clarianus
Clara Hunt's milk-vetch (E)
S

Blennosperma bakeri
Baker's stickyseed [=Sonoma Sunshine] (E)
S

Castilleja affinis ssp. neglecta
Tiburon paintbrush (E)
S

Cordylanthus mollis ssp. mollis
soft bird's-beak (E)
S

Eryngium constancei
Loch Lomond coyote-thistle (=button-celery) (E)
S

Lasthenia burkei
Burke's goldfields (E)
S

Lasthenia conjugens
Contra Costa goldfields (E)
Critical habitat, Contra Costa goldfields (X)
S

Limnanthes vinculans
Sebastopol meadowfoam (E)
S

Navarretia leucocephala ssp. pauciflora
few-flowered navarretia (E)
S

Navarretia leucocephala ssp. plieantha
many-flowered navarretia (E)
S

Plagiobothrys strictus
Calistoga allocarya (popcorn-flower) (E)
S

Poa napensis
Napa bluegrass (E)
S

Sidalcea keckii

Keck's checker-mallow (=checkerbloom) (E)
S

Sidalcea oregana ssp. valida
Kenwood Marsh checkermallow (=checkerbloom) (E)
S

Trifolium amoenum
showy Indian clover (E)
S

Proposed Species

Plants

Cordylanthus mollis ssp. mollis
Critical habitat, soft bird's-beak (PX)
S

Key:

(E) *Endangered* - Listed as being in danger of extinction.
(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.
(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.
(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
Critical Habitat - Area essential to the conservation of a species.
(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.
(C) *Candidate* - Candidate to become a proposed species.
(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6520.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be May 29, 2014.

Appendix E: CNDDB Map

Exhibit 2 - Initial Study/Mitigated Negative Declaration

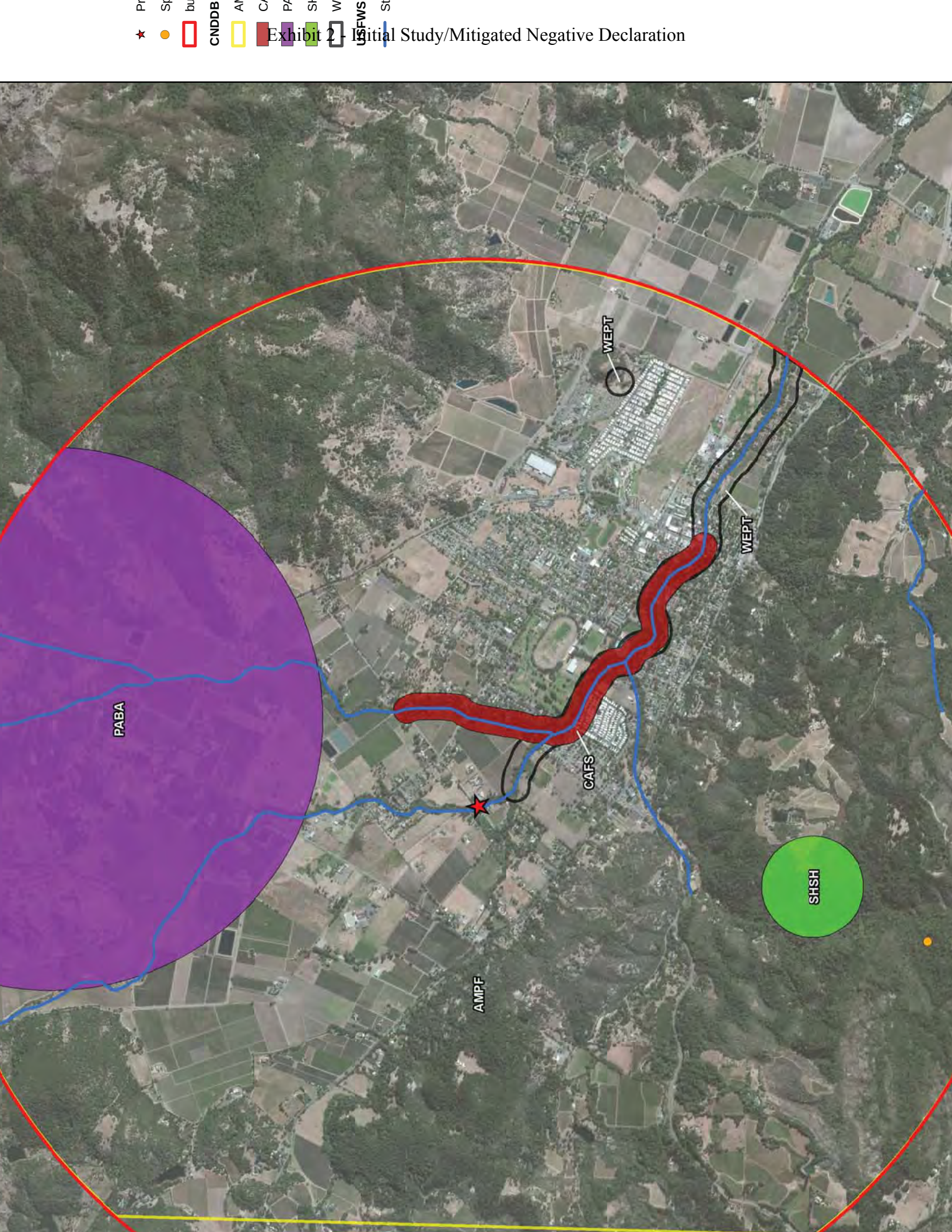

Exhibit 2 - Initial Study/Mitigated Negative Declaration

Appendix F: California Freshwater Shrimp Habitat Survey Results

Scott Cressey
Fisheries Biologist
147 Ashbury Avenue • El Cerrito, CA 94530 • (510) 525-4389

March 26, 2014

Syd Temple
Questa Engineering Corporation
1220 Brickyard Cover Road, Suite 206
Pt. Richmond, CA 94801-4171

Re: Freshwater Shrimp Habitat Survey Results, Napa River at Greenwood Ave, Calistoga

Dear Syd;

On March 13, 2014, Jeremy Sarrow, Watershed Resources Specialist with Napa County, and I met at the Greenwood Avenue crossing of the Napa River in Calistoga to conduct a survey for suitable California freshwater shrimp habitat in the vicinity of the Greenwood Avenue Culvert Replacement Project (Project) area. The protocol we used for the shrimp habitat survey is described in a memo dated March 9, 2014 that was send to you previously and is repeated below.

STUDY AREA

As noted in the memo referenced above, it was determined in conversation with resource agency staff to survey 200 feet of the Napa River channel downstream of the Greenwood Avenue culvert, and 500 feet of channel upstream the culvert. While this survey boundary is mostly outside of the Project area, it was determined that surveying these areas would provide a better reference for potential freshwater shrimp habitat as the majority of suitable habitat is thought to occur upstream of the Project area. The survey conducted March 13 actually surveyed 250 feet downstream of the culvert and 564 feet above the culvert as it was necessary to survey channel habitat units through their full length.

METHODS

A draft field data sheet was developed that incorporates most of the information suggested during the March 4 conference call with the resource agencies' personnel involved with this Project. This data sheet was finalized after reviewing the 2011 freshwater shrimp paper by Larry Serpa and the freshwater shrimp habitat paper by Martin et al. 2009, and incorporating Larry Serpa's definitions of freshwater shrimp habitat rating categories of "Poor, Fair, Good, and Excellent." A copy of the two pages of completed field data sheet is attached.

Information Collected during the Survey

During the field survey, the following information was recorded on a field sheet (attached) or in a field notebook.

- Linear distance of basic instream habitat types (pool, glide, riffle).
- Maximum water depth associated with pool habitats.
- Percent sand bottom.
- Presence and linear distance of undercut streambanks.
- Length of undercut beneath streambank.
- Water depth at beginning of undercut streambank.
- Presence or absence of vegetation roots exposed within the undercut.
- Presence or absence of overhanging vegetation touching the water.
- Vegetation type on undercut banks.
- Assessment of winter and summer (est.) shrimp habitat quality using Larry Serpa's habitat assessment definitions.
- GPS coordinates of pools sufficiently deep to likely still occur during summer.
- Photographs of habitat types and undercut streambanks in stream channel surveyed.

A stream flow measurement was taken at a suitable site upstream of Greenwood Avenue within the surveyed reach. Additional stream flow information was supplied by Syd Temple the following day by reading online the stream gage for the Napa River at Dunaweal Lane operated by the Napa County Flood Control District and by an estimation of the wetted width of water passing through the culvert beneath Greenwood Avenue.

Habitat Survey Protocol

All surveys, above and below Greenwood Avenue, began at the existing culvert beneath the road. A hip chain was used to measure the linear distance to each habitat feature and to measure the length of habitats. The length of undercut streambanks was measured with a stadia rod. The stadia rod was also used to measure water depths and the distance of the undercut beneath streambanks. Photographs of habitat were taken with a digital camera. GPS coordinates were determined with a Garmin E-Trex handheld GPS and recorded in a Rite-in-the-Rain notebook.

The assessment of the quality of the existing freshwater shrimp habitat used the "Poor, Fair, Good, Excellent" categories as defined by Larry Serpa in his 2011 paper. His description of habitat classification and definitions of his four categories of habitat quality are reproduced below.

<u>Larry Serpa's Habitat Classification</u>

Habitat quality was rated by a combination of features known to be important to the shrimp, including water depth, presence or absence of undercut banks, current speed, and the quality and quantity of tree roots and herbaceous vegetation hanging into the water. Although this is somewhat subjective, it is actually a relatively consistent method of habitat evaluation. The following criteria were used to make this determination for each of the four categories.

Poor Habitat
1. Water usually less than 6 inches deep, but could be much deeper if there is a sheer bank of earth or rock.
2. Very little or no roots, twigs, branches, or vegetation hanging into the water.

Fair Habitat
1. Water usually more than 6 inches deep, but could be shallower if the habitat was otherwise well developed.
2. At least one of the following features also present: some herbaceous vegetation, hair-like fine roots, coarse roots (> 0.5 cm diameter), twigs or branches in the water, or an undercut bank extending inward away from the stream for more than 6 inchs.

Good Habitat
1. Water 1 to 4 feet deep.
2. Usually at least two of the following features also need to be present: hair-like fine roots, coarse roots (>0.5cm diameter), blackberries or dogwood or shrubs or ferns with roots in water, grass on the water, undercut banks(> 6 inches away from stream) or abundant herbaceous vegetation. A well-developed section of fine roots, or blackberries with adventitious roots, would qualify for good habitat by itself, even without the complementary presence of one of the other features noted.

Excellent Habitat
1. Water 1 to 3 feet deep.
2. Usually at least two of the following features are also required to be present, better developed than above: hair-like fine roots, coarse roots (>0.5cm diameter), blackberries or dogwood or shrubs or ferns with roots in water, grass on the water, undercut banks that extend >6 inches away from the stream. Only one of the above would be needed if it was exceptionally well developed.

If the current was excessive, or there was too much silt or algae, the habitat quality was reduced by a rank. An otherwise "excellent" habitat then became a "good" habitat.

The actual assessment of potential shrimp habitat in the field was made by Jeremy Sarrow as I recorded the information on my field sheets (attached).

RESULTS

Streamflow

The Napa River flow gage at Dunaweal Lane was checked for a stream flow reading the morning after the survey. The gage reading, when adjusted for the size of the watershed's contributing flow to the Napa River at the gage's location, indicates the stream flow at the Project site was approximately 1.68 cfs. Using a photograph from the survey showing the flow within the Greenwood Avenue culvert, measuring the wetted width and applying that to a flow capacity formula for the culvert, the stream flow was calculated to be 3 cfs. It was therefore estimated

that the actual Napa River flow at the time of the survey was approximately 2.5 cfs at Greenwood Avenue.

Shrimp Habitat Survey Results

The habitat survey results are presented in three tables (attached). Table 1 lists the habitats occurring in the survey reaches above and below the culvert, the lengths, the number of the photograph depicting the habitat (attached), and the GPS coordinates of the pools containing potential shrimp habitat. Table 2 presents the field sheet habitat information and ratings for the pool habitats, as fast current habitats such as riffles and glides have too much current to be consider potential shrimp habitat. Table 3 lists the linear feet of the four categories of potential shrimp habitat for both summer and winter conditions.

During summer conditions, linear feet of potential freshwater shrimp habitat within the total length surveyed are: 2.6 feet of Poor habitat; 79.5 feet of Fair habitat; 63.4 feet of Good habitat, and no Excellent habitat. This same length surveyed provides the following lengths of winter habitat: 87.2 feet of Poor habitat; 44.8 feet of Fair habitat; 13.5 feet of Good habitat; and no Excellent habitat. The following paragraphs break this down into freshwater shrimp habitat downstream of the culvert, the first 250 upstream of the culvert, and the final 256 feet of channel surveyed upstream of this section.

Downstream of Greenwood Avenue

The pool immediately downstream of the Greenwood Avenue culvert had no potential shrimp habitat on the right bank (looking downstream) which is covered with riprapped. However, the pool's left bank has 29 feet of Fair habitat and 13.5 feet of Good habitat during the summer. In winter, the 13.5 feet of Good habitat remains, but the other 29 feet of potential shrimp habitat is rated as Poor (see Table 3).

Upstream of Greenwood Avenue

The first 250 feet of the Napa River upstream of Greenwood Avenue contains two pool habitats (US-2 and US-4) with potential pool habitat ending in the middle of unit US-4. The linear feet of potential freshwater shrimp summer habitat within these two pools is: 17.9 feet of Fair habitat; 2.3 feet of Good habitat; and no Excellent habitat. These same two pools provide the following lengths of winter habitat: 17.9 feet of Poor habitat and 2.3 feet of Fair habitat; no Good habitat; and no Excellent habitat.

Upstream of pool US-4 is 256 linear feet of channel that comprises the final section surveyed. Within this reach are pools US-6, -8, and -10 (photos 10, 11, and 13-16, respectively). This reach contains the best potential freshwater shrimp habitat in the total length surveyed (see Table 3) and is well outside of the Project area. The linear feet of freshwater shrimp summer habitat within this reach is: 2.6 feet of Poor Habitat; 32.6 feet of Fair habitat; 47.6 feet of Good habitat; and no Excellent habitat. These same pools provide the following lengths of winter habitat: 40.3 feet of Poor habitat and 42.5 feet of Fair habitat; no Good habitat; and no Excellent habitat.

The most suitable potential habitat identified for freshwater shrimp begins approximately 386 feet upstream of Greenwood Avenue at pools # US-8 and US-10 (see Table 3 and photos 11 and 13-16). The distance of these pools upstream of Greenwood Avenue, and the presence of a bedrock grade control outcropping at approximately US-4, should minimize any hydraulic changes in these pools from the Project. The uppermost pool surveyed is well protected during the summer dry period by a substantial hydraulic control at its lower end (see photo 13) and during the winter high flows by large woody debris (see photos 14-16).

RECOMMENDATIONS

Attempts to design and construct suitable summer or winter habitat for freshwater shrimp during the culvert replacement effort should focus first of all on the reach immediately below the culvert. This reach is going to be modified to ensure steelhead passage through the culvert, so it is logical to include in the design habitat features that maintain or improve shrimp habitat at this location where feasible. Characteristics of suitable freshwater shrimp habitat include:

- Water depth of 1-4 feet deep;
- A streambank undercut greater than 6 inches and preferably at least 2 feet undercut for winter habitat;
- Fine and course plant roots penetrating into the wetted portion of the undercut bank;
- Streambank vegetation of dogwood, blackberry cane, ferns or other plants that tend to have branches lying submerged in the water adjacent to the undercut bank; and
- No perceivable (to the naked eye) current flowing through the undercut.

The second location for possible improvement of shrimp habitat is the first pool upstream of Greenwood Avenue. At this location the existing Fair summer habitat and Poor winter habitat may be altered by increased high water flow velocities through this reach as a result of culvert replacement resulting in increased capacity for passing winter flows. It may be possible to maintain or improve shrimp habitat here if a pocket of low velocity, undercut bank habitat with penetrating roots can be created.

Literature Cited

Martin, B.A., M.K. Saiki, and D. Fong. 2009. Habitat requirements of the endangered California freshwater shrimp (*Sycaris pacifica*) in Lagunitas and Olema creeks, Marin County, California, USA. Journal of Crustacean Biology, 29(4):595-604.

Serpa, L. 2011. Survey (2011) of the California Freshwater Shrimp (*Sycaris pacifica*) in Lagunitas Creek, Marin County, California. Prepared for the Marin Municipal Water District, Corte Madera, CA.

Sincerely,

Scott Cressey
Fisheries Biologist

Attach: Tables 1 though 3
Photos 1 though 16
Field data sheets pages 1 and 2

Table 1. Napa River Instream Habitats Surveyed above and below Greenwood Ave, Calistoga, March 13, 2014

Habitat No.	Habitat Type	Hip Chain Reading (ft)	Napa River Station No.	Habitat Length (ft)	Photo Number	GPS Coordinates	
						Latitude ^{0}	Longitude ^{0}
From the downstream side of the culvert, progressing downstream: downstream end of culvert is River Station 2300+10							
Downstream 1	Pool	0 - 91	2300-81	91	1 & 2	38.58869	122.59751
Downstream 2	Riffle	185	2300-175	94	3 & 4		
Downstream 3	Glaide	250	2300-240	65	3 & 4		
From the upstream side of the culvert, progressing upstream: upstream end of culvert is River Station 2300+70							
Upstream 1	Riffle	not used	2300+70	18	5		
Upstream 2	Pool	0 - 74	2300+88	74	6		
Upstream 3	Riffle	184	2300+162	110	7 & 8		
Upstream 4	Pool	290	2300+272	106	9	38.58971	122.59797
Upstream 5	Riffle	316	2300+378	26	10		
Upstream 6	Pool	361	2300+404	45	10		
Upstream 7	Riffle	368	2300+449	7			
Upstream 8	Pool	444	2300+456	76	11	38.59042	122.59762
Upstream 9	Riffle	484	2300+532	40	12		
Upstream 10	Pool	546	2300+572	62	13 - 16	38.59060	122.59778

Length of instream habitat surveyed downstream from culvert: 250 feet
Length of instream habitat surveyed upstream from culvert: 564 feet

Table 2. Summary of Potential California Freshwater Shrimp Pool Habitat Survey Results, Napa River at Greenwood Ave, Calistoga, March 13, 2014

Date: March 13, 2014	Location: Greenwood Ave, Calistoga	Stream: Napa River	Est. Flow: 2-3 cfs	Surveyors: Scott Cressey and Jeremy Sarrow (Napa County)

Habitat Unit Number	Habitat Type	Habitat Length (ft)	% Sand Substrate	Max. Depth of Habitat (ft)	Undercut Bank Length (ft)	Depth (ft) at Undercut[2]	Distance (ft) Undercut	Fine Roots Present	Vegetation Habitat[3]	Veg. Type on Undercut Banks	Habitat Rating[4]		Habitat[5] Photo No.	GPS[5] Recorded
											Summer	Winter		
Downstream of Culvert, habitat unit numbers progressing downstream:														
DS-1 (RB[1])	Pool	91	40%	6 to 8	9.0	3.1	1 to 2	Course	None	Grass; Clover	Fair	Poor	1 & 2	X
No. 2300-91			40%		10.0	1.7	1.0	Course	None	Grass; Rumex	Fair	Poor		
			40%		10.0	4.8	1.5	Course	None	Grass; Sedge	Fair	Poor		
			40%		13.5	4.8	2.5	Yes	None	Tree; Grass; Clover	Good	Good		
Upstream of Culvert, habitat unit numbers progressing upstream:														
US-2 (LB)	Pool	74	25%	3	2.5	0.9	<0.5	Yes	None	Grass	Fair	Poor	6	
No. 2300+88			25%		3.5	2.5	0.9	Course	None	Willow	Fair	Poor		
			10%		5.4	2.3	1.6	No	None	Grass	Fair	Poor		
US-4	Pool	106	60%	4.8	6.5	1.6	0.7	little bit	None	Grass	Fair	Poor	9	X
No. 2300+272			40%		2.3	2.1	1.1	Yes	None	Grass; Laural	Good	Fair		
US-6	Pool	45	30%	3	10.2	2.4	1.2	Yes	None	Grass	Fair	Poor	10	
No. 2300+404			30%		2.6	1.4	0.6	Yes	None	Grass	Poor	Poor		
US-8	Pool	76	40%	3.5	8.8	2.9	1.9	Yes	None	Poison Oak; Grass; Alder	Good	Fair	11	X
No. 2300+456			60%		8.3	2.2	1.6	Yes	None	Grass	Good	Fair		
			40%		12.5	3.1	1.8	Yes	None	Tree roots	Good	Poor		
US-10 (RB)	Pool	62	60%	3.6	7.4	3.4	0.8	Yes	None	Eroded	Fair	Fair	13 - 16	
No. 2300+572			80%		2.5	1.7	1.2	Yes	None	Large Woody Debris (LWD)	Good	Fair		
			80%		15.5	2.1	1.0	Course	None	Eroded	Good	Fair		
(LB)			30%		15.0	2.1	1.0	Yes	None	Large Woody Debris (LWD)	Fair	Poor		X

[1] Right Bank is indicated by RB; Left Bank is LB. Left and right designations are determined looking downstream.

[2] Water depth at the edge of the undercut streambank.

[3] Emergent vegetation (EV) or the presence of overhanging vegetation (OV) that is touching the water at the time surveyed.

[4] The habitat rating system uses the "Poor, Fair, Good, Excellent" described by Larry Serpa in his 2011 paper on freshwater shrimp in Lagunitas Creek prepared for Marin Municipal Water District.

[5] The photograph number corresponds to the attached photos, and the GPS coordinates of the better pool habitats are shown in Table 1.

Table 3. Linear Feet of Potential Shrimp Habitat of Various Quality, Napa River at Greenwood Ave, Calistoga, March 13, 2014

Pool Habitat Number [1]	Napa River Station No.	Length (feet) of Shrimp Habitat			
		Poor	Fair	Good	Excellent
Summer Habitat					
Downstream of Culvert 250 Feet:					
DS-1	2300-81		9		
			10		
			10		
				13.5	
Feet of Shrimp Habitat:		**0**	**29**	**13.5**	**0**
Upstream of Culvert 308 Feet:					
US-2	2300+88		2.5		
			3.5		
			5.4		
US-4	2300+272		6.5		
				2.3	
Feet of Shrimp Habitat:		**0**	**17.9**	**2.3**	**0**
Upstream of Culvert 308-564 Feet:					
US-6	2300+404		10.2		
		2.6			
US-8	2300+456			8.8	
				8.3	
				12.5	
US-10	2300+572		7.4		
				2.5	
				15.5	
			15		
Feet of Shrimp Habitat:		**2.6**	**32.6**	**47.6**	**0**
Grand Tot. Feet of Habitat:		**2.6**	**79.5**	**63.4**	**0**
		Poor	**Fair**	**Good**	**Excellent**

Pool Habitat Number [1]	Napa River Station No.	Length (feet) of Shrimp Habitat			
		Poor	Fair	Good	Excellent
Winter Habitat:					
Downstream of Culvert 250 Feet:					
DS-1	2300-81	9			
		10			
		10			
				13.5	
Feet of Shrimp Habitat:		**29**	**0**	**13.5**	**0**
Upstream of Culvert 308 Feet:					
US-2	2300+88	2.5			
		3.5			
		5.4			
US-4	2300+272	6.5			
			2.3		
Feet of Shrimp Habitat:		**17.9**	**2.3**	**0**	**0**
Upstream of Culvert 308-564 Feet:					
US-6	2300+404	10.2			
		2.6			
US-8	2300+456		8.8		
			8.3		
		12.5			
US-10	2300+572		7.4		
			2.5		
			15.5		
		15			
Feet of Shrimp Habitat:		**40.3**	**42.5**	**0**	**0**
Grand Tot. Feet of Habitat:		**87.2**	**44.8**	**13.5**	**0**
		Poor	**Fair**	**Good**	**Excellent**

Photo 1. Pool (Station 2300-81) downstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 2. Left bank of pool (Station 2300-81) downstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 3. Riffle (Station 2300-175) and glide (Station 2300-240) downstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 4. Glide (Station 2300-240) at lower end of habitat surveyed downstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 5. Riffle (Station 2300+70) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 6. Pool (Station 2300+88) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 7. Lower end of riffle (Station 2300+162) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 8. Upper end of riffle (Station 2300+162) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 9. Pool (Station 2300+272) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 10. Upper end of riffle (Station 2300+378) and pool (Station 2300+404) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 11. Pool (Station 2300+456) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 12. Riffle (Station 2300+532) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 13. Lower end of pool (Station 2300+572) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 14. Middle of pool (Station 2300+572) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 15. Middle of pool (Station 2300+572) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Photo 16. Upper end of pool (Station 2300+572) upstream of culvert, Napa River, Greenwood Ave, Calistoga

Pile Driving Impacts to Freshwater Shrimp Memo

MEMORANDUM

DATE: June 6, 2014

TO: Jeremy Sarrow and Ryan Watanabe

FROM: Scott Cressey

SUBJECT: Greenwood Ave Culvert Replacement, pile driving impacts to freshwater shrimp

---

Syd Temple wanted me to describe to you his plans for pile driving for the culvert replacement and get your thoughts on possible adverse impacts and constraints on pile driving relative to the freshwater shrimp.

First of all, note that all pile driving is done in dewatered portions of the stream that are isolated by cofferdams. There will be no pile driving in wetted areas of the stream channel. Each pile is a 30-foot long steel H pile, and there will be 12 piles driven on each side of the culvert for a total of 24 piles driven into the dewatered construction site. Syd wanted to know if the freshwater shrimp outside the dewatered area are perceived to be particularly vulnerable to adverse impacts from the pile driving shock waves.

The alternative to pile driving is to use drilled piers that will have each drill hole encased and dewatered. Secondary impacts from drilling would be increased truck traffic, additional concrete poured, and noise. This approach would also increase costs and construction time.

I suspected that, lacking a swim bladder, shrimp would be less susceptible to pile driving impacts than fish. I spoke with Dr. Bud Abbott, recently retired, who has been a leader in assessing pile driving impacts to fish in the SF Bay area. Bud agreed with me that, lacking a swim bladder, shrimp are less vulnerable to shock wave impacts than fish. He said he has never seen shrimp (salt or fresh water varieties) impacted by pile driving.

Our conclusion is that the mitigation measures taken to protect juvenile salmonids from the impacts of pile driving on the Project site should be more than adequate to protect the freshwater shrimp present at the site.

What are your thoughts on this assessment?

APPENDIX D
Geotechnical Data

Greenwood Avenue Culvert

Geotechnical Investigation Report

Prepared for:

Napa County Department of Public Works
1195 Third Street, Suite 101
Napa, CA 94559-3092

Submitted by:

Questa Engineering Corporation
1220 Brickyard Cove Road, Suite 206
P. O. Box 70356
Point Richmond, California 94807
(510) 236-6114

September 2014

Greenwood Avenue Culvert Project

Geotechnical Investigation Report

Prepared for:

Napa County Department of Public Works
1195 Third Street, Suite 101
Napa, CA 94559-3092

Submitted by:

Questa Engineering Corporation
1220 Brickyard Cove Road, Suite 206
P. O. Box 70356
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Questa Project Number 1300218

Sydney Temple, PE # 59695
Principal/Senior Engineer

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Greenwood Avenue Culvert Project

Geotechnical Investigation Report

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INTRODUCTION

This report presents results from our Geotechnical Investigation for the Greenwood Avenue Culvert Project near Calistoga, Napa County, California. The project as currently planned, will consist of removal of the existing culvert, restoration of stream banks, and construction of a bridge crossing the restored channel. Questa's geotechnical investigation included background geologic and seismic data review, a subsurface investigation including drilling, logging and sampling of three boreholes, laboratory soils testing, engineering analysis, and development of geotechnical design recommendations.

FIELD INVESTIGATION

Subsurface Drilling Investigation

The subsurface drilling investigation included completion of three boreholes to depths of 33 feet below ground surface to 51.5 feet BGS. Drilling was performed on February 11, 2014, by Pearson Drilling of Forestville, California, using a truck mounted CME 75. Drilling utilized hollow-stem augers and sampling was performed using a 140-pound safety hammer dropped from a height of 30 inches. Samples were collected using the California Modified split-spoon sampler with 2.45 inch inside diameter brass liners and with the Standard Penetration Test sampler with 1.38 inch inside diameter**.** Boreholes were logged by a Staff Geologist under the supervision of our Senior Engineering Geologist. Borehole locations are presented on **Figure 1,** site location and borehole location plan.

Borehole 1 (BH-1) was completed adjacent to the west side of the existing culvert on the northwest side of Greenwood Ave. The log of BH-1 is presented as **Figure 2.** The soils as penetrated in this borehole underlie a topsoil section 0.5 feet deep. The soils consist of clayey sand with gravel fill to 9.5 feet below ground surface (BGS), clayey gravel fill to 14 feet BGS, and well graded sandy gravel fill to 19 feet BGS. Native sandy fat clay was found from 19 to 21.5 feet BGS and sandy lean clay from 21.5 to 24 feet BGS. Medium dense to dense, well-graded sandy gravel with silt was found from 24 to 28 feet BGS, with the groundwater table penetrated at 25 feet BGS or approximately 359 NAVD. Underlying the channel sandy gravels, we found sandy clay from 28 to 33 feet BGS, silty sand with gravel from 33 to 35.5 feet BGS, and sandy clay from 33.5 to 39.5 feet BGS. Clayey sand, well-graded and medium dense to dense, was penetrated from 39.5 feet to 51.5 feet BGS, the total depth of borehole BH-1.

Borehole 2 (BH-2) was completed on the southeast side of Greenwood Ave. adjacent to the east side of the existing culvert. The log of BH-2 is presented as **Figure 3.** The soils as penetrated in this borehole underlie asphalt concrete and Class 2 AB which extend to approximately 0.5 foot in depth. The soils consist of clayey sand with gravel fill from 0.5 to 10.5 feet BGS and medium stiff sandy lean to fat clay from 10.5 feet to 23 feet BGS. Medium dense to dense, well-graded silty gravel with sand was found from 23 to 27 feet BGS, with the groundwater table penetrated at 25 feet BGS, near the channel bottom elevation. Underlying the channel silty gravels, medium dense well-graded clayey sand with gravel extended from 27 to 30 feet BGS, stiff sandy silt with gravel from 30 to 31 feet BGS, and medium dense silty sand with gravel from 31 to 32 feet BGS. Clayey sand, loose to medium dense, was penetrated from 32 to 35.5 feet BGS with sandy clay at the bottom of the borehole from 35.5 to 36 feet BGS, the total depth of BH-2.

Borehole 3 (BH-3) was completed on the southwest side of Greenwood Ave. approximately 65 feet to the west of the existing culvert. The log of BH-3 is presented as **Figure 4.** This borehole penetrated approximately 0.5 feet of asphalt concrete and Class 2 aggregate base at the surface. The soils as penetrated in this borehole consist of sandy clay fill from 0.5 feet to 4.0 feet BGS and native sandy fat to lean clay from 4.0 feet to 11.5 feet BGS. Underlying the sandy clay, the borehole penetrated medium dense well-graded silty sand with gravel from 11.5 to 14 feet BGS, medium dense well-graded sandy gravel with silty from 14 to 16.5 feet BGS, medium stiff to stiff elastic silt with sand from 16.5 to 20 feet BGS, and stiff fat clay with sand from 20 to 24 feet BGS. Medium dense, well-graded sandy gravel was penetrated from 24 to 30 feet BGS, with the groundwater table penetrated at 25 feet BGS. Underlying the channel sandy gravels, medium dense, well-graded clayey sand was found from 30 to 33 feet BGS, the total depth of BH-3.

All boreholes were logged in accordance with the Unified Soil Classification System (ASTM D 2487). **Figure 5** presents a summary of the Unified Soil Classification System and a Key to Test Data.

LABORATORY TESTING

Laboratory testing was performed on selected soil samples from the boreholes. Laboratory testing was performed in Questa's laboratory in general accordance with American Society for Testing and Materials (ASTM) standards for moisture content, dry density, particle size analysis, and liquid and plastic limits (including plasticity index). We also performed unconfined compressive strength testing using the pocket penetrometer. A brief explanation of testing performed follows.

Moisture/Density

Moisture content and dry density testing were performed on selected soil samples to characterize the moisture content and dry density of material throughout the soil column. Testing was performed in accordance with ASTM 2937. In this test, the dry density of the soil is determined by a mathematical relationship between moisture content and wet density of the soil sample. Results of moisture-density testing are summarized on the borehole logs (**Figures 2** through **4**) as well as on **Table 1**.

Particle Size Analysis

Particle size analysis testing was performed in accordance with ASTM D 422. Samples collected from each of the boreholes were tested for grain size using both the dry sieve method and the hydrometer method, used to determine clay and silt fraction percentages. Results are presented on **Figures 6** through **13** and summarized on **Table 1.**

Liquid Limit, Plastic Limit and Plasticity Index

Testing of liquid limit, plastic limit and plasticity index were performed in accordance with ASTM D 4318. Samples collected from each of the boreholes were tested by this method.
Results are presented on **Figures 14** through **17** and summarized on **Table 1.**

Strength Testing

Triaxial shear strength testing, unconsolidated, undrained (TXUU) was performed by Soil Mechanics Laboratory of Oakland, California. Results of TXUU testing are presented in **Appendix A**. Results are also summarized on **Table 1** below.

A summary of laboratory test data for physical properties is presented on **Table 1**.

Table 1. Results of Laboratory Testing

Sample Number	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Gravel (%)	Sand (%)	Percent Passing #200 (% fines)	Liquid Limit (%)	Plastic Limit (%)	PI	Shear Strength (psf)
BH-1 @ 6'	SC	21	101	29	20	41.9	--	--	--	--
BH-1 @ 15.5'	GW	9.9	106	49	41	10.0	--	--	--	--
BH-1 @ 23'	CL	24.5	96	3	83	66.8	33	21	12	--
BH-1 @ 21'	CL-CH	35.6	86.4	--	--	--	--	--	--	640
BH-1 @ 46'	SC	--	--	1.4	57	41.6	47	26	21	--
BH-2 @ 11'	CL	24.1	86	11	39	50.0	44	23	21	--
BH-2 @ 18'	CH	28.8	90.4	0.2	22	77.8	51	25	26	2,980
BH-2 @ 30'	MH	30.2	90	6	38	55.7	55	25	30	--
BH-2 @ 31'	SM	30.8	91	21	58	20.7	--	--	--	--
BH-2 @ 34'	SC	30.0	92.8	--	--	--	--	--	--	350
BH-2 @ 34.5'	SC	34	87	30	42	27.7	45	22	23	--
BH-3 @ 5'	SC	19.1	103	--	--	--	--	--	--	610
BH-3 @ 6'	SC	16.1	100	6	40	53.8	51	24	27	--
BH-3 @ 10'	CL-CH	17.7	91	--	--	--	--	--	--	550
BH-3 @ 11'	CL	14.6	86.1	4	43	52.8	--	--	--	--
BH-3 @ 15.5'	CL-CH	21.8	101	--	--	--	--	--	--	1,740
BH-3 @ 16'	GW	14.7	97.7	57	34	9.3	--	--	--	--
BH-3 @ 17.5'	MH	28.3	90.7	--	--	82	64	22	42	--
BH-3 @ 21'	CH	39.6	77.1	0.5	13.2	86.3	55	27	29	--
BH-3 @ 26'	GW	15.1	110	44	46	9.9	--	--	--	--
BH-3 @ 31'	CL	21.5	95.9	23	53	24.2	--	--	--	--

Notes: USCS- Unified Soil Classification System; pcf- pounds per cubic foot; psf- pounds per square foot
PI-Plasticity Index

Corrosion Testing

Corrosion testing was performed on a sample collected from the fill soils located adjacent to the existing culvert from borehole BH-1 at 8 to 10 feet BGS. Based on the results of the corrosion analyses, the existing fill soils are considered non-corrosive by Caltrans standards (Caltrans Corrosion Guidelines version 2.0) with a resistivity of 1,060 ohm-cm and a pH of 7.03. Additionally, chloride concentration is 243 ppm, sulfate is 30 ppm, and redox result was +243.3 mV, also indicating an environment with a low corrosion hazard. However, the native soils

present below the fill include a high percentage of volcanic source materials; therefore, we anticipate that the native soils may be corrosive to steel and to concrete. Type II/V concrete should be used for all concrete structures. The full laboratory test report by Cooper Testing Laboratory is presented in **Appendix A**.

REGIONAL SEISMICITY

The project site is located within the Coast Ranges Geomorphic Province of northern California, a region of northwest trending ridges and valleys that stretches along much of the California Coast and is dissected by only a few structural depressions, the largest of which are San Francisco and San Pablo Bays. The ridges and valleys trend northwest to southeast due to fault geometry along the transform plate boundary between the North American and Pacific Plates. Scientists estimate as much as 5 to 6 centimeters of strain accumulates annually along the margin between the Pacific and North American Tectonic Plates. This strain is periodically released by fault slip that generates earthquakes along the San Andreas Fault System. For this reason the Bay Area is among the most seismically active regions in the United States and there exists an approximately 63 percent chance of a major earthquake in the area within the next 30 years (Working Group on California Earthquake Probabilities, 2008; Wills and others, 2008).

FAULTING

No active earthquake faults are located on the project site and the risk of fault rupture is considered low. The project site is not located within an Alquist-Priolo Earthquake Fault Zone. The nearest active earthquake fault trace in relation to the project site is the Maacama Fault, located approximately 6 miles to the west. Other nearby active faults include, the Healdsburg-Rodgers Creek Fault 9.5 miles west, the Hunting Creek fault 14 miles to the east, the West Napa fault 15 miles to the southeast, the Green Valley fault located 24 miles to the east, and the San Andreas Fault 30 miles to the west, and the Hayward fault 38 miles to the south (California Geological Survey, 2007; California Geological Survey, 2010). **Table 2** presents a summary of the regional active faults that could impact the site. No faults zoned as active by the State of California Geological Survey cross the subject area.

Table 2. Regional Faults and Activity

Fault Name	Distance From Site (mi)	Direction From Site	Activity	Mean Characteristic Moment Magnitude*	Maximum Credible Earthquake**	Modified Mercalli Intensity***
Maacama	6	West	Active	7.4	7.25	VIII
Healdsburg-Rodgers Creek	9.5	West	Active	7.1	7.5	VII
Hunting Creek-Berryessa	14	East	Active	7.1	6.75	VII
West Napa	15	Southeast	Active	6.7	6.75	VI
Collayomi	16	Northwest	Potentially Active	6.7	6.5	----
Green Valley	24	East	Active	6.8	8.0	V
Bartlett Springs	25	North	Active	7.3	6.5	----
Great Valley	28	East	Active	7.1	7.5	V

San Andreas-North Coast	30	West	Active	7.5	8.0	VI
Hayward	38	South	Active	7.3	7.5	V

*WGCEP, 2007; ** Caltrans, California Seismic Hazard Map, 1996; *** Association of Bay Area Governments, 2014

Table 3 presents a summary of the major historic earthquakes in Central California with the date of occurrence, magnitude and the approximate distance and direction to the epicenter relative to the site location.

Table 3. List of Major Historic Earthquakes

Location	Date of Earthquake	Magnitude (Richter)	Distance From Site (mi)	Direction To Epicenter
San Francisco	June 21, 1808	5.5	54.5	South
Santa Cruz	September 00, 1825	5.5	104.2	South
San Francisco	April 3, 1827	5.5	58.2	South
San Francisco to San Juan Bautista	June 00, 1838	7.4	92.4	South
Petaluma-San Francisco	August 27, 1855	5.5	34.2	South
SW San Francisco Peninsula	January 2, 1856	5.7	89.2	South
San Francisco Peninsula	February 15, 1856	5.9	77.0	South
Hayward Fault	October 21, 1868	7.0	67.1	Southeast
Hayward Fault	April 2, 1870	5.8	50.3	Southeast
Hayward Fault	July 31, 1889	5.6	58.7	Southeast
Napa	October 12, 1891	5.6	22.7	Southeast
Santa Rosa	August 9, 1893	5.6	14.2	Southwest
Mare Island	March 31, 1898	6.4	27.4	South
San Francisco Area	June 2, 1899	5.6	61.7	South
Great 1906 Earthquake	April 18, 1906	7.8	61.7	South
Monterey Bay	October 24, 1926	5.8	110.5	South
Santa Rosa	October 2 1969	5.6	9.6	Southwest
Santa Rosa	October 2 1969	5.7	10.2	Southwest
Loma Prieta	October 17, 1989	6.9	108	South

Source: California Geological Survey, 2013, California Historical Earthquake Online Database (M>=5.5)

SITE GEOLOGY

Geology of the project site as presented on Geologic Maps of the area (**Plate 1**) is characterized as consisting of active stream channel deposits that include sand, silt, and gravel and alluvial deposits that include sand, silt, gravel and clay deposits and combinations of these materials of Holocene age (Delattre and Gutierrez, 2013). These sediments are characterized as poorly to moderately sorted, that form smooth surfaces with little or no dissection. The nearest bedrock to the project site consist of deposits of the Sonoma Volcanics (Pliocene age) to the east, north and west consisting of andesite and various varieties of rhyolite tuff including agglomerate, tuff breccia, and welded tuff. These rock types are all present in gravels collected from the stream channel and as components of the alluvial deposits underlying the site.

SITE SOILS

Site soils encountered in our subsurface investigation include fill soils adjacent to the existing Culvert under Greenwood Avenue consisting of clayey sand, sandy clay and well-graded gravels. At depth, the stream channel and alluvial deposits underlying Greenwood Avenue include well-graded silty sand with gravel, well-graded silty gravel, well-graded sand with gravel, clayey sand with gravel, silty sand with gravel, sandy lean clay and fat clay and other poorly-sorted, well-graded sediments.

Expansive clay soils are present, especially in old river bank and alluvial deposits encountered in the boreholes. The expansive soils include sandy lean clay with low to moderate expansion potential and sandy fat clay with moderate expansion potential.

SLOPE (STREAMBANK) STABILITY

The site is located in the Napa River basin. The primary areas of potential slope instabilities are associated with the banks of the Napa River and other creeks in the area. Existing unstable slopes are present along the Napa River banks and associated with erosion of the fill exposed adjacent to the existing culvert at the edge of Greenwood Avenue. Modification of the existing river banks and culvert backfill materials will require stabilization of the exposed fill and native soils.

GROUNDWATER

Groundwater was encountered in each of the three boreholes completed at the site at depths of 25 feet below the top of the road surface. Groundwater levels will fluctuate seasonally, with higher groundwater levels during the rainy season and lower levels during dry periods and summer months.

LIQUEFACTION

Stream channel deposits in the Napa River basin are generally considered to have a very high potential susceptibility to liquefaction (Sowers and others, 1998). Associated alluvial fan deposits can vary from a low to high potential susceptibility to liquefaction depending on the composition of the soils. Liquefaction susceptibility is related to several factors including the type of soil or sediment, density of the materials, gradation of materials, groundwater depth and other factors. Liquefaction occurs when pore pressures buildup in sand and silty sand soils during strong seismic ground shaking and causes a loss of soil strength. This loss of soil strength can lead to settlement of structures at the ground surface or settlement of piles or foundations in or above the liquefiable sediments.

Liquefaction Analysis

The predominance of the soils encountered during our subsurface investigation consists of well-graded mixtures of gravel, sand, silt and clay at various grain size distributions. The soils that are most susceptible to liquefaction consist of clean sands and silty sands, which were not found

in our boreholes to the deepest depth of drilling at 51 feet BGS in BH-1, 36 feet BGS in BH-2, and 33 feet BGS in BH-3. Groundwater was present in each of the boreholes at depths of approximately 25 feet BGS. The predominance of the soils consisted of well-graded poorly-sorted sandy gravel, silty gravel, clayey sand with gravel and cohesive soils such as sandy lean clay and fat clay with significant concentrations of fines (silt + clay). However, there are clayey sand and silty sand soils that are medium dense in the area that were penetrated by our boreholes that have a low to moderate potential for liquefaction.

Liquefaction Settlement

Liquefaction settlement of granular soil lenses were calculated using the methods as outlined in NCEER (1997), and recommended in Special Publication 117A, California Geological Survey (2008). Based on Liquefaction factor of safety analysis, the clayey sand and silty sand soils penetrated in the boreholes below the groundwater depth of 25 feet BGS have a low to moderate likelihood of liquefaction during earthquake-induced strong to violent ground motions (Seed and Idriss, 1971; Seed and others, 1985; Andrus and Stokoe, 2000). Liquefaction settlement analysis indicates that liquefaction induced settlements as great as 3.0 inches could occur at depth below a bridge structure (Tokimatsu and Seed, 1987). However, based on the well-graded nature of site sediments and the considerable distance to seismic sources, we consider these to be conservative estimates. This amount of liquefaction settlement could only occur if a maximum moment magnitude earthquake were to occur near the site on the Maacama fault or the Rodgers Creek fault.

Lateral Spreading

Lateral spreading is another secondary effect of seismically induced ground shaking wherein pore-pressure buildup during liquefaction can result in the movement of gently sloping ground towards a free face or down slope direction. Liquefaction in the stream banks would likely only occur during high ground water events such as in times of flooding. Soils encountered in our boreholes included sandy lean clay and fat clay native soils that were likely the former river bank slopes. Sandy and silty gravels were also found in the upper 20 feet of the boreholes that would be exposed during removal of the existing culvert. These materials are unlikely to undergo liquefaction reducing the likelihood of lateral spreading of the river banks. We estimate that there is a low to very low probability of liquefaction accompanied by lateral spreading of the river banks at the site.

GEOTECHNICAL RECOMMENDATIONS

Site Preparation and Grading

Areas to be graded during bridge construction should be cleared and grubbed to a depth of 4 to 6 inches to remove vegetation and surface organic soils, or to the depth of subgrade soil preparation at the base of the road structural section which includes Class 2 aggregate base (AB) and roadway hot mix asphalt (HMA) surfacing.

Roadway Subgrade

Subgrade soils underlying road sections should be scarified to a minimum of twelve inches, moisture conditioned to 2 to 4 percent above the optimum moisture content, and compacted to a minimum of 90 percent of the maximum dry density as determined in the laboratory in accordance with ASTM D 1557. Subgrade under other fill areas should be similarly scarified, moisture conditioned, and recompacted to a minimum of 90 percent.

Aggregate Base (AB)

The replacement road section underlying hot mix asphalt/asphalt concrete pavement should consist of a minimum of 12 inches of Class 2 aggregate base (AB). AB should meet requirements of Sections 26 of the Caltrans Standard Specifications, including an R-value of 78 minimum, a sand equivalent of 22 minimum, and a durability index of 35 minimum. The AB should be free from organic matter. Aggregate base should be properly keyed-in and placed in uniform layers not exceeding 8 inches in loose thickness before compaction. Each layer should be watered or dried as required to bring the material to the required moisture content range, spread, graded and then compacted mechanically by means of suitable equipment, such as a vibratory drum roller. Each layer should be compacted to a minimum 95 percent of the maximum dry density at moisture contents within two percent of optimum moisture content in accordance with ASTM D 1557.

Hot Mix Asphalt (HMA)

Hot Mix Asphalt (HMA) pavement, formerly known as asphalt concrete (AC) pavement, should be a minimum of 6 inches in thickness for the reconstructed Greenwood Avenue over the new bridge. HMA should conform to Caltrans Standard Specifications Section 39.

Bridge Foundations

Foundations for the new bridge crossing should consist of pile foundations gaining support through a combination of skin friction and end bearing in the alluvial soils below the fill. To provide a greater factor of safety and to support the bridge on soils located below the potentially liquefiable silty sands found beneath the existing culvert in the area to be restored as a creek channel, the bridge can be supported on a deep foundation consisting of driven piles connected at the bridge foundation with a concrete pile cap or grade beam to reduce the potential for differential settlements.

<u>Deep Foundations</u>

As noted in our liquefaction settlement analysis, some silty sand soils located at an approximate depth of 33 to 35.5 feet below ground surface below the bottom of the channel could be subject to liquefaction during seismic shaking events. To reduce the potential for liquefaction settlement, the bridge foundation may be designed to incorporate a pile foundation that extends to depths below the potentially liquefiable materials. A pile supported foundation will need to incorporate a grade beam or pile cap.

Driven pile foundations may consist of H-beam type steel piles or 14-inch diameter pre-cast pre-stressed concrete piles (PSPC). The recommended piles should be designed to support vertical loads based on a skin friction of 500 pounds per square foot (psf) in the fill soils and 650 psf in the alluvial soils, neglecting the upper five feet of surface soils. The recommended skin friction is for dead load plus long-term live loads and can be increased by 33 percent for wind or seismic forces. End bearing capacity can be considered 3,500 psf in the stiff clay and dense gravels. Lateral bearing and resistance to lateral loads should be based on passive soil pressures of 150 psf in fill soils and 225 psf in alluvial soils.

Pile tip elevations should be a minimum of 5 feet below the potentially liquefiable sands located at a depth of approximately 35 feet below road surface at approximate El. 349 ft. The minimum pile tip elevation is El. 344 ft.

Axial Capacity

Driven pile axial capacity should be determined by developing curves illustrating the ultimate axial compressive and tensile capacities for the piles selected for use. A safety factor of at least 2 should be used for sustained compressive loads and a safety factor of at least 3 should be used for sustained uplift. A safety factor of at least 1.5 may be used for all loading conditions for additional loads caused by wind or seismic forces.

Axial pile capacity analysis should include estimates of down drag due to loss of strength from liquefaction of potentially liquefiable silty sands.

Lateral Capacity

The lateral resistance of piles is a function of the surrounding soil strength and stiffness, size and stiffness of the pile, pile top connection and induced moments and forces at the top of the pile. For the selected piles, pile deflection, bending moment, and shear versus pile length should be developed using lateral pile computer software.

Additional lateral load resistance can be obtained from passive resistance acting against the faces of pile caps. For calculation of the passive resistance, we recommend using an equivalent fluid weight (triangular distribution) of 300 pounds per cubic foot (pcf). These values include a factor of safety of about 1.5.

Pile Driving Equipment

The piles should be driven into the ground using a typical pile driving hammer. It may be possible to use a vibratory pile driver due to noise limitations based on the proximity of residences to the project site. However ultimate pile capacity may be more difficult to verify using this technique. Ultimate pile capacity may need to be verified by installation and testing of test piles as part of an indicator pile program. The results of an indicator pile and load testing program may be used to verify pile driver performance, establish pile driving criteria and confirm the lengths of the production piles.

Corrosion Protection Measures

The corrosion testing performed on fill soils indicated that the surface fill soils have low corrosion potential. However, the soils at depth are variable in composition and include a high

percentage of volcanic materials. Measures should be taken to mitigate the potential for deterioration of concrete piles, grade beams, and pile caps in contact with alluvial soils located at depth below the site. These measures include using Type II modified cement for the piles with a water-to-cement ratio of 0.35 or less and a minimum steel cover of two inches. For concrete pile caps and grade beams in contact with fill soils, Type II modified cement with a water-to-cement ratio of 0.40 or less and a minimum steel cover of three inches should be used. For steel piles installed through fill and alluvial soils, a corrosion allowance of 1/16 to 1/8 inch on all exposed surfaces of the piles is generally assumed. If steel piles will be used, a corrosion consultant should be retained to provide corrosion allowance recommendations for this project.

Scour

Creek channels will be protected from scour using rock riprap. The potential scour depth without rock riprap is estimated to be at El. 356 ft. Scour conditions should be verified with the Project Hydrologist.

Retaining Wall Design Parameters

Retaining walls at the site must be designed to resist lateral earth pressures plus additional lateral pressures that may be caused by surcharge loads such as seismic forces. Walls that are free to rotate should be designed for active lateral earth pressures. If walls are restrained by rigid elements to prevent rotation, then they should be designed for at-rest earth pressures. Retaining walls backfilled with granular soils should be designed to resist lateral earth pressures due to an equivalent fluid having unit weight as shown in **Table 3**.

Table 3. Retaining Wall Design Parameters

	Active Pressure pounds per cubic foot (pcf)	At-Rest Earth Pressure (pcf)
Above Design Groundwater Table Elevation	57	76
Below Design Groundwater Table Elevation	90	100

Retaining walls that are designed to be fully drained and include a backdrain can be designed for active pressures or at-rest earth pressure in accordance with the values given in **Table 5** for the above design groundwater condition. Retaining walls that are designed to be located below the design groundwater table or that do not include a backdrain should be designed to withstand the pressure of saturated soils as presented in **Table 3** for below design groundwater table elevation.

The seismic conditions should be determined by adding the pressures from earthquake loading to active pressure on the retaining walls. All walls greater than 6 feet in height should include seismic pressure. We recommend an incremental seismic pressure of 16H in pounds per square foot (psf), where H is the height of the retaining wall in feet. The pressure distribution may be considered to be an inverted triangle with the maximum pressure at the top and zero on the bottom. The resultant of this force may be assumed to be located at 1/3 the height of the wall below the top of the wall. Unit weight (total) of the existing soils is approximately 116 pcf. Unit weight (total) of aggregate base granular backfill is approximately 135 pcf for recycled and 145 pcf for quarried material. The effective internal angle of friction of the sandy clay existing soils

can be assumed to be 20 degrees and the aggregate base or gravel backfill 40 degrees for design purposes. The design groundwater elevation for the project should be 10 feet below the road surface, or at approximate Elevation 374.

Drainage Measures

Retaining walls located above the design groundwater level should be back-drained with Caltrans Class 2 Permeable drain material and a perforated four-inch diameter HDPE or SDR 35 pipe covered in a minimum of 36 inches of ¾-inch diameter crushed rock and wrapped in filter fabric such as Mirafi 160N. This subsurface drain should extend to at least the base of the grade beam or footing, have a minimum slope of two percent and be gravity drained by connection to a non-perforated HDPE tight line with water transmitted to an energy dissipating structure at the channel.

Seismic Design Criteria

Bridge

A replacement bridge constructed at the site should be designed in accordance with seismic design criteria of the 2013 California Building Code. The project seismic design criteria presented in **Table 4** were calculated in accordance with provisions of 2010 ASCE 7-10 (with 2013 errata) in accordance with the 2013 California Building Code, using the United States Geological Survey U.S. Design Maps Tool version 3.1.0 last updated July 7, 2013 (USGS, 2013).

Table 4. Seismic Design Criteria in accordance with ASCE 7-10 (with 2013 errata) and 2013 CBC

Site Class	D
Soil Profile Name	Stiff Soil
Risk Category	II
Seismic Design Category	E
Mapped Spectral Response for Short Periods- 0.2 Sec (S_s)	1.5 g
Mapped Spectral Response for Long Periods- 1 Sec (S_1)	0.6 g
Site Coefficient- Fa, based on the mapped spectral response for short periods	1.0
Site Coefficient- Fv, based on the mapped spectral response for long periods	1.5
Adjusted Maximum Considered EQ Spectral Response for Short Periods (S_{MS})	1.5
Adjusted Maximum Considered EQ Spectral Response for Long Periods (S_{M1})	0.9
Design (5-percent damped) Spectral Acceleration Parameters at short periods (S_{DS})	1.0
Design (5-percent damped) Spectral Acceleration Parameters at long periods (S_{D1})	0.6
T_1	8 seconds
Peak Ground Acceleration (PGA)	0.563
Site Coefficient F_{PGA}	1.0
C_{RS}	1.028
C_{Rl}	1.007

CONCLUSIONS

The project is feasible from a Geotechnical standpoint, provided that our recommendations are followed during design and construction of the project. Provided that the site is properly

prepared and the structures and foundations are designed and constructed as recommended, we estimate that normal post-construction settlement for the bridge will be relatively small, less than 1.0 inches. Differential settlements from the west bridge abutment to the east bridge abutment could be as much as 0.75 inches. Up to 90% of this settlement would be expected to occur during construction and within the first 12 months after completion of the foundations.

Liquefaction settlement analysis indicates that liquefaction induced settlements as much as 3.0 inches could occur in the sediments underlying the creek channel. Differential settlements associated with the liquefaction could be as much as 1.5 inches between the east and west bridge abutments.

LIMITATIONS

This investigation was performed in accordance with present geotechnical and engineering geologic standards applicable to this project. In our opinion, the scope of services adequately supports the conclusions and recommendations presented. The findings are valid now, but should not be relied upon after two years without our review.

The recommendations of this report are based upon the assumption that the conditions do not deviate from those interpreted from the surface observations of this investigation and review of available subsurface information developed by others. If any variation or undesirable conditions are encountered during construction, or if the proposed construction differs from that planned at the present time, we should be notified so that supplemental recommendations can be given. The recommendations of this report are intended for the site described only, and must not be extended to adjacent areas.

This report is issued with the understanding that it is the responsibility of the owner to ensure that contractors and subcontractors carry out the recommendations presented.

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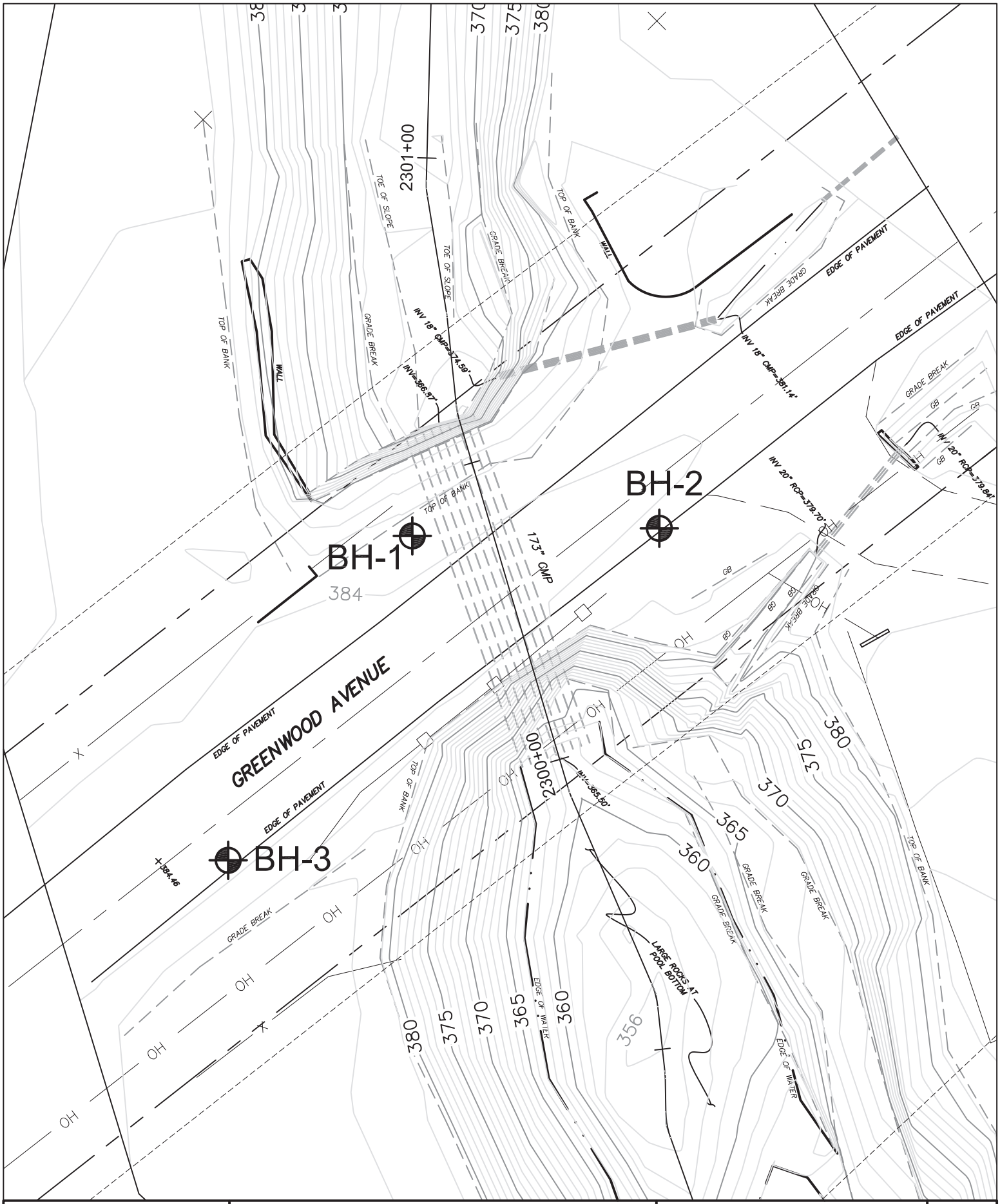
Figures



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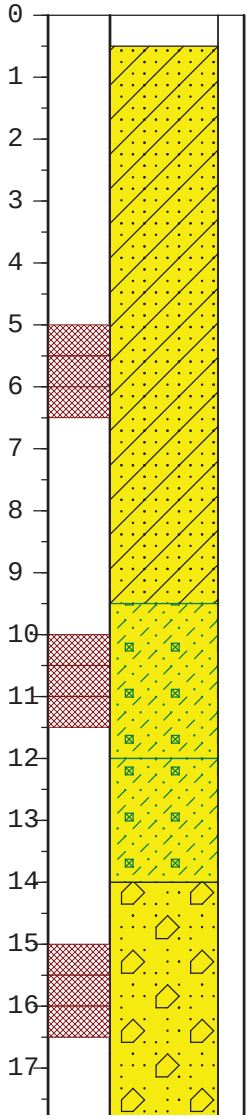
GRAPHIC SCALE
0 2 4 8
(IN FEET)
1 inch = 8 ft.

BH-3 - Borehole Location

Site and Borehole Location Map
Greenwood Ave. Culvert
Calistoga, CA

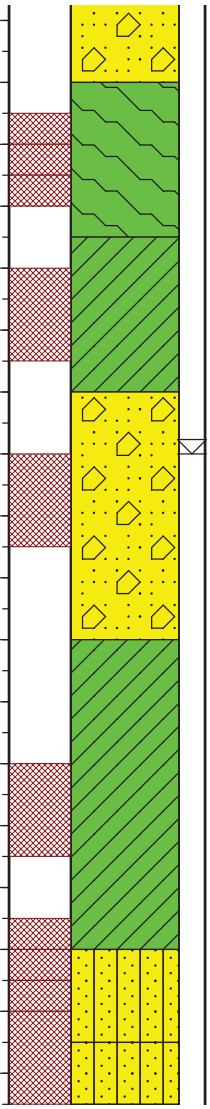
Figure
1

Lab Tests	Torvane, tsf	Sampler Type	% Passing #200 Sieve	Dry Density, pcf	Moisture %	Penetrometer, tsf	Blows/Foot * (Converted to SPT N-value)	Sample Location	Graphical Symbol	Groundwater Depth	USCS Symbol	Lithologic Description
												Topsoil
											SC	SC: Light Yellow Brown Clayey Sand w/gravel, moist, medium dense, medium plasticity (Fill)
		CA MOD	41.9	101	21	1.5	5*					
											GC	GC: Light Yellow Brown Clayey Gravel w/sand, dry, well graded, coarse to fine, medium dense, weak cementation (Fill)
		CA MOD	32.6		8.8		16*					
											GC	GC: Light Brown Clayey Gravel w/sand, dry, well graded, coarse to fine, medium dense (Fill)
											GW	GW: Mottled brown, gray & red Sandy Gravel, moist, well graded, coarse to fine, dense (Fill)
		CA MOD	10.0	106	9.9	>4.5	40*					



Questa Engineering Corporation 1220 Brickyard Cove Road, Suite 206 Point Richmond, CA 94807	**LOG OF BOREHOLE BH-1** Greenwood Ave. Culvert Calistoga, CA	Figure **2**

Lab Tests	Torvane, tsf	Sampler Type	% Passing #200 Sieve	Dry Density, pcf	Moisture %	Penetrometer, tsf	Blows/Foot * (Converted to SPT N-value)	Sample Location	Graphical Symbol	Groundwater Depth	USCS Symbol	Lithologic Description
								18				
								19			CH	CH: Mottled Gray & Reddish Brown Sandy fat Clay, moist, medium plasticity, stiff
		CA MOD		84	36.5	2	8*	20				
								21				
								22			CL	CL: Mottled Gray & Reddish Brown Sandy lean Clay, moist, medium plasticity, stiff
LL33 PL21 PI12		SPT	66.8	96	24.5	4	14	23				
								24			GW	GW: Mottled brown, gray & green Gravelly Sand w/silt, moist, well graded, weak cementation
								25				
		SPT	12.0				26	26				
								27				
								28			CL	CL: Light grayish brown Sandy Clay, wet, medium plasticity, stiff
								29				
								30				
		SPT	66.6		31		16	31				
								32				
		CA MOD	18.1			1	10*	33			SM	SM: Gray Silty Sand w/gravel, wet, poorly graded, low plasticity, medium dense
								34				
		SPT	60.8		16.2	>4.5	28	35			SM	SM: Grayish Brown Silty Sand w/gravel, wet, poorly graded, gravel size



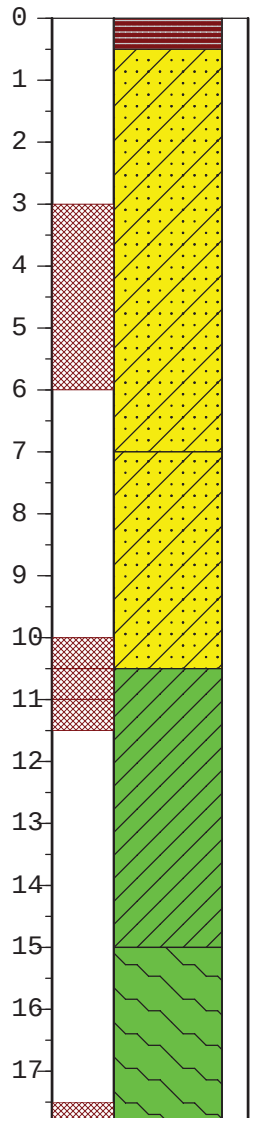
Questa Engineering Corporation 1220 Brickyard Cove Road, Suite 206 Point Richmond, CA 94807	**LOG OF BOREHOLE BH-1** Greenwood Ave. Culvert Calistoga, CA	**Figure 2**

Lab Tests	Torvane, tsf	Sampler Type	% Passing #200 Sieve	Dry Density, pcf	Moisture %	Penetrometer, tsf	Blows/Foot * (Converted to SPT N-value)	Sample Location	Graphical Symbol	Groundwater Depth	USCS Symbol	Lithologic Description
								36			CL	CL: Grayish Brown Sandy Clay, wet, stiff, coarse sand, stiff
								37				
								38				
								39				
								40			SC	SC: Grayish Brown Clayey Sand, wet, stiff, coarse sand, medium dense
		SPT	29.8		22.1		19	41				
								42				
								43				
								44			SC	SC: Mottled Brown Clayey Sand, wet, medium dense, well graded, medium plasticity
LL47 PL26 PI21								45				
		SPT					11	46				
								47				
								48			SC	SC: Grayish Brown Clayey Sand, wet, medium dense, well graded, coarse sand, medium plasticity
								49				
								50				
		SPT	15.0		17.3		33	51				
								52				Borehole B-1 drilled to a total depth of 51.5 feet BGS on February 11th, 2014. Groundwater encountered @ 25'
								53				

Questa Engineering Corporation 1220 Brickyard Cove Road, Suite 206 Point Richmond, CA 94807	**LOG OF BOREHOLE BH-1** Greenwood Ave. Culvert Calistoga, CA	**Figure 2**

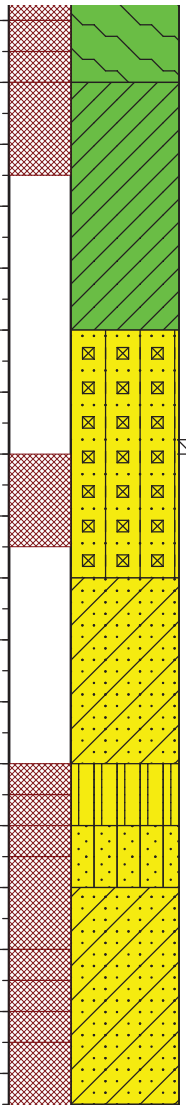
Lab Tests	Torvane, tsf	Sampler Type	% Passing #200 Sieve	Dry Density, pcf	Moisture %	Penetrometer, tsf	Blows/Foot * (Converted to SPT N-value)	USCS Symbol	Lithologic Description
								SC	ASPHALT: Asphalt and Class 2 AB SC: Light Brown Clayey Sand w/gravel, dry, medium stiff, low plasticity, medium dense (Fill)
		BULK	76.2						
								SC	SC: Light Brown Clayey Sand w/gravel, dry, medium stiff, low plasticity, medium dense (increase in grain size and drilling difficulty) (Fill)
LL44 PL23 PI21		CA MOD	50.0	86	24.1	>4.5	5*	CL	CL: Grayish Brown Sandy Lean Clay, moist, medium plasticity, medium stiff (Old River Bank)
								CH	CH: Light Brown Sandy Fat Clay w/gravel, moist, medium plasticity, cohesive, stiff

Sample Location / Graphical Symbol / Groundwater Depth



Questa Engineering Corporation	LOG OF BOREHOLE BH-2	Figure
1220 Brickyard Cove Road, Suite 206 Point Richmond, CA 94807	Greenwood Ave. Culvert Calistoga, CA	3

Lab Tests	Torvane, tsf	Sampler Type	% Passing #200 Sieve	Dry Density, pcf	Moisture %	Penetrometer, tsf	Blows/Foot * (Converted to SPT N-value)	Sample Location	Graphical Symbol	Groundwater Depth	USCS Symbol	Lithologic Description
LL51 PL25 PI26						>4.5		18				
		CA MOD	77.8	82	28.8		15*	19			CL	CL: Mottled Gray & Reddish Brown Sandy Lean Clay, moist, medium plasticity, stiff
		SPT	87.4		36.8	2	10	20				
								21				
								22				
								23			GM	GM: Mottled brown, gray & green Silty Gravel w/sand, moist, well graded, weak cementation
								24				
								25				
		SPT	17.1			3	26	26				
								27			SC	SC: Mottled brown, gray & green Clayey Sand w/gravel, moist, well graded, weak cementation (decrease in sand and gravel size/increase in clay content)
								28				
								29				
LL55 PL25 PI30			55.7	90	30.2			30			MH	MH: Mottled Clayey Sandy Silt w/gravel, wet, medium stiff, high plasticity
		CA MOD	20.7	91	30.8	4	14*	31			SM	SM: Grayish Brown Silty Sand w/gravel, wet, well graded
								32			SC	SC: Grayish Brown Clayey Sand, wet, loose, low plasticity (poor sample secovery due to gravel clast size)
		SPT	42.9				5	33				
		CA MOD				2		34				
LL45 PL22			27.7	87	34	>4.5	9*	35				

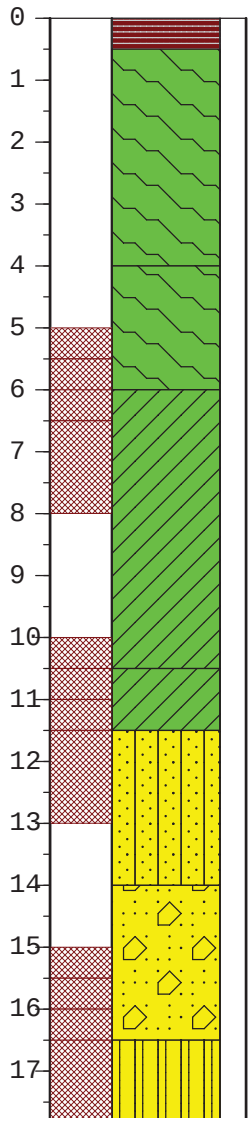


Questa Engineering Corporation	LOG OF BOREHOLE BH-2	Figure
1220 Brickyard Cove Road, Suite 206 Point Richmond, CA 94807	Greenwood Ave. Culvert Calistoga, CA	3

Lab Tests	Torvane, tsf	Sampler Type	% Passing #200 Sieve	Dry Density, pcf	Moisture %	Penetrometer, tsf	Blows/Foot * (Converted to SPT N-value)	Sample Location	Graphical Symbol	Groundwater Depth	USCS Symbol	Lithologic Description
PI23		SPT					28	36 37 38			CL	CL: Mottled Brown Sandy Clay, m. dense Borehole B-2 drilled to a total depth of 36 feet BGS on February 11th, 2014. Groundwater encountered @ 25'

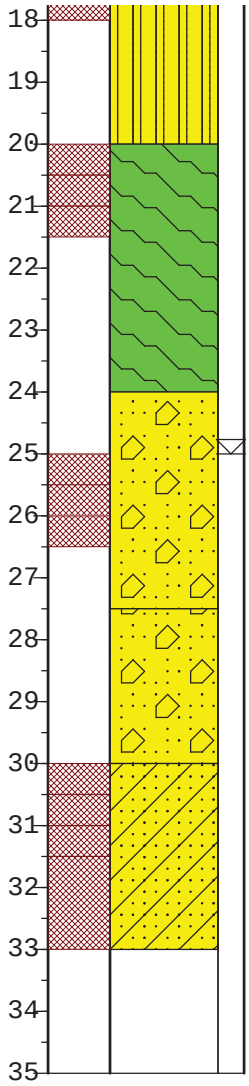
Questa Engineering Corporation 1220 Brickyard Cove Road, Suite 206 Point Richmond, CA 94807	**LOG OF BOREHOLE BH-2** Greenwood Ave. Culvert Calistoga, CA	**Figure 3**

Lab Tests	Torvane, tsf	Sampler Type	% Passing #200 Sieve	Dry Density, pcf	Moisture %	Penetrometer, tsf	Blows/Foot * (Converted to SPT N-value)	Sample Location	Graphical Symbol	Groundwater Depth	USCS Symbol	Lithologic Description
												ASPHALT: Asphalt and Class 2 AB
											CH	CH: Light Brown Sandy fat Clay w/gravel, dry, low plasticity, medium dense, cohesive (Fill)
											CH	CH: Dark Brown Sandy fat Clay w/gravel, moist, medium stiff, high plasticity, medium dense, very cohesive
LL51 PL24 PI27		CA MOD	53.8	100	16.1	>4.5	14*				CL	CL: Mottled Brown Sandy Lean Clay, dry, stiff, cohesive, coarse (decrease in clay content)
		SPT					14					
		CA MOD	52.8	86.1	14.6	>4.5	12*				CL	CL: Mottled Brown Sandy Clay w/gravel, medium stiff, moist
		SPT	12.4				13				SM	SM: Mottled Brown Silty Sand w/gravel, moist, medium dense, well graded
											GW	GW: Mottled Sandy Gravel w/silt, wet, partially consolidated, well graded, medium dese to dense
LL64 PL22 PI42		CA MOD	9.3	97.7	14.7	>4.5	26*				MH	MH: Mottled Gray, Red & Brown elastic Silt w/sand,moist,stiff,h. plasticity
		SPT	82	90.7	28.3	2.5	9					



Questa Engineering Corporation 1220 Brickyard Cove Road, Suite 206 Point Richmond, CA 94807	**LOG OF BOREHOLE BH-3** Greenwood Ave. Culvert Calistoga, CA	Figure **4**

Lab Tests	Torvane, tsf	Sampler Type	% Passing #200 Sieve	Dry Density, pcf	Moisture %	Penetrometer, tsf	Blows/Foot * (Converted to SPT N-value)	Sample Location	Graphical Symbol	Groundwater Depth	USCS Symbol	Lithologic Description
LL55 PL27 PI29		CA MOD	86.3	79.8 77.1	41.8 39.6	2	7*				CH	CH: Mottled Gray, Red & Brown Fat Clay w/sand, moist, stiff, high plasticity, stiff (sand content decreasing and gravel % increasing)
		CA MOD	9.9	111	15.1	>4.5	24*				GW	GW: Mottled Gray Sandy Gravel, wet, medium dense, well graded, gravel size increases down unit
											GW	GW: Mottled Gray Sandy Gravel, wet, medium dense, well graded, gravel content has cause drilling to slow and shake drill rig
		CA MOD	24.2	95.9	21.5	>4.5	14*				SC	SC: Mottled Gray, Red & Brown Clayey Sand w/gravel, wet, medium dense, well graded
		SPT					23					Borehole B-3 drilled to a total depth of 33 feet BGS on February 11th, 2014. Groundwater encountered @ 25'



Questa Engineering Corporation 1220 Brickyard Cove Road, Suite 206 Point Richmond, CA 94807	**LOG OF BOREHOLE BH-3** Greenwood Ave. Culvert Calistoga, CA	Figure **4**

SOIL CLASS KEY.CDR

MAJOR DIVISION				TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN #4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	Well graded Gravels, Gravel-Sand mixtures
			GP	Poorly graded Gravels, Gravel-Sand mixtures
		GRAVELS WITH OVER 12% FINES	GM	Silty Gravels, poorly graded, Gravel-Sand-Silt mixtures
			GC	Clayey Gravels, poorly graded Gravel-Sand-Clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS LARGER THAN #4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	Well graded Sands, Gravelly-Sands
			SP	Poorly graded Sands, Gravelly-Sands
		SANDS WITH OVER 12% FINES	SM	Silty Sands, poorly graded, Sand-Silt mixtures
			SC	Clayey Sands, poorly graded, Sand-Clay mixtures
FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	Inorganic Silts and very fine Sands, rock flour, Silty or Clayey fine Sands, or Clayey-Silts with slight plasticity
			CL	Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, lean Clays
			OL	Organic Clays and Organic Silty Clays of low plasticity
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	Inorganic Silts, micaceous or diatomaceous fine Sandy or Silty Soils,elastic Silts
			CH	Inorganic Clays of high plasticity, fat Clays
			OH	Organic Clays of medium to high plasticity, organic Silts
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils

BGS	Below Ground Surface	PSA	Particle Size Analysis
SPT	Standard Penetration Test Sampler (1.38“ inside diameter)	UC/TXUU	Unconfined Compression / Triaxial Shear Unconsolidated-Undrained
CAM	California Modified Sampler (S & H) (2.45“ inside diameter)	LL, PL, PI	Liquid Limit, Plastic Limit, Plasticity Index

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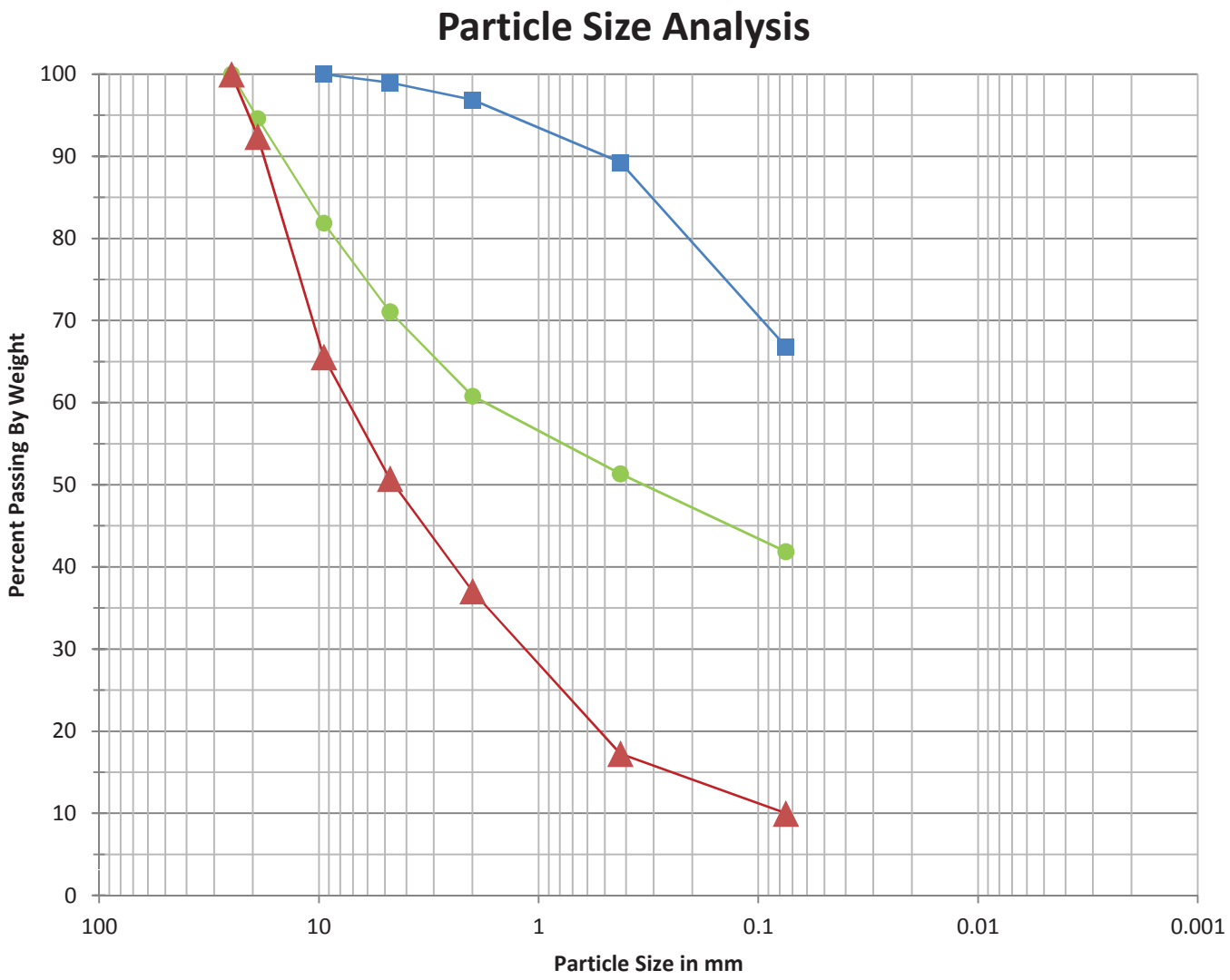
UNIFIED SOIL CLASSIFICATION SYSTEM AND KEY TO ABBREVIATIONS

FIGURE 5



Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

Symbol	Source
●	Borehole 1, 6 to 6.5 ft bgs
▲	Borehole 1, 15.5 to 16 ft bgs
■	Borehole 1, 22 to 23.5 ft bgs

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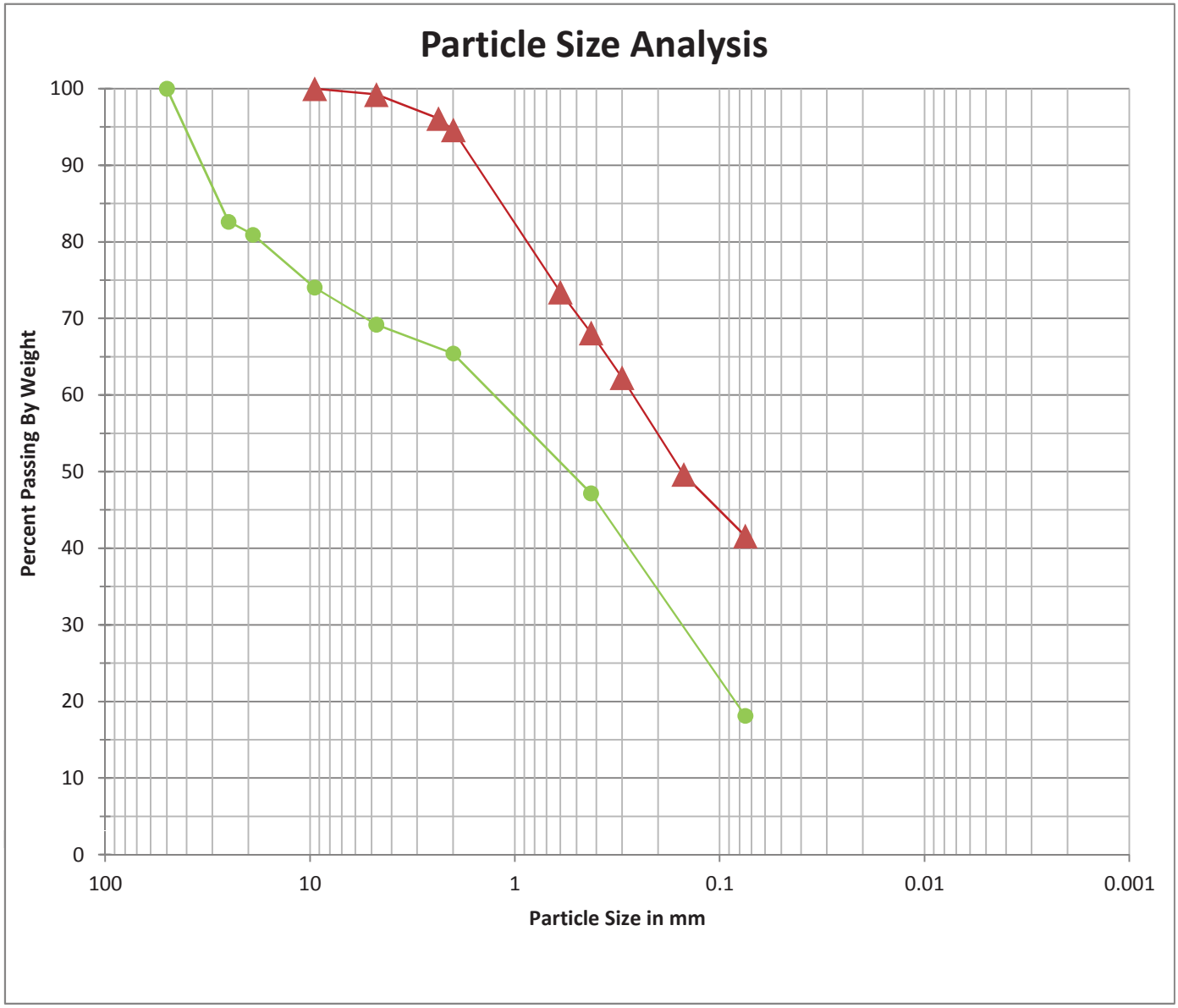
Particle Size Analysis

Greenwood Ave. Culvert
Calistoga, CA

Figure

6



Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

Symbol	Source
●	Borehole 1, 33 to 33.5 ft bgs
▲	Borehole 1, 45 to 46.5 ft bgs
■	

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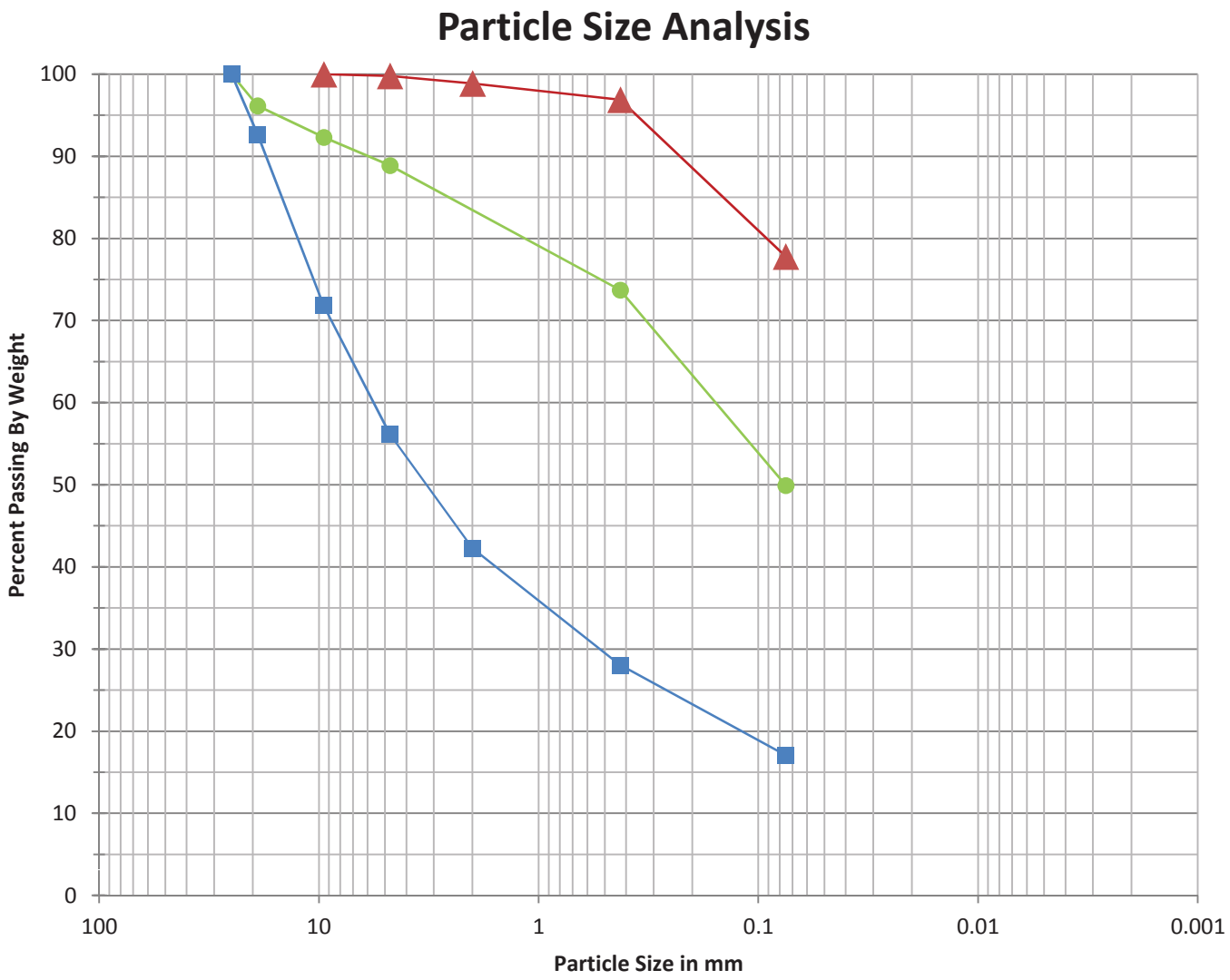
Particle Size Analysis

Greenwood Ave. Culvert
Calistoga, CA

Figure

7



Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

Symbol	Source
●	Borehole 2, 11 to 11.5 ft bgs
▲	Borehole 2, 18.5 to 19 ft bgs
■	Borehole 2, 25 to 26.5 ft bgs

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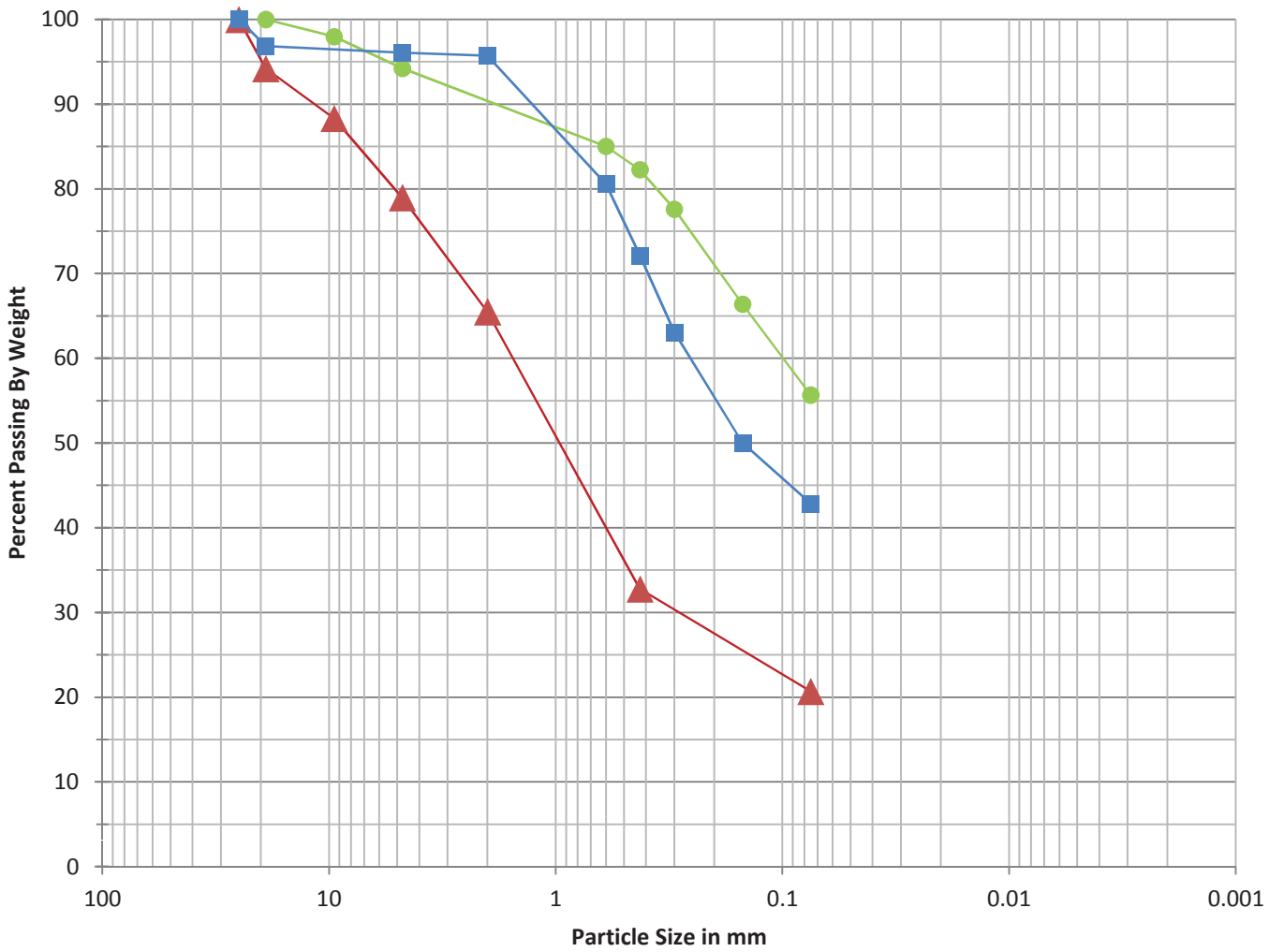
Particle Size Analysis

Greenwood Ave. Culvert
Calistoga, CA

Figure

8

Particle Size Analysis



Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

Symbol	Source
●	Borehole 2, 30 to 30.5 ft bgs
▲	Borehole 2, 31 to 31.5 ft bgs
■	Borehole 2, 33 to 33.5 ft bgs

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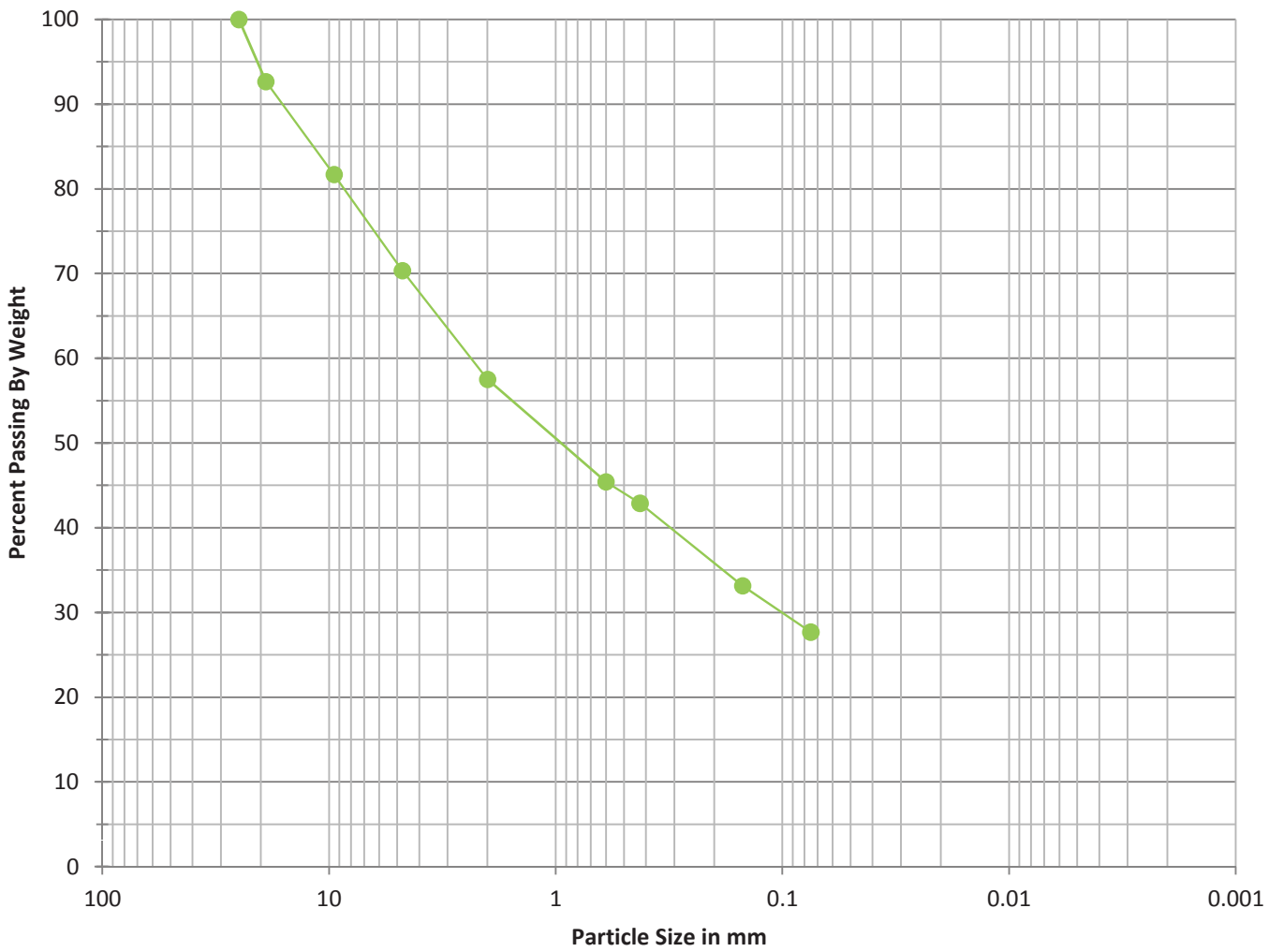
Particle Size Analysis

Greenwood Ave. Culvert
Calistoga, CA

Figure

9

Particle Size Analysis



Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

Symbol	Source
●	Borehole 2, 34.5 to 36 ft bgs
▲	
■	

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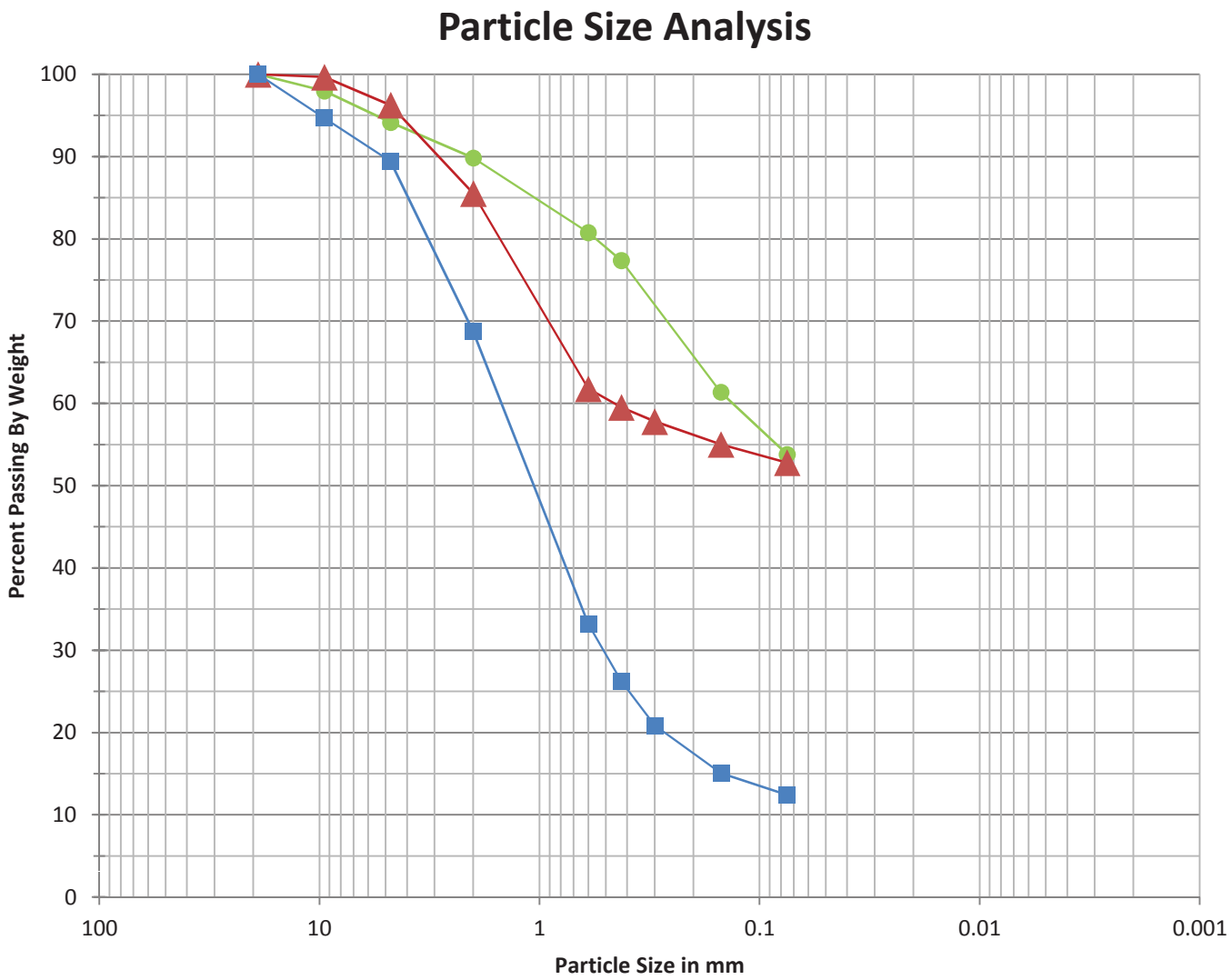
Particle Size Analysis

Greenwood Ave. Culvert
Calistoga, CA

Figure

10



Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

Symbol	Source
●	Borehole 3, 5.5 to 6 ft bgs
▲	Borehole 3, 10.5 to 11 ft bgs
■	Borehole 3, 11.5 to 13 ft bgs

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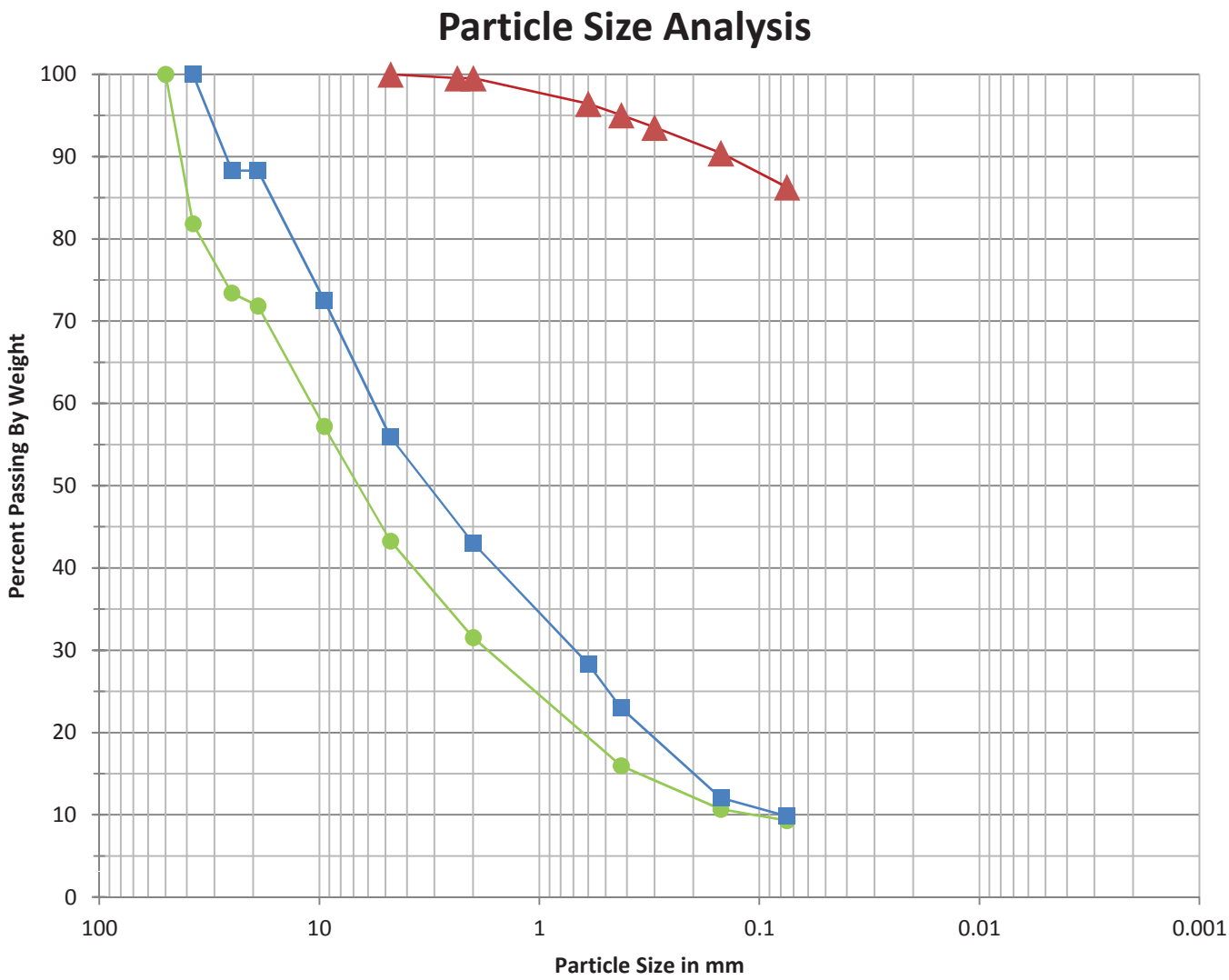
Particle Size Analysis

Greenwood Ave. Culvert
Calistoga, CA

Figure

11



Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

Symbol	Source
●	Borehole 3, 16 to 16.5 ft bgs
▲	Borehole 3, 20.5 to 21 ft bgs
■	Borehole 3, 26 to 26.5 ft bgs

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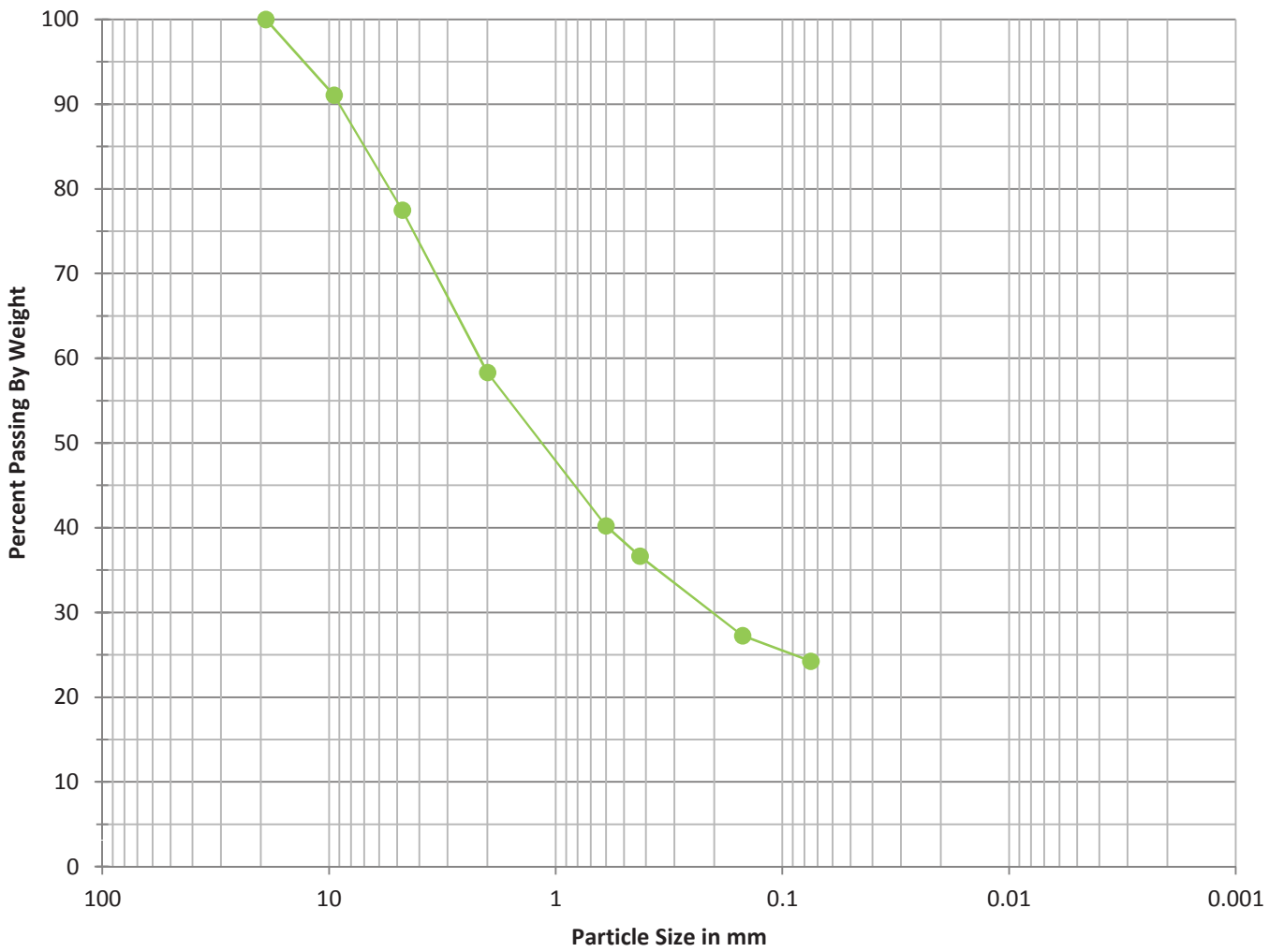
Particle Size Analysis

Greenwood Ave. Culvert
Calistoga, CA

Figure

12

Particle Size Analysis



Gravel		Sand			Silt	Clay
Coarse	Fine	Coarse	Medium	Fine		

Symbol	Source
●	Borehole 3, 30.5 to 31 ft bgs
▲	
■	

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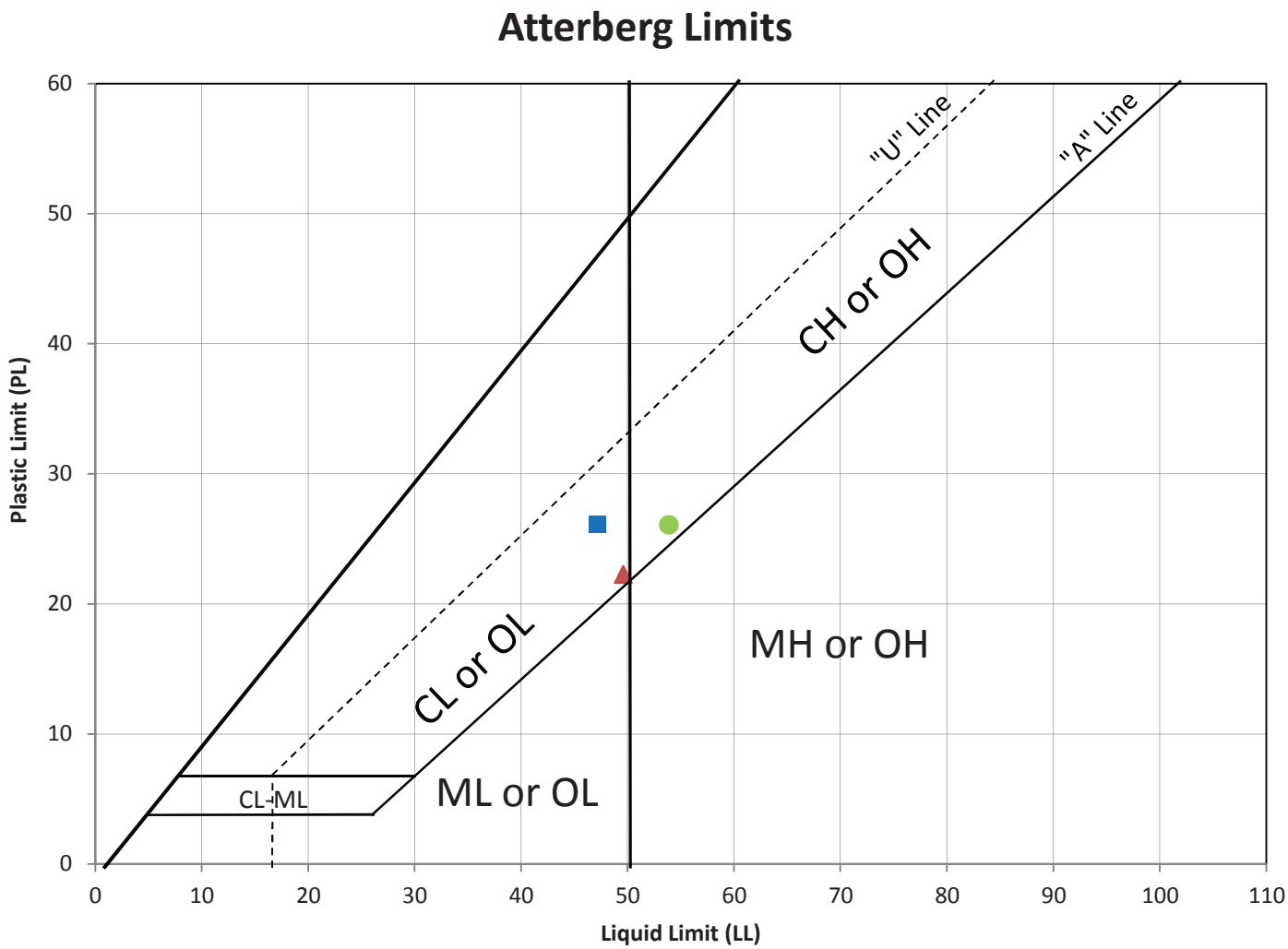
Particle Size Analysis

Greenwood Ave. Culvert
Calistoga, CA

Figure

13



Symbol	Classification & Source	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve
●	Sandy Clay (CH), Borehole 1, 20.5 to 21 ft bgs	54	26	28	65.4
▲	Sandy Clay (CL), Borehole 1, 22 to 23.5 ft bgs	50	22	27	66.8
■	Sandy Clay (CL), Borehole 1, 45 to 46.5 ft bgs	47	26	21	41.6

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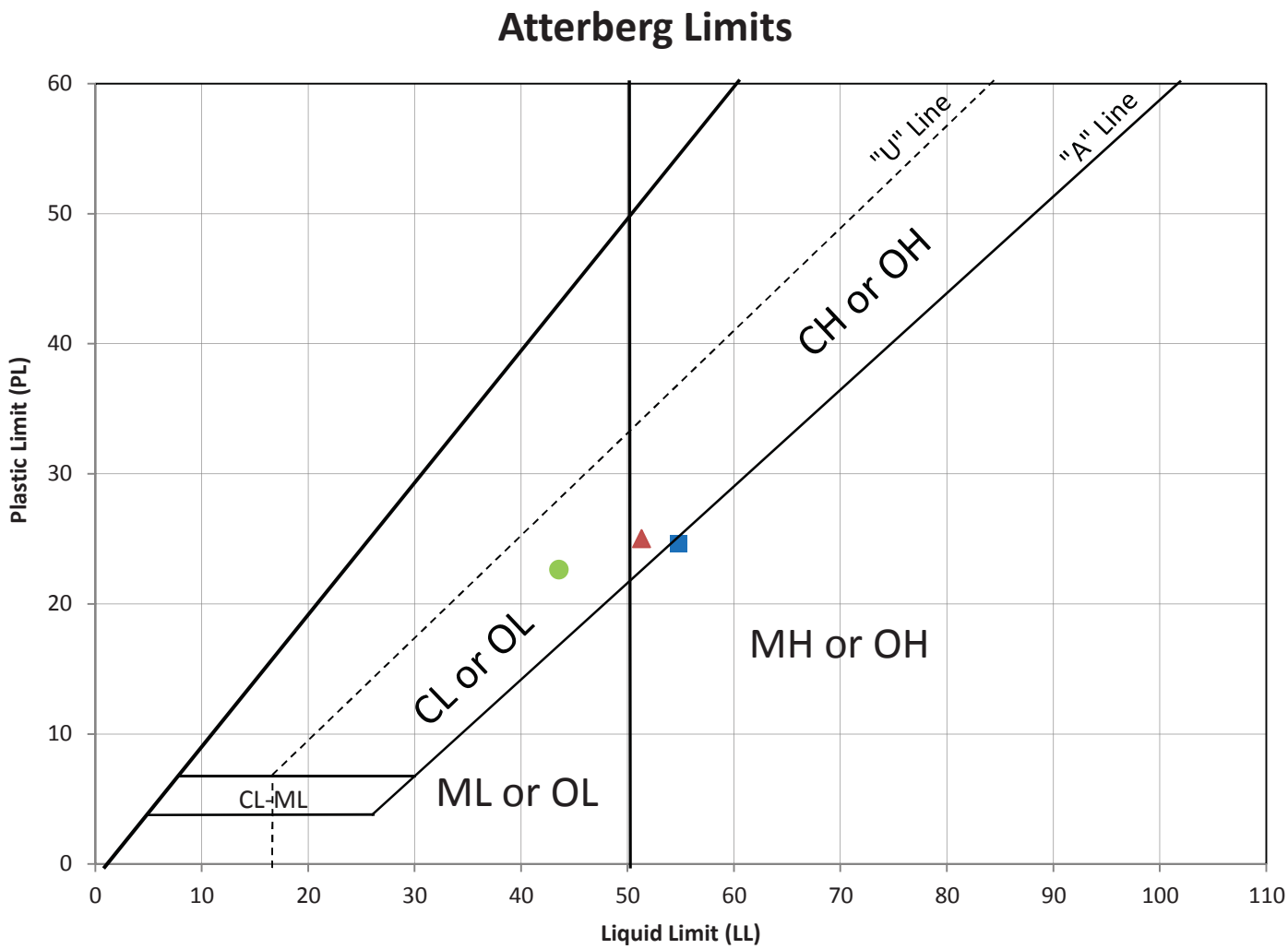
Atterberg Limits (ASTM D4318)

Greenwood Ave. Culvert
Calistoga

Figure

14



Symbol	Classification & Source	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve
●	Sandy Clay (CL), Borehole 2, 11 to 11.5 ft bgs	44	23	21	50.0
▲	Sandy Clay w/gravel (CH), Borehole 2, 18.5 to 19 ft bgs	51	25	26	77.8
■	Sandy Silt w/gravel (MH), Borehole 2, 30 to 30.5 ft bgs	55	25	30	55.7

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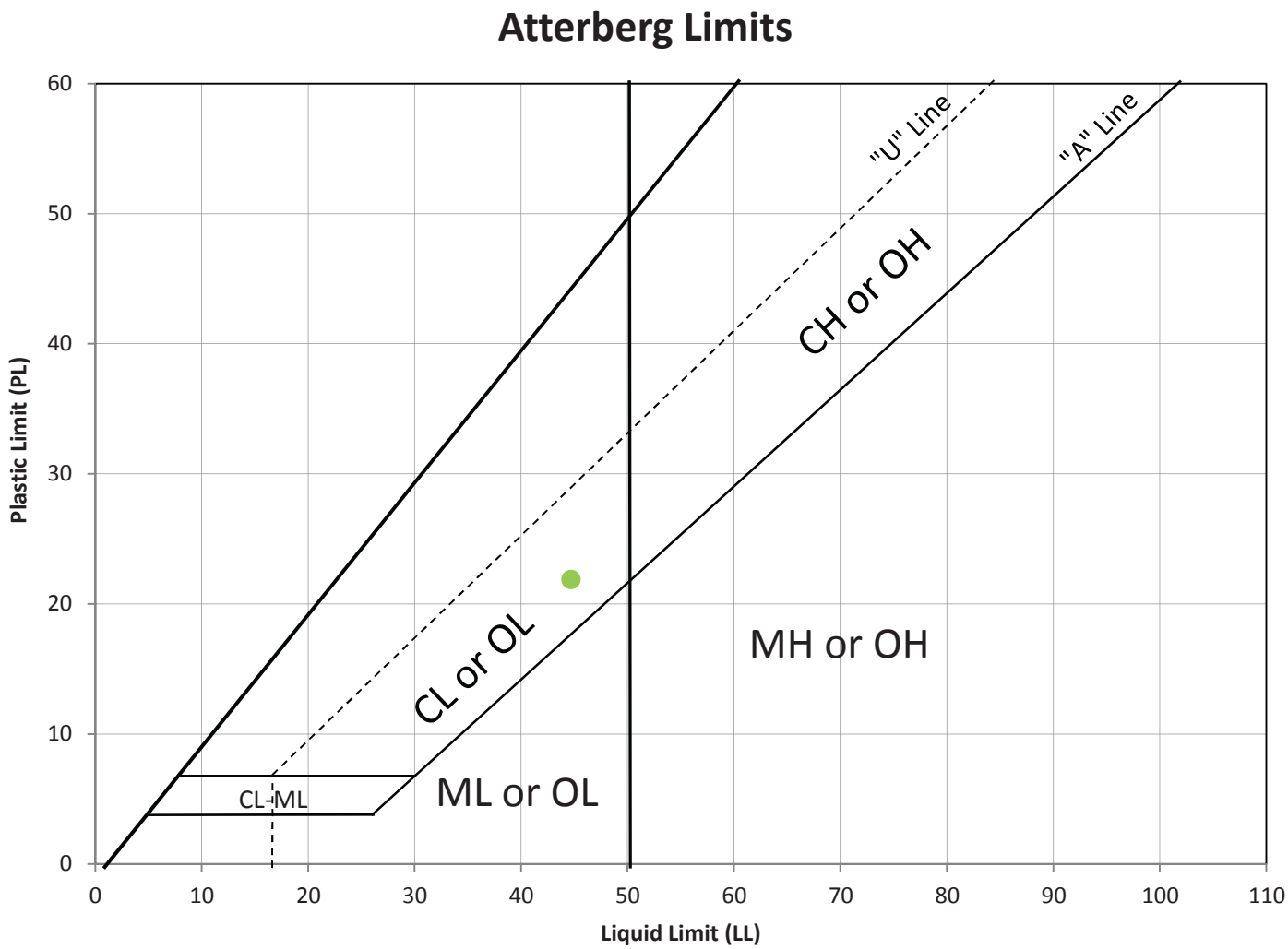
Atterberg Limits (ASTM D4318)

Greenwood Ave. Culvert
Calistoga, CA

Figure

15



Symbol	Classification & Source	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve
●	Clayey Sand (SC), Borehole 2, 34.5 to 36 ft bgs	45	22	23	27.7
▲					
■					

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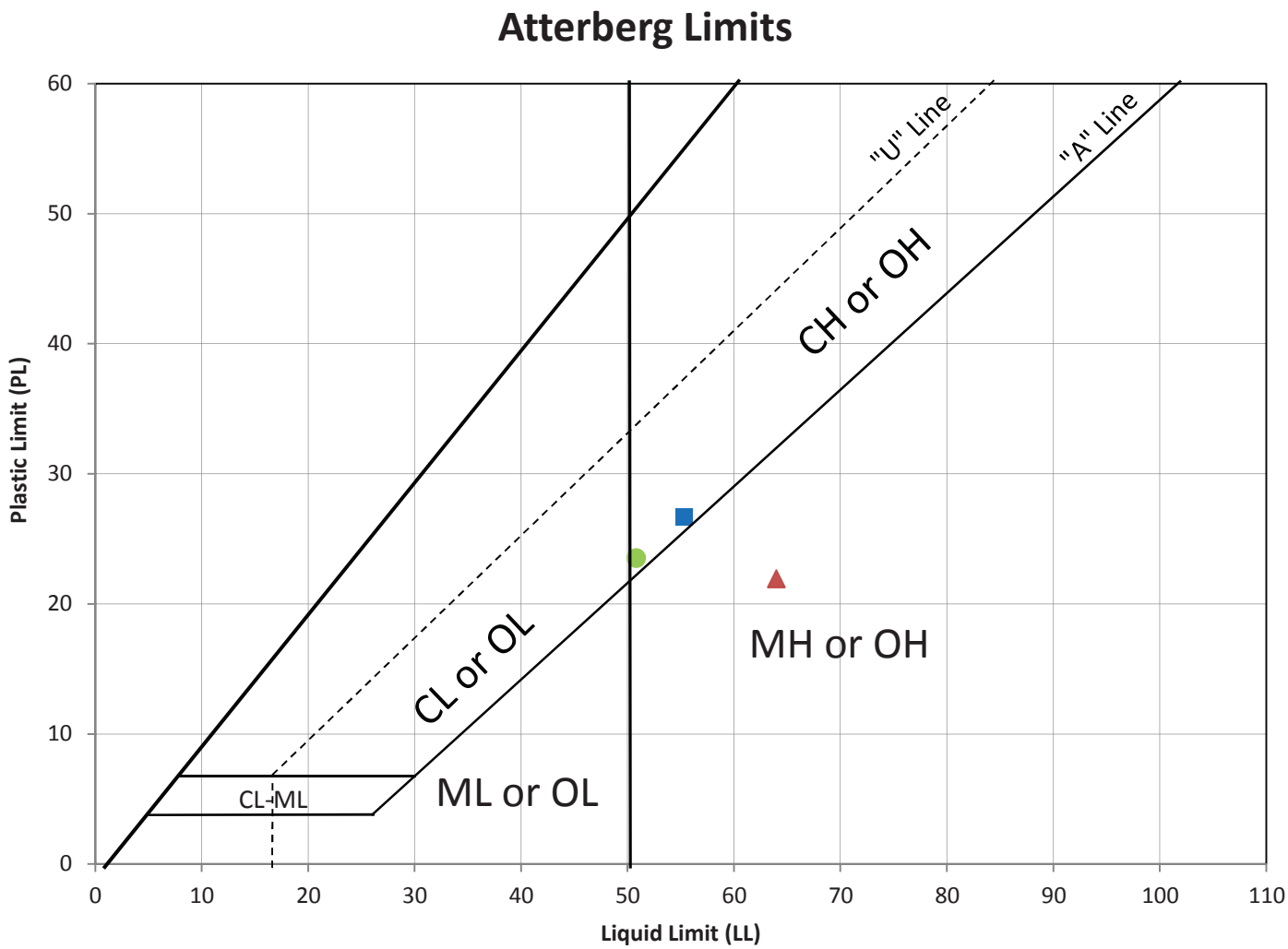
Atterberg Limits (ASTM D4318)

Greenwood Ave. Culvert
Calistoga, CA

Figure

16



Symbol	Classification & Source	Liquid Limit	Plastic Limit	Plasticity Index	% Passing #200 Sieve
●	Sandy Clay w/gravel (CH), Borehole 3, 5.5 to 6 ft bgs	51	24	27	53.8
▲	Silt w/sand (MH), Borehole 3, 16.5 to 18 ft bgs	64	22	42	82.0
■	Clay w/sand (CH) Borehole 3, 20.5 to 21 ft bgs	55	27	29	86.3

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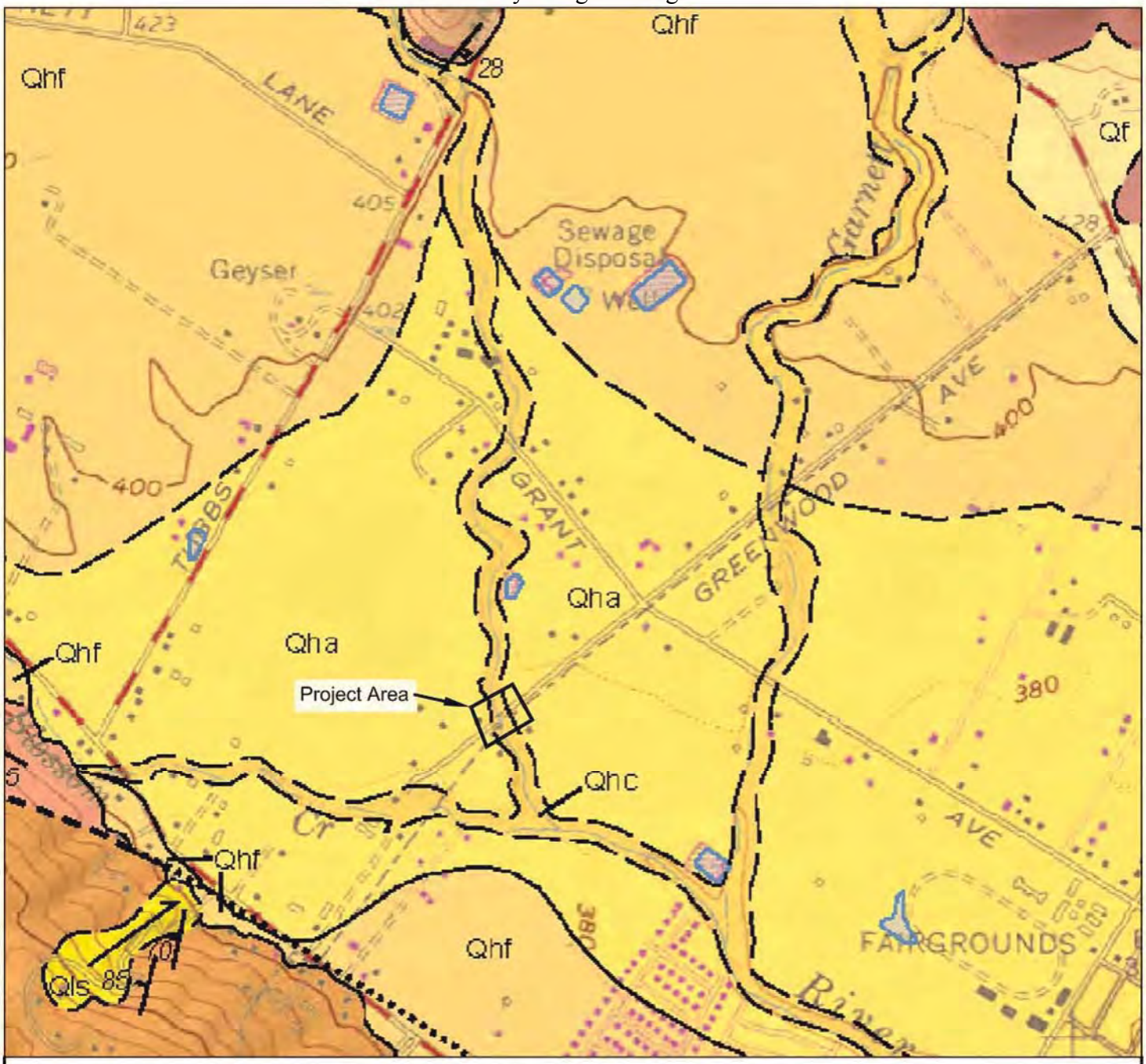
Atterberg Limits (ASTM D4318)

Greenwood Ave. Culvert
Claistoga, CA

Figure

17

Plates



Description of Map Units

Qhc — **Stream channel deposits (modern to latest Holocene)** – Fluvial deposits within active, natural stream channels composed of loose sand, silt and gravel.

Qha — **Alluvial deposits, undifferentiated (Holocene)** – Alluvium deposited in fan, terrace, or basin environments that could not be readily separated for mapping. Typically, consist of poorly to moderately sorted sand, silt, and gravel that form smooth geomorphic surfaces with little to no dissection.

Qhf — **Alluvial fan deposits (Holocene)** – Sediment emanating from canyons to produce relatively undissected, fan-shaped deposits on alluvial valley floors. Sediments are typically moderately to poorly sorted and composed of sand, gravel, silt, and occasionally clay.

Qls — **Landslide deposits (historical to Pleistocene)** – Arrows indicate direction of movement; queried where landslide existence is questionable.

QTg — **Unnamed fluvial and lacustrine deposits (early Pleistocene to Pliocene)** – Weakly consolidated gravel, tuffaceous sand, silt and clay, mapped west of Calistoga unconformably overlying the Sonoma Volcanics. Gravels generally consist of sub-rounded to rounded Tertiary volcanic clasts, including obsidian pebbles, with little or no basement material. Previously mapped as part of the Glen Ellen Formation; name not used here because of new stratigraphic data from similar gravels to the west (McLaughlin and others, 2004), and uncertain age and lithologic correlations with the type locality.

Tstp — **Tuff of Petrified Forest** – Thick section of silicic tuff, tuff breccia, and agglomerate, with several intercalated andesitic to dacitic lava flows. Tuffs are largely pumiceous and lithic ash-flows, with some water-lain reworked tuff, minor air fall tuff, and locally welded tuff. Based on radiometric dating and tephra correlations in the Mark West Springs quadrangle (McLaughlin and others, 2004, 2005), this unit includes the tuff that forms the Petrified Forest and Putah tuff (3.27-3.35 Ma) at the base, dacitic tuff of Pepperwood Ranch (3.22 Ma), and ash-flow tuff of Franz Valley (2.85 Ma).

Tsaj — **Andesite of Jericho Canyon** – Undated andesite and basaltic andesite flows and flow breccias, with intercalated tuff; similar to Tsva in appearance, but contact and stratigraphic relationships suggest an older age.

Tsrc — **Rhyolite of Calistoga** – Rhyolitic to rhyodacitic domes and flows found on both sides of the upper Napa Valley and forming domical hills protruding from the valley alluvium in and around Calistoga. Composed of highly variable assemblages of massive or flow banded rhyolite; intercalated crystal and lithic tuff, and lithoidal welded tuff grading to vitrophyre, locally perlitic; and agglomerate with glassy bombs. The unit has experienced widespread hydrothermal alteration to kaolinite and other clay minerals with finely disseminated pyrite, and more pronounced mineralization locally and along faults. Fission-track dating of zircons from this unit yielded ages of 2.6 Ma from near the east end of Franz Valley, and 3.7 Ma from lower Kortum Canyon Rd., although the latter age appears marginally too old based on contact relations with other dated units (Fox et. Al, 1985). More recent radiometric dating of this unit from near Glass Mountain to the east and Pepperwood Ranch to the west yielded ages of 2.78 Ma and 3.19 Ma, respectively (McLaughlin and others, 2005).

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N

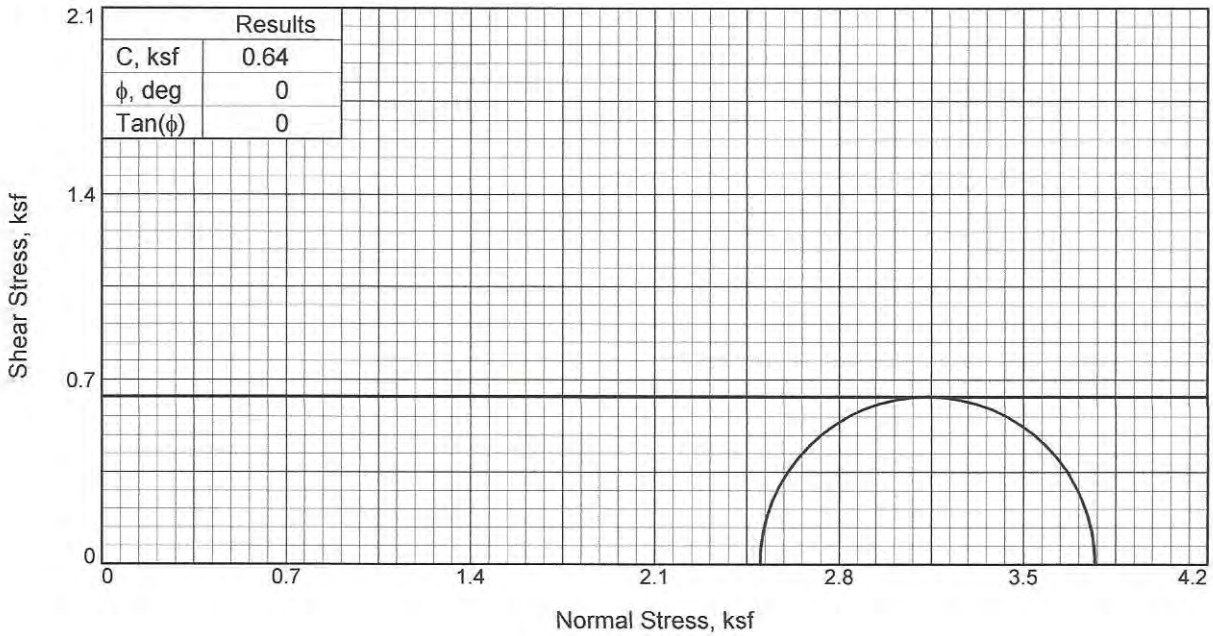
0 500' 1000'
(1" = 1000')

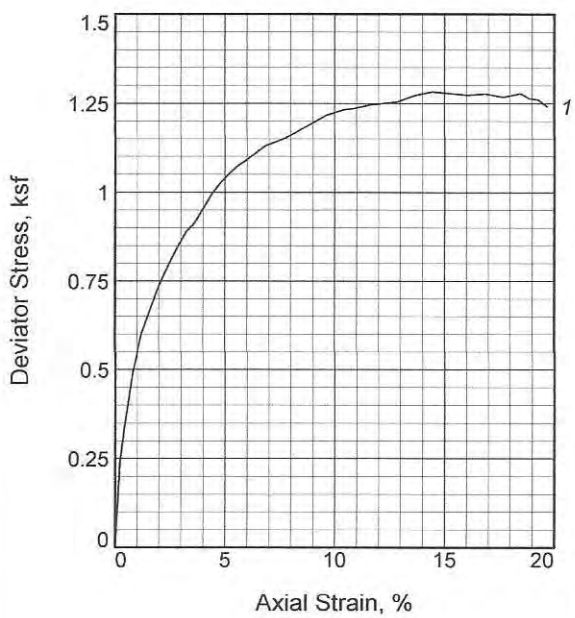
Source: Preliminary Geologic Map of the Calistoga 7.5' Quadrangle, Napa and Sonoma Counties, CA by M. Delattre & C. Gutierrez: California Geological Survey (2013)

Geologic Map
Greenwood Ave. Culvert
Calistoga, CA

Date: 4/11/14
Project: 1300218
Plate: 1

Appendix A





Sample No.		1
Initial	Water Content, %	35.6
	Dry Density, pcf	86.4
	Saturation, %	101.2
	Void Ratio	0.9501
	Diameter, in.	2.42
	Height, in.	4.98
At Test	Water Content, %	35.6
	Dry Density, pcf	86.4
	Saturation, %	101.2
	Void Ratio	0.9501
	Diameter, in.	2.42
	Height, in.	4.98
Strain rate, in./min.		0.08
Back Pressure, psi		0.00
Cell Pressure, psi		17.36
Fail. Stress, ksf		1.27
Ult. Stress, ksf		
σ_1 Failure, ksf		3.77
σ_3 Failure, ksf		2.50

Type of Test:
Unconsolidated Undrained

Sample Type: Mod.Cal.

Description: Soft,dark gray LEAN CLAY(CL-CH)

Specific Gravity= 2.70

Remarks:

Figure _____

Client: Questa Engineering Corp.

Project: Greenwood Avenue Culvert.

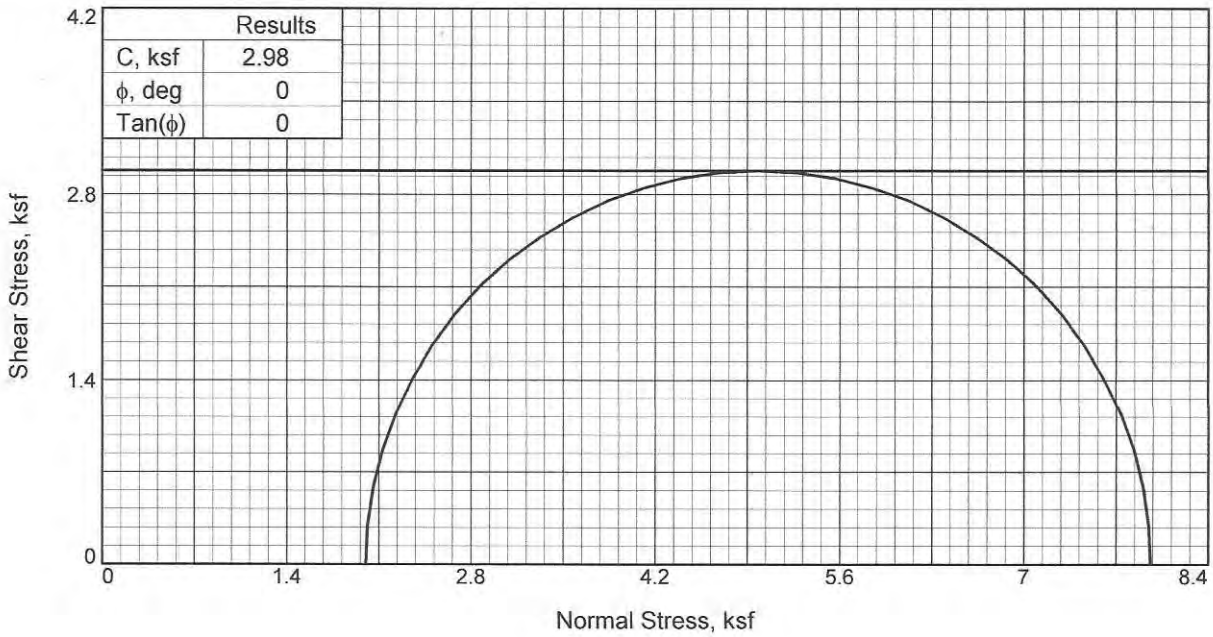
Location: BH-1

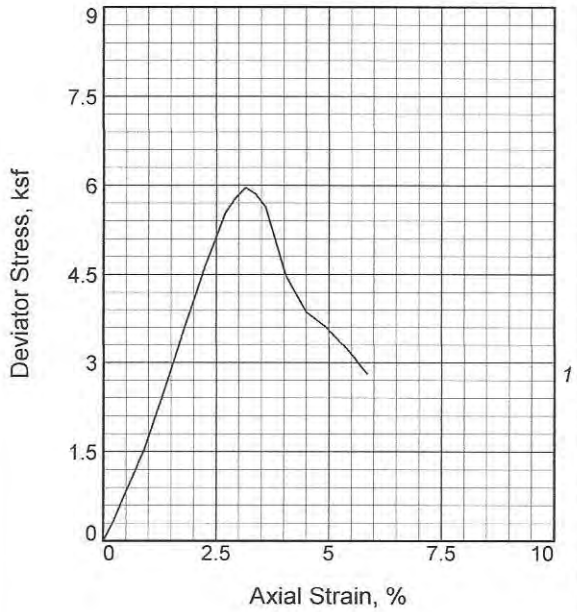
Depth: 21'

Proj. No.: 1300218 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Soil Mechanics Lab
Oakland, California

Tested By: MA





Sample No.		1
Initial	Water Content, %	22.0
	Dry Density, pcf	90.4
	Saturation, %	68.7
	Void Ratio	0.8650
	Diameter, in.	2.42
	Height, in.	4.45
At Test	Water Content, %	32.0
	Dry Density, pcf	90.4
	Saturation, %	100.0
	Void Ratio	0.8650
	Diameter, in.	2.42
	Height, in.	4.45
Strain rate, in./min.		0.08
Back Pressure, psi		0.00
Cell Pressure, psi		13.89
Fail. Stress, ksf		5.96
Ult. Stress, ksf		
σ_1 Failure, ksf		7.96
σ_3 Failure, ksf		2.00

Type of Test:
Unconsolidated Undrained

Sample Type: Mod.Cal.

Description: Stiff,brittle,dark gray LEAN CLAY(CL)

Specific Gravity= 2.70

Remarks:

Client: Questa Engineering Corp.

Project: Greenwood Avenue Culvert.

Location: BH-2

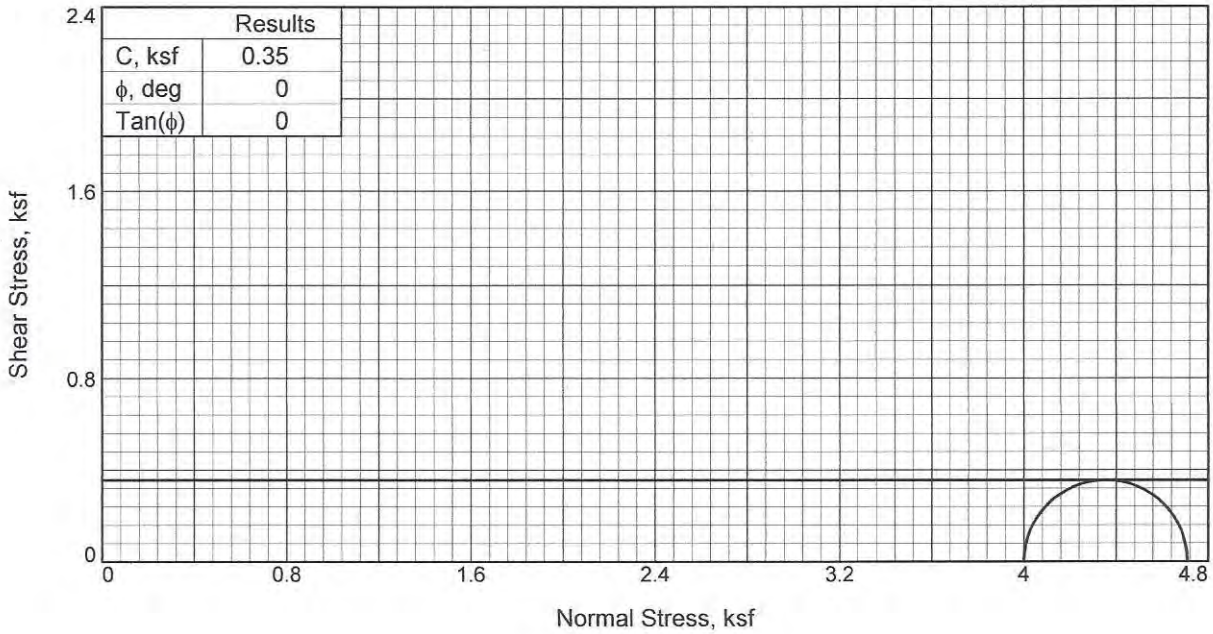
Depth: 18'

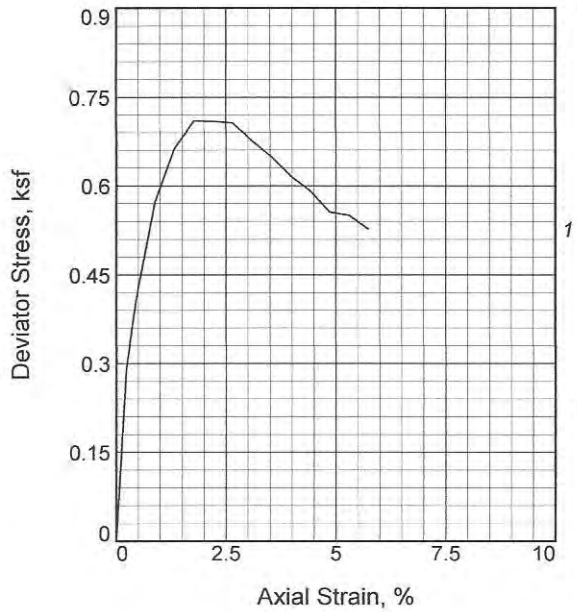
Proj. No.: 1300218 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Soil Mechanics Lab
Oakland, California

Figure _____

Tested By: MA





Sample No.		1
Initial	Water Content, %	30.0
	Dry Density, pcf	92.8
	Saturation, %	99.4
	Void Ratio	0.8154
	Diameter, in.	2.42
	Height, in.	4.53
At Test	Water Content, %	30.2
	Dry Density, pcf	92.8
	Saturation, %	100.0
	Void Ratio	0.8154
	Diameter, in.	2.42
	Height, in.	4.53
Strain rate, in./min.		0.08
Back Pressure, psi		0.00
Cell Pressure, psi		27.78
Fail. Stress, ksf		0.71
Ult. Stress, ksf		
σ_1 Failure, ksf		4.71
σ_3 Failure, ksf		4.00

Type of Test:
Unconsolidated Undrained
Sample Type: Mod.Cal.
Description: Soft,dark gray clayey,med. to coarse SAND w/fine gravel(SC)

Specific Gravity= 2.70
Remarks:

Figure _____

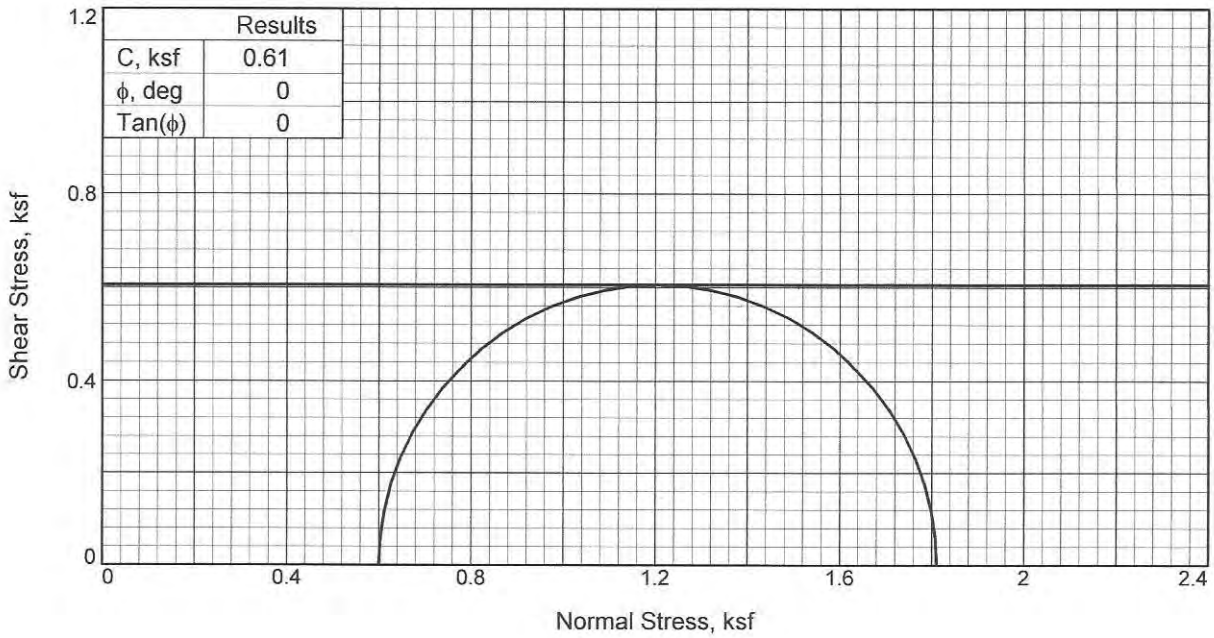
Client: Questa Engineering Corp.

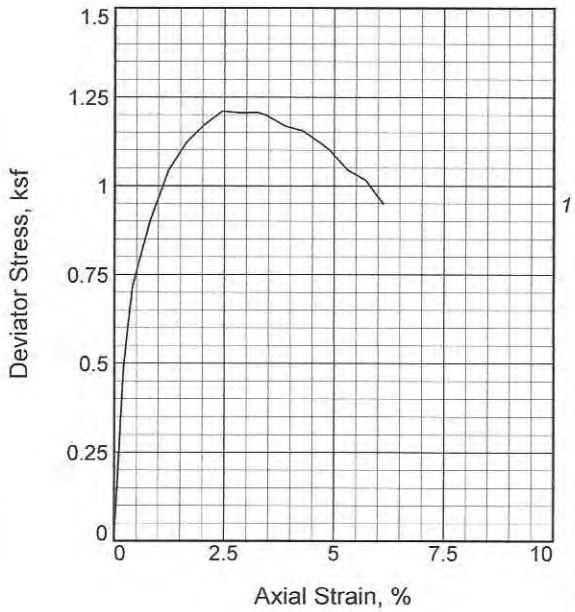
Project: Greenwood Avenue Culvert.

Location: BH-2
Depth: 34'
Proj. No.: 1300218 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Soil Mechanics Lab
Oakland, California

Tested By: MA





Sample No.		1
Initial	Water Content, %	19.1
	Dry Density, pcf	103.0
	Saturation, %	80.8
	Void Ratio	0.6370
	Diameter, in.	2.42
	Height, in.	4.90
At Test	Water Content, %	23.6
	Dry Density, pcf	103.0
	Saturation, %	100.0
	Void Ratio	0.6370
	Diameter, in.	2.42
	Height, in.	4.90
Strain rate, in./min.		0.08
Back Pressure, psi		0.00
Cell Pressure, psi		4.17
Fail. Stress, ksf		1.21
Ult. Stress, ksf		
σ_1 Failure, ksf		1.81
σ_3 Failure, ksf		0.60

Type of Test:
Unconsolidated Undrained

Sample Type: Mod.Cal.

Description: Compact,dark gray clayey f-c SAND w/f-m gravel(SC)

Specific Gravity= 2.70

Remarks:

Client: Questa Engineering Corp.

Project: Greenwood Avenue Culvert.

Location: BH-3

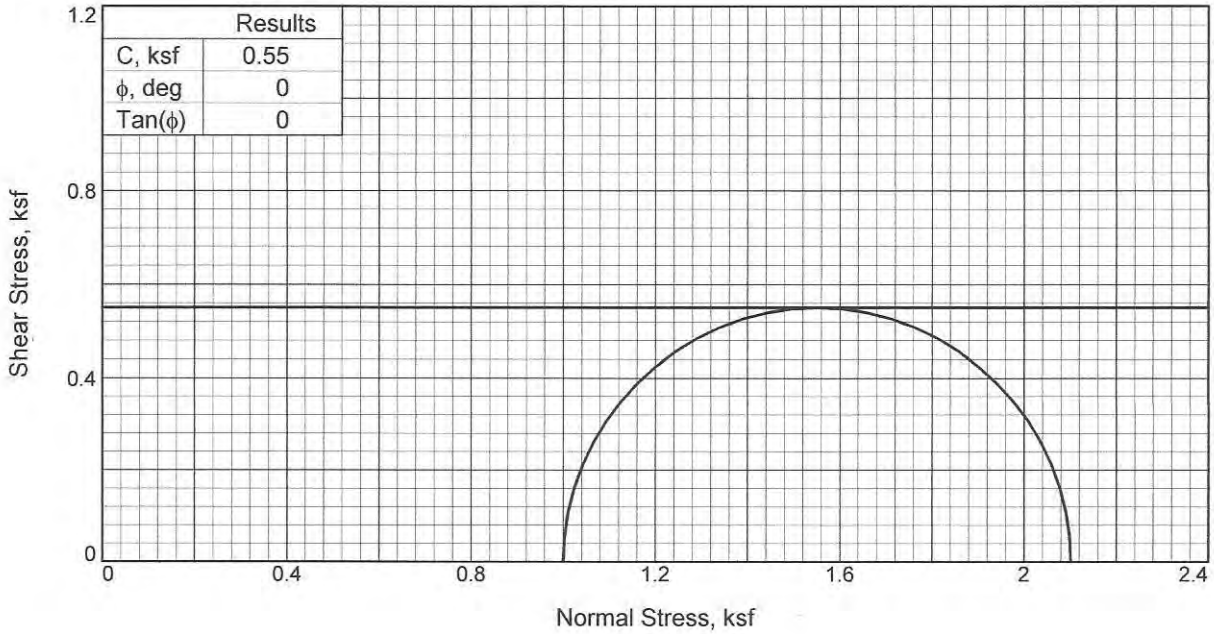
Depth: 5'

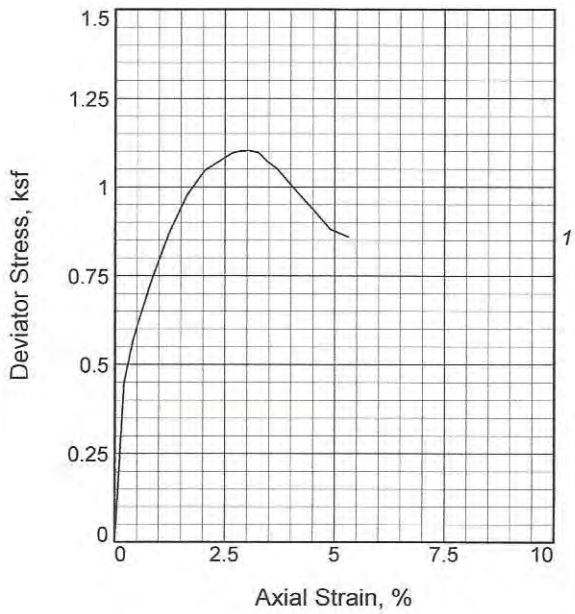
Proj. No.: 1300218 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Soil Mechanics Lab
Oakland, California

Figure _____

Tested By: MA





Sample No.		1
Initial	Water Content, %	17.7
	Dry Density, pcf	90.6
	Saturation, %	55.5
	Void Ratio	0.8602
	Diameter, in.	2.42
	Height, in.	4.90
At Test	Water Content, %	31.9
	Dry Density, pcf	90.6
	Saturation, %	100.0
	Void Ratio	0.8602
	Diameter, in.	2.42
	Height, in.	4.90
Strain rate, in./min.		0.08
Back Pressure, psi		0.00
Cell Pressure, psi		6.94
Fail. Stress, ksf		1.10
Ult. Stress, ksf		
σ_1 Failure, ksf		2.10
σ_3 Failure, ksf		1.00

Type of Test:
Unconsolidated Undrained
Sample Type: Mod.Cal.
Description: Compact,dk.brown f-m silty SAND(SM) over very stiff,very dark brown FAT CLAY(CH)w/sand.
Specific Gravity= 2.70
Remarks:

Client: Questa Engineering Corp.

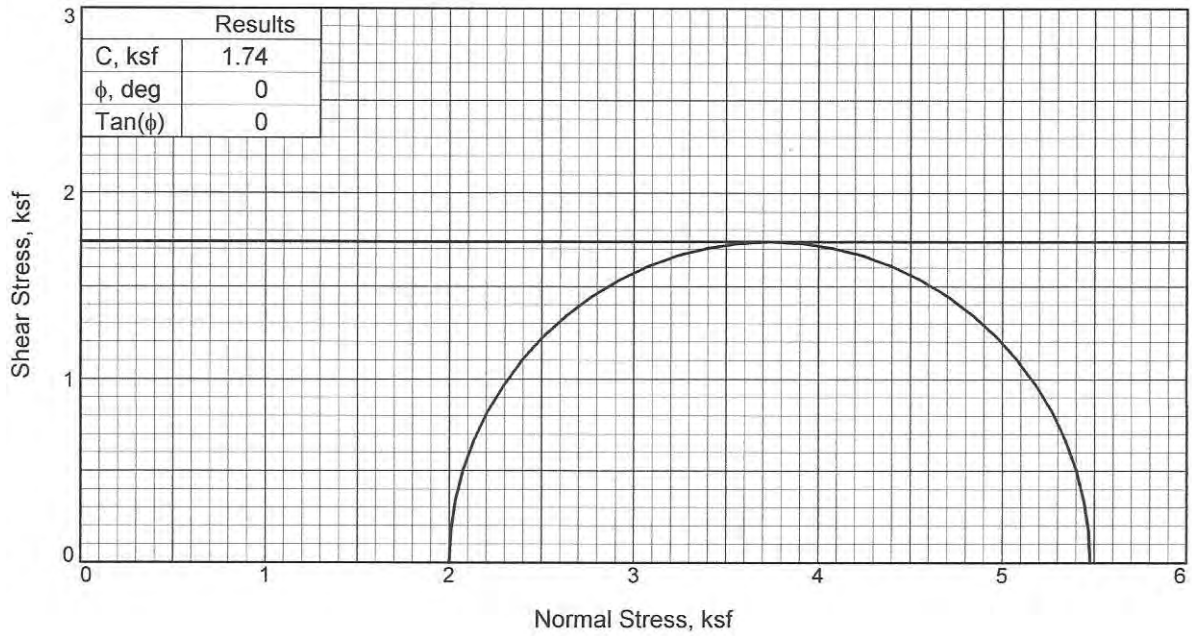
Project: Greenwood Avenue Culvert.

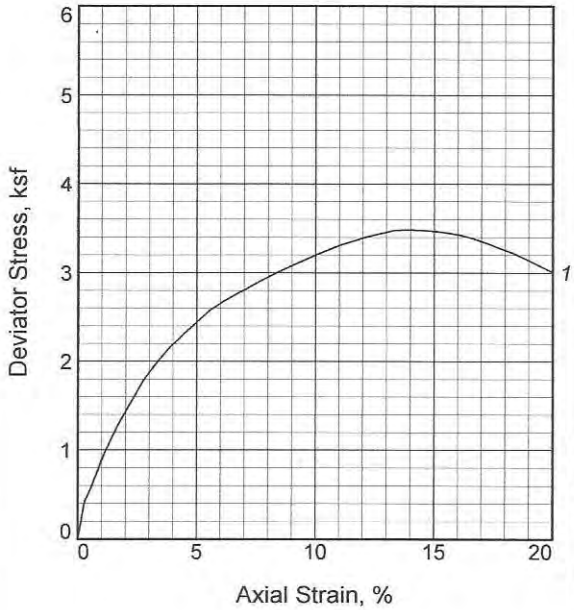
Location: BH-3
Depth: 10'
Proj. No.: 1300218 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Soil Mechanics Lab
Oakland, California

Figure _____

Tested By: MA





Sample No.		1
Initial	Water Content, %	21.8
	Dry Density, pcf	101.0
	Saturation, %	88.3
	Void Ratio	0.6681
	Diameter, in.	2.42
	Height, in.	3.60
At Test	Water Content, %	24.7
	Dry Density, pcf	101.0
	Saturation, %	100.0
	Void Ratio	0.6681
	Diameter, in.	2.42
	Height, in.	3.60
Strain rate, in./min.		0.08
Back Pressure, psi		0.00
Cell Pressure, psi		13.89
Fail. Stress, ksf		3.48
Ult. Stress, ksf		
σ_1 Failure, ksf		5.48
σ_3 Failure, ksf		2.00

Type of Test:
Unconsolidated Undrained

Sample Type: Mod.Cal.

Description: Very stiff,very dark brown sandy FAT CLAY(CH)

Specific Gravity= 2.70

Remarks:

Client: Questa Engineering Corp.

Project: Greenwood Avenue Culvert.

Location: BH-3

Depth: 15.5'

Proj. No.: 1300218 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Soil Mechanics Lab
Oakland, California

Figure _____

Tested By: MA

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-Analytical Labs
-Technical Support

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Petaluma, CA 94954
(707) 778-9605/FAX 778-9612

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COMPANY: Questa Engineering, 1220 Brickyard Cove Road, Suite 220, Point Richmond, CA			ANALYST(S)	SUPERVISOR
ATTN: Jeff Peters		DATE of	D. Salinas	D. Jacobson
JOB: Culvert, Greenwood Avenue, Calistoga, California	DATE RECEIVED	COMPLETION	S. Santos	LAB DIRECTOR
JOB #: n.a.	5/6/2014	5/13/2014		G.S. Conrad PhD

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SOIL pH -log[H+]	NOMINAL RESISTIVITY ohm-cm	ELECTRICAL CONDUCTIVITY µmhos/cm	SULFATE SO4 ppm	CHLORIDE Cl ppm
05854-1	GA1/C	BH-1 @ 8-10' (Bulk)	**7.03**	**1,060**	**[942]**	**30**	**243**
Method	Detection	Limits --->	---	1	0.1	1	1

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SALINITY ECe mmhos/cm	SOLUBLE SULFIDES (S=) ppm	SOLUBLE CYANIDES (CN=) ppm	REDOX mV	PERCENT MOISTURE %
05854-1	GA1/C	BH-1 @ 8-10' (Bulk)				**+243.3**	**2.94**
Method	Detection	Limits --->	---	0.1	0.1	-400 -> +800	0.1

**********COMMENTS**********

Resistivity is just over 1,000 ohm-cm, i.e., very low (assign 2-10 pts, depending on specs); soil reaction (i.e., pH) is almost neutral (barely alkaline) which is acceptable (assign Ø pts); sulfate is very low (@ <200 ppm, assign Ø pts), but chloride is mildly elevated (@ >100 ppm but <500 ppm, assign Ø-3 pts, depending on specs); and soil is mildly reduced (@ 200-400 mV, assign Ø-3.5 pts, depending on specs). The standard CalTrans times to perforation for this soil are as follows: for 18 ga steel the time is ~18 yrs, and for 12 ga it goes up to <40 yrs. For gray/ductile steels and cast iron the calculated average pitting rate (according to Uhlig) is @ ≈0.155 mm/yr, thus pitting to a 2 mm depth is <13 yrs, and to a 4 mm depth is <26 yrs. Chloride is mildly elevated, thus this could be a mild issue for steel and rebar; but sulfate is low so there would be no significant adverse impact on concrete, cements, grouts and mortars. Soil redox could be a minor issue (i.e., in the mid+200 mV range). In principle, this soil could benefit from alkaline or mild cement treatment in that raising its pH to the 7.5-8.5 range would increase its 18 ga perf time to ~25.5 yrs (i.e., only ~42% better); and pitting rate would decline to ~0.12 mm/yr putting the 2 mm depth time at <17 yrs (only ~30% better). But lime treatment only persists in protected places (under slabs/bldgs, etc.), and while cement treatment Is superior in this regard as it is a more permanent fix, it has other practical limitations. Metals longevity in this material could be Improved by upgrading the steel, in fact, often times structural strength considerations will require heavier gauge steel than used in the presented examples such that perf & pitting times can end up being safely beyond the specified life span. Other general alternatives include use of specialized engineering fill, or the use of bonded plastic coated steel, or plastic, fiberglass or concrete assets, etc. In general, standard concrete mixes should be fine in this material based on these results. Total points for this material would be anywhere in the range of 2-16.5 pts depending on the actual specifications, i.e., a huge range meaning that any assessment of this soil's utility or acceptability will be dependent on the exact specificatons. Last, this soil is very dry having a moisture content of just under 3%.

\\\\NOTES: Methods are from following sources: extractions by Cal Trans protocols as per Cal Test 417 (SO4), 422 (Cl), and 532/643 (pH & resistivity); &/or by ASTM Vol. 4.08 & ASTM Vol. 11.01 (=EPA Methods of Chemical Analysis, or Standard Methods); pH - ASTM G 51; Spec. Cond. - ASTM D 1125; resistivity - ASTM G 57; redox - Pt probe/ISE; sulfate - extraction Title 22, detection ASTM D 516 (=EPA 375.4); chloride - extraction Title 22, detection ASTM D 512 (=EPA 325.3); sulfides - extraction by Title 22, and detection EPA 376.2 (= SMEWW 4500-S D); cyanides - extraction by Title 22, and detection by ASTM D 4374 (=EPA 335.2).

APPENDIX E
Hydrologic Data

Schaaf & Wheeler
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TO: Napa County

DATE: September 4, 2014

FROM: Dan Schaaf, PE

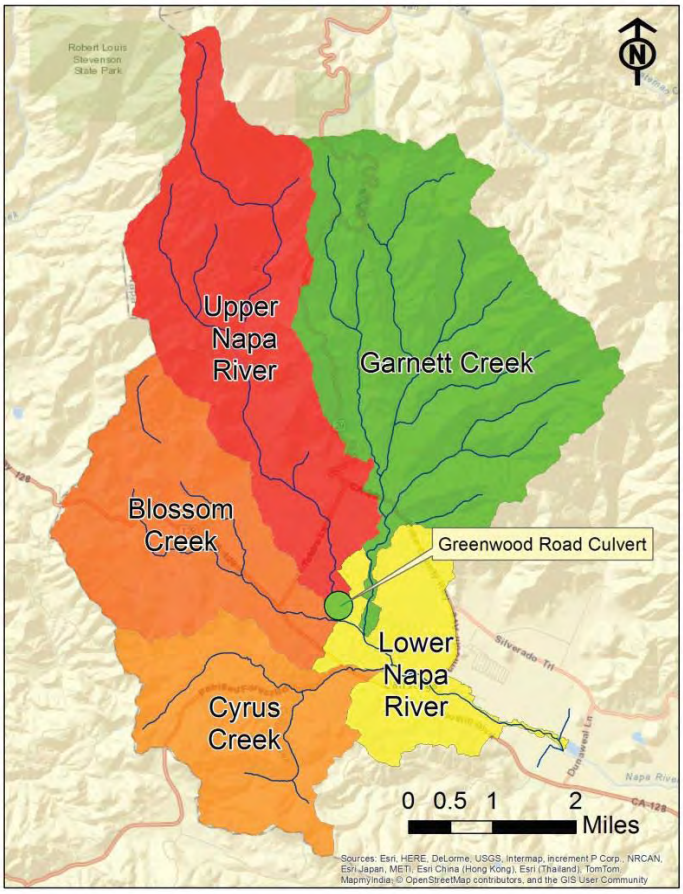
JOB #: CONA.01.14

SUBJECT: **Greenwood Road Hydrology Study**

Introduction and Purpose

The proposed Napa River crossing at Greenwood Road may have hydrologic impacts on downstream communities. Schaaf & Wheeler has been contracted by Napa County to determine the possible impacts from replacing the existing 15-foot diameter culvert with a structure ranging from a 30-foot arch culvert to a free span bridge. Effective FEMA hydrologic models are not available; therefore, new HEC-HMS models of the region (Figure 1) were developed.

Figure 1: Watershed



Available Data

There are several published studies of the Napa River watershed. Many of these studies included hydrologic analyses and modeling. Schaaf & Wheeler worked with the County to determine the appropriate precipitation pattern and loss methods to apply to this study. The unit hydrographs published in the 1963 Review Report for Flood Control and Allied Purposes, Napa River Basin were utilized along with the 1964 Laytonville storm pattern. Basin characteristics including length, length to centroid, average channel slope and drainage area were developed from the County's GIS data. FEMA effective peak discharges were used to calibrate the hydrologic models. The discharges and corresponding drainage areas are shown in Table 1. The first area figure listed is from FEMA's Flood Insurance Study and the second is from an application of the most recent County GIS. With the exception of Blossom Creek the drainage areas are within 10 percent of each other. For Blossom Creek they are within 15 percent of one another. Either drainage area could be used for model purposes as model will be calibrated to the effective FEMA discharges.

Table 1: FEMA Flow Rates

Basin	Area (square miles)	100-yr Discharge (cfs)
Napa River at Corp Limits	5.4/5.7	3,500*
Garnett Creek	6.9/7.5	3,200
Blossom Creek	3.4/3.9	1,700
Cyrus Creek	2.9/3.1	1,500

**Published value (5,100cfs) includes Blossom Creek flows.*

Rainfall Intensity

Rainfall statistics from NOAA Atlas 14 Point Precipitation Frequency Estimates for California (http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca) were used to develop rainfall depths and balance the Laytonville storm pattern. These statistics were completed in 2011. The NOAA website allows the user to pin-point a place on a map or to enter latitude and longitude coordinates. NOAA statistics are then readily produced. These are reportedly based on 11 nearby daily stations. This NOAA web site does provide a statistical analysis it does not show the raw data and does not show computed Mean Annual Precipitation (MAP) values for any site selected.

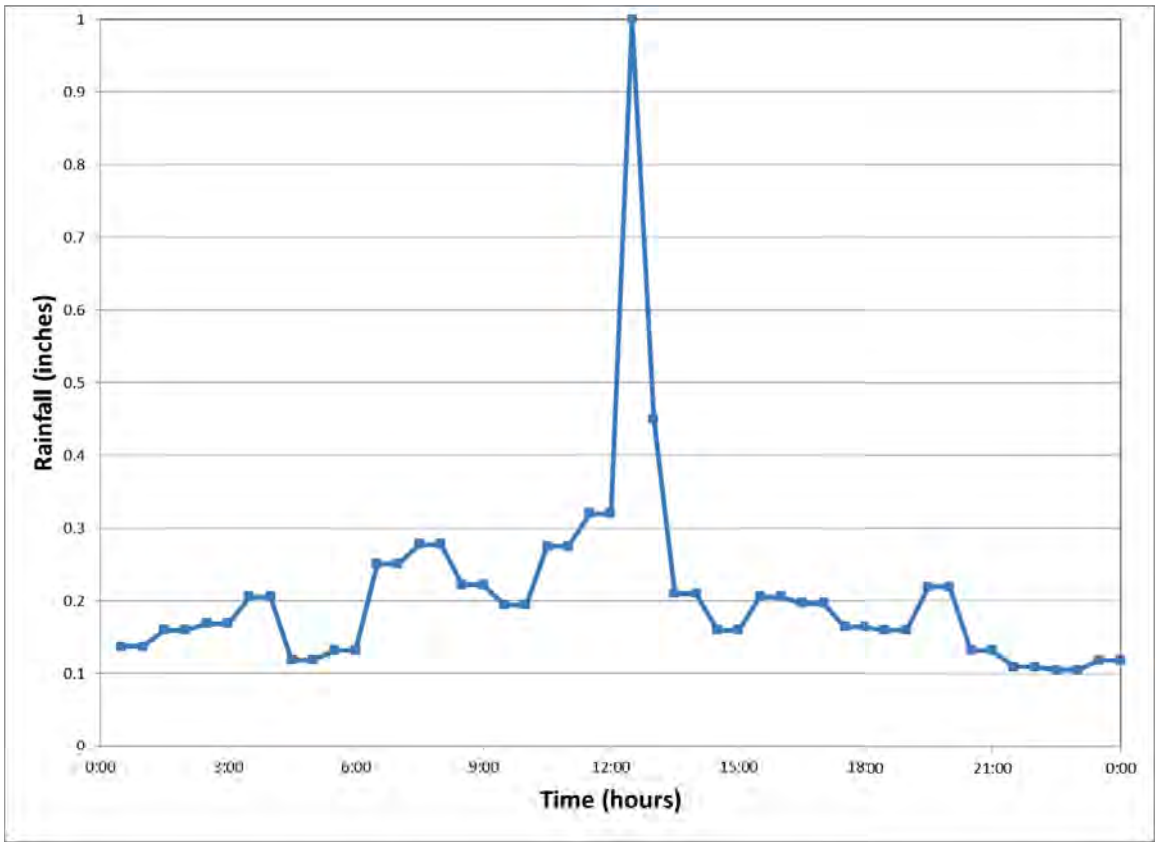
Balanced Rainfall Pattern

A 96-hr Laytonville storm pattern was selected for this study. This pattern was shortened to a 24-hour duration by extracting hours 34 through 57, which is roughly the storm peak. 100-year rainfall depths at the centroid of the study area from NOAA Atlas 14 where utilized to balance the 24-hour storm. Table 2 lists the balancing depths. The resulting balanced storm is shown in Figure 2.

Table 2: 100-year Rainfall Depths

Duration	Depth (inches)
30-min	1.0
60-min	1.45
2-hour	2.1
3-hour	2.6
6-hour	4.0
12-hour	6.4
24-hour	9.9

Figure 2: 24-hour Rainfall Pattern



Unit Hydrographs

A unit hydrograph for each basin was developed using the S-Graph from the published unit hydrograph of Napa River at Bale Dam. This S-Graph was applied based on basin lag and drainage area. Basin hydrologic parameters are listed in Table 3 and 30-minute unit hydrographs for each basin area shown in Table 4.

Table 3: Basin Characteristics

Catchment	L (mi)	Lc (mi)	Slope (ft/mi)	Basin N	Lag (hrs)
Blossom	3.72	1.79	311.5	0.15	2.49
Cyrus	3.10	1.26	286.2	0.15	2.06
Garnett	5.40	2.83	433.4	0.15	3.20
Lower Napa	1.60	0.68	391.2	0.15	1.20
Upper Napa	6.75	3.34	528.8	0.15	3.57

Table 4: Unit Hydrographs

Time	Blossom Creek	Garnett Creek	Cyrus Creek	Napa River at Corp Limits
0:30	0	0	0	0
1:00	64	81	80	56
1:30	214	235	269	143
2:00	536	474	779	264
2:30	965	989	795	428
3:00	755	1449	450	1019
3:30	469	1307	329	953
4:00	357	782	240	775
4:30	277	626	186	529
5:00	221	512	150	417
5:30	184	423	123	348
6:00	151	355	104	297
6:30	129	303	86	255
7:00	114	264	72	213
7:30	95	220	61	189
8:00	82	198	50	167
8:30	72	180	41	148
9:00	62	162	32	132
9:30	53	141	27	121
10:00	45	126	22	109
10:30	37	111	17	98
11:00	32	101	13	87
11:30	26	89	10	78
12:00	22	78	5	72
12:30	18	70	3	66
13:00	14	61	2	57
13:30	12	51	0	51
14:00	8	46	0	46
14:30	5	40	0	41
15:00	4	35	0	35
15:30	3	30	0	32
16:00	2	26	0	28
16:30	0	22	0	25
17:00	0	19	0	22
17:30	0	14	0	19
18:00	0	10	0	16
18:30	0	7	0	14
19:00	0	5	0	13
19:30	0	5	0	9
20:00	0	3	0	7
20:30	0	0	0	0
21:00	0	0	0	0

Hydrologic Routing

Routing in the HEC-HMS models is based on the Muskingum method. X is set at 0.2 to represent flow generally contained within the channel. The K values are approximated using 2/3 of the 100-year channel velocities from the HEC-2 models by Nolte and Associates. Table 5 lists routing parameters.

Table 5: Routing Parameters

Reach	HEC2 XS	Vch (fps)	Length (ft)	K (hrs)	X
Greenwood Rd to Blossom Ck	12790	6.5	770	0.05	0.2
Blossom Ck to Garnett Ck	12780	5.8	1,360	0.10	0.2
Garnett Ck to Cyrus Ck	12750 12760	8.0	2,140	0.11	0.2

Model Calibration

The HEC-HMS model was developed with previously listed data. The model was calibrated to published FEMA 100-year flows by adjusting the constant loss value. No initial loss was applied. Rainfall depth was based on NOAA Atlas 14 and adjusted as needed. Table 7 lists the constant loss and rainfall depths for the 100-year and 10-year events.

Table 7: Rainfall and Losses

Catchment	10-year Rainfall (in)	100-year Rainfall (in)	10-year Constant Loss (in/hr)	100-year Constant Loss (in/hr)
Blossom	6.79	9.78	0.18	0.15
Cyrus	6.76	9.72	0.15	0.11
Garnett	7.3	10.50	0.17	0.14
Lower Napa	6.63	9.56	0.16	0.14
Upper Napa	8.53	12.98	0.00	0.00

Existing Culvert and Proposed Arch Hydraulics

The HEC-RAS models of the current Greenwood Road culvert (Figure 3), a proposed arch culvert (Figure 4), and free span bridge (Figure 5) were utilized to create rating curves (Figure 6) of hydraulic performance. County LiDAR topography (Figure 8) was used to create elevation vs. storage curves (Figure 7). These curves were utilized to route the Upper Napa flows through the floodplain and culvert at Greenwood Road in HEC-HMS. The proposed crossing improvements lower the 100-year water surface 6.5-feet, significantly reducing the floodplain upstream of Greenwood Road.

Figure 3: Existing Culvert Section at Greenwood Road

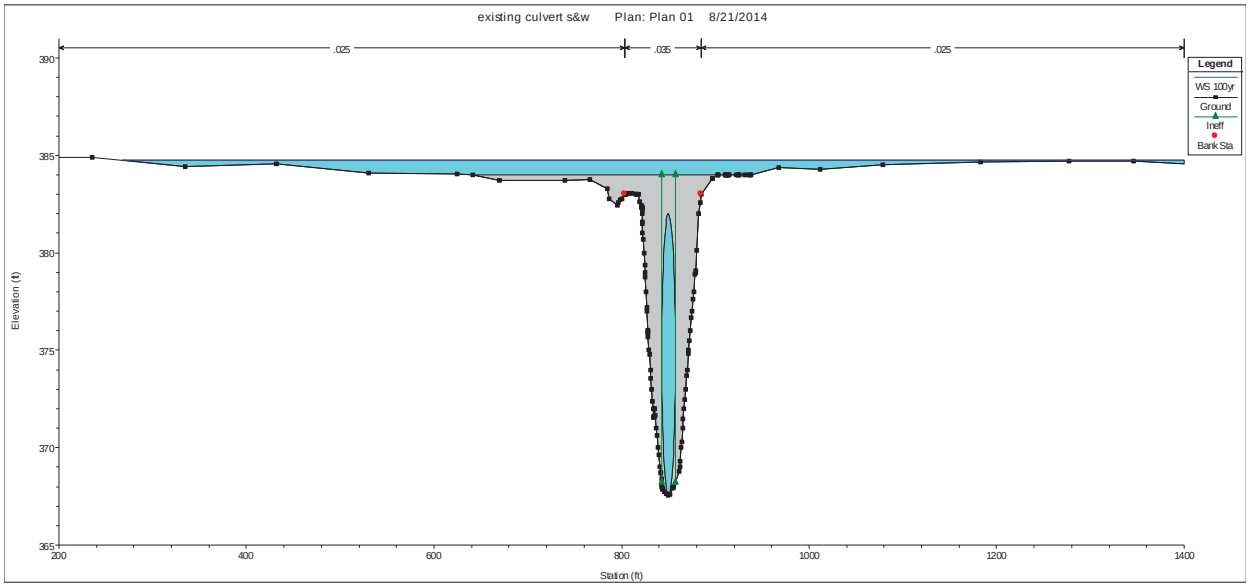


Figure 4: Proposed Arch Culvert Section at Greenwood Road

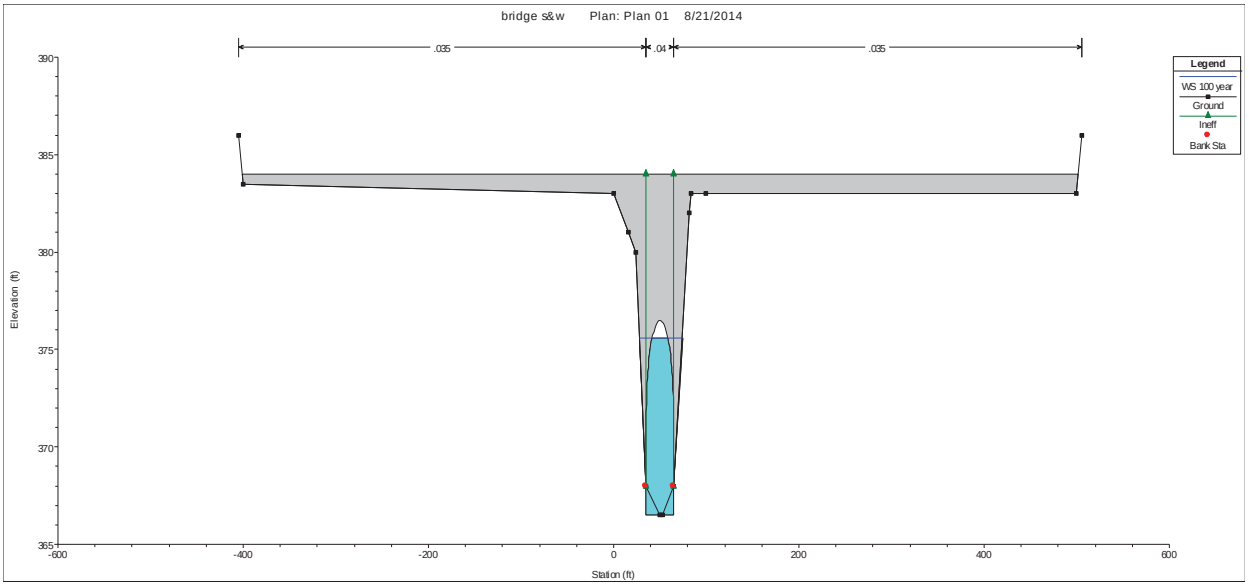


Figure 5: Free Span Bridge Section at Greenwood Road

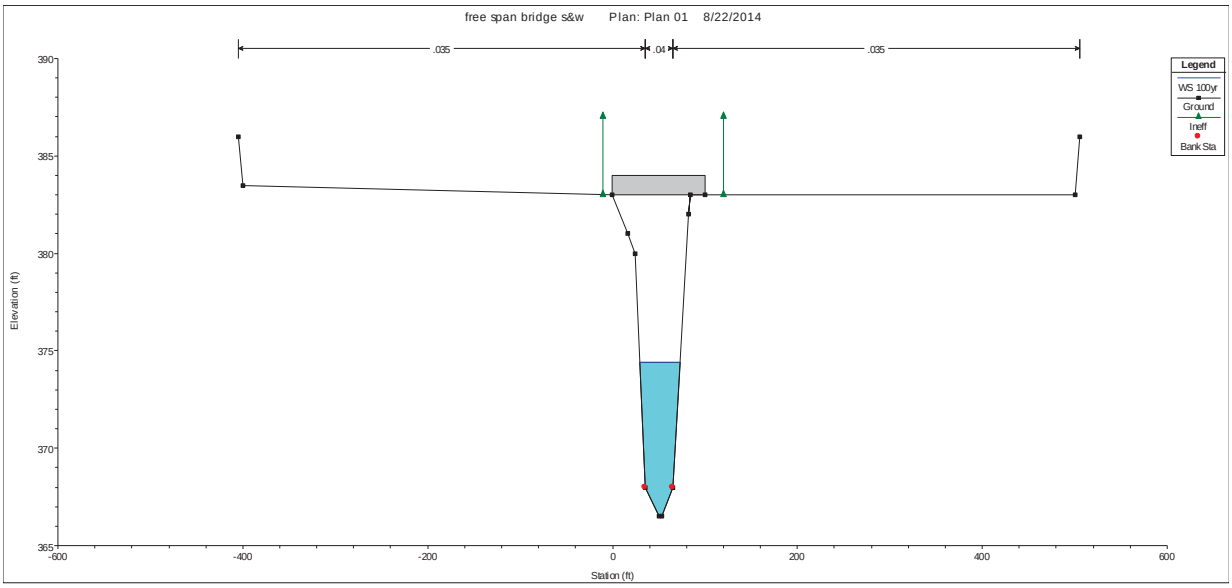


Figure 6: Greenwood Road Arch and Culvert Curves

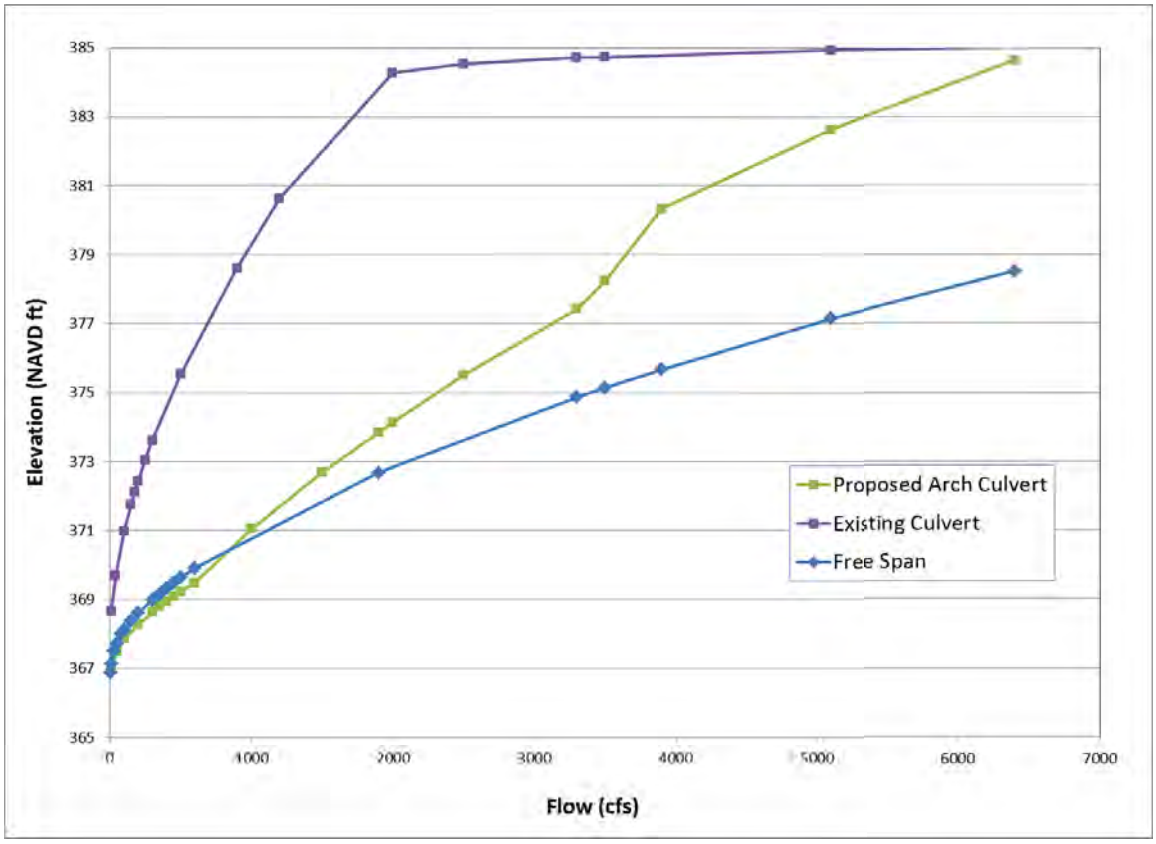


Figure 7: Greenwood Road Elevation-Area Curve

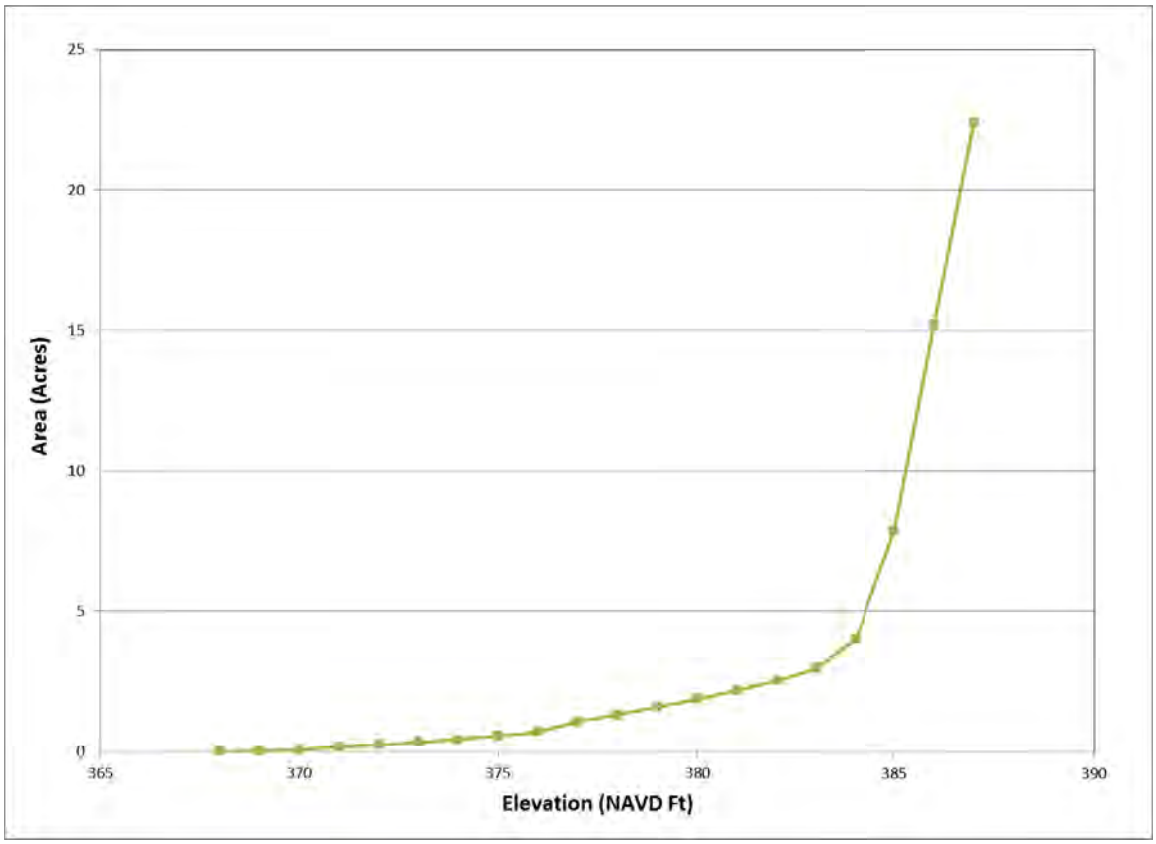
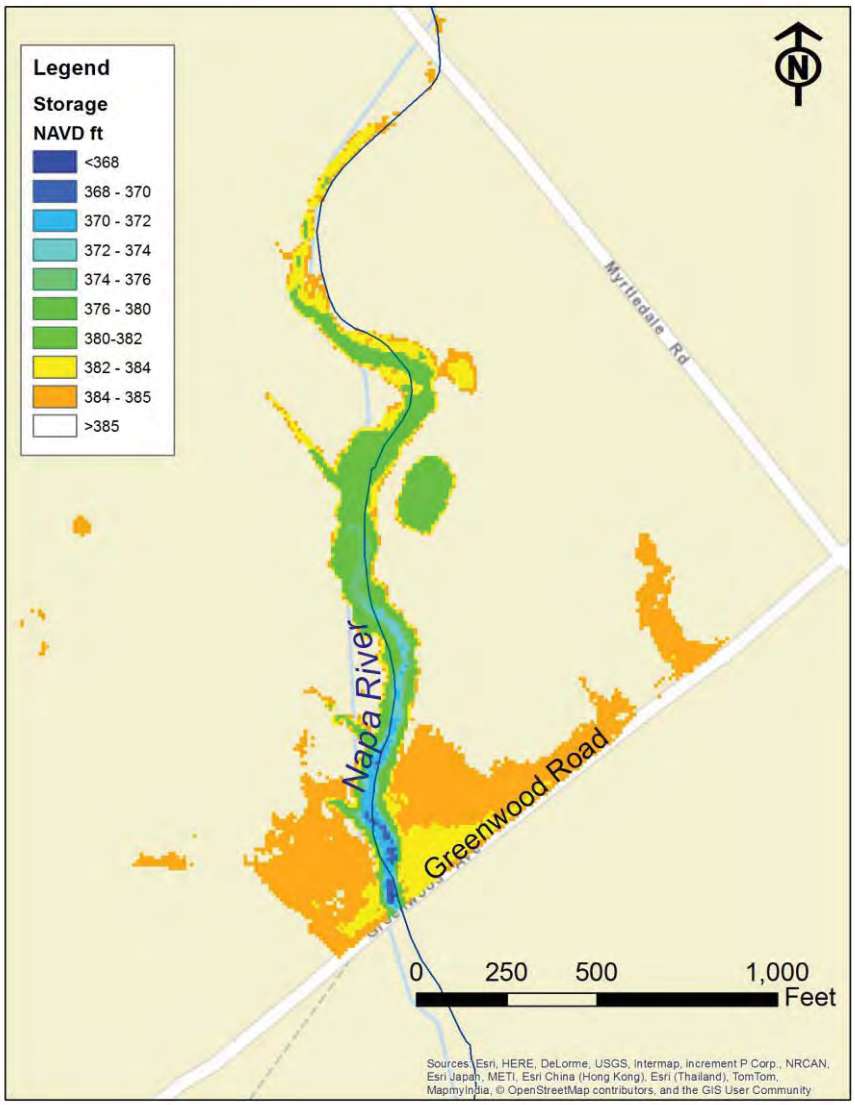

25
20
15
10
5
0
Area (Acres)
365
370
375
380
385
390
Elevation (NAVD Ft)

Figure 8: Floodplain Storage Area



Model Results

The HEC-HMS models show no significant impacts on downstream flows at either the 10-year or and the 100-year 24-hour events. Figure 9 shows the 10-year and 100-year hydrographs on the Napa River at the confluence with Cyrus Creek. Table 8 lists the peak discharges at key locations within the Napa River system for both the existing and proposed culvert system.

Figure 9: Napa River Flow Hydrographs at Confluence with Cyrus Creek

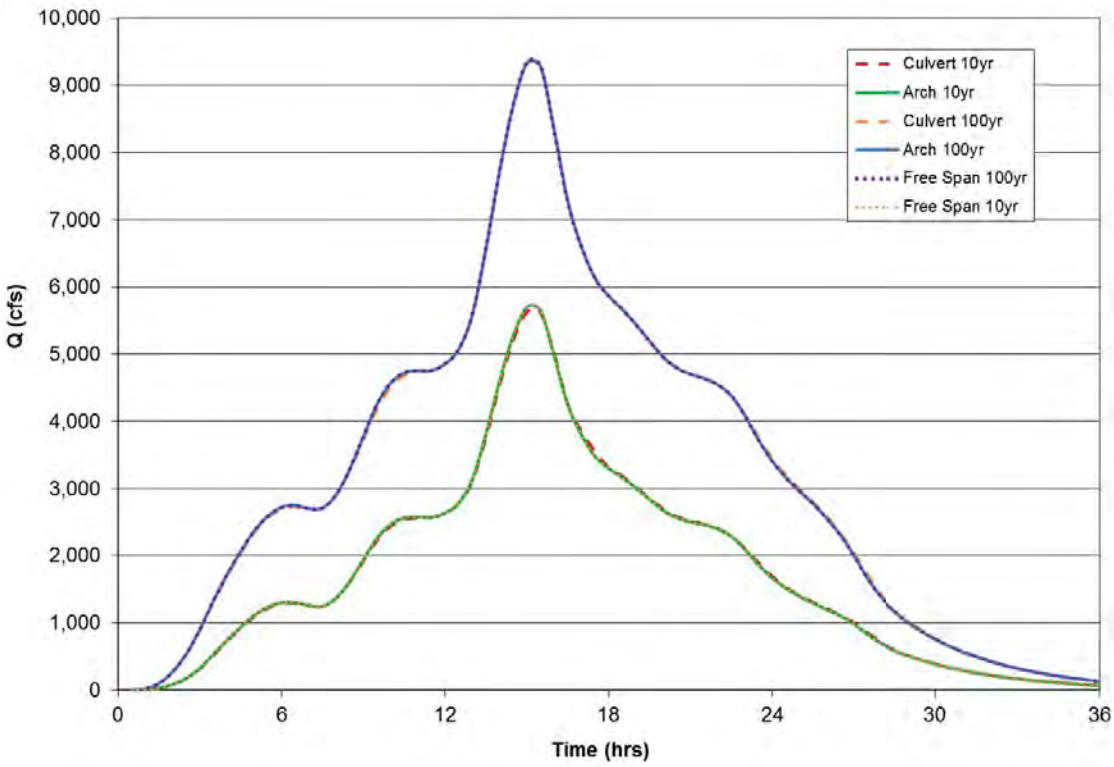


Table 8: Model Peak Discharges

Location	Existing 10-year (cfs)	Arch Culvert 10-year (cfs)	Free Span 10-year (cfs)	Existing 100-year (cfs)	Arch Culvert 100-year (cfs)	Free Span 100-year (cfs)
Napa River at Greenwood Culvert	2,380	2,320	2,310	3,540	3,520	3,520
Napa River at Blossom Creek	3,080	3,120	3,130	4,940	4,900	4,940
Napa River at Garnett Creek	4,920	4,980	4,990	8,080	8,060	8,080
Napa River at Cyrus Creek	5,630	5,700	5,700	9,350	9,330	9,350

Historic Storm Pattern Model Results

Schaaf & Wheeler also modeled the full 96-hour 1964 Laytonville Standard Project (SP) storm pattern with HEC-HMS. Rainfall depths were based on US Army Corps of Engineers reports. 38.4 inches was used for the 100-year event throughout the watershed, while 25 inches was used for the 10-year event. Constant loss rates were adjusted to calibrate the SP peak flows to the published FEMA flows. Table 9 lists the 96-hour hydrologic parameters. Proposed arch and existing culvert hydrographs are shown in Figure 10. Peak flows are shown in Table 10. Again there is no significant impact on downstream flows from the proposed arch project.

Table 9: 96-hour Rainfall and Losses

Catchment	10-year Rainfall (in)	100-year Rainfall (in)	10-year Constant Loss (in/hr)	100-year Constant Loss (in/hr)
Blossom	25	38.4	0.35	0.45
Cyrus	25	38.4	0.30	0.40
Garnett	25	38.4	0.31	0.42
Lower Napa	25	38.4	0.30	0.40
Upper Napa	25	38.4	0.08	0.10

Figure 10: 96-hour Napa River Flow Hydrographs at Confluence with Cyrus Creek

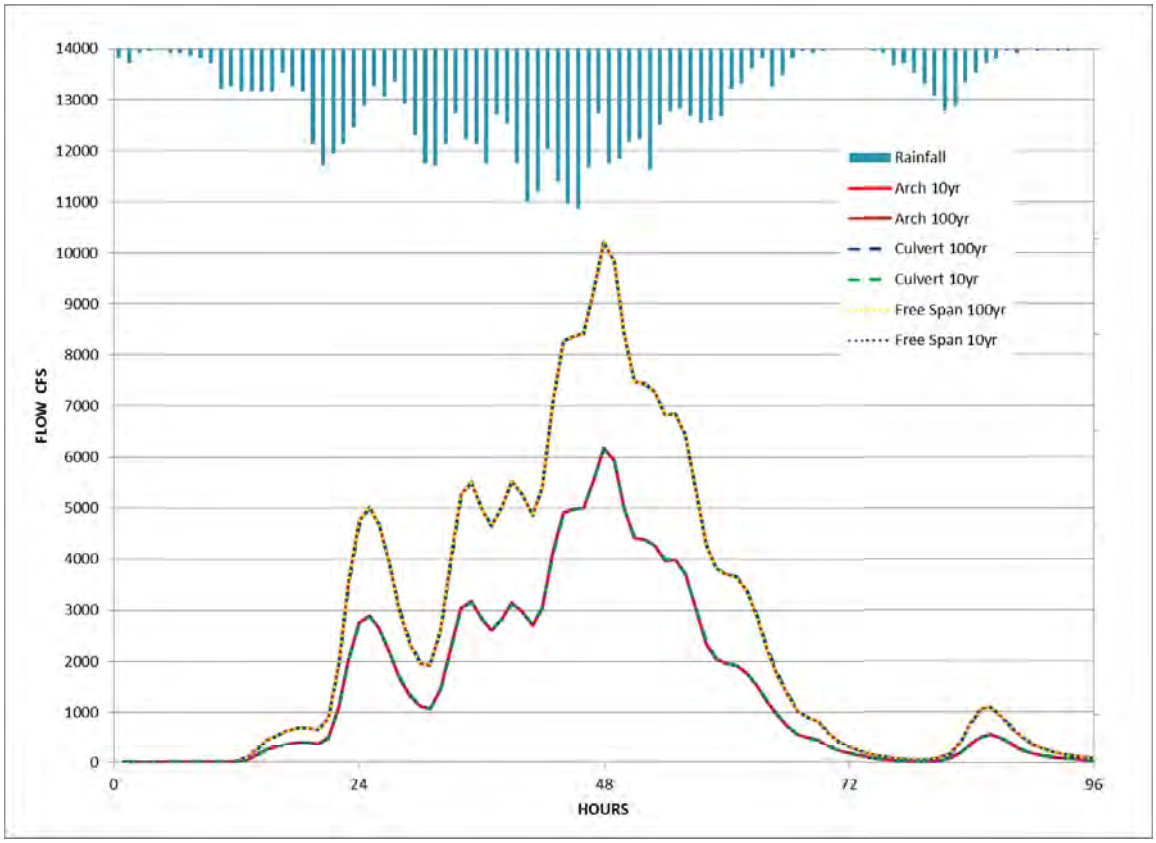


Table 10: 96-hour Model Peak Discharges

Location	Existing 10-year (cfs)	Arch Culvert 10-year (cfs)	Free Span 10-year (cfs)	Existing 100-year (cfs)	Arch Culvert 100-year (cfs)	Free Span 100-year (cfs)
Napa River at Greenwood Culvert	2,270	2,290	2,290	3,600	3,600	3,600
Napa River at Blossom Creek	3,230	3,210	3,310	5,250	5,220	5,230
Napa River at Garnett Creek	5,100	5,100	5,110	8,420	8,400	8,420
Napa River at Cyrus Creek	6,160	6,180	6,180	10,210	10,200	10,220

Conclusion

Schaaf & Wheeler has found no significant hydrologic impact and expects no impact from projects that have a rating curve ranging between the existing culvert and a free span bridge as shown on Figure 4 on the Napa River at Greenwood Road. The floodplain storage loss at the 100-year level is roughly 20 acre-feet. This volume is insignificant compared to the 2,600 acre-feet of runoff above Greenwood Road during a 24-hour 10-year event or the 20,000 acre-feet of runoff during the 96-hour 100-year event in the in Calistoga.

Hydraulic models of the Napa River were not analyzed under this study; however, the hydrologic analyses are a strong indicator there should be no significant impact on the peak 100-year water surface elevations downstream of Greenwood Road. The City of Calistoga may see slightly higher peak flows during more frequent events (10-year). There is no indication the proposed Greenwood Road Culvert replacement Project would increase flood risk in the City of Calistoga during a 100-year event.