PUBLIC REVIEW DRAFT

Initial Study / Mitigated Negative Declaration

Via Verdi Slope Stabilization Project

Richmond, CA

October 2019

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Via Verdi Slope Stabilization Project

Richmond, CA

Initial Study / Mitigated Negative Declaration

Prepared for:

City of Richmond

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MITIGATED NEGATIVE DECLARATION

The City of Richmond, California, a municipal corporation, does hereby prepare, declare, and publish this Mitigated Negative Declaration for the following described project:

Project Name: Via Verdi Slope Stabilization Project.

Project Location: The project is located along the Via Verdi roadway in the City of Richmond, Contra Costa County, California, between El Portal Drive and the Sobrante Glen neighborhood. The project encompasses a total of 7.2 acres at two distinct project locations: the primary project area and the proposed mitigation site on Rheem Creek.

Project Description: The proposed project has been designed by the City of Richmond (City) to reconstruct a segment of the Via Verdi roadway that was damaged by a landslide in 2017; the road was closed at that time and an emergency roadway continues to provide access for the Sobrante Glen neighborhood. Reconstruction of the roadway requires installation of a culvert within San Pablo Creek, backfilled with engineered fill, to buttress the landslide and provide a stabilized footing for the roadway embankment. An offsite mitigation area is included as part of the project.

Findings: The City of Richmond has reviewed the proposed project and, on the basis of the whole record before it, has determined that there is no substantial evidence that the project, with mitigation measures as identified in the attached Initial Study, will have a significant effect on the environment. This Mitigated Negative Declaration reflects the City's independent judgment and analysis as Lead Agency. An Environmental Impact Report is not required pursuant to the Environmental Quality Act of 1970 (Sections 21000, et seq., Public Resources Code of the State of California).

Mitigation measures necessary to avoid the potentially significant effects on the environment are included in the attached Initial Study, which is hereby incorporated and fully made part of this Mitigated Negative Declaration. The City of Richmond has hereby agreed to implement each of the identified mitigation measures, which would be adopted as part of the Mitigation Monitoring and Reporting Program.

This Negative Declaration has been prepared pursuant to Title 14, Section 15070 of the California Code of Regulations; the Local Environmental Regulations adopted by the City of Richmond; and the Richmond Municipal Code.

Copies are also available for review at the following locations: **Richmond Public Library - Main Branch** 325 Civic Center Plaza, Richmond, CA 94804 and City of Richmond, **Planning and Building Department**, City Hall, 450 Civic Center Plaza, Richmond, CA, 94804.

Director of Planning and Building Services, City of Richmond, California, a municipal corporation

Dated: 10/25/19

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Executive Summary

PROJECT DESCRIPTION

The proposed Via Verdi Slope Stabilization Project (project) has been designed by the City of Richmond (City) to reconstruct a segment of the Via Verdi roadway that was damaged by a landslide in 2017; the road was closed at that time and an emergency roadway continues to provide access to the Sobrante Glen neighborhood. Reconstruction of the roadway requires installation of a concrete box culvert within San Pablo Creek, backfilled with engineered fill, to buttress the landslide and provide a stabilized footing for the roadway embankment. An offsite mitigation area is included as part of the project.

The project is located in the City of Richmond, Contra Costa County, California. The project encompasses a total of 7.2 acres at two distinct project locations: the primary project area and the proposed mitigation site on Rheem Creek.

The primary project area covers approximately 6.2 acres, and includes a portion of Via Verdi, a section of San Pablo Creek, a soil stockpile staging area, an existing temporary emergency access road, and a landslide slope area north of Via Verdi (Figure ES-1). The project area includes City rights-of-way and portions of adjacent private parcels where roadway reconstruction activities are to occur. This portion of the project overlaps or is located adjacent to portions of the following Assessor's Parcel Numbers: (414-340-002, 414-340-001, 414-202-128, 420-021-038, 414-132-001, 414-132-002, 416-140-050, 416-140-033, 416-140-021, and 414-360-041). The project occupies portions of the Richmond, California, 7.5-minute United States Geological Survey quadrangle.

The mitigation site includes a section of Rheem Creek and associated banks, covering an approximately 1.0-acre area, adjacent to the Contra Costa College parking lot and college facilities near Mills Avenue and Shane Drive (Figure ES-2).

Figure ES-1. Project Overview Map

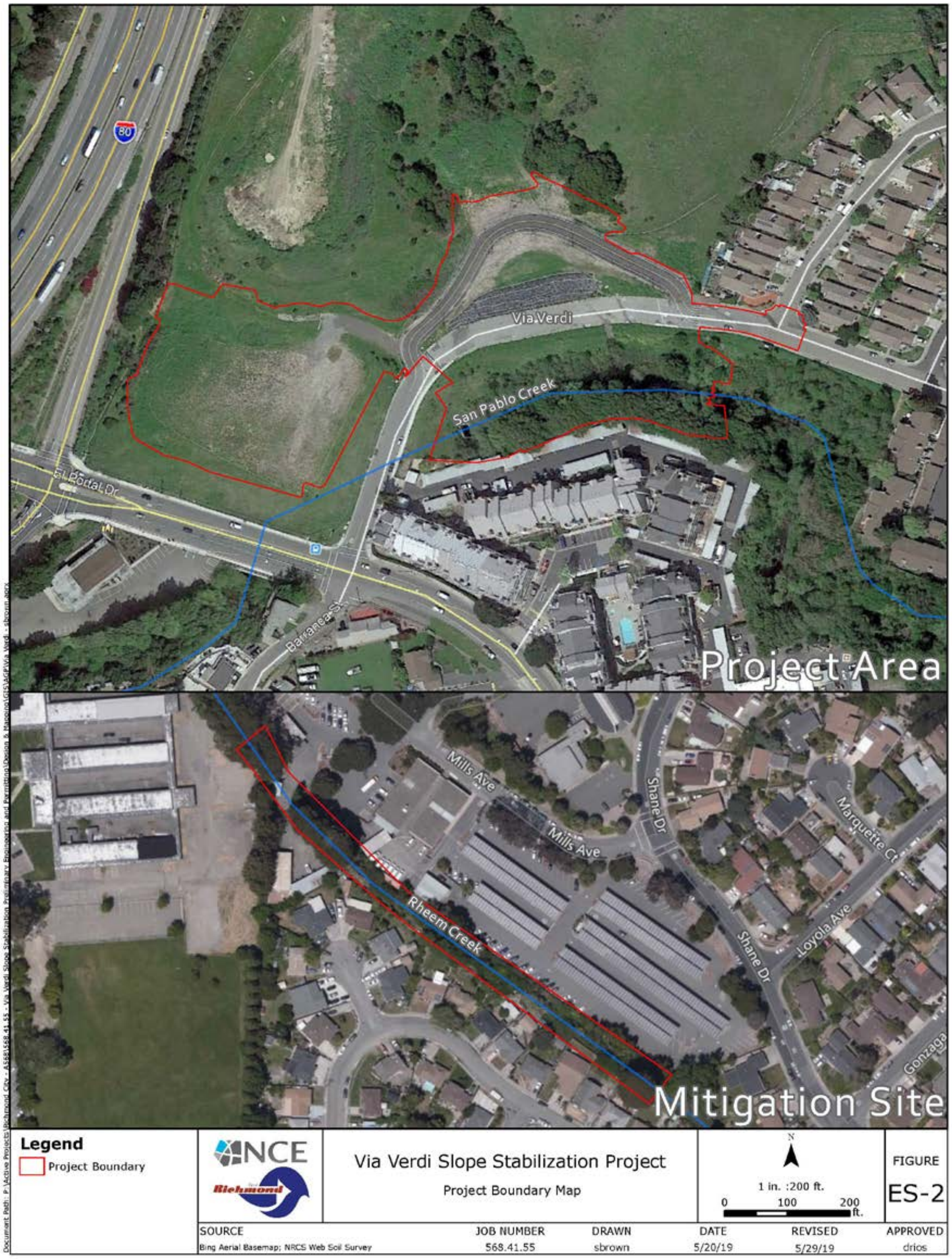

Figure ES-2. Project Boundary Map

Project Features

The proposed project would reconstruct approximately 650 linear feet of Via Verdi and the associated utilities that pass under the roadway. In order to stabilize the landslide, the project would construct an approximately 350-linear-foot concrete box culvert within San Pablo Creek below the landslide area. The culvert would be approximately 17.5 feet high and 24 feet wide. The creek channel would be excavated to provide space for the culvert and the foundation section, a compacted building pad of crushed rock approximately 2.5 feet thick. Once the concrete structure is constructed, approximately 18,000 to 20,000 cubic yards of engineered fill (rock/soil) would be placed around and over the culvert to buttress the landslide and achieve an acceptable factor of safety for the slope. When the culvert is in place, creek slopes including areas above the culvert will be revegetated and planted with native seed mixes in combination with erosion control blankets. Trees would be replanted to the extent required by regulatory agencies. Culvert headwall slopes and slopes upstream of the culvert that are affected by earthwork and grading will also be revegetated in combination with bioengineered slope protection that may include brush mattress and rip rap and pole plantings.

Once the reconstruction of Via Verdi is complete, the temporary emergency access road would be demolished and all work areas, including the staging area, would be revegetated. The total area of disturbance within the project area, including revegetation areas, would be approximately 6.2 acres.

Mitigation – Urban Stream Restoration

To mitigate for permanent impacts associated with placement of a concrete culvert within San Pablo Creek, the project proposes to restore and enhance approximately 1.0 acre of urban stream habitat at Rheem Creek. The Rheem Creek mitigation site is located southwest of Mills Avenue and Shane Drive, immediately adjacent to the Contra Costa College parking lot and college facilities.

The site includes a section of Rheem Creek and its associated heavily vegetated area. The creek is dominated by non-native and invasive plant species. The project proposes to enhance and restore the urban stream environment by implementation of a Restoration Planting Plan that targets removal of non-native species and revegetation with native species (including trees).

To avoid directly impacting Rheem Creek, tree stumps immediately adjacent to the creek bank would be left in the ground and treated with herbicide to prevent re-sprouting.

POTENTIAL IMPACTS

Based on the environmental evaluation performed for this IS, the proposed project would have:

- ***No Impact*** on Agriculture and Forestry Resources, Mineral Resources, Population and Housing, Public Services, and Recreation.
- ***Less Than Significant Impact*** on Aesthetics, Cultural Resources, Energy, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise, Transportation, Utilities and Service Systems, and Wildfire.
- ***Less Than Significant Impact with Mitigation Incorporated*** on Air Quality, Biological Resources, Geology and Soils, and Tribal Cultural Resources.

MITIGATION MEASURES

The following mitigation measures shall be implemented to reduce project impacts to a "Less than Significant" level:

- **Mitigation Measure AQ-1:** Requires implementation of all Basic Construction Mitigation Measures from the BAAQMD CEQA Guidelines to reduce construction emissions near sensitive receptors.
- **Mitigation Measure BIO-1:** Requires a pre-construction migratory bird nesting survey and avoidance measures to reduce potential impacts to migratory birds.
- **Mitigation Measure BIO-2:** Requires the City to obtain permits from the U.S. Army Corps of Engineers, State of California Department of Fish and Wildlife, and the State of California Water Resources Control Board and implement all agency-required mitigation to reduce impacts to streams and associated habitats to less than significant.
- **Mitigation Measure GEO-1:** Requires the City to retain a professional qualified paleontologist to determine paleontological resource potential at the project area. If the project area contains high potential, follow procedures to establish an adequate program for mitigating impacts from development, including a paleontological monitor on-site during construction.
- **Mitigation Measure TCR-1:** Requires Cultural Resources and Tribal Cultural Resources Sensitivity and Awareness Training Program prior to ground-disturbing activities to train construction workers in the proper identification and treatment of unanticipated discoveries.

- **Mitigation Measure TCR-2:** Requires actions to be taken in the event of inadvertent discovery of archaeological and/or TCR resources which implement avoidance and minimization measures and procedures to evaluate and protect resources.
- **Mitigation Measure TCR-3:** Requires implementation of certain performance standards in the event of inadvertent discovery of human remains.

List of Abbreviations

AB	Assembly Bill
APE	Area of Potential Effect
AWS	Alameda whipsnake
BA	Biological Assessment
BAAQMD	Bay Area Air Quality Management District
Basin Plan	Water Quality Control Plan for the San Francisco Bay Basin
BMP	Best Management Practice
CAL FIRE	California Department of Forestry and Fire Protection
CalEEMod	California Emissions Estimator Model
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
City	City of Richmond
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CRHR	California Register of Historical Resources
CRLF	California red-legged frog
CWA	Clean Water Act
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
General Plan	Richmond General Plan 2030
GWP	Global Warming Potential
HSC	California Health and Safety Code
HTE	Hultgren-Tillis Engineers
IS	Initial Study
JMC	Johnson Marigold Consulting
LSA	Lake or Streambed Alteration
LSN	LSA Notification
MBTA	Migratory Bird Treaty Act
MLRA	Major Land Resource Area
MMRP	Mitigation Monitoring and Reporting Plan
MND	Mitigated Negative Declaration
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission

NCE	Nichols Consulting Engineers
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OPR	Governor’s Office of Planning and Research
PCE	primary constituent elements
PM	particulate matter
ppm	parts per million
PRC	Public Resource Code
project	Via Verdi Slope Stabilization Project
RoadMod	District’s Road Construction Emissions Model
ROG	reactive organic gases
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SHMA	Seismic Hazards Mapping Act
SHPO	State Historic Preservation Officer
SLF	Sacred Lands File
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Boar
THPO	Tribal Historic Preservation Offices
UBC	Uniform Building Code
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
VHFHSZ	Very High Fire Hazard Severity Zones
VMT	vehicle miles traveled
VOC	volatile organic compound
WEAP	Worker Environmental Awareness Program
WOUS	Waters of the United States
$\mu g/m^3$	micrograms per cubic meter

Section 1 Project Information

1. Project title:	Via Verdi Slope Stabilization Project
2. Lead agency name and address:	City of Richmond Engineering Services Department 450 Civic Center Plaza Richmond, CA 94804
3. Contact person and phone number:	Lina Velasco Planning & Building Services Director City of Richmond Planning Division (510) 620-6841
4. Project location:	Via Verdi roadway, east of Interstate 80 in Richmond, CA, near the intersection of El Portal Drive; proposed Rheem Creek mitigation site is located immediately adjacent to Contra Costa College
5. Project sponsor's name and address:	City of Richmond Engineering Services Department 450 Civic Center Plaza Richmond, CA 94804
6. General Plan designations:	Medium density residential, open space, and medium intensity mixed use
7. Zoning:	CM-3: Commercial mixed-use, commercial emphasis; RM-1: Medium density multi-family residential; and OS: Open space
8. Description of project:	Reconstruction of a roadway impacted by landslide and stabilization of adjacent slopes, including construction of new culvert in San Pablo Creek.

9. Surrounding land uses and setting:

Residential uses, cemetery property, San Pablo Creek. Interstate 80 is located to the west, and San Pablo Dam Road and commercial uses are to the south.

10. Other public agencies whose approval is required:

U.S. Army Corps of Engineers

San Francisco Regional Water Quality Control Board

California Department of Fish and Wildlife

U.S. Fish and Wildlife Service

11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, is there a plan for consultation that includes, for example, the determination of significance of impacts to tribal cultural resources, procedures regarding confidentiality, etc.?

The tribes were initially contacted regarding the project area on December 18, 2017. A follow-up letter describing the mitigation site was sent on June 11, 2019, and follow-up phone calls were made on June 27, 2019. Responses are provided in Section 4.18. Because the Sacred Lands File search came back positive, mitigation that provides for unanticipated discoveries and consultation has been required.

The USACE conducted a separate outreach and consultation process pursuant to requirements of the National Historic Preservation Act Section 106 (Appendix K).

Section 2 Introduction

2.1 Focus of the Environmental Review

The City of Richmond (City) has prepared this Draft Initial Study (IS) and Mitigated Negative Declaration (MND) pursuant to the California Environmental Quality Act (CEQA) for the proposed Via Verdi Slope Stabilization Project (project). This IS/MND is an informational document, provided to help the public and decision-makers understand the potential effects the project may have on the environment, and how potential adverse effects may be mitigated. The Notice of Intent to Adopt a Mitigated Negative Declaration provides notice to interested agencies and the public that it is the City's intent to adopt an MND and, pending public review, expects to determine from this study that the proposed project would not have a significant effect on the environment. This Public Review Draft IS/MND is subject to modification based on comments received by interested agencies and the public.

2.2 Summary of Findings

The environmental factors checked below would potentially be significantly impacted by this project without the implementation of mitigation measures.

	Aesthetics		Agricultural and Forestry Resources	✓	Air Quality
✓	Biological Resources		Cultural Resources		Energy
✓	Geology/Soils		Greenhouse Gas Emissions		Hazards and Hazardous Materials
	Hydrology/Water Quality		Land Use/Planning		Mineral Resources
	Noise		Population/Housing		Public Services
	Recreation		Transportation	✓	Tribal Cultural Resources
	Utilities/Service Systems		Wildfire	✓	Mandatory Findings of Significance

Based on the environmental evaluation performed for this IS (Section 4), the proposed project would have:

- ***No Impact*** on Agriculture and Forestry Resources, Mineral Resources, Population and Housing, Public Services, and Recreation.
- ***Less Than Significant Impact*** on Aesthetics, Cultural Resources, Energy, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Noise, Transportation, Utilities and Service Systems, and Wildfire.
- ***Less Than Significant Impact with Mitigation Incorporated*** on Air Quality, Biological Resources, Geology and Soils, and Tribal Cultural Resources. The following mitigation measures have been incorporated into the project and would reduce potential adverse effects to a less-than-significant level.
    - **Mitigation Measure AQ-1:** Requires implementation of all Basic Construction Mitigation Measures from the Bay Area Air Quality Management District's CEQA Guidelines to reduce construction emissions near sensitive receptors.
    - **Mitigation Measure BIO-1**: Requires a pre-construction migratory bird nesting survey and avoidance measures to reduce potential impacts to migratory birds.
    - **Mitigation Measure BIO-2**: Requires the City to obtain permits from the U.S. Army Corps of Engineers, State of California Department of Fish and Wildlife, and the State of California Water Resources Control Board and implement all agency-required mitigation to reduce impacts to I to streams and associated habitats to less than significant.
    - **Mitigation Measure GEO-1**: Requires the City to retain a professional qualified paleontologist to determine paleontological resource potential at the project area. If the project area contains high potential, follow procedures to establish an adequate program for mitigating impacts from development, including a paleontological monitor on-site during construction.
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    - **Mitigation Measure TCR-2**: Requires actions to be taken in the event of inadvertent discovery of archaeological and/or TCR resources which

implement avoidance and minimization measures and procedures to evaluate and protect resources.

- o **Mitigation Measure TCR-3**: Requires implementation of certain performance standards in the event of inadvertent discovery of human remains.

2.3 REQUIRED PERMITS AND ADDITIONAL APPROVALS

Permits

The project will obtain or comply with the following permits:

- City of Richmond Right-of-Way Encroachment Permit
- Clean Water Act Section 404 Permit
- Clean Water Act Section 401 Water Quality Certification
- California Department of Fish and Game Code Section 1602 (Streambed Alteration Notification)
- Construction General Permit Order 2009-0009-DWQ
- Potential local or county permits, as applicable

Trustee Agencies

- California Department of Fish and Wildlife

2.4 LEAD AGENCY 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 (EIR) 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 EIR 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.

Li Velasco	10/25/19
Signature	Date
Lina Velasco	Director
Name	Title

Section 3 Project Description

The proposed project has been designed by the City to reconstruct a segment of the Via Verdi roadway that was damaged by a landslide in 2017. The road was closed when it was determined to be unstable and an emergency roadway was constructed. The emergency roadway continues to provide access for the Sobrante Glen neighborhood. Reconstruction of Via Verdi requires installation of a concrete box culvert within San Pablo Creek, backfilled with engineered fill, to buttress the landslide and provide a stabilized footing for the roadway embankment. An offsite mitigation site is included as part of the project. The project location, objectives, background, setting and characteristics of the project and mitigation site are discussed below.

Appendix A contains a photographic log of conditions from 2010 through the present.

3.1 PROJECT LOCATION

The project is located in the City of Richmond, Contra Costa County, California. The project encompasses a total of 7.2 acres at two distinct project locations: the primary project area (labeled project area) and the proposed mitigation site at Rheem Creek, as detailed on Figure 1 and Figure 2.

3.2 PROJECT AREA

The primary project area covers approximately 6.2 acres, and includes a portion of Via Verdi, a section of San Pablo Creek, a soil stockpile staging area, an existing temporary emergency access road, and a landslide slope area north of Via Verdi (Figure 3). The project area includes City rights-of-way and portions of adjacent private parcels where roadway reconstruction activities are to occur. This portion of the project overlaps or is located adjacent to portions of the following Assessor's Parcel Numbers: (414-340-002, 414-340-001, 414-202-128, 420-021-038, 414-132-001, 414-132-002, 416-140-050, 416-140-033, 416-140-021, and 414-360-041). The project occupies portions of the Richmond, California 7.5-minute United States Geological Survey (USGS) quadrangle.

Please refer to **Appendix B** for the engineered site plan.

Mitigation Site

The mitigation site includes a section of Rheem Creek and associated banks, covering an approximately 1.0-acre area, adjacent to the Contra Costa College parking lot and college facilities near Mills Avenue and Shane Drive.

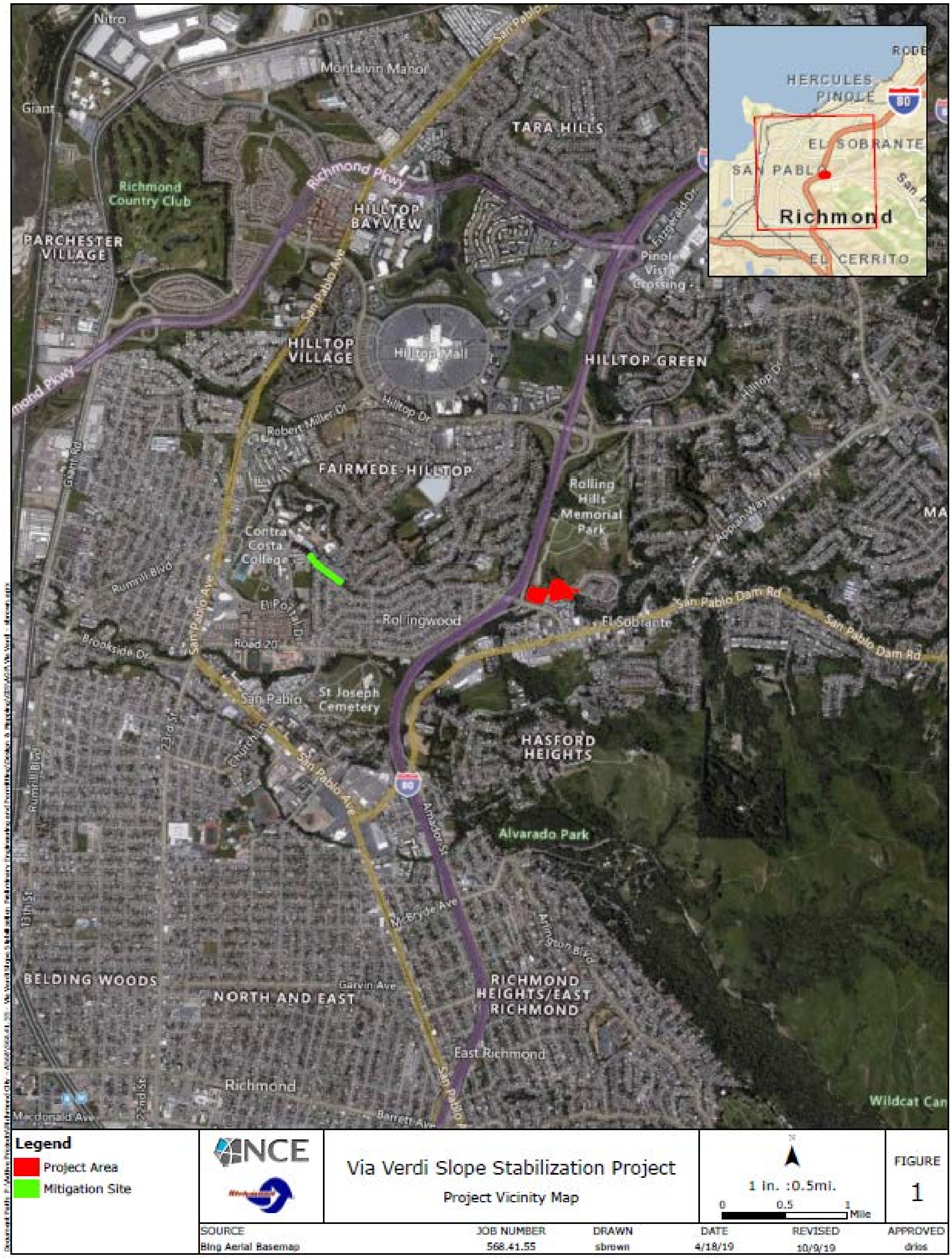

Figure 1. Project Vicinity Map

Figure 2. Project Boundary Map

Figure 3. Project Overview Map

3.3 PROJECT PURPOSE, NEED, AND OBJECTIVES

The overall purpose and need of the proposed project is to permanently stabilize the slope above and below the Via Verdi roadway and to allow the reconstruction and reopening of Via Verdi roadway in its original alignment. Via Verdi is a residential street that serves as the only access to 85 single-family homes and 100 apartment units in an area known as the Sobrante Glen neighborhood. Residents are currently accessing the Sobrante Glen neighborhood via an approximately 650-foot-long emergency access road that was constructed following the 2017 landslide.

The project objectives are to:

- Reconstruct Via Verdi, the only access road into the Sobrante Glen neighborhood, thereby providing safe access and egress to the existing residential neighborhood.
- Reconstruct affected utilities within the landslide area, including sewer, gas, electrical, telecom, and drinking water supply to provide safe and reliable services.
- Provide safe conveyance of San Pablo Creek through a highly urbanized area.
- Stabilize the failing creek bank to prevent further landslide; bank collapse could cause complete blockage and fill of San Pablo Creek.
- Protect the riparian environment and creek corridor habitat from significant sediment releases and potential utility spills that could result if the creek bank or roadway collapses.
- Maintain current creek flows and capacities, water quality, and habitat functions.

3.4 PROJECT BACKGROUND

Prior to the current landslide, the City faced a similar emergency on Via Verdi in April 2010. Immediately downstream of the current project area, a section of a large elliptical corrugated metal pipe culvert on San Pablo Creek collapsed, creating a sinkhole in the southern end of Via Verdi roadway near El Portal Drive (**Appendix A**, Photos 1 and 2). The sinkhole required the City to close the roadway, which blocked access to the Sobrante Glen subdivision. The collapsed area was approximately 130 feet long, 30 to 50 feet wide and 30 feet deep, although the upstream headwall adjacent to the collapsed portion of culvert remained in place. In addition to the sinkhole, the culvert collapse damaged utilities. The City conducted emergency repairs and constructed a temporary emergency access road through the Cemetery Trust Property to the Sobrante Glen neighborhood.

In 2012, the City completed permanent repairs to the area, constructing a new, reinforced concrete box culvert (**Appendix A**, Photos 3 and 4). The City also rehabilitated pavement and reconstructed Via Verdi and El Portal Drive, reconstructed damaged utilities, demolished the temporary bypass road, restored areas of the creek adjacent to the culvert headwall and endwall, daylighted the creek to the extent feasible, and restored the adjacent damaged Cemetery Trust Property.

On February 20, 2017, the City became aware of roadway distress within the Via Verdi roadway area further north of El Portal Drive (Figure 2, above) and closer to the entrance to the Sobrante Glen neighborhood. At a site visit on February 28, 2017, it was determined that over 200 feet of the Via Verdi road embankment had moved down towards San Pablo Creek as part of a larger landslide and included settling of the roadway and buckling of concrete flatwork (**Appendix A**, Photos 9-10, 14-16).

As shown in the photos, the landslide was observable within the roadway as undulations/settlement with some cracking in the asphalt pavement and concrete sidewalk, with a vertical offset at the developing scarp[1] (**Appendix A**, Photos 9 and 10). In addition, there was damage to water, stormwater, and sewer utilities that required temporary repairs. By late March, the landslide scarp had become more pronounced and the pavement had settled up to several feet, with the pavement requiring frequent patching by the City to maintain the roadway driving surface.

The City proclaimed the landslide to be a local emergency with potential impacts to street infrastructure, access to nearby communities, local utilities (sanitary sewer, water supply, gas, electricity, and telecom), San Pablo Creek, the San Pablo Reservoir (located upstream), and the nearby apartment structures. An emergency access road was immediately constructed (**Appendix A**, Photo 12). The City then secured Federal Emergency Management Agency (FEMA) funding for permanent repairs. The funding is administered by the California Governor's Office of Emergency Services under Presidential Major Disaster Declaration FEMA-4308-DR-CA for winter storm events occurring in February/March 2017.

Alternatives

An Alternatives Analysis was conducted in 2018 to evaluate a range of project alternatives and to provide analyses of the potential environmental impacts, costs, and practicability of each alternative for a permanent repair of the area. The preferred alternative—toe buttress with culvert—was determined to be the only

[1] A scarp is a steep (nearly vertical) region of exposed soil and rock at the head of a landslide where the failure surface ruptures the ground surface. (http://www.kgs.ku.edu/Publications/pic13/pic13_2.html)

viable design alternative to address landslide damage and repair Via Verdi roadway with an acceptable factor of safety (Johnson Marigold Consulting & Nichols Consulting Engineers [JMC/NCE] 2018). The full Alternatives Analysis is provided as **Appendix C**.

3.5 EXISTING CONDITIONS

The project area is located within a mixed-use suburban area adjacent to Interstate 80 in the lower reaches of the Richmond Hills. The area comprises a mixture of residential and commercial properties, along with undeveloped watershed areas generally associated with San Pablo Creek and its tributary drainages. Moderately steep, grass-covered hillsides to the north of the project area slope down to the south into the creek drainage. Via Verdi cuts through this slope, approximately 50 feet above the creek. Above the roadway, the vegetation is managed as part of the cemetery property. Below Via Verdi, the creek banks are heavily vegetated with groundcover, shrubs, and large trees. An apartment complex immediately abuts the opposite bank of the creek.

The Via Verdi roadway is approximately 40 feet wide with a narrow sidewalk along its southern edge. The roadway remains closed to traffic due to safety issues and ongoing landslide movement; residents are currently accessing the Sobrante Glen neighborhood via an approximately 650-foot-long emergency access road that was constructed just north of the existing roadway. Temporary utilities were constructed through a vacant land parcel to maintain service for Sobrante Glen residents (JMC/NCE 2018).

The landslide is within the Via Verdi roadway fill embankment, with the top of the head scarp above (or north) of Via Verdi, and the landslide extending down through Via Verdi and into the San Pablo Creek bank. The landslide currently affects approximately 250 feet of the Via Verdi roadway. The landslide scarp has been mostly obscured by earthwork and grading to construct the emergency access road and appropriate erosional control measures, but the landslide is still evident within Via Verdi with several feet of settlement.

The location of the project area showing the approximate extent of the landslide scarp is shown on the attached engineered site plan (**Appendix B**).

3.6 PROJECT FEATURES

The proposed project would reconstruct approximately 650 linear feet (0.6-acre) of Via Verdi and the associated utilities that pass under the roadway. In order to stabilize the landslide, a section of San Pablo Creek south of the roadway reconstruction area would be culverted; engineered fill would be installed above the culvert on an approximately 1.9-acre area to stabilize the landslide and the roadway area. Once the reconstruction of Via Verdi is complete, the temporary emergency access road would be demolished and all work areas, including the staging area, would be revegetated. The total area of disturbance within the project area, including revegetation areas, would be approximately 6.2 acres.

Refer to Figure 3 for the Project Overview Map.

Project Construction

Concrete Box Culvert

The proposed project would construct an approximately 350 linear-foot concrete box culvert within San Pablo Creek below the landslide area. The culvert would be approximately 17.5 feet high and 24 feet wide. The creek channel would be excavated to provide space for the culvert and the foundation section, a compacted building pad of crushed rock approximately 2.5 feet thick. Construction of the culvert would require tree removal as discussed in Section 4.4, below. Once the concrete structure is constructed, approximately 18,000 to 20,000 cubic yards of engineered fill (rock/soil) would be placed around and over the culvert to buttress the landslide and achieve an acceptable factor of safety for the slope.

Creek slopes, including areas above the culvert, would then be revegetated and planted with native seed mixes in combination with erosion control blankets. Culvert headwall slopes and slopes upstream of the culvert that are affected by earthwork and grading would also be revegetated in combination with bioengineered slope protection that may include brush mattress and rip rap and pole plantings.

Temporary Dewatering

Construction would occur during the creek's low-flow summer months; however, dewatering of San Pablo Creek would be necessary to complete the project. Prior to dewatering, a bypass system consisting of temporary coffer dams, wire mesh screens, pumps, piping, and sedimentation and siltation control would be constructed. The temporary coffer dams would serve as barriers to fish and frogs upstream and downstream of the construction site. Water would be pumped around the construction area and discharged downstream. Downstream flows would be maintained throughout construction.

Temporary dewatering of groundwater may be required up to 5 feet below the bottom of the new culvert excavation area. Dewatered groundwater would be stored in settling tanks to remove sediment prior to discharging back to San Pablo Creek.

Repair of Via Verdi

Approximately 650 linear feet of the Via Verdi roadway would be reconstructed, requiring minor grading to re-establish street grades and drainage and to restore utilities. This would also include replacement of sidewalk, curb and gutter, and stormwater pipes and inlets, and installation of curb ramps that are compliant with the Americans with Disabilities Act.

Existing materials such as existing asphalt concrete pavement, concrete sidewalk, and curb and gutter would be rubblized[2] to reuse existing pavement materials as the aggregate base for road reconstruction. Full-depth reclamation would be used to mix the rubblized aggregate base, subgrade material, and cement to construct the subgrade for the new pavement. Subsequent to the placement of the subgrade, Via Verdi would be paved with a 4-inch-thick layer of hot-mix asphalt. Temporary utilities constructed as part of the Via Verdi emergency access road would be removed. All utilities (i.e., gas, electrical, water, sewer) would be restored underground within the Via Verdi right-of-way. An existing chain link fence to the north of the Via Verdi emergency access road, between the fire lane access to the Cemetery Trust Property and the first residence on Mozart Drive, would be replaced next to the curb and gutter along the north side of Via Verdi.

Emergency Access Road Restoration

Upon completion of the Via Verdi roadway, the emergency access road would be demolished. The portion of the Cemetery Trust Property affected by the construction of the Via Verdi emergency access road would be restored, similar to previous conditions, but the grading would be modified to improve drainage. Soil material that was excavated and stockpiled on the Cemetery Trust Property would be removed and used as fill for grading. An approximately 1.5-acre area where the temporary road will be removed would be revegetated.

Site Drainage

A new rock-lined swale would be constructed to convey runoff from the Cemetery Trust Property and Via Verdi into San Pablo Creek, just upstream of the new culvert headwall. The rock-lined swale would extend to an existing storm drainpipe underneath Via Verdi to capture runoff discharging from the ephemeral drainage culvert. The swale would accommodate site drainage and protect the integrity of the new culvert.

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[2] Rubblization is a construction and engineering technique that involves saving time and transportation costs by reducing existing concrete into rubble at its current location rather than hauling it to another location.

Mitigation – Urban Stream Restoration

To mitigate for permanent biological impacts associated with placement of a concrete culvert within San Pablo Creek, the project proposes to restore and enhance approximately 1.0 acre of urban stream habitat at Rheem Creek. The Rheem Creek mitigation site is located southwest of Mills Avenue and Shane Drive, immediately adjacent to the Contra Costa College parking lot and college facilities (Figure 2).

The site includes a section of Rheem Creek and its associated, heavily vegetated area. The creek is dominated by non-native and invasive plant species. The project proposes to enhance and restore the urban stream environment by implementation of a Restoration Planting Plan that targets removal of non-native species and revegetation with native species. Hand crews using a variety of mechanized tools would be utilized for restoration planting activities. Small- to medium-sized excavators may be used to remove root wads. Approximately 51 non-native trees would be removed. Approximately 12 eucalyptus trees would be left in place but would be trimmed to allow for sunlight to reach the creek. Approximately seven native trees would be protected in place.

To avoid directly impacting Rheem Creek, tree stumps immediately adjacent to the creek bank would be left in the ground and treated with herbicide to prevent resprouting. A silt fence would be installed along the top of the bank to protect water quality; the fence would also serve as a construction-limit boundary to prevent equipment and persons from entering the creek. Hydroseeding, protection of native species in place, revegetation, and use of erosion control blankets would also be used to protect water quality.

Detailed specifics of the Restoration Planting Plan are included in **Appendix D**.

Construction Access and Staging

At the project area, staging is planned to occur within a combination of the currently closed section of Via Verdi, the approximately 1.5-acre graded and compacted terrace at the adjacent Cemetery Trust Property, and the portion of land between Via Verdi and the existing culvert headwall. Access to the project area would occur via the existing Via Verdi roadway where it meets the project area (**Appendix A**, Photo 13).

At the Rheem Creek mitigation site, it is anticipated that staging and access would occur from the adjacent Contra Costa College parking lot.

Construction Schedule

Construction is anticipated to begin in April 2020 and end in October 2020.

Equipment and Labor Force

Various types of equipment would be needed for the construction of the project elements. Medium-sized dozers would be used to clear the work area of vegetation and to move soil. Dewatering and creek water diversion would require the use of medium to large pumps depending on water flows at the time of construction.

The foundation section for the culvert would require dump trucks, excavators, and dozers to place aggregate rock materials and roller compactors to compact the aggregate. The reinforced concrete culvert would be constructed of cast-in-place concrete placed in reusable formwork. After reinforcing rebar is placed, concrete trucks and a concrete pump would transfer the concrete to the forms. Temporary drilled, vibratory, and/or driven vertical shoring members may be required at the headwall areas as well as where the existing culvert ties in within the new proposed culvert section.

Construction of the roadway would require a pavement milling machine, a concrete crusher to crush concrete into usable aggregate base, a reclaimer to mix the subgrade materials, a compactor, a grader, asphalt pavers, and rollers to compact the asphalt pavement. Various smaller equipment would be needed like a skip loader, back-hoe, water truck, and lifting equipment to complete the numerous tasks of this project.

At the Rheem Creek mitigation site, hand crews would use a variety of mechanized tools for restoration planting activities. Small- to medium-sized excavators may be used to remove root wads.

A skilled labor force would be required to complete this project, including equipment operators, steel workers, carpenters, concrete finishers, asphalt paving crews, truck drivers, laborers, and landscape contractors.

3.7 CONSERVATION MEASURES AND CONSTRUCTION CONTROLS

The project is required to comply with local, state, and federal regulations pertaining to protection of human health, safety, and environment. In addition, the project must meet project-specific permit conditions established by regulatory agencies (see Section 2.3).

The following required conservation measures and construction controls from local, state, and federal agencies have been incorporated into the project design. In general, the City follows the California Department of Transportation (Caltrans) *Construction Site Best Management Practices Manual* (Caltrans 2017) for construction projects.

Wildlife

The U.S. Fish and Wildlife (USFWS) issued a Biological Opinion for the Via Verdi Slope Stabilization project (USFWS 2019) which outlines requirements for implementation of the following construction measures to avoid and/or minimize impacts to California red-legged frog (CRLF) and Alameda whipsnake (AWS). These measures must be incorporated as part of the project design:

1. Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the USFWS has been received that the biologist(s) is qualified to conduct the work. The USFWS-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.
2. Before any construction activities begin, a USFWS-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the Alameda whipsnake and the CRLF and their habitats, the importance of the AWS and the CRLF and their respective habitats, the general measures that are being implemented to conserve the AWS and the CRLF as they relate to the proposed project, the penalties for non-compliance, and the boundaries within which the proposed project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers will sign a form stating that they attended the program and understand all protection measures for the AWS and the CRLF.
3. Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a USFWS-approved biologist to ensure that no AWS or CRLF are present. This survey is not intended to be a protocol-level survey, but rather one designed to verify that no AWS or CRLF are present within the construction area before construction activities begin. Two pre-construction surveys for CRLF and AWS will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected, and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any CRLF are found, the USFWS will be contacted, and the USFWS-approved biologist will be

allowed sufficient time to move any CRLF from the work site before work activities begin. If any AWS are found, all activities will cease, the USFWS will be immediately contacted, and no other actions will be taken without authorization from the USFWS. Only USFWS-approved biologists will participate in activities associated with the capture, handling, and monitoring of CRLF. Any biologist involved with the surveying/handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.

4. Immediately after the second survey, construction fencing and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The USFWS-approved biologist will supervise the installation of the fencing around the work area. Access routes, tum-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.

5. A USFWS-approved biologist will monitor all ground-disturbing construction activities. After ground-disturbing project activities are complete, the USFWS-approved biologist will train an individual to act as the on-site biological monitor. The USFWS-approved biological monitor will have attended the training described in Conservation Measure 2 above. Both the USFWS-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The USFWS-approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly, and quarterly summaries will be placed on a file-sharing website that is accessible to regulatory staff at any time.

6. A USFWS-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of AWS or CRLF. These site inspections will take place each morning before the start of construction activities.

7. If any AWS or CRLF are found, all activities will cease, the USFWS will be immediately contacted. and no other actions will be taken without authorization from the USFWS. Construction will be halted until all AWS or CRLF depart on their own or are removed from the work area by the USFWS-approved biologist. Actions taken to relocate AWS or CRLF will be conducted under the guidance of the USFWS and California Department of

Fish and Wildlife (CDFW). The USFWS-approved biologist may relocate any AWS or CRLF that are in danger of immediate harm from project-related activities to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The USFWS-approved biologist will monitor any CRLF or AWS that has been relocated until it is determined that it is not imperiled by predators or other dangers.

8. Construction will take place during daylight hours only.

9. Prior to being brought on-site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on-site.

10. A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no AWS, CRLF, or other amphibians or reptiles are taken at the pump.

11. Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.

12. Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for CRLF: April 15 to October 15).

13. All areas disturbed as a result of project-related activities will be re-vegetated with native plant species only.

14. Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water on-site. These devices will be placed at all locations where the likelihood of sediment input exists.

15. The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to ensure that it does not become clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.

16. All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side casting of material into any waterway.

17. During project activities, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be managed to minimize the provision of cover for AWS and CRLF by removing all surface construction debris daily except that required for construction.

18. To mitigate for erosion impacts, best management practices (BMPs) for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.

19. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The U.S. Army Corps of Engineers (USACE) and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the USACE will ensure that the applicant will prepare a plan to allow 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.

20. The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project area will be removed.

21. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in pre-construction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

22. Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that AWS do not become entangled in the mesh. Coconut coir matting is an acceptable

erosion control material. No plastic mono-filament matting shall be used for erosion control.

23. To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fencing or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.

24. Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.

25. All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.

26. A post-construction survey will be conducted the night before the cofferdams are removed to make sure no AWS or CRLF have occupied the temporary pool created upstream of the site. If any AWS or CRLF are present, they will be captured by hand and removed upstream of the pond to prevent them being potentially stranded when the dams are removed during the daylight hours and the water levels drop.

These conservation measures have been added to the Mitigation Monitoring and Reporting Plan (MMRP) to enable the client to track implementation. The full Biological Opinion is located in **Appendix E**.

Geology and Soils

The Hydrology and Water Quality controls section below outlines erosion and sediment BMPs that would minimize impacts to geology and soils during construction.

Hydrology and Water Quality

Construction activities that disturb one acre or more of land, and construction on smaller sites that are part of a larger project, must comply with a California State Water Resources Control Board (SWRCB) Construction General Permit (Order 2009-0009-DWQ) that regulates stormwater leaving construction sites. Site owners must notify the state, prepare and implement a Stormwater Pollution Prevention Plan (SWPPP), and monitor the effectiveness of the plan. The SWPPP must outline measures that will protect hydrology and water quality resources, including groundwater, from negative impacts during construction.

Furthermore, *Action CN1.D – Creek Corridor Performance Standards* within the Conservation, Natural Resources, and Open Space Element of the General Plan (City of Richmond 2012) requires projects to implement construction BMPs to reduce erosion potential. Such BMPs include, but are not limited to, construction scheduled for dry season; high flow bypass until the system is stabilized; temporary and permanent erosion and sediment controls; prevention of runoff during construction.

Construction site stormwater BMPs would follow the *Caltrans Construction Site Best Management Practices Manual* (Caltrans 2017) to control and minimize the impacts of construction related activities. The following BMPs, at a minimum, would be implemented at the site during construction:

1. Temporary erosion and sediment control BMPs to prevent the transport of earthen materials and other construction waste materials from disturbed land areas, stockpiles, and staging areas during periods of precipitation or runoff (such as silt fence, erosion control fabric, fiber rolls).
2. Tracking controls (such as designated ingress and egress areas) and designated staging areas outside of drainage areas.
3. Revegetation of all disturbed areas, including staging with native species only.
4. Temporary BMPs to prevent wind erosion and sediment transport of disturbed areas, such as use of water for dust control and covering of stockpiles.
5. Construction boundary fencing to limit land disturbance to areas not planned for construction.

Additionally, several of the conservation measures required in the USFWS Biological Opinion similarly protect water quality from impacts during construction (e.g., sediment and erosion-control measures).

Hazards and Hazardous Materials

The Construction General Permit requires that a Spill Prevention Plan be developed along with the project specific SWPPP to detail site-specific BMPs to prevent accidental spills from impacting water and land resources. The plan must outline response protocols and information for contacting the San Francisco Bay Regional Water Quality Control Board and other responsible agencies. Additionally, spill containment and absorbent materials must be kept on-site at all times, and petroleum products and hazardous waste must be removed from the project area and disposed of at an appropriate location.

Traffic During Construction

For activities within a city right-of-way, a California Manual on Uniform Traffic Control Devices Traffic/Pedestrian Control Plan must be prepared and submitted for review and approval by the City Engineering Department prior to issuance of the Encroachment Permit (City of Richmond, n.d.).

Section 4 Environmental Evaluation

The following sections evaluate the potential adverse impacts of the project in compliance with CEQA. Appendix G of the CEQA Guidelines (California Natural Resources Agency 2019) provides a sample checklist with a series of questions designed to enable the lead agency to identify project impacts with respect to 20 environmental topics; this IS generally follows this checklist. Except where a specific threshold has been adopted by a public agency and is specified in the sections below, such as an air quality threshold, the Appendix G questions are used as thresholds of significance in this document.

Potential environmental impacts are described as follows:

- **Potentially Significant Impact**: An environmental impact that could be significant and for which no feasible mitigation is known. If any potentially significant impacts are identified in this Checklist, an EIR must be prepared.
- **Less than Significant Impact with Mitigation Incorporated**: An environmental impact that requires the implementation of mitigation measures to reduce that impact to a less than significant level.
- **Less than Significant Impact**: An environmental impact may occur; however, the impact would not exceed significance thresholds.
- **No Impact**: No environmental impacts would result from implementation of the project.

4.1 AESTHETICS

Environmental Setting

The City is bounded by the Berkeley Hills, San Pablo Ridge, Sobrante Ridge, and Point Richmond. The hillsides surrounding Richmond, and the San Francisco and San Pablo bays, are considered prominent scenic areas in Richmond. The project area does not contain, nor is it within the viewshed of, any designated hillside or ridge areas as defined in the Conservation, Natural Resources and Open Space Element of the Richmond General Plan 2030 (General Plan; City of Richmond 2012:7.21).

The Via Verdi project area is located in a suburban setting. While mostly zoned for mixed use with a commercial focus and residential, the area west and north of the project area are currently characterized by undeveloped land and open space (see Figure 12 in Section 4.11**,** Land Use & Planning).

The open space designation within the project area contains a segment of San Pablo Creek and its associated riparian corridor. The creek and riparian corridor are characterized by dense trees, vegetation, and a perennial waterway, and provide natural habitat views from within the project area. The mitigation site similarly contains a densely vegetated stream corridor surrounded by residential and commercial uses.

There are no designated scenic vistas or scenic highways within the vicinity of the project.

Regulatory Setting

The General Plan and Zoning Ordinance identify goals, objectives, and standards that regulate activities that can affect scenic vistas within the City. The Updated Zoning and Subdivision Regulations (Amended January 15, 2019 – Ordinance No. 01-19) include land use regulations and development standards for zoning districts, citywide standards, and permitting and review procedures that enable the City to implement General Plan policies to achieve the City's vision and goals for economic development as well as the physical, social, and cultural environments. These plans and policies guide the City's public works activities as well as private development.

While the City attempts to preserve creeks, streambeds, water courses, and channels in their natural state, the zoning ordinance allows exceptions for actions that are needed to mitigate existing flood and erosion problems.

Environmental Checklist

Except as provided in Public Resources Code Section 21099, would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?			✓	
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?				✓

Answers to Checklist Questions

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

Less than Significant Impact. The Via Verdi project area is located in a neighborhood with a mix of commercial, residential, public and open space uses. There are no designated national, state, or regional scenic vistas in proximity to the project or mitigation areas. As discussed in the Environmental and Regulatory Setting sections, the project area contains a section of hillside that is designated as open space.

Within the open space hillside area along Via Verdi, the project proposes to revegetate the area affected by landslide. Impacts to the scenic quality of the hillside would be temporary during project construction and are anticipated to be beneficial once the project is implemented, the impact to hillside scenic quality would be less than significant.

The project would result in a longer-term change to San Pablo Creek because most of the vegetation in the existing creek corridor would be removed within the project area during construction. The culvert would be constructed in a natural stream area and would result in a loss of views of the creek and tree/shrub vegetation. The soil would be backfilled over the culvert, then revegetated. The creek slopes, including areas above the culvert, would be planted with native seed mixes in combination with erosion control blankets. Trees would be replanted to the extent required by regulatory agencies. Culvert headwall slopes and slopes upstream of the culvert that are affected by earthwork and grading would also be revegetated. Proposed vegetation enhancements associated with the Restoration Planting Plan at the mitigation site is anticipated to have beneficial impacts on scenic quality. Therefore, the project would have a less than significant impact on the scenic quality of the area.

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

No Impact. The City contains no designated California scenic highways. Because the project is not located within a designated a state scenic highway, there would be no impact.

c) In non-urbanized areas, would the project substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

Less than Significant Impact. The project is located in an urbanized area. The repair and reopening of Via Verdi would provide an aesthetic improvement for the currently abandoned roadway area.

Construction of the new culvert would temporarily impact San Pablo Creek as discussed in (a) above; however, the project is considered necessary for flood and erosion mitigation. There would therefore be no conflict with applicable zoning or other regulations governing scenic quality and the impact would be less than significant.

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 Impact. No new lighting such as streetlights, or sources of glare such as road signs, are proposed as part of the project; therefore, there would be no impact on day or nighttime views in the area.

4.2 Agricultural and Forestry Resources

Environmental Setting

According to the General Plan Land Use Element Map (adopted December 18, 2018), the project area is zoned for mixed use with a commercial focus, residential, and open space land use. The mitigation site, adjacent to the Contra Costa College parking lot, is zoned for PCI – Public, Cultural, and Industrial.

There are no agriculture or forestry land uses on or near the project area or mitigation site (Contra Costa County Department of Conservation and Development 2017a). The Contra Costa County Important Farmland 2008 Map depicts that the majority of farmland of regional or state importance is located in the eastern regions of Contra Costa County (California Department of Conservation 2009).

Regulatory Setting

The Williamson Act, also known as the California Land Conservation Act of 1965, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. In return, landowners receive property tax assessments which are much lower than normal because they are based upon farming and open space uses as opposed to full market value (California Department of Conservation 2019).

Environmental Checklist

Would the project:

Environmental Issue	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 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 (PRC) § 12220(g)), timberland (as defined by PRC § 4526), or timberland zoned Timberland Production (as defined by Government Code § 51104(g))?				✓
d) Result in the loss of forest land or conversion of forest land to non-forest use?				✓

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
e) 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?				✓

Answers to Checklist Questions

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 non-agricultural use?

No Impact. As discussed in the Environmental Setting section, the project is not located in an area of 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. Additionally, the project does not propose features that would result in a change in land use; therefore, the project would have no impact on farmland or change to non-agricultural use.

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

No Impact. Although the project area contains land designated within Major Land Resource Areas (MLRAs) used in statewide agricultural planning, the area is urbanized and not zoned for agricultural use. Additionally, there are no Williamson Act contracts in the vicinity (Contra Costa County Department of Conservation and Development 2017b). Because there are no agricultural zoning designations and no Williamson Act contracts associated with the project, there would be no impact.

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

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

No Impact. There are no forestland or timberland land uses or zoning designations in the project vicinity. The nature of the project has no impact on land development or conversion of land use. Therefore, the project does not have potential to conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production.

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?

No Impact. Refer to responses a-d. There is no potential for this infrastructure project to result in a conversion of land and there is no farmland or forestland associated with the project.

4.3 AIR QUALITY

Environmental Setting

The topography of a region can substantially impact air flow and resulting pollutant concentrations. California is divided into 15 air basins with similar topography and meteorology to better manage air quality throughout the state. Each air basin has a local air district that is responsible for identifying and implementing air quality strategies to comply with ambient air quality standards.

The project is located within the San Francisco Bay Air Basin, which includes Marin, Napa, San Mateo, Contra Costa, Alameda, Santa Clara, and parts of Sonoma and Solano counties. Air quality regulation in the San Francisco Air Basin is administered by the Bay Area Air Quality Management District (BAAQMD).

Air pollution within the City is generated by stationary, areawide, and mobile sources. Stationary sources include both point and area sources. Point-source emissions occur at specific locations and are usually associated with manufacturing and industry (City of Richmond 2012). A certain amount of air pollution comes from industrial sources, such as refineries and power plants; however, a greater percentage of harmful air emissions comes from cars and trucks, construction equipment, and other motor vehicles. In the wintertime, the largest single source of air pollution is residential wood burning (BAAQMD 2018).

Due to its proximity to the Golden Gate and the location of the East Bay Hills to the east, Richmond is subject to windy conditions and often cooled by heavy fog during the summer months. Because of this, the City's air quality is generally better than in other parts of the Bay Area (City of Richmond 2012).

Regulatory Setting

Both the EPA and CARB have established ambient air quality standards for common air pollutants. These ambient air quality standards are prescribed levels of pollutants that represent safe levels that avoid specific adverse health effects associated with each pollutant. The ambient air quality standards cover what are called "criteria" pollutants because the health and other effects of each pollutant are described in criteria documents. The federal and State ambient standards were developed independently with differing purposes and methods, although both processes attempted to avoid health-related effects. As a result, federal and State standards differ in some cases.

Federal Regulations

The EPA is responsible for enforcing the federal Clean Air Act and the 1990 amendments to it, as well as the National Ambient Air Quality Standards (NAAQS) that the EPA establishes. These standards identify levels of air quality for six criteria pollutants, which are considered the maximum levels of ambient air pollutants considered safe, with an adequate margin of safety, to protect public health and welfare. The six criteria pollutants are ozone, carbon dioxide (CO_2), nitrogen dioxide, sulfur dioxide, respirable particulate matter with an aerodynamic diameter of 10 micrometers (PM_{10}), fine particulate matter with an aerodynamic diameter of 2.5 micrometers ($PM_{2.5}$), and lead.

State Regulations

CARB oversees air quality planning and control throughout California. It is primarily responsible for ensuring implementation of the 1989 amendments to the California Clean Air Act, responding to the federal Clean Air Act Amendment requirements, and regulating emissions form motor vehicles and consumer products within the state. In general, California standards are more stringent than federal standards. This is particularly true for ozone and PM_{10}.

Under the transportation conformity regulations (40 Code of Federal Regulations [CFR] 93.123(c)(5)), construction-related activities that cause temporary increases in emissions are not required to conduct a hot-spot analysis. A “hot spot” is an area where air toxics levels are higher than in the overall region. This may be caused by emissions from a local facility. These temporary increases in emissions are those that occur only during the construction phase and last 5 years or less at any individual site.

Federal and State Air Quality Attainment Status

Air quality conditions in the Bay Area are compared against ambient air quality standards set at the federal level (NAAQS) and at the State level (California Ambient Air Quality Standards). The attainment status is classified for each pollutant.

Under the NAAQS, the Bay Area is classified as nonattainment for ozone and particulate matter of 2.5 microns in diameter ($PM_{2.5}$). Although the U.S. Environmental Protection Agency (EPA) issued a final rule in 2013 to determine that the Bay Area attains the 24-hour $PM_{2.5}$ national standard, the Bay Area continues to be designated as “nonattainment” for the 24-hour $PM_{2.5}$ NAAQS standard until BAAQMD submits a “redesignation request” and a “maintenance plan” to EPA, and EPA approves the proposed redesignation. For the pollutants nitrogen dioxide, carbon monoxide and sulfur dioxide, the area is designated as attainment. While BAAQMD monitoring data show the region meets the PM_{10} NAAQS, the area is technically designated “unclassified.” At the State level, the area is considered nonattainment for ozone, $PM_{2.5}$ and PM_{10} and considered “attainment” for all other criteria air pollutants (California Air Resources Board [CARB] 2018a).

Regional Regulations

The BAAQMD is the regional agency tasked with managing air quality in the region. The BAAQMD adopted the 2017 Clean Air Plan (BAAQMD 2017a) to plan for and achieve compliance with the federal and State ozone standards. The 2017 plan updates the 2010 Clean Air Plan pursuant to air quality planning requirements. To fulfill state ozone planning requirements, the 2017 Plan includes a wide range of control measures designed to decrease emissions of harmful air pollutants, such as particulate matter, ozone (measured as reactive organic compounds (ROG) and nitrogen oxides (NOx), and toxic air contaminants; decrease greenhouse gas emissions; and decrease emissions of CO_2 by reducing fossil fuel combustion (BAAQMD 2017a).

The BAAQMD has published their *CEQA Air Quality Guidelines* (BAAQMD 2017b) that are used in this analysis to evaluate air quality impacts of projects; while these guidelines have been updated to reflect current Supreme Court opinions, they are currently being further updated. The Guidelines provide BAAQMD-recommended procedures for evaluating potential air quality impacts during the environmental review process consistent with CEQA requirements. The control measures identified in the 2017 Plan are identified in the Guidelines as recommendations and/or mitigation measures.

Thresholds of Significance

In June 2010, BAAQMD adopted thresholds of significance to assist in the review of projects under CEQA that meet or exceed federal and State standards. These thresholds were designed to establish the level at which BAAQMD believe air pollution emissions would cause significant environmental impacts under CEQA.

Table 1 presents the significance thresholds used in this analysis, including annual emissions for operational emissions and daily standards for short-term construction-related emissions. A project with daily emission rates below these thresholds is considered to have a less than significant effect on air quality (BAAQMD 2017b).

Table 1. BAAQMD Thresholds of Significance for Construction-Related Criteria Air Pollutants and Precursors

Criteria Air Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs/day)	Average Daily Emissions (lbs/day)	Annual Average Emissions (tons/year)
ROG	54	54	10
NOx	54	54	10

Criteria Air Pollutant	Construction Thresholds	Operational Thresholds	
	Average Daily Emissions (lbs/day)	Average Daily Emissions (lbs/day)	Annual Average Emissions (tons/year)
PM_{10}	82 (Exhaust)	82	15
$PM_{2.5}$	54 (Exhaust)	54	10
Carbon Monoxide	Not Applicable	9.0 ppm (8-hour average) or 20.0 ppm (1-hour average)	
Fugitive Dust	Construction Dust Ordinance or other Best Management Practices	Not Applicable	

Source: Bay Area Air Quality Management District. 2017. *CEQA Guidelines*. May.

CUMULATIVE IMPACTS

In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. If a project exceeds the identified significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions. Therefore, additional analysis to assess cumulative impacts is unnecessary.

HEALTH EFFECTS

Ozone, PM_{10} and $PM_{2.5}$ emissions can cause adverse health impacts. High concentrations of ozone have the potential to irritate lungs, and long-term exposure may cause lung tissue damage and cancer. Typical sources of low-altitude ozone are almost entirely formed from ROG/volatile organic compounds (VOC) and NOx in the presence of sunlight and heat. Common precursor emitters include motor vehicles and other internal combustion engines, solvent evaporation, boilers, furnaces, and industrial processes (CARB 2019a).

Particulate matter PM_{10} (respirable particulate matter) and $PM_{2.5}$ (fine particulate matter) can irritate the eyes and respiratory tract and decrease lung capacity. Both are associated with increased cancer and mortality and contribute to haze and reduced visibility (CARB 2019b).

If emissions generated from project construction do not exceed the applicable BAAQMD thresholds for ozone, PM_{10}, and $PM_{2.5}$, the emission of criteria pollutants for which the area is non-attainment would not be associated with adverse health impacts.

SCREENING CRITERIA - CONSTRUCTION RELATED IMPACTS

Criteria Air Pollutants and Precursors

For construction projects, the BAAQMD has identified screening criteria to assist with determining whether the project would substantially impact air quality.

If all of the following construction screening criteria are met, the construction of the proposed project would result in a *less than significant impact* from criteria air pollutant and precursor emissions. If not, then construction emissions need to be quantified (BAAQMD 2017b).

1. The project is below the applicable screening level size shown in Table 3-1 of the BAAQMD CEQA Guidelines (Operational-Related);
2. All *Basic Construction Mitigation Measures* would be included in the project design and implemented during construction; and
3. Construction-related activities would not include any of the following:
   a. Demolition;
   b. Simultaneous occurrence of more than two construction phases (e.g., paving and building construction would occur simultaneously);
   c. Simultaneous construction of more than one land use type (e.g., project would develop residential and commercial uses on the same site) (not applicable to high density infill development);
   d. Extensive site preparation (i.e., greater than default assumptions used by the Urban Land Use Emissions Model for grading, cut/fill, or earth movement); or
   e. Extensive material transport (e.g., greater than 10,000 cubic yards of soil import/export) requiring a considerable amount of haul truck activity.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with or obstruct implementation of the applicable air quality plan?			✓	
b) 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?			✓	
c) Expose sensitive receptors to substantial pollutant concentrations?		✓		
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?			✓	

Answers to Checklist Questions

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

Less than Significant Impact. Projects that could generate emissions in excess of the BAAQMD-recommended significance thresholds would be considered to potentially conflict with or obstruct implementation of the applicable air plan.

The proposed project is an infrastructure repair project that involves only construction activities and no operational effects. As identified by BAAQMD, construction-related activities result in the generation of criteria air pollutants including carbon monoxide, sulfur dioxide, particulate matter (PM_{10}, and $PM_{2.5}$), precursor emissions such as ROG and NOx, and greenhouse gas emissions from exhaust, fugitive dust, and off-gas emissions.

During construction, short-term degradation of air quality is expected from the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and other activities related to construction. Emissions from construction equipment powered by gasoline and diesel engines are also anticipated and would include carbon monoxide, NOx, ROG, directly emitted PM_{10}, and $PM_{2.5}$, and toxic air contaminants such as diesel exhaust particulate matter. These emissions would be temporary and limited to the immediate area surrounding the construction site.

Screening

Because the project proposes demolition of the existing temporary emergency access road for purposes of restoration as well as other construction activities, the project exceeds the screening criteria requirements for a *less than significant* determination.

EMISSION QUANTIFICATION

The BAAQMD recommends the use of Sacramento Metropolitan Air Quality Management District's Road Construction Emissions Model (RoadMod) to analyze construction emissions for transportation projects, and the California Emissions Estimator Model (CalEEMod Road Construction Emissions Model) to analyze construction emissions for land use development projects. Both RoadMod (version 9.0.0) and CalEEMod (version 2016.3.2) were used to estimate average daily construction exhaust emissions. Project features that fell into the 'transportation project' category, such as the emergency access road restoration and Via Verdi roadway repair, were analyzed using RoadMod. Project features that fell into the 'land use development' category were analyzed using the CalEEMod. The emissions estimates from both models were then added together to capture all project activities and to provide more accuracy with estimate determination. Most restoration work at the mitigation site is anticipated to be conducted with hand tools, so there was no attempt to model potential small equipment at that site.

The project schedule and equipment usage assumptions used within the models assumed the project would be constructed over a period of approximately 6 months beginning in 2020, or an estimated 132 construction workdays (based on an average of 22 workdays per month). Average daily emissions were computed by dividing the total construction emissions by the number of construction days.

Roadway Activities

Average daily construction exhaust emissions for Via Verdi road repair and emergency access road restoration activities were predicted using the RoadMod Model (version 9.0.0). Inputs to the model included the construction year, total expected duration, proposed equipment usage, and road length. Other model inputs such as soil import and export, concrete truck trips, and asphalt truck trips were input to the model. The model predicts emissions of ozone precursor pollutants (i.e., ROG and NOx) and particulate matter (i.e., PM_{10}, and $PM_{2.5}$) and emissions of CO2e.

Table 2 displays a summary of the average daily emissions estimates from work associated with the emergency access road and Via Verdi roadway. The results of the RoadMod emission calculations are included in **Appendix F**. The emissions presented are based on the best information available at the time of calculations.

Table 2. Estimated Construction Emissions for Roadway Work

Scenario	ROG	NOx	Total PM_{10} (Exhaust + Dust)	Total $PM_{2.5}$ (Exhaust + Dust)
Total construction emissions	0.06 tons	0.69 tons	0.48 tons	0.12 tons
Average daily emissions[1]	0.9 lbs/day	10.45 lbs/day	7.2lbs/day	1.8 lbs/day

[1]Assumes 132 workdays

Slope Stabilization Emission Estimates

Average daily construction exhaust emissions for slope stability project features associated with buttressing of the landslide, such as grading, installation of the concrete culvert and engineered backfill, and revegetation were predicted using CalEEMod.

Table 3 displays a summary of the average daily emissions estimates from work associated with slope stabilization activities. The results of the CalEEMod emission calculations are also included in **Appendix F**. The emissions presented are based on the best information available at the time of calculations.

Table 3. Estimated Construction Emissions for Slope Stability Work

Scenario	Reactive Organic Gases	Nitrogen Oxides	Total PM_{10} (Exhaust + Dust)	Total $PM_{2.5}$ (Exhaust + Dust)
Total construction emissions	0.14 tons	1.37 tons	0.32 tons	0.20 tons
Average daily emissions[1]	2 lbs/day	20 lbs/day	4.8 lbs/day	3 lbs/day

[1]Assumes 132 workdays

Table 4 summarizes the total estimated construction emissions across all activities of the project. The estimated total project emissions would not exceed the BAAQMD-recommended thresholds of significance; therefore, impacts would be less than significant. Projects that are determined to be less than significant would not have potential to conflict with or obstruct implementation of the BAAQMD Clean Air Plan.

Table 4. Total Project Construction Emissions Estimate

Criteria Air Pollutant and Threshold of Significance	ROG (54 lbs/day)	NOx (54 lbs/day)	Total PM_{10} (Exhaust + Dust) (82 lbs/day – exhaust only)	Total $PM_{2.5}$ (Exhaust + Dust) (54 lbs/day – exhaust only)	CO_2e (1,100 metric tons/yr)
RoadMod	0.9	10.5	7.2	0.12	90.44
CalEEMod	2	20	4.8	3	142.32
Total Project Emissions	2.9	30.5	12	3.12	232.76
Exceedance	No	No	No	No	No

b) 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?

Less than Significant Impact. The project region is non-attainment for federal ambient air quality standards for ozone and $PM_{2.5}$, and state ambient air quality standards for ozone, PM_{10}, and $PM_{2.5}$.

The BAAQMD has established that if a project exceeds the identified significance thresholds, its emissions would be considered cumulatively considerable and additional analysis to determine cumulative impacts would be unnecessary.

As evaluated in a) above, the project does not result in an exceedance for any criteria air pollutant for which the region is in non-attainment; therefore, there would be no cumulatively considerable net increase in criteria pollutants that would adversely impact human health.

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

Less than Significant Impact with Mitigation Incorporated. BAAQMD defines sensitive receptors to include residential dwellings, including apartments, houses, and condominiums; schools, colleges, and universities; daycare centers and hospitals, and senior-care facilities. Most of the surrounding area is developed with residential and commercial use. The Sobrante Glen neighborhood (single-family homes and apartments) is located immediately adjacent (east) of the project area. Other sensitive receptors located within 500 feet of the project area are Rancho

Elementary school (approximately 300 feet to the south) and Bright Futures bilingual preschool, approximately 450 feet to the southwest.

Project impacts related to increased community risk can occur either by introducing a new sensitive receptor, such as a residential use, in proximity to an existing source of toxic air contaminants or by introducing a new source of contaminants with the potential to adversely affect existing sensitive receptors in the project vicinity. The project would not introduce new sensitive receptors, nor would it introduce a new toxic air contaminant source. However, construction activity would generate dust and equipment exhaust on a temporary basis that could affect nearby sensitive receptors.

For all proposed projects, BAAQMD recommends the implementation of all Basic Construction Mitigation Measures (BAAQMD 2017b) whether or not construction-related emissions exceed applicable thresholds of significance. Although the project emissions are well below the BAAQMD thresholds and a health risk assessment was not required for this project, the Basic Construction Mitigation Measures are included as **Mitigation Measure AQ-1** as specified in the BAAQMD CEQA Guidelines.

- ***Mitigation Measure AQ-1***: The following measures shall be implemented to minimize impacts to air quality during construction:
    - *a.* All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day.
    - *b.* All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
    - *c.* Visible mud or dirt track-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 is prohibited.
    - *d.* All vehicle speeds on unpaved roads shall be limited to 15 mph.
    - *e.* All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
    - *f.* 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 the California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

g. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

h. A publicly visible sign shall be posted with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Finding: *Implementation of **Mitigation Measure AQ-1** would reduce potentially significant impacts to sensitive receptors from air pollutant concentrations to less than significant.*

d) Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

Less than Significant Impact. Temporary construction activities associated with the project would involve the use of a variety of gasoline or diesel-powered equipment and pavement coatings emitting temporary exhaust fumes and odors. However, construction related emissions would be temporary in nature and would dissipate rapidly with increasing distance from the project area. As a result, short-term construction activities would not expose a substantial number of people to objectional odors. Additionally, as shown in Table 2, there is no Threshold of Significance for construction-related odor impacts. Because no significant odor impacts from construction-related projects have been identified, and due to their temporary nature, the impact would be less than significant, and mitigation would not be necessary.

4.4 BIOLOGICAL RESOURCES

Environmental Setting

Habitat Types

The project area encompasses four distinct habitat types: ruderal/developed, annual grassland, riparian woodland, and oak woodland. General descriptions of these natural communities that occur within the project area are provided below. Figure 4 shows the locations of the different habitat types present at the site.

Ruderal/Developed

Ruderal and developed areas still exhibit the impacts of development, often characterized by pavement of heavily compacted soil. Plants are mostly non-native invasive with few native species present and are characterized by the ability to thrive in areas of frequent disturbance.

Within the project area, ruderal vegetation is located on the west side of the project area where previous construction resulted in a graded and compacted pad. This area would be utilized for staging during project construction.

Annual Grassland

Annual grassland areas are composed of mostly non-native grasses and weedy annual and perennial forbs. Some native grasses and forbs may be present in sparse areas where competition from non-natives is low.

Annual grassland is present throughout the project area. In the area north of the temporary access road, annual grasses are growing through the erosion control blanket that was installed to control erosion during the rainy season from 2017-2018. An approximately 0.25-acre area of annual grassland on the south side of Via Verdi has been planted with sapling oaks as part of a habitat restoration effort resulting from the 2012 culvert project. This area is noted as ‘annual grassland/oak restoration’ on Figure 4.

Riparian Woodland

Riparian woodland, present along the banks of San Pablo Creek, is dominated by boxelder (*Acer negrundo*), red willow (*Salix laevigata*), California buckeye (*Aesculus californica*), and poison oak (*Toxicodendron diversilobum*).

Oak Woodland

Oak Woodland is typically dominated by coast live oak (*Quercus agrifolia*). The shrub layer at the project area is composed of elderberry (*Sambucus* sp.) and

Figure 4. Project Area Habitat Location Map

poison oak. Also present in the understory is wild cucumber (*Marah fabacea*), Himalayan blackberry (*Rubus armeniacus*), and periwinkle (*Vinca major*). Oak woodland is predominantly present along either side of the riparian corridor of San Pablo Creek.

San Pablo Creek

Approximately 460 linear feet of San Pablo Creek flows through the project area, in an east to west direction. An existing concrete box culvert, constructed as part of the 2012 sinkhole repairs, carries San Pablo Creek underneath the intersection of Via Verdi and El Portal Drive. The existing landslide extends downgradient through Via Verdi and into the San Pablo Creek bank. San Pablo Creek contains a heavily vegetated corridor consisting of riparian and oak woodland habitats (Figure 4).

There are no wetlands within the project area (NCE 2018c).

Wildlife

A query of federally listed wildlife species for the USGS 7.5-minute quadrangle encompassing the project area was obtained from the USFWS's Sacramento Endangered Species Office IPaC website on December 7, 2017 (USFWS n.d.). Additional information about the distribution of special status species with the potential to occur within the project area was compiled from the CDFW California Natural Diversity Database for occurrences of special status species within a 1-mile radius of the proposed project alignment; from aerial photographs of the project area; and from USGS 7.5-minute quadrangle maps of the project area. Information on the distribution of special status species with potential to occur in the project region also was compiled from published literature.

The database searches identified 11 federally listed fish and wildlife species and 3 federally listed plant species with potential to occur within the project area. The official list is provided within the Biological Assessment (BA; NCE 2018a), provided as **Appendix G**. In addition, a reconnaissance-level field survey of the project area was conducted on April 20, 2018. This survey focused on identifying the presence of special status species or their habitat within the project vicinity.

Based on literature review, the reconnaissance-level field survey, and habitat assessment of the project area, the BA concluded that the project may contain potential habitat for the CRLF within San Pablo Creek, and potential foraging and dispersal habitat for the AWS (**Appendix G**).

Mitigation site - Rheem Creek

Rheem creek is a perennial waterway in a highly urbanized setting. Within the mitigation boundary, the creek is bound by the Contra Costa College parking lot and college facilities to the north, and by residential homes and college facilities to the south. The creek has an average width of 4.5 feet through the mitigation site boundary and flows in an east to west direction towards the San Pablo Bay.

Habitat within the Rheem Creek mitigation site is classified as ruderal vegetation characterized by a non-native tree overstory including blackwood acacia (*Acacia melanoxylon*), privet (*Ligustrum* sp.), eucalyptus (*Eucalyptus globulus*), and wild plum (*Prunus cerasifera*). The understory is dominated by English ivy (*Hedera helix*), non-native annual grasses, and Himalayan blackberry (*Rubus armeniacus*) with a large, approximately 60-foot by 20-foot patch of giant reed (*Arundo donax*) located in the southern portion of the creek (NCE 2019a).

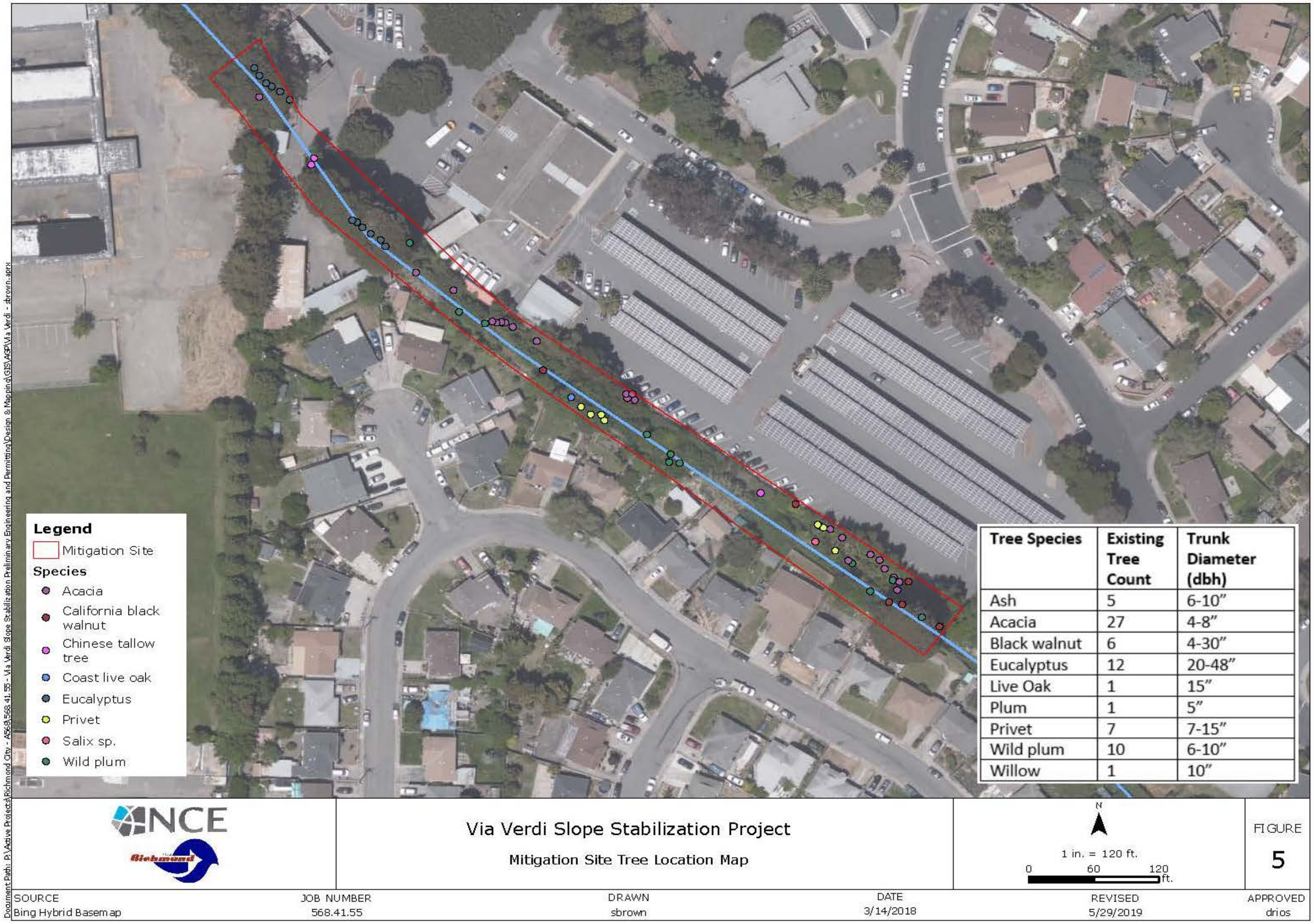
During a 2019 field survey, NCE identified 7 native trees and 63 non-native trees within the proposed mitigation site (Figure 5). No special status species were observed within or adjacent to the mitigation site during the site visit. Additionally, based on the assessment of existing habitat present, it is unlikely that any special status plant or animal species would occur within or adjacent to the mitigation site (NCE 2019a).

Regulatory Setting

Special Status Species

State and federal legislation regarding endangered species provides the CDFW and the USFWS with a mechanism for conserving and protecting plant and animal species of limited distribution and/or low or declining populations. Species listed as threatened or endangered under provisions of the State and federal endangered species acts, candidate species for such listing, state species of special concern, and some plants listed as endangered by the California Native Plant Society are collectively referred to as special status species.

Permits may be required from both the CDFW, a Trustee Agency under CEQA, and USFWS if activities associated with a proposed project will result in the “take” of a listed species, including migratory birds. “Take” is defined by the state of California as “to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill” (California Fish and Game Code, Section 86). “Take” is more broadly defined by the federal Endangered Species Act to include “harm” (16 United States Code [U.S.C.], Section 1532(19), 50 CFR, Section 17.3). Both agencies review CEQA documents in order to determine the adequacy of their treatment of endangered species issues and to make project-specific recommendations for their conservation.



Tree Species	Existing Tree Count	Trunk Diameter (dbh)
Ash	5	6-10"
Acacia	27	4-8"
Black walnut	6	4-30"
Eucalyptus	12	20-48"
Live Oak	1	15"
Plum	1	5"
Privet	7	7-15"
Wild plum	10	6-10"
Willow	1	10"

Figure 5. Mitigation Site Tree Location Map

Special Status Habitats

Federal

The Clean Water Act (CWA), passed in 1972, regulates and protects surface water quality across the United States. Sections 401 and 404 relate directly to local agency planning. Section 401 of the CWA requires a State Water Quality Certification for all federal permit or license applications for any activity that may result in a discharge to a water body to ensure compliance with state water quality standards. Most Certifications are issued in connection with Section 404 permits for dredge and fill discharges (City of Richmond 2012).

The Migratory Bird Treaty Act (MBTA) makes it illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid Federal permit. Migratory bird species protected by the Act are listed in 50 CFR 10.13. The USFWS has statutory authority and responsibility for enforcing the MTBA.

The USACE regulates dredge and fill activities within waters of the United States, including wetlands (WOUS) under the CWA Section 404 program. The extent of jurisdiction within drainage channels is defined by the ordinary high-water mark on opposing channel banks. All activities that involve the discharge of fill into jurisdictional waters are subject to the permit requirements of the USACE. This program requires that all projects impacting jurisdictional WOUS incorporate mitigation to result in "no net loss" of size, function, and values of the aquatic resource.

State

Any entity applying for a federal Section 404 permit must also comply with Section 401 of the CWA, requiring the applicant to receive certification from the state water board that the actions will comply with state water quality standards. In California, Section 401 Water Quality Certifications are issued by the State Water Resources Control Board through nine Regional Water Quality Control Boards (RWQCBs). The project is under the jurisdiction of the San Francisco Bay RWQCB.

The CDFW is responsible for protecting and conserving fish and wildlife resources, and the habitats upon which they depend. Section 1600 of the California Fish and Game Code requires that the CDFW review any project that proposes to alter the bed or bank of a water feature, such as streams, rivers, or lakes. Under the Lake and Streambed Alteration (LSA) Program, entities are required to notify the CDFW of proposed impacts through an LSA Notification (LSN). If it is determined by the CDFW that the activity, as described in an LSN, will substantially alter a river, stream, or lake, and may substantially adversely affect existing fish or wildlife resources, then an LSA Agreement must be prepared. The LSA Agreement would include necessary mitigation measures to protect fish and wildlife resources from significant impacts.

Local

CITY OF RICHMOND MUNICIPAL CODE

The Code's Tree Preservation Standards (15.04.840.050) states that the Director of the Department of Public Works shall review all projects, both new development and additions or renovations to existing properties, to ensure their compliance with the provisions of the Urban Forest Management Plan and related city or any other specific ordinances and guidelines. Landmark trees and major groves will be preserved as required by the Director of the Department of Public Works and this Code.

CITY OF RICHMOND GENERAL PLAN

The Conservation, Natural Resources and Open Space Element of the General Plan includes the following policies aimed at protecting natural resources considered "vital to the City and surrounding region because they provide a biologically diverse environment for people."

Policy CN1.1 – *Habitat and Biological Resources Protection and Restoration* provides guidance for protection of natural resources by coordinating with the CDFW, San Francisco Bay RWQCB, East Bay Regional Park District, and other regional agencies to identify areas of special protection and establish appropriate protection measures for those areas. The policy also includes directives to implement conservation measures to protect resources; use siting and design to protect wetlands; restore and protect creek and riparian areas; and at a minimum require mitigation of impacts to sensitive species in coordination with the USFWS, CDFW, and other regulatory agencies.

Policy CN1.2 – *Local Native Plant Species* promotes the use of locally propagated native plant and tree species, including removal and control of invasive exotic plant species.

Policy CN1.3 – *Urban Creek Restoration* promotes the restoration of urban creeks, and the coordination of property owners and local interest groups in the restoration efforts.

Policy CN6.2 - *Protection and Expansion of Tree Resources* protects native trees, heritage trees and oak woodlands, and promotes trees as economic and environmental resources for the use, education and enjoyment of current and future generations

CITY OF RICHMOND URBAN GREENING MASTER PLAN

The City's Urban Greening Master Plan is structured around five core goals and identifies policies and actions to achieve these goals. Goal 1 seeks a net zero loss of trees. The Plan supports greening efforts in all areas of the City, although is primarily focused on planting street trees and additional landscaping.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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 & Wildlife (CDFW) or U.S. Fish & Wildlife Service (USFWS)?		✓		
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 CDFW or USFWS?		✓		
c) Have a substantial adverse effect on state or federally protected wetlands (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?				✓

Answers to Checklist Questions

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 & Wildlife (CDFW) or U.S. Fish & Wildlife Service (USFWS)?

Less than Significant Impact with Mitigation Incorporated.

Project Area

A Biological Assessment (BA) was prepared by NCE in July 2018 to review the proposed project in sufficient detail to determine the extent to which the project may affect any federally designated special status species, and/or designated critical habitat. The BA (NCE 2018a) was prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)).

As previously mentioned, database searches identified 11 federally listed fish and wildlife species and 3 federally listed plant species with potential to occur within the project area. The official list is provided in Appendix C of the attached BA (**Appendix G**). The field survey, conducted by NCE on April 20, 2018, focused on identifying the presence of special status species or their habitat within the project area.

Species identified in the literature and database review for which the project was determined to have no effect include the salt marsh harvest mouse (*Reithrodontomys raviventris*), Ridgway's rail (formerly known as California clapper rail)(*Rallus obsoletus*), California least tern (*Sterna antillarum browni*), western snowy plover (*Charadrius alexandrines nivosus*), yellow-billed cuckoo (*Coccyzuz americanus*), Delta smelt (*Hypomesus transpacificus*), tidewater goby (*Eucyclogobius newberryi*), Callippe silverspot butterfly (*Speyeria callippe callippe*), San Bruno elfin butterfly (*Callophrys mossii bayensis*), California seablite (*Suaeda californica*), pallid manzanita (*Arctostaphylos pallida*), and Santa Cruz tarplant (*Holocarpha macradenia*). Suitable habitat for these species is absent from the project area; therefore, no effects on these species are expected to occur as a result of project activities.

The project is expected to have no effect on Central California Coast Steelhead (*Oncorhynchus mykiss*) based on a phone conversation with Gary Stern at National Marine Fisheries Service on May 9, 2011 (Appendix B of the attached BA) – due to existing obstructions to the historical spawning habitat in San Pablo Creek including the San Pablo dam. Furthermore, project construction will not take place during spawning season (NCE 2018a).

Based on literature review, the reconnaissance-level field survey, and habitat assessment of the project area, the BA concluded that the project may contain potential habitat for the CRLF within the aquatic habitat associated with San Pablo Creek, and potential foraging and dispersal habitat for the AWS in open grassy areas.

CALIFORNIA RED-LEGGED FROG (CRLF)

The CRLF is listed as federally threatened (USFWS 1996) and is considered a Species of Special Concern by CDFW. Critical habitat was designated in 2006 and revised in 2010 (USFWS 2006a, 2010). The project is located outside of designated critical habitat for the CRLF and the nearest critical habitat unit is CCS-1, located in Contra Costa County, approximately 2.25 miles east of the project area.

The species usually occurs in or near still or slow-moving sources of water that remain inundated long enough for larvae to complete metamorphosis, which typically occurs from 3.5 to 7 months after hatching (Fellers et al. 2001). During summer, CRLF may take refuge in cool, moist areas, including small mammal burrows, leaf litter, or other moist sites within a few hundred feet of riparian areas (Rathbun et al. 1993, cited by USFWS 1996).

The velocity of water flow with the San Pablo Creek channel combined with shaded conditions, a lack of emergent vegetation and the likely presence of fish that could prey on CRLF eggs make it unlikely that CRLF successfully breed within San Pablo Creek where it passes through the action area. It is unlikely that any CRLF would be using this portion of San Pablo Creek as foraging habitat or as a refuge due to its distance from known population occurrences and the physical barriers to upland foraging habitat. However, CRLF presence is possible as CRLF may use San Pablo Creek as a dispersal corridor (NCE 2018a).

ALAMEDA WHIPSNAKE (AWS)

The AWS is listed as threatened under both federal (USFWS 1997) and State endangered species laws. Critical habitat was designated in 2000 and revised in 2006 (USFWS 2000, 2006b). The project is not located within designated critical habitat for the AWS. The nearest critical habitat to the action area is Unit 1: Tilden-Briones, a 34,119-acre area unit with represents the northwestern portion of the subspecies' range (USFWS 2006b) located 0.5 miles southeast of the project area.

The primary constituent elements (PCEs) of AWS critical habitat include 1) scrub/shrub communities with a mosaic of open and closed canopy; 2) woodland or annual grasslands contiguous to lands containing PCE 1; and 3) lands containing rock outcrops, talus, and small mammal burrows within or adjacent to PCE 1 and/or PCE 2.

AWS are generally found in chaparral (northern coastal sage scrub and coastal sage). Recent telemetry data indicate that AWS can venture up to 500 feet into habitats adjacent to chaparral including grassland, oak savanna, and occasionally oak-bay woodland (USFWS 2005).

The project area predominantly occurs in open grasslands, closed canopy oak woodland and urban-suburban areas that are bordered on three sides by paved roadways. High-quality AWS habitat consisting of areas with open or partially open canopy scrub or adjacent grassland habitats is absent from the project area (NCE 2018a). High-quality basking sites and natural rock outcrops that provide habitat for AWS prey species are also absent. The project area is not adjacent to high-quality scrub habitat or situated between areas containing scrub habitat where snakes would potentially disperse. The project area is located at the extreme edge of the species' known range and given the lack of suitable habitat in the urbanized area surrounding the project, it is unlikely that individual AWS might use the project area as a dispersal corridor. However, incidental presence of AWS is possible within the action area as AWS may be found during dispersal or foraging activities (NCE 2018a).

CONSERVATION MEASURES

Conservation measures to avoid significant impacts to CRLF and AWS were provided by the USFWS in the 2012 Biological Opinion for the *Verdi Culvert Repair Project*. Due to the similarities in project location and scope, NCE presented the same conservation measures in the 2018 BA to be implemented as part of the proposed project to avoid significant impacts to CRLF and AWS.

The BA is included as **Appendix G**.

The USFWS issued a Biological Opinion for the Via Verdi Slope Stabilization Project that the project is not likely to jeopardize the continued existence of the CRLF and AWS, based on the following: (1) successful implementation of the conservation measures described in the BA will minimize the adverse effects on individual CRLF and AWS; (2) only foraging/dispersal habitat for CRLF and AWS and no breeding habitat would be temporarily disturbed; (3) all foraging/dispersal habitat will be restored within the project area under a USFWS-approved revegetation plan; and (4) no suitable habitat would be permanently removed (USFWS 2019; provided in **Appendix E**).

Because the USFWS requires that the conservation measures be implemented to minimize adverse effects on CRLF and AWS (including biological monitoring and reporting), and that all foraging/dispersal habitat be restored by a USFWS-approved revegetation plan, additional mitigation is not anticipated to be required.

The USFWS-approved conservation measures that would be implemented as part of the project are listed below. These conservation measures have been added to the MMRP to enable the client to track implementation.

1. Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the USFWS has been received that the biologist(s) is qualified to conduct the work. The USFWS-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.
2. Before any construction activities begin, a USFWS-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the Alameda whipsnake (AWS) and the CRLF and their habitats, the importance of the AWS and the CRLF and their respective habitats, the general measures that are being implemented to conserve the AWS and the CRLF as they relate to the proposed project, the penalties for non-compliance, and the boundaries within which the proposed project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers will sign a form stating that they attended the program and understand all protection measures for the AWS and the CRLF.
3. Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a USFWS-approved biologist to ensure that no AWS or CRLF are present. This survey is not intended to be a protocol-level survey, but rather one designed to verify that no AWS or CRLF are present within the construction area before construction activities begin. Two pre-construction surveys for CRLF and AWS will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected, and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any CRLF are found, the USFWS will be contacted, and the USFWS-approved biologist will be allowed sufficient time to move any CRLF from the work site before work activities begin. If any AWS are found, all activities will cease, the USFWS will be immediately contacted, and no other actions will be taken without authorization from the USFWS. Only USFWS-approved biologists will

participate in activities associated with the capture, handling, and monitoring of CRLF. Any biologist involved with the surveying/handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.

4. Immediately after the second survey, construction fencing, and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The USFWS-approved biologist will supervise the installation of the fencing around the work area. Access routes, tum-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.

5. A USFWS-approved biologist will monitor all ground-disturbing construction activities. After ground-disturbing project activities are complete, the USFWS-approved biologist will train an individual to act as the on-site biological monitor. The USFWS-approved biological monitor will have attended the training described in Conservation Measure 2 above. Both the USFWS-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The USFWS-approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly, and quarterly summaries will be placed on a file-sharing website that is accessible to regulatory staff at any time.

6. A USFWS-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of AWS or CRLF. These site inspections will take place each morning before the start of construction activities.

7. If any AWS or CRLF are found, all activities will cease, the USFWS will be immediately contacted. and no other actions will be taken without authorization from the USFWS. Construction will be halted until all AWS or CRLF depart on their own or are removed from the work area by the USFWS-approved biologist. Actions taken to relocate AWS or CRLF will be conducted under the guidance of the USFWS and California Department of Fish and Wildlife (CDFW). The USFWS-approved biologist may relocate any AWS or CRLF that are in danger of immediate harm from project-related activities to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The USFWS-approved biologist will monitor any CRLF or AWS that has been relocated

until it is determined that it is not imperiled by predators or other dangers.

8. Construction will take place during daylight hours only.

9. Prior to being brought on-site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on-site.

10. A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no AWS, CRLF, or other amphibians or reptiles are taken at the pump.

11. Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.

12. Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for CRLF: April 15 to October 15).

13. All areas disturbed as a result of project-related activities will be re-vegetated with native plant species only.

14. Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water on-site. These devices will be placed at all locations where the likelihood of sediment input exists.

15. The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to ensure that it does not become clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.

16. All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side casting of material into any waterway.

17. During project activities, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be managed to minimize the provision of cover for AWS and CRLF by removing all surface construction debris daily except that required for construction.

18. To mitigate for erosion impacts, best management practices (BMPs) for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.

19. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The U.S. Army Corps of Engineers (USACE) and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the USACE will ensure that the applicant will prepare a plan to allow 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.

20. The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project area will be removed.

21. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in pre-construction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

22. Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that AWS do not become entangled in the mesh. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control.

23. To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fencing or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.

24. Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.
25. All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.
26. A post-construction survey will be conducted the night before the cofferdams are removed to make sure no AWS or CRLF have occupied the temporary pool created upstream of the site. If any AWS or CRLF are present, they will be captured by hand and removed upstream of the pond to prevent them being potentially stranded when the dams are removed during the daylight hours and the water levels drop.

The full Biological Opinion is included as **Appendix E**.

Rheem Creek

A literature and database review and a reconnaissance level field survey were completed to determine the potential presence of special status species within the proposed Rheem Creek mitigation site.

The proposed mitigation site was visited by NCE staff on November 13, 2018, and April 17, 2019, to determine if special status species or their habitats have potential to exist in the mitigation site boundary. No special status species were observed within or adjacent to the mitigation site during the site visit. Additionally, based on database review and results of the field survey, it is unlikely that any special status plant or animal species would occur within or adjacent to the mitigation site (NCE 2019a).

Relevant information used to assess the likelihood of special status species to occur within the proposed mitigation site, complete species lists, and the results of the field survey are detailed in full in the *Rheem Creek Mitigation Site Memo* included as **Appendix H**.

Migratory Birds

As discussed in the Environmental Setting, both the project area and mitigation site contain trees which may provide habitat for migratory birds. Migratory birds are protected under the Migratory Bird Treaty Act (MBTA). The MBTA makes it illegal to “take” protected species except under the terms of a federal permit.

It is possible that nesting habitat could be disturbed during construction due to tree removal, noise, and vibrations from construction equipment. This would be a potentially significant impact on migratory birds.

Implementation of **Mitigation Measure BIO-1** would reduce potentially significant impacts to migratory birds to less than significant.

- ***Mitigation Measure BIO-1***: If any construction activities (e.g., grubbing or grading) are scheduled during the bird nesting season (typically defined by CDFW as February 1 to September 1), the City or approved construction contractor shall retain a qualified biologist to conduct a pre-construction survey of the project area and a 100-foot buffer, as access is available, to locate active bird nests, identify measures to protect the nests, and locate any other special status species.

  The pre-construction survey shall be conducted no more than 14 days prior to the implementation of construction activities (including staging and equipment storage). Any active nest should not be disturbed until young have fledged or under the direction provided by a qualified biologist. Any special status species shall not be disturbed without the direction of a qualified biologist. If an active nest is found during construction, disturbance shall not occur without direction from a qualified biologist.

***Finding**: Implementation of the Biological Opinion requirements and **Mitigation Measure BIO-1** would reduce potentially significant impacts to candidate, sensitive, or special status species including migratory birds to less than significant.*

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 CDFW or USFWS?

Less than Significant Impact with Mitigation Incorporated. The project proposes to buttress the landslide and prevent future sediment dispersal into the creek by culverting a section of San Pablo Creek. Placement of the culvert within the creek would impact 0.08 acres of San Pablo Creek, 0.004 acre of ephemeral drainage culvert, and 1.35 acres of riparian and oak woodland habitat.

San Pablo Creek is a regulated water of the U.S. (WOUS) and water of the State. The San Pablo Creek riparian corridor is zoned as open space within the General Plan and is protected by General Plan Policy CN1.1 as discussed in the Regulatory Setting. Project impacts to the creek and riparian corridor would be potentially significant and would require permitting pursuant to sections 404 and 401 of the CWA, and California Fish and Game Code Section 1602.

The Section 404 and 401 permits provide a mechanism for Trustee agencies to closely review projects and establish mitigation protocols that they have determined will mitigate adverse impacts on sensitive natural communities to less than significance. As part of the proposed project, the Rheem Creek Replanting Plan will mitigate for permanent impacts to San Pablo Creek and the ephemeral drainage culvert at a 2:1 ratio by restoring and enhancing approximately 800 feet (1.0-acre) of urban stream environment.

For stream and riparian habitat unavoidable impacts, the City will coordinate with the CDFW to determine if an LSA Agreement is required.

The proposed Replanting Plan and regulatory oversight of required permits is determined by the City to be sufficient to mitigate for impacts to San Pablo Creek and associated habitat. **Mitigation Measure BIO-2** requires the City to obtain applicable permits. Compliance with the permit conditions would further ensure mitigation of the project's impact on riparian and other natural communities to less than significant.

Additionally, with implementation of **Mitigation Measure BIO-2**, the project would comply with General Plan Policies CN1.2 – Local Native Plant Species, and CN1.3 – Urban Creek Restoration, by ensuring implementation of the proposed mitigation Restoration Planting Plan, which would restore an urban creek by removal of exotic species and revegetation with native species. This mitigation plan for the restoration efforts will be coordinated with property owners and local interest groups.

- ***Mitigation Measure BIO-2***: Prior to construction, the City shall obtain a Section 404 CWA permit from the USACE and a Section 401 Water Quality Certification from the San Francisco Bay RWQCB, and an LSN or LSA Agreement from the CDFW. The City shall comply with all mitigation measures identified in the permit approvals.

Finding: *Regulatory compliance with requirements in the Section 404 CWA permit, Section 401 Water Quality Certification, and LSN or LSA Agreement has been determined by Trustee Agencies to mitigate potential impacts on natural communities to less than significant.*

c) Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

No Impact. A survey was conducted to assess the presence of wetlands by NCE on December 18, 2017. The survey determined there are no State- or federally protected wetlands in the project area or mitigation site. As discussed in item b) above, the project proposes to impact San Pablo Creek and the ephemeral drainage culvert that crosses beneath Via Verdi and provides vegetation restoration to

Rheem Creek as mitigation. These features are State- and federally regulated waters of the State and WOUS, but do not meet the definition of wetlands.

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?

Less than Significant Impact with Mitigation Incorporated. There are no established migratory corridors associated with the project. Construction could temporarily interrupt movement of native resident or migratory wildlife species through the project area. As discussed above, the project may contain habitat for and has potential to impact migratory birds, AWS, and CRLF. The project would not have potential to impact the migratory California Coast Steelhead (*Oncorhynchus mykiss*) due to existing obstructions to the historical spawning habitat in San Pablo Creek, including the San Pablo dam. Additionally, project construction would not take place during spawning season.

With implementation of mitigation measures BIO-1 and BIO-2, species utilizing the project area during construction would be protected against significant impacts.

***Finding**. Implementation of mitigation measures BIO-1 and BIO-2 provide sufficient species protection during construction to mitigate potential adverse effects on resident or migratory species to less than significant.*

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

Less than Significant Impact. The General Plan contains policies pertaining to the protection of biological resources. Trees are protected through Policy CN6.2 of the General Plan, which promotes the protection of oak woodlands.

Slope stabilization and landslide buttressing activities, including construction of the concrete box culvert and placement of engineered backfill would require removal of 132 oak woodland and riparian tree species within the project area. Proposed tree removal locations at the project area are displayed on Figure 6. Removal of trees within the San Pablo Creek riparian corridor/open space area would be a significant impact.

The project intends to mitigate for permanent impacts to San Pablo Creek and the ephemeral drainage at a 2:1 ratio by restoring and enhancing approximately 800 feet (1.0-acre) of urban stream environment on Rheem Creek as a part of the proposed project. There is no oak woodland tree removal proposed at the Rheem Creek mitigation site. Tree removal at the proposed mitigation site shall target non-native species, including approximately 51 non-native trees.

Approximately twelve eucalyptus trees would be left in place but would be trimmed to allow for sunlight to reach the creek. Approximately seven native trees would be protected in place. The area would be revegetated with native species, including trees. The project would result in 800 feet (1.0-acre) of habitat restoration and enhancement.

Detailed specifics of the Restoration Planting Plan are included in **Appendix D**. The Rheem Creek Restoration Planting Plan will be included as a part of the Section 404 and 401 permits as mitigation for the loss of habitat values on San Pablo Creek. The regulatory agencies will ensure this plan is sufficient to mitigate the loss of trees and oak woodland due to the project, and may not lower, but could increase the mitigation requirement. Replanting the San Pablo Creek project area with native vegetation and restoring Rheem Creek by removal of non-native tree species and replanting with native tree species would reduce the impact on native tree resources to less than significant and would be consistent with Policy CN6.2 of the General Plan.

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

No Impact. There are no known Habitat Conservation Plans or Natural Community Conservation plans associated with the project area. No impacts are anticipated, and no mitigation measures are required.

Tree Species	Number of Trees to be Removed	Trunk Diameter (dbh)
Big leaf maple	1	24"
Boxelder	5	10-24"
California bay	33	4-48"
California black walnut	3	4-30"
California Buckeye	24	4-10"
Coast live oak	36	4-48"
Salix sp.	30	8-48"

Figure 6. Project Area Tree Removal Map

4.5 CULTURAL RESOURCES

Environmental Setting

The area of potential effect (APE) for cultural resources includes the approximate 6.2 acres associated with the project area, and approximately 1.0 acre associated with the mitigation site, for a total APE area of 7.2 acres. The APE is identical to the project boundary shown on Figure 2.

The APE is located in an urban environmental area adjacent to the I-80 corridor in a sparsely developed area with moderately steep, grass-covered hillsides to the north that slope down into the heavily vegetated San Pablo Creek drainage to the south. The surrounding land use is a mixture of residential and commercial properties, along with undeveloped watershed areas generally associated with San Pablo Creek, Rheem Creek, and their tributary drainages. The project area consists of natural soils overlain or mixed with eight to 35 feet of fill soil (Shafer and Crow, 2012; Hultgren-Tillis Engineers [HTE], 2018).

Historic Resources Inventory

The Historical Resources Element of the General Plan contains a list of the City's historic resources, listed on either the National Register of Historic Places, California State Historical Landmarks and Properties, or Rosie the Riveter/WWII Home Front National Historical Park Resources.

None of the historical resources listed in the General Plan are located within project boundaries.

Site Investigation

An investigation was conducted to locate, describe, and evaluate cultural resources present within the APE. Much of the APE has experienced some level of previous disturbance (e.g., landslide events, cut and fill activities, and urban development).

A records search was conducted at the Northwest Information Center. The search results indicate that no sites have been previously recorded within the APE (NCE 2019b). Pedestrian surveys of the APE were conducted on November 5, 2018, and April 17, 2019. Fieldwork was performed in accordance with federal and State standards.

No cultural resources were identified within or adjacent to the APE.

Regulatory Setting

Federal

The National Historic Preservation Act (NHPA) was enacted by Congress in 1966 to establish national policy for historic preservation in the United States. The NHPA establishes the role and responsibilities of the federal government in historic preservation. The NHPA directs agencies to identify and manage historic properties under their control; to undertake actions that will advance the Act's provisions and avoid actions contrary to its purposes; to consult with others while carrying out historic preservation activities; and to consider the effects of their actions on historic properties. The project is funded through a federal agency (FEMA); therefore, the NHPA regulations apply.

State

The California Register of Historical Resources (CRHR) is a guide to cultural resources that must be considered when a government agency undertakes a discretionary action subject to CEQA. The CRHR helps government agencies identify and evaluate California's historical resources and indicates which properties are to be protected, to the extent prudent and feasible, from substantial adverse change (PRC § 5024.1(a)). Any resource listed in, or eligible for listing in, the CRHR is to be taken into consideration during the CEQA process.

PRC § 5097.5 prohibits excavation or removal of any "archaeological, paleontological or historical feature, situated on public lands, except with express permission of the public agency having jurisdiction over such lands." Public lands are defined to include lands owned by or under the jurisdiction of the state or any city, county, district, authority or public corporation, or any agency thereof. PRC § 5097.5 states that any unauthorized disturbance or removal of archaeological or historical materials or sites located on public lands is a misdemeanor.

Local

The Historic Resources Element is an optional element that Richmond has elected to include in its General Plan. The element is consistent with State of California Government Code which authorizes local jurisdictions to adopt additional elements to those required by State law when they relate to the physical development of the jurisdiction (Code section 65303). *Policy HR1.1 Preservation of Diverse Resources* directs the City to protect, preserve and enhance the diverse range of historic, cultural and archaeological sites and resources in the City for the benefit of current and future residents and visitors.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource pursuant to CEQA Guidelines § 15064.5?				✓
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines § § 15064.5?			✓	
c) Disturb any human remains, including those interred outside of dedicated cemeteries?			✓	

Answers to Checklist Questions

a) Would the project cause a substantial adverse change in the significance of a historical resource pursuant to CEQA Guidelines § 15064.5?

No Impact. As noted above, the records search and field survey investigation determined that much of the APE has experienced some level of previous disturbance. No cultural resources were identified within or adjacent to the APE by either the records search or site surveys. No CRHR-listed properties or historical resources are known to be present. The USACE initiated consultation with the State Historic Preservation Officer (SHPO) on July 18, 2019 pursuant to Section 106 of the NHPA, and its implementing regulation at 36 CFR Part 800. The USACE concluded that there is a low probability of encountering any previously undiscovered cultural resources in the APE and determined the project would have *no effect* on historic properties. In a letter dated August 7, 2019, SHPO concurred with the USACE's finding of *no historic properties affected* for the project undertaking. The Section 106 concurrence letter is provided in **Appendix K**. Therefore, the project would cause no substantial adverse change in the significance of a historical resource.

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

Less than Significant Impact. No cultural resources were identified within or adjacent to the APE. As discussed above in question (a), SHPO concurred with the USACE's conclusion that the project area has a low potential to contain undocumented cultural resources, and a finding of *no historic properties affected* was issued. Therefore, archaeological resources other than tribal cultural resources are not anticipated at the project location.

However, there is always the possibility of exposing previously undiscovered buried cultural resources during construction. While buried cultural resources are not anticipated to be affected by the project, there is general concern that the loss of any cultural resources may be cumulatively significant. **Mitigation Measure TCR-1** and **Mitigation Measure TCR-2** require, respectively, training of construction crews and a plan for inadvertent resource discovery that would be sufficient to ensure any unanticipated archaeological resources exposed during construction would be protected. See Section 4.18, Tribal Cultural Resources, for a discussion of the mitigation measures.

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

Less than Significant Impact. Based on the prehistoric and historic uses of the area and the prior ground disturbance within the APE, human remains are not expected to be discovered during construction activities. However, in the event that unknown burials or human remains are discovered, **Mitigation Measure TCR-3** and compliance with PRC Section 5097.98 and Section 7050.5 of California Health and Safety Code would ensure that potential impacts to human remains would be less than significant. See Section 4.18, Tribal Cultural Resources, for a discussion of the mitigation measures.

4.6 ENERGY

Environmental Setting

The City relies on clean energy sources, waste reduction practices, sustainable buildings and innovative land use planning to reduce energy impacts. The use of progressive measures has resulted in significant reductions in fossil fuel use as well as cost savings and emission reductions (City of Richmond 2012). There are no existing energy sources or uses within the project area or mitigation site.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?			✓	
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?				✓

Answers to Checklist Questions

a) Would the project result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Less than Significant Impact. Energy for the project would only be required during construction and would not require additional capacity on a local or regional scale. **Mitigation Measure AQ-1**, which requires implementation of recommended BAAQMD construction BMPs, would reduce use of fossil fuels and increase energy efficiency of construction vehicles. Because energy use would be temporary during construction and would comply with BAAQMD efficiency requirements and the City's fossil fuel reduction goals, the project would not result in wasteful, inefficient, or unnecessary consumption of energy resources. The impact would be less than significant.

b) Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

No Impact. The project would not conflict or obstruct the goals and policies of the City's Energy and Climate Change Element of the General Plan. Implementing BMPs to reduce fossil fuel use by construction vehicles would be consistent with these goals and policies.

Because the project will conform with the Goals and Policies of the Energy and Climate Change Element of the General Plan, the project would have no impact.

4.7 GEOLOGY & SOILS

Environmental Setting

The project area is located between a hillside slope and San Pablo Creek and was graded to develop the Sobrante Glen subdivision and its Via Verdi access road. Much of the project area is defined by the relatively flat Via Verdi roadway fill embankment, with grades of elevation between 100 to 105 feet above mean sea level. The road is located approximately 50 feet above San Pablo Creek, and the slope continues above the road, extending upgradient about 100 feet in elevation. The project area along San Pablo Creek ranges between 9% and 30% slopes (Figure 7).

A geotechnical investigation was conducted at the landslide site; the Geotechnical Report prepared for the project is included as **Appendix I** (HTE 2018).

In general, the landslide area is underlain by fill. Historical grading plans indicate that older landslide debris was present in the subsurface of the project area.

The existing landslide is approximately 300 feet wide and extends up to 53 feet below the ground surface. The approximate volume of the landslide is 80,000 cubic yards. The landslide is moving towards San Pablo Creek. Results from the Geotechnical Investigation indicate that the base of the landslide is in the Orinda Formation rock (HTE 2018).

Regional Geologic Setting

The project area is located in the eastern portion of the San Francisco Bay Area, which lies within the Coast Ranges geomorphic province. The San Francisco Bay is generally a northwest-trending wide depression that is bounded by similarly trending ridges that comprise the Berkeley Hills to the east and the San Francisco and Marin Peninsulas to the west. This bay trough and ridge structure was formed as a result of a combination of faulting and warping related to the San Andreas Fault system whereby the bay is underlain by a down dropped or tilted block (California Division of Mines and Geology 1969). The oldest and most widespread rocks in the San Francisco Bay Area are composed of the Jurassic-Cretaceous age Franciscan Formation. The Franciscan Formation can be fault-contacted with other Mesozoic sedimentary rocks and is then in turn overlain by Tertiary- and Quaternary-age sedimentary and volcanic rock units. Within the San Francisco region, many of the valleys have been in-filled with quaternary-age sediments (e.g., alluvium and bay deposits) and include marine and non-marine clays, silts, sands, and gravels.

Figure 7. Project Area Topography

The project area lies at the lower reaches of the Richmond Hills and is underlain by deposits of alluvium associated with San Pablo Creek with underlying rock of the Orinda Formation (Miocene Age) consisting of poorly consolidated sedimentary rock including conglomerate, sandstone, siltstone, and claystone (Graymer et al. 1994 and Dibblee 1980).

Seismicity and Faulting

The project area is within a seismically active region, and historically numerous moderate to strong earthquakes related to the San Andreas system of faults have occurred in this region. Active faults are considered to be those that have moved during the past 11,000 years, and generally only active faults are considered in evaluating seismic risk for building construction. The nearest active fault is the Hayward fault, an Alquist-Priolo Fault located approximately 3,000 feet to the west of the project area, and approximately 60 feet from the Rheem Creek mitigation site, as shown on Figure 8 (USGS n.d.). Other major faults that could cause significant shaking at the project area are the, Concord, Green Valley, Calaveras, San Andreas, Greenville, West Napa, San Gregorio, and Rodgers Creek faults.

Liquefaction

The *Susceptibility Map of the San Francisco Bay Area* (Figure 9) identifies San Pablo Creek and adjacent area as 'Very High' (red) in downstream creek corridors, and 'Moderate' (yellow) on adjacent slopes and in the vicinity of the primary project area. This is the same general area where the landslide occurred. Liquefaction can occur when wet or saturated cohesionless soils temporarily lose strength due to the buildup of excess water pressure during events such as earthquakes. Soil most susceptible to liquefaction is loose, clean, saturated, uniformly graded sand. Based on the 2000 *USGS Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine County San Francisco Bay Region*, the project area overall is identified to have moderate susceptibility to liquefaction within the alluvial soils from San Pablo Creek. Based on soil borings, the majority of the soils are clays and/or of sufficient density to have a high resistance to liquefaction (HTE 2018).

Groundwater

As part of the geotechnical investigation, nested piezometers were installed in the spring of 2017 at two locations within the landslide and one location up slope of the landslide. Groundwater levels during the spring months up slope of the landslide were within a few feet of the ground surface, which was consistent with observed ponding of water at the surface. The groundwater within the slide mass was

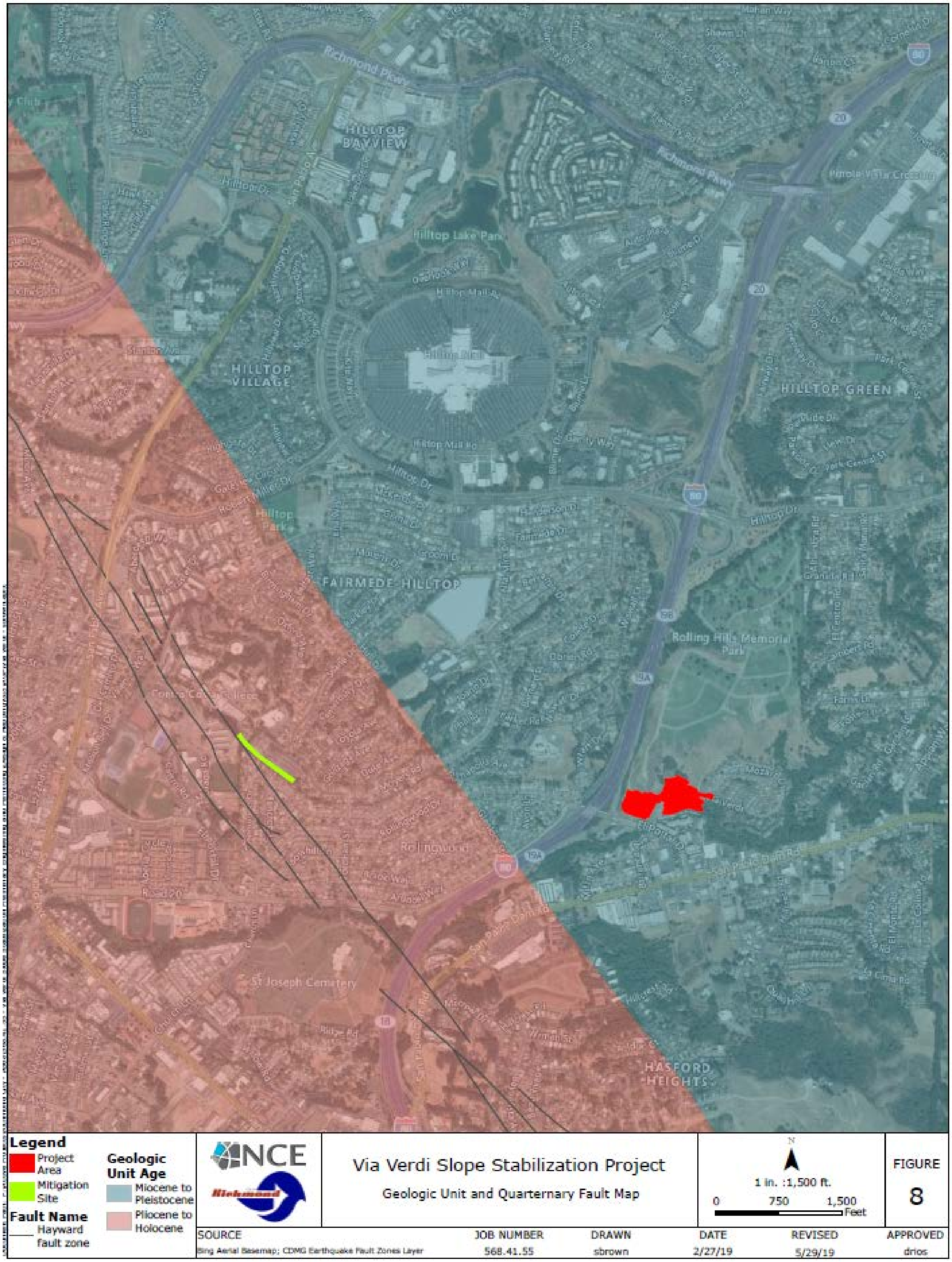


Figure 8. Geologic Unit and Fault Map

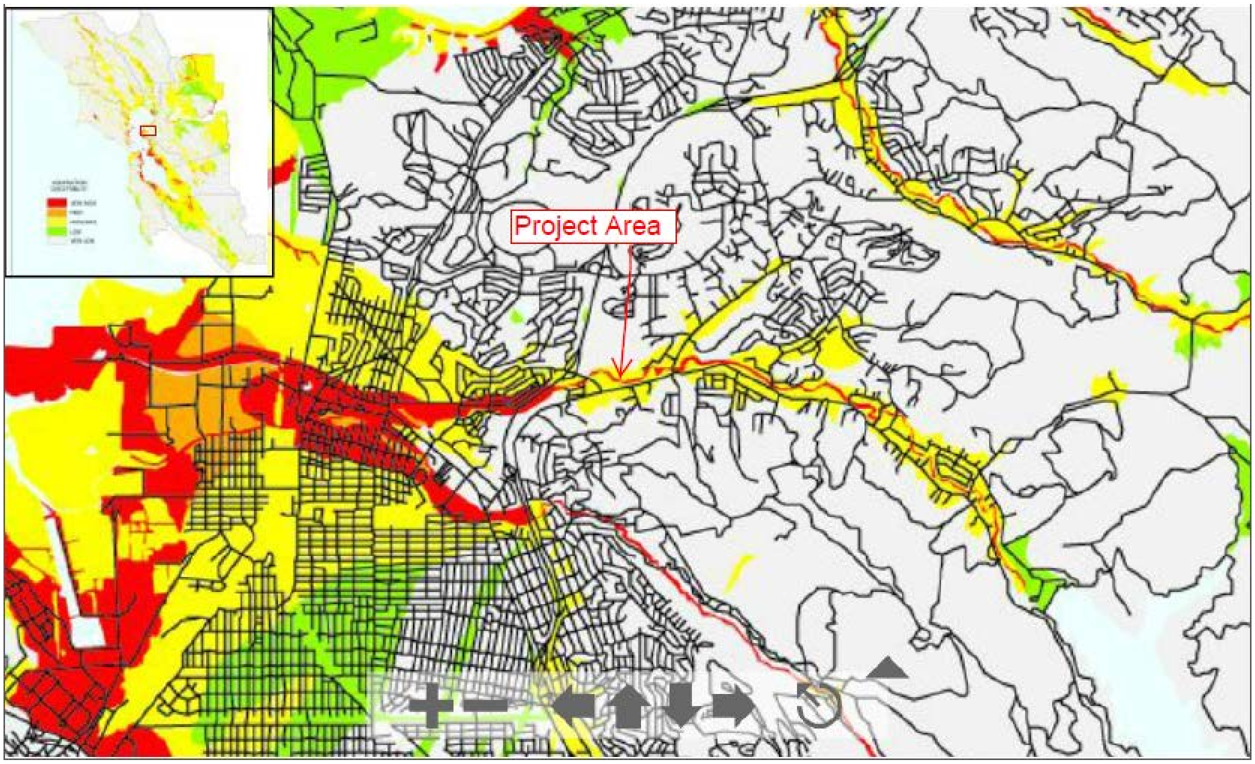


Figure 9. Liquefaction Susceptibility Map

Source: USGS 2019.

between elevation 71 feet and 89 feet (North American Vertical Datum of 1988) or about 17.5 feet to 31.5 feet below existing grade (HTE 2018).

Soils

Soil types found in Richmond include Tierra Loam, Millsholm Loam, Los Osos Clay Loam and Clear Lake Clay. The predominant drainage class of these soils, which is a measure of the expected natural frequency and duration of wet periods, are moderately well drained or better (City of Richmond 2012).

There are three Natural Resource Conservation Service (NRCS) Soil Survey soils mapped in the project area (Figure 10). Two of the soil units are classified as MLRAs. MLRAs are used in statewide agricultural planning. The two MLRAs within the project area are MLRA 14: Central California Coastal Valleys, and MLRA 15: Central California Coast Range.

Rheem Creek Soil

There are two mapped soils units within the Rheem Creek mitigation site. Soil unit CC: Clear Lake clay, 0 to 15 percent slopes is also within MLRA 15. Soil Unit TaC: Tierra loam, 2 to 9 percent slopes, is within MLRA 14. Refer to Figure 10 for locations of mapped soil units within the Rheem Creek mitigation site.

Figure 10. NRCS Soil Units

Appendix J contains the full NRCS Web Soil Survey custom soil resource report for the project.

Regulatory Setting

Federal

Uniform Building Code (1994)

The Uniform Building Code (UBC) of 1994 establishes the Expansion Index test as a standard method to rate soil's expansion potential. The Code mandates that special design consideration be employed if a soil's Expansion Index is 20 or greater, as listed in UBC Table 18-1-C.

State

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (SHMA) of 1990 directs the California Geological Society to identify and map area prone to earthquake hazards of liquefaction, earthquake-induced landslides and amplified ground shaking. The SHMA requires the State Geologist to establish regulatory zones and to issue appropriate maps (Seismic Hazard Zone maps). These maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling construction and development.

Public Resources Code § 5097.5

This code prohibits excavation or removal of any "vertebrate paleontological site ... situated on public lands, except with express permission of the public agency having jurisdiction over such lands." Public lands are defined to include lands owned by or under the jurisdiction of the state or any city, county, district, authority or public corporation, or any agency thereof. PRC § 5097.5 states that any unauthorized disturbance or removal of paleontological materials or sites located on public lands is a misdemeanor.

Local

The General Plan contains a Public Safety Element (City of Richmond 2012) that outlines the protection of the community from known geologic hazards, such as seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche and dam failure, and slope instability. Specifically, the law mandates that the General Plan address emergency response and prevention measures associated with these risks.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Directly or indirectly cause potential substantial adverse effects, including 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?			✓	
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 direct or indirect risks to life or property?			✓	
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				✓
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?		✓		

Answers to Checklist Questions

a) Would the project directly or indirectly cause potential substantial adverse effects, including 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.

Less than Significant Impact. The primary project area is not within an Alquist-Priolo Earthquake Fault Zone that designates a known active fault (fault that is defined to be active if it has ruptured or shows evidence of displacement in the Holocene or the last 11,000 years) that is susceptible to fault rupture as defined by the California Geologic Survey (formerly the California Division of Mines and Geology). Therefore, the potential for fault rupture at the project area is considered to be low.

The Rheem Creek proposed mitigation site is located within approximately 0.5 mile of the Hayward fault zone (Figure 8). The mitigation activities proposed for Rheem Creek include vegetation management and enhancement. Vegetation management and enhancement would not pose risk, loss, or injury due to rupture of a known earthquake fault. Therefore, potential impacts would be less than significant.

ii. Strong seismic ground shaking?

Less than Significant Impact. The primary geologic hazard at the project area is the potential for moderate to strong ground shaking associated with nearby faults discussed in the prior section on seismicity and faulting. Factors determining the characteristics of earthquake ground motion at the project area would depend upon the magnitude of the earthquake, distance from the zone of energy release, travel path, topographic effects, subsurface materials, and rupture/source mechanism.

The proposed culvert construction has been designed to accommodate anticipated ground motions in accordance with appropriate building codes and seismic design criteria. No buildings are proposed at the project area or mitigation site; therefore, there is no potential to expose people or structures from substantial adverse effects due to seismic ground shaking.

iii. Seismic-related ground failure, including liquefaction?

Less than Significant Impact. As discussed in the Environmental Setting, the project area overall is identified to have moderate susceptibility to liquefaction within the alluvial soils from San Pablo Creek. Based on soil borings, the majority of the soils are clays and/or of sufficient density to have a high resistance to liquefaction (HTE 2018). Therefore, the potential for liquefaction at the primary project site is considered to be low. The structure and associated grading of the culvert has been designed to accommodate liquefaction settlement and would not result in an increased risk of exposing people or structures to liquefaction hazards. The proposed project would stabilize the existing landslide and the proposed culvert structure would be designed in accordance with appropriate building codes and seismic design criteria. There are no activities associated with the mitigation site Restoration Planting Plan which would be susceptible to ground failure or liquefaction.

iv. Landslides?

Less than Significant Impact. As discussed in iii above, the project is in response to a landslide and proposes improvements that would result in increased stability and a greater factor or safety once implemented. The project proposes to stabilize the landslide and failing creek bank to prevent further landslide movement, and, in the event of bank collapse, reduce potential for complete blockage and fill of San Pablo Creek. Site structures and proposed grading have been designed to resist and stabilize the subject landslide to an acceptable factor in accordance with appropriate building codes and design criteria. Once the project is implemented, the improvements would make it unlikely for another landslide to occur within the immediate location of new construction.

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

Less than Significant Impact. During construction, the project may have potential to cause the loss of topsoil or cause erosion during earth-moving and clearing activities. The project would implement erosion and sediment BMPs as outlined in Section 3.7 that would prevent significant soil loss or erosion during construction, including use of native revegetation to stabilize disturbed areas. Implementation of the project SWPPP would further reduce potential for erosion and topsoil loss during construction.

Once the project is constructed, it is anticipated for there to be a beneficial impact on erosion and topsoil due to implementation of slope stability measures such as installation of a culvert with engineered backfill, revegetation, and erosion and slope stability control. These measures would reduce erosion and topsoil loss in the project area and reduce potential for future sediment dispersal from the landslide into San Pablo Creek.

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?

Less than Significant Impact. As discussed in the Environmental Setting, the project area contains unstable soil and rock formations that contain the existing subject landslide.

There are known erosion and stability issues associated with the project area. The project is located within unstable fill and an unstable rock unit known as the Orinda Formation. The project was designed in response to a landslide and proposes improvements that would result in increased stability and a greater factor of safety once implemented. The proposed project purpose is to stabilize the existing landslide. Site structures and proposed grading at the project area will be designed to resist and stabilize the landslide to an acceptable factor in accordance with appropriate building codes and design criteria. The project would also stabilize the existing failing creek bank to prevent further landslide and potential for complete blockage and fill of San Pablo Creek in the event of bank collapse. Once the project is implemented, the improvements would make it unlikely for another landslide to occur within the immediate location of new construction.

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

Less than Significant Impact. Based on exploratory borings completed during the geotechnical investigation (HTE 2018), the project area can contain expansive clay deposits. The proposed grading at the project area have been designed to accommodate expansive clay soils and therefore would not create substantial direct or indirect risks to life or property.

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

No Impact. The project does not propose use of septic tanks and would not require use of alternative wastewater disposal services; therefore, there would be no impact from these systems.

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

Less than Significant Impact with Mitigation Incorporated. The Northwest Information Center records search revealed there are no previously recorded or existing paleontological resources identified within the project area or mitigation site. No unique geological resources were identified during review of geologic resources within the project boundary.

However, results from the Geotechnical Investigation indicate that the base of the landslide is in the Orinda Formation, a terrestrial sedimentary sequence consisting of fluvial conglomerates, as well as sandstone, mudstone, and siltstone facies. The Orinda Formation is fossiliferous, and the University of California Paleontology Museum database includes entries for the following vertebrates from these Miocene deposits:

- Gomphotherium (primitive elephantid)
- Hipparion, Nannipus, and Pliohippus (primitive horses)
- Barbourofelis (a member of the primitive cat family Nimravidae)
- Cranioceras (deer-like artiodactyl)
- Ticholeptus (an oreodont; an extinct group of pig-like grazing animals)
- Desmostylus (an extinct sea-cow morphologically similar to a hippopotamus)

Tedford and others (2004) assign most of the Orinda Formation vertebrate material to the middle Clarendonian Land Mammal Age, or about 11 to 12 million years ago.

According to the geotechnical investigation of the project area, the subgrade along Via Verdi roadway contains fill that is approximately 31 to 35 feet thick; it becomes less thick to the south along the San Pablo Creek bank where it transitions to native alluvial soils. The Orinda Formation was encountered below the fill and below other landslide debris. Portions of the excavation for the proposed culvert are expected to toe-in and require cuts and grading work within the Orinda Formation. Impacts to the Orinda Formation could be potentially significant if the unit contains paleontological resources.

Mitigation Measure GEO-1 would ensure that paleontological resources are protected during construction by requiring the City to coordinate with a qualified paleontologist to determine if the project area requires a detailed paleontological resource impact assessment.

- ***Mitigation Measure GEO-1***: The City shall retain a professional qualified paleontologist to review the *Paleontological Resource Potential Maps* and determine if the project area contains the potential for paleontological resources. The City shall coordinate for a "request for opinion" from a qualified professional paleontologist, state paleontological clearinghouse, or an accredited institution with an established paleontological repository housing paleontological resources from the region of interest.

If the paleontological resource potential of a rock unit cannot be determined from the literature search and specimen records, a field survey by a qualified professional paleontologist will be necessary to determine the fossiliferous potential and the distribution or concentrations of fossils within the extent of the rock units present in a specific project area.

In areas determined to have high or undetermined potential for significant paleontological resources, an adequate program for mitigating the impact must include:

a. An intensive field survey and surface salvage prior to earth moving.

b. Monitoring by a qualified paleontological resources monitor during excavations in previously undisturbed rock.

c. Salvage of unearthed fossil remains and/or traces (e.g., tracks, trails, burrows).

d. Screen washing to recover small specimens, if applicable.

e. Preparation of salvaged fossils to a point of being ready for curation;

f. Identification, cataloguing, curation, and provision for repository. storage of prepared fossil specimens.

g. A final report of the findings and their significance.

To assure compliance at the start of the project, a statement that confirms the site's paleontological potential, confirms the repository agreement with an established public institution, and describes the program for impact mitigation, must be deposited with the lead agency and contractor(s) before any ground disturbance begins.

Finding: *Implementation of* ***Mitigation Measure GEO-1*** *would ensure that paleontological resources are protected during construction, which would reduce the potential for impacts to a less than significant level.*

4.8 GREENHOUSE GAS EMISSIONS

Environmental Setting

The term *greenhouse gas* is used to describe atmospheric gases that absorb solar radiation and subsequently emit radiation in the thermal infrared region of the energy spectrum, trapping heat in the Earth's atmosphere. Greenhouse gases of concern include CO_2, methane, nitrous oxide, and fluorinated gases[3]. A growing body of research attributes long-term changes in temperature, precipitation, and other elements of Earth's climate to large increases in greenhouse gas emissions since the mid-nineteenth century, particularly from human activity related to fossil fuel combustion. Unlike emissions of criteria and toxic air pollutants, which have local or regional impacts, emissions of greenhouse gases have a broader, global impact.

Greenhouse gases differ by the amount of heat each traps in the atmosphere, known as global warming potential, or GWP. Carbon dioxide is the most significant greenhouse gas, so amounts of other gases are expressed relative to CO_2, using a metric called "carbon dioxide equivalent" (CO_2e). The global warming potential of CO_2 is assigned a value of 1, and the warming potential of other gases is assessed as multiples of CO_2. For example, the 2007 *International Panel on Climate Change Fourth Assessment Report* calculates the GWP of methane as 25 and the GWP of nitrous oxide as 298, over a 100-year time horizon (IPCC 2007).

Generally, estimates of all greenhouse gases are summed to obtain total emissions for a project or given time period, usually expressed in metric tons or million metric tons CO_2e.

Regulatory Setting

Federal

The EPA has no regulations or legislation enacted specifically addressing greenhouse gas emissions reductions and climate change at the project level. In addition, the EPA has not issued explicit guidance or methods to conduct project-level greenhouse gas analysis.

State

CARB is the lead agency in the development of greenhouse gas reduction for the State. CARB and other State agencies are currently working on regulations and other initiatives to implement the AB 32 Climate Change Scoping Plan (CARB 2018b), which set 2020 targets. By 2050, the State plans to reduce emissions to 80

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[3] U.S. Environmental Protection Agency. "Overview of Greenhouse Gases." https://www.epa.gov/ghgemissions/overview-greenhouse-gases.

percent below 1990 levels. On September 8, 2016, Governor Brown signed Senate Bill (SB) 32, which legislatively established the greenhouse gas reduction target of 40 percent of 1990 levels by 2030. In November 2017, CARB issued California's 2017 Climate Change Scoping Plan. While the State is on track to exceed the AB 32 scoping plan 2020 targets, this plan is an update to reflect the enacted SB 32 reduction target.

In the updated Scoping Plan, CARB recommends statewide targets of no more than 6 metric tons CO_2e per capita (statewide) by 2030 and no more than 2 metric tons CO_2e per capita by 2050. The statewide per capita targets account for all emissions sectors in the State, statewide population forecasts, and the statewide reductions necessary to achieve the 2030 statewide target under SB 32 and the longer-term State emissions reduction goal of 80 percent below 1990 levels by 2050.

Regional - Construction Emissions

The BAAQMD does not have an adopted Threshold of Significance for construction-related greenhouse gas emissions. For operational, on-going emissions, the significance threshold is 1,100 metric tons per year (Table 5). Sources of construction-related greenhouse gases only include exhaust, for which the BAAQMD recommends following the same detailed guidance as for criteria air pollutants and precursors (BAAQMD 2017b).

Table 5. Greenhouse Gas Operational Threshold of Significance

Greenhouse Gas Emissions	
Land Use Projects – direct and indirect emissions	Compliance with a Qualified Greenhouse Gas Reduction Strategy OR 1,100 metric tons annually or 4.6 metric tons per capita (for 2020) Adjusted to 660 metric tons annually or to 2.6 metric tons per capita (for 2030)*
Note: ROG = reactive organic gases, PM_{10} = course particulate matter or particulates with an aerodynamic diameter of 10 micrometers (µm) or less, $PM_{2.5}$ = fine particulate matter or particulates with an aerodynamic diameter of 2.5µm or less. *BAAQMD does not have a recommended post-2020 greenhouse gas threshold.	

BAAQMD relies on the lead agency to quantify and disclose emissions that would occur during construction and make a determination of significance of greenhouse gas emissions in relation to meeting AB 32 greenhouse gas reduction goals (BAAQMD 2017b). They also recommend implementing BMPs to reduce greenhouse gas emissions during construction.

Local

In 2007, the City signed the *U.S. Conference of Mayors Climate Protection Agreement*, committing the City to reduce greenhouse gas emissions to meet or surpass the Kyoto Protocol targets. The City Council subsequently initiated a citywide agreement greenhouse gas emissions inventory as a means of establishing a baseline for emissions, identifying sources of energy use, and providing a foundation for developing relevant energy and climate change policies.

Recently approved State legislation (AB 32 and SB 375) and new air emissions standards adopted by CARB lay the foundation for local policy development on energy and climate change in Richmond. Richmond's Energy and Climate Change Element of the General Plan includes goals, policies, and actions to position the City for sustainable, physical, and economic development now, and in the future (City of Richmond 2012).

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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?			✓	

Answers to Checklist Questions

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

Less than Significant Impact. The project would result in short-term, temporary increases in greenhouse gas emissions during construction due to equipment and vehicle use at the site. For a construction period of a maximum 140 working days, heavy equipment such as excavators, haul trucks, as well as worker commutes would generate exhaust.

Based on the air quality emissions analysis (Table 4, Section 4.3), estimated total project construction CO_2e would be 232.76 metric tons, which is significantly less than the thresholds for operational emissions. However, BAAQMD only provides thresholds for land use operational emissions, and not for construction emissions.

BMPs are recommended for reducing construction emissions. Results of the emissions analysis are included in **Appendix F**.

Because the project does not propose a new, long-term operational source of greenhouse gases, project effects would be considered less than cumulatively significant. In addition, **Mitigation Measure AQ-1** requires implementation of BMPs identified by BAAQMD as being effective in minimizing greenhouse gas emissions, such as using alternative fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet; using local building materials of at least 10 percent; and recycling or reusing at least 50 percent of construction waste or demolition materials.

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

Less than Significant Impact. Project-related emissions would be short-term (over the course of up to 140 days) and increases in greenhouse gases that could be attributed to the project would not interfere with adopted goals and policies. The greenhouse gas emissions generated during construction would not be considered significant and would not limit the State's ability to attain the reduction targets identified in AB 32, the Scoping Plan, or SB 32. Additionally, implementation of the project would not conflict with any of the greenhouse gas emission policies within the Energy and Climate Change Element of the General Plan. Therefore, the proposed project does not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

4.9 HAZARDS & HAZARDOUS MATERIALS

Environmental Setting

Soil contamination is a concern, especially in areas where industrial and commercial uses have historically been concentrated. Such uses have been primarily focused in Central Richmond and along the shoreline. Most of Richmond's known contaminated and hazardous sites are located in the industrial zone south of Interstate 580 and west of the Richmond Parkway (City of Richmond 2012).

The project area is located northeast of Interstate 80 and San Pablo Dam Road along Via Verdi, approximately 2.5 miles northeast of downtown Richmond and approximately 2.75 miles west of the coastline. The surrounding land use is a mixture of residential and commercial properties and open space. The nearest major road, San Pablo Dam Road, is approximately 1,000 feet south of the project area and has several commercial facilities, including a Shell gas station, car rental facility, laundromat, bakery, and several stores.

The mitigation site is located west of Interstate 80, approximately 0.8 miles from the project area. The mitigation site is bound by a parking lot associated with Contra Costa College to the north, and residential properties to the south.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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 § 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				✓

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 or excessive noise for people residing or working in the project area?				✓
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				✓
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?				✓

Answers to Checklist Questions

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

Less than Significant Impact. The use of hazardous materials at the project area is anticipated to be limited to fuels and other maintenance-related chemicals to run equipment machinery. In addition, new concrete and asphalt materials will be used to construct the new roadway and old materials will be removed from the previously constructed emergency roadway. There would be no routine transport, use, or disposal of hazardous waste associated with the mitigation site Restoration Planting Plan activities.

Transport and use of hazardous materials at the project area is anticipated to be minimal. The use, storage, and management of fuels and other vehicle-related chemicals as well as construction materials will be managed according to the on-site Storm Water Pollution Prevention Plan (SWPPP). BMPs outlined in the SWPPP would also be implemented during implementation of the Restoration Planting Plan. For example, equipment fueling and maintenance, if performed at the job site, will be performed in a designated area, away from watercourses, utilizing secondary containment with a spill kit nearby. Rinsing of concrete tools and chutes will also be performed according to the SWPPP, including utilizing concrete washouts and/or requiring that wastewater be kept within the concrete truck and hauled offsite for recycling. No disposal of hazardous materials is anticipated as part of this 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?

Less than Significant Impact. As described above (a), hazardous materials use as part of the proposed project is expected to be minimal and the required on-site SWPPP will manage use of fuels and chemicals. Should a spill occur, spill procedures in the SWPPP will be followed.

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?

Less than Significant Impact. The nearest school to the project area is Vista High School, located approximately 700 feet west of the project area on the other side of Interstate 80. The mitigation site is immediately adjacent to Contra Costa College, however there are no permanent emission sources or hazardous waste associated with Restoration Plating Plan activities. As discussed above, hazardous materials use as part of the proposed project is anticipated to be limited. Construction-related vehicles would produce routine emissions that would be temporary and less than significant. For a discussion on air quality, see Section 4.3.

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

No Impact. NCE conducted a search of the project area and mitigation site on the SWRCB GeoTracker website and the Department of Toxic Substances Control EnviroStor website. The search revealed that most hazardous waste sites in the region (pursuant to Government Code 65962.5) are located west and southwest of the project area, along the coastline and towards the more heavily developed areas of Richmond. The nearest regulated sites tend to be along the major roads, with several closed leaking underground storage tank sites south of the project along San Pablo Dam Road, east along Appian Way, and a few sites north of Via Verdi along Hilltop Drive (SWRCB 2019). These include the Shell Station on the northeast corner of San Pablo Dam Road and El Portal Drive, the Tosco Facility at the end of Hillcrest Road, and the Chevron on the southwest corner of Barranca Street and San Pablo Dam Road.

There are no previous uses or hazardous materials sites associated with the project; therefore, there would be 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 or excessive noise for people residing or working in the project area?

No Impact. The nearest airport, Buchanan Field Airport, is over 14 miles from the project area. The project area and mitigation site are not located within a comprehensive land use planning area, and the project does not involve habitable improvements that would be sensitive to airport operations.

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

No Impact. The project proposes the replacement of a damaged road, stabilization of the associated creek bed, and habitat restoration as proposed mitigation. Emergency response and evacuation during construction at the project area will be available through an existing temporary access road. The emergency access road would be removed upon project completion. The project would have a beneficial effect by improving access to and from the residential development at the end of Via Verdi. Implementation of the proposed Restoration Planting Plan would not have an impact on emergency response or evacuation.

g) Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?

No Impact. The project involves replacement of a damaged road and stabilization of the associated creek bed, as well as habitat restoration on an off-site creek. Roadway access will be provided at all times. The project would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.

4.10 HYDROLOGY & WATER QUALITY

Environmental Setting

The project area is within the jurisdictional limits of the San Francisco Bay RWQCB. The project area contains two hydrological features: San Pablo Creek and an ephemeral drainage culvert underneath Via Verdi that discharges runoff into San Pablo Creek. The proposed mitigation site contains a segment of Rheem Creek.

As discussed in Section 4.4, Biological Resources, these hydrological features are considered WOUS and waters of the State of California.

San Pablo Creek

Approximately 460 linear feet of San Pablo Creek flows through the project area, in an east to west direction. An existing concrete box culvert, constructed as part of the 2012 sinkhole repairs, carries San Pablo Creek underneath the intersection of Via Verdi and El Portal Drive.

Flow data within San Pablo Creek located approximately 1 mile downstream of the project area indicate peak flows of 2,250 cubic feet per second (cfs), 4,000 cfs and 5,100 cfs for the 10-year, 50-year, and 100-year events respectively (NCE 2018b). No USGS stream gage stations are located on San Pablo Creek; however, the mean of monthly discharges from two nearby stations show that the highest flow rates typically occur during the winter months of January, February, and March, with periods of low-flow to near-dry conditions in July, August, and September (NCE 2018b).

In July 2011, a base flow measurement of San Pablo Creek was collected by NCE at the project area. The flow rate was 2.8 cfs, which was assumed to be representative of the summer months as it had not rained for several weeks prior to the measurement.

The existing landslide extends downgradient through Via Verdi and into the San Pablo Creek bank. Continued or future landslide movement would be a potential water quality concern for sediment release into San Pablo Creek.

Rheem Creek

Rheem Creek is a perennial waterway in a highly urbanized setting. Within the mitigation boundary, the creek is bound by the Contra Costa College parking lot and college facilities to the north, and by residential homes and college facilities to the south. Within the mitigation site boundary, the creek has an average width of 4.5 feet and flows in an east-to-west direction towards the San Pablo Bay.

Regulatory Setting

Federal

Clean Water Act

The CWA, passed in 1972, regulates and protects surface water quality across the United States. Sections 401 and 404 relate directly to local agency planning. Section 401 of the CWA requires a State Water Quality Certification for all federal permit or license applications for any activity that may result in a discharge to a water body to ensure compliance with state water quality standards. Most Certifications are issued in connection with Section 404 permits for dredge and fill discharges. Activities in waters of the U.S. that are regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects.

NPDES Permit

The CWA requires National Pollution Discharge Elimination System (NPDES) permits for stormwater discharges from municipal storm drain systems. The *Water Quality Control Plan for the San Francisco Bay Basin* (San Francisco Bay RWQCB 2017; Basin Plan) is the Water Board's planning document. The Water Board issues the municipal stormwater NPDES permits to address stormwater impairments and recommend actions. The City of Richmond and 15 other cities and towns, Contra Costa County, and the Contra Costa County Clean Water Program are co-permittees under a single stormwater NPDES Permit (No. CAS0029912 or successor permit).

Federal Emergency Management Agency

FEMA implements the National Flood Insurance Program (NFIP). Per Section 60.3(d)(3) of the NFIP regulations regarding floodplain management, the placement of fill, new construction, substantial improvements, and other development within the adopted regulatory floodway cannot result in any increase in flood levels during occurrence of the base flood discharge (100-year event).

State

As noted above, the project is within the jurisdictional limits of the San Francisco Bay RWQCB. Because the project proposes to disturb 1 acre or more, it is subject to Construction General Permit Order 2009-0009-DWQ, which regulates stormwater leaving construction sites. Under this order, site owners must notify the state, prepare and implement a SWPPP, and monitor the effectiveness of the plan. The SWPPP must outline measures which will protect hydrology and water quality resources, including groundwater, from negative impacts during construction.

Local

The City's Municipal Code section 15.08.570 requires that major drainage channels and conduits shall have sufficient capacity to contain the flows of a 50-year event.

The project is also subject to the following General Plan policies related to hydrology and water quality:

Policy CN3.1 – Stormwater Management

Develop strategies to promote stormwater management techniques that minimize surface water runoff in public and private developments. Utilize low-impact development techniques to best manage stormwater through conservation, on-site filtration, and water recycling

Policy CN3.2 - Water Quality

Work with public and private property owners to reduce stormwater runoff in urban areas to protect water quality in creeks, marshlands, and water bodies and the bays. Promote the use of sustainable and green infrastructure design, construction, and maintenance techniques on public and private lands to protect natural resources. Incorporate integrated watershed management techniques to improve surface water and groundwater quality, protect habitat and improve public health by coordinating infrastructure and neighborhood planning, and establishing best practices for reducing non-point runoff.

Policy CN3.3 - Flood Management

Minimize the flood hazard risks to people, property, and the environment. Address potential damage from a 100-year flood, tsunami, sea level rise and seiche, and implement and maintain flood management measures in all creeks and in all watersheds.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?			✓	
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?			✓	

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:			✓	
i. result in substantial erosion or siltation on- or off-site;			✓	
ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;			✓	
iii. 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; or			✓	
iv. impede or redirect flood flows?			✓	
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?			✓	
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?			✓	

Answers to Checklist Questions

a) Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?

Less than Significant Impact. Overall, the project proposes features that would have a beneficial effect on water quality. As discussed in the Project Description (Section 3), current water quality concerns associated with San Pablo Creek are a result of the failing creek bank and potential for continued landslide movement that could create sediment blockage and/or transport within the creek. Continued landslide movement also creates potential for utility spills that would impact water quality. The project addresses these water quality concerns by implementing slope stability features such as installing a concrete culvert and associated backfill to buttress the landslide, creating a stabilized rock swale to improve site drainage, and revegetating disturbed areas.

There is potential for construction activities to temporarily impact water quality at the both the project area and mitigation site. Activities such as grading and use of machinery near and within the water course are sources of potential pollution that could impact water quality within San Pablo Creek. Soil disturbance associated with vegetation removal and plantings at the mitigation site are also potential sources of pollution that could impact water quality within Rheem Creek.

The project would comply with all required permits, including the preparation and implementation of a SWPPP. This document includes measures to minimize impacts to stormwater quality during construction. Water quality BMPs following the

Caltrans Construction Site BMP Manual, detailed in Section 3.7, would be implemented as part of the project at both the project and mitigation sites.

The project would also comply with the General Plan requirement to implement BMPs to reduce erosion potential, including, but not limited to, scheduling construction during the dry season, temporary dewatering, temporary and permanent erosion and sediment controls, and preventing runoff during construction.

Additionally, during culvert construction in San Pablo Creek, the project proposes to use settling tanks to remove sediments from groundwater encountered during culvert excavation prior to discharging the water back into San Pablo Creek. There is no dewatering or work within the waterway associated with the Restoration Planting Plan at the Rheem Creek mitigation site.

With these protection measures, no significant impacts to surface or groundwater quality would occur.

Overall, the project would have a beneficial impact on water quality once implemented because the damaged streambank area would be stabilized from future sediment releases into San Pablo Creek.

b) Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

Less than Significant Impact. The project proposes to manage stormwater runoff by constructing a lined rock swale that would discharge runoff into San Pablo Creek (Figure 3). The swale would capture runoff from the cemetery property and Via Verdi roadway.

If groundwater is encountered during construction of the concrete box culvert, the area would be dewatered and placed into settling tanks to remove sediments prior to discharging groundwater back into San Pablo Creek. Water for the Sobrante Glen neighborhood is serviced by a water main from the East Bay Municipal Utility District; therefore, the temporary dewatering of groundwater would not decrease supplies and would have a less than significant impact on groundwater. The project area is not within a priority groundwater basin (Department of Water Resources 2019) and there are no applicable sustainable groundwater management plans associated with the project.

Because stormwater runoff and groundwater would be discharged back into the creek system, the project would not result in a decrease in groundwater supply, recharge, or prevent sustainable management of groundwater in the basin;

therefore, the project is anticipated to have a less than significant impact on groundwater resources.

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 or through the addition of impervious surfaces, in a manner which would:

i. Result in substantial erosion or siltation on- or off-site?

Less than Significant Impact. The project has incorporated slope stability, stormwater design, and construction controls into the design such that the project, once constructed, would not result in substantial erosion or siltation on- or off-site. The project would stabilize the failing bank of San Pablo Creek and would result in a reduction of sediment generation and transport once the landslide area is repaired. Impacts resulting from the project are anticipated to be beneficial.

ii. Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Less than Significant Impact. The project does not propose features that would increase runoff at the site, such as an increase in paved surfaces. The project proposes to deconstruct an existing paved surface and restore the area with native vegetation; this would have a beneficial impact on infiltration of surface runoff at the site. The new concrete culvert has been appropriately sized to capture surface runoff at the site that is discharging into San Pablo Creek. Construction of the new lined rock swale would also improve stormwater management of runoff to ensure discharge of flow into the creek and minimize risk of flooding.

iii. 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?

Less than Significant Impact. The project does not propose an increase in impervious coverage, other than placement of the culvert within San Pablo Creek. Placement of the culvert within the creek would not impede runoff from discharging into the creek. Additionally, the project proposes to improve site drainage and management of stormwater runoff by creation of a lined rock swale that would convey runoff from the cemetery property and Via Verdi and discharge into San Pablo Creek. Therefore, the project would have a less than significant impact on stormwater drainage systems and would not result in new substantial sources of polluted runoff.

During construction, potentially polluted runoff would be managed by the project specific SWPPP.

iv. Impede or redirect flood flows?

Less than Significant Impact. NCE conducted a hydraulic analysis to model scenarios of existing pre-project conditions within San Pablo Creek versus proposed project conditions of the new culvert.

Results of the analysis indicate that the project would not have significant adverse impacts to the hydrologic condition of San Pablo Creek, nor the water surface elevations associated with the 50-year and 100-year events as a result of the new culvert within San Pablo Creek (NCE 2018b). Therefore, impacts would be less than significant.

d) Is the project in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

Less than Significant Impact.

Flood Hazard

As shown in Figure 11, the portion of the project that lies within the San Pablo Creek corridor is within FEMA flood hazard *Zone A*. Zone A designated areas are considered high risk and are subject to inundation by the 1-percent annual chance flood event. The remainder of the project area is within *Zone X,* designated for areas of minimal flood hazard.

The proposed concrete culvert within San Pablo Creek *Zone A* was designed to comply with FEMA, City, and County Code regulations requiring that the channel and culvert be sized to convey the flows of the 50-year event, while ensuring that the flows of the 100-year event will be managed to minimize damages and overtopping. Because project features were designed to comply with these requirements, the area is not anticipated to become inundated or release pollutants during a flood event; therefore, impacts would be less than significant.

The remaining project activities that occur within *Zone X* would have no impact on flood hazard or potential release of pollutants due to flood hazard.

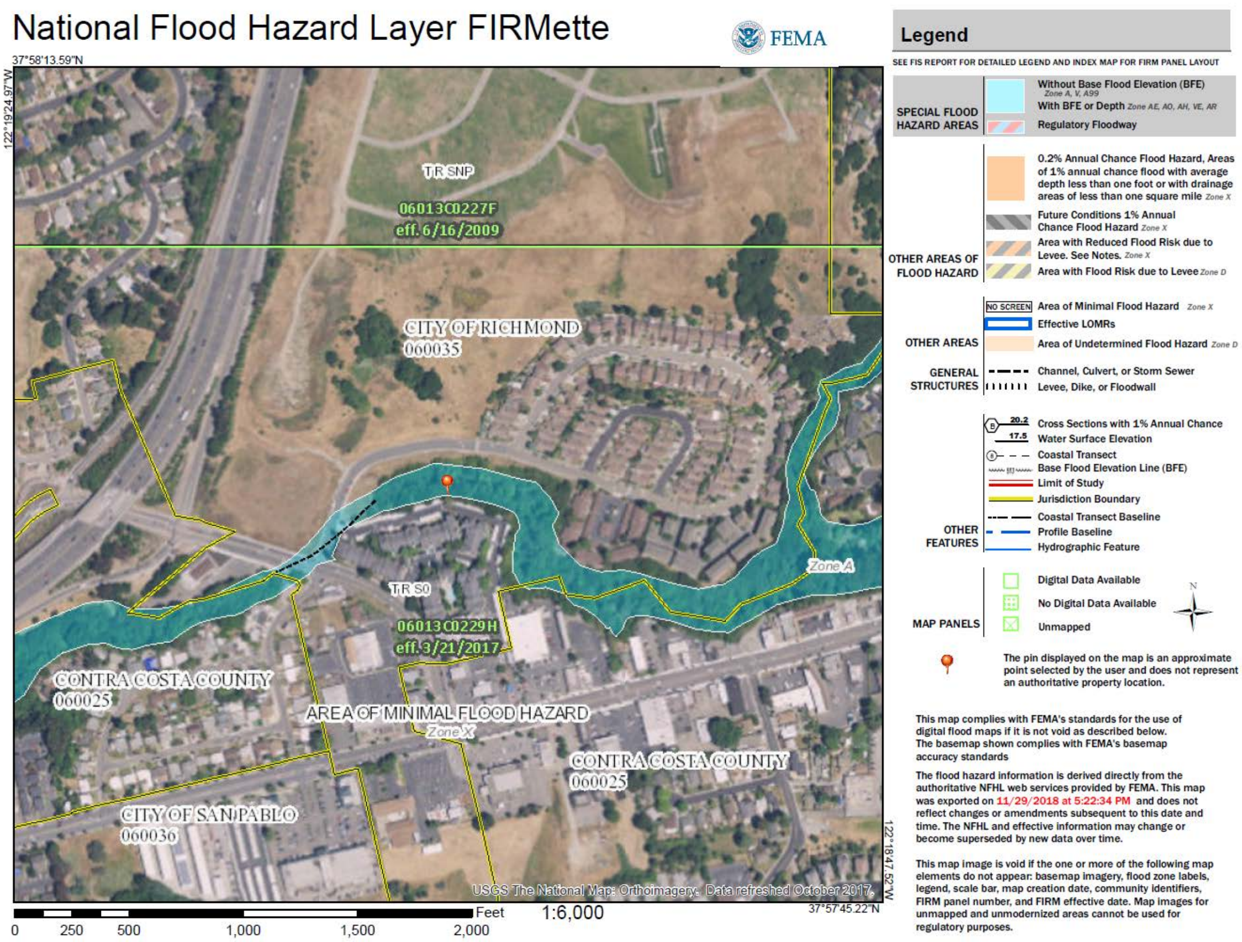


Figure 11. FEMA Flood Zone Map

Tsunami Hazard

According to the *Tsunami Inundation Map for Emergency Planning, Richmond Quadrangle*, tsunami inundation areas are located along San Pablo Bay and San Francisco Bay water's edge, and do not extend inland into the project area (California Emergency Management Agency 2009). Therefore, there would be no risk of impact from tsunami.

Seiche Hazard

A seiche is a standing wave oscillating in a landlocked body of water, such as a lake. Because the project area does not contain landlocked bodies of water, there would be no risk associated with seiche hazard.

e) Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Less than Significant Impact. The Basin Plan sets forth water quality standards for the surface and ground waters of the region. The project is not anticipated to conflict with water quality standards and would therefore not obstruct implementation of a water quality control plan.

The State Sustainable Groundwater Management Act requires local agencies of groundwater basins in high- or-medium priority areas to implement sustainable groundwater management plans. The project area is not within a priority groundwater basin (Department of Water Resources 2019) and therefore there are no applicable sustainable groundwater management plans associated with the project.

Additionally, the project proposes to manage runoff by constructing a lined rock swale that would discharge runoff into San Pablo Creek. Because runoff would be discharged into the creek system with only a minor relative change in culvert length, the project would not result in a decrease in groundwater supply or obstruct sustainable management of groundwater. Implementation of the Restoration Planting Plan would have no impact on groundwater resources.

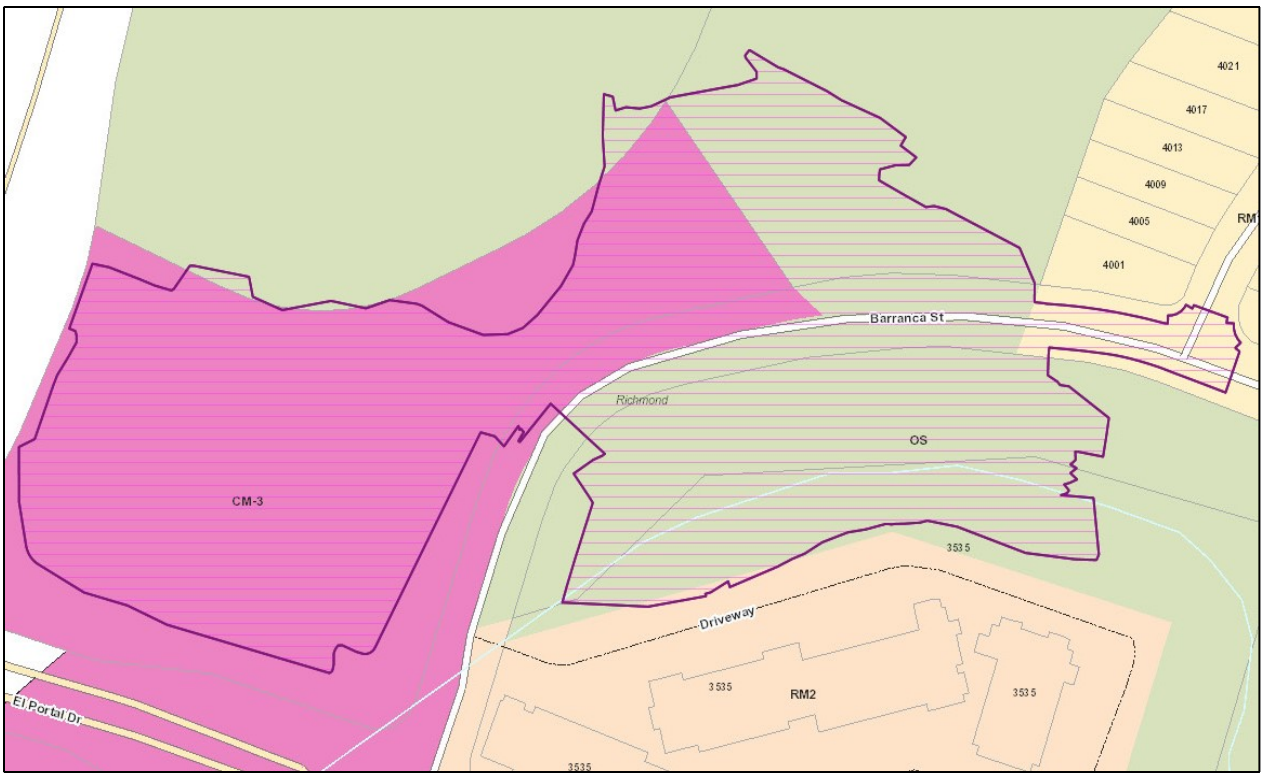
4.11 LAND USE & PLANNING

Environmental Setting

Project Area

The project area is located within the City of Richmond, Contra Costa County, California. The City is divided into zoning districts that correspond with General Plan land use designations.

The project area is zoned for mixed use with a commercial focus, residential, and open space (Figure 12). Specifically, the project covers the following zoning designations: CM-3: Commercial mixed-use, commercial emphasis; RM-1: Medium density multi-family residential; and OS: Open space. Within the project area, open space is designated for the San Pablo Creek riparian corridor, and a portion of the hillside above Via Verdi roadway, including part of the Cemetery Trust Property.



Source: City of Richmond Zoning Map, 2016

Figure 12. Project Area Zoning

Mitigation Site

The Mitigation site, adjacent to the Contra Costa College parking lot, is zoned for PCI – Public, Cultural, and Industrial (Figure 13). The corresponding designated land use for the mitigation site is public and civic use, and parks and other public areas, surrounded by single family low-density residential.

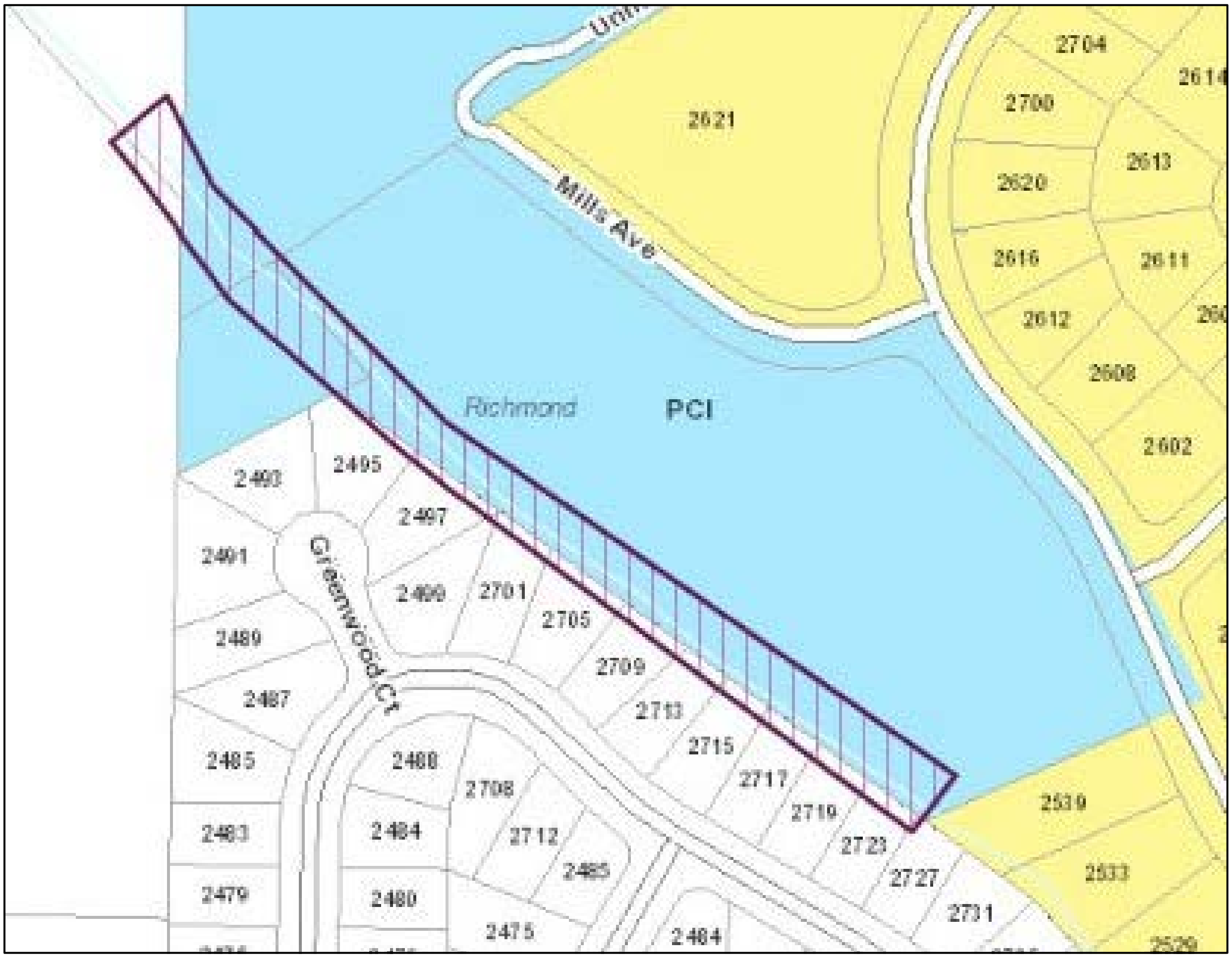


Figure 13. Mitigation Site Zoning
Source: City of Richmond Zoning Map, 2016

Regulatory Setting

State

California requires all cities to include a general plan land use element regulating development and allowable types of uses in specified areas. Government Code Section 65303 enables local jurisdictions to adopt additional elements to those required by State law in cases when they relate to the physical development of the jurisdiction.

The State also requires that general plans include a conservation element to address issues related to conservation, development, and utilization of natural resources (Government Code Section 65302d).

Local

The City relies on their General Plan and Zoning Ordinance to initiate design standards for development projects. The zoning districts implement the Land Use Element of the General Plan. All projects in the City must be consistent with the goals and policies of the General Plan.

The Conservation, Natural, Resources and Open Space element of the General Plan contains goals and policies concerned with managing all open space, undeveloped lands, and outdoor recreation areas including open space used for the preservation of natural resources, consistent with Government Code Section 65302. This element contains Policy CN1.1, which outlines the requirement to work with resource agencies to protect sensitive habitat and biological resources; specifically,

-Protect and restore creek corridors and riparian areas to ensure they function as healthy wildlife habitat and biological areas.

-Protect and restore creek corridors and riparian areas by restoring riparian habitat with appropriate vegetation and channel design; removing culverts and hardened channels where appropriate; improving creek access; avoiding future culverting or channelization of creeks; and ensuring appropriate and ongoing maintenance.

-At a minimum, require mitigation of impacts to sensitive species ensuring that a project does not contribute to the decline of the affected species populations in the region. Identify mitigations in coordination with the U.S. Fish and Wildlife service, the California Department of Fish and Game and other regulatory agencies.

Additional Open Space land use policies include:

Policy CN2.1 – Open Space and Conservation Areas: Preserve open space areas along the shoreline, creeks, and in the hills to protect natural habitat and maintain the integrity of hillsides, creeks and wetlands. Protect existing open space, agriculture lands and parks.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Physically divide an established community?				✓

b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?			✓	

Answers to Checklist Questions

a) Would the project physically divide an established community?

No Impact. The project would not physically divide an established community. The overall purpose of the project is to repair a roadway that serves as the only point of access to the Sobrante Glen neighborhood. Implementation of the project and repair of Via Verdi roadway would restore connectivity to the Sobrante Glen neighborhood and would have an overall beneficial impact on the established community.

b) Would the project cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

Less than Significant Impact. The project area contains open space, medium density residential, and medium intensity mixed use.

Construction activities would primarily occur within open space land use associated with the San Pablo Creek corridor and the Rolling Hills Memorial Park area that is upgradient from Via Verdi roadway where the landslide occurred.

Staging and revegetation within the Cemetery Trust Property would not conflict with the land use plan, policies, or regulations associated with medium intensity mixed use designation.

The General Plan land use designation for open space includes a broad range of areas such as wetlands, mudflats, creek corridors, and other natural preservation areas, as well as private lands used for recreation purposes or deed-restricted, or open space preservation (City of Richmond 2012). More specifically, this zoning district is intended for undeveloped publicly owned lands, visually significant open lands, water areas, and water habitat.

The project would comply with the land use plan, policies, and regulations adopted for the purpose of avoiding or mitigating environmental effects by implementing controls to protect or avoid impacts to sensitive resources and mitigate impacts that are unavoidable. As discussed in Section 3.7, the project would implement the conservation measures required by the USFWS Biological Opinion for the project.

For culvert construction and landslide repair activities that result in unavoidable impacts to San Pablo Creek and the ephemeral drainage culvert, the City will implement **Mitigation Measure BIO-2** (see Section 4.4, Biological Resources), which requires the City to obtain regulatory permits prior to construction (including implementation of the Restoration Planting Plan at the Rheem Creek mitigation site). These permits establish appropriate mitigation measures for impacts to waters of the U.S., waters of the State, and associated stream habitat that protect against significant impacts. The City shall comply with all mitigation measures identified in the permit approvals.

Because the project would comply with the City land use plan, policies, and regulations, as well as federal and state regulations administered by the permitting agencies adopted for the purpose of avoiding or mitigating environmental impacts, the proposed project would not conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

4.12 MINERAL RESOURCE

Environmental Setting

Minerals are naturally occurring chemical elements or compounds, or groups of elements and compounds, formed from inorganic processes and organic substances including, but not limited to, coal, peat, and oil-bearing rock, but excluding geothermal resources, natural gas, and petroleum. Rock, sand, gravel, and earth are also considered minerals when extracted by surface mining operations (City of Richmond 2012).

Mineral production in Richmond has been largely limited to sand, gravel, and rock products. Mining for manganese, crude oil, and clay once occurred the area. Mining for sandstone and crushed rock was until recently limited to one quarry on Canal Boulevard near the Port of Richmond and another at Point Molate. The Canal Boulevard quarry has been closed and remediated. The Point Molate quarry is focused on recycling and handling operations rather than extraction. No quarry operations currently operate or are anticipated in the future (City of Richmond 2012).

Regulatory Setting

Local

The General Plan contains Policy CN2.8 – Mineral Resources: Preserve mineral resources in undeveloped areas that have been classified by the State Mining and Geology Board as having statewide or regional significance for possible future extraction.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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?				✓

Answers to Checklist Questions

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?

No Impact. According to the State Mining and Geology Board and the General Plan, there are no state or regionally valuable mineral resources within the project boundary. The proposed project would therefore not result in the loss 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?

No Impact. According to the State Mining and Geology Board and the General Plan, there are no resource recovery sites associated with the project; therefore, there would be no impact.

4.13 NOISE

Environmental Setting

Noise is defined as a sound or series of sounds that are intrusive, objectional, or disruptive to daily life. Noise levels are measured in order to regulate ambient noise and protect residents of Richmond from exposure to excessive noise. Different land uses have different acceptability levels in terms of noise disturbance. For example, industrial uses have a higher noise threshold than residential uses. Noise standards provide a means of assessing exposure and compatibility based on specific uses. The State of California's General Plan Guidelines define land use compatibility standards for a range of noise exposure levels (City of Richmond 2012). Richmond's significant noise generators include motor vehicles, airports, railroads, Bay Area Rapid Transit, and a variety of stationary sources common to an urban setting.

Within the project area, existing sources of noise include motor vehicles from local roads and Interstate 80 as well as nearby urban sources.

Regulatory Setting

State

California requires a noise element of General Plans prepared in accordance with guidelines established by the State Department of Health Services' Office of Noise Control (Section 65302f). This requirement draws upon California Noise Control Act findings that: excessive noise is a serious hazard to public health and welfare, and exposure to certain levels of noise can result in physiological, psychological, and economic damage (California Noise Control Act of 1973 Code § 46010 (1975)).

Local

Noise Ordinance

The City's Noise Ordinance establishes noise limits and allowable hours for construction activities. However, Chapter 9.52.090 of the Municipal Code also states that construction equipment noise is exempt from the Noise Ordinance regulations on approved projects, including public works projects to protect public health and safety.

Environmental Checklist

Would the project result in:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			✓	
b) Generation of excessive groundborne vibration or groundborne noise levels?			✓	
c) For a project located within the vicinity of a private airstrip or 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 expose people residing or working in the project area to excessive noise levels?				✓

Answers to Checklist Questions

a) Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Less than Significant Impact. The City has determined that construction noise generated during projects that protect the public health and safety does not exceed the City's threshold of significance.

b) Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

Less than Significant Impact. Vibration is described in terms of frequency and amplitude. Unlike sound, there is no standard way of measuring and reporting amplitude. Construction activities may result in intermittent exposure of groundborne vibration to the project area from bulldozers and loaded trucks. The City has determined that construction noise generated during projects that protect the public health and safety does not exceed the City's threshold of significance.

None of the restoration planting activities proposed at the Mitigation Site would use vibratory equipment.

c) For a project located within the vicinity of a private airstrip or 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 expose people residing or working in the project area to excessive noise levels

No Impact. There are no airports in the City of Richmond. The City is served by two airports, the Oakland International Airport approximately 20 miles south of the City, and the San Francisco International Airport approximately 30 miles away. Aircraft using both airports fly over the City, but the City is outside their 65 dBA Community Noise Equivalent Level noise impact areas; therefore, the project would not expose construction workers to excessive aircraft noise.

4.14 POPULATION & HOUSING

Environmental Setting

As of 2018, the City had an estimated population of 108,853 residents and an estimated housing stock of 39,534 dwelling units (California Department of Finance 2013-2017). Via Verdi is the only access road to the Sobrante Glen neighborhood, which consists of approximately 85 single-family homes and 100 apartment units.

The mitigation site is surrounded by Contra Costa College facilities and residential communities. In fiscal year 2016-17, the college served more than 10,000 students and employed 948 full- and part-time faculty and staff (Emsi 2018).

Regulatory Setting

State

State law requires every jurisdiction in California to adopt a Housing Element as one of the seven mandated elements of the General Plan. Housing Element law mandates that local government adequately plan to meet the existing and projected housing needs of all economic segments of the community.

State law also requires the California State Department of Housing and Community Development to review local housing elements for compliance and to report its findings to the local government.

Local

The *5th Cycle Housing Element Update (2015-2023)* of the General Plan contains guidance, regulation, and housing policies.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Induce substantial unplanned 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 people or housing, necessitating the construction of replacement housing elsewhere?				✓

Answers to Checklist Questions

a) Would the project induce substantial unplanned 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)?

No Impact. The project would remediate slope failure with bank stabilization and a concrete culvert to provide safe public access to the residential community located at the end of Via Verdi. The proposed project and mitigation site would not induce population growth directly by adding new housing or commercials uses, or indirectly by adding new infrastructure.

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

No Impact. Implementing the proposed project would not influence population growth, either directly or indirectly. The project does not propose any removal or construction of features that would result in displacement of persons and would therefore not require construction or replacement housing elsewhere. There would be no impact.

4.15 PUBLIC SERVICES

Environmental Setting

Fire Protection

The Richmond Fire Department serves the project area at Via Verdi and the mitigation site at Rheem Creek. The Department consists of 85 professionals across seven stations; the closest stations to the proposed project area are:

- Station 68, located approximately 2.2 miles to the northwest of the project area
- Station 63, located approximately 2.9 miles to the east of the project area

Police Protection

Richmond maintains a Police Department of about 170 sworn officers. The Richmond Police Department serves the project area at Via Verdi and the mitigation site at Rheem Creek. The proposed project area is within Northern District Beat 9 and the mitigation site is within Northern District Beat 8. In case of emergencies, the community can reach an on-call first responder on a 24-hour basis at the City Emergency Operations Center.

Regulatory Setting

Local

The Public Safety and Noise Element of the General Plan identifies and evaluates public health and safety hazards, and outlines means of limiting unreasonable risks and minimizing losses that can occur as a result of natural or human-caused disasters. The element addresses emergency preparedness and coordinated response, police, fire protection, and emergency services.

Policies in the General Plan relevant to the proposed project include the following:

- *Policy SN2.2 – Level of Service*: Provide a high level of police and fire service in the community.
- *Policy SN2.3 – Fire Safety*: Regularly update policies that will protect the community and its urban and natural areas from fire hazards.
- *Policy SN3.1 – Emergency and Disaster Preparedness*: Maintain staff and facilities that will continue to support a coordinated and effective response to emergencies and natural disasters throughout the City.

Environmental Checklist

Would the project result in:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Substantial adverse physical impacts associated with the need and/or provision of new or physically altered governmental services and/or facilities in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services?				✓
i. Fire protection?				✓
ii. Police protection?				✓
iii. Schools?				✓
iv. Parks?				✓
iv. Other public facilities?				✓

Answers to Checklist Questions

a) Would the project result in substantial adverse physical impacts associated with the need and/or provision of new or physically altered governmental services and/or facilities in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services?

i. Fire protection?
ii. Police protection?
iii. Schools?
iv. Parks?
v. Other public facilities?

No Impact. The proposed project would stabilize Via Verdi, the only access road that leads to the Sobrante Glen neighborhood. Currently, residents and emergency services must use an emergency access road in order to reach the residential area. Once the project is completed, it will provide a stable emergency access road for fire and police services to that community.

The project would not increase dwelling units or road capacity at either Via Verdi or the Rheem Creek mitigation site, and thus involves no increase in demand for public services such as schools, libraries, or parks.

During construction, the project may have a negligible increase in emergency services demand to protect construction equipment or personnel; this potential demand increase can be adequately served by existing services. There are adequate fire and police services to protect the construction sites and construction workers without affecting emergency services ratios, response times or other performance objectives. Therefore, the proposed project would not require new or physically altered governmental services and/or facilities in order to maintain acceptable service ratios, response times, or other performance objectives.

4.16 Recreation

Environmental Setting

Regional and State Parks

Richmond has approximately 5,718 acres of regional and state parklands. These parklands provide active and passive recreational opportunities for residents and a rich plant and animal habitat. These parklands range in character from large-scale hillside open space areas to shoreline parks.

There are no designated recreational areas within the project area; however, the open space land use within the project area boundary could be used passively for recreational purposes. Designated land use for the proposed mitigation site is public and civic use, and parks and other public areas, as the area is adjacent to the Contra Costa College facilities.

Regulatory Setting

The General Plan contains a Parks and Recreation Element that provides direction for developing and maintaining a comprehensive system of quality parks, recreational facilities, programs, support services and open space. The goals, policies and implementing actions within this General Plan element are focused to preserve resources and enrich parks and recreational offerings (City of Richmond 2012).

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) 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) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				✓

Answers to Checklist Questions

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?*

No Impact. The project is a landslide and roadway repair project. The project does not include recreational features or facilities or require construction or expansion of recreational facilities because the project does not influence population growth. Population growth is the main driver for new or expansion of facilities; therefore, there would be no effect on recreation and no subsequent environmental impact from construction or expansion activities.

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

No Impact. The project does not include recreational facilities or improvement, such as trail biking or connectivity, or induce population growth that would lead to an increased demand for recreational services; therefore, there is no potential for the project to cause a significant environmental impact from those features.

4.17 TRANSPORTATION

Environmental Setting

Via Verdi is an approximately 35-foot-wide collector street that serves as the only access to the Sobrante Glen neighborhood. Following landslide damage in 2017, the road was closed due to safety reasons. Residents are currently accessing the Sobrante Glen neighborhood via an approximately 650-foot-long emergency access road that was constructed following the landslide.

Photos 11-13 in **Appendix A** depict the temporary emergency access road; Photos 14-17 depict existing conditions of Via Verdi roadway damage.

Regulatory Setting

State

In December 2018, the California Natural Resources Agency certified and adopted the CEQA Guidelines update package. The CEQA Guidelines 2019 update added Section 15064.3 (Senate Bill 743), which describes the specific considerations for evaluating a project's transportation impacts. The section focuses on using vehicle miles traveled (VMT) as a measure for transportation impacts.

While public agencies may immediately apply Section 15064.3 of the updated Guidelines, statewide application is not required until July 1, 2020. Projects for which a Notice of Preparation will be issued any time after December 28, 2018 should consider including an analysis of VMT/induced demand if the project has the potential to increase VMT (Governor's Office of Planning and Research [OPR] 2018), particularly if the project will be approved after July 2020.

Local

The Circulation Element of the General Plan complies with the State mandate that general plans include a circulation element regulating the location and extent of transportation modes, accessways, and thoroughfares in the City (California Government Code Section 65302b). As required by State law, the Circulation element correlates with the Land Use and Urban Design Element of the General Plan (City of Richmond 2012).

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?				✓
b) Would the project conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b)?			✓	
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				✓
d) Result in inadequate emergency access?				✓

Answers to Checklist Questions

a) Would the project conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

No Impact. The project proposes to repair and reopen an existing transportation roadway that was closed to vehicle, pedestrian, and bike access due to landslide damage. A temporary emergency access road was constructed to provide access to the Sobrante Glen neighborhood. Once Via Verdi is repaired and reopened, the temporary emergency access road would be demolished, and the impacted area revegetated to natural conditions. The project does not propose new transportation facilities. The project proposes to repair and reopen an existing roadway, which would have beneficial impact on transportation circulation.

b) Would the project conflict or be inconsistent with CEQA Guidelines § 15064.3, subdivision (b)?

Less than Significant Impact. As discussed in the Regulatory Setting section, CEQA Guidelines § 15064.3, subdivision (b) pertain to use of VMT to analyze transportation impacts. Because the project does not propose new transportation facilities, features, routes, or land development that would produce vehicle trips, there would be no impact on VMT from such uses. Construction equipment and worker vehicles would generate vehicle trips for the duration of construction. This would produce a temporary, minor addition to existing VMT. Therefore, the project would have a less than significant impact on regional VMT.

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

No Impact. The purpose of the project is to stabilize and reopen Via Verdi road with an increased factor of safety. Via Verdi would be repaired in its original alignment and the project does not propose new features that would increase hazards due to a design feature or incompatible use. Slope stabilization and subsequent repair of Via Verdi would have a beneficial impact on safety.

d) Would the project result in inadequate emergency access?

No Impact. The proposed project will stabilize Via Verdi, the only access road that leads to the Sobrante Glen neighborhood. Once the project is completed, it will provide a stable emergency access road for fire and police services to that community. The existing emergency access road will remain open for use until construction of the project is completed.

Although the City does not have an adopted emergency plan for the project area, the project would improve emergency response capabilities by stabilizing, repairing, and reopening the neighborhood's only access road.

4.18 TRIBAL CULTURAL RESOURCES

Environmental Setting

The Bay Area has been inhabited by prehistoric peoples since the terminal Pleistocene (Moratto 1984). By the time of Spanish settlement in 1776, seven native languages were spoken within the region including Southern Pomo, Wapo, Patwin, Coast Miwok, Bay Miwok, Karkin Costanoan, and San Francisco Costanoan (Milliken et al. 2007).

Ethnographic literature indicates that the region surrounding the project APE was near the northwestern extent of the Ohlone or Costanoan people's pre-contact territory (Levy 1978). Their territory ranged from the San Francisco Peninsula in the north to Big Sur in the south and from the Pacific Ocean in the west to the Diablo Range in the east. Their vast region included the San Francisco Peninsula, Santa Clara Valley, Santa Cruz Mountains, Monterey Bay area, as well as present-day Alameda County, Contra Costa County, and the Salinas Valley.

The Ohlone people today belong to one of several geographically distinct groups. The Muwekma Ohlone Tribe has members from around the Bay Area and comprises descendants of the Ohlones from the San Jose, Santa Clara, and San Francisco missions. The Ohlone Costanoan Esselen Nation, consisting of descendants of intermarried Rumsen Costanoan and Esselen speakers of Mission San Carlos Borromeo, are centered within the Greater Monterey Bay Area. The Amah-Mutsun Tribe, located inland from Monterey Bay, are descendants of Mutsun Costanoan speakers of Mission San Juan Bautista. The Costanoan Rumsien Carmel Tribe of Pomona/Chino are descendants from Mission San Carlos and now reside in southern California (NCE 2019b).

The Cultural Resource Inventory Report prepared for the project is included as **Appendix K**.

Regulatory Setting

Federal

Section 106 of the NHPA (36 CFR Part 800) requires federal agencies to take into account the effects of undertakings on historic properties through consultation with State Historic Preservation Offices (SHPO), Tribal Historic Preservation Offices (THPO), and tribes. Consultation with tribes must recognize a government-to-government relationship between the undertaking's lead federal agency and Native American tribes identified by the NAHC. Consultation enables SHPO, THPO, and tribes to identify concerns and potential effects of an undertaking on historic properties, including those of traditional religious and cultural importance, advise on the identification and evaluation of those historic properties, and participate in the resolution of determined adverse effects.

Under 33 CFR Part 325 and the USACE Tribal Consultation Policy, it is stated that tribal consultation will be directed by USACE at the district or division level under the guidance of a Tribal Liaison (USACE 2012, 2013). It is, therefore, the assumed responsibility of the USACE to conduct Native American consultation for the project.

State

Assembly Bill 52

AB 52 establishes that "[a] project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment" (Pub. Resources Code, § 21084.2). To help determine whether a project may have such an effect, the PRC requires a lead agency to consult with any California Native American tribe that requests consultation and is traditionally and culturally affiliated with the geographic area of a proposed project. That consultation must take place prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report for a project (Pub. Resources Code, § 21080.3.1).

By including tribal cultural resources early in the CEQA process, the California legislature intended to ensure that local and Tribal governments, public agencies, and project proponents would have information available early in the project planning process to identify and address potential adverse impacts to tribal cultural resources (OPR 2017).

California Health and Safety Code

The California Health and Safety Code (HSC) Section 7050.5b, requires in the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains until the coroner of the county in which the human remains are discovered has determined, in accordance with Chapter 10 (commencing with Section 27460) of Part 3 of Division 2 of Title 3 of the Government Code, that the remains are not subject to the provisions of Section 27491 of the Government Code or any other related provisions of law concerning investigation of the circumstances, manner and cause of any death, and the recommendations concerning the treatment and disposition of the human remains have been made to the person responsible for the excavation, or to his or her authorized representative, in the manner provided in Section 5097.98 of the Public Resources Code. The Coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or State lands (HSC Section 7050.5[b]).

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in PRC § 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i. Listed or eligible for listing in CRHR, or in a local register of historical resources as defined in PRC § 5020.1(k), or		✓		
ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC § 5024.1. In applying the criteria set forth in subdivision (c) of PRC § 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.		✓		

Answers to Checklist Questions

a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in PRC § 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

i. Listed or eligible for listing in CRHR, or in a local register of historical resources as defined in PRC § 5020.1(k)?

ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC § 5024.1. In applying the criteria set forth in subdivision (c) of PRC § 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?

Less than Significant Impact with Mitigation Incorporated. In accordance with AB 52 and Section 106 of NHPA, Native American tribes (tribes) identified by the Native American Heritage Commission (NAHC) were invited to consult on the project. Two sets of NAHC requests and tribe letter invitations were sent out for the project.

Native American correspondence was initiated by NCE with a letter and attached map to the NAHC on December 12, 2017. The letter requested a contact list for regional tribes and a record search of their Sacred Lands File (SLF) for the project area's archival study area. A response was received from the NAHC on December 15, 2017, which indicated positive SLF results within the project area. Inquiry letters were mailed on City letterhead to the tribes identified by NAHC on December 18, 2017.Once the Rheem Creek mitigation site was identified, a second request was sent to NAHC on October 31, 2018. A response was received on November 19, 2018, indicating positive SLF results within the mitigation site and an updated tribe list consistent with the original. An updated letter was sent to interested Native American tribes on June 11, 2019, providing another opportunity for the tribes to consult on the project, and follow-up phone calls were made the week of June 27, 2019. Five of the tribes identified by the NAHC claimed the letters. No requests for consultation were received. A detailed correspondence log is included in Appendix K.

As mentioned above, federal regulations state that tribal consultation will be directed by USACE at the district or division level under the guidance of a Tribal Liaison (USACE 2012, 2013). While USACE has assumed responsibility for Section 106 responsibilities to conduct Native American consultation for the project (Email from Dina Ryan, USACE, to Molly Laitinen, NCE, dated November 29, 2018), the City's responsibilities under AB 52 are a separate requirement.

Because the SLF search identified known Sacred Lands in the project area and mitigation site, there may be a potential for project activities to inadvertently impact tribal cultural resources during ground-disturbing activities. Although the significance and depth below ground surface of these resources are unknown, inadvertently displacing, removing, or harming tribal cultural resources during construction would be considered a significant environmental impact.

Therefore, the project proposes Mitigation Measures TCR-1 through TCR-3 to ensure that construction crews are sensitive to potential cultural resources and understand the processes needed to protect them, and that avoidance and minimization measures and procedures for respectfully protecting inadvertent discoveries are implemented.

- ***Mitigation Measure TCR-1***: Conduct a Worker Environmental Awareness Program. The City shall require the contractor to provide a cultural resources and tribal cultural resources sensitivity and awareness training program (Worker Environmental Awareness Program [WEAP]) for all personnel involved in project construction, including field consultants and construction workers, before any project-related construction activities begin. The WEAP shall be developed in coordination with culturally affiliated Native American tribes and a qualified archaeologist, as defined by the Secretary of the

Interior's Professional Qualifications Standards for Archeology. The City may invite Native American representatives from interested culturally affiliated Native American tribes to participate.

The WEAP shall include relevant information regarding sensitive cultural resources and tribal cultural resources, including applicable regulations, protocols for avoidance, and consequences of violating State laws and regulations. The WEAP shall also describe appropriate avoidance and impact minimization measures for resources that could be located at the project area or mitigation site and provide procedures and contact information should workers encounter any potential cultural resources or tribal cultural resources. The WEAP will emphasize the requirement for confidentiality and culturally appropriate treatment of any discovery of significance to Native Americans and will discuss appropriate behaviors and responsive actions, consistent with Native American tribal values.

- ***Mitigation Measure TCR-2***: In the event that cultural resources or tribal cultural resources are discovered during construction, the following avoidance and minimization measures to avoid significant impacts and procedures to evaluate resources will be implemented:

  a. If cultural resources or tribal cultural resources (such as structural features, unusual amounts of bone or shell, artifacts, or human remains) are encountered at the project area or mitigation site during construction, work shall be suspended within 100 feet of the find (based on the apparent distribution of cultural materials), and the construction contractor shall immediately notify the project's City representative.

  b. Avoidance and preservation in place is the preferred manner of mitigating impacts to cultural resources and tribal cultural resources. This will be accomplished, if feasible, by several alternative means, including:

  - Recommendations for avoidance of unanticipated cultural resources and tribal cultural resources will be reviewed by the City representative, interested culturally affiliated Native American tribes and other appropriate agencies, in light of factors such as costs, logistics, feasibility, design, technology and social, cultural, and environmental considerations, and the extent to which avoidance is consistent with project objectives. Avoidance and design alternatives may include realignment within the project area to avoid cultural resources or tribal cultural resources, modification of the design to eliminate or reduce impacts to cultural resources or tribal cultural resources, or modification or realignment to avoid highly significant features within a cultural resource or tribal cultural resource.

- Native American representatives from interested culturally affiliated Native American tribes will be invited to review and comment on these analyses and shall have the opportunity to meet with the City representative and its representatives who have technical expertise to identify and recommend feasible avoidance and design alternatives, so that appropriate and feasible avoidance and design alternatives can be identified.
- If the discovered cultural resource or tribal cultural resource can be avoided, the construction contractor(s) shall install protective fencing outside the site boundary, including a 100-foot buffer area, before construction restarts and for the duration of construction, demarking the area as an "Environmentally Sensitive Area." The boundary of a cultural resource or a tribal cultural resource will be determined in consultation with interested culturally affiliated Native American tribes and tribes will be invited to monitor the installation of fencing. Use of temporary and permanent forms of protective fencing will be determined in consultation with Native American representatives from interested culturally affiliated Native American tribes.

c. If a cultural resource or a tribal cultural resource cannot be avoided, each resource shall be evaluated for CRHR eligibility through application of established eligibility criteria (CCR 15064.636), in consultation with consulting Native American tribes, as applicable.

d. If a cultural resource or a tribal cultural resource is determined to be eligible for listing in the CRHR, the City shall avoid damaging effects to the resource in accordance with California PRC Section 21084.3, if feasible. The City shall coordinate the investigation of the find with a qualified archaeologist (as described in **Mitigation Measure TCR-1**) and with interested culturally affiliated Native American tribes that respond to the City's invitation. As part of the site investigation and resource assessment, the City and the archaeologist shall consult with interested culturally affiliated Native American tribes to assess the significance of the find, make recommendations for further evaluation and treatment as necessary, and provide proper management recommendations should potential impacts to the resources be determined by the City to be significant. A written report detailing the site assessment, coordination activities, and management recommendations shall be provided to the City representative by the qualified archaeologist. These recommendations shall be documented in the project record. For any recommendations made by interested culturally affiliated Native American tribes that are not implemented, a justification for why the recommendation was not followed shall be provided in the project record.

e. If the City determines that the project may cause a significant impact to a tribal cultural resource, measures to avoid or minimize significant adverse impacts shall be identified in the consultation process to either avoid and preserve resources in place, and treat the resource with culturally appropriate dignity, taking into account the Tribal cultural values and meaning of the resource.

- ***Mitigation Measure TCR-3***: If an inadvertent discovery of human remains is made at any time during project-related construction activities or project planning, the City shall meet the following performance standards prior to implementing or continuing actions such as construction that may result in damage to or destruction of human remains:

  a. In accordance with the California Health and Safety Code (HSC), if human remains are encountered during ground-disturbing activities, the City shall immediately halt potentially damaging excavation in the area of the remains and notify the County Coroner and a professional archaeologist to determine the nature of the remains. The Coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or State lands (HSC Section 7050.5[b]). If the human remains are of historic age and are determined to be not of Native American origin, the City will follow the provisions of the HSC Section 7000 (et seq.) regarding the disinterment and removal of non-Native American human remains.

  b. If the Coroner determines that the remains are those of a Native American, he or she must contact the NAHC by phone within 24 hours of making that determination (HSC Section 7050[c]). After the Coroner's findings have been made, the archaeologist and the NAHC-designated Most Likely Descendant, in consultation with the landowner, shall determine the ultimate treatment and disposition of the remains. The responsibilities of the City for acting upon notification of a discovery of Native American human remains are identified in California PRC Section 5097.9 et seq.

Finding: *Implementation of* ***Mitigation Measures TCR-1, TCR-2, and TCR-3*** *would ensure that construction crews are sensitive to potential Tribal Cultural Resources and understand the processes needed to protect them, and that avoidance and minimization measures and procedures for respectfully protecting inadvertent discoveries are implemented, which would reduce the potential for impacts to Tribal Cultural Resources to less than significant.*

4.19 UTILITIES & SERVICE SYSTEM

Environmental Setting

The Via Verdi right-of-way serves as the alignment for utilities that service the Sobrante Glen neighborhood. These utilities include water, sanitary sewer, gas, electricity, and telecommunications. The 2017 landslide caused damage to utilities including water, stormwater, and sewer requiring temporary repairs.

An East Bay Municipal Utility District water main and a sanitary sewer line were damaged from the initial slide movement in February 2017. Both utilities were then replaced with above-grade pipes. In late March 2017, the City constructed the emergency bypass road above the landslide, and utilities (sanitary sewer, gas, and electric) were relocated along the shoulders of the bypass road in mid-April 2017 to maintain safe access for Sobrante Glen residents.

Environmental Checklist

Would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?			✓	
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?				✓
c) Result in a determination by 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?				✓
d) Generate solid waste in excess of State or local standards or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals??			✓	
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?			✓	

Answers to Checklist Questions

> *a) Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?*

Less than Significant Impact. The emergency bypass road and temporary utilities that were relocated along the shoulders of the emergency bypass road (i.e., gas, electrical, water, sewer) would be removed as part of the project. The area would then be revegetated to restore the area impacted by the emergency bypass road. All utilities would be restored underground within the Via Verdi right-of-way, including sewer, gas, electrical, telecom, and drinking water supply to provide safe and reliable service.

The project does not propose construction or expansion of facilities which would have an impact on the need for new or expanded utility facilities. The repair and replacement of the utilities are ancillary to the landslide repairs and there are no significant environmental effects related to their repair within Via Verdi.

> *b) Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?*

No Impact. Slope stabilization and repair of Via Verdi would have no impact on water usage. The project does not propose features that would require water services; therefore, there would be no impact.

> *c) Would the project result in a determination by 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?*

No Impact. The project does not involve direct or indirect discharge of wastewater to sanitary sewer or on-site septic systems. The project would not utilize the sanitary sewer system for dewatering; collected water will be placed in settling tanks before being released back into the creek. No demand for wastewater treatment or facilities would occur as a result of the project. The project would not create wastewater and therefore would have no impact on a wastewater treatment operator.

d) Would the project generate solid waste in excess of State or local standards or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

e) Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

Less than Significant Impact. Construction activities associated with the project would generate solid wastes requiring disposal at area landfills. Waste generated during project construction would be limited to vegetation debris, asphalt, and road subgrade, some of which will be recycled on-site. Waste generation would be temporary during construction and would not reduce available capacities at existing landfills. Disposal of construction waste would comply with federal, State, and local statutes and regulations related to solid waste.

4.20 WILDFIRE

Environmental Setting

The California Department of Forestry and Fire Protection (CAL FIRE) designates fire hazard severity zones for areas under state jurisdiction. For areas under local jurisdiction, CAL FIRE identifies areas that the department considers to be Very High Fire Hazard Severity Zones (VHFHSZs); the local jurisdiction must choose whether to adopt the CAL FIRE recommendations. The project area nor mitigation site is within a state designated VHFHSZ; however, the City has adopted the CalFire recommended local designation of VHFHSZ. The project area is adjacent to an area of locally designated VHFHSZ (Figure 14).

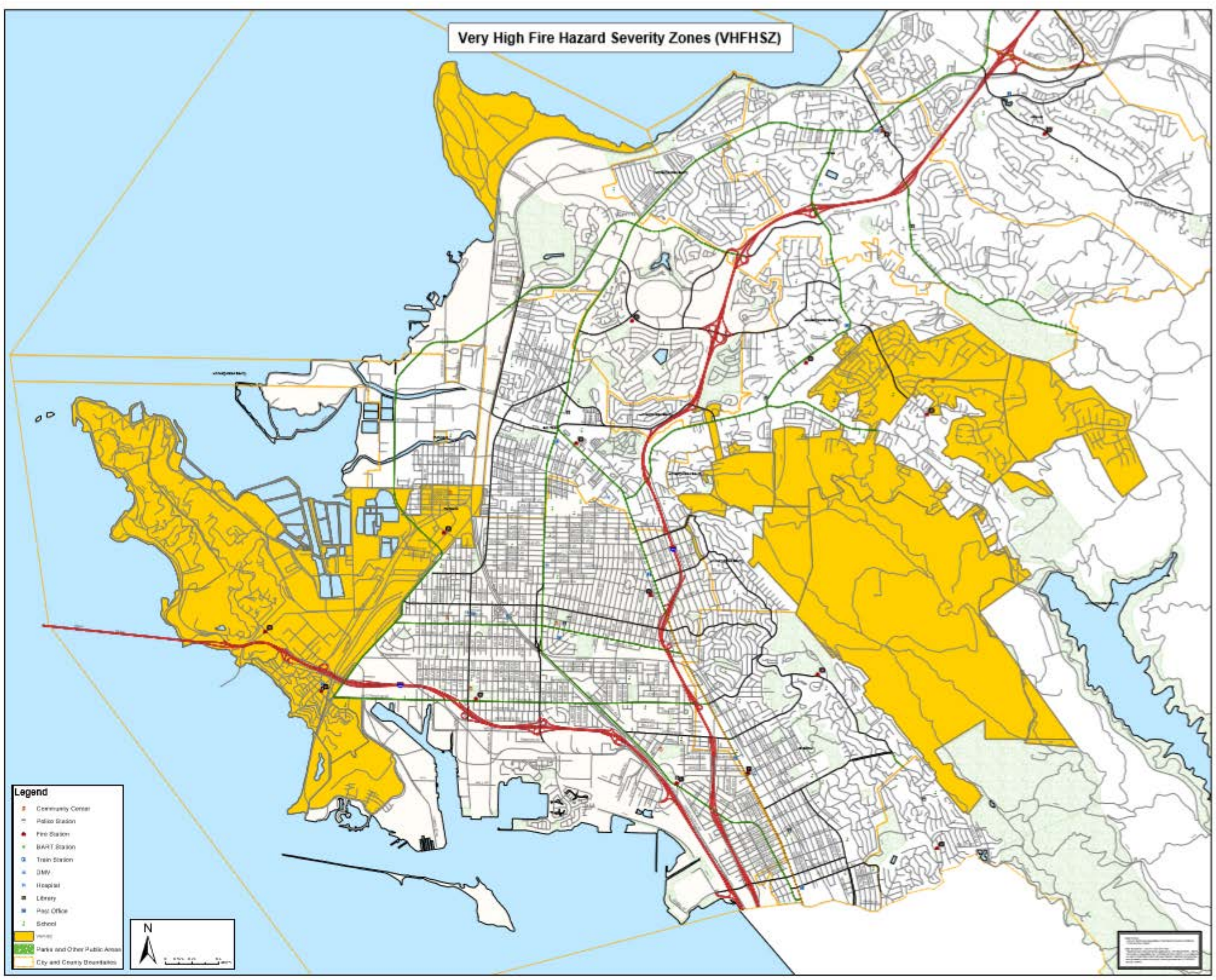


Figure 14. Local Designation Fire Hazard Severity Zone Map

Regulatory Setting

The City has adopted the CAL FIRE local designation VHFHSZ map. The Richmond Municipal Code (Section 8.16.080) establishes regulations for the construction of new roads, structures, and vegetation management within these zones.

Environmental Checklist

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?			✓	
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?				✓
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?				✓
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?				✓

Answers to Checklist Questions

If located in or near state responsibility areas or lands classified as very high fire hazard severity zones:

a) Would the project substantially impair an adopted emergency response plan or emergency evacuation plan?

Less than Significant Impact. The project area nor mitigation site is located within a State responsibility area. The project area is adjacent to locally designated VHFHSZ; however, none of the project features encroach into this boundary designation. Although the City does not have an adopted emergency plan for the project area, the project would improve fire response capabilities by stabilizing the neighborhood's only access road. Currently, emergency response and residents must use the existing emergency access road to reach the community. The emergency access road within the project area would remain open for use until construction of the project is completed.

b) Would the project, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire??

No Impact. The project would remediate slope failure problems that have disrupted access to and from the Sobrante Glen neighborhood. The project does not propose to construct or modify habitable structures within the project area or mitigation site that could expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire.

c) Would the project require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

No Impact. The proposed project does not require associated infrastructure or utilities that would exacerbate fire risk. The project improvements are designed to stabilize the subject landslide at Via Verdi and maintain reliable access for residents in the Sobrante Glen neighborhood. Plant removal and revegetation will be the only activities at the mitigation site.

d) Would the project expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

No Impact. The proposed project mitigates existing slope failure and drainage issues and would reduce the exposure of people or structures to future risks from wildfire caused slope failure and flooding in the project area. The project will stabilize the landslide slope and support drainage flows in the channel with a concrete culvert. Implementation of the Restoration Plating Plan at the mitigation site would stabilize temporarily disturbed soils while revegetation occurs and would not contribute to significant risks associated with downstream flooding or landslides.

4.21 MANDATORY FINDINGS OF SIGNIFICANCE

Environmental Issue	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to substantially 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, substantially 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, or 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?			✓	

Answers to Checklist Questions

a) Does the project have the potential to substantially 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, substantially 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?

Less than Significant Impact with Mitigation Incorporated. The results of the IS indicate that the project does not have the potential to substantially degrade the quality of environment with regards to agriculture and forestry, scenic resources, cultural resources, energy, greenhouse gas emissions, hydrology and water quality, hazards and hazardous materials, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation, utilities and services, or wildfires.

As discussed in Section 4.3, Air Quality, the project could temporarily degrade air quality during construction due to the release of particulate emissions (airborne dust) and emissions from construction equipment and vehicles. Although screening analysis revealed that project emissions are well below the BAAQMD thresholds for significance, the BAAQMD recommends the implementation of all Basic Construction Mitigation Measures whether or not construction-related emissions exceed applicable thresholds of significance. Because a health risk assessment was not conducted for residential uses near the construction site, the BAAQMD Basic Construction Mitigation Measures have been required as **Mitigation Measure AQ-1** to ensure health risks on nearby residential users are less than significant.

As discussed in Section 4.4, Biological Resources, project construction could potentially impact migratory birds. Implementation of **Mitigation Measure BIO-1** would reduce impacts to less than significant levels by requiring pre-construction surveys of the project area. Construction of the proposed culvert would result in permanent impacts to jurisdictional WOUS. including San Pablo Creek and an ephemeral drainage culvert, as well as riparian and woodland oak habitat. Impact within a jurisdictional WOUS. may cause significant impact to a sensitive habitat; however, **Mitigation Measure BIO-2** would reduce impacts to less than significant by requiring the City to apply for and secure a CWA Section 404 permit from the USACE, a Water Quality Certification from the San Francisco Bay RWQCB, and to submit an LSN to the CDFW, all of which require implementation of measures to mitigate for impacts. The Biological Opinion issued by the USFWS further determined that construction measures required as part of the project reduce the potential for impacts to the CRLF and AWS to less than significant. After **Mitigation Measures BIO-1 and BIO-2** are implemented, the project would not have the potential to degrade the quality of the environment, would not substantially reduce the habitat of a fish or wildlife species, would not cause a fish or wildlife population to drop below self-sustaining levels, would not threaten to eliminate a plant or animal community, and would not reduce the number or restrict the range of rare or endangered plants or animals.

As discussed in Section 4.7, Geology and Soils, the project area is situated atop the Orinda formation, which is fossiliferous and may contain paleontological resources. **Mitigation Measure GEO-1** would ensure that paleontological resources are protected during construction by requiring the City to coordinate with a qualified paleontologist to determine if the project area requires a detailed paleontological resource impact assessment. If the project is determined to have high or undetermined potential for significant paleontological resources, the City would be required to implement an adequate program for mitigating the impact.

Tribal Cultural Resources could potentially be present in the project area. The Sacred Lands Search indicated the project and mitigation site and vicinity had positive results in the search. Construction could inadvertently impact tribal cultural resources during ground-disturbing activities if there are resources in the APE, although no Native American tribes have responded to date with concerns. Inadvertently displacing, removing or harming tribal cultural resources during construction would be a significant impact. Implementation of **Mitigation Measures TCR-1, TCR-2, and TCR-3** would ensure that construction crews are sensitive to potential tribal cultural resources and understand the processes needed to protect them. The mitigation measures would also ensure that procedures for protecting inadvertent discoveries of cultural, tribal, and human remains are implemented, therefore reducing potentially significant impacts to less than significant.

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, or the effects of probable future projects.)?

Less than Significant Impact. The project proposes slope stabilization and road repair in response to a landslide. Without implementation of the project, there is potential for continued landslide movement and impacts to the roadway, utilities and service systems, and the creek system. The project addresses these potential negative cumulative effects by proposing repair strategies that would buttress the landslide and stabilize the road slope and creekbank areas.

The project does not result in an increase in population or growth that would require new housing, facilities, or structures that would cause environmental degradation. The project does not result in an exceedance for any criteria air pollutant for which the region is in non-attainment; therefore, there would be no cumulatively considerable net increase in criteria pollutants. The project would be consistent with local, state, and federal regulations pertaining to the protection and mitigation of impacts to sensitive resources, and compliance with the terms of permitting conditions would ensure that adverse impacts to resources are mitigated and would not result in cumulative impacts. All identified potentially significant impacts from construction and implementation would be reduced to less than significant with the mitigation measures that have been included in the project.

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

Less than Significant Impact. All potential impacts associated with construction and implementation of the project identified in this Mitigated Negative Declaration are either less than significant after mitigation or less than significant and do not require mitigation. No adverse effects on human beings, such as noise or hazards was identified. Additionally, implementation of BMPs and compliance with State and federal regulations protecting human and environmental health during construction, such as preparation of a SWPPP and Spill Prevention Plan, would be implemented. Therefore, the project would not result in environmental effects that cause substantial adverse effects on human beings either directly or indirectly.

Section 5 Mitigation Monitoring and Reporting Plan

CEQA requires review of any project that could have significant adverse effects on the environment. In 1988, CEQA was amended to require reporting on and monitoring of mitigation measures adopted as part of the environmental review process. This Mitigation Monitoring and Reporting Plan is designed to aid the City in their implementation and monitoring of measures proposed in the IS for the proposed project.

Table 6 provides details of the MMRP. The mitigation measures are taken from the IS and are assigned the same number as in the IS. The MMRP describes the actions that must take place to implement each mitigation measure, the timing of those actions, and the entities responsible for implementing and monitoring the actions.

In addition to the mitigation measures, the MMRP includes the USFWS Biological Opinion conservation measures and additional construction controls incorporated into the project in order to help the lead agency track implementation of these activities.

The table consists of the following columns:

- Monitoring and Reporting Action – Listing of the Mitigation Measure, Conservation Measure, or Construction Control from the IS.
- Implemented By – Entities required to implement the action(s).
- Monitored By – Entity responsible for monitoring the action(s).
- Monitoring Schedule – Time(s) when monitoring will be conducted.
- Verification of Compliance – Documentation that the required action was completed.

Table 6. Mitigation Monitoring and Reporting Plan

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Mitigation Measures					
Air Quality Mitigation Measure AQ-1					
The following measures shall be implemented to minimize impacts to air quality during construction: *a.* All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered at least two times per day. *b.* All haul trucks transporting soil, sand, or other loose material off-site shall be covered. *c.* Visible mud or dirt track-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 is prohibited. *d.* All vehicle speeds on unpaved roads shall be limited to 15 mph. *e.* All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. *f.* 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 the California Code of Regulations [CCR]). Clear	Project Contractors, BAAQMD, and City of Richmond Capital Projects Division	BAAQMD and City of Richmond Capital Projects Division	Capital Projects Division to verify inclusion of BAAQMD BMPs in applicable construction plans and specifications submitted before construction. City of Richmond Capital Projects to inspect site during construction to ensure compliance with project construction plans.	Prior to any earthwork. Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Air Quality Mitigation Measure AQ-1 (cont.)					
signage shall be provided for construction workers at all access points. *g.* All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. *h.* A publicly visible sign shall be posted with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.					
Biology Mitigation Measure BIO-1					
If any construction activities (e.g., grubbing or grading) are scheduled during the bird nesting season (typically defined by CDFW as February 1 to September 1), the City or approved construction contractor shall retain a qualified biologist to conduct a pre-construction survey of the project area and a 100-foot buffer, as access is available, to locate active bird nests, identify measures to protect the nests, and locate any other special status species. The pre-construction survey shall be conducted no more than 14 days prior to the implementation of	Project Contractors shall hire a qualified biologist to conduct pre-construction surveys as described. Project Contractors shall prepare construction	Project Contractors City of Richmond Capital Projects Division and Biologist	Review and approve a qualified biologist. Review pre-construction survey reports. If active nests are found, inspect construction site to confirm buffer zones.	No more than 14 days before start or restart of construction during the months of February through August.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
construction activities (including staging and equipment storage). Any active nest should not be disturbed until young have fledged or under the direction provided by a qualified biologist. Any special status species shall not be disturbed without the direction of a qualified biologist. If an active nest is found during construction, disturbance shall not occur without direction from a qualified biologist.	plans that incorporate pre-construction surveys and buffer zones. If required, avoidance procedures shall be implemented.				
Biology Mitigation Measure BIO-2					
Prior to construction, the City shall obtain a Section 404 CWA permit from the USACE and a Section 401 Water Quality Certification from the San Francisco Bay RWQCB, and an LSN or LSA from the CDFW. The City shall comply with all mitigation measures identified in the permit approvals.	City of Richmond Capital Projects Division	U.S. Army Corps of Engineers San Francisco Bay RWQCB California Department of Fish and Wildlife	Agencies to review and approve the City of Richmond prepared permit applications.	Review and approval of applicable permits prior to construction.	*Verified by:* *Date:*
Geology Mitigation Measure GEO-1					
The City shall retain a professional qualified paleontologist to review the Paleontological Resource Potential Maps and determine if the project area contains the potential for paleontological resources. The City shall coordinate for a “request for opinion” from a qualified professional paleontologist, state	Project Contractor and qualified Paleontologist	City of Richmond Capital Projects Division	Review and approval of Paleontologist. If resources are encountered, Contractor to verify work is suspended as required, review and approve paleontologist and paleontologist’s recommendations.	Prior to and during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
paleontological clearinghouse, or an accredited institution with an established paleontological repository housing paleontological resources from the region of interest. If the paleontological resource potential of a rock unit cannot be determined from the literature search and specimen records, a field survey by a qualified professional paleontologist will be necessary to determine the fossiliferous potential and the distribution or concentrations of fossils within the extent of the rock units present in a specific project area.		Project Contractor			
Tribal Cultural Resources Mitigation Measure TCR-1					
Conduct a Worker Environmental Awareness Program. The City shall require the contractor to provide a cultural resources and tribal cultural resources sensitivity and awareness training program (Worker Environmental Awareness Program [WEAP]) for all personnel involved in project construction, including field consultants and construction workers, before any project-related construction activities begin. The WEAP shall be developed in coordination with culturally affiliated Native American tribes and a qualified archaeologist, as defined by the Secretary of the Interior's Professional Qualifications Standards for Archeology. The City may invite Native American representatives from interested culturally affiliated Native American tribes to participate. The WEAP shall include relevant information regarding sensitive cultural resources and tribal cultural resources, including applicable regulations, protocols	Project Contractor	City of Richmond Capital Projects Division	Verify attendance and training by all project personnel prior to beginning work onsite.	Prior to construction commencement.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
for avoidance, and consequences of violating State laws and regulations. The WEAP shall also describe appropriate avoidance and impact minimization measures for resources that could be located at the project area or mitigation site and provide procedures and contact information should workers encounter any potential cultural resources or tribal cultural resources. The WEAP will emphasize the requirement for confidentiality and culturally appropriate treatment of any discovery of significance to Native Americans and will discuss appropriate behaviors and responsive actions, consistent with Native American tribal values.					
Tribal Cultural Resources Mitigation Measure TCR-2					
In the event that cultural resources or tribal cultural resources are discovered during construction, the following avoidance and minimization measures to avoid significant impacts and procedures to evaluate resources will be implemented: If cultural resources or tribal cultural resources (such as structural features, unusual amounts of bone or shell, artifacts, or human remains) are encountered at the project area or mitigation site during construction, work shall be suspended within 100 feet of the find (based on the apparent distribution of cultural materials), and the construction contractor shall immediately notify the project's City representative. Avoidance and preservation in place is the preferred manner of mitigating impacts to cultural resources and tribal cultural resources. This will be accomplished, if feasible, by several alternative means, including:	Project Contractor and Archaeologist	Contractor, City of Richmond Capital Projects Division, and Archaeologist	Review and approval of archaeologist. Review and approval of the construction plan that includes archaeological mitigation. Inspect site during construction.	Prior to construction. Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Recommendations for avoidance of unanticipated cultural resources and tribal cultural resources will be reviewed by the City representative, interested culturally affiliated Native American tribes and other appropriate agencies, in light of factors such as costs, logistics, feasibility, design, technology and social, cultural, and environmental considerations, and the extent to which avoidance is consistent with project objectives. Avoidance and design alternatives may include realignment within the project area to avoid cultural resources or tribal cultural resources, modification of the design to eliminate or reduce impacts to cultural resources or tribal cultural resources, or modification or realignment to avoid highly significant features within a cultural resource or tribal cultural resource. Native American representatives from interested culturally affiliated Native American tribes will be invited to review and comment on these analyses and shall have the opportunity to meet with the City representative and its representatives who have technical expertise to identify and recommend feasible avoidance and design alternatives, so that appropriate and feasible avoidance and design alternatives can be identified. If the discovered cultural resource or tribal cultural resource can be avoided, the construction contractor(s) shall install protective fencing outside the site boundary, including a 100-foot buffer area, before construction restarts and for the duration of construction, demarking the area as an “Environmentally Sensitive Area." The boundary of a cultural resource or a tribal cultural resource will be determined in consultation with interested culturally					

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
affiliated Native American tribes and tribes will be invited to monitor the installation of fencing. Use of temporary and permanent forms of protective fencing will be determined in consultation with Native American representatives from interested culturally affiliated Native American tribes. If a cultural resource or a tribal cultural resource cannot be avoided, each resource shall be evaluated for CRHR eligibility through application of established eligibility criteria (CCR 15064.636), in consultation with consulting Native American tribes, as applicable. If a cultural resource or a tribal cultural resource is determined to be eligible for listing in the CRHR, the City shall avoid damaging effects to the resource in accordance with California PRC Section 21084.3, if feasible. The City shall coordinate the investigation of the find with a qualified archaeologist (as described in Mitigation Measure TCR-1) and with interested culturally affiliated Native American tribes that respond to the City's invitation. As part of the site investigation and resource assessment, the City and the archaeologist shall consult with interested culturally affiliated Native American tribes to assess the significance of the find, make recommendations for further evaluation and treatment as necessary, and provide proper management recommendations should potential impacts to the resources be determined by the City to be significant. A written report detailing the site assessment, coordination activities, and management recommendations shall be provided to the City representative by the qualified archaeologist. These recommendations shall be documented in the project record. For any recommendations made by interested culturally affiliated Native American tribes					

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
that are not implemented, a justification for why the recommendation was not followed shall be provided in the project record. If the City determines that the project may cause a significant impact to a tribal cultural resource, measures to avoid or minimize significant adverse impacts shall be identified in the consultation process to either avoid and preserve resources in place, and treat the resource with culturally appropriate dignity, taking into account the Tribal cultural values and meaning of the resource.					
Tribal Cultural Resources Mitigation Measure TCR-3					
If an inadvertent discovery of human remains is made at any time during project-related construction activities or project planning, the City shall meet the following performance standards prior to implementing or continuing actions such as construction that may result in damage to or destruction of human remains: In accordance with the California Health and Safety Code (HSC), if human remains are encountered during ground-disturbing activities, the City shall immediately halt potentially damaging excavation in the area of the remains and notify the County Coroner and a professional archaeologist to determine the nature of the remains. The Coroner is required to examine all discoveries of human remains within 48 hours of receiving notice of a discovery on private or State lands (HSC Section 7050.5[b]). If the human remains are of historic age and are determined to be not of Native American origin, the City will follow the provisions of the HSC Section 7000 (et seq.) regarding	Project Contractor and Archaeologist	Contractor, City of Richmond Capital Projects Division, and Archaeologist	City to verify mitigation measure on construction plans. Inspect site during construction to ensure compliance with project construction plans.	Prior to construction. Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
the disinterment and removal of non-Native American human remains. If the Coroner determines that the remains are those of a Native American, he or she must contact the NAHC by phone within 24 hours of making that determination (HSC Section 7050[c]). After the Coroner's findings have been made, the archaeologist and the NAHC-designated Most Likely Descendant, in consultation with the landowner, shall determine the ultimate treatment and disposition of the remains. The responsibilities of the City for acting upon notification of a discovery of Native American human remains are identified in California PRC Section 5097.9 et seq.					
Conservation Measures Incorporated into Project					
Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the USFWS has been received that the biologist(s) is qualified to conduct the work. The USFWS-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.	City of Richmond Capital Projects Division	USFWS	Submit the name(s) and credentials of biologists who will conduct activities specified in the Conservation Measures.	Within 15 calendar days, prior to the onset of construction activities.	*Verified by:* *Date:*
Before any construction activities begin, a USFWS-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the AWS and the CRLF and their habitats, the importance of the AWS and the	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects	Conduct training session for all construction personnel.	Before construction activities begin.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
CRLF and their respective habitats, the general measures that are being implemented to conserve the AWS and the CRLF as they relate to the proposed project, the penalties for non-compliance, and the boundaries within which the proposed project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers will sign a form stating that they attended the program and understand all protection measures for the AWS and the CRLF.		Division and USFWS	Construction workers sign form confirming attendance and understanding of protection measures for AWS and CRLF.		
Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a USFWS-approved biologist to ensure that no AWS or CRLF are present. This survey is not intended to be a protocol-level survey, but rather one designed to verify that no AWS or CRLF are present within the construction area before construction activities begin. Two pre-construction surveys for CRLF and AWS will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected, and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any CRLF are found, the USFWS will be contacted, and the USFWS-approved biologist will be allowed sufficient time to move any CRLF from the work site before work activities begin. If any AWS are found, all activities will cease, the USFWS will be immediately contacted, and no other actions will be taken without authorization from the USFWS. Only USFWS-approved biologists will participate in activities associated with the capture, handling, and monitoring	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	Conduct preconstruction surveys per measure. If any CRLF or AWS are found, all activities will cease, and the USFWS will be immediately contacted. Only approved biologist(s) will participate in activities associated with contact of AWS or CRLF per instructions in measure.	Prior to the initiation of excavation, construction, or vehicle operation; one within 48 hours prior to construction and one within 24 hours prior to construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
of CRLF. Any biologist involved with the surveying/ handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.					
Immediately after the second survey, construction fencing and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The USFWS-approved biologist will supervise the installation of the fencing around the work area. Access routes, tum-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	City to verify inclusion of condition on construction plans. USFWS biologist to supervise installation of fencing. Inspect site during construction to ensure compliance with measure.	Immediately after second pre-construction survey.	*Verified by:* *Date:*
A USFWS-approved biologist will monitor all ground-disturbing construction activities. After ground-disturbing project activities are complete, the USFWS-approved biologist will train an individual to act as the on-site biological monitor. The USFWS-approved biological monitor will have attended the training described above. Both the USFWS-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The USFWS-approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly, and quarterly summaries will be placed on a file-sharing website that is accessible to regulatory staff at any time.	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	Biologist and/or Biologist-trained Monitor to monitor construction activities and complete log as prescribed in measure.	During and after ground-disturbing project activities.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
A USFWS-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of AWS or CRLF. These site inspections will take place each morning before the start of construction activities.	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	Conduct daily monitoring per measure. City to verify inclusion of condition on construction plans.	Daily before the start of construction activities.	*Verified by:* *Date:*
If any AWS or CRLF are found, all activities will cease, the USFWS will be immediately contacted and no other actions will be taken without authorization from the USFWS. Construction will be halted until all AWS or CRLF depart on their own or are removed from the work area by the USFWS-approved biologist. Actions taken to relocate AWS or CRLF will be conducted under the guidance of the USFWS and CDFW. The USFWS-approved biologist may relocate any AWS or CRLF that are in danger of immediate harm from project-related activities to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The USFWS-approved biologist will monitor any CRLF or AWS that has been relocated until it is determined that it is not imperiled by predators or other dangers.	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	If any AWS or CRLF are found, all activities will cease, the USFWS will be immediately contacted and no other actions will be taken without authorization from the USFWS. USFWS biologist will relocate and monitor per measure.	Ongoing if any AWS or CRLF are found	*Verified by:* *Date:*
Construction will take place during daylight hours only.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Daily during construction.	*Verified by:* *Date:*
Prior to being brought on-site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on-site.	Project Contractor	City of Richmond Capital Projects	Inspect vehicles for fluid leaks prior to being brought on-site.	During construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
		Division and USFWS	City to verify inclusion of condition on construction plans.		
A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no AWS, CRLF, or other amphibians or reptiles are taken at the pump.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect intake to the pump used for the upstream cofferdam during construction to ensure compliance with measure.	During construction.	*Verified by:* *Date:*
Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During construction.	*Verified by:* *Date:*
Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for CRLF: April 15 to October 15)	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
All areas disturbed as a result of project-related activities will be re-vegetated with native plant species only.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During construction.	*Verified by:* *Date:*
Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction	Project Contractor	City of Richmond Capital Projects	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water on-site. These devices will be placed at all locations where the likelihood of sediment input exists.		Division and USFWS			
The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to ensure that it does not become clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.	USFWS-approved Biologist, Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site once daily to ensure erosion and sediment control devices functioning properly. USFWS to report to Project Contractor if control measures need to be repaired or replaced.	At least once each day during construction.	*Verified by:* *Date:*
All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side casting of material into any waterway.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During construction.	*Verified by:* *Date:*
During project activities, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be managed to minimize the provision of cover for AWS and CRLF by removing all surface construction debris daily except that required for construction.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Daily during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
To mitigate for erosion impacts, best management practices (BMPs) for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.	Project Contractor	City of Richmond Capital Projects Division and USFWS	Inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	During and post-construction.	*Verified by:* *Date:*
All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The USACE and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the USACE will ensure that the applicant will prepare a plan to allow 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.	Project Contractor and USACE	City of Richmond Capital Projects Division, USFWS, and USACE	USACE to ensure a spill response plan is developed and implemented. Contractor to educate workers about spill prevention and response per measure.	Prior to and during construction.	*Verified by:* *Date:*
The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project area will be removed.	USFWS-approved Biological Monitor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure.	During construction.	*Verified by:* *Date:*
To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in pre-construction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.	Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that AWS do not become entangled in the mesh. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control.	Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fencing or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.	Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.	USFWS-approved Biologist	City of Richmond Capital Projects Division and Biologist	USFWS to inspect pipes to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.	Project Contractor	City of Richmond Capital Projects Division and USFWS	USFWS to inspect site during construction to ensure compliance with measure. City to verify inclusion of condition on construction plans.	Ongoing	*Verified by:* *Date:*
A post-construction survey will be conducted the night before the cofferdams are removed to make sure no AWS or CRLF have occupied the temporary pool created upstream of the site. If any AWS or CRLF are present, they will be captured by hand and removed upstream of the pond to prevent them being	Project Contractor, USFWS-approved Biologist	City of Richmond Capital Projects Division and USFWS	USFWS-approved biologist to conduct post-construction survey at cofferdam site to ensure compliance with measure.	The night before the cofferdams are removed.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
potentially stranded when the dams are removed during the daylight hours and the water levels drop.					
Construction Controls Incorporated into Project					
Hydrology and Water Quality					
Prepare and implement a Stormwater Pollution Prevention Plan (SWPPP) and monitor the effectiveness of the plan.	Project Contractor	San Francisco Bay Regional Water Quality Control Board City of Richmond Capital Projects Division and Engineering Services Department/ Water Resource Recovery Department	The San Francisco Bay RWQCB to review and approve the SWPPP. City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Review and approval of the SWPPP prior to construction. Field inspections during construction.	*Verified by:* *Date:*
Temporary erosion and sediment control BMPs will be used to prevent the transport of earthen materials and other construction waste materials from disturbed land areas, stockpiles, and staging areas during periods of precipitation or runoff (such as silt fence, erosion control fabric, fiber rolls).	Project Contractor	City of Richmond Capital Projects Division and Water Resource	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
		Recovery Department			
Tracking controls (such as designated ingress and egress areas) and designated staging areas outside of drainage areas will be implemented.	Project Contractor	City of Richmond Capital Projects Division and Water Resource Recovery Department	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*
All disturbed areas will be revegetated, including staging with native species only.	Project Contractor	City of Richmond Capital Projects Division and Water Resource Recovery Department	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*
Temporary BMPs will be used to prevent wind erosion and sediment transport of disturbed areas, such as use of water for dust control and covering of stockpiles.	Project Contractor	City of Richmond Capital Projects Division and Water Resource Recovery Department	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Implement construction BMPs to reduce erosion potential. Such BMPs include, but are not limited to, construction scheduled for dry season; high flow bypass until the system is stabilized; temporary and permanent erosion and sediment controls; prevention of runoff during construction.	Project Contractor	City of Richmond Capital Projects Division	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*
Construction boundary fencing will be installed to limit land disturbance to areas not planned for construction.	Project Contractor	City of Richmond Capital Projects Division	City of Richmond Water Resource Recovery Department to monitor implementation of project BMPs.	Field inspections during construction.	*Verified by:* *Date:*
Hazards and Hazardous Materials					
Prepare a Spill Prevention Plan with details of site-specific BMPs to prevent accidental spills from impacting water and land resources. Outline response protocols and information for contacting the San Francisco Bay Regional Water Quality Control Board and other responsible agencies.	Project Contractor	City of Richmond Capital Projects Division	Contractor to prepare Spill Prevention Plan per measure. City of Richmond Capital Projects Division to approve Spill Prevention Plan.	Prior to permit issuance.	*Verified by:* *Date:*
Provide spill containment and absorbent materials on-site at all times.	Project Contractor	City of Richmond Capital Projects Division	Field inspections during construction to verify compliance with measure.	During construction.	*Verified by:* *Date:*
Remove petroleum products and hazardous waste must be removed from the project area and disposed of at an appropriate location.	Project Contractor	City of Richmond Capital Projects Division	Field inspections during construction to verify compliance with measure.	During construction.	*Verified by:* *Date:*

Project Mitigation Measures, Conservation Measures, and Construction Controls	Implemented By	Monitored By	Monitoring and Reporting Action	Monitoring Schedule	Verification of Compliance
Traffic During Construction					
Prepare and submit for review a California Manual on Uniform Traffic Control Devices Traffic/Pedestrian Control Plan for activities within a City right-of-way.	Project Contractor	City of Richmond Engineering Department and City of Richmond Capital Projects Division.	Contractor to prepare Plan. City Richmond Capital Projects Division of to approve Plan.	Prior to issuance of Encroachment Permit	*Verified by:* *Date:*

Section 6 References

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Appendix A

PHOTOGRAPHIC LOG

Photograph 1. Via Verdi CMP culvert collapse in April 2010 near the El Portal Drive intersection.

Photograph 2. Via Verdi CMP culvert collapse in April 2010 near the El Portal Drive intersection.

Photograph 3. Headwall of concrete box culvert constructed in 2012.

Photograph 4. Headwall of existing 2012 concrete box culvert.

Photograph 5. View upstream of the 2012 concrete Via Verdi box culvert in San Pablo Creek

Photograph 6. San Pablo Creek immediately downstream of the existing 2012 concrete Via Verdi culvert.

Photograph 7. View upstream of San Pablo Creek from within the existing 2012 concrete Via Verdi culvert.

Photograph 8. Existing Via Verdi culvert headwall, location of the proposed culvert tie-in.

Photograph 9. Landslide scarp along Via Verdi. Photo taken in March 2017.

Photograph 10. Landslide scarp along Via Verdi. Photo taken in March 2017.

Photograph 11. Site overview looking north (left to right) emergency access road, landslide, and existing Via Verdi. Photo taken in January 2019.

Photograph 12. Emergency access road looking south. Photo taken in January 2019.

Photograph 13. Entrance to emergency access road (site access). Photo taken in January 2019.


Photograph 14. Uneven condition of the existing Via Verdi roadway. Photo taken in January 2019.

Photograph 15. Detail of existing Via Verdi and landslide conditions. Photo taken in January 2019.

Photograph 16. Uneven condition of the existing Via Verdi roadway. Photo taken in January 2018.

Photograph 17. Detail of existing Via Verdi and landslide conditions. Photo taken in January 2019.

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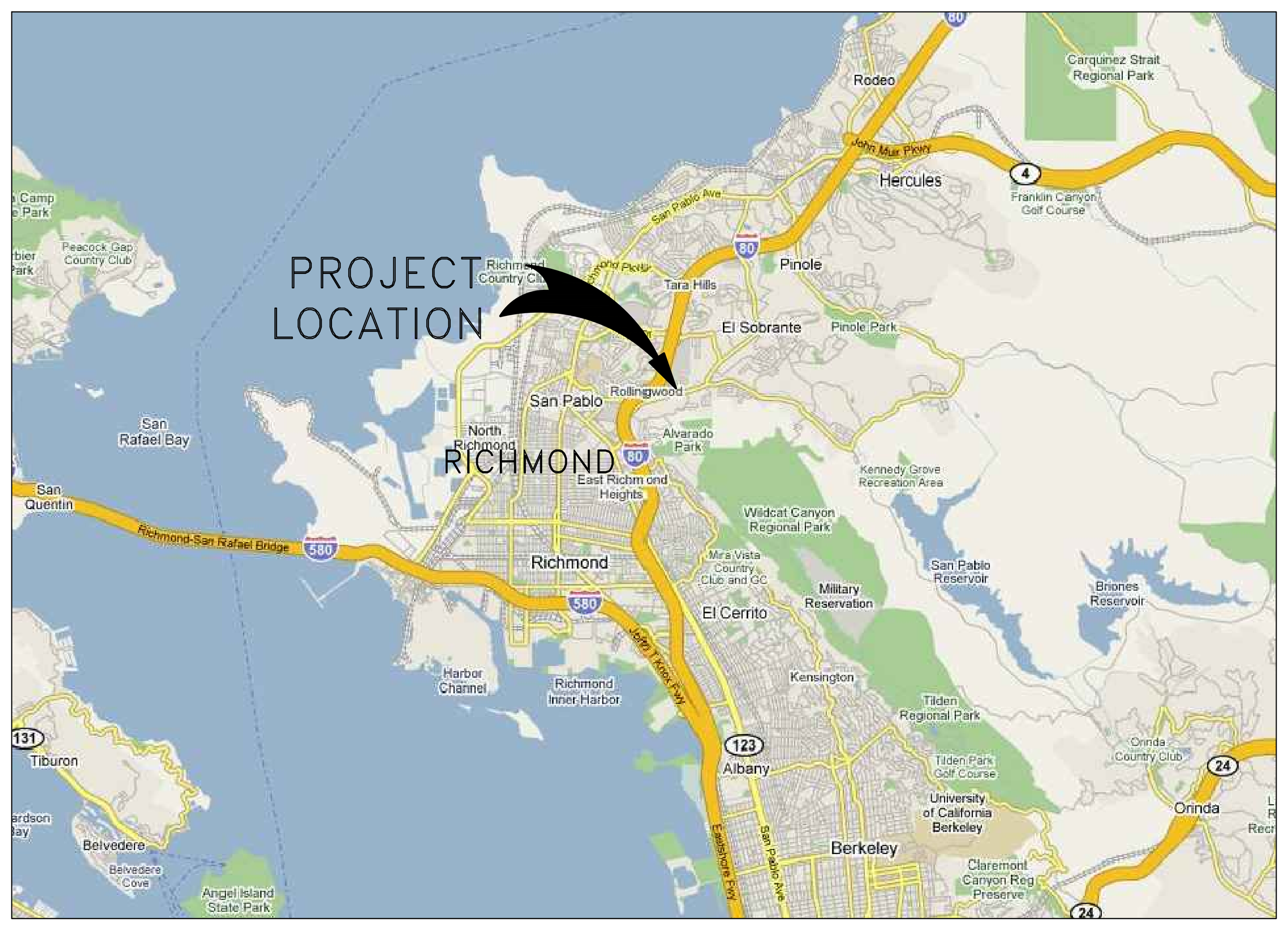
Appendix B

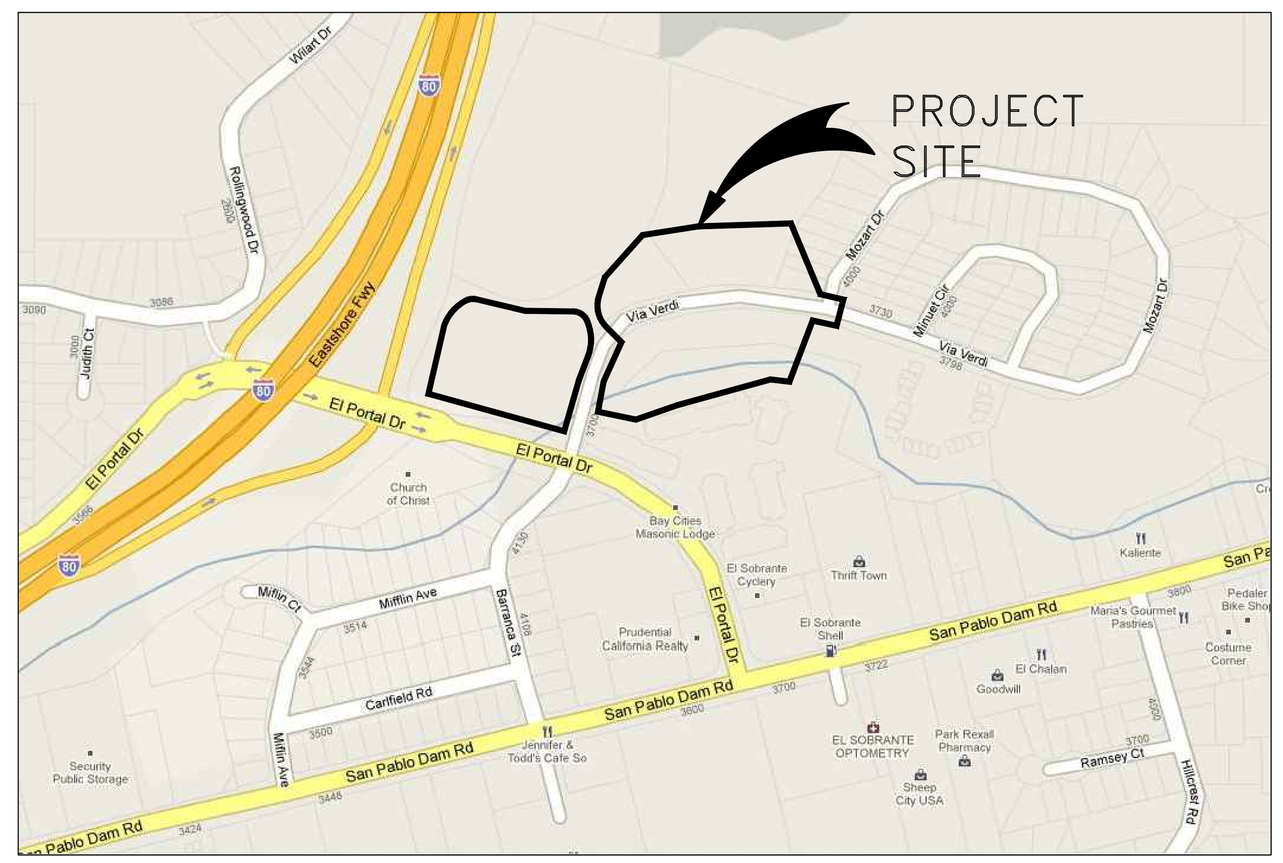
ENGINEERED SITE PLAN

VIA VERDI SLOPE STABILIZATION PROJECT

CITY OF RICHMOND
CONTRA COSTA COUNTY, CALIFORNIA



LOCATION MAP
(NOT TO SCALE)



VICINITY MAP
(NOT TO SCALE)

SHEET INDEX		
SHEET NO.	DRAWING	SHEET TITLE
1	G1	TITLE SHEET
2	G2	NOTES, LEGEND, AND ABBREVIATIONS
3	C1	SITE PLAN 1
4	C2	SITE PLAN 2
5	C3	REMOVAL PLAN 1
6	C4	REMOVAL PLAN 2
7	C5	DEWATERING AND BMP PLAN
8	C6	EXCAVATION PLAN
9	C7	REINFORCED CONCRETE CULVERT PLAN AND PROFILE
10	C8	CULVERT CROSS SECTIONS 1
11	C9	CULVERT CROSS SECTIONS 2
12	C10	EARTHWORK AND GRADING PLAN
13	C11	DRAINAGE PLAN
14	C12	EROSION CONTROL AND REVEGETATION PLAN
15	C13	VIA VERDI RECONSTRUCTION 1 PLAN AND PROFILE
16	C14	VIA VERDI RECONSTRUCTION 2 PLAN AND PROFILE
17	C15	SANITARY SEWER REPLACEMENT PLAN AND PROFILE
18	C16	CEMETERY PROPERTY RESTORATION PLAN 1
19	C17	CEMETERY PROPERTY RESTORATION PLAN 2
20	D1	SECTIONS AND DETAILS – CULVERT
21	D2	SECTIONS AND DETAILS – DRAINAGE
22	D3	SECTIONS AND DETAILS – EROSION CONTROL AND REVEGETATION
23	D4	SECTIONS AND DETAILS – ROAD AND SIDEWALK RECONSTRUCTION
24	D5	SECTIONS AND DETAILS – SANITARY SEWER
25	D6	SECTIONS AND DETAILS – DEWATERING AND FENCING
26	D7	SECTIONS AND DETAILS – CULVERT BAFFLE
27	S0.1	GENERAL NOTES
28	S1.1	CULVERT DETAILS
29	S2.1	HEADWALL DETAILS
30	S3.1	MISCELLANEOUS DETAILS

OWNER:

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PROJECT MANAGER, TAWFIC HALABY, P.E.
TEL. 510-621-1612

ENGINEER:

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501 CANAL BOULEVARD, SUITE I
PT. RICHMOND, CA 94804
TEL 510-215-3620

YADER BERMUDEZ
ENGINEERING AND CAPITAL IMPROVEMENTS PROJECTS DIRECTOR
CITY OF RICHMOND

DATE

PREPARED UNDER THE DIRECTION OF:

FRANZ HAIDINGER, P.E.
ENGINEERING MANAGER – NCE

DATE

Know what's below. Call before you dig.

PRELIMINARY
FOR REVIEW
NOT FOR CONSTRUCTION
DATE: 04-12-19

NCE
501 Canal Blvd., Suite I
Richmond, Ca. 94804
(510) 215-3620 * Fax (510) 215-2898

REGISTERED PROFESSIONAL ENGINEER
FRANZ G. HAIDINGER
NO. C 64725
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO: 568.41.55
DESIGNED BY: FGH, VL
DRAWN BY: VL
CHECKED BY: JWN DATE 03/28/2019
DATE: 04/12/2019

SHEET TITLE

TITLE SHEET

DRAWING

G1

SHEET 1 OF 30

GENERAL NOTES

1. THIS PLAN SET WAS PROVIDED TO THE CITY OF RICHMOND FOR CONSTRUCTION RELATED TO THE STABILIZATION OF THE LANDSLIDE SLOPE AT VIA VERDI ALONG SAN PABLO CREEK CULVERT, AND AFFECTED ROADWAYS, INCLUDING VIA VERDI.
2. ALL DRAWINGS AND SPECIFICATIONS ARE CONSIDERED PART OF THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEW AND COORDINATION OF ALL DRAWINGS AND SPECIFICATIONS PRIOR TO START OF CONSTRUCTION. ANY DISCREPANCIES THAT OCCUR SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE START OF CONSTRUCTION SO THAT A CLARIFICATION MAY BE ISSUED. WORK IN CONFLICT WITH THE CONTRACT DOCUMENTS OR BUILDING CODE REQUIREMENTS SHALL BE CORRECTED BY THE CONTRACTOR AT HIS OWN EXPENSE AND AT NO EXPENSE TO THE OWNER, ARCHITECT, OR ENGINEER(S).
3. SPECIFIC NOTES AND DETAILS TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
4. FEATURES OF CONSTRUCTION SHOWN ARE TYPICAL, AND THEY SHALL APPLY GENERALLY THROUGHOUT FOR SIMILAR CONDITIONS. MODIFY TYPICAL DETAILS AS DIRECTED TO MEET SPECIAL CONDITIONS. CONTRACT STRUCTURAL DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT ARE NOT LIMITED TO, BRACING AND SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT. OBSERVATION VISITS TO THE SITE BY THE STRUCTURAL ENGINEER WILL NOT INCLUDE INSPECTION OF THE AFOREMENTIONED ITEMS.
5. SHOP DRAWINGS, SPECIAL INSPECTIONS, AND MATERIAL SAMPLING AND TESTING, WHEN REQUIRED, ARE SPECIFIED IN THEIR RESPECTIVE SECTIONS OF THE GENERAL NOTES.
6. WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF THE 2016 CALIFORNIA BUILDING CODE AS AMENDED BY THE CITY OF RICHMOND, AS WELL AS ANY OTHER REGULATING AUTHORITY OVER ANY PORTION OF THE WORK INCLUDING THOSE ADDITIONAL CODES AND STANDARDS LISTED IN THE STRUCTURAL NOTES AND SPECIFICATIONS.
7. THE REMOVAL, CUTTING, DRILLING, ETC. OF EXISTING WORK SHALL BE PERFORMED WITH CARE AND APPROPRIATE EQUIPMENT IN ORDER NOT TO JEOPARDIZE THE EXISTING STRUCTURAL INTEGRITY. IF EXISTING STRUCTURAL MEMBERS, NOT INDICATED FOR REMOVAL, INTERFERE WITH THE NEW WORK, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY FOR APPROVAL BEFORE REMOVAL OF THE EXISTING MEMBERS.
8. ALL EXISTING FEATURES ARE BASED ON TOPOGRAPHIC SURVEY INFORMATION. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY LOCATIONS, ELEVATIONS, ETC. OF EXISTING FACILITIES AND TO IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY FIELD CONFLICTS.
9. ALL CONSTRUCTION MUST BE TO THE CITY OF RICHMOND AND CALTRANS STANDARDS AND ACCEPTED BY THE PUBLIC WORKS INSPECTOR. STANDARD PLANS ARE AVAILABLE AT THE OFFICE OF THE PUBLIC WORKS INSPECTOR.
10. CONTRACTOR SHALL MEET WITH CITY OF RICHMOND PRIOR TO START OF CONSTRUCTION. 48 HOURS NOTICE IS REQUIRED ON ALL INSPECTIONS.
11. CONTRACTOR IS RESPONSIBLE TO MAKE ALL ARRANGEMENTS FOR SITE INSPECTIONS AND TESTING, AND ENSURE THAT ALL CURRENT STANDARDS FOR THE CITY OF RICHMOND AND CALTRANS ARE FOLLOWED PRIOR TO BEGINNING ANY PHASE OF CONSTRUCTION WORK.
12. CONTRACTOR SHALL VERIFY DIMENSIONS PRIOR TO START OF CONSTRUCTION. THE ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES OR INCONSISTENCIES. FOR DIMENSIONS NOT SHOWN ON THE STRUCTURAL DRAWINGS, REFER TO THE CIVIL AND OTHER DRAWINGS.
13. CONSTRUCTION SHALL BE LIMITED TO BETWEEN THE HOURS OF 8:00 A.M. AND 5:00 P.M., MONDAY THRU FRIDAY AND INSPECTION REQUESTS SHALL BE LIMITED TO NORMAL CITY BUSINESS HOURS: 8:00 A.M. TO 5:00 P.M., MONDAY THRU FRIDAY. ARRANGEMENTS FOR ANY OVERTIME INSPECTION SERVICES AND PAYMENTS OF FEES FOR SAME SHOULD BE MADE 48 HOURS IN ADVANCE AND ARE SUBJECT TO INSPECTION AVAILABILITY AND APPROVAL BY THE CITY ENGINEER.
14. IT IS THE CONTRACTOR'S RESPONSIBILITY TO SEE TO IT THAT ALL MATERIAL TESTING REQUIRED BY THE ENGINEER IS PERFORMED.
15. DUST SUPPRESSION AND EROSION CONTROL DURING ALL PHASES OF CONSTRUCTION IS THE RESPONSIBILITY OF THE CONTRACTOR. IT IS ALSO THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN GOOD HOUSEKEEPING WITHIN THE CONSTRUCTION AREA.
16. WATER FOR DUST CONTROL AND USE FOR COMPACTION MAY BE PURCHASED FROM THE APPROPRIATE AGENCY PRIOR TO THE START OF ANY WORK, AND IT IS THE RESPONSIBILITY OF THE CONTRACTOR FOR ANY FEES OR DEPOSITS.
17. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT FOR APPROVAL THE PROPOSED ROUTE(S) FOR ALL CONSTRUCTION TRAFFIC RELATED TO THE PROJECT. UPON APPROVAL, THE CONTRACTOR SHALL STRICTLY ADHERE TO THAT ROUTE(S) ONLY, UNLESS WRITTEN PERMISSION IS OBTAINED TO CHANGE THE ROUTE(S). IN ADDITION TO THE CONTRACTOR'S PROPOSED ROUTE(S), A DETOUR PLAN SHALL BE SUBMITTED FOR APPROVAL BY THE CITY'S TRAFFIC ENGINEER. THROUGH ACCESS VIA THE EMERGENCY ACCESS ROAD OR VIA VERDI SHALL BE MAINTAINED AT ALL TIMES.
18. CONTRACTOR IS TO PROTECT EXCAVATED SOILS PER SWPPP AS SPECIFIED IN THE PROJECT SPECIFICATIONS AND SHALL EMPLOY BEST MANAGEMENT PRACTICES SO THAT NO DAMAGE OR IMPACTS ARE INCURRED TO THE CREEK HABITAT AND LOCAL WATERSHED.
19. BIDDERS SHOULD NOTE THE PRESENCE OF OVERHEAD UTILITIES IN THE WORK AREA. AS PART OF THEIR PRE-BID INSPECTION, BIDDERS SHALL NOTE THE TYPE AND LOCATION OF OVERHEAD UTILITIES IN THE PROPOSED WORK AREA. BIDDERS PRICE SHALL INCLUDE PROVISIONS FOR WORKING IN AREAS WHERE UTILITIES EXIST AT THE TIME OF BIDDING, AND NO ADDITIONAL COMPENSATION IS ALLOWED.
20. THE CONTRACTOR SHALL MAINTAIN ACCESS TO RESIDENCES AND BUSINESSES AFFECTED BY THE PROJECT THROUGHOUT THE LIFE OF THE CONTRACT AS SPECIFIED IN THE SPECIAL PROVISIONS. THE CONTRACTOR SHALL AT NO TIME BLOCK ACCESS TO RESIDENTS. SEE SITE PLAN FOR ACCESS AREAS AND APPROVED LAYDOWN/CONSTRUCTION AREAS.
21. CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICES ALERT (U.S.A.) 800-227-2600 (OR DIAL 811), AT LEAST TWO (2) WORKING DAYS OR MORE PRIOR TO START OF ANY EXCAVATION OR DEMOLITION OPERATIONS.
22. THE CONTRACTOR IS RESPONSIBLE TO NOTIFY ALL UTILITIES TWO (2) WORKING DAYS PRIOR TO ANY EXCAVATION SO THAT LINES CAN BE MARKED. CONTRACTOR SHALL EXERCISE CARE DURING EXCAVATION OR DEMOLITION, PARTICULARLY IN LOCATIONS WITH UTILITIES THAT WILL REMAIN IN SERVICE. CONTRACTOR SHALL ALSO COORDINATE UTILITY REINSTALLATION WITH UTILITY COMPANIES DURING ROADWAY RECONSTRUCTION.
23. ANY DAMAGE TO THE EXISTING FACILITIES INCLUDING TREES, LANDSCAPING, IRRIGATION, FENCES, WALLS, SIDEWALK, UTILITIES, AND OTHER PAVEMENT SURFACES SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE. CONTRACTOR SHALL RESTORE ANY AND ALL PAVEMENT AND OTHER FACILITIES OUTSIDE LIMITS OF WORK AFFECTED BY THE CONSTRUCTION OPERATIONS AT NO ADDITIONAL COST. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VIDEOTAPE OR DOCUMENT EXISTING CONDITIONS PRIOR TO START OF WORK TO SUBSTANTIATE ANY PREVIOUS DAMAGES, ETC.
24. TRAFFIC CONTROL DURING CONSTRUCTION SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL PROVIDE ALL LIGHTS, SIGNS, BARRICADES, FLAGGERS, AND OTHER DEVICES TO PROVIDE FOR SAFE PASSAGE OF PUBLIC VEHICULAR AND PEDESTRIAN TRAFFIC.
25. TYPICAL DETAILS REFERRED TO ON THESE DRAWINGS ARE FROM THE LATEST VERSIONS OF THE CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS) STANDARD PLANS, AND CITY OF RICHMOND STANDARD PLANS.
26. CONTRACTOR SHALL POSSESS A VALID CLASS 'A' OR A COMBINATION OF A CLASS 'C-8', 'C-12', AND 'C-32' LICENSE AT THE TIME OF AWARD OF THE CONTRACT.
27. CONTRACTOR SHALL SUBMIT A SWPPP WRITTEN BY A QUALIFIED QSP/QSD FOR CITY'S APPROVAL PRIOR TO START OF CONSTRUCTION. DURING CONSTRUCTION, CONTRACTOR SHALL ADHERE TO THE SWPPP, PROVIDE DOCUMENTATION OF COMPLIANCE, AND PROVIDE ACCESS TO THE SITE FOR INSPECTIONS PER SWPPP.
28. IN CONJUNCTION WITH CONSTRUCTION SURVEYING, A MONITORING PROGRAM SHALL BE SET UP AND EXECUTED BY THE CONTRACTOR TO DETERMINE THE EFFECTS OF THE EXCAVATION ON THE ADJACENT STRUCTURES. PRE-EXISTING CONDITION SURVEYS SHALL BE PERFORMED BY THE CONTRACTOR. REFERENCE POINTS (AT LEAST TWO PER STRUCTURE) SHALL BE SET ON THE BASE OF THE EXISTING STRUCTURES AND READ PRIOR TO THE START OF CONSTRUCTION AND DEWATERING ACTIVITIES, AND POINTS SHALL BE SET ON THE SHORING AS SOON AS INITIAL INSTALLATIONS ARE MADE. BOTH LATERAL AND VERTICAL MOVEMENTS SHALL BE MEASURED DURING CONSTRUCTION TO THE NEAREST ⅛ OF AN INCH DAILY THROUGHOUT THE DURATION OF THE PROJECT. IF EXCESSIVE LATERAL OR VERTICAL MOVEMENTS ARE RECORDED BY THE SURVEYS, MODIFICATIONS TO THE RETAINING SYSTEMS AND/OR UNDERPINNINGS MAY BE REQUIRED AT THE SOLE EXPENSE OF THE CONTRACTOR. CAUTION SHOULD BE EXERCISED TO MINIMIZE DEFLECTION OF THE SHORING SYSTEM AND SETTLEMENT OF THE GROUND SURFACE SURROUNDING THE EXCAVATION AS A RESULT OF CONSTRUCTION ACTIVITIES SUCH AS EXCAVATION, DEWATERING, AND SHORING INSTALLATION. THE ALLOWABLE DEFLECTION AND SETTLEMENT SHALL BE 0.2% TO 0.3% OF WALL HEIGHT AT THE TOP OF SHORING AND 0" AT BUILDING FOUNDATION AND FLAT WORK. IF MEASUREMENTS EXCEED THE PREDETERMINED LIMITS, THE CITY AND ITS CONSULTANT SHALL BE CONSULTED REGARDING ALTERNATIVE CONSTRUCTION TECHNIQUES THAT MAY BE PROPOSED BY THE CONTRACTOR. THE CONTRACTOR WILL BE SOLEY RESPONSIBLE FOR ALL SOIL MOVEMENT/SETTLEMENT AND ANY RESULTING DAMAGE OR DISTRESS TO ADJACENT STRUCTURES.
29. CONTRACTOR SHALL IMMEDIATELY TAKE MONITORING MEASUREMENTS AT ESTABLISHED MONITORING POINTS IF THERE ARE ANY INDICATIONS THAT MOVEMENT HAS OR IS OCCURRING.
30. THE CONTRACTOR SHALL REFER TO THE SPECIFICATIONS FOR A DETAILED SEQUENCE OF WORK / PHASING PLAN.

811 Know what's below. Call before you dig.

LEGEND

PROPOSED FEATURES

100	PROPOSED CONTOUR MAJOR
	PROPOSED CONTOUR MINOR
	PROPOSED EP
	PROPOSED CURB AND GUTTER
	SAWCUT
8" W	WATER LINE
12"SD	STORM DRAIN PIPE
	STORM DRAIN MANHOLE
OR	STORM DRAIN INLET
6"SS	SANITARY SEWER PIPE
	SANITARY SEWER MANHOLE
SSCO	SANITARY SEWER CLEANOUT
T	TELECOM LINE
GAS	GAS LINE
E	ELECTRIC
SS	SANITARY SEWER
	FILTER FABRIC FENCE / SILT FENCE
	CHAIN LINK / CONSTRUCTION FENCING
	SILT ROLL / FIBER ROLL
3	DETAIL IDENTIFICATION NUMBER
D1	NUMBER OF SHEET ON WHICH DETAIL IS LOCATED
	PORTLAND CEMENT CONCRETE
	AC PAVEMENT
	RIP RAP
	STABILIZED CONSTRUCTION ENTRANCE
	GRAVEL
	EROSION CONTROL BLANKET
	REVEGETATION
	BRUSH MATTRESS WITH LIVE STAKING
	GRAVEL ACCESS ROAD
0.20%	SLOPE INDICATORS

EXISTING FEATURES

Legend

	Boundary / Property Line
	Building
	Centerline
	Concrete
	Curb & Gutter
	Edge of Pavement
	Fence Line
	Tree / Shrub Dripline (Aerially Derived)
	Wall
	Bollard
c	Communications Utility Box
	Curb Inlet Access Manhole
	Drain Inlet
ec	Electric Cabinet
e	Electric Utility Box
ev	Electric Vault
	Electrolier
	Fire Hydrant
	Guy Wire
hb	Hose Bib
mw	Monitoring Well
	Sign
	Site Light
+19.7	Spot Elevation (Aerially Derived)
×19.7	Spot Elevation
sdjb	Storm Drain Junction Box
D	Storm Drain Manhole
	Survey Well Monument Rim
	Survey Well Monument Rim (Disturbed – See Note 4)
6"	Tree Trunk / Size
u	Utility Box (Type Unknown)
	Utility Manhole (Type Unknown)
	Utility Pole
	Utility Pole w/Light
uv	Utility Vault (Type Unknown)
v	Water Valve
I-2	Inclinometer
P-2	Piezometer

ABBREVIATIONS

NOT ALL ABBREVIATIONS LISTED ARE USED IN THESE PLANS

AB	AGGREGATE BASE
AC	ASPHALT CONCRETE OR ACRE
A/G	ABOVE GROUND
@	AT
APPROX.	APPROXIMATE
ASS'Y	ASSEMBLY
AVG.	AVERAGE
AWWA	AMERICAN WATER WORKS ASSOCIATION
BMP	BEST MANAGEMENT PRACTICES
BO	BOTTOM OF
BOW	BOTTOM OF WALL
BSP	BLACK STEEL PIPE
BW	BOTTOM OF WALL
BVC	BEGIN VERTICAL CURVE
C&G	CURB AND GUTTER
CB	CATCH BASIN
CF	CUBIC FEET
CL	CENTERLINE
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
COMM	COMMUNICATION
CONC	CONCRETE
CONST	CONSTRUCT
COR	CITY OF RICHMOND
CP	CONTROL POINT
CY	CUBIC YARD
° OR DEG	DEGREE(S)
DI	DROP INLET
ø OR DIA.	DIAMETER
D.I.	DUCTILE IRON
DWG	DRAWING
DW, DWY	DRIVEWAY
EA.	EACH
EASE.	EASEMENT
E	EAST
EG	EXISTING GRADE
ELEC	ELECTRIC
EP	EDGE OF PAVEMENT
EL	ELEVATION, ELBOW
EVC	END OF VERTICAL CURVE
EX	EXISTING
FCA	FLANGE COUPLER ADAPTER
FH	FIRE HYDRANT
FG	FINISH GRADE
FFC	FRONT FACE CURB
FES	FLARED END SECTION
FL	FLOWLINE
FLG	FLANGED
FT or '	FOOT, FEET
FV	FLUSH VALVE
G	GAS
GV	GATE VALVE
GB	GRADE BREAK
GSP	GALVANIZED STEEL PIPE
HP	HIGH POINT
HOR	HORIZONTAL
HDPE	HIGH DENSITY POLYETHYLENE
HMAC	HOT MIXED ASPHALT CONCRETE
IN. or "	INCH
INT	INTERSECTION
IE	INVERT ELEVATION
IRR.	IRRIGATION
LT,L	LEFT
LEN	LENGTH
LF	LINEAR FEET
LFG	LANDFILL GAS
LP	LOW POINT
LS	LUMP SUM
MFGR	MANUFACTURER
MH	MANHOLE
MAX	MAXIMUM
MDD	MAXIMUM DRY DENSITY
MJ	MECHANICAL JOINT
MI	MILE
MIN	MINIMUM
MISC	MISCELLANEOUS
MSB	MAIN SWITCH BOARD
MVC	MIDDLE OF VERTICAL CURVE
N	NORTH
NAD83	NORTH AMERICAN DATUM OF 1983
NAVD88	NORTH AMERICAN VERTICAL DATUM OF 1988
NEC	NATIONAL ELECTRICAL CODES
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
# OR NO.	NUMBER
O.C.	ON CENTER
O.G.	ORIGINAL GRADE
OH	OVERHEAD
OHWM	ORDINARY HIGH WATER MARK
OWS	OIL/WATER SEPARATOR
±	PLUS OR MINUS
PT.	POINT
PCC	PORTLAND CEMENT CONCRETE
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
POC	POINT OF CURVE
POS	POSITIVE
PP	POWER POLE
PSI	POUNDS PER SQUARE INCH
PL	PROPERTY LINE
PUE	PUBLIC UTILITY EASEMENT
PVC	POINT OF VERTICAL CURVE
PVI	POINT OF VERTICAL INTERSECTION
(P)	PROPOSED
QSD	QUALIFIED SWPPP DEVELOPER
QSP	QUALIFIED SWPPP PRACTITIONER
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
REVEG	REVEGETATION
R/W, ROW	RIGHT-OF-WAY
RT,R	RIGHT
S	SLOPE, SOUTH
SCH	SCHEDULE
SD	STORM DRAIN
SDR	STANDARD DIMENSION RATIO
SDJB	STORM DRAIN JUNCTION BOX
SDMH	STORM DRAIN MANHOLE
SF	SQUARE FOOT/FEET
SHT	SHEET
S/L	STREET LIGHT
SSMH	SANITARY SEWER MANHOLE
SSCO	SANITARY SEWER CLEAN OUT
SS	SANITARY SEWER, STAINLESS STEEL
STD	STANDARD
STA	STATION
SWPPP	STORM WATER POLLUTION PREVENTION PLAN
SY	SQUARE YARD
TAC	TOP OF ASPHALT
TBC	TOP BACK OF CURB
TC	TOP OF CURB
TEMP	TEMPORARY
TOW	TOP OF WALL
TYP	TYPICAL
UGE	UNDERGROUND ELECTRIC LINES
UGT	UNDERGROUND TELEPHONE LINES
U/G	UNDERGROUND
VC	VERTICAL CURVE, VITRIFIED CLAY
VG	VALLEY GUTTER
W	WATER, WEST
WCWD	WEST COUNTY WASTEWATER DISTRICT
WL	WATERLINE
W/	WITH
WM	WATER METER
WV	WATER VALVE

PRELIMINARY
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DATE: 04-12-19

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REGISTERED PROFESSIONAL ENGINEER
FRANZ G. HAIDINGER
NO. C 64725
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA
DRAFT

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

City of Richmond

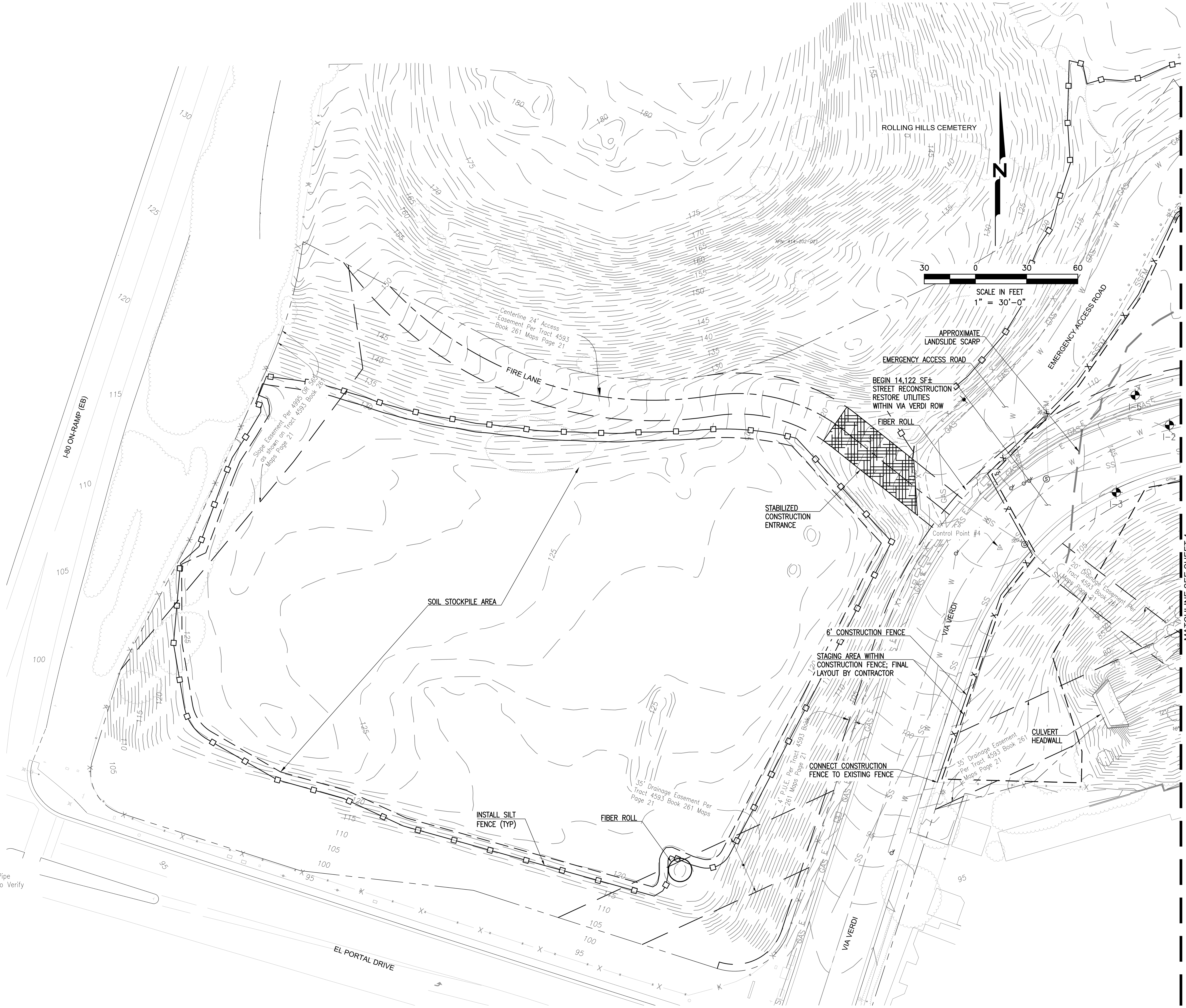
NO.	DATE	DESCRIPTION

PROJECT NO: 568.41.55
DESIGNED BY: FGH, VL
DRAWN BY: VL
CHECKED BY: JWN DATE 03/28/2019
DATE: 04/12/2019

SHEET TITLE

NOTES, LEGEND, AND ABBREVIATIONS

DRAWING
G2



Survey Notes:

1) All features shown hereon represent surface conditions of the project area compiled from an aerial survey performed in June of 2017 and supplemental ground surveys in July of 2017. The creek area southeasterly of the intersection of Via Verde and Mozart Drive was surveyed in December of 2018 by ground survey cross sections taken at approximately 50' intervals due to dense vegetation and may not reflect all surface irregularities in between cross sections. Surveyor made no attempt to determine the existence or extent of underground utilities or other features not surface visible.

2) Boundary and easement information shown hereon is based upon record information that was compiled in 2012 and is not based upon a field survey. Surveyor made no attempt to determine if said information is still correct and is to be used for general reference only.

3 Horizontal Datum is based upon the NAD83 horizontal datum; Vertical Datum is based upon the NAVD88 vertical datum. Temporary control points have been established on-site and are shown hereon for future project reference.

4) Surveyor notes that some survey monument wells within Via Verdi appear to have been disturbed due to recent slide activity.

Survey Control:

- Control Point #3 – Brass Disc within a City Standard Monument Well
  Northing: 2179589.01
  Easting: 6037736.92
  Elevation: 101.39
- Control Point #4 – Mag Nail & Washer
  Northing: 2179523.72
  Easting: 6037170.92
  Elevation: 106.46

Invert Details:

SD-A
SDMH Rim: 106.30
12" Inv. W: 100.85
18" CMP Inv. E: 100.78

SD-B
SDMH Rim: 97.89
12" Inv. N: 91.69
12" Inv. SE: 92.34
18" Inv. S: 89.24
18" Inv. N: 89.46

SD-C
SDMH Rim: 101.47
12" Inv. NE: 94.47
12" Inv. NW: 94.67
12" Inv. W: 94.42
18" Inv. N: 94.32
22" Inv. S: 94.19

SD-D
SDJB Rim: 101.10
12" Inv. E: 95.55
18" Inv. N: 95.55

DI-A
Catch Basin TC: 99.08
12" Inv. N: 95.15
12" Inv. S: 95.10

DI-B
Catch Basin TC: 99.07
12" Inv. NW: 95.75
12" Inv. S: 95.15

DI-C
Catch Basin TC: 98.40
12" Inv. W: 94.41

DI-D
(Not Used)

DI-E
Drain Inlet Grate: 109.47
15" Inv. NW: 103.52
15" Inv. NW: 103.62
22" Inv. E: 103.47

DI-F
Drain Inlet Grate: 102.57
12" Inv. E: 97.37

DI-G
Catch Basin TC: 101.74
12" Inv. S: 97.63

DI-H
Catch Basin TC: 101.80
12" Inv. S: 98.10

SS-A
SSMH Rim: 99.50
8" Inv. E+W Thru: 89.05

SS-B
SSMH Rim: 101.80
Approximate Bottom: 93.30
2-4" Pipes NW: 101.50 Top of Pipe
Pump Station Manhole, Unable to Verify Other Inverts, Not Visible

NOTE:

1. SURVEY NOTES, SURVEY CONTROL, AND INVERT DETAILS APPLY TO SHEETS 3-19.

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REGISTERED PROFESSIONAL ENGINEER
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EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO:	568.41.55
DESIGNED BY:	FGH, VL
DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE

SITE PLAN 1

DRAWING

C1

SHEET 3 OF 30

Survey Notes:

1) All features shown hereon represent surface conditions of the project area compiled from an aerial survey performed in June of 2017 and supplemental ground surveys in July of 2017. The creek area southeasterly of the intersection of Via Verde and Mozart Drive was surveyed in December of 2018 by ground survey cross sections taken at approximately 50' intervals due to dense vegetation and may not reflect all surface irregularities in between cross sections. Surveyor made no attempt to determine the existence or extent of underground utilities or other features not surface visible.

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4) Surveyor notes that some survey monument wells within Via Verdi appear to have been disturbed due to recent slide activity.

Survey Control:

- Control Point #3 – Brass Disc within a City Standard Monument Well
  Northing: 2179589.01
  Easting: 6037736.92
  Elevation: 101.39
- Control Point #4 – Mag Nail & Washer
  Northing: 2179523.72
  Easting: 6037170.92
  Elevation: 106.46

Invert Details:

SD-A
SDMH Rim: 106.30
12" Inv. W: 100.85
18" CMP Inv. E: 100.78

SD-B
SDMH Rim: 97.89
12" Inv. N: 91.69
12" Inv. SE: 92.34
18" Inv. S: 89.24
18" Inv. N: 89.46

SD-C
SDMH Rim: 101.47
12" Inv. NE: 94.47
12" Inv. NW: 94.67
12" Inv. W: 94.42
18" Inv. N: 94.32
22" Inv. S: 94.19

SD-D
SDJB Rim: 101.10
12" Inv. E: 95.55
18" Inv. N: 95.55

DI-A
Catch Basin TC: 99.08
12" Inv. N: 95.15
12" Inv. S: 95.10

DI-B
Catch Basin TC: 99.07
12" Inv. NW: 95.75
12" Inv. S: 95.15

DI-C
Catch Basin TC: 98.40
12" Inv. W: 94.41

DI-D
(Not Used)

DI-E
Drain Inlet Grate: 109.47
15" Inv. NW: 103.52
15" Inv. NW: 103.62
22" Inv. E: 103.47

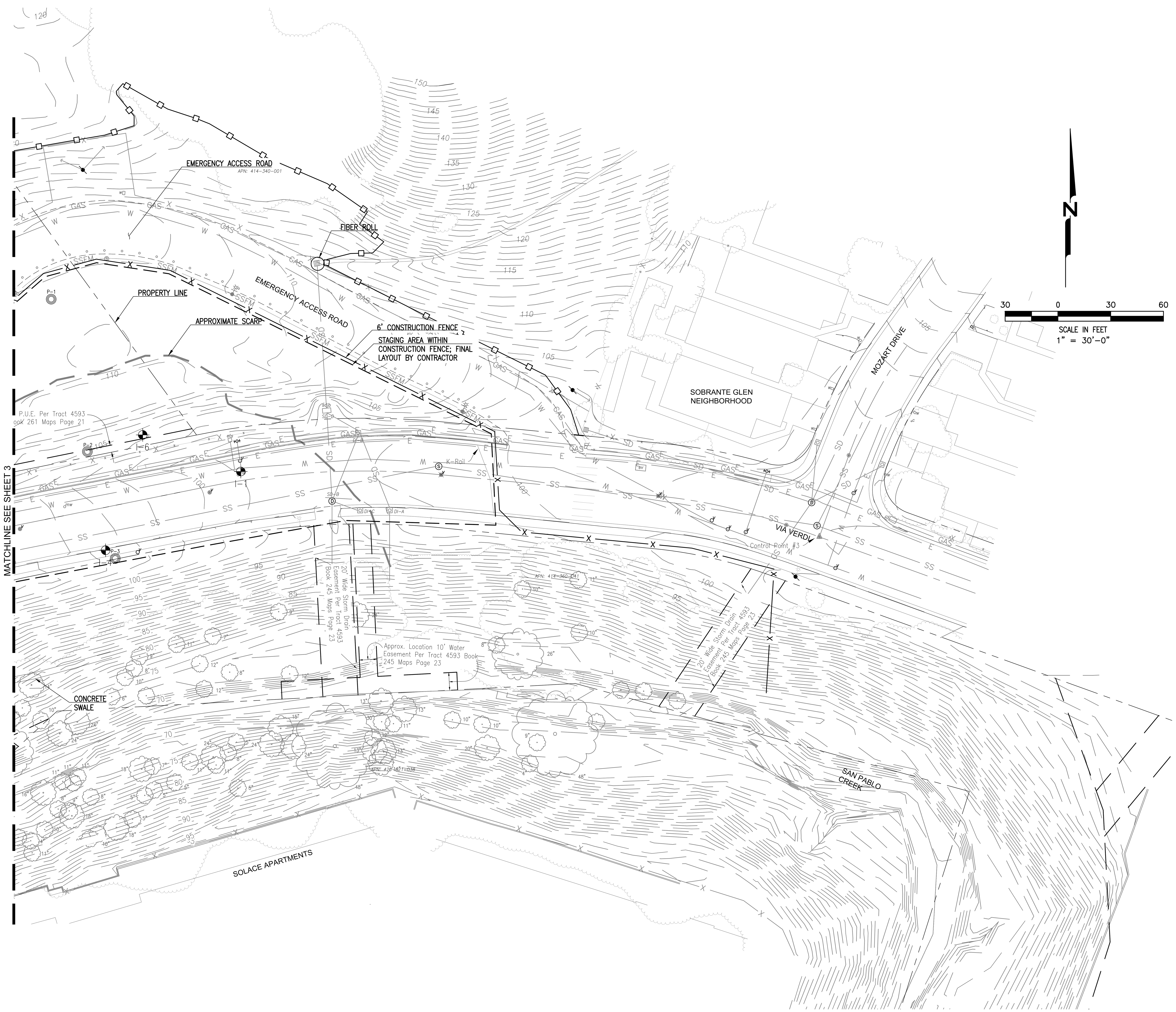
DI-F
Drain Inlet Grate: 102.57
12" Inv. E: 97.37

DI-G
Catch Basin TC: 101.74
12" Inv. S: 97.63

DI-H
Catch Basin TC: 101.80
12" Inv. S: 98.10

SS-A
SSMH Rim: 99.50
8" Inv. E+W Thru: 89.05

SS-B
SSMH Rim: 101.80
Approximate Bottom: 93.30
2-4" Pipes NW: 101.50 Top of Pipe
Pump Station Manhole, Unable to Verify Other Inverts, Not Visible



NOTE:

1. SURVEY NOTES, SURVEY CONTROL, AND INVERT DETAILS APPLY TO SHEETS 3-19.

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VIA VERDI SLOPE STABILIZATION

OWNER

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City of Richmond

NO.	DATE	DESCRIPTION

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DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE

SITE PLAN 2

DRAWING

C2

LEGEND

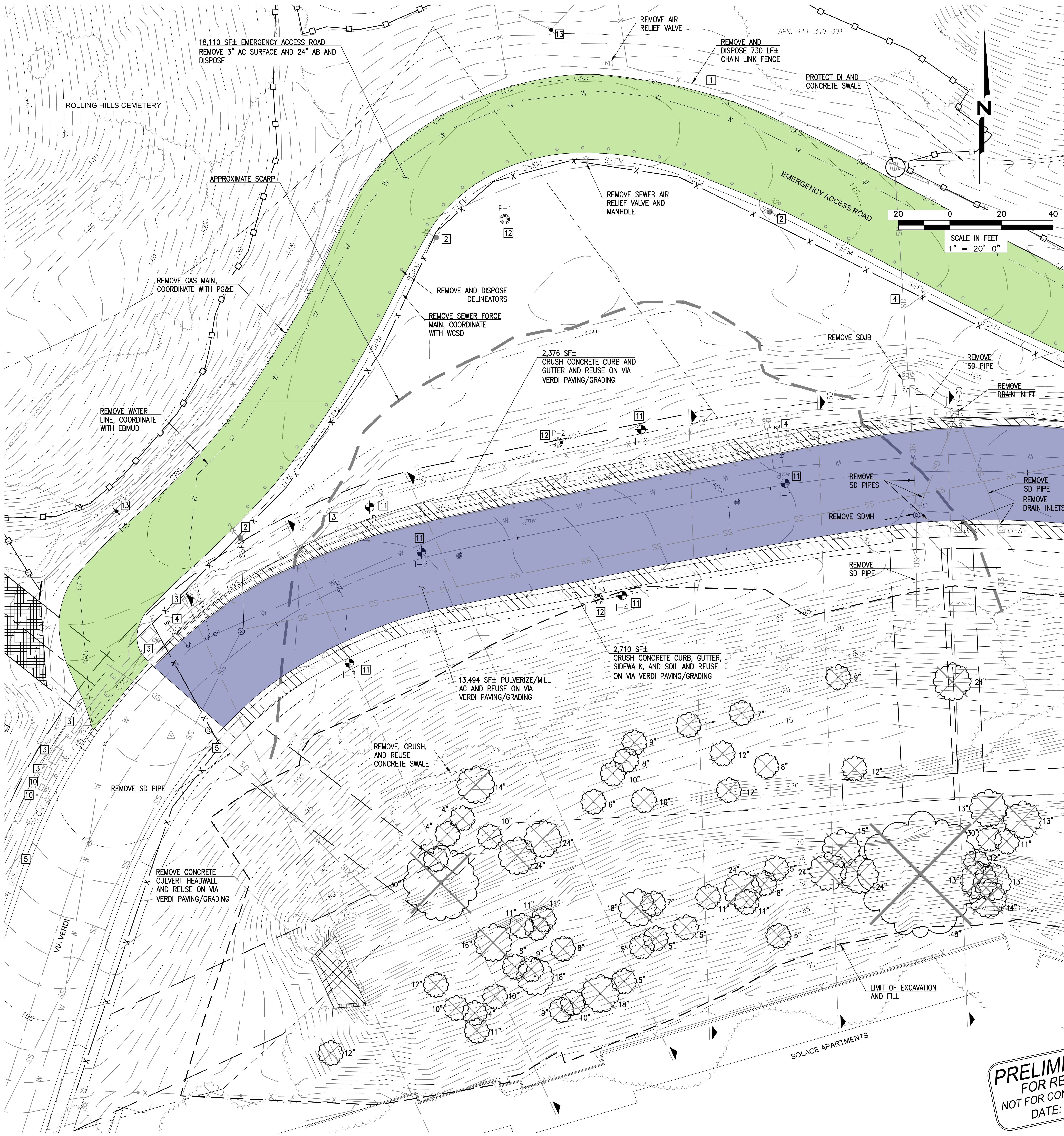
- PULVERIZE AND REUSE EXISTING AC PAVEMENT SECTION TO DEPTH OF 4" ON VIA VERDI
- PULVERIZE 3" ROADWAY AC SURFACE AND REMOVE AGGREGATE BASE (18" 1-1/2" AB, 6" 3/4" AB)
- REMOVE AND REUSE EXISTING SIDEWALK, CURB, GUTTER, AND SOIL AS FILL
- REMOVE AND REUSE EXISTING CONCRETE CULVERT HEADWALL AS FILL
- 12" REMOVE EXISTING TREE (DIAMETER AS NOTED)

NOTES:

1. CONTRACTOR SHALL CONDUCT REMOVAL IN ACCORDANCE WITH ALL STATE AND FEDERAL SAFETY STANDARDS.
2. DEMOLITION INCLUDES REMOVAL, TRANSPORTATION AND DISPOSAL ACCORDING TO STATE AND FEDERAL REGULATIONS.
3. UTILITIES WITHIN THE LIMITS OF WORK ARE OUT OF SERVICE AND CAN BE DEMOLISHED. THE CONTRACTOR SHALL OBTAIN CLEARANCE FROM THE VARIOUS UTILITIES PRIOR TO DEMOLITION WITHIN THE OUTLINED LIMIT.

KEYNOTES:

1. REMOVE & DISPOSE 8' CHAINLINK FENCE
2. STREET LIGHT POLE, LIGHTS, AND WIRES; COORDINATE REMOVAL WITH PG&E
3. PROTECT EXISTING UTILITY CABINETS/VAULTS/BOXES (COORDINATE W/ AGENCIES AS NEEDED)
4. PROTECT EXISTING FIRE HYDRANT
5. PROTECT EXISTING SIDEWALK, CURB, AND GUTTER
6. PROTECT EXISTING STORM DRAIN PIPE
7. NOT USED
8. REMOVE & DISPOSE CMP PIPE AND PCC COLLAR
9. NOT USED
10. PROTECT EXISTING STREET LIGHT
11. ABANDON INCLINOMETER
12. ABANDON PIEZOMETER
13. UTILITY POLE AND WIRES; COORDINATE REMOVAL WITH PG&E



811
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REGISTERED PROFESSIONAL ENGINEER FRANZ G. HAIDINGER NO. C 64725 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

OWNER
CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO:	568.41.55
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DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE
REMOVAL PLAN 1

DRAWING
C3

LEGEND

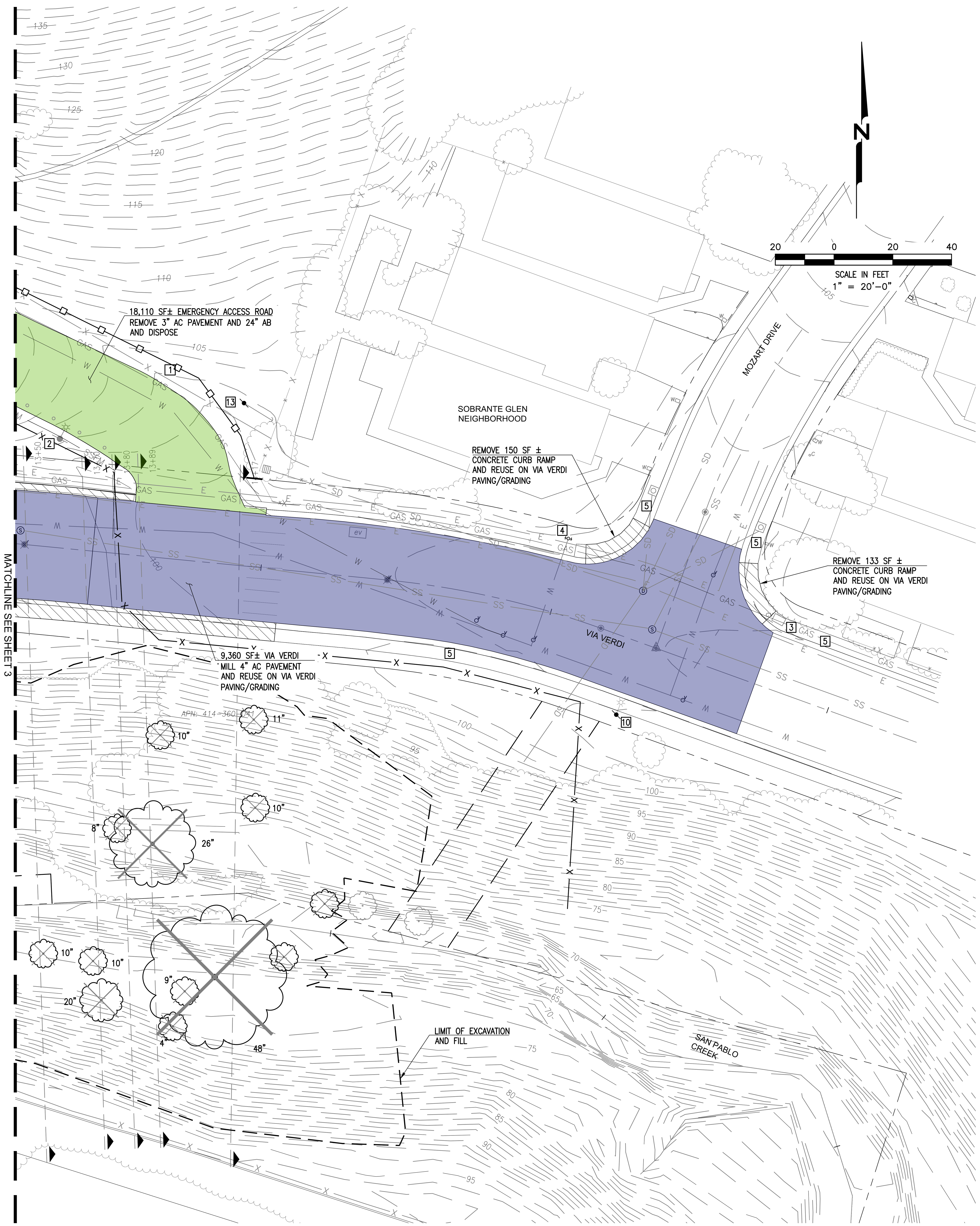
(blue fill)	PULVERIZE AND REUSE EXISTING AC PAVEMENT SECTION TO DEPTH OF 4" ON VIA VERDI
(green fill)	PULVERIZE 3" ROADWAY AC SURFACE AND REMOVE AGGREGATE BASE (18" 1-1/2" AB, 6" 3/4" AB)
(hatch)	REMOVE AND REUSE EXISTING SIDEWALK, CURB, GUTTER, AND SOIL AS FILL
(cross-hatch)	REMOVE AND REUSE EXISTING CONCRETE CULVERT HEADWALL AS FILL
12"	REMOVE EXISTING TREE (DIAMETER AS NOTED)

NOTES:

1. CONTRACTOR SHALL CONDUCT REMOVAL IN ACCORDANCE WITH ALL STATE AND FEDERAL SAFETY STANDARDS.
2. DEMOLITION INCLUDES REMOVAL, TRANSPORTATION AND DISPOSAL ACCORDING TO STATE AND FEDERAL REGULATIONS.
3. UTILITIES WITHIN THE LIMITS OF WORK ARE OUT OF SERVICE AND CAN BE DEMOLISHED. THE CONTRACTOR SHALL OBTAIN CLEARANCE FROM THE VARIOUS UTILITIES PRIOR TO DEMOLITION WITHIN THE OUTLINED LIMIT.

KEYNOTES:

1. REMOVE & DISPOSE 8' CHAINLINK FENCE
2. STREET LIGHT POLE, LIGHTS, AND WIRES; COORDINATE REMOVAL WITH PG&E
3. PROTECT EXISTING UTILITY CABINETS/VAULTS/BOXES (COORDINATE W/ AGENCIES AS NEEDED)
4. PROTECT EXISTING FIRE HYDRANT
5. PROTECT EXISTING SIDEWALK, CURB, AND GUTTER
6. PROTECT EXISTING STORM DRAIN PIPE
7. NOT USED
8. REMOVE & DISPOSE CMP PIPE AND PCC COLLAR
9. NOT USED
10. PROTECT EXISTING STREET LIGHT
11. ABANDON INCLINOMETER
12. ABANDON PIEZOMETER
13. UTILITY POLE AND WIRES; COORDINATE REMOVAL WITH PG&E



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REGISTERED PROFESSIONAL ENGINEER FRANZ G. HAIDINGER NO. C 64725 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

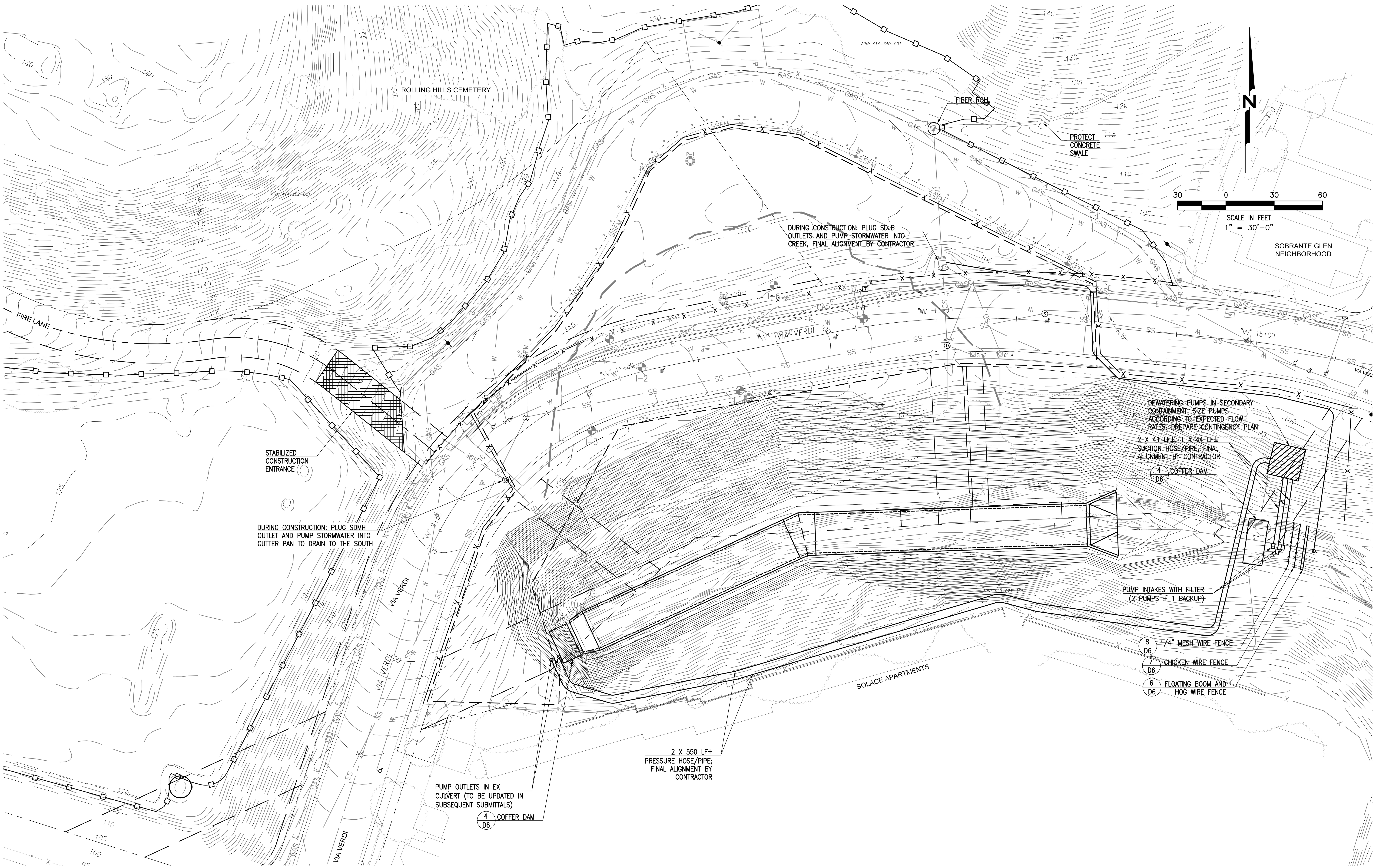
PROJECT NO:	568.41.55
DESIGNED BY:	FGH, VL
DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE

REMOVAL PLAN 2

DRAWING

C4



DEWATERING NOTES
1. FLOWS OF 3-5 CFS CAN BE EXPECTED IN SAN PABLO CREEK DURING THE SUMMER MONTHS.
2. PRIOR TO STORM EVENTS, RELEASES FROM SAN PABLO RESERVOIR APPROACHING 200 CFS MAY REASONABLY BE EXPECTED; CONTRACTOR SHALL PROVIDE CONTINGENCY PLAN FOR HIGH FLOW STORM EVENTS.
3. THE CULVERT EXCAVATION SHALL BE DEWATERED TO 5' BELOW THE BOTTOM OF EXCAVATION. CONTRACTOR SHALL DESIGN AND CONSTRUCT DEWATERING SYSTEM.
4. CONTRACTOR SHALL PROVIDE SETTLING TANKS FOR GROUNDWATER BEFORE DISCHARGING INTO CREEK.
5. CONTRACTOR MAY PROPOSE ALTERNATIVE DEWATERING METHODS AS LONG AS WATER QUALITY AND PROTECTION OF WILDLIFE ARE MAINTAINED.
6. SIZE DISCHARGE PIPE AND FITTINGS AS REQUIRED.

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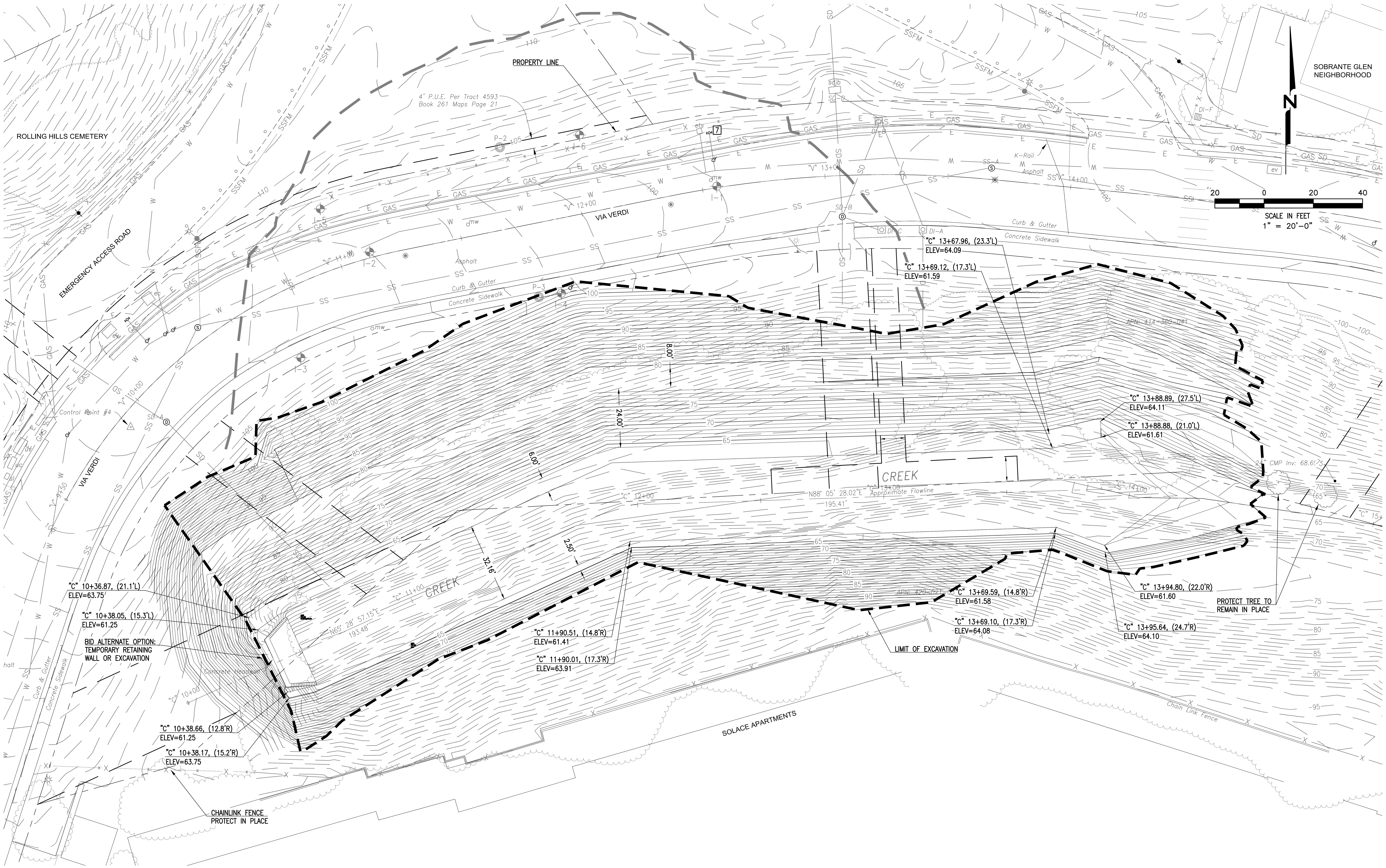
SHEET TITLE
DEWATERING AND BMP PLAN

DRAWING
C5

SHEET 7 OF 30



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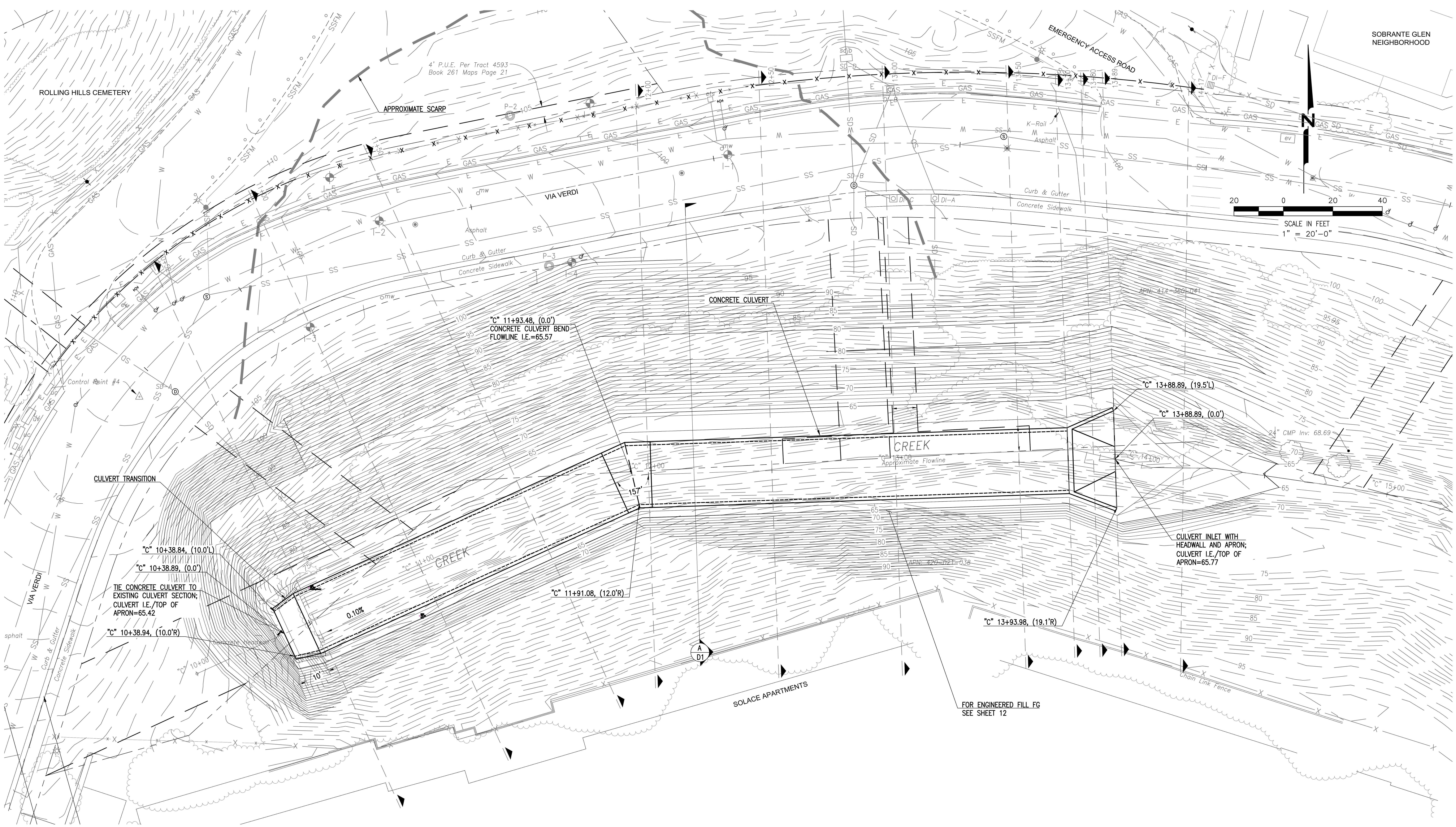
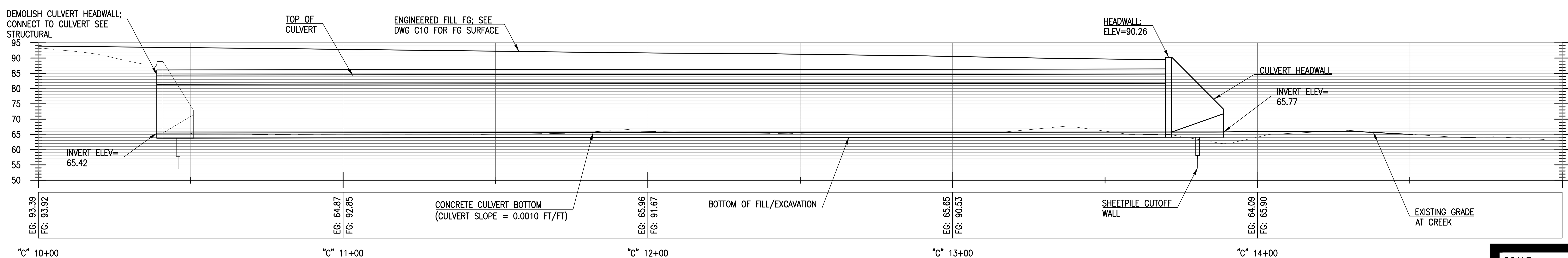
SHEET TITLE

EXCAVATION PLAN

DRAWING C6

SHEET 8 OF 30





SCALE:
HORIZONTAL: 1" = 20'
VERTICAL: 1" = 20"

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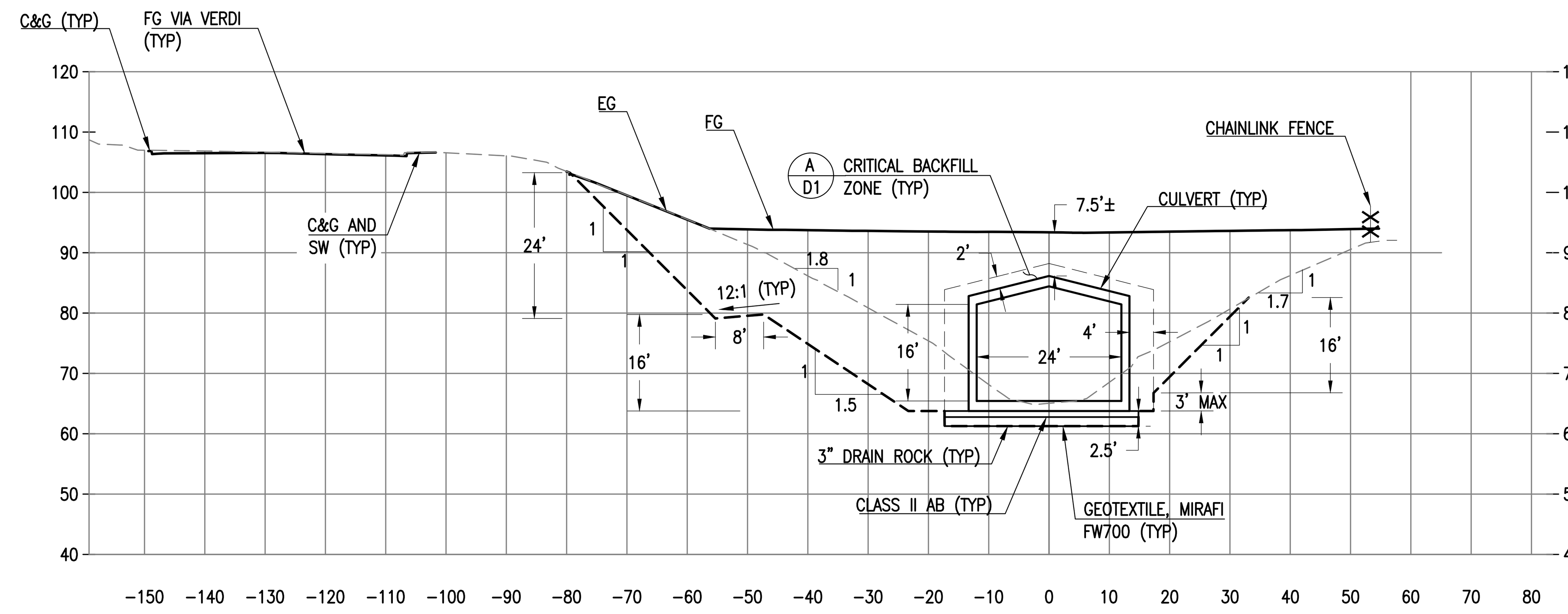
SHEET TITLE

REINFORCED CONCRETE CULVERT PLAN AND PROFILE

DRAWING
C7

SCALE:
HORIZONTAL: 1" = 20'
VERTICAL: 1" = 20'



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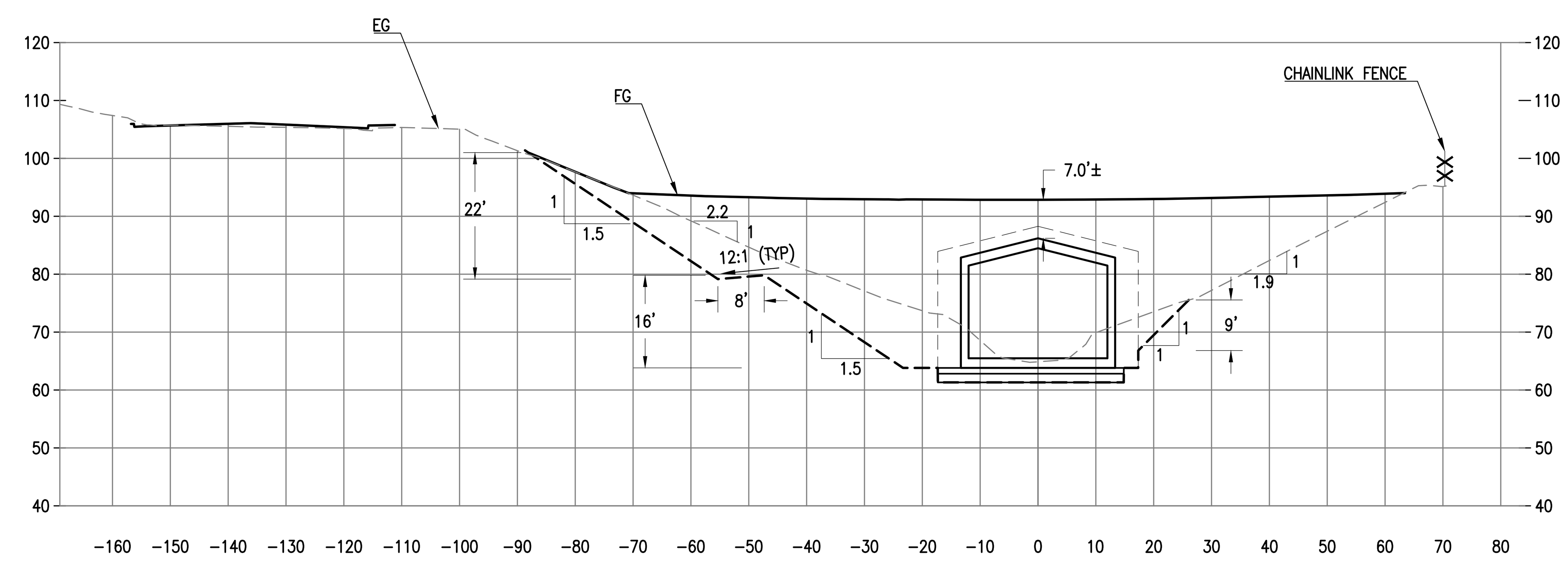

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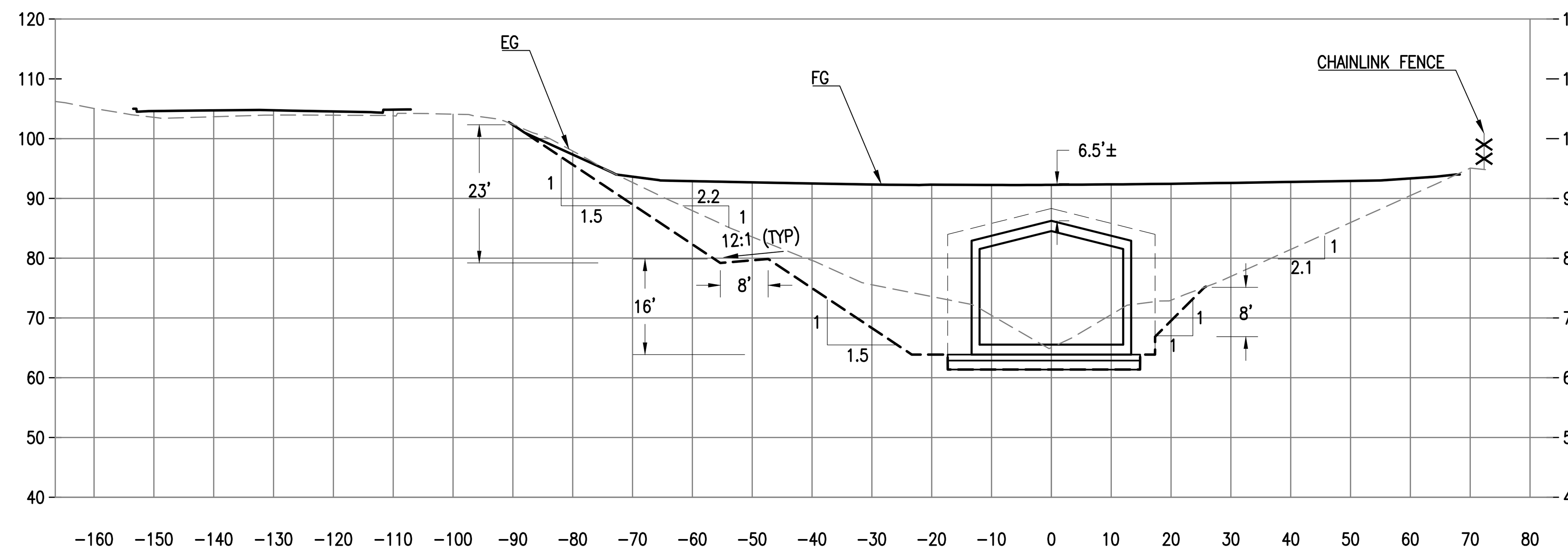

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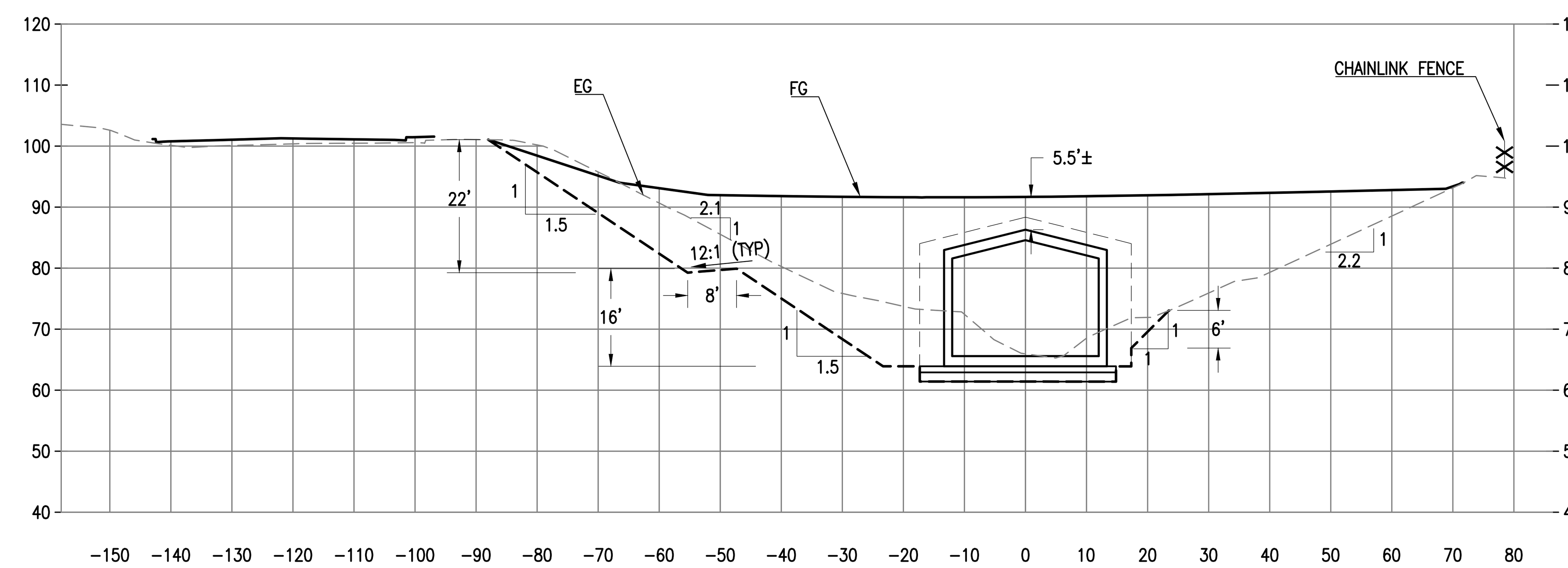

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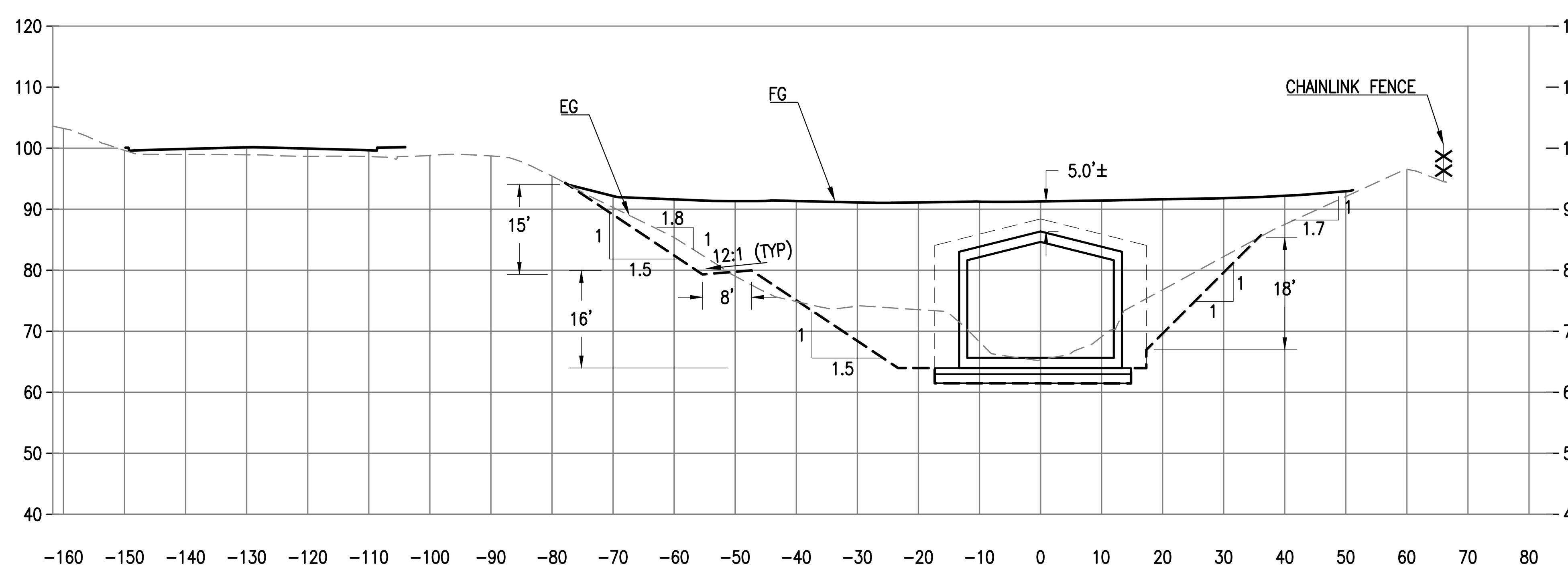

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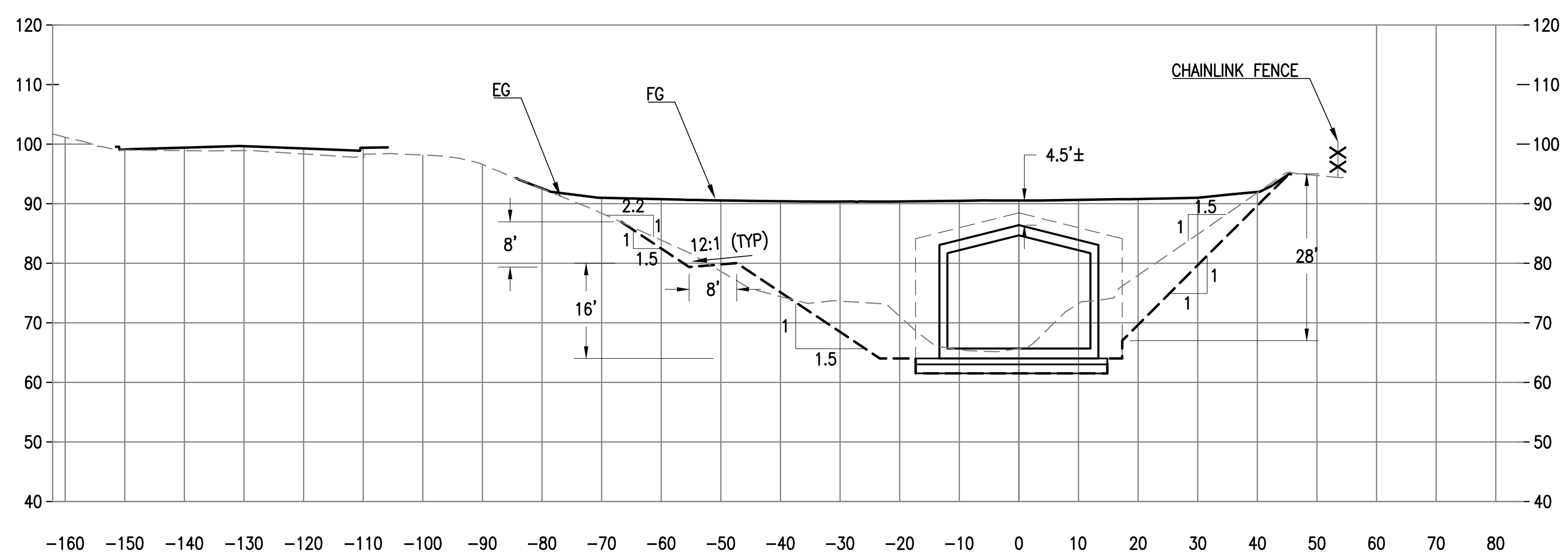

13+00.00

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SHEET TITLE

CULVERT CROSS SECTIONS 1

DRAWING

C8

SHEET 10 OF 30

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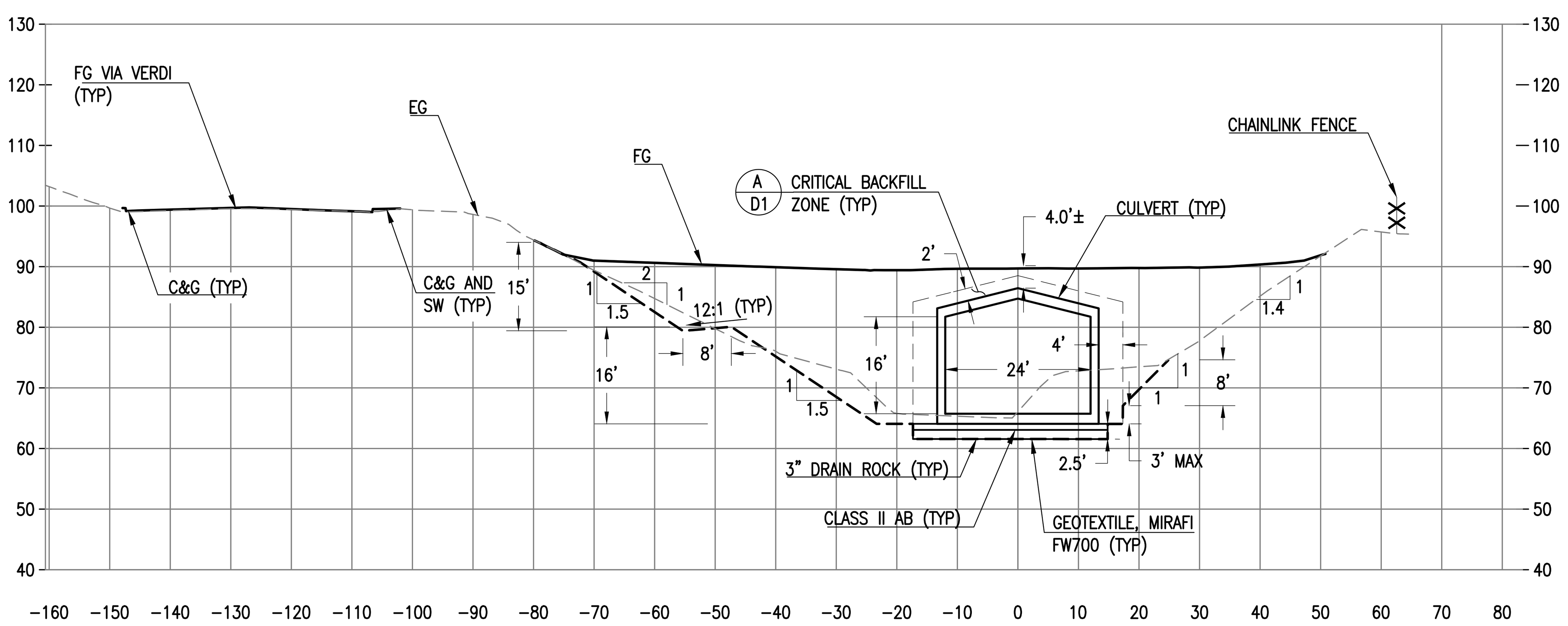
VERTICAL: 1" = 20'



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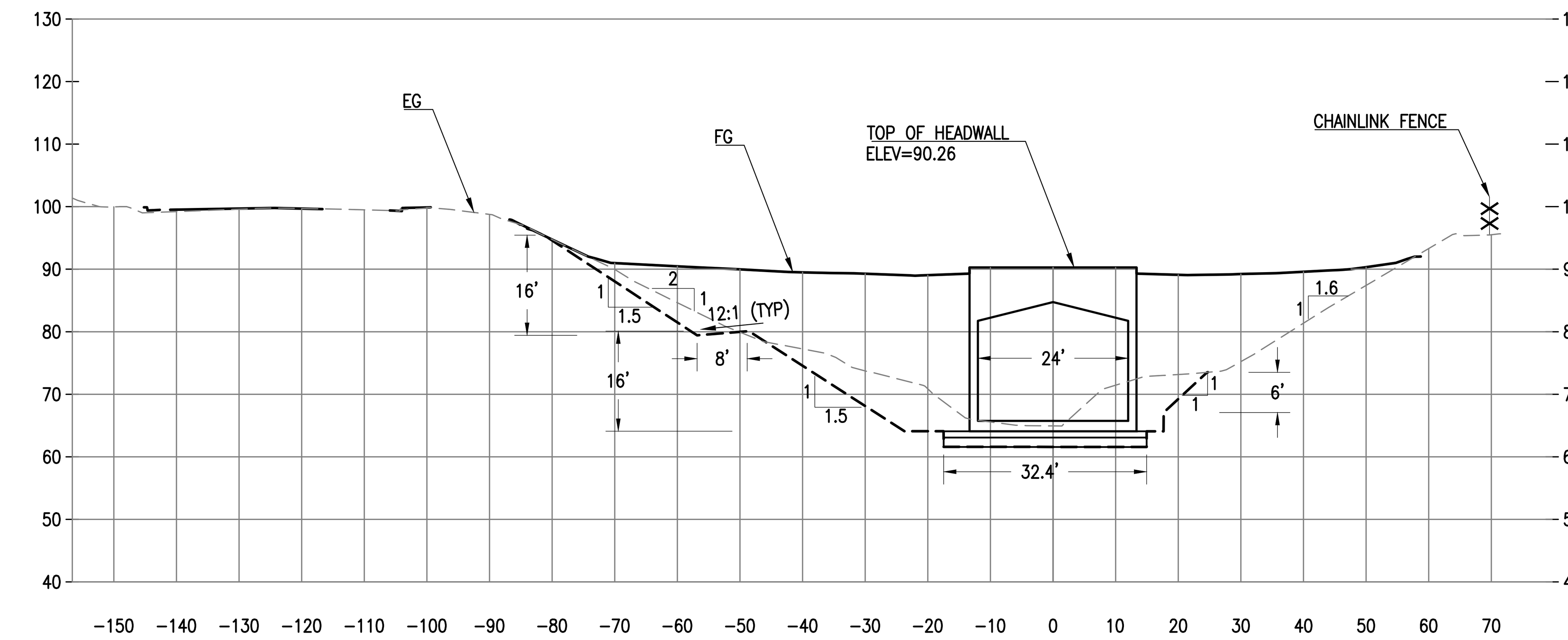

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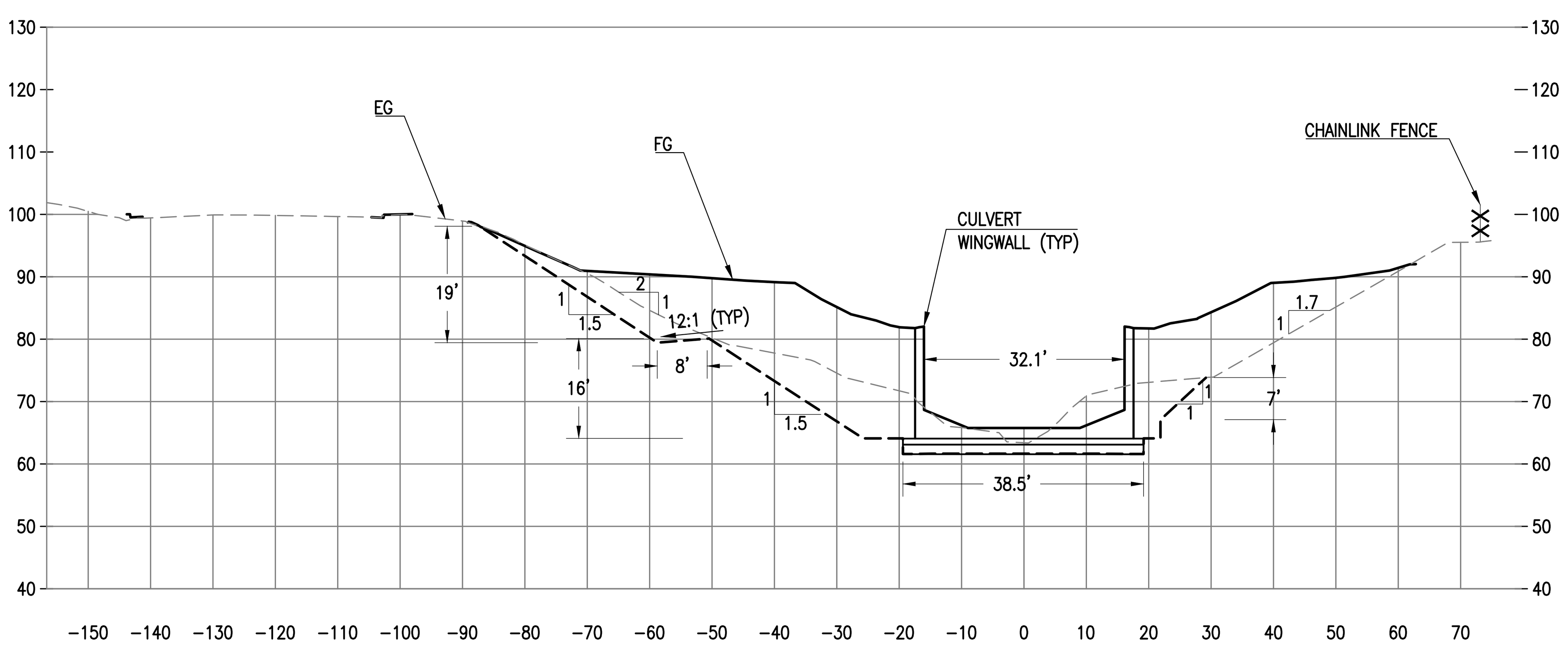
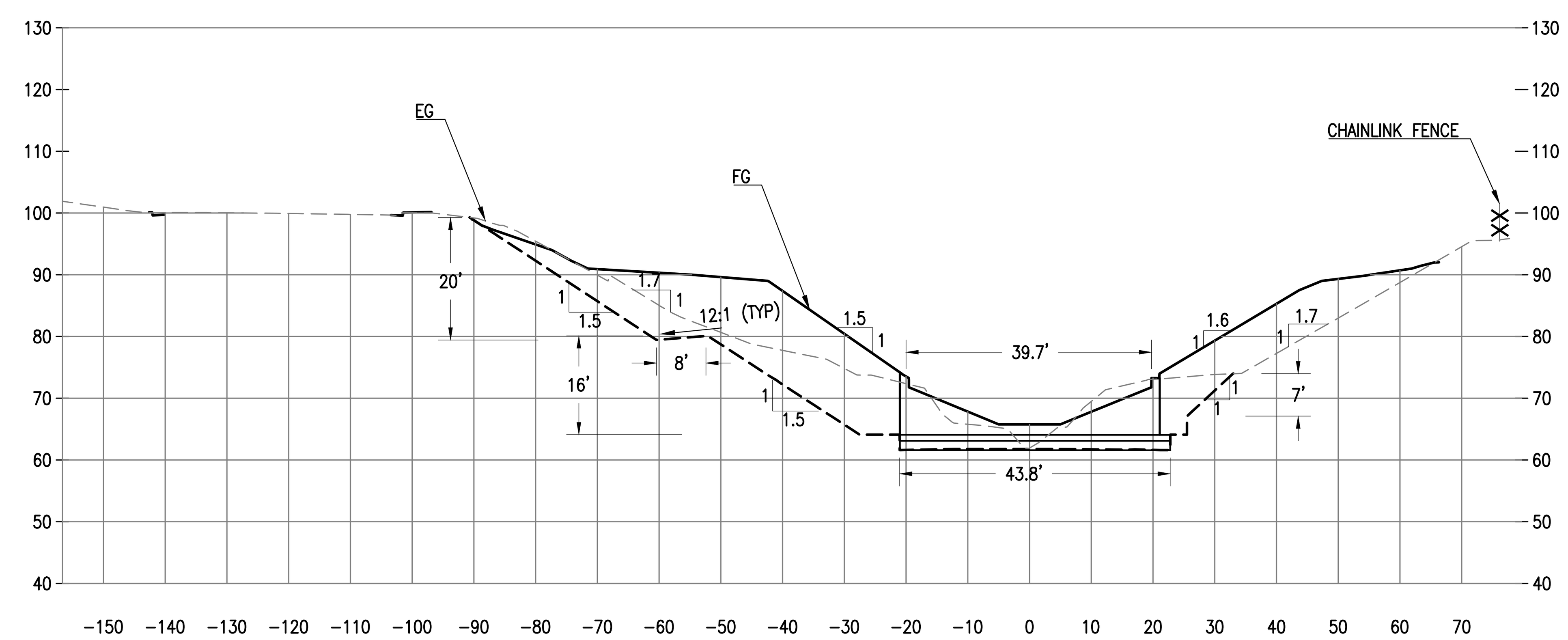
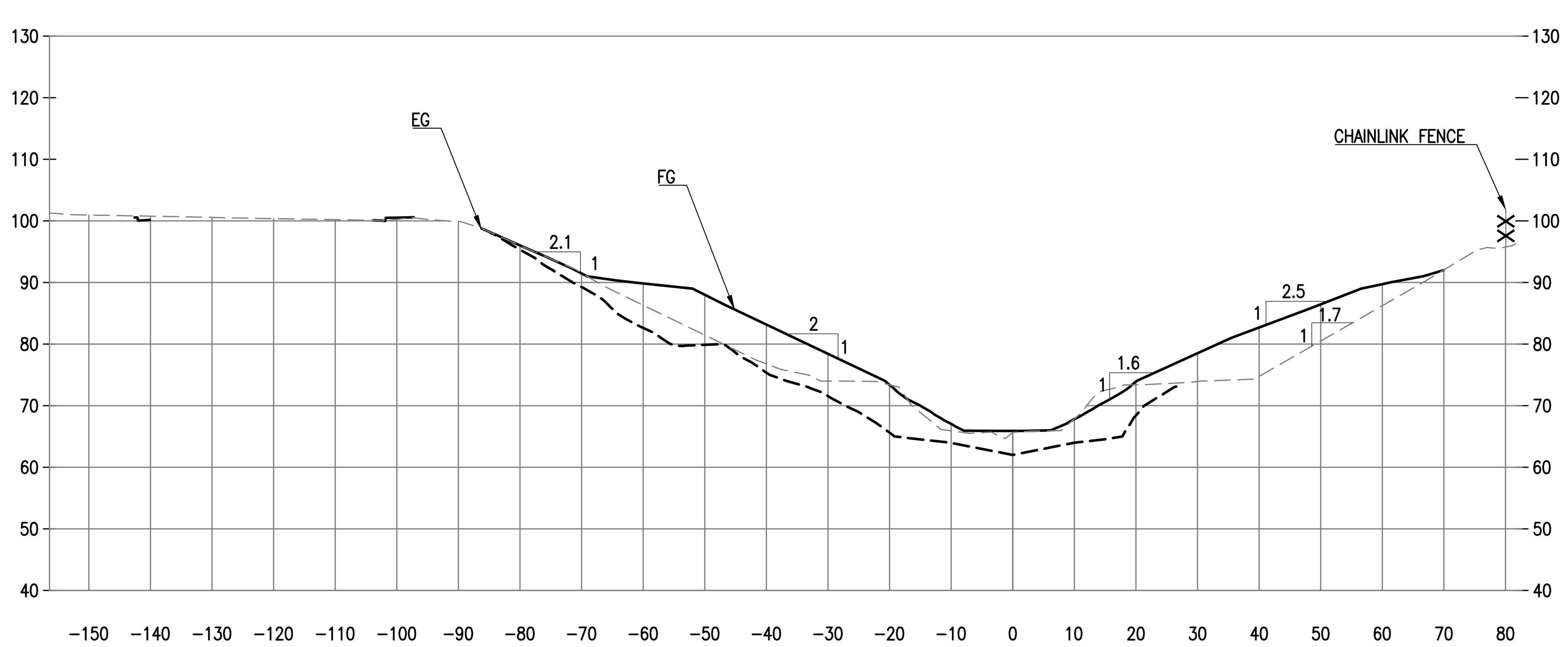


13+80.14



13+88.89



14+16.86

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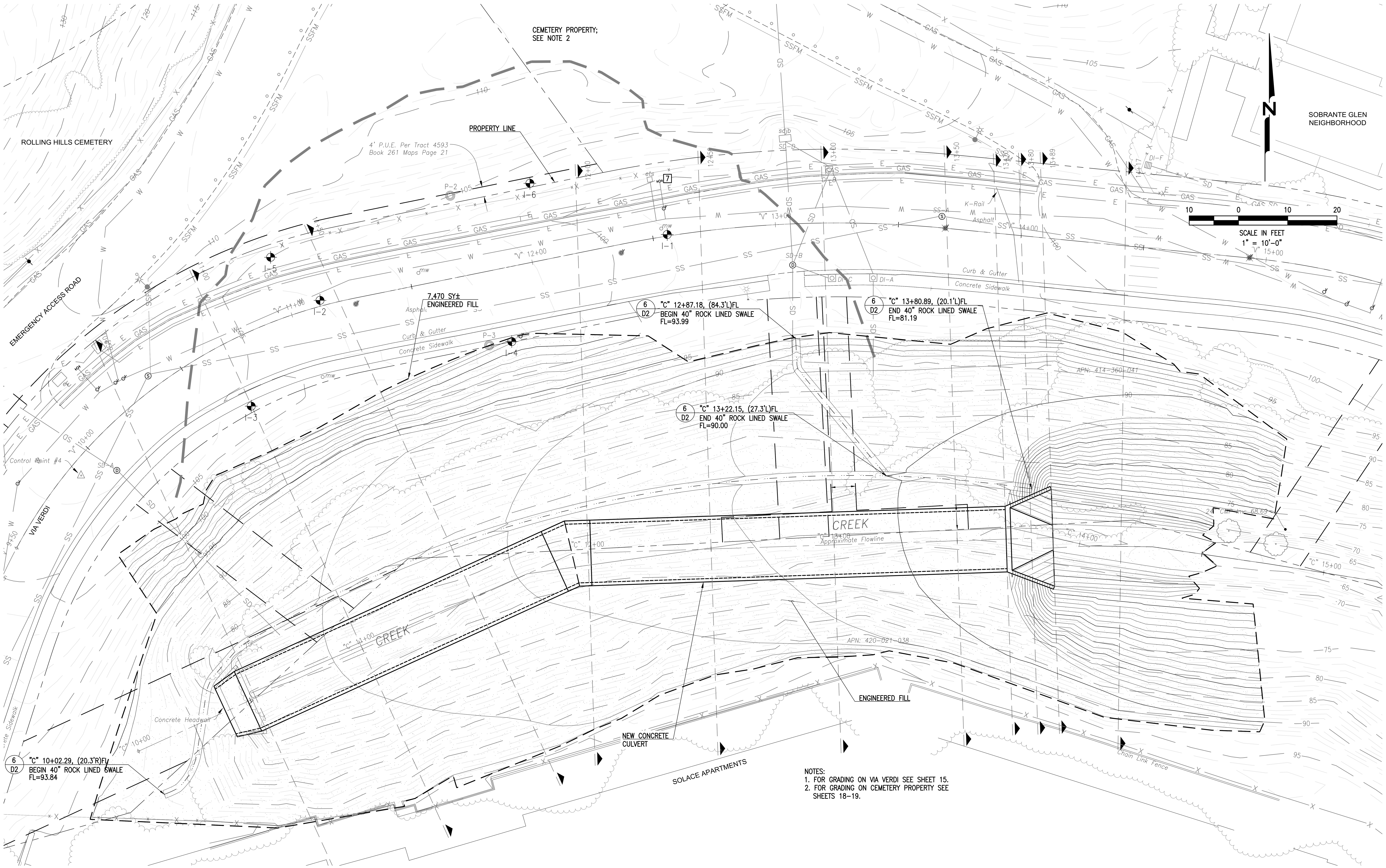
SHEET TITLE

CULVERT CROSS SECTIONS 2

DRAWING
C9

SHEET 11 OF 30



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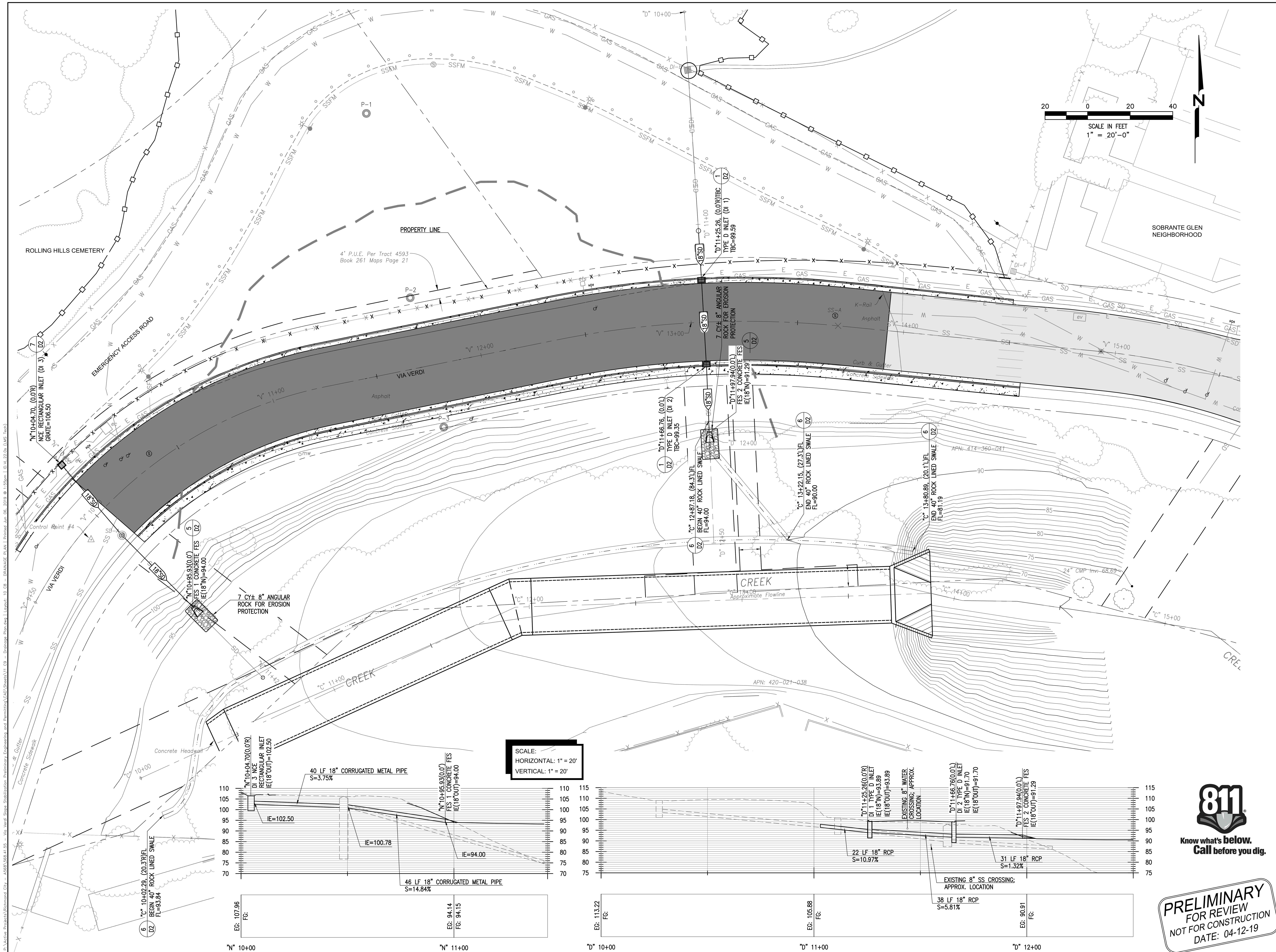
SHEET TITLE

EARTHWORK AND GRADING PLAN

DRAWING
C10



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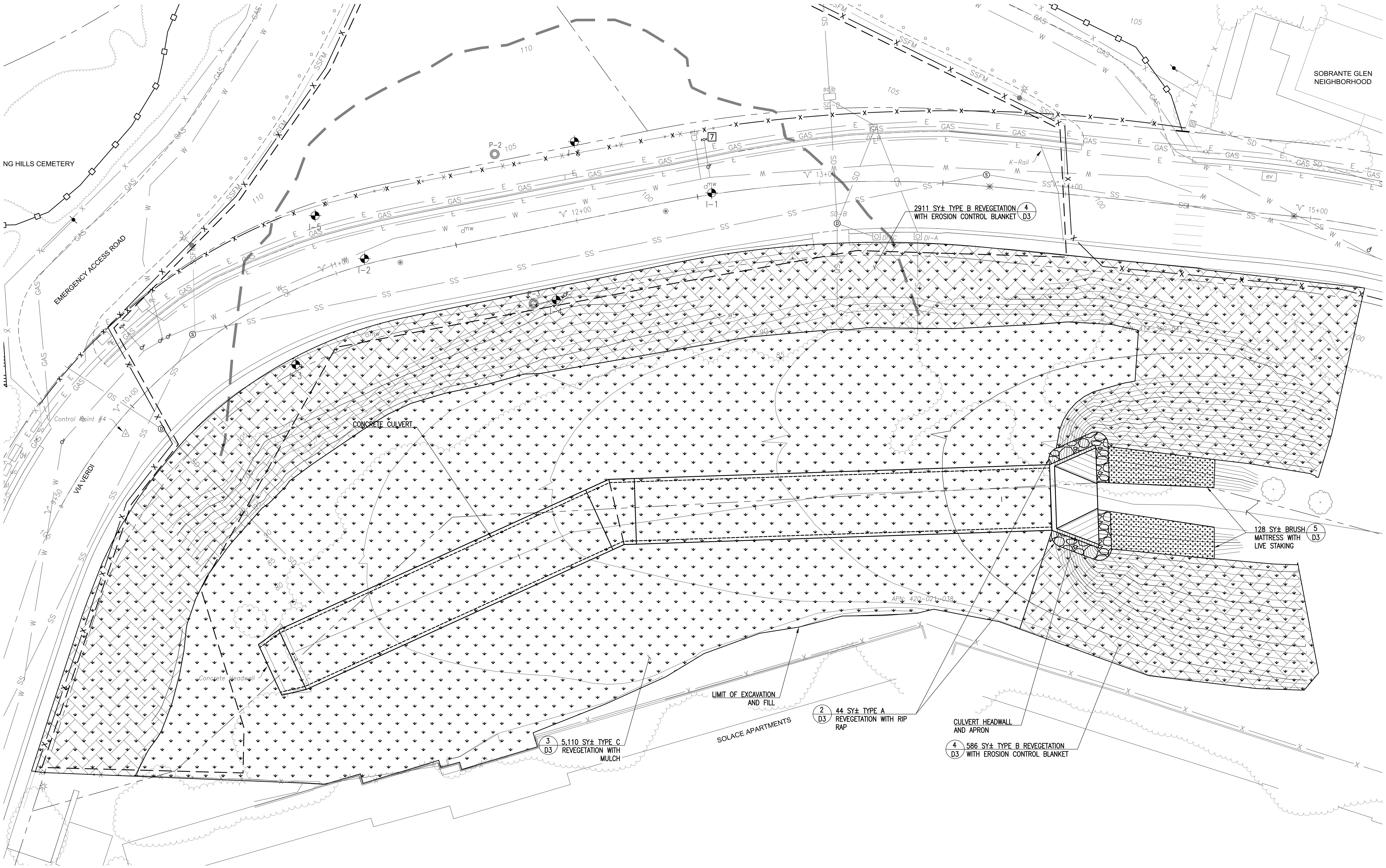
SHEET TITLE

DRAINAGE PLAN

DRAWING

C11



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SHEET TITLE

EROSION CONTROL AND REVEGETATION PLAN

DRAWING C12

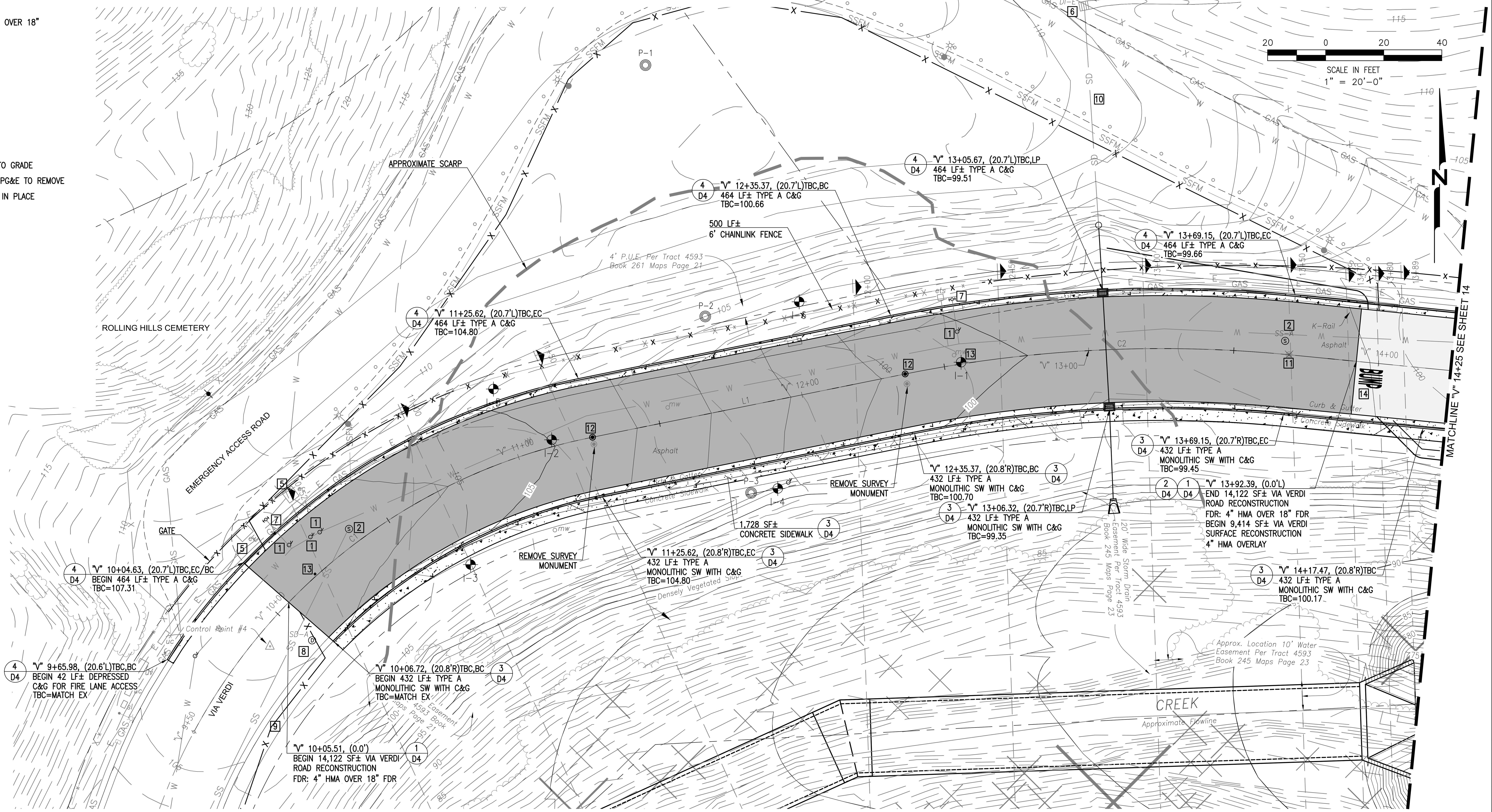
LEGEND

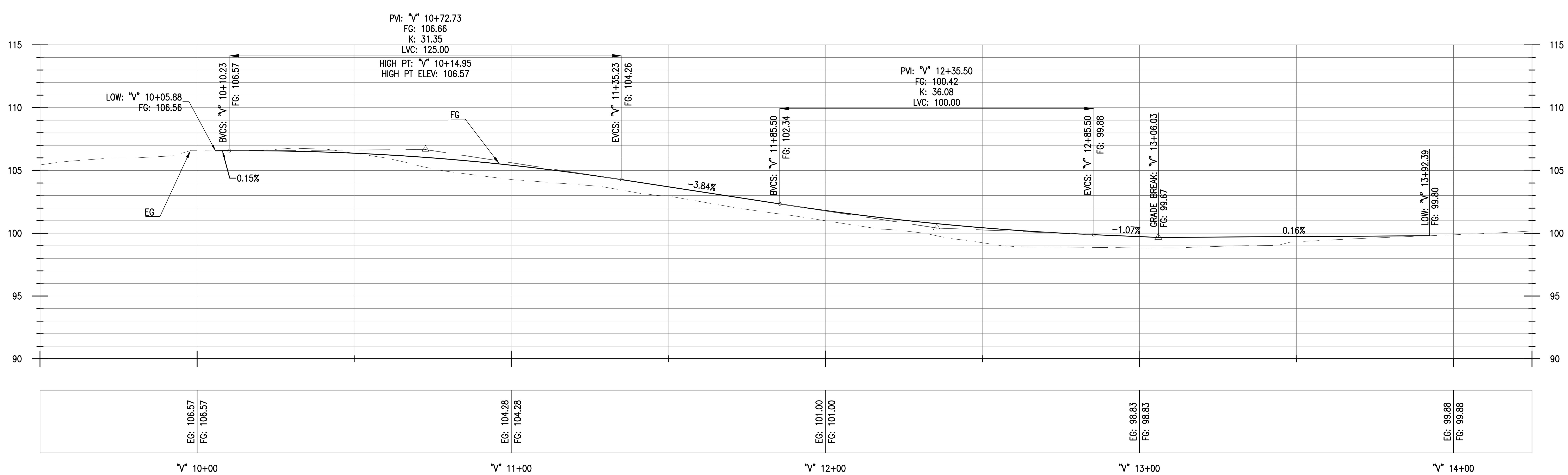
- FULL-DEPTH RECLAMATION (FDR): 4" HMA OVER 18" FDR
- SURFACE RECONSTRUCTION: 4" HMA
- SIDEWALK, CURB, AND GUTTER

KEYNOTES:

1. ADJUST WATER VALVE BOX AND COVER TO GRADE
2. ADJUST SANITARY SEWER MANHOLE AND RIM TO GRADE
3. ADJUST STORM DRAIN MANHOLE AND RIM TO GRADE
4. ADJUST STORM DRAIN INLET BOX AND/OR CATCH BASIN TO GRADE
5. PROTECT ELECTRICAL VAULT IN PLACE; COORDINATE WITH PG&E TO REMOVE
6. PROTECT STORM DRAIN INLET BOX AND/OR CATCH BASIN IN PLACE
7. PROTECT FIRE HYDRANT IN PLACE
8. PROTECT STORM DRAIN MANHOLE IN PLACE
9. PROTECT EXISTING SIDEWALK, CURB, AND GUTTER
10. PROTECT EXISTING STORM DRAIN PIPE
11. ADJUST SURVEY MONUMENT BOX AND COVER TO GRADE
12. INSTALL SURVEY MONUMENT
13. INSTALL FIRE HYDRANT BLUE MARKER
14. INSTALL "BUMP" MARKING; SEE DETAIL 2/C14.

V			
Number	Radius	Length	Line/Chord Direction
C1	200.00	175.62	N53° 24' 19.83"E
L1		109.75	N78° 33' 42.11"E
C2	450.00	133.78	N87° 04' 42.11"E
L2		124.05	S84° 24' 17.89"E
C3	300.00	74.70	S77° 16' 17.92"E
L3		82.11	S70° 08' 17.89"E





SCALE:
HORIZONTAL: 1" = 20'
VERTICAL: 1" = 5'

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DATE: 04/12/2019

SHEET TITLE

VIA VERDI RECONSTRUCTION 1 PLAN AND PROFILE

DRAWING

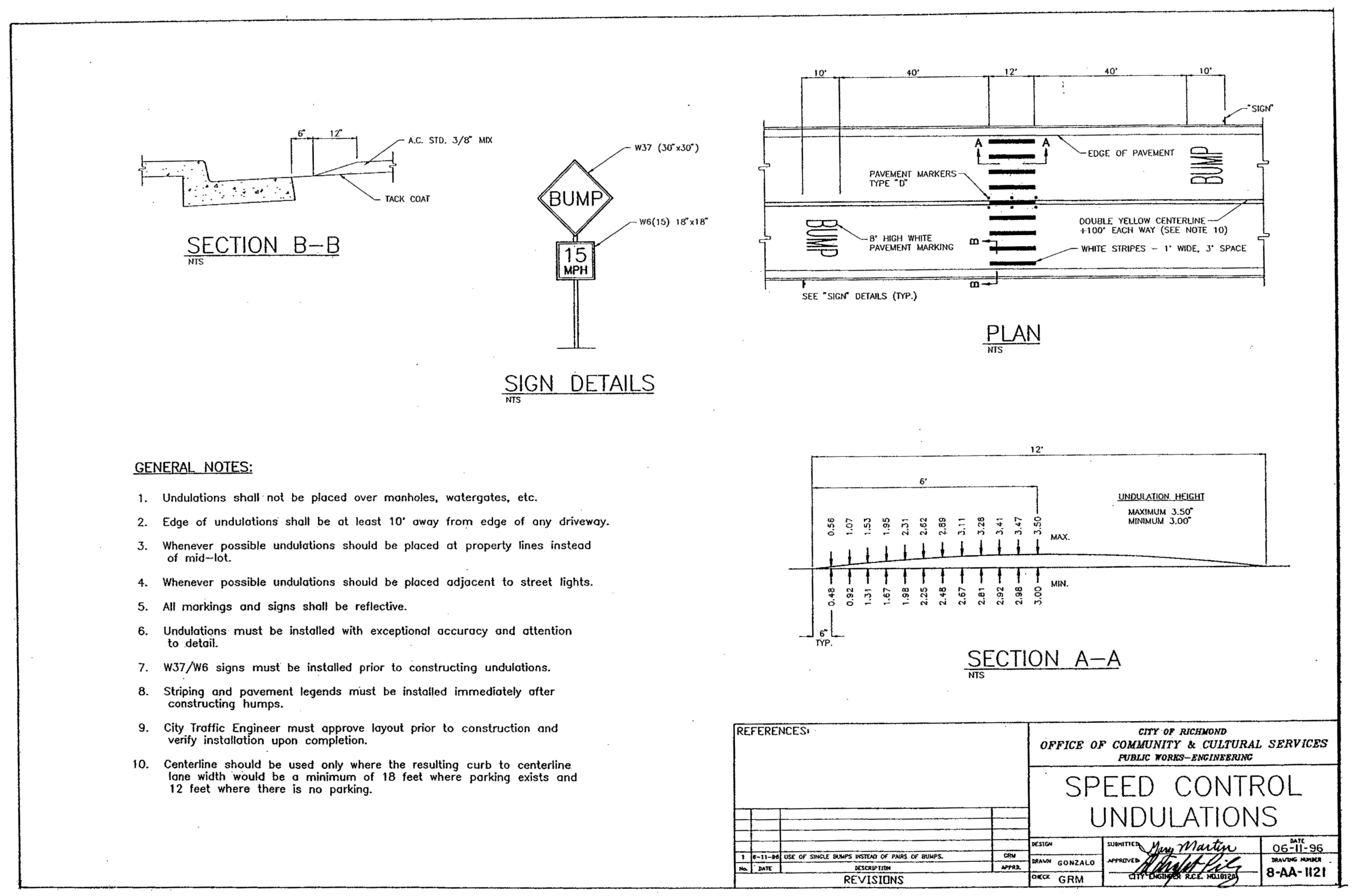
C13

LEGEND

- FULL-DEPTH RECLAMATION (FDR): 4" HMA OVER 18" FDR
- SURFACE RECONSTRUCTION: 4" HMA
- SIDEWALK, CURB, AND GUTTER

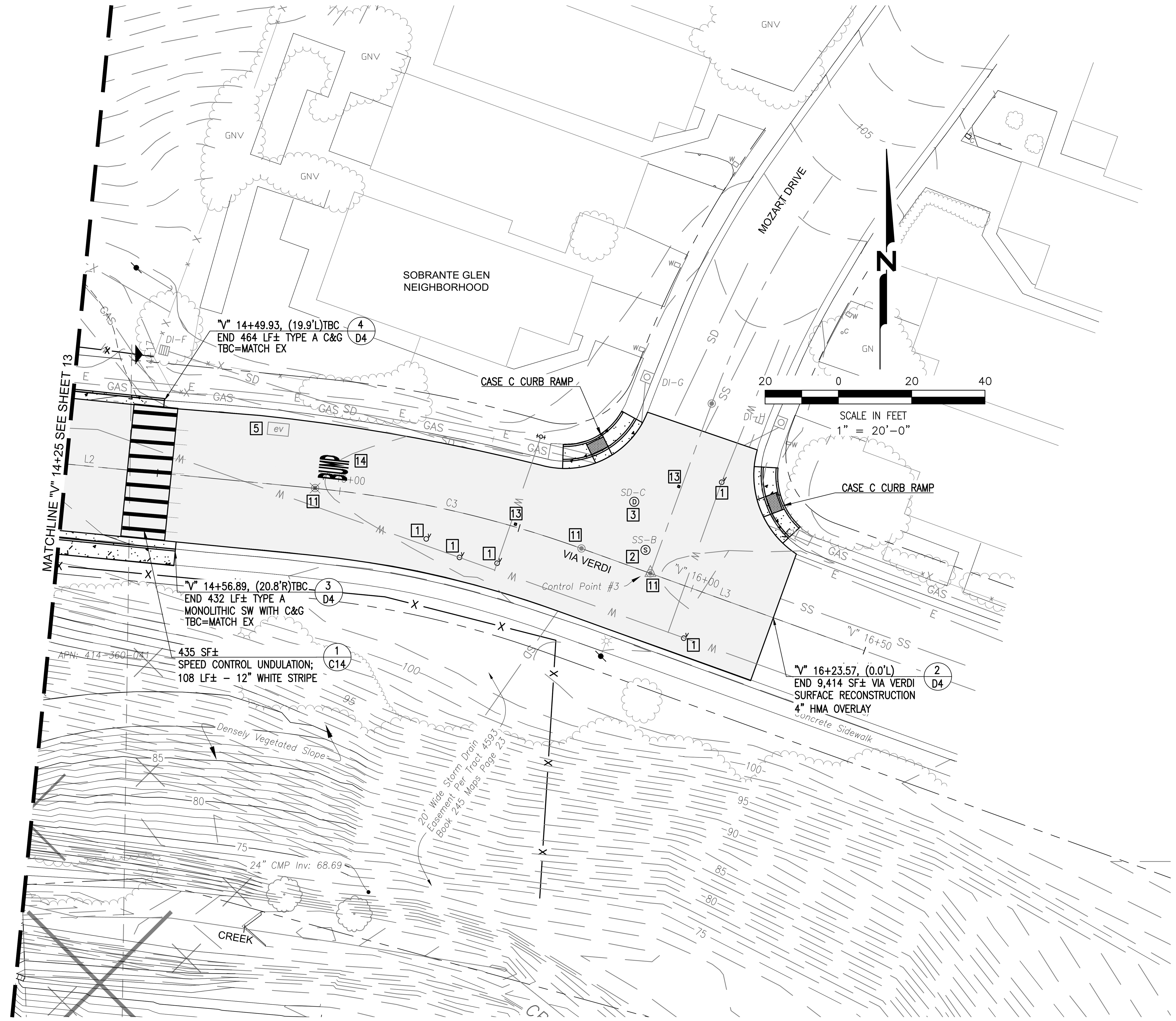
KEYNOTES:

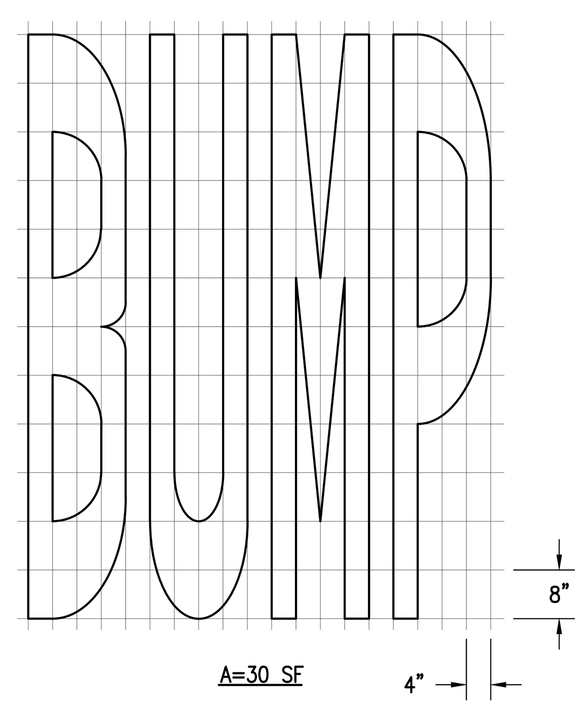
1. ADJUST WATER VALVE BOX AND COVER TO GRADE
2. ADJUST SANITARY SEWER MANHOLE AND RIM TO GRADE
3. ADJUST STORM DRAIN MANHOLE AND RIM TO GRADE
4. ADJUST STORM DRAIN INLET BOX AND/OR CATCH BASIN TO GRADE
5. PROTECT ELECTRICAL VAULT IN PLACE; COORDINATE WITH PG&E TO REMOVE
6. PROTECT STORM DRAIN INLET BOX AND/OR CATCH BASIN IN PLACE
7. PROTECT FIRE HYDRANT IN PLACE
8. PROTECT STORM DRAIN MANHOLE IN PLACE
9. PROTECT EXISTING SIDEWALK, CURB, AND GUTTER
10. PROTECT EXISTING STORM DRAIN PIPE
11. ADJUST SURVEY MONUMENT BOX AND COVER TO GRADE
12. INSTALL SURVEY MONUMENT
13. INSTALL FIRE HYDRANT BLUE MARKER
14. INSTALL "BUMP" MARKING; SEE DETAIL 2/C14.



1/C14 SPEED CONTROL UNDULATIONS

N.T.S.





2/C14 "BUMP" PAVEMENT MARKING

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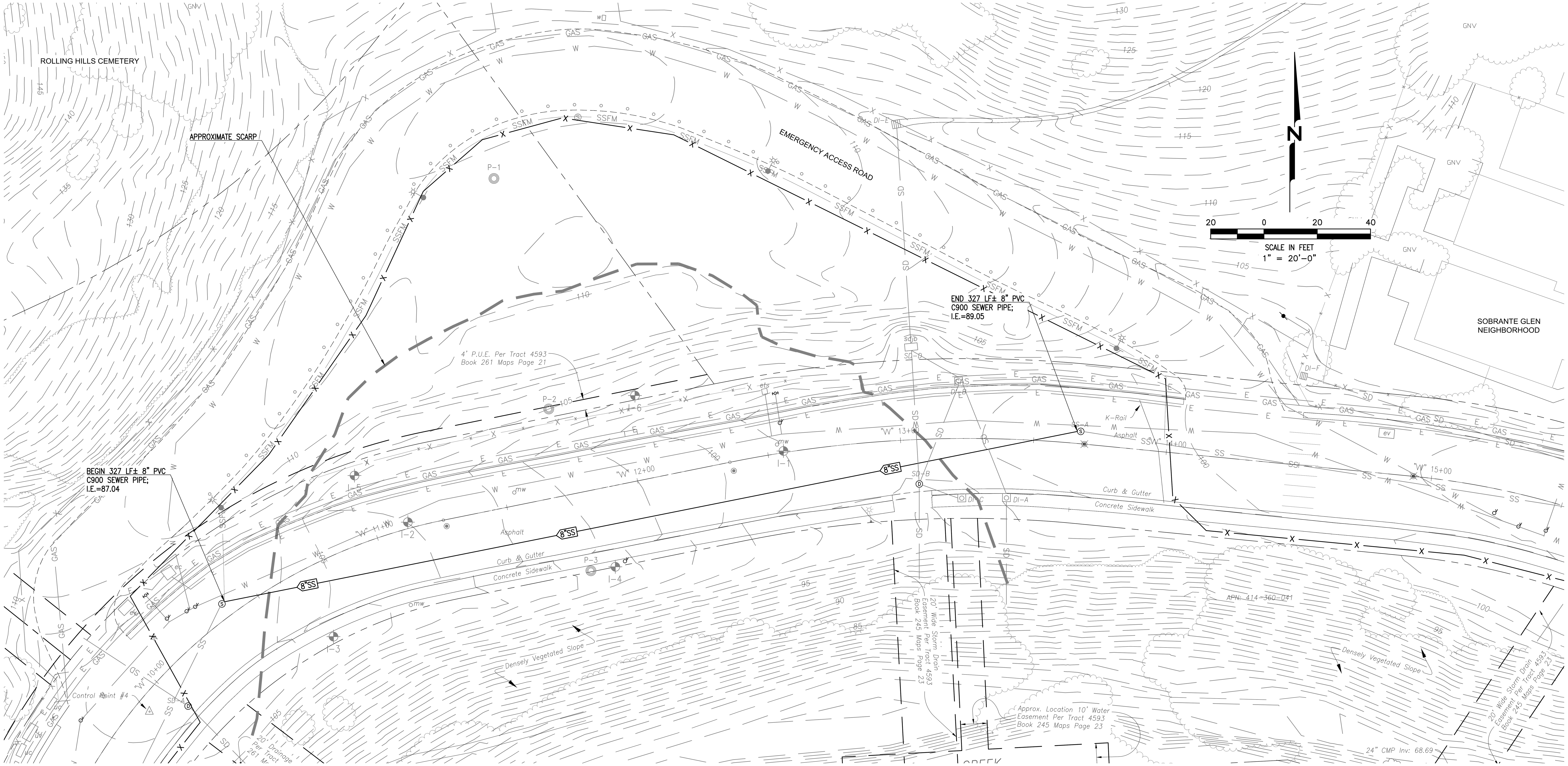
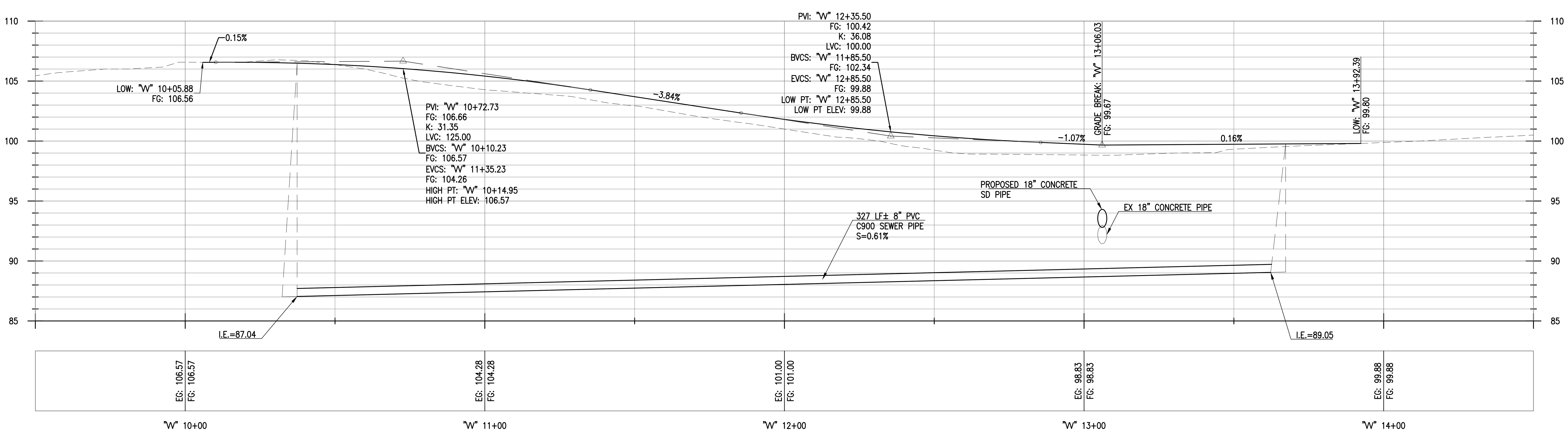
SHEET TITLE

VIA VERDI RECONSTRUCTION 2 PLAN AND PROFILE

DRAWING C14





SCALE:
HORIZONTAL: 1" = 20'
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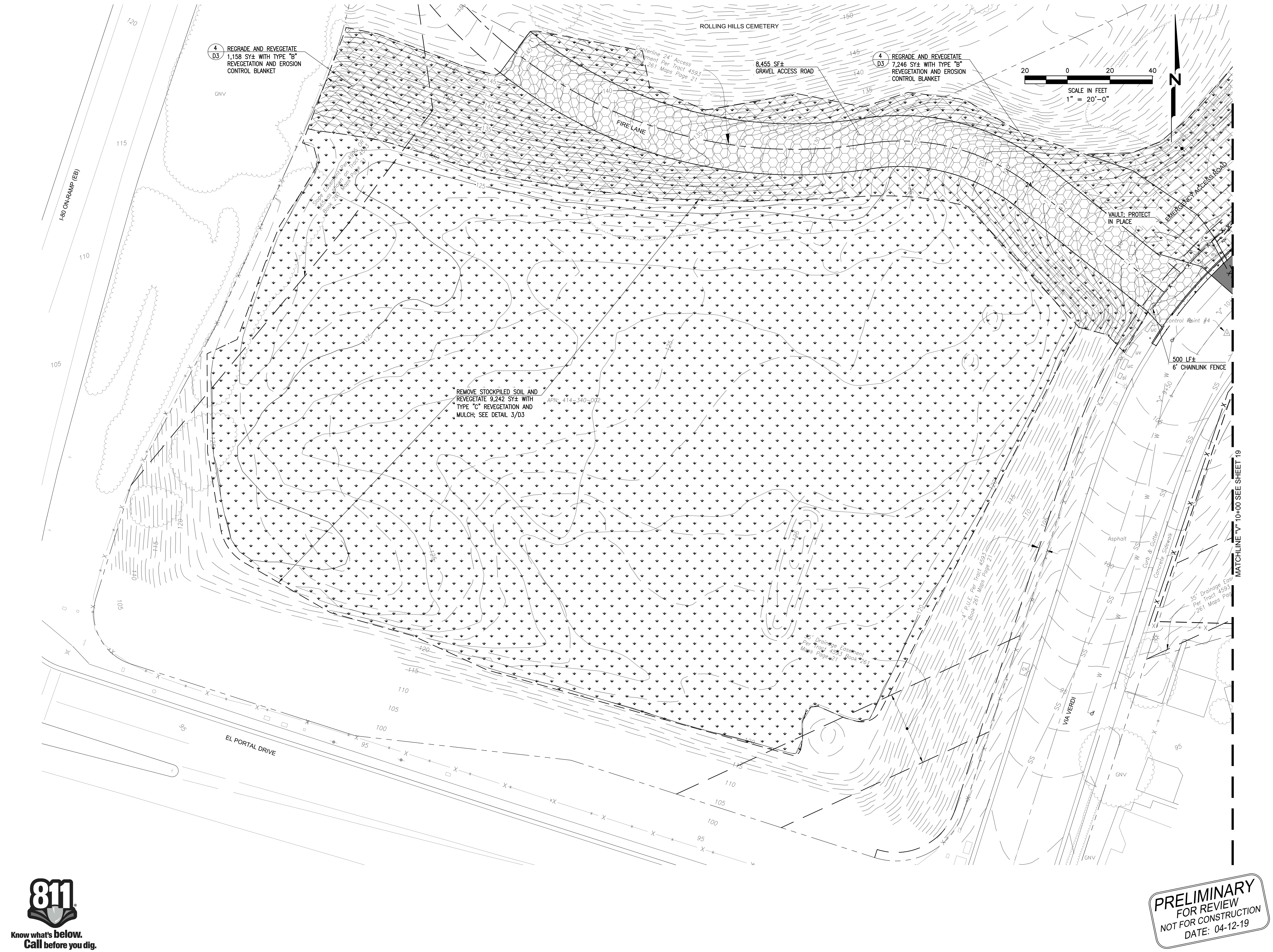
SHEET TITLE

SANITARY SEWER REPLACEMENT PLAN AND PROFILE

DRAWING

C15

SHEET 17 OF 30



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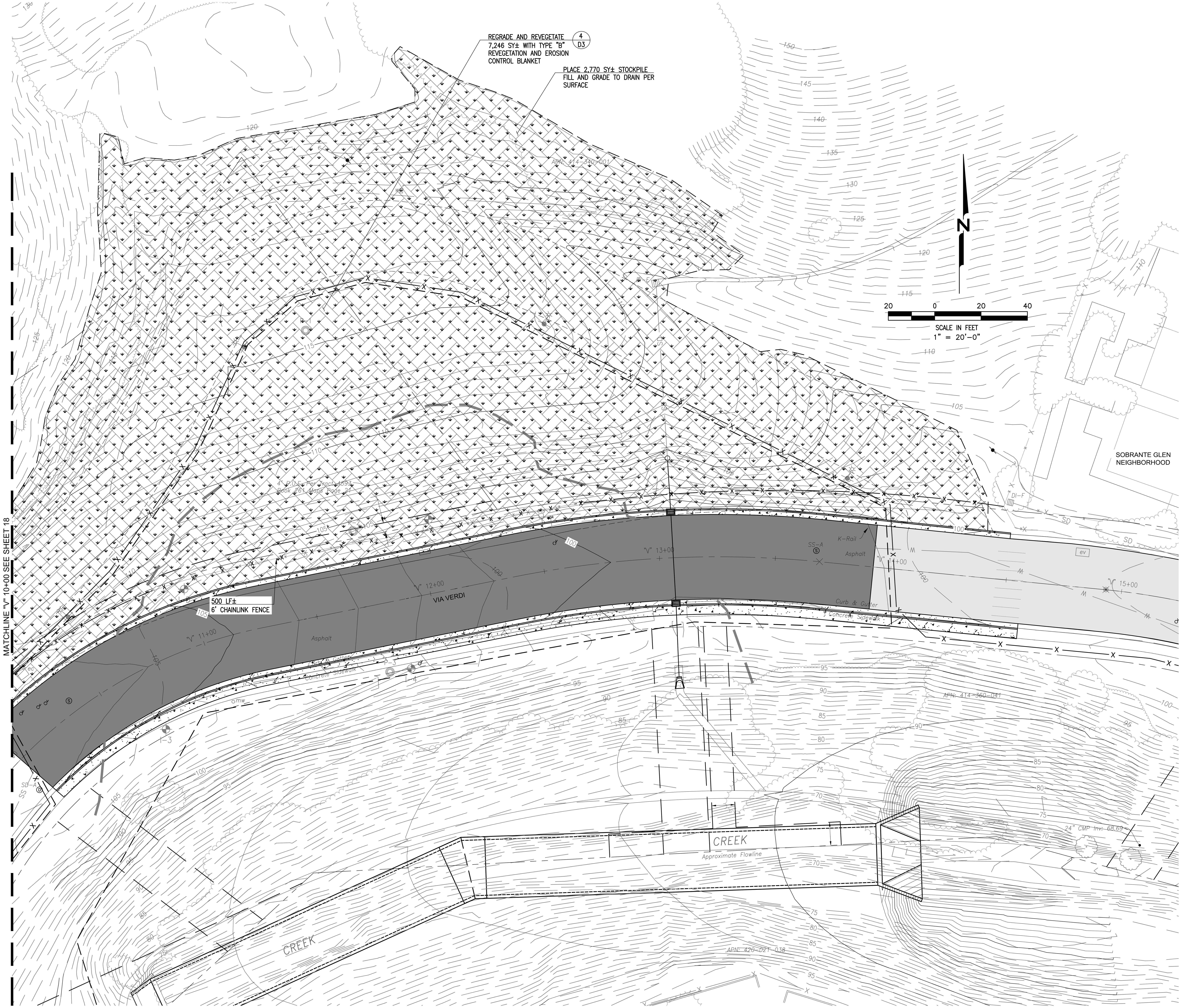
SHEET TITLE

CEMETERY PROPERTY RESTORATION PLAN 1

DRAWING C16



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DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE

CEMETERY PROPERTY RESTORATION PLAN 2

DRAWING

C17

811
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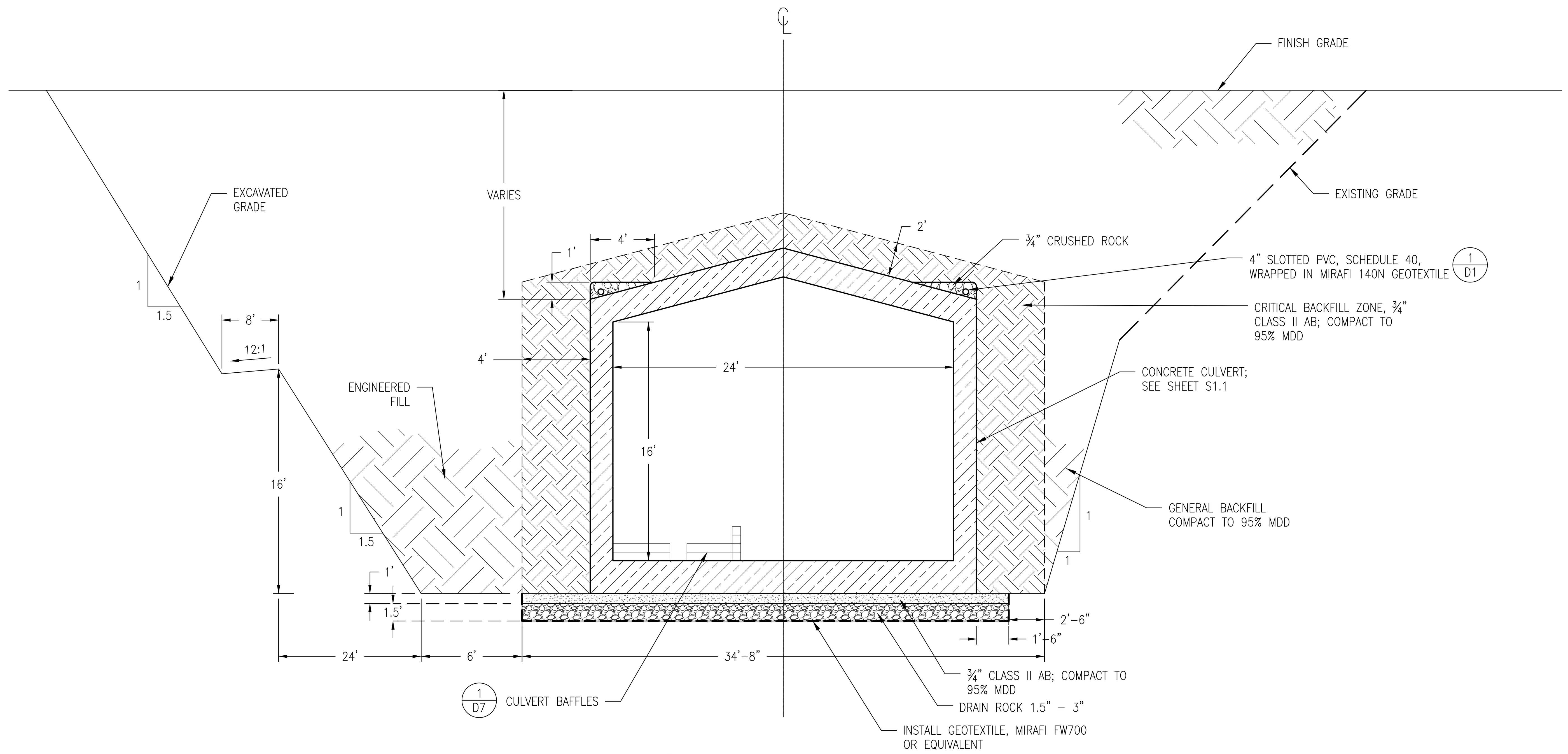
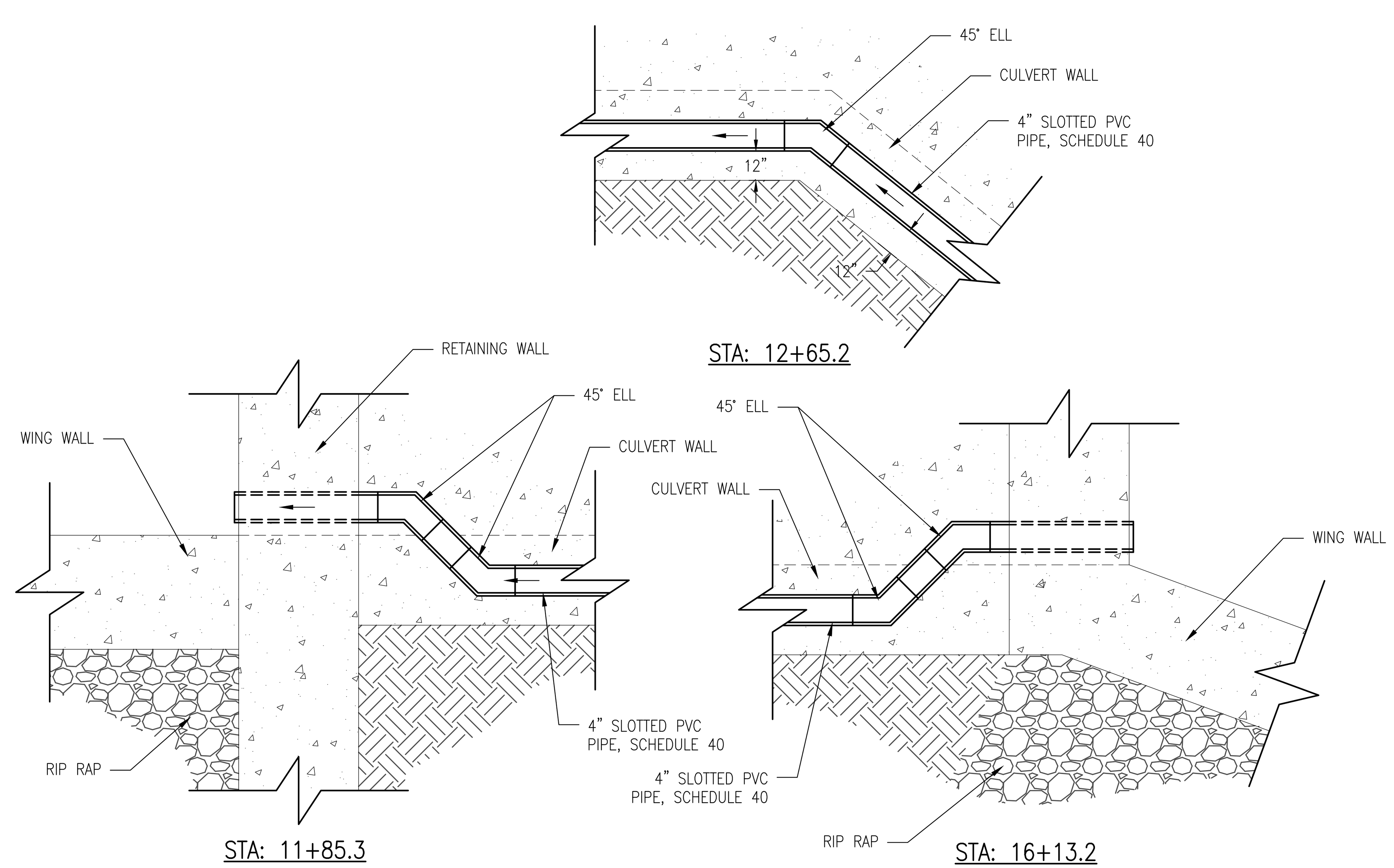
DATE: 04-12-19



A
D1
TYP. CULVERT SECTION
N.T.S.



1
D1
SLOTTED PVC PIPE DRAINS PLAN VIEW
N.T.S.

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NCE
501 Canal Blvd., Suite I
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REGISTERED PROFESSIONAL ENGINEER
FRANZ G. HAIDINGER
NO. C 64725
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO:	568.41.55
DESIGNED BY:	FGH, VL
DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
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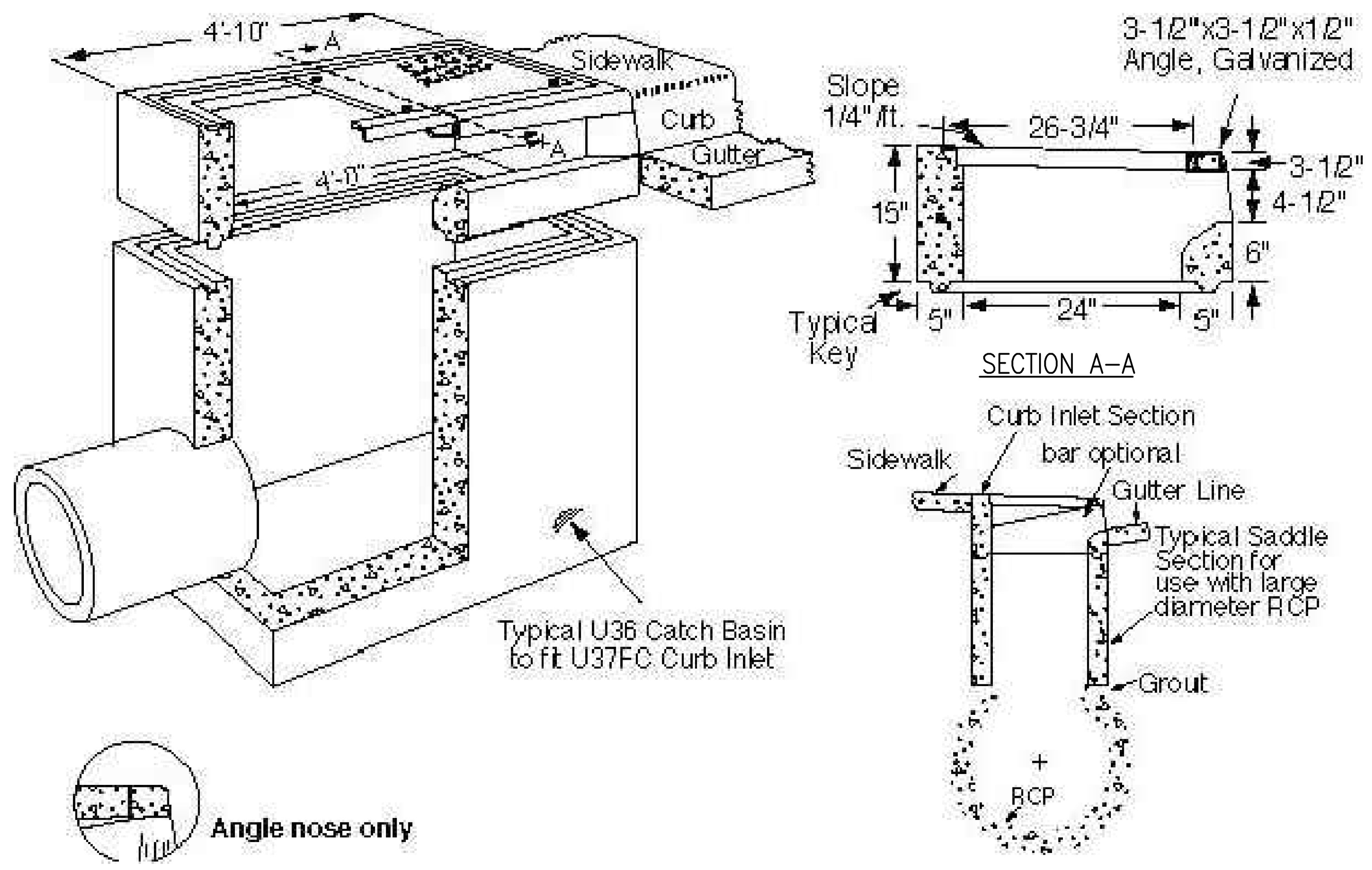
SHEET TITLE

SECTIONS AND DETAILS - CULVERT

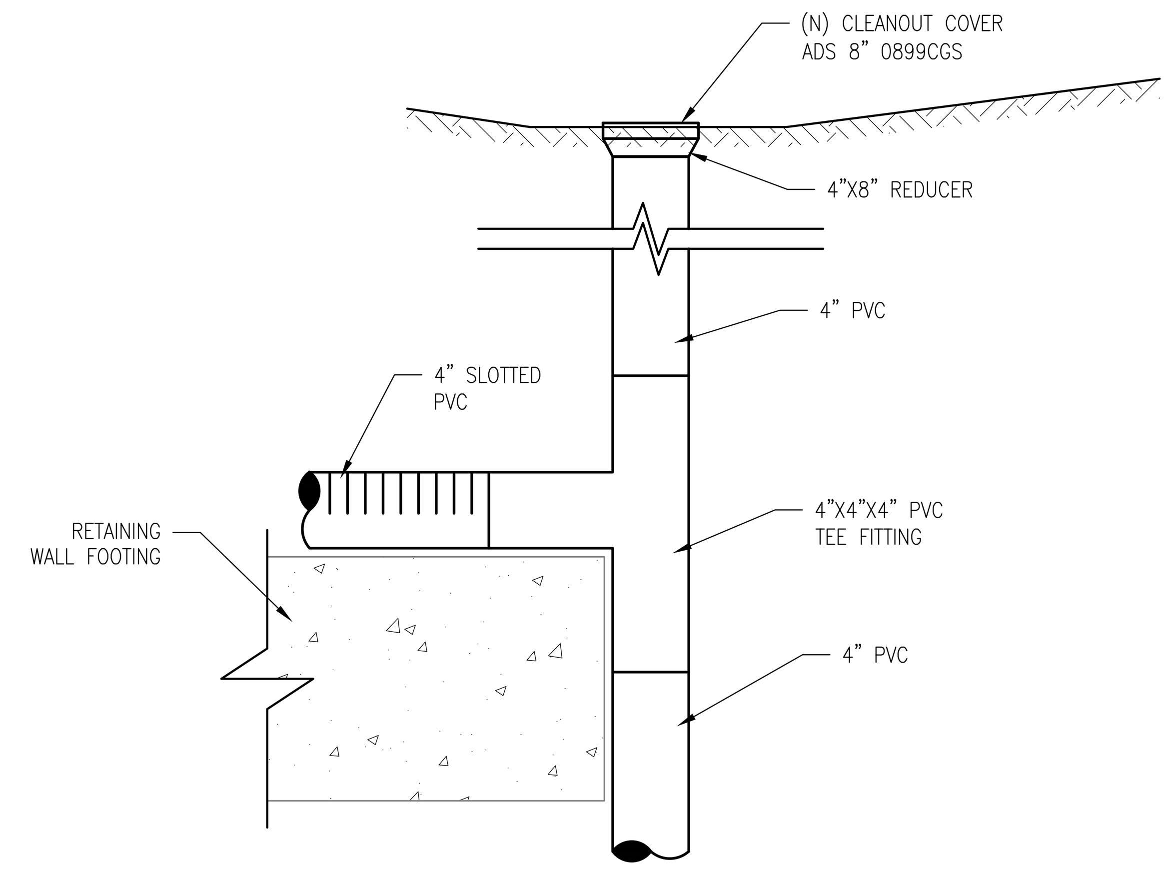
DRAWING

D1

SHEET 20 OF 30



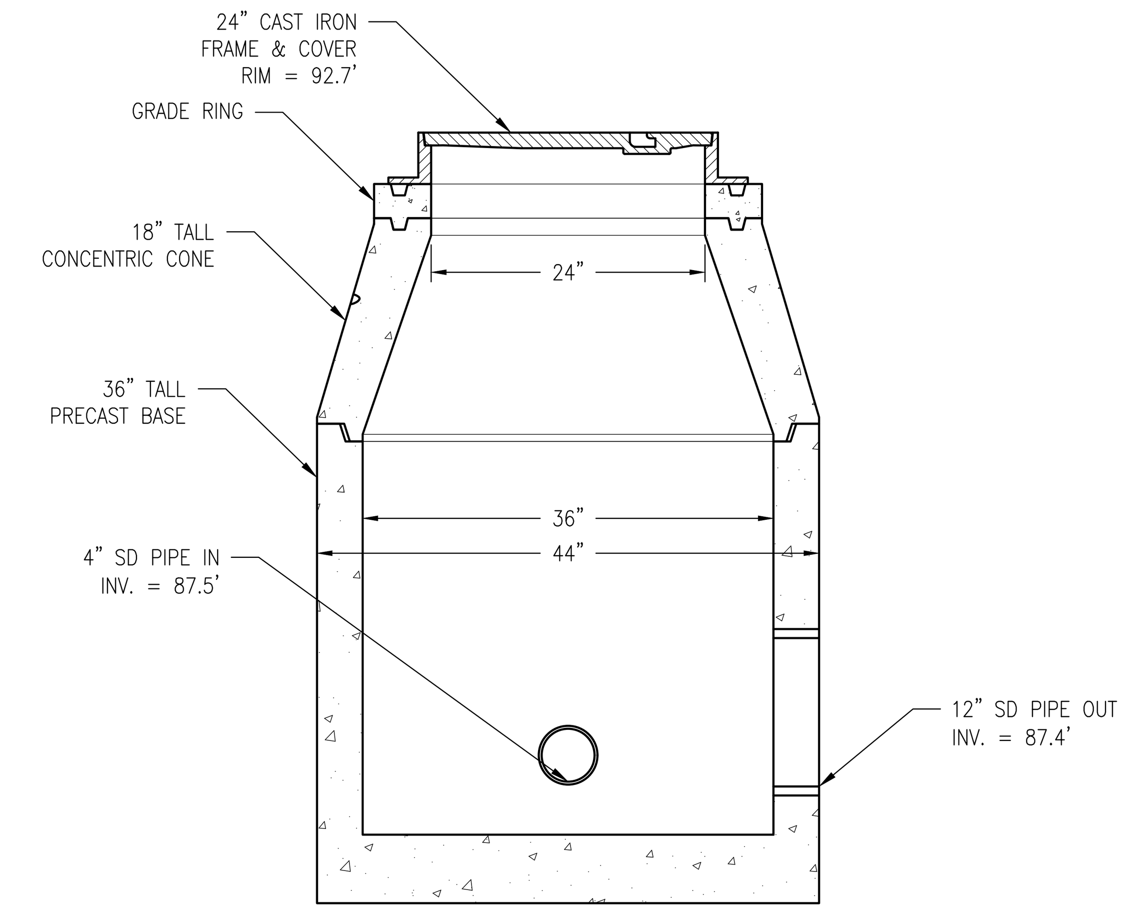
1 TYPE D INLET
D2 CHRISTY CURB INLET U37FC
N.T.S.



NOTES:

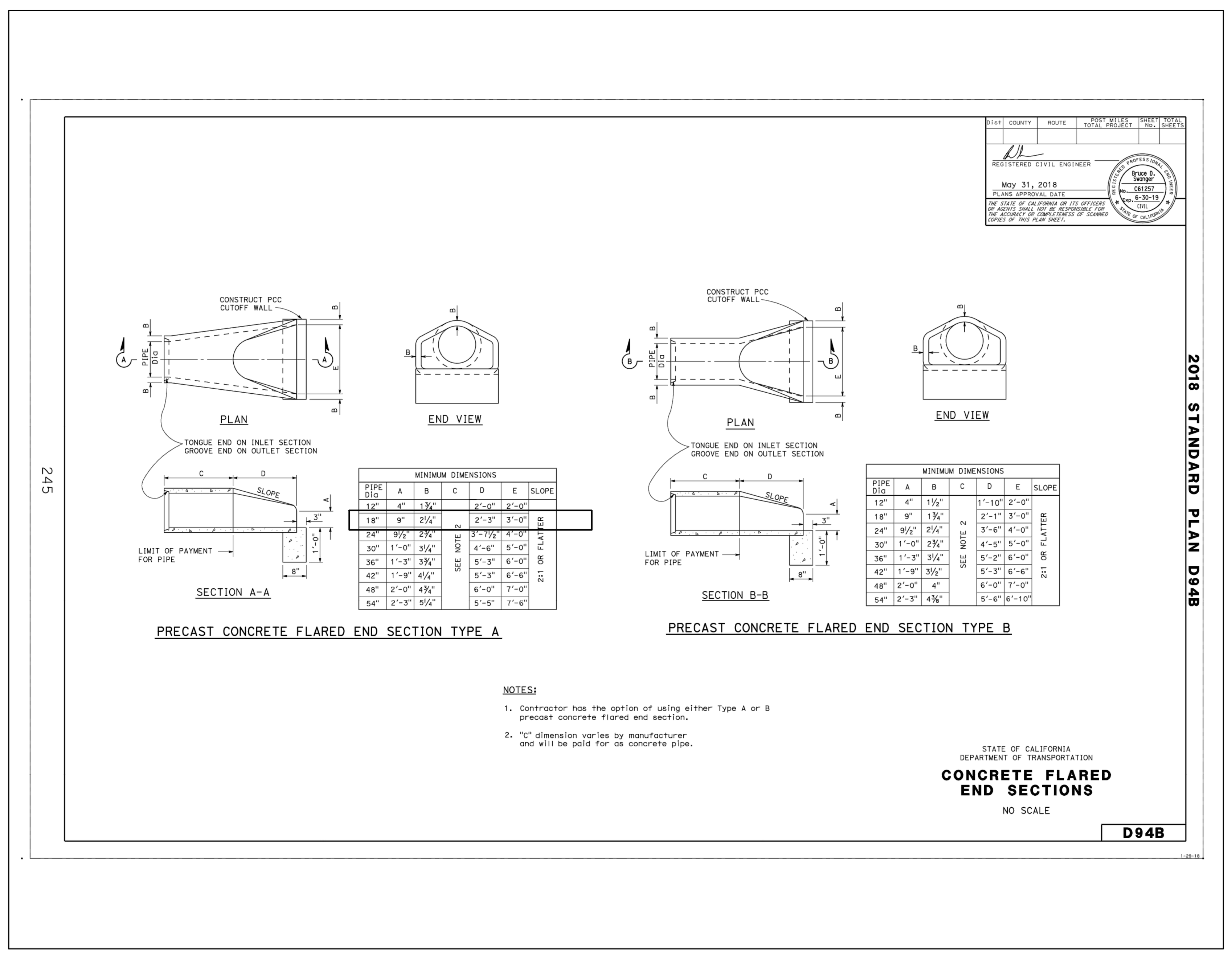
1. VERIFY DEPTH OF (N) PVC PIPE AND INSTALL CLEANOUT TO MATCH FIT SITE CONDITIONS.

3 IN-LINE CLEANOUT DETAIL
D2 N.T.S.

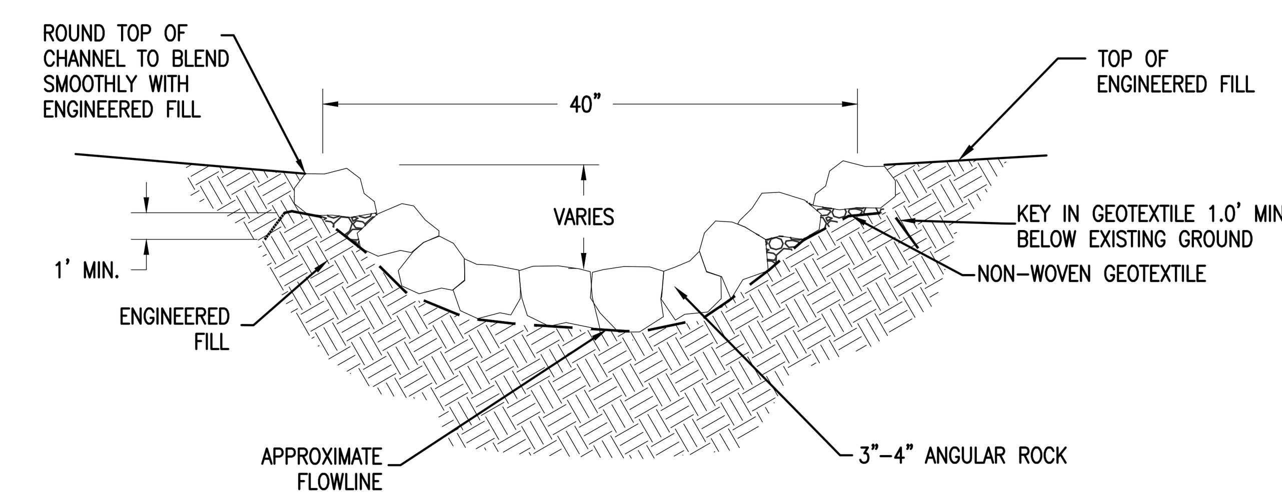


NOTE: COMPONENTS BY JENSEN PRECAST

4 STORM DRAIN MANHOLE 1 DETAIL
D2 N.T.S.



5 CONCRETE FLARED END SECTIONS
D2 N.T.S.



6 40" ROCK LINED SWALE
D2 N.T.S.

NOTE:

1. FLOWLINE DEPTH MAY VARY DEPENDING ON ENGINEERED FILL FINISH GRADING; SEE SHEET 12 FOR GRADING.

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CHECKED BY: JWN	DATE 03/28/2019
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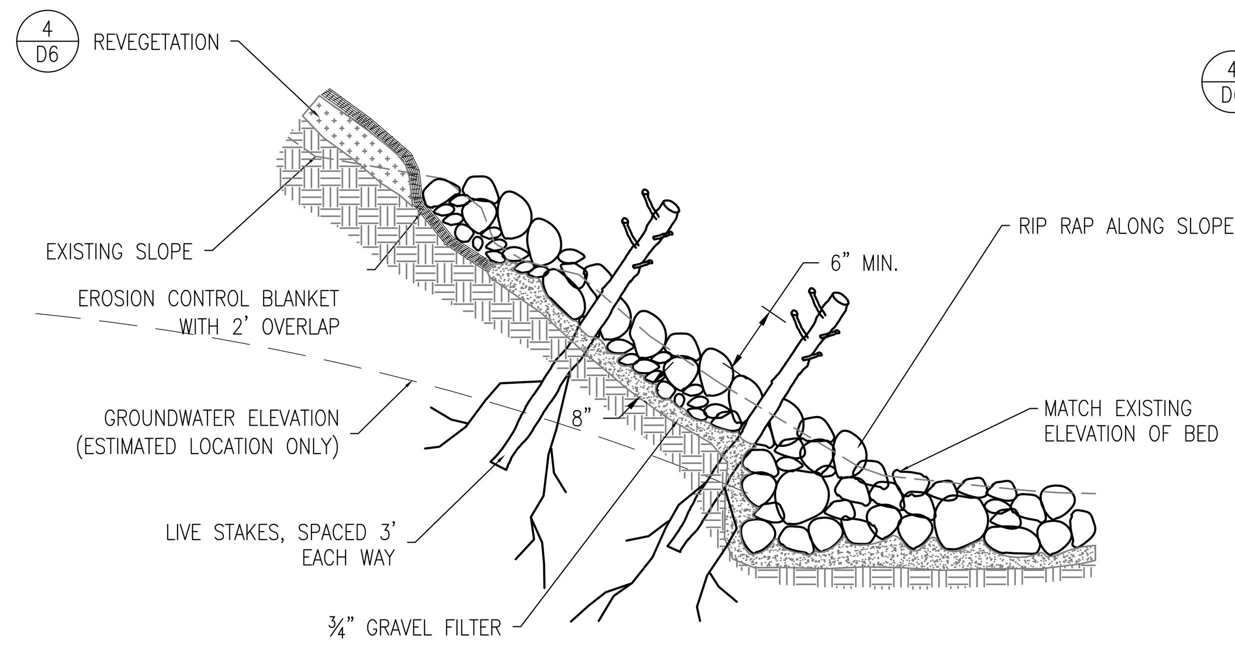
SHEET TITLE

SECTIONS AND DETAILS - DRAINAGE

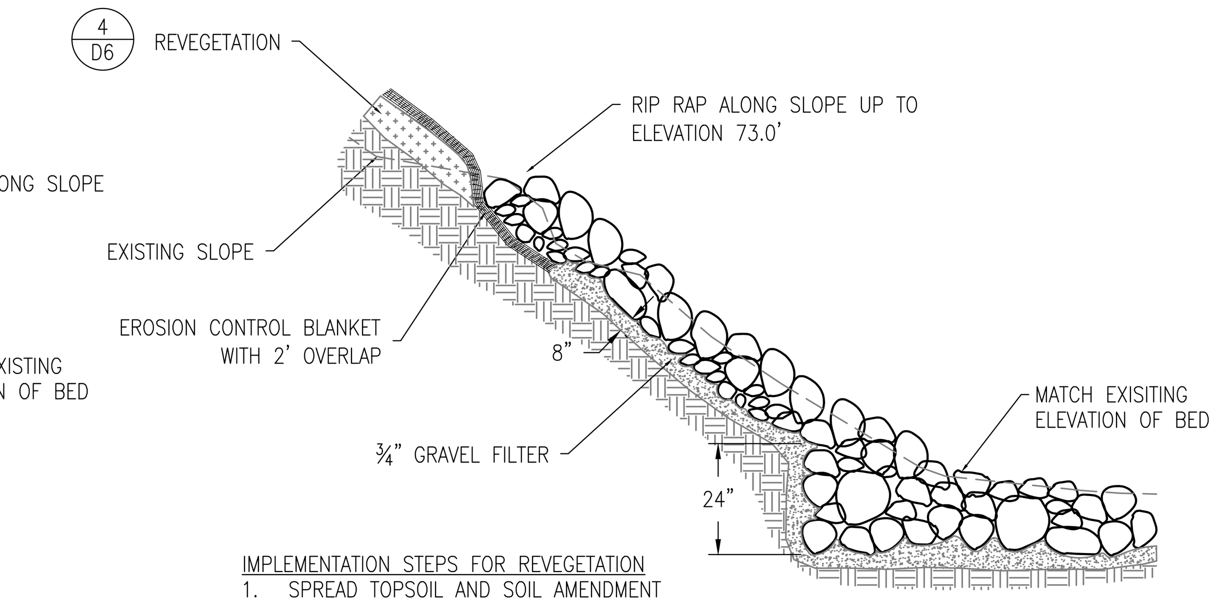
DRAWING

D2

SHEET 21 OF 30

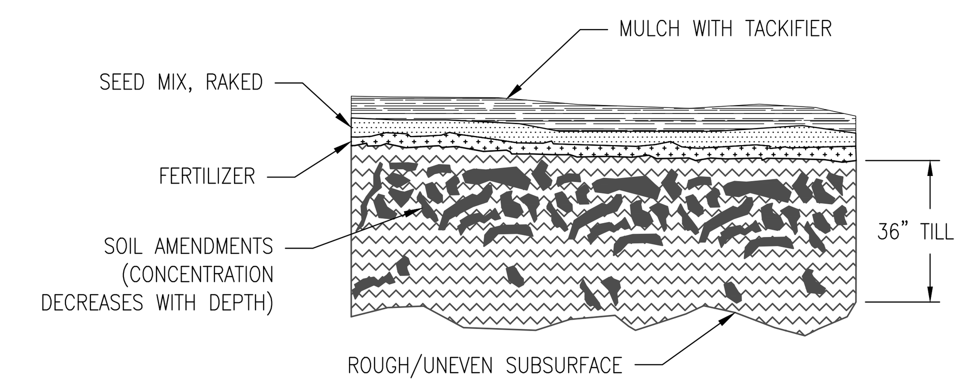


1 D3 RIP RAP WITH JOINT PLANTING
N.T.S.



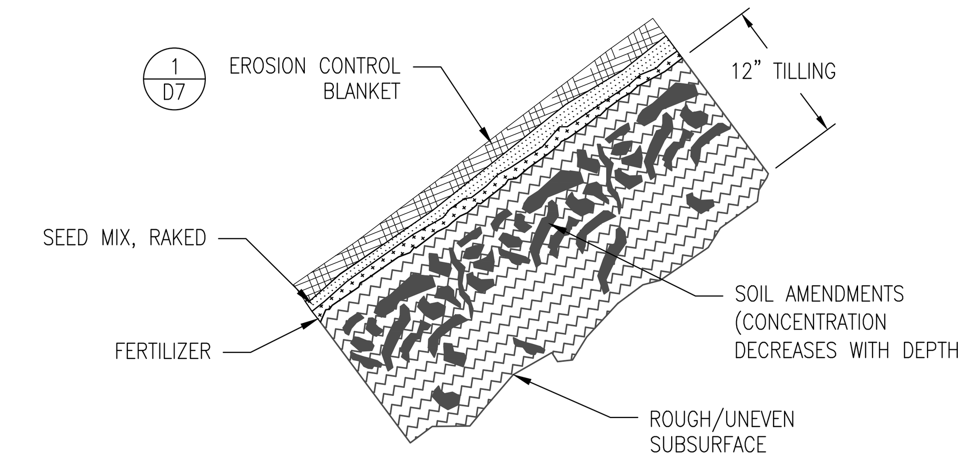
IMPLEMENTATION STEPS FOR REVEGETATION
1. SPREAD TOPSOIL AND SOIL AMENDMENT BETWEEN ROCKS
2. SEED APPLICATION TO DEPTH OF ¼"
3. MULCH APPLICATION

2 D3 TYPE A REVEGETATION WITH RIP RAP
N.T.S.



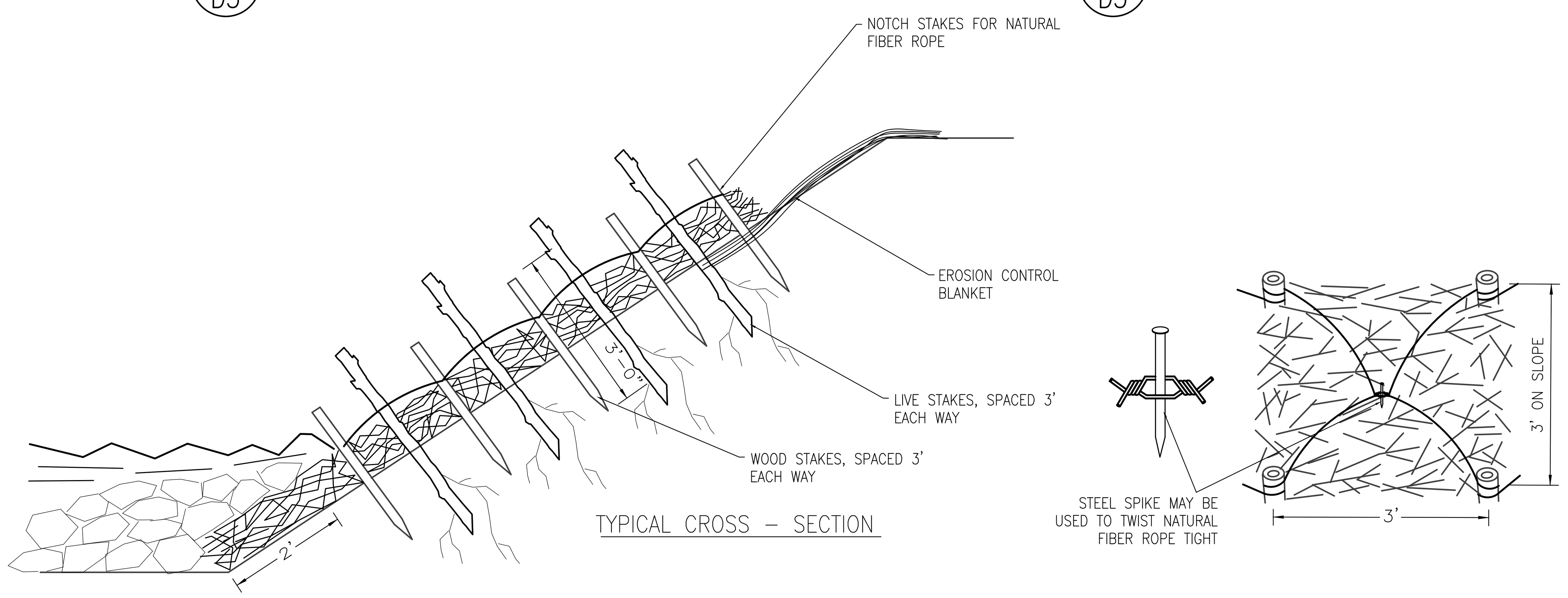
IMPLEMENTATION STEPS FOR REVEGETATION
1. REMOVAL AND STORAGE OF TOPSOIL
2. GRADING AND EXCAVATION
3. TILLING TO DEPTH OF 36"
4. TOPSOIL AND/OR AMENDMENT REPLACEMENT/APPLICATION TO 4"
5. SURFACE PREPARATION
6. SEED APPLICATION TO DEPTH OF ¼"
7. MULCH APPLICATION
8. TACKIFIER APPLICATION
9. TEMPORARY IRRIGATION

3 D3 TYPE C REVEGETATION WITH MULCH
N.T.S.



IMPLEMENTATION STEPS FOR REVEGETATION
1. REMOVAL AND STORAGE OF TOPSOIL
2. GRADING AND EXCAVATION
3. TILLING TO DEPTH OF 12"
4. TOPSOIL AND/OR AMENDMENT REPLACEMENT/APPLICATION TO 4"
5. SURFACE PREPARATION
6. SEED APPLICATION TO DEPTH OF ¼"
7. EROSION CONTROL BLANKET INSTALLATION
8. TEMPORARY IRRIGATION (CONTRACTOR TO DESIGN)

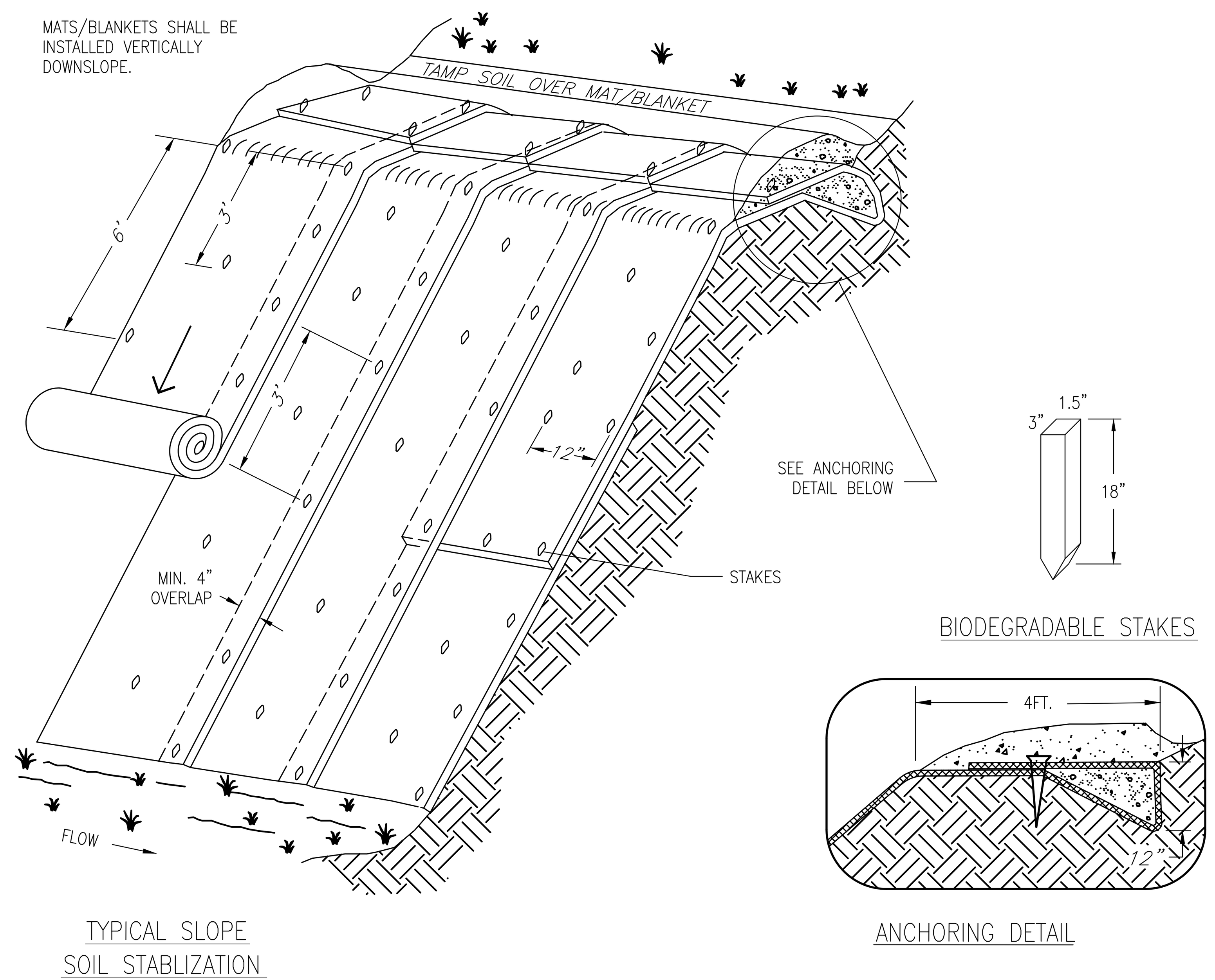
4 D3 TYPE B REVEGETATION WITH EROSION CONTROL BLANKET
N.T.S.



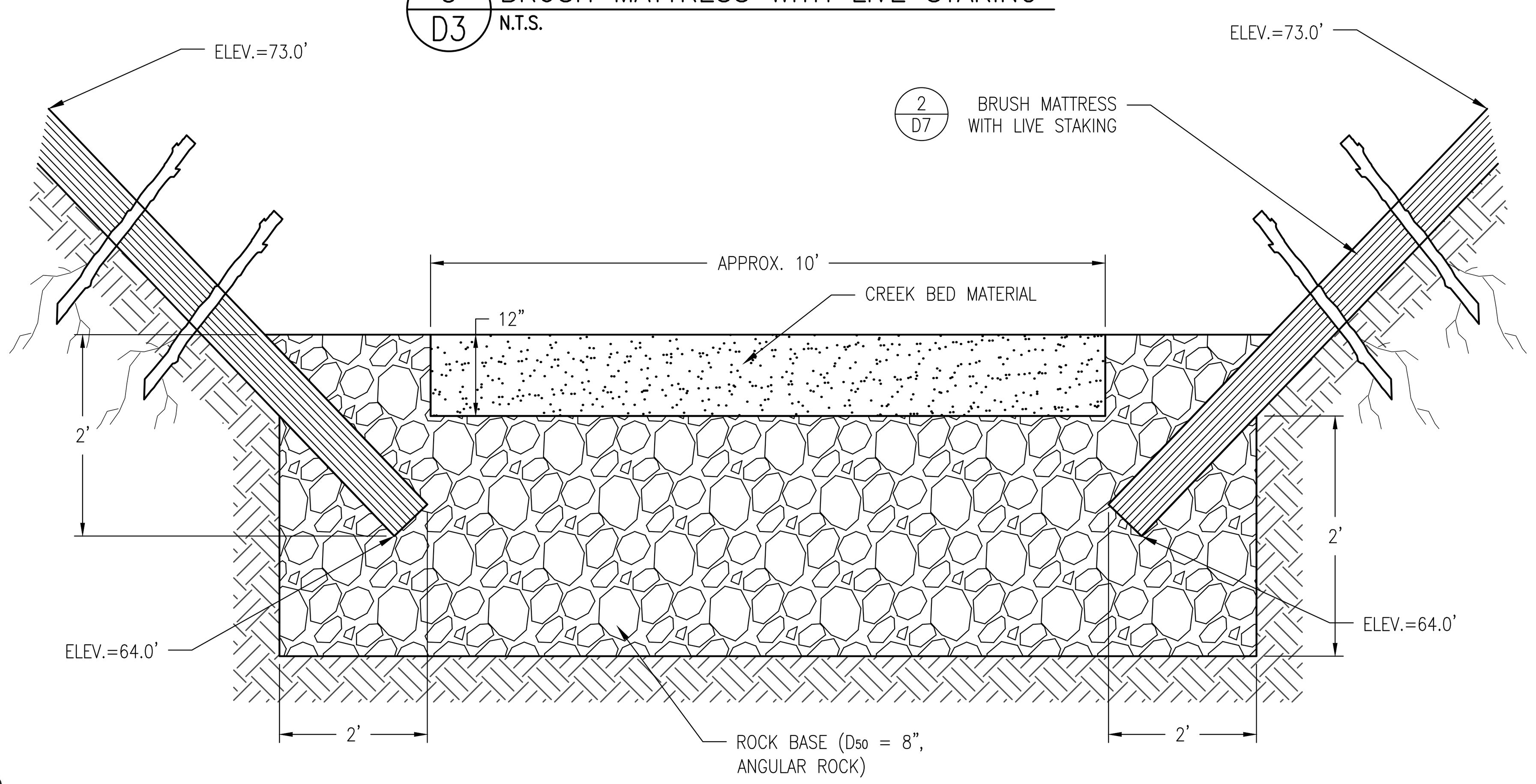
CONSTRUCTION SPECIFICATIONS

1. PREPARE SLOPE SURFACE BY GRADING TO A UNIFORM, SMOOTH SURFACE.
2. EXCAVATE A TRENCH AT THE TOE OF THE SLOPE.
3. LAY THE CUTTINGS FLAT AGAINST THE GRADED SLOPE WITH ENDS SET INTO TRENCH WORKING IN AN UPSTREAM DIRECTION.
4. THE UPSTREAM EDGE OF THE MATTRESS SHALL BE KEYED INTO THE SLOPE A MINIMUM OF 2 FEET.
5. AMEND, SEED, AND INSTALL THE EROSION CONTROL BLANKET ON REVEGETATED SLOPE ABOVE THE BRUSH MATTRESS. LAY THE EROSION CONTROL BLANKET BENEATH THE BRUSH MATTRESS AND ENSURE THAT THERE IS A MINIMUM 2 FOOT OVERLAP.
6. INSTALL LIVE STAKING 3 FEET ON CENTER.
7. DRIVE NOTCHED DEAD STOUT STAKES INTO MATTRESS IN A GRID PATTERN 3 FEET ON CENTER. SECURE THE BRUSH MATTRESS BY TYING NATURAL FIBER ROPE IN A DIAMOND PATTERN BETWEEN THE ROWS OF DEAD STOUT STAKES.
8. BACKFILL THE TRENCH WITH RIPRAP TO EXISTING CHANNEL BED ELEVATION. LAY ADDITIONAL RIPRAP AGAINST BOTTOM FOOT OF BRUSH MATTRESS.
9. WASH LOOSE SOIL INTO CUTTINGS. APPROXIMATELY HALF OF THE DEPTH OF THE MATTRESS SHOULD BE COVERED.

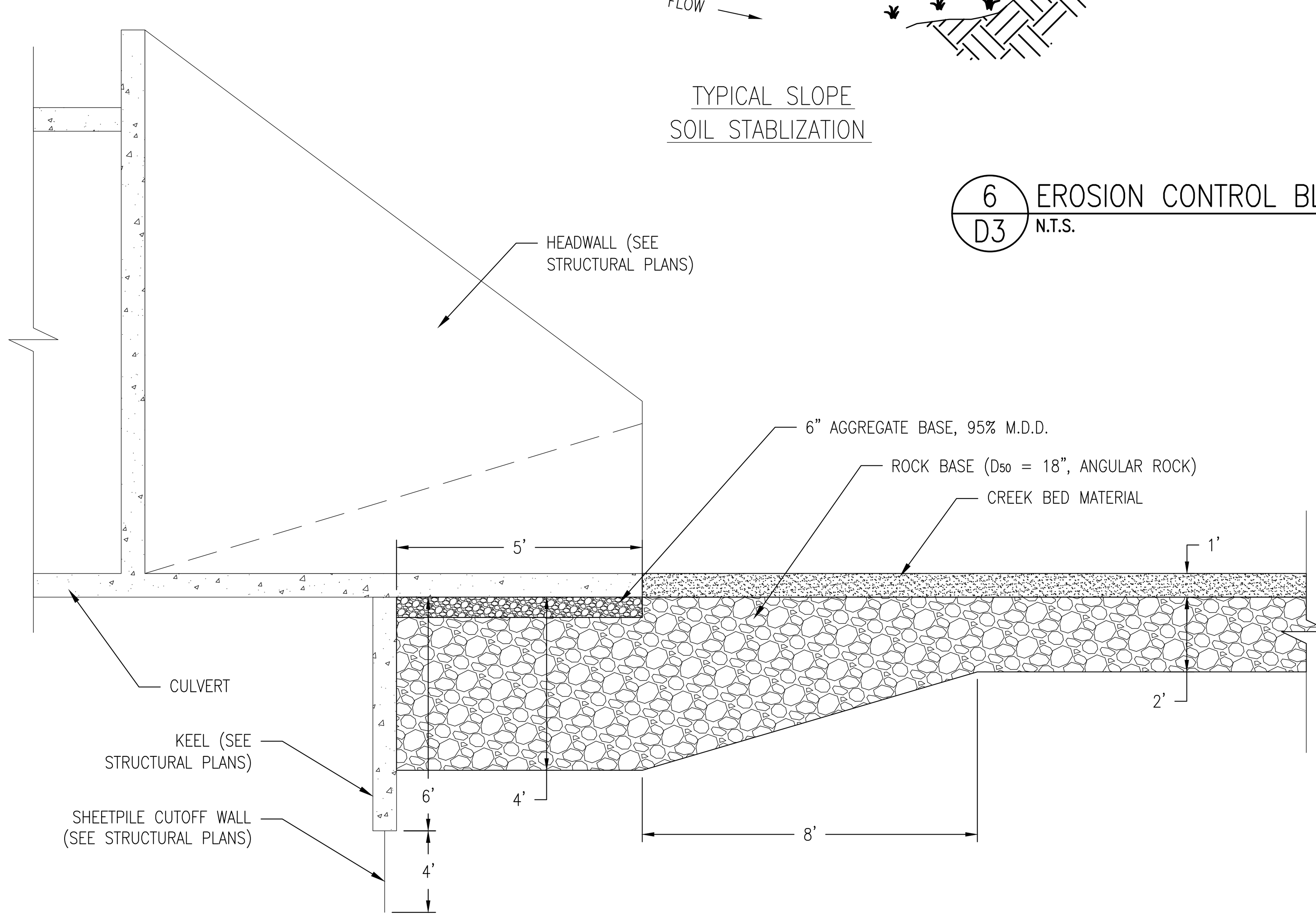
5 D3 BRUSH MATTRESS WITH LIVE STAKING
N.T.S.



6 D3 EROSION CONTROL BLANKET
N.T.S.



7 D3 UPSTREAM TYPICAL CHANNEL
N.T.S.



8 D3 HEADWALL ROCK BASE PLACEMENT
N.T.S.

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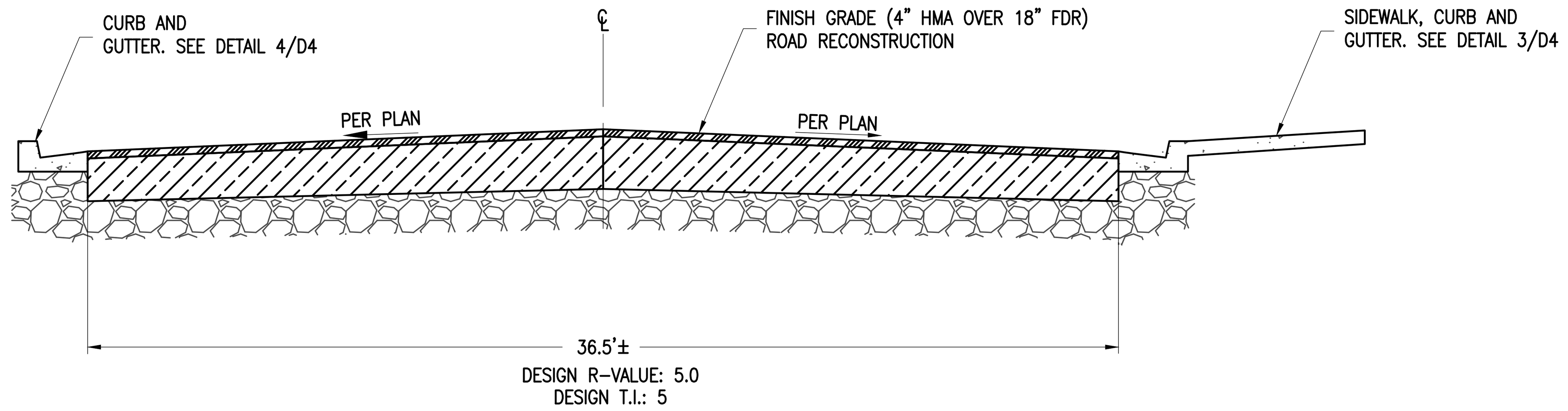
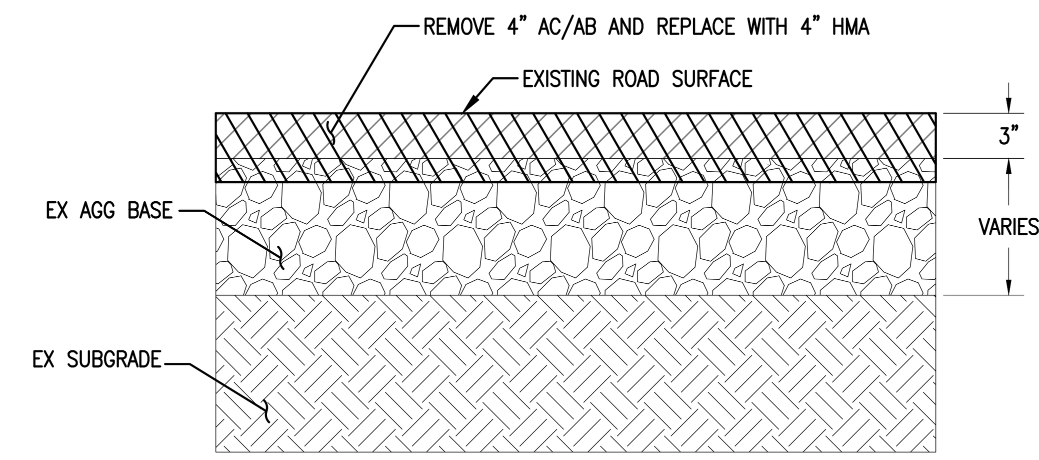
DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE
SECTIONS AND DETAILS - EROSION CONTROL AND REVEGETATION

DRAWING
D3

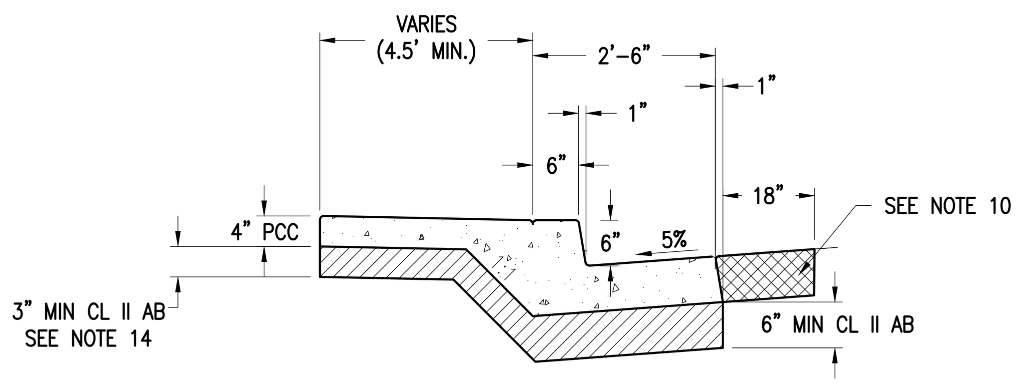


1 D4 VIA VERDI ROAD RECONSTRUCTION CROSS SECTION
N.T.S.

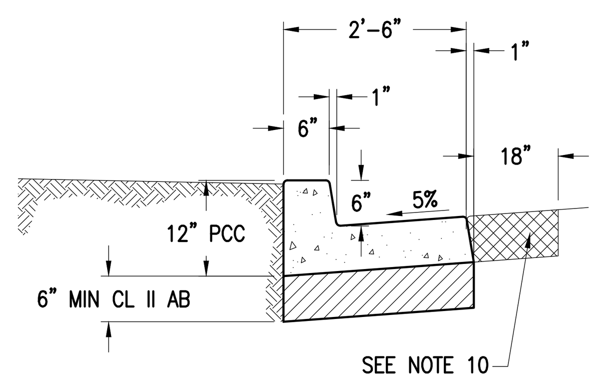


NOTES:
1. MAINTAIN EXISTING GRADES.
2. COMPACT EXISTING AGG BASE TO 95% M.D.D.

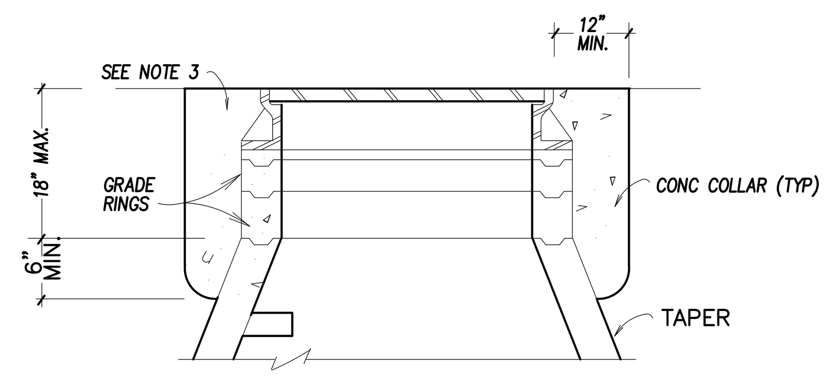
2 D4 VIA VERDI SURFACE RECONSTRUCTION SECTION
N.T.S.



3 D4 TYPE A MONOLITHIC SIDEWALK WITH CURB AND GUTTER
N.T.S.

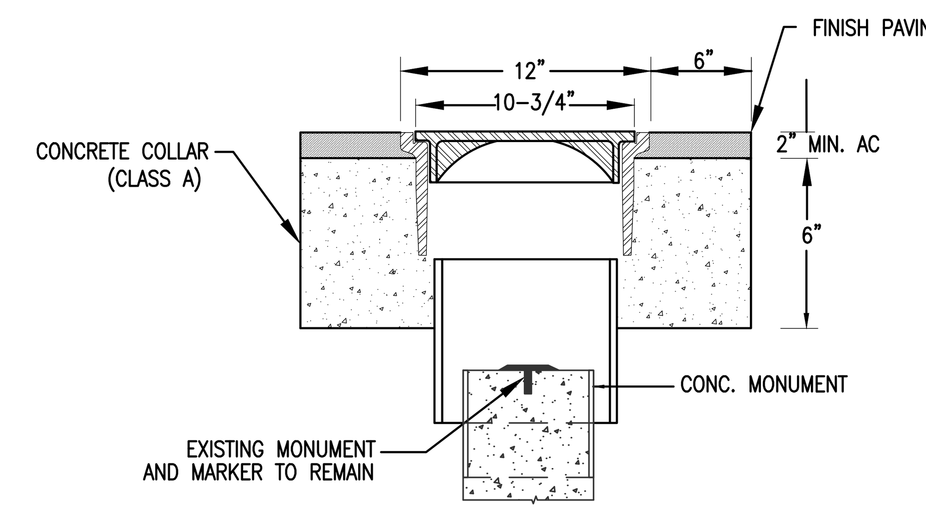


4 D4 TYPE A CURB AND GUTTER
N.T.S.



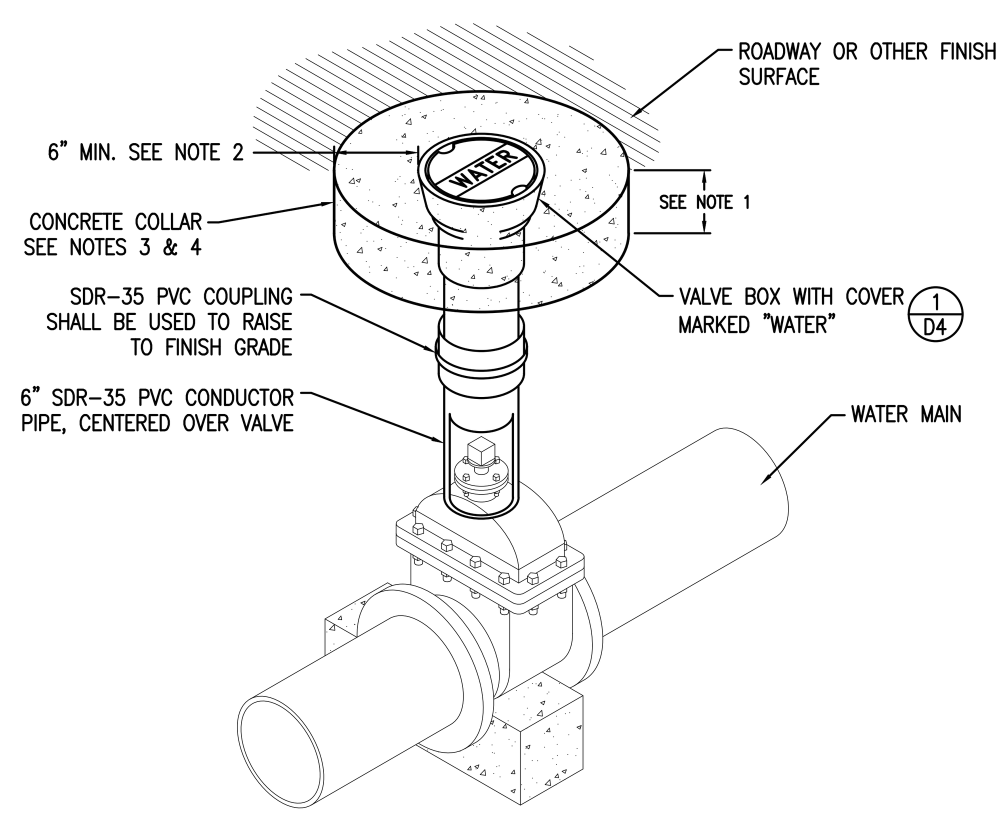
NOTES
1. CONCRETE COLLAR TO BE PORTLAND CEMENT CONCRETE (PCC) WITH THE FOLLOWING CHARACTERISTICS: 4000 PSI MIN. COMPRESSIVE STRENGTH AT 28 DAYS, MIN. 6 SACKS OF CEMENT PER CUBIC YARD WITH A MAX. WATER/CEMENT RATIO OF 0.45, AIR ENTRAINMENT 6% ±1.5% AND SLUMP AT 1 TO 4 INCHES.
2. HEIGHT OF COLLAR SHALL BE CONSISTENT ALL AROUND MANHOLE.
3. CONC COLLAR SHALL BE FLUSH W/ADJACENT PAVEMENT.

5 D4 MANHOLE ADJUSTMENT
N.T.S.



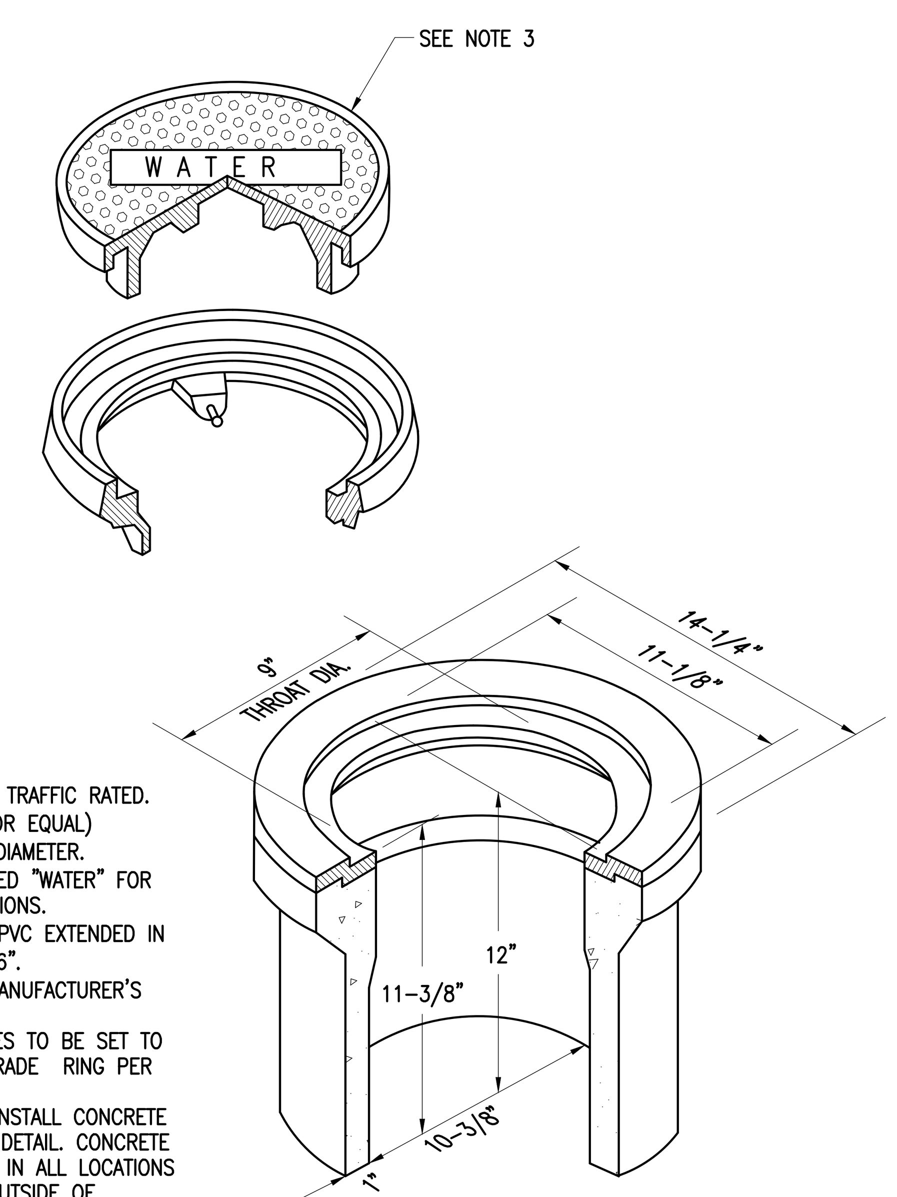
NOTE:
1. MONUMENT BOX AND COVER TO BE "CHRISTY G-5".
2. BREAK DOWN MONUMENT BOX COVER TO TEMPORARY GRADE; INSTALL TEMPORARY TRAFFIC RATED COVER.

6 D4 NEW MONUMENT BOX DETAIL
N.T.S.



NOTES:
1. CONCRETE COLLAR SHALL BE MINIMUM 6-INCHES THICK OR MATCH PAVEMENT THICKNESS, WHICHEVER IS GREATER, UNLESS OTHERWISE SPECIFIED BY THE JURISDICTIONAL AGENCY RESPONSIBLE FOR THE ROADWAY.
2. FOR MULTIPLE VALVE/RISER BOXES IN CLOSE PROXIMITY, A MONOLITHIC CONCRETE COLLAR MAY BE POURED. PLACE VALVE BOX AND CONCRETE COLLAR FLUSH WITH ASPHALT.
3. CONTRACTOR AND/OR DESIGN ENGINEER SHALL CONSULT WITH THE JURISDICTIONAL AGENCY RESPONSIBLE FOR THE ROADWAY FOR REQUIREMENTS THAT MAY VARY FROM THIS STANDARD PRIOR TO CONSTRUCTION.
4. UNLESS OTHERWISE SPECIFIED BY THE JURISDICTIONAL AGENCY RESPONSIBLE FOR THE ROADWAY, PORTLAND CEMENT CONCRETE (P.C.C.) FOR CONCRETE COLLAR SHALL HAVE THE FOLLOWING CHARACTERISTICS: 4,000 PSI MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS, MINIMUM 6 SACKS OF CEMENT PER CUBIC YARD WITH A MAXIMUM WATER/CEMENT RATIO OF 0.45, AIR ENTRAINMENT 6% ±1.5%, SLUMP AT 1 TO 4 INCHES. BAG CONCRETE MIX IS NOT ACCEPTABLE.

7 D4 VALVE ADJUSTMENT
N.T.S.



GENERAL NOTES
1. VALVE BOX MUST BE TRAFFIC RATED. (CHRISTY G-5 BOX OR EQUAL)
2. MIN. OF 10" INSIDE DIAMETER.
3. CAST IRON LID MARKED "WATER" FOR WATER LINE APPLICATIONS.
4. RISER OF 6" OR 8" PVC EXTENDED IN VALVE CAN MIN. OF 6".
5. TORQUE BOLTS TO MANUFACTURER'S RECOMMENDATIONS.
6. ALL NEW VALVE BOXES TO BE SET TO GRADE. ONLY ONE GRADE RING PER VALVE BOX.
7. CONTRACTOR SHALL INSTALL CONCRETE COLLARS PER VALVE DETAIL. CONCRETE COLLAR IS REQUIRED IN ALL LOCATIONS
8. WHERE VALVES LIE OUTSIDE OF ROADWAYS, CONTRACTOR SHALL SET RIM APPROX. 6" ABOVE FINISH GRADE

8 D4 VALVE BOX
N.T.S.

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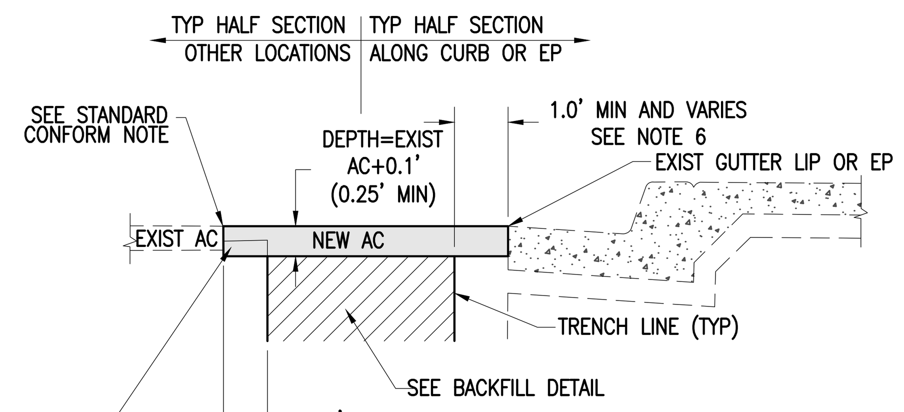
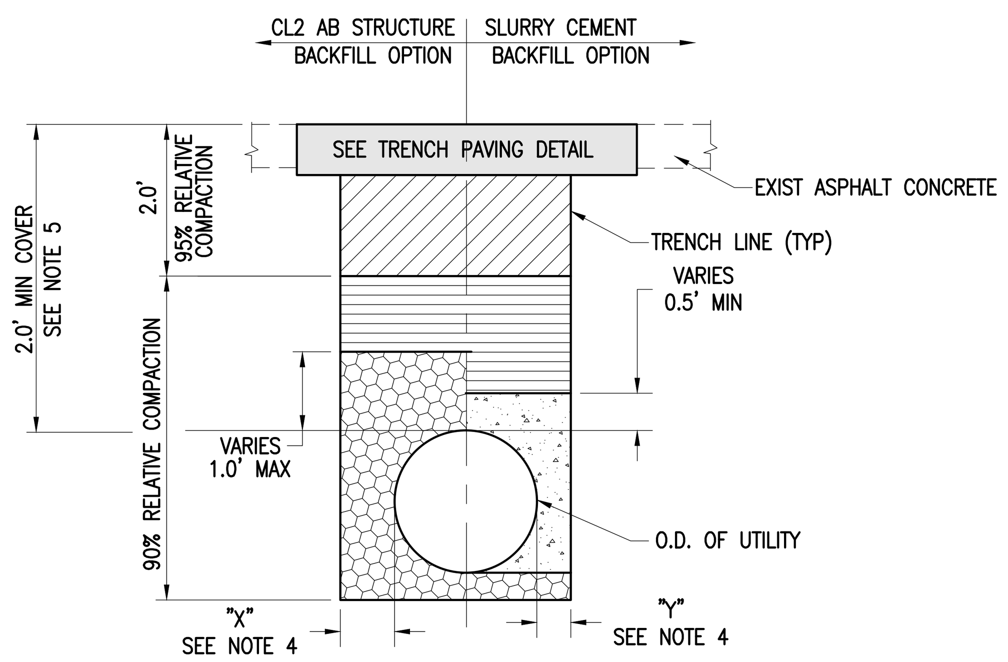
SHEET TITLE
SECTIONS AND DETAILS - ROAD AND SIDEWALK RECONSTRUCTION

DRAWING
D4

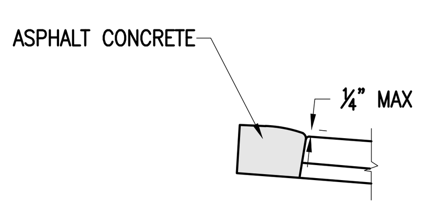


TRENCH PAVING DETAIL



TRENCH BACKFILL DETAIL

LEGEND
- ASPHALT CONCRETE PAVING SEE NOTE 7
- CLASS 2 AGGREGATE BASE (AB)
- UTILITY SPECIFIED MATERIAL SEE NOTE 2
- SLURRY CEMENT BACKFILL SEE NOTE 8
- CLASS 2 AGGREGATE BASE (AB), OR SUITABLE NATIVE BACKFILL MATERIAL AS APPROVED BY THE PUBLIC WORKS DEPT.



DETAIL A
GUTTER LIP PAVING

CONFORM NOTES:

THE PAVEMENT CONFORM SHALL BE AS FOLLOWS

STANDARD CONFORM

THE ASPHALT CONCRETE SHALL BE CUT THROUGH THE FULL LENGTH OF EXISTING ASPHALT CONCRETE TO A NEAT STRAIGHT LINE AT LEAST 1.0' OUTSIDE THE TRENCH LINE. PAVEMENT EDGES DAMAGED DURING CONSTRUCTION SHALL BE RE-CUT TO NEAT LINES PRIOR TO PAVING. PAINT BINDER (TACK COAT) SHALL BE APPLIED TO ALL VERTICAL SURFACES IN ACCORDANCE WITH THE LATEST EDITION OF CALTRANS STANDARD SPECIFICATIONS.

ALTERNATE CONFORM

THE EXISTING ASPHALT CONCRETE OUTSIDE THE TRENCH LINE MAY BE GROUND TO A MINIMUM DEPTH OF 0.20' TO A NEAT STRAIGHT LINE. THE EXISTING ASPHALT CONCRETE AT THE TRENCH LINES SHALL BE CUT THROUGH THE FULL DEPTH OF THE EXISTING ASPHALT CONCRETE TO A NEAT STRAIGHT LINE. ANY PAVEMENT EDGES INCLUDING GROUND EDGES, DAMAGED DURING CONSTRUCTION SHALL BE RE-CUT OR RE-GROUND TO NEAT STRAIGHT LINES PRIOR TO PAVING. PAINT BINDER (TACK COAT) SHALL BE APPLIED TO ALL VERTICAL SURFACES IN ACCORDANCE WITH THE LATEST EDITION OF CALTRANS STANDARD SPECIFICATIONS.

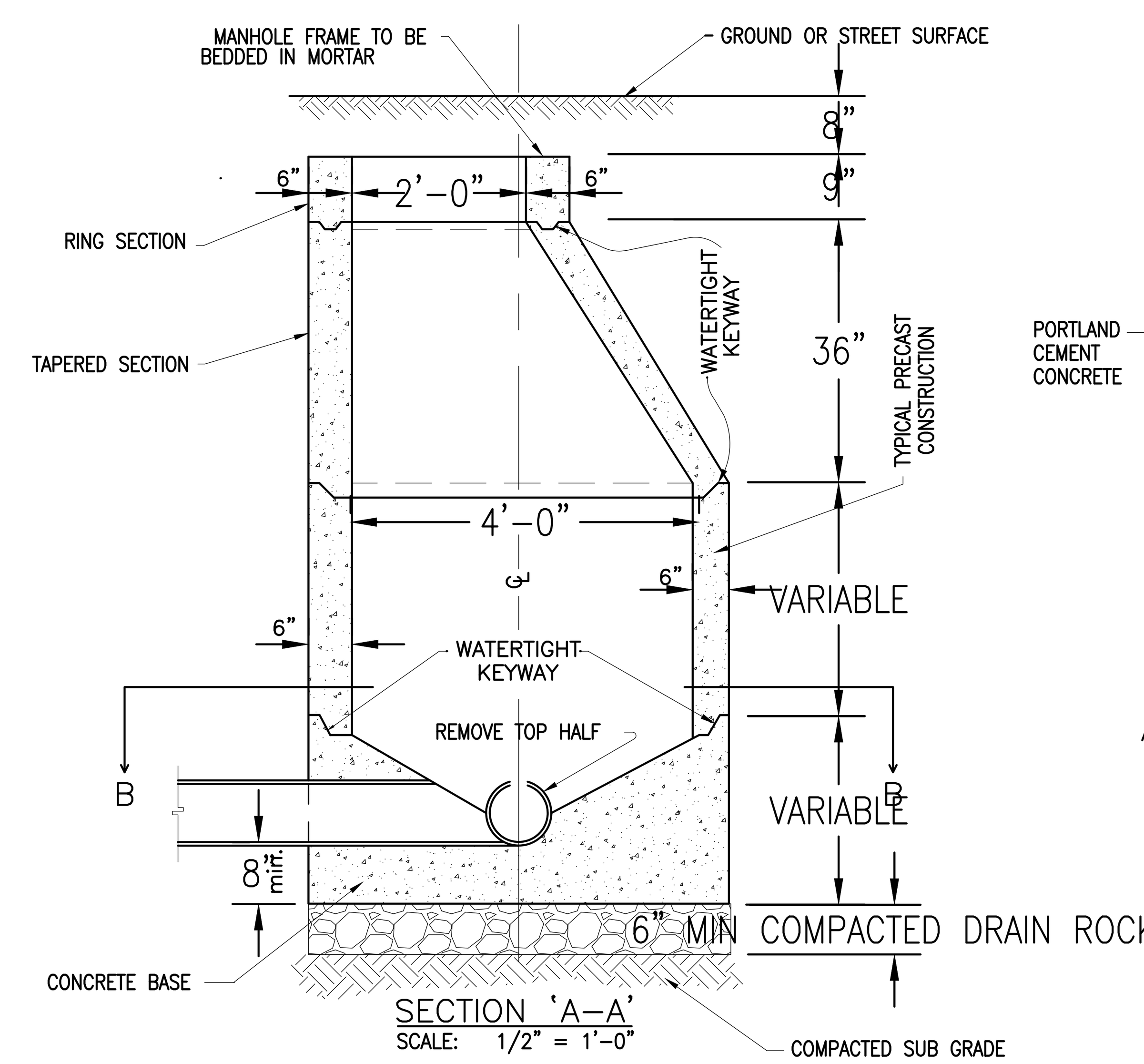
NOTES:

1. AN ENCROACHMENT PERMIT IS REQUIRED FOR ALL WORK WITHIN COUNTY ROAD RIGHT OF WAY. THE PERMIT SHALL BE OBTAINED PRIOR TO BEGINNING WORK.
2. BACKFILL MATERIAL AND ANY BEDDING SHALL BE AS SPECIFIED BY THE UTILITY OWNER, AND APPROVED BY THE PUBLIC WORKS DEPT. IN NO CASE SHALL "PEA" GRAVEL BE ALLOWED.
3. UNSUITABLE NATIVE MATERIAL SHALL BE EXCAVATED BELOW THE LIMIT OF EXCAVATION AND REPLACED WITH SUITABLE BACKFILL MATERIAL WHEN DIRECTED BY THE PUBLIC WORKS DEPT.
4. "X" AND "Y" SHALL BE AS A MINIMUM, THE DIMENSIONS SHOWN BELOW FOR THE UTILITY O,D,

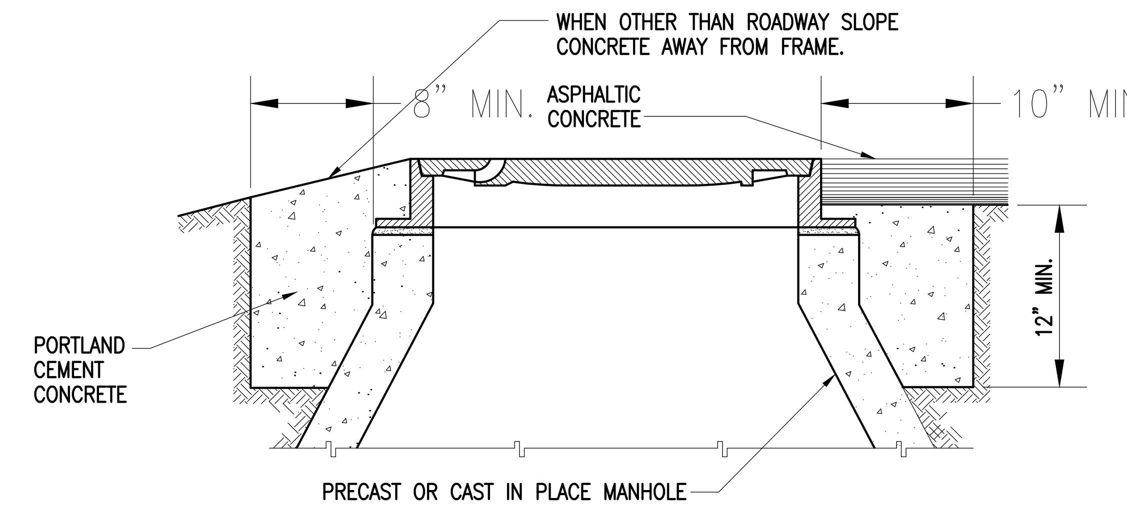
O.D.	"X"	"Y"
UNDER 1.0'	0.5'	0.25'
1.0'–4.5'	1.0'	0.5'
OVER 4.5'	2.0'	1.0'

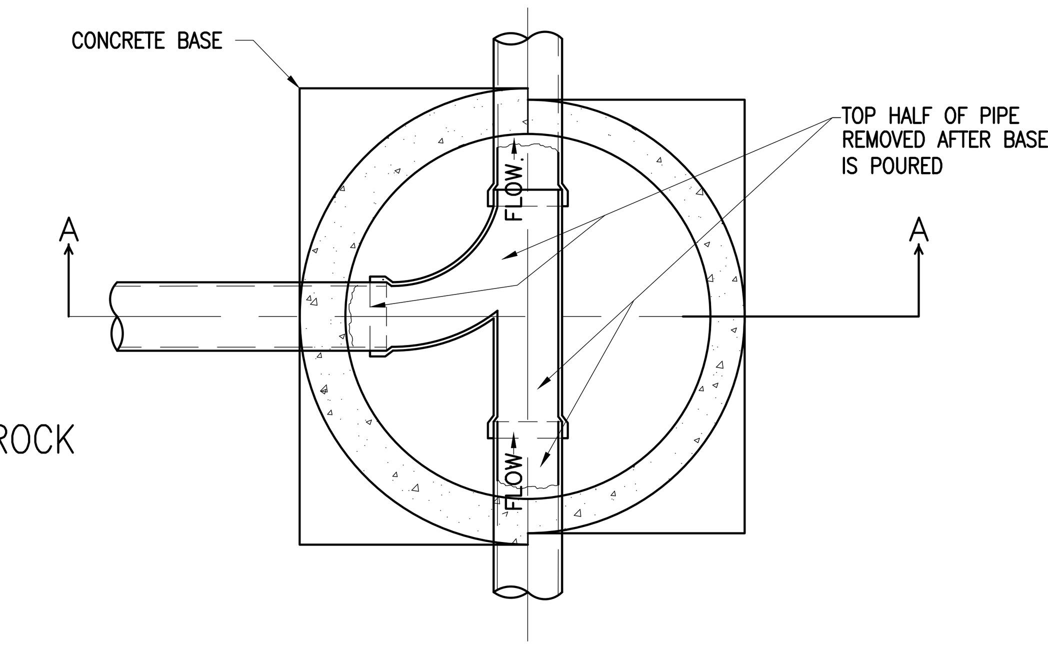
5 MINIMUM COVER OVER UTILITIES IS GOVERNED BY THE CALIFORNIA PUBLIC UTILITIES COMMISSION. UTILITY OWNERS SHALL CONSIDER PLACING THEIR UTILITY LINE AT A GREATER DEPTH TO AVOID FUTURE RELOCATION DUE TO STREET/ROAD RECONSTRUCTION. THE INCREASED DEPTH SHOULD INCLUDE SUFFICIENT CLEARANCE BETWEEN THE UTILITY AND PAVEMENT STRUCTURAL SECTION SUBGRADE TO PREVENT DAMAGE BY CONSTRUCTION EQUIPMENT. THE PUBLIC WORKS DEPT. RECOMMENDS A MINIMUM OF 4' COVER IN ARTERIAL ROADS AND 3' ELSEWHERE. IF COVER IS LESS THAN 2', A SPECIAL DESIGN IS REQUIRED WITH APPROVAL BY THE PUBLIC WORKS DEPT.
6. WHERE THE TRENCH PARALLELS CURB AND THE NEAREST TRENCH LINE IS LESS THAN 3' FROM THE GUTTER LIP, ALL EXISTING ASPHALT CONCRETE SHALL BE REPLACES TO THE GUTTER LIP. FOR GUTTER LIP PAVING DETAIL SEE DETAIL "A".
7. ASPHALT CONCRETE SHALL BE ½ INCH TYPE A ASPHALT CONCRETE UNLESS OTHERWISE SPECIFIED IN THE ENCROACHMENT PERMIT'S SPECIAL ROAD ENCROACHMENT PERMIT CONDITIONS OR AS DIRECTED BY THE PUBLIC WORKS DEPT.
8. SLURRY CEMENT BACKFILL SHALL COMPLY WITH THE LATEST EDITION OF CALTRANS STANDARD SPECIFICATIONS.
9. THIS STANDARD PLAN SHALL GOVERN OVER ENCROACHMENT PERMIT'S STANDARD ROAD ENCROACHMENT PERMIT CONDITIONS, AND GENERAL PERMIT CONDITIONS–ATTACHMENT 1. ENCROACHMENT PERMIT'S SPECIAL ROAD ENCROACHMENT PERMIT CONDITIONS SHALL GOVERN OVER THIS STANDARD PLAN.

1 / D5 SANITARY SEWER TRENCH
N.T.S.



SECTION 'A-A'
SCALE: 1/2" = 1'-0"

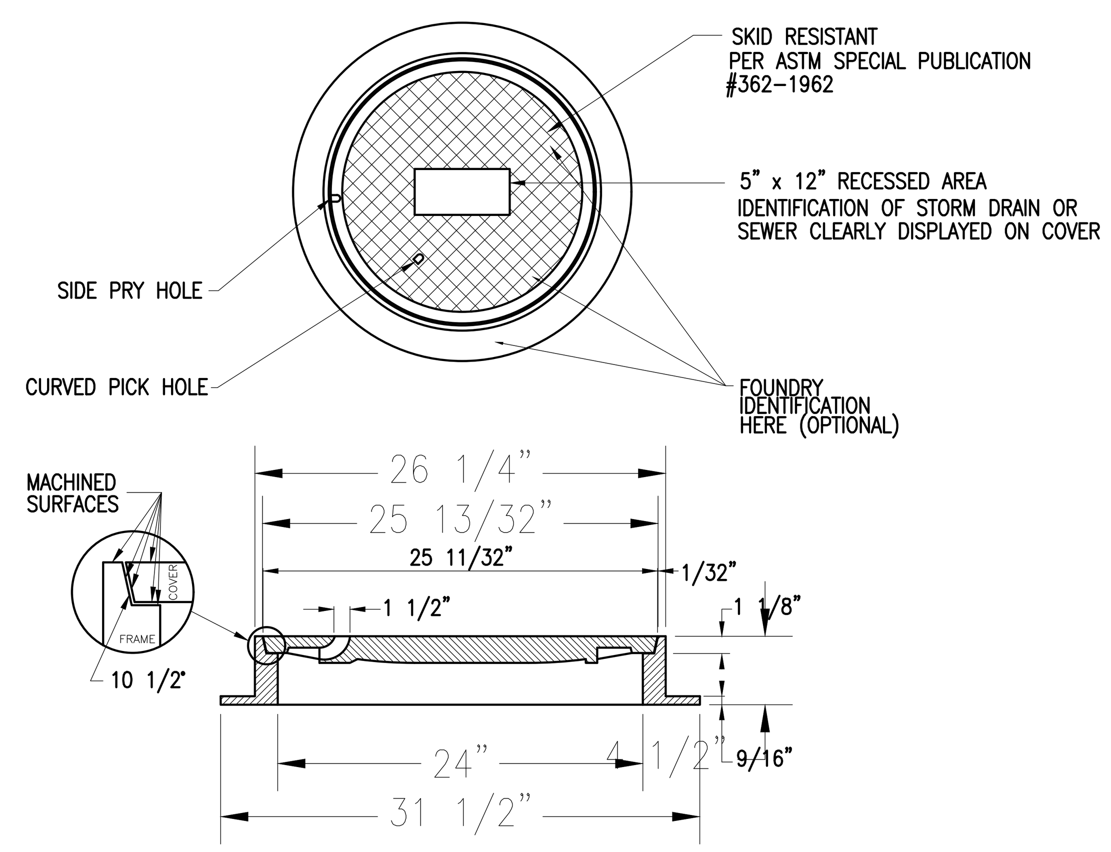




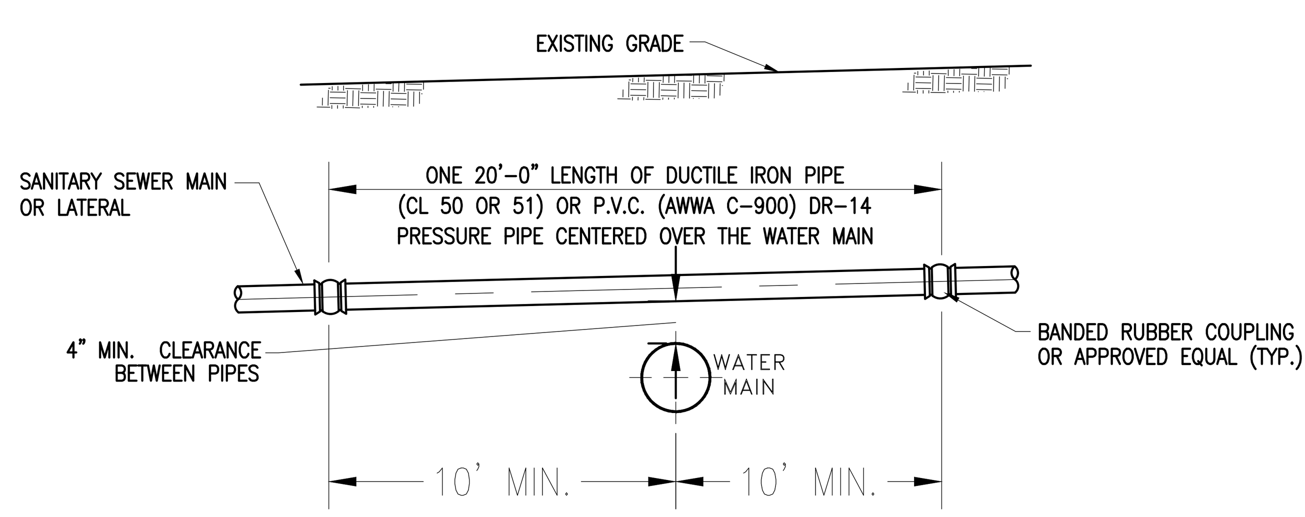
SECTION 'B-B'
SCALE: 1/2" = 1'-0"

NOTE:
POLYPROPYLENE RUNGS ARE REQUIRED ON MANHOLES 3 FEET OR MORE IN DEPTH.

2 / D5 SANITARY SEWER MANHOLE
N.T.S.

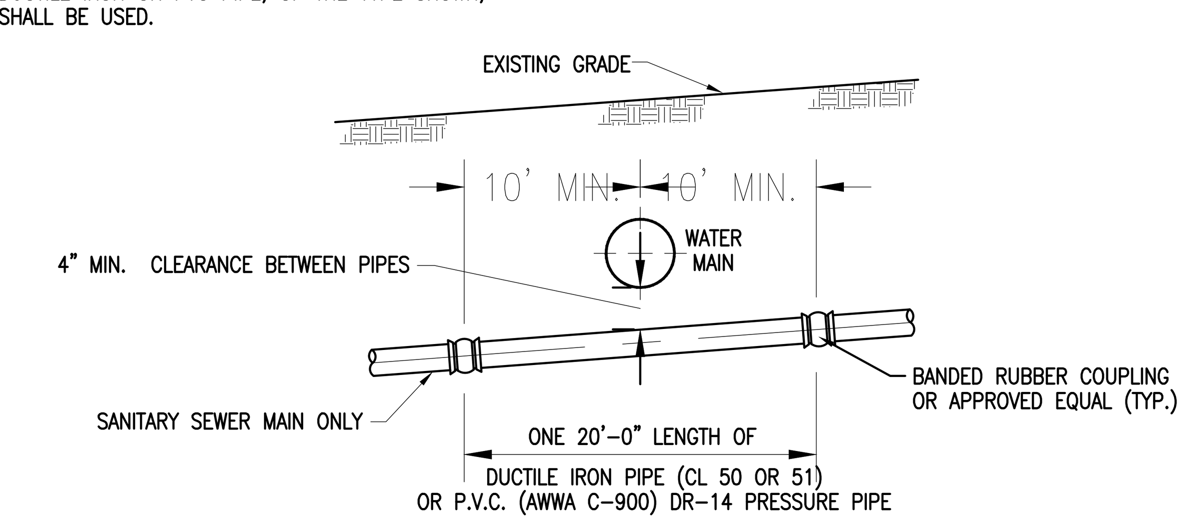


3 / D5 MANHOLE FRAME AND COVER
N.T.S.



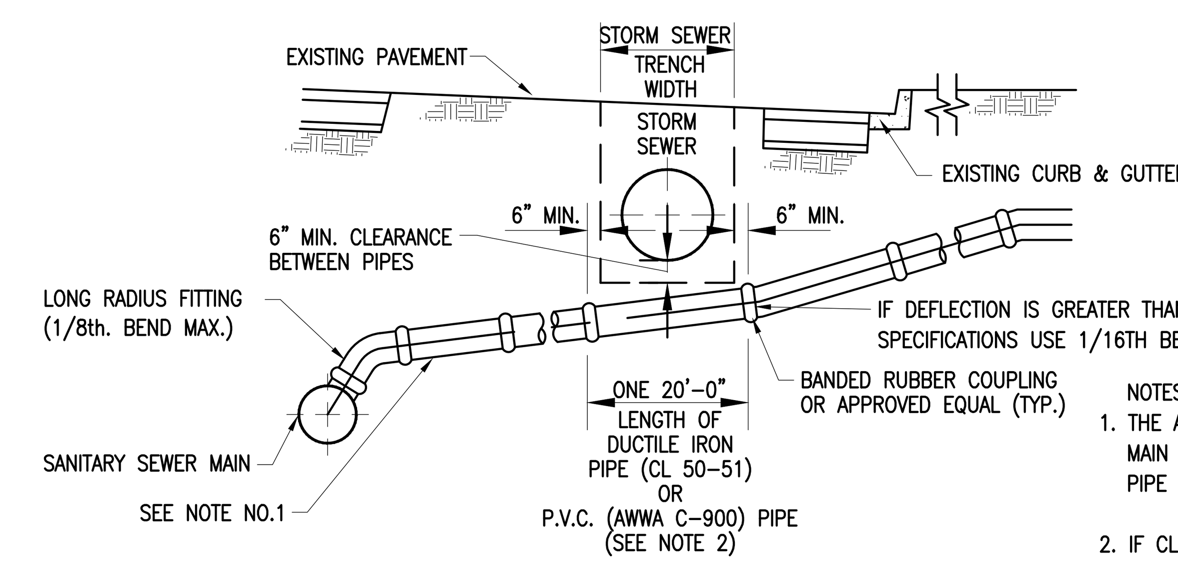
TYPICAL CROSSING OVER WATER MAIN

NOTE:
IF CLEARANCE BETWEEN PIPES IS LESS THAN 1' DUCTILE IRON OR PVC PIPE, OF THE TYPE SHOWN, SHALL BE USED.



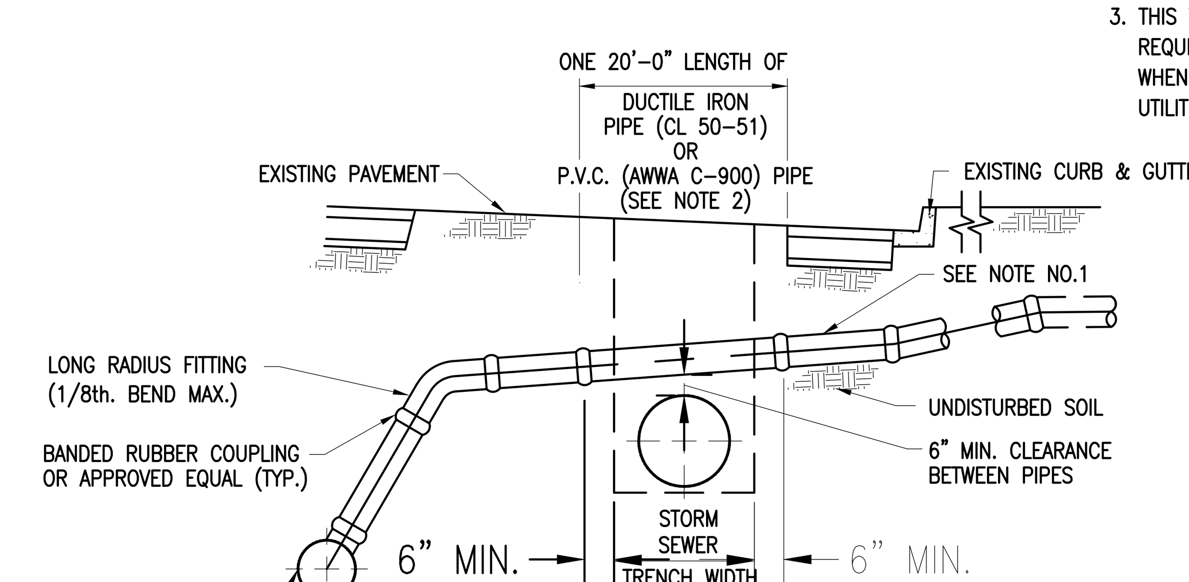
TYPICAL CROSSING UNDER WATER MAIN

4 / D5 SEWER-WATER CROSSING
N.T.S.



TYPICAL CROSSING UNDER STORM SEWER

NOTES:
1. THE ABOVE DETAILS ARE TYPICAL FOR MAIN AND BUILDING SEWERS WHEN RIGID PIPE IS USED.
2. IF CLEARANCE BETWEEN PIPES IS LESS THAN 6", DUCTILE IRON OR PVC PIPE OF THE TYPE SHOWN SHALL BE USED.
3. THIS TYPE OF CROSSING MAY ALSO BE REQUIRED BY THE CITY OF RICHMOND WHEN CROSSING CERTAIN OTHER UTILITIES.



TYPICAL CROSSING OVER STORM SEWER

5 / D5 SEWER-STORM DRAIN CROSSING
N.T.S.

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PRELIMINARY FOR REVIEW NOT FOR CONSTRUCTION DATE: 04-12-19

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REGISTERED PROFESSIONAL ENGINEER FRANZ G. HAIDINGER No. C 64725 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

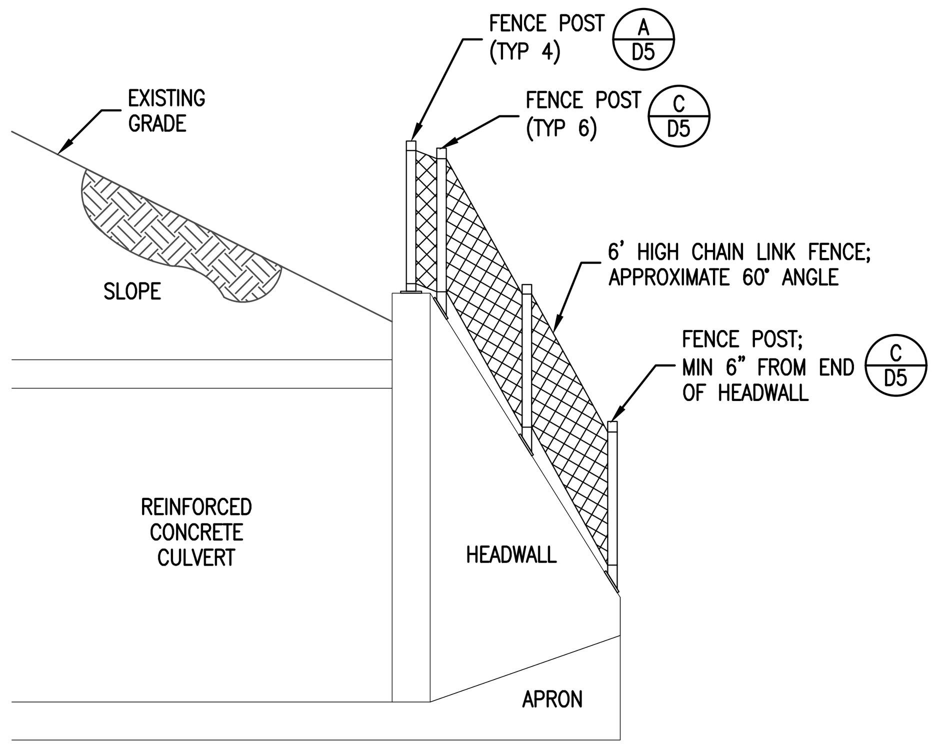
OWNER
CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

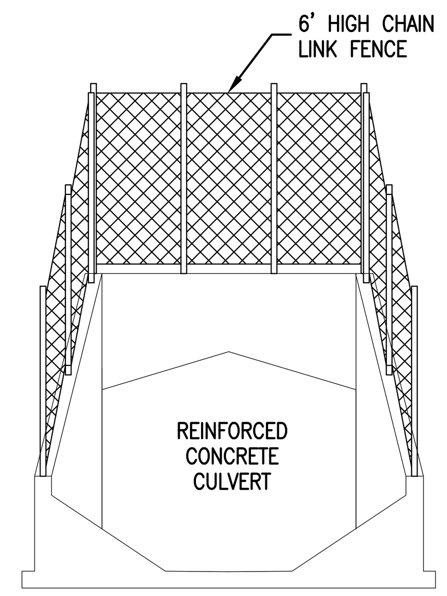
PROJECT NO:	568.41.55
DESIGNED BY:	FGH, VL
DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE
SECTIONS AND DETAILS - SANITARY SEWER

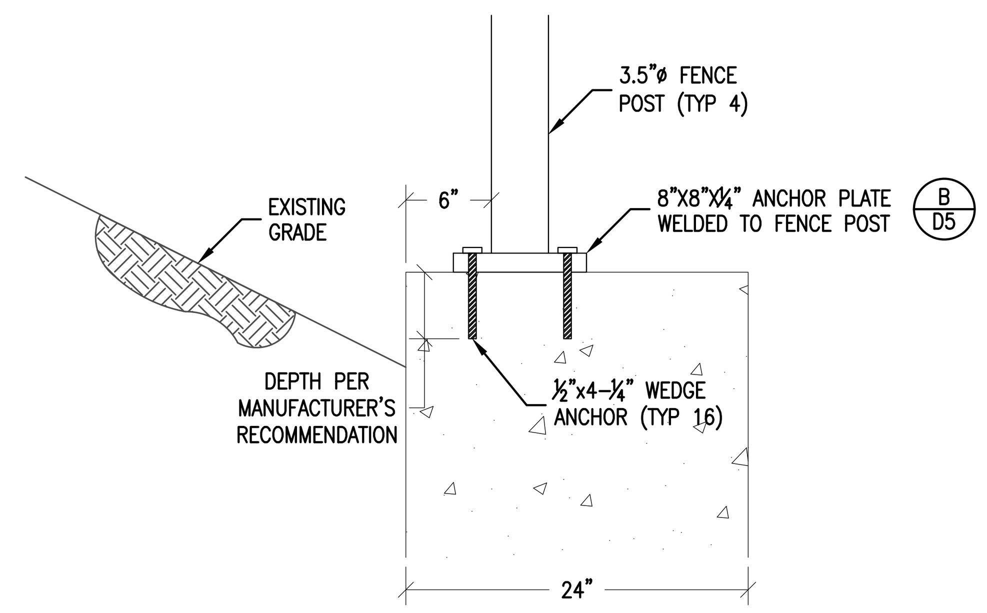
DRAWING
D5



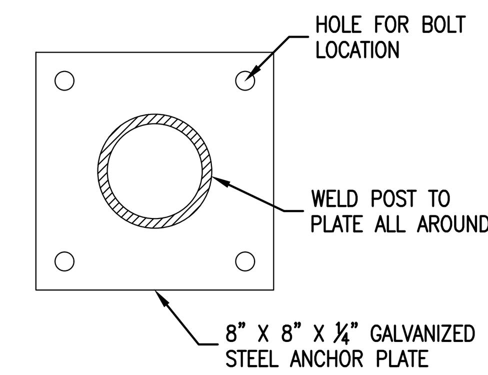
1 D6 HEADWALL FENCE PROFILE VIEW
N.T.S.



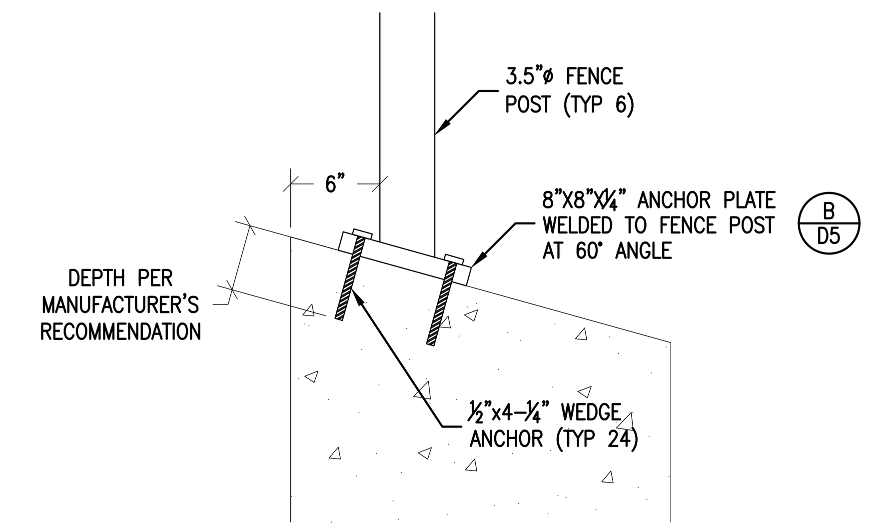
2 D6 HEADWALL FENCE FRONT VIEW
N.T.S.



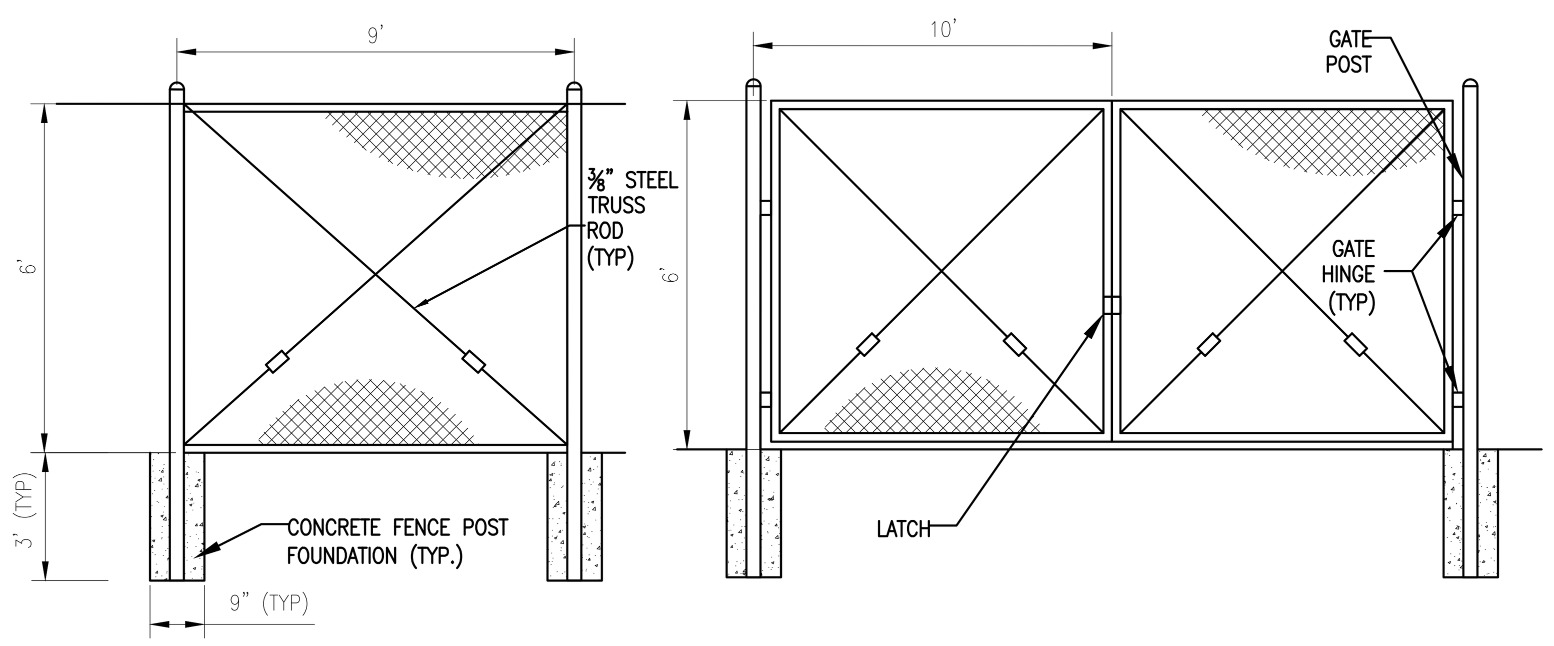
A D6 FENCE POST ANCHOR DETAIL
FLAT HEADWALL SURFACE



B D6 FENCE POST ANCHOR DETAIL
PLATE MOUNT

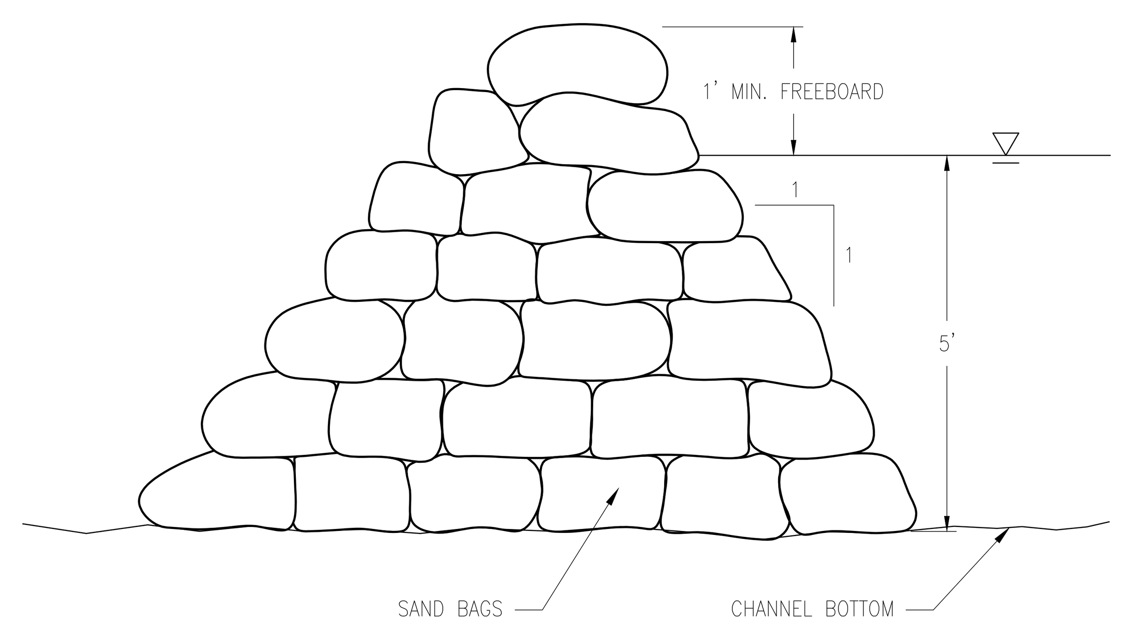


C D6 FENCE POST ANCHOR DETAIL
SLOPED HEADWALL SURFACE

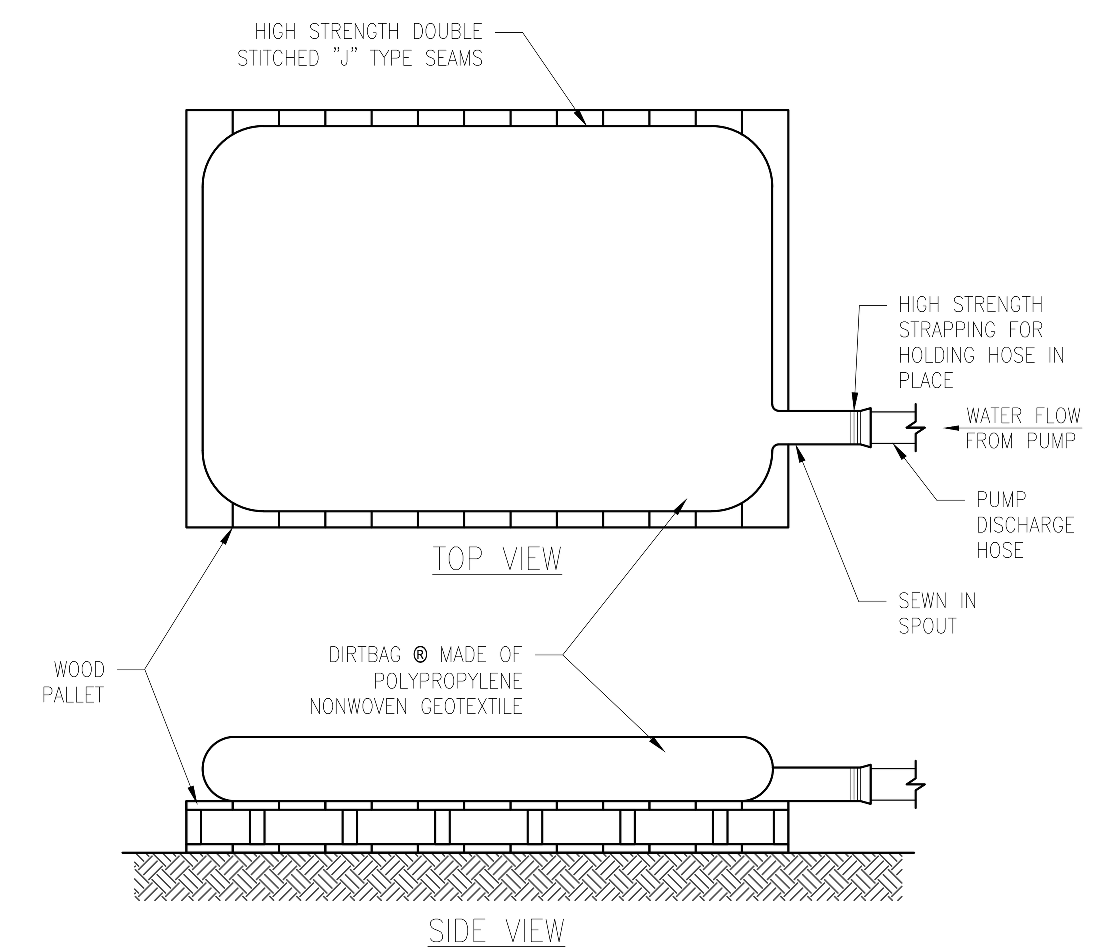


NOTES:
1. CHAIN LINK FABRIC SHALL BE ZINC COATED STEEL MANUFACTURED IN COMPLIANCE WITH ASTM STANDARD A 392 WITH A 2 INCH MESH OF 9 GAUGE WIRE WITH KNUCKLED SELVAGE.
2. TENSION WIRE SHALL BE 7 GAUGE.

3 D6 FENCE PANEL AND GATE DETAIL
N.T.S.

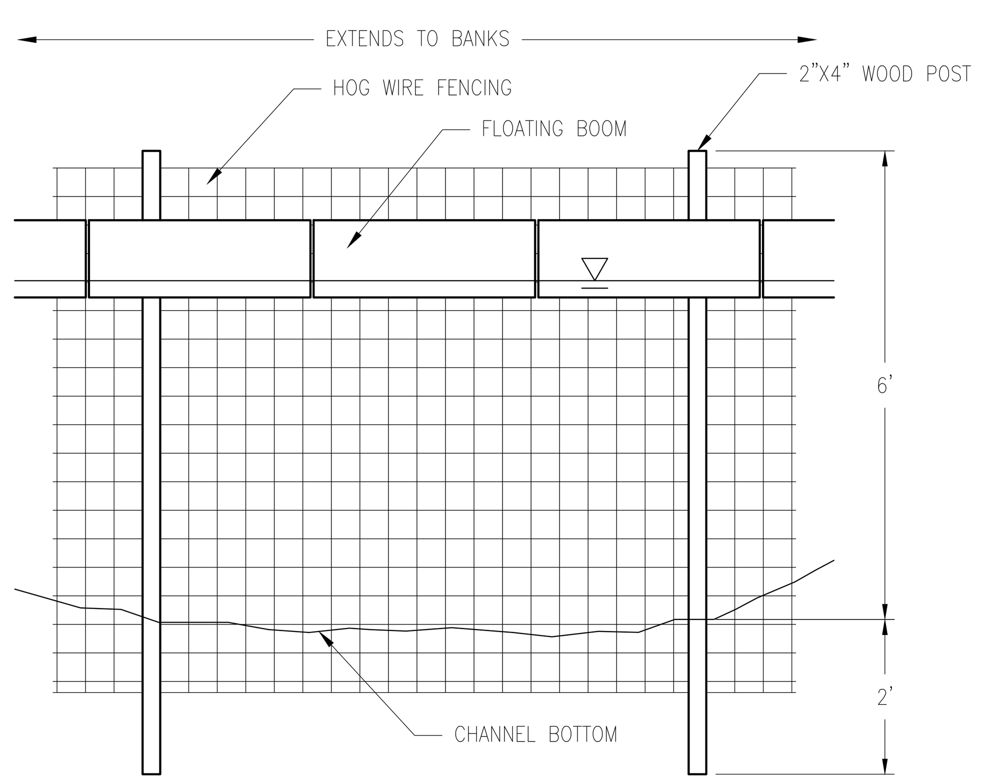


4 D6 COFFER DAM
N.T.S.

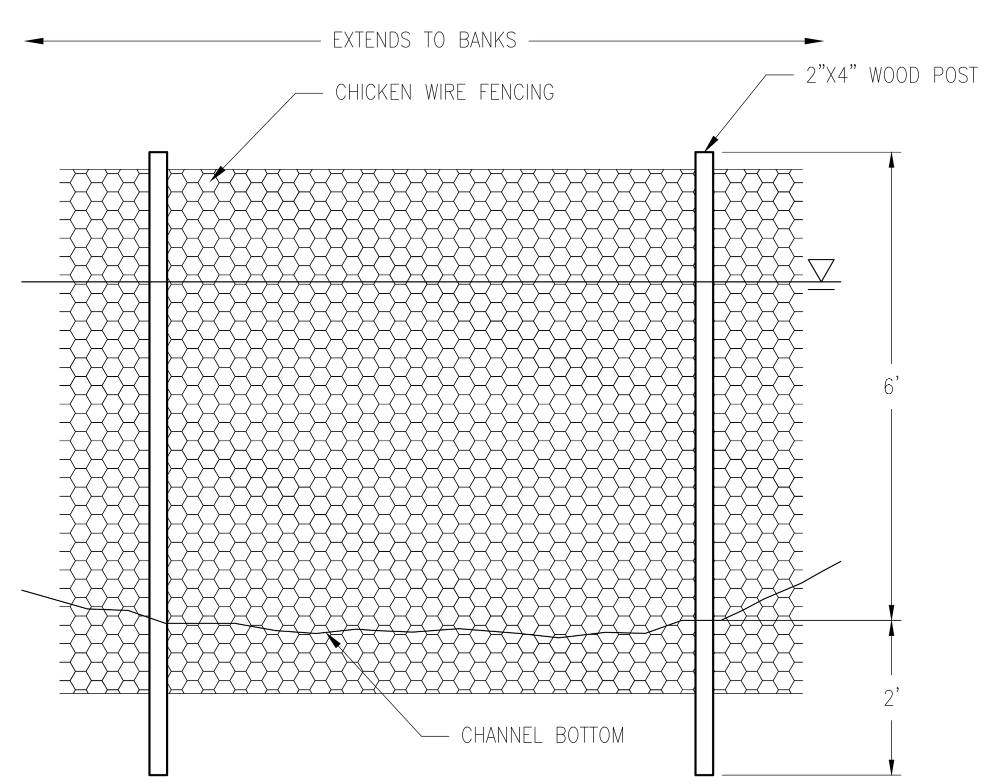


5 D6 DIRTBAG(R) ON WOOD PALLET
N.T.S.

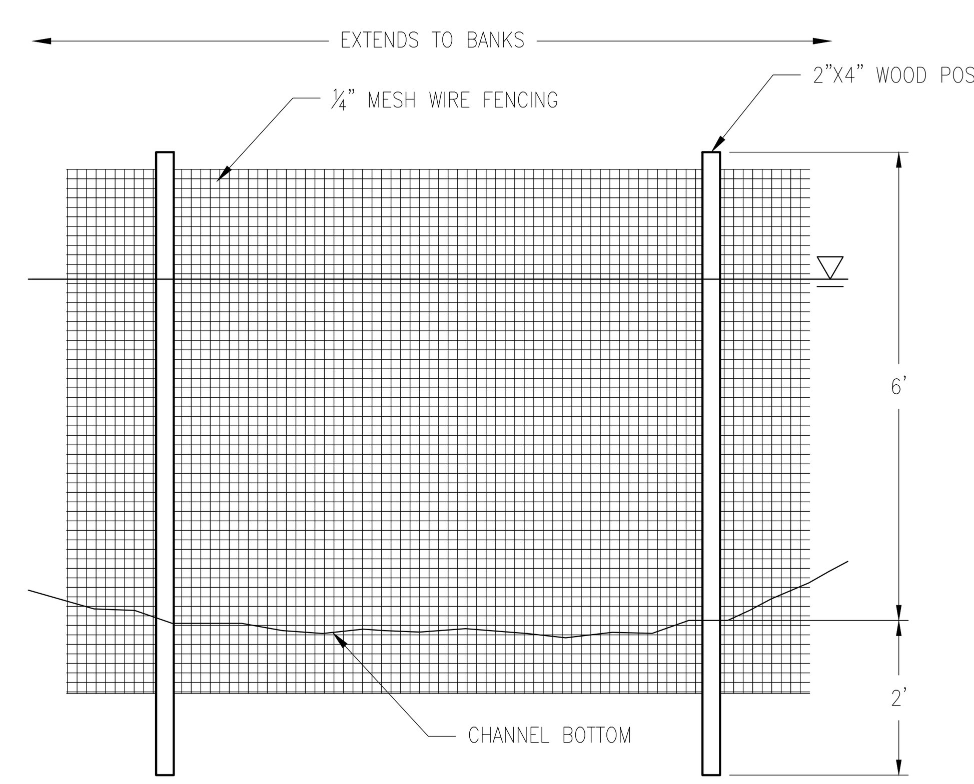
NOTE:
1. DIRTBAG SHALL BE MANUFACTURED PER SI GEOSOLUTIONS' SPECIFICATIONS OR APPROVED EQUIVALENT.



6 D6 FLOATING BOOM & HOG WIRE FENCE
N.T.S.



7 D6 CHICKEN WIRE FENCE
N.T.S.



8 D6 1/4" MESH WIRE FENCE
N.T.S.

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NOTES:
1. MINOR ADJUSTMENTS MAY BE REQUIRED TO MEET FINAL FIELD CONDITIONS.
2. CHAIN LINK FENCE AND ACCESSORY MATERIALS SHALL BE GALVANIZED STEEL.
3. CHAIN LINK FENCE INSTALLATION SHALL CONFORM TO CALTRANS STANDARD SPECIFICATIONS SECTION 80.

PRELIMINARY FOR REVIEW NOT FOR CONSTRUCTION DATE: 04-12-19

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VIA VERDI SLOPE STABILIZATION

OWNER
CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

City of Richmond

NO.	DATE	DESCRIPTION

PROJECT NO:	568.41.55
DESIGNED BY:	FGH, VL
DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE
SECTIONS AND DETAILS - DEWATERING AND FENCING

DRAWING
D6

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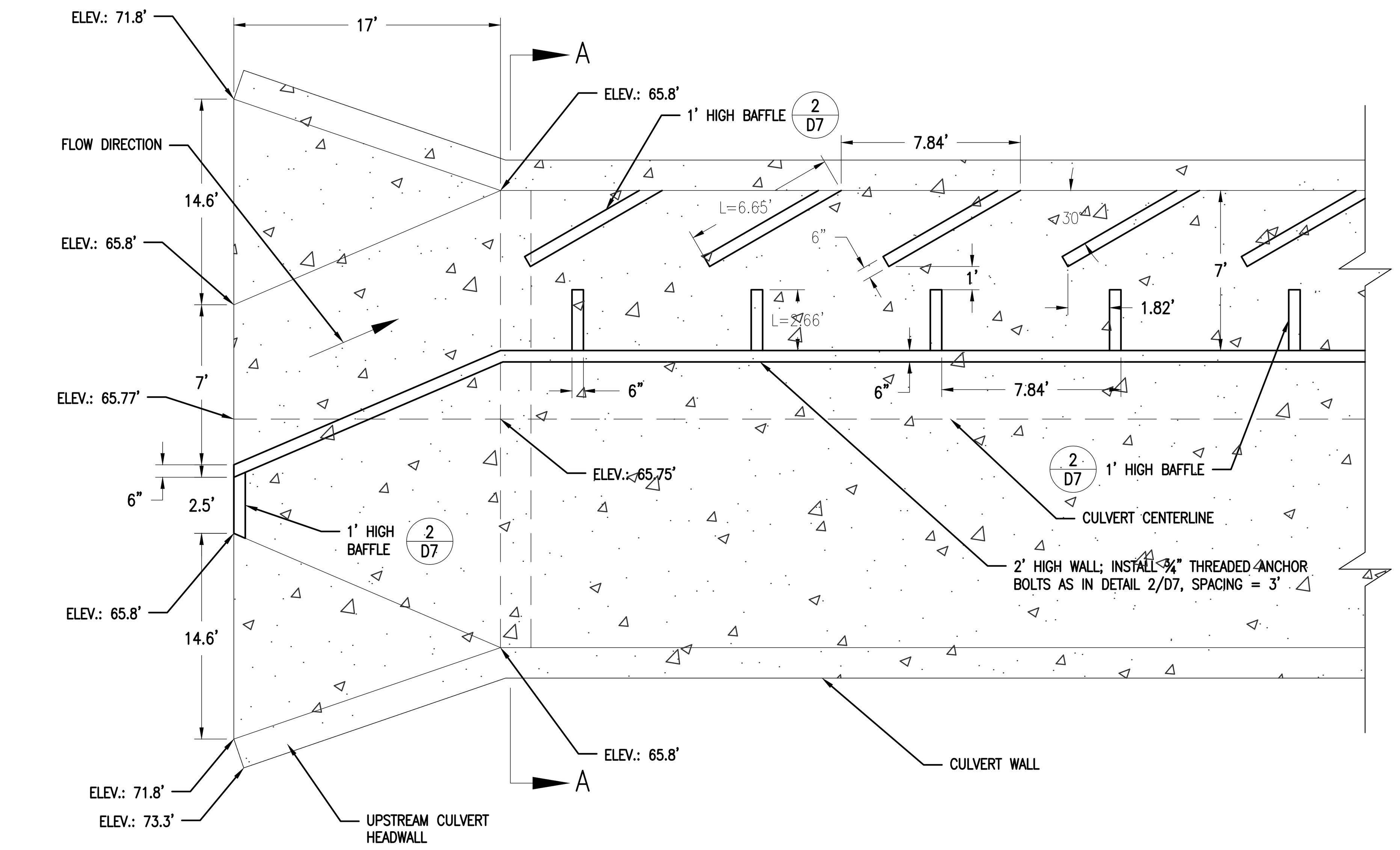
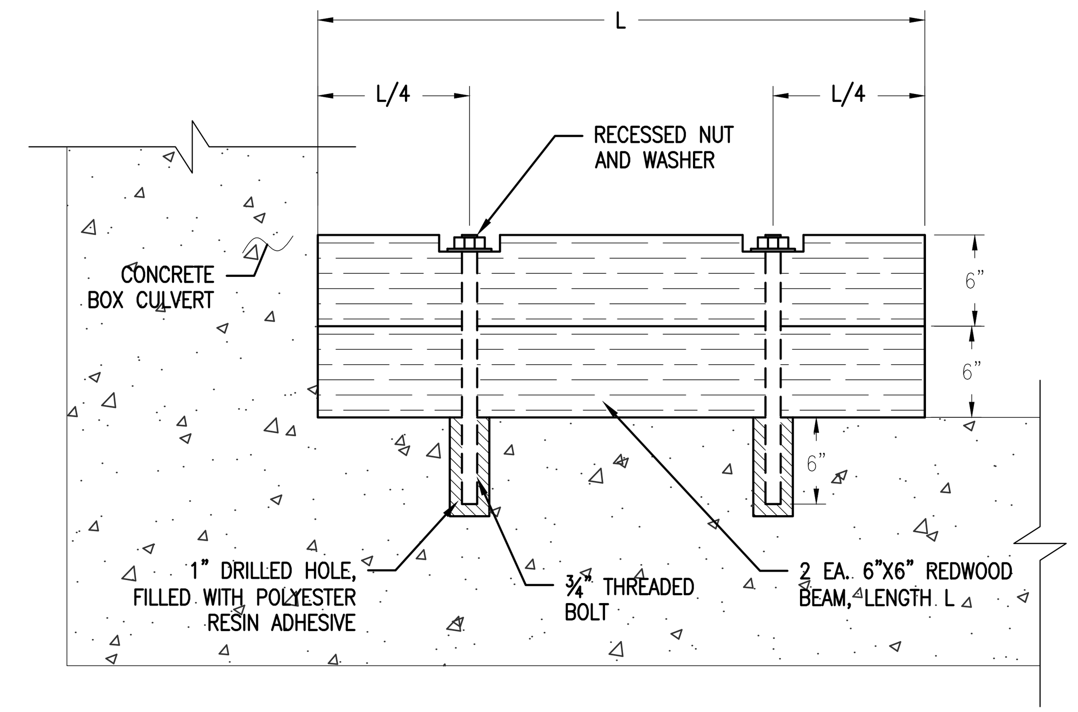
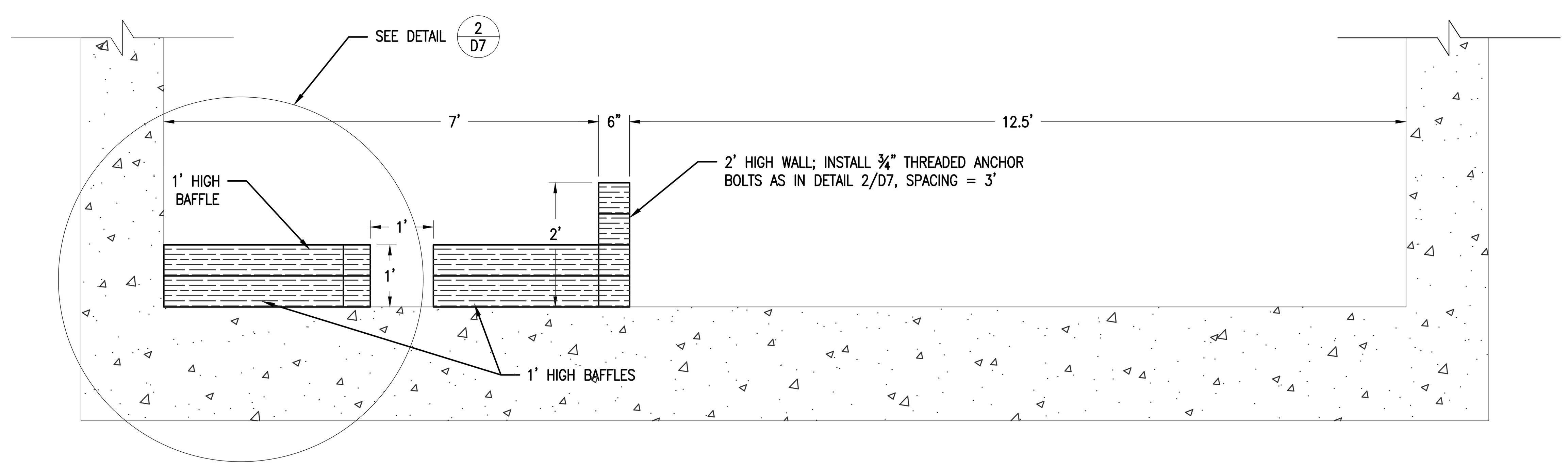


PLAN VIEW



2 / D7 BAFFLE INSTALLATION
N.T.S.

NOTE:
1. LUMBER DIMENSIONS MAY BE NOMINAL.
2. BOLTS, NUTS AND WASHERS SHALL BE HOT-DIP GALVANIZED.



SECTION A–A

1 / D7 CULVERT BAFFLE LAYOUT PLAN & SECTION
N.T.S.

NOTE:
1. ALL BAFFLES SHALL BE CONSTRUCTED OF 6"X6" ROUGH-SAWN REDWOOD TIMBERS.

Know what's **below.**
Call before you dig.

PRELIMINARY
FOR REVIEW
NOT FOR CONSTRUCTION
DATE: 04-12-19

REGISTERED PROFESSIONAL ENGINEER
FRANZ G. HAIDINGER
NO. C 64725
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO:	568.41.55
DESIGNED BY:	FGH, VL
DRAWN BY:	VL
CHECKED BY: JWN	DATE 03/28/2019
DATE:	04/12/2019

SHEET TITLE

SECTIONS AND DETAILS - CULVERT BAFFLE

DRAWING
D7

SHEET 26 OF 30

STRUCTURAL NOTES

GENERAL:

Verify dimensions prior to start of construction. The Engineer shall be notified of any discrepancies or inconsistencies.

All Drawings and Specifications are considered part of the contract documents. The contractor shall be responsible for review and coordination of all drawings and specifications prior to start of construction. Any discrepancy that occurs shall be brought to the attention of the Architect prior to the start of construction so that a clarification may be issued. Work in conflict with the contract documents or Building Code requirements shall be corrected by the Contractor at his own expense and at no expense to the owner or Structural Engineer.

Specific Notes and Details take precedence over General Notes and Typical Details.

Work shall conform to the minimum standards of the 2010 California Building Code as amended by the City of Richmond, as well as any other regulating authority over any portion of the work including those additional codes and standards listed in these Structural Notes and Specifications.

Refer to the Civil and other Drawings for the following:
-Dimensions not shown on the Structural Drawings.
-Soil properties and details for trenching, excavation, subgrade preparation and backfill.

Features of construction shown are typical, and they shall apply generally throughout for similar conditions. Modify typical details as directed to meet special conditions. Contract Structural Drawings represent the finished structure. They do not indicate the method of construction. Provide all measures necessary to protect the structure and site during construction. Such measures shall include, but are not limited to, bracing and shoring for loads due to construction equipment. Observation visits to the site by the Structural Engineer will not include inspection of the aforementioned items.

Shop Drawings, special inspections, and material sampling and testing, when required, are specified in their respective sections of the general notes.

EXISTING CONSTRUCTION:

Existing construction shown on the Structural Drawings was obtained from field surveys or drawings prepared by others. Verify all existing conditions and notify the Engineer of all exceptions before proceeding with the work.

The removal, cutting, drilling, etc. of existing work shall be performed with great care and small tools in order not to jeopardize the existing structural integrity. If existing structural members, not indicated for removal, interfere with the new work, the Engineer shall be notified immediately for approval before removal of the existing members.

STRUCTURAL STEEL AND MISCELLANEOUS IRON:

Fabricate and erect Structural Steel and Miscellaneous Iron according to the American Institute of Steel Constructions's "Specification for Design, Fabrication, and Erection of Structural Steel Buildings," latest edition and the "Code for Standard Practice for Steel Buildings and Bridges," latest edition.

Unless otherwise noted, steel wide flange shapes shall conform to ASTM A992 (Fy=50 ksi). Steel pipe shall conform to A53 Grade B (Fy=35 ksi) or ASTM A501 (Fy=36 ksi). Hollow Structural Sections (Circular or Rectangular) shall conform to ASTM A500 Grade B (Fy=46 ksi). All steel plates, bars and other shapes shall conform to ASTM A501 (Fy=36 ksi).

All steel sections, including shapes, bars, pipes, tubes, plates, bolts, nuts and washers exposed to weather or soil shall be hot dipped galvanized.

Weld connections according to the "Structural Welding Code - Steel," AWS-D1.1, latest edition. Welding shall be performed by welders certified for the welds to be made. All welding should be done with E70XX electrodes, unless noted otherwise. Refer the Specifications for the welding process to be used. All welds exposed to the weather shall be grounded smooth and painted with 2 coats of Z.R.C. cold galvanizing compound.

The weld lengths called for on the Structural Drawings are the net effective length required. Where fillet weld symbol is given without indication of size, use the minimum size welds as specified in the AISC Manual of Steel Construction, Table J2.4.

Shop Drawings shall be submitted to the Engineer for Review prior to fabrication.

The testing agency shall send copies of all Structural testing and inspection reports directly to the Engineer.

REINFORCING STEEL:

Reinforcing steel detailing, fabrication, and placement shall conform to the "Uniform Building Code", Chapter 19; the "Manual of Standard Practice of the Concrete Reinforcing Steel Institute", latest edition; and the "Building Code Requirements for Structural Concrete and Commentary", ACI 318, Latest Edition; unless otherwise noted.

Reinforcing steel shall conform to the following standards:
-Deformed Bars: ASTM A615, Grade 60
-Welded Reinforcement: ASTM A706, Grade 60
-Welded Wire Fabric WWF: ASTM A185

Securely tie steel reinforcement in place so as to maintain the exact position before and during the placement of concrete. Securely tie reinforcing steel in place with #16 annealed iron wire. Support bars in beams and slabs well cured concrete blocks or approved plastic tipped metal chairs, as specified by CRSI Manual of Standard Practice. Accessories for epoxy-coated reinforcing, where shown on plans, shall be as noted in the Specifications. Wire fabric in slabs shall be securely fastened to supporting devices to maintain their position during concrete placement.

Bars shall be continuous unless noted otherwise.

Submit requested rebar lap splices, in locations not shown on the Structural Drawings, to the Structural Engineer for approval. Laps in bars shall be 36 bar diameters, or 24" minimum unless noted otherwise. Laps in Welded Wire Fabric shall be 12" minimum, unless noted otherwise.

Concrete coverage (clear distance between steel and forms) shall be as follows unless noted otherwise:
-Concrete cast against earth: 3"
-Formed surfaces in contact with earth: 2"
-Slabs on Rolled Grade: 2"
-Clear Distance Between Adjacent Bars: 2"
-Bar Spacing for Bars Spliced with Non-Contact Laps:Lap/5 or 6"
-Clear Distance Between Bars and inserts: 2"
-Column or Beam Ties: 1 1/2"
-Wall surfaces in exposed to weather: 1 1/2"
-Wall surfaces not exposed to weather: 3/4"
-Suspended slabs or joists: 3/4"

Shop Drawings shall be submitted to the Architect for review prior to fabrication. Shop Drawings shall include elevations of all walls, slabs, beams and columns showing bar and lap locations. See Shop Drawing Submittal Requirements elsewhere in the General Notes. Submit mill certificates for reinforcing prior to rebar placement.

CONCRETE WORK:

Concrete work shall conform to the "California Building Code", Chapter 19 and the "Building Code Requirements for Structural Concrete and Commentary", ACI 318 Latest Edition; unless otherwise noted.

Properly constructed formwork conforming to the concrete surfaces as shown on the Structural Drawings, sufficiently tight to prevent leakage, sufficiently strong and braced to maintain their shape and alignment until no longer needed to support the concrete. Forms for exposed concrete shall be plywood, using sheets as large as practicable, with all joints tightly fitted and blocked, and shall produce a finished concrete surface which is smooth, true and free from blemishes according to accepted standards for architectural concrete.

Remove debris from forms prior to concrete placement.

Remove forms and shoring only after the concrete has attained sufficient strength to withstand all loads to be imposed without excessive stress, creep, or deflection. See specifications for shoring requirements.

Concrete shall be ready mixed conforming to ASTM C94. Cement shall be Portland Cement Type II, conforming to ASTM C150. All hardrock (H.R.) concrete used in suspended slabs and slabs on grade shall be designed for low shrinkage (L.S.).

Submit for review of the Engineer the concrete mixes proposed for use, designed by the concrete supplier and reviewed by an approved testing laboratory.

Use maximum size aggregate as noted below. Use 3/8" maximum aggregate where necessary for proper placing, such as thin or congested sections. Superplasticizers may be used to improve workability in thin congested sections. Incorporate superplasticizers into concrete mix designs.

Concrete shall have the following characteristics:

Notes: 1. Slump shall be the minimum consistent with proper placing.

Location	Aggregate Size	Strength at 28 days	Maximum Slump	Minimum Cement Content	Maximum Water/Cement Ratio
Culvert	3/4" H.R	5000 psi	3 1/2"	6 Sacks	0.45
All other	3/4" H.R	4000 psi	3 1/2"	6 Sacks	0.45

The Contractor shall inform the Engineer at least 3 days prior to placing any structural concrete so that the Engineer may have the opportunity to review the work prior to concrete placement.

Concrete shall be mechanically vibrated so as to completely fill the forms without causing undue segregation.

Four test cylinders from each 100 yards, or fraction thereof, poured in any one day, shall be secured and tested by an independent testing agency, contracted to the owner; one to be tested at 7 days, two at 28 days, and the fourth to be held in reserve.

Remove and replace any concrete which fails to attain specified strength in 28 days, if so directed by the Structural Engineer. Satisfactorily repair defects in the hardened concrete or replace the hardened concrete.

SHOP DRAWING SUBMITTALS:

The Structural Engineer will review, or take other appropriate action, on the Contractor submittals, such as Shop Drawings, product data, samples and other data, which the Contractor is required to submit, but only for the limited purpose of checking for conformance with the design concept and the information shown in the Construction Documents. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. The Structural Engineer's review will be conducted with reasonable promptness while allowing sufficient time in the Structural Engineer's judgment to permit adequate review. Review of a specific item shall not indicate that the Structural Engineer has reviewed the entire assembly of which the item is a component. The Structural Engineer shall not be responsible for any deviations from the Construction Documents not brought to the attention of the Structural Engineer in writing by the Contractor. The Structural Engineer will not be required to review partial submissions or those for which submissions of correlated items have not been received.

The following is a summary of the required shop drawing submittals.
-Structural Steel
-Reinforcing steel placement
-Construction joint and key schedule

SPECIAL INSPECTION:

Special Inspections, provided by the owner, per Section 1701 of the 2010 California Building Code are required for the following types of work:
-Structural Welding
-Reinforcing steel
-Concrete placement

Notify the Special Inspector at least 72 hours prior to performing the work for which the Special Inspection is required. Construction performed without required special inspection will be subjected to rejection by the Engineer or the City of Richmond.

The Inspection/Testing agency shall send copies of all Inspection/Testing reports directly to the Engineer and Building Department. Any materials which fail to meet the project specifications shall immediately be brought to the attention of the Engineer.

STRUCTURAL OBSERVATION:

The Structural Engineer of Record, or his designated engineer, shall provide structural observation of the structural system for general conformance to the approved plans and specifications at significant construction stages, and at completion of the structural system, as required by the UBC Section 1702 or as noted elsewhere in the contract documents.

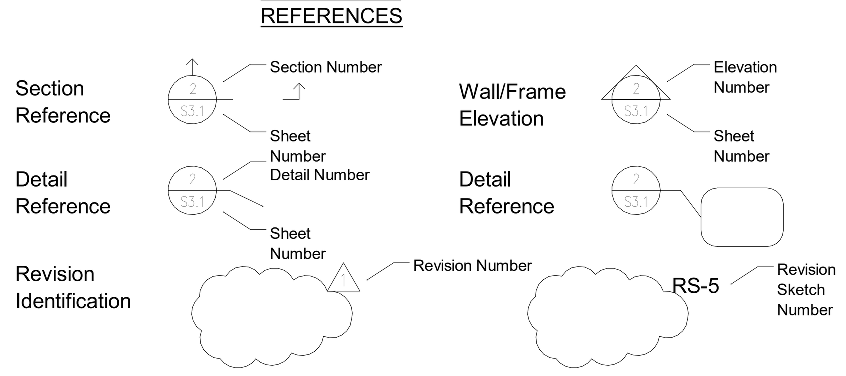
Notify the Structural Engineer of Record a minimum of 72 hours prior to the date the observation is required.

The following items require Structural Observation:

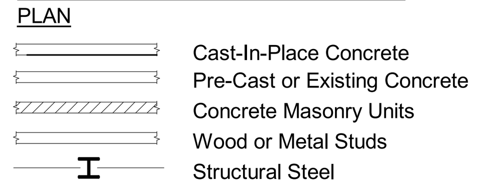
-Structural steel erection
-Reinforcing placement

STRUCTURAL LEGEND

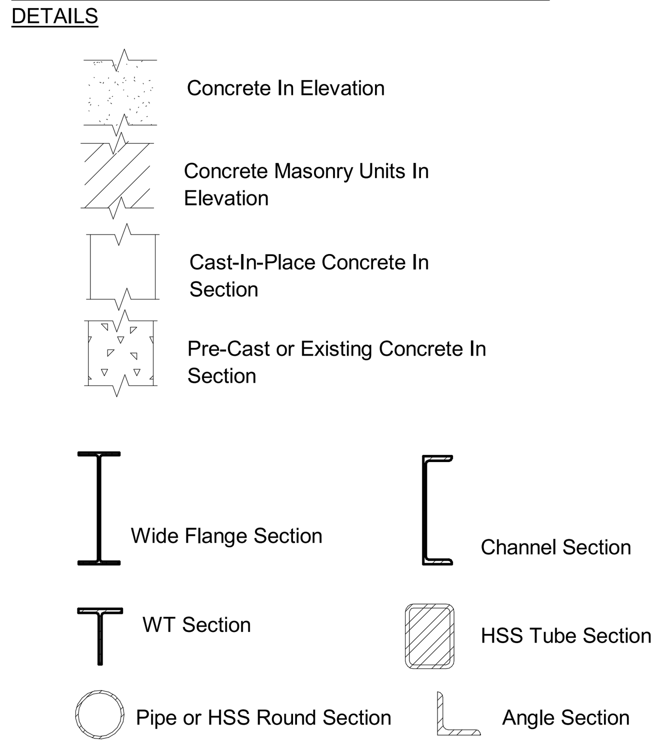
STRUCTURAL REFERENCES

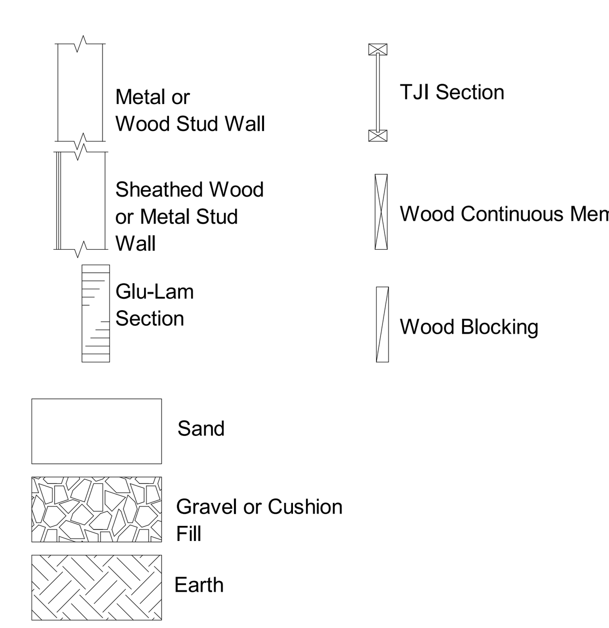


STRUCTURAL MATERIALS SHOWN ON PLAN



STRUCTURAL MATERIALS SHOWN ON SECTIONS OR DETAILS





STRUCTURAL ABBREVIAIONS

A.B.	Anchor Bolt
ABV	Above
ACI	American Concrete Institute
ADDL	Additional
ADJ	Adjacent
AISC	American Institute ofSteel Construction
ALT	Alternate
APPROX	Approximately
ARCH	Architect or Architectural
ASPH	Asphalt
ASTM	American Society of Testing and Materials
BAL	Balance
B.L.	Bottom Lower
BLDG	Building
BM	Beam
B.O.	Bottom of
BOT	Bottom
B.P.	Break Point
BRG	Bearing
BRKT	Bracket
BTWN	Between
B.U.	Bottom Upper
C	Channel
C.I.P.	Cast In Place
C.J.	Construction or Control Joint
CLG	Ceiling
CL	Center Line ℄
CLR	Clear
CMU	Concrete Masonary Unit
COL	Column
CONC	Concrete
CONN	Connection
CONSTR	Construction
CONTIN	Continuous
C.J.P.	Complete Joint Penetration
CPJ	Construction Pour Joint
CTR	Center
CTRD	Centered
CTRSNK	Countersink
d	Penny weight
DBL	Double
DEPR	Depression
D.F.	Douglas Fir
DIA or Ø	Diameter
DIAG	Diagonal
DIM	Dimension
DL	Dead Load
DN	Down
do	Ditto
DWG	Drawing
(E)	Existing
EA	Each
E.F.	Face
E.J.	Expansion Joint
EL	Elevation
ELEC	Electrical
ELEV	Elevator
EMBED	Embedment
E.N.	Edge Nail
ENGR	Engineer
E.O.	Edg of
E.O. MAS	Edge of Masonry
E.O. PL	Plate
E.O. SLAB	Edge of Slab
EQ	Equal
EQPT	Equipment
E.W.	Each Way
EXP	Expansion
EXT	Exterior
EWEF	Each Way, Each Face
FDN	Foundation
FIN	Finish
FLR	Floor
F.O.	Face of
F.O. CONC	Face of Concrete
F.O. MAS	Face of Masonry
F.O. STUD	Stud
FRMG	Framing
F.S.	Far Side
FT	Foot or Feet
FTG	Footing
GA	Gage
GALV	Galvanized
G.B.	Grade Beam
GLB	Glued Laminated Beam
GR	Grade
GYP	Gypsum
HDR	Header
HGR	Hanger
HK	Hook
HORIZ	Horizontal
H.P.	High Point
H.R.	Hard Rock
HSS	Hollow Structural Section
HT	Height
I	Moment of Inertia
I.D.	Inside Diamenter
I.F.	Face
INFO	Information
INT	Interior
JST	Joist
JT	Joint
KIPS	1000 Pounds
KSF	KIPS Per Square Foot
L	Angle
LBS	Pounds
LL	Live Load
LLH	Long Leg Horizontal
LLV	Vertical
LONGIT	Longitudinal
L.P.	Low Point
L.S.	Shrinkage
LSL	Laminated Strand Lumber
LT	Light
LVL	Laminated Veneer Lumber
LTWT	Light Weight
MACH	Machine
MAS	Masonry
MATL	Material
MAX	Maximum
M.B.	Machine Bolt
MC	Miscellaneous Channel
M.D.	Mid-Depth
MECH	Mechanical
M.F.	Moment Frame
MFR	Manufacturer
MIN	Minimum
MISC	Miscellaneous
MTL	Metal
(N)	New
N.A.	Not Applicable
N.I.C.	Not In Contract
NO.	Number
N.P.	No Profile
N.S.	Near Side
N.T.S.	Not To Scale
o.c.	On Center
O.D.	Outside Diameter
O.F.	Outside Face
O.H.	Opposite Hand
OPNG	Opening
OPP	Opposite
OSB	Oriented Strand Board
O.W.S.G.	Open Web Steel Girder
O.W.S.J.	Open Web Steel Joist
P/C	Precast
PCF	Pounds per Cubic Foot
P.D.F.	Powder Driven Fastener
P.D.P.	Powder Driven Pin
⅊	Property Line
PL	Plate
PLF	Pounds per Linear Foot
PLYWD	Plywood
P.J.P.	Partial Joint Penetration
PSF	Pounds per Square Foot
PSI	Pounds per Square Inch
PSL	Parallel Strand Lumber
P/T	Post-Tensioned
P.T.	Pressure Treated
R	Radius
RDWD	Redwood
REF	Reference
REINF	Reinforcing
REQD	Required
REV	Revision
RF	Roof
R.O.	Rough Opening
S	Section Modulus
S.A.D.	See Architectural Drawings
S.C.D.	See Civil Drawings
SECT	Section
SCHED	Schedule
S.E.D.	See Electrical Drawings
SF	Square Feet
SHT	Sheet
SHTG	Sheathing
SIM	Similiar
S.J.	Seismic Joint or Slip Joint
S.L.D.	See Landscape Drawings
S.M.D.	See Mechanical Drawings
S.M.F.	Special Moment Frame
S.M.S.	Sheet Metal Screw
SCJ	Sheet Metal Screw
S.O.G.	Shrinkage Control Joint
SP	Space or Spacing
S.P.D.	See Plumbing Drawings
SPEC	Specification
SQ.	Square
STAGG	Staggered
STD	Standard
STIFF	Stiffener
STL	Steel
STRUCT	Structural
SYM	Symmetric
T & B	Top and Bottom
T & G	Tongue and Groove
T.B.	Tie Beam
THK	Thick
THRU	Through
T.L.	Top Lower
T.O.	Top Of
T.O.C.	Top Of Concrete
T.O.S.	Top Of Steel
T.O.W.	Top Of Wall
TRANS	Tranverse
TS	Tube Steel
T.U.	Top Upper
TYP	Typical
UBC	Uniform Building Code
U.N.O.	Unless Noted Otherwise
U.O.N.	Unless Otherwise Noted
V.B.	Vapor Barrier
VERT	Vertical
V.I.F.	Verify In Field
W	Wide Flange
w/	With
w/o	Without
WD	Wood
WF	Wide Flange
W.P.	Work Point
W.P.J.	Weakened Plane Joint
WT	Weight or Structural T
W.W.F.	Welded Wire Fabric

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PRELIMINARY
FOR REVIEW
NOT FOR CONSTRUCTION
DATE: 04-12-19

VIA VERDI SLOPE STABILIZATION

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO: B8425021.00

DESIGNED BY: NR

DRAWN BY: QL

CHECKED BY: NR DATE

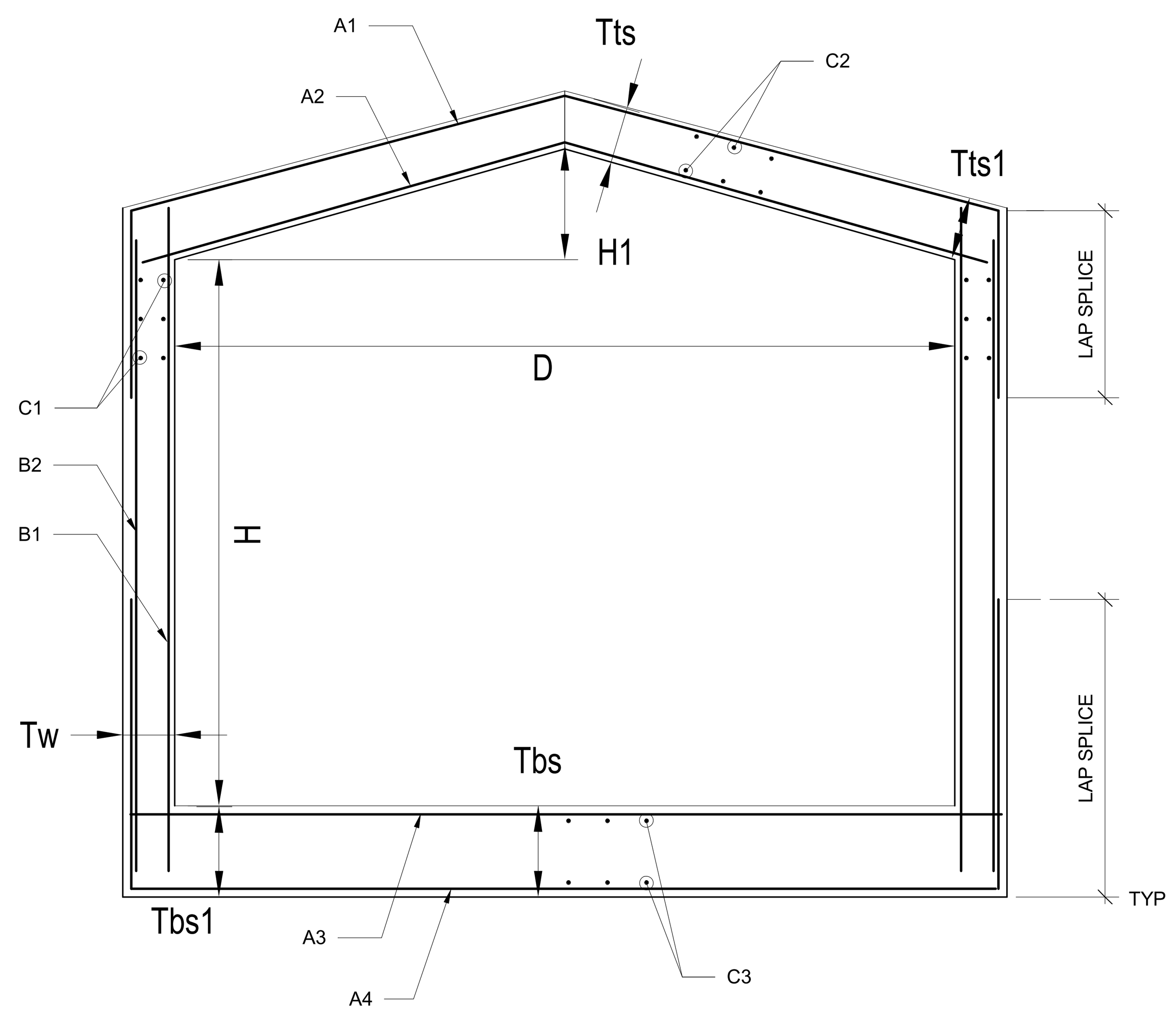
DATE: 04-18-2019

SHEET TITLE

GENERAL NOTES

DRAWING

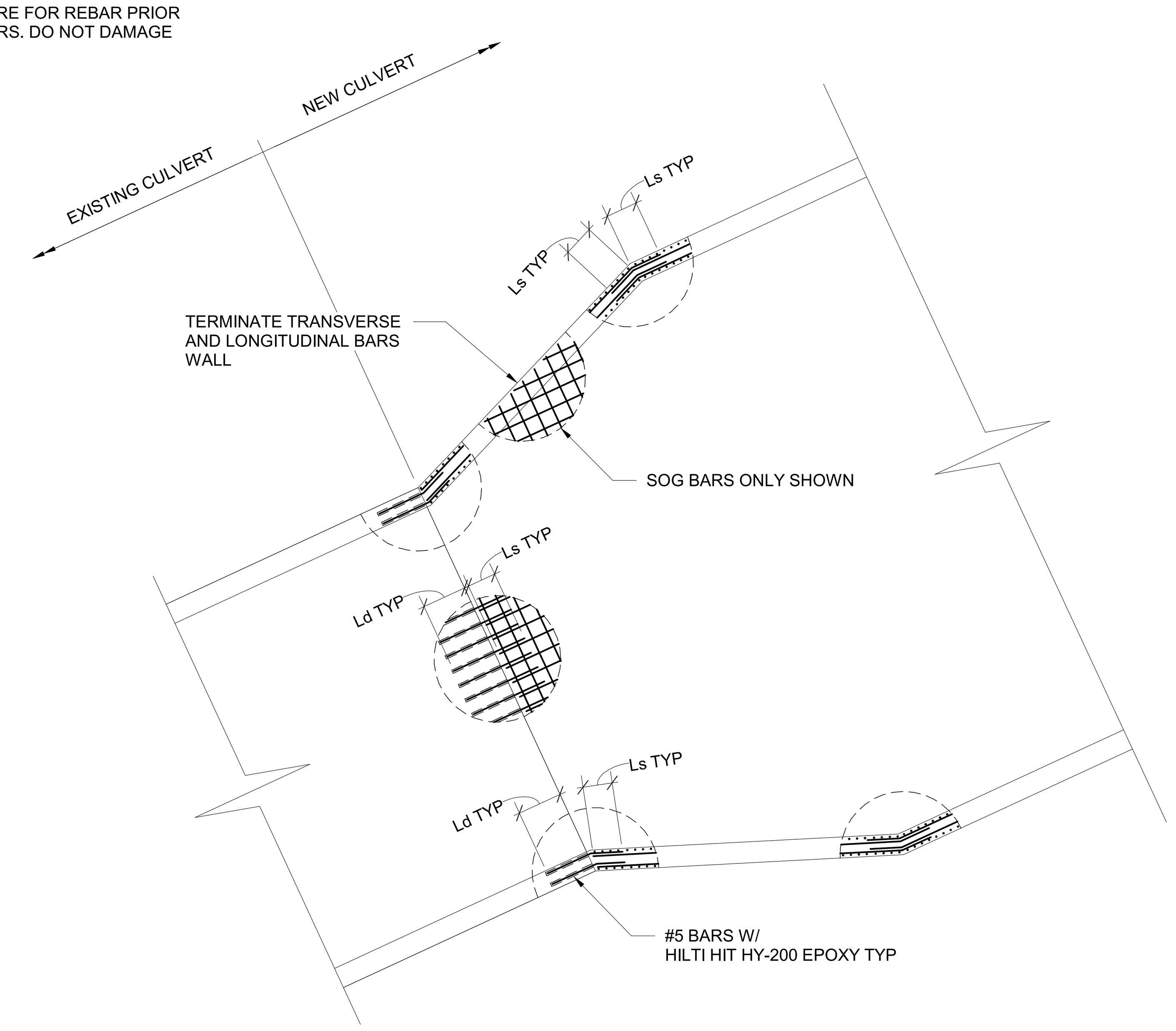
S0.1



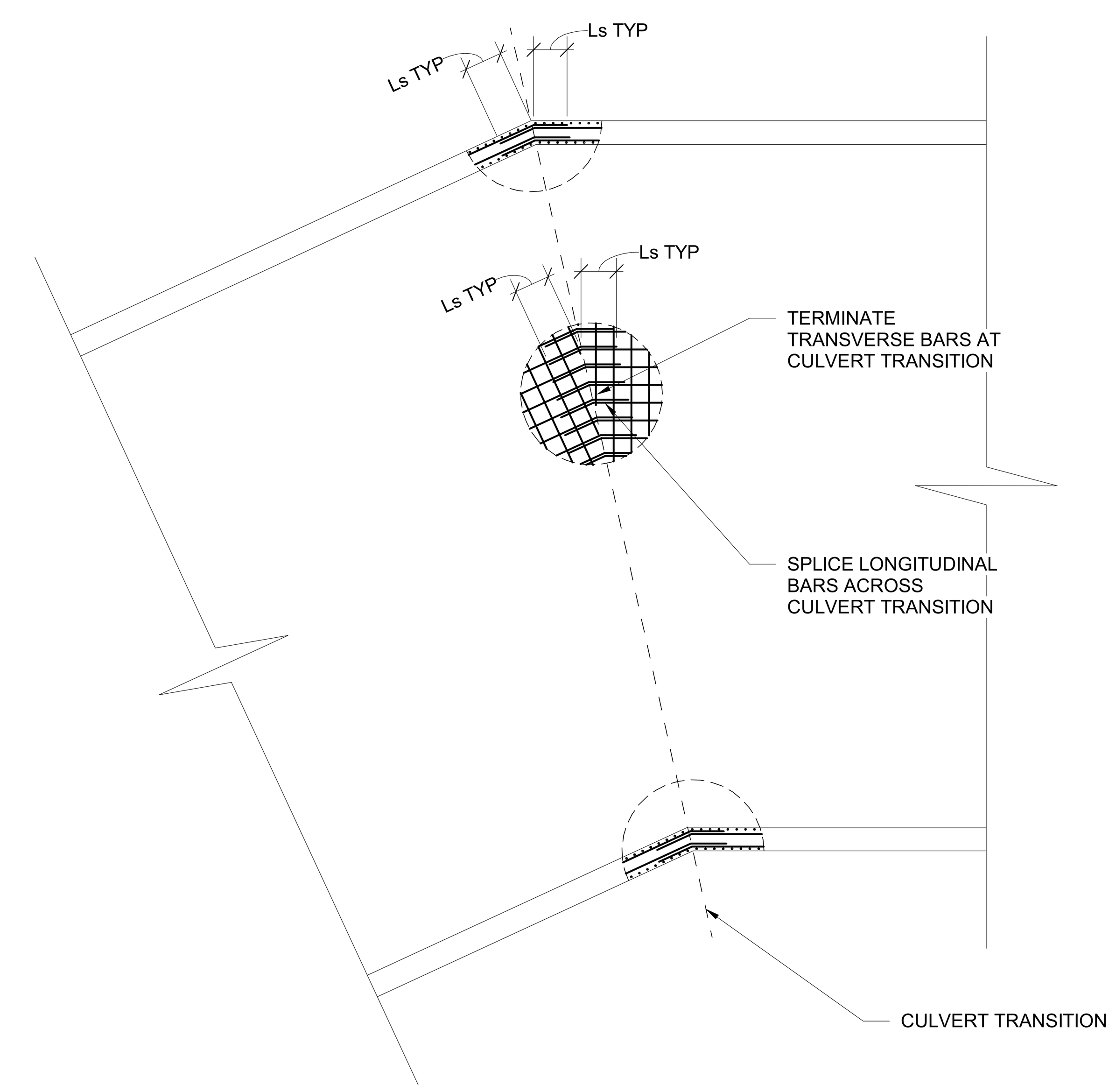
CULVERT PROPERTIES	
OPTION	VALUE
D	24'-0"
H	16'-0"
H1	3'-0"
Tw	1'-8"
Tts	1'-8"
Tts1	1'-8"
Tbs	1'-8"
Tbs1	1'-8"
A1	#11 @ 5" OC
A2	#11 @ 5" OC
A3	#11 @ 5" OC
A4	#11 @ 5" OC
B1	#11 @ 5" OC
B2	#11 @ 5" OC
C1	#5 @ 12" OC
C2	#5 @ 12" OC
C3	#5 @ 12" OC

MAINTAIN 1.25" CLEAR COVER TO CIRCUMFERENTIAL BARS
LAP SPLICES AND HOOKS SEE 7/S3.1 AND 9/S3.1
SECTIONS OF PRECAST CULVERT TO BE 4'-0" LONG MAX.
BASED ON SIZE OF CRANE TO ACCOMMODATE EXISTING POWER LINES.
CONTRACTOR MAY PROPOSE TO USE LONGER SECTIONS AFTER FIELD
CONDITIONS HAVE BEEN VERIFIED.

NOTE:
SCAN EXISTING STRUCTURE FOR REBAR PRIOR TO INSTALLING EPOXY BARS. DO NOT DAMAGE EXISTING BARS.



CONSTRUCTION JOINT AT EXISTING CULVERT PLAN



CULVERT CORNER TRANSITION PLAN

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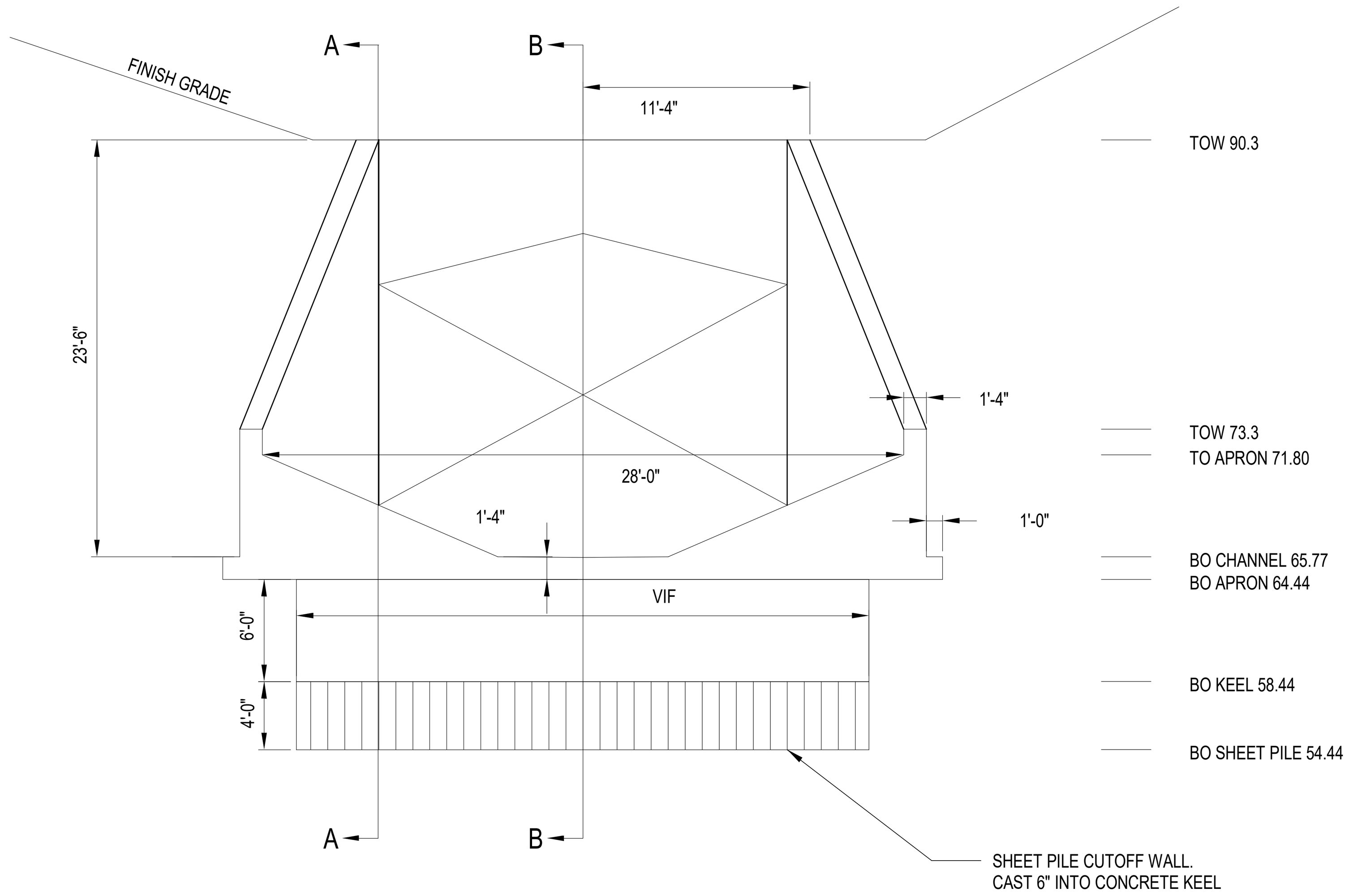
DRAWN BY: QL
CHECKED BY: NR DATE
DATE: 04-18-2019

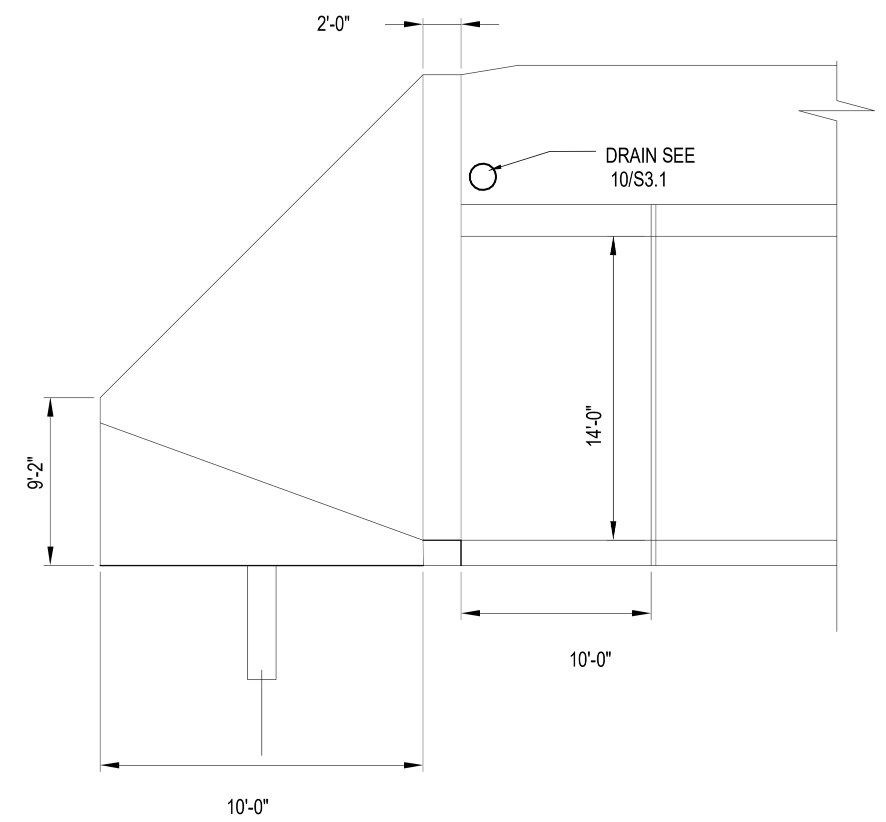
SHEET TITLE

CULVERT DETAILS

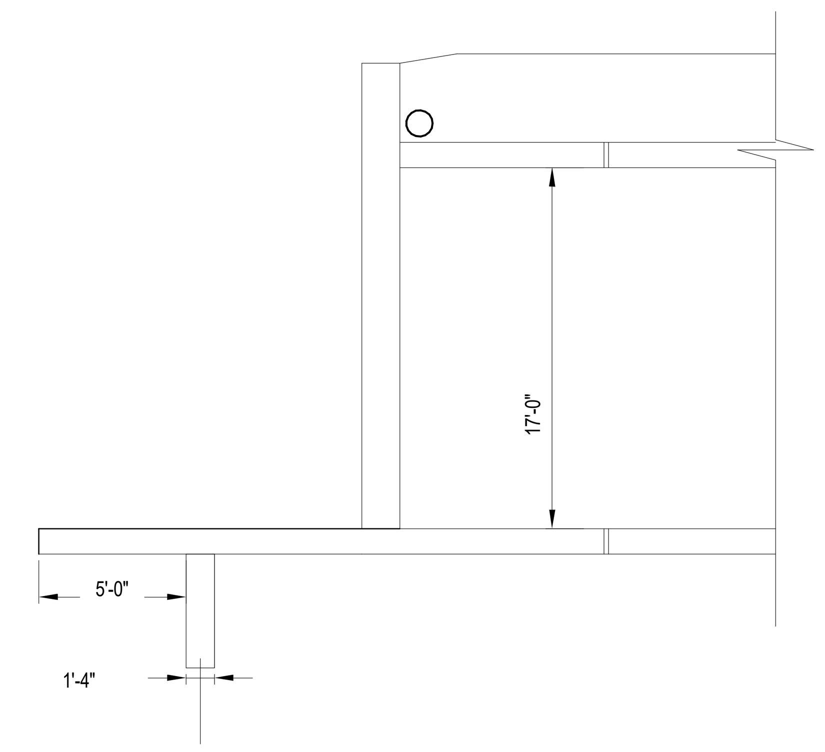
DRAWING S1.1



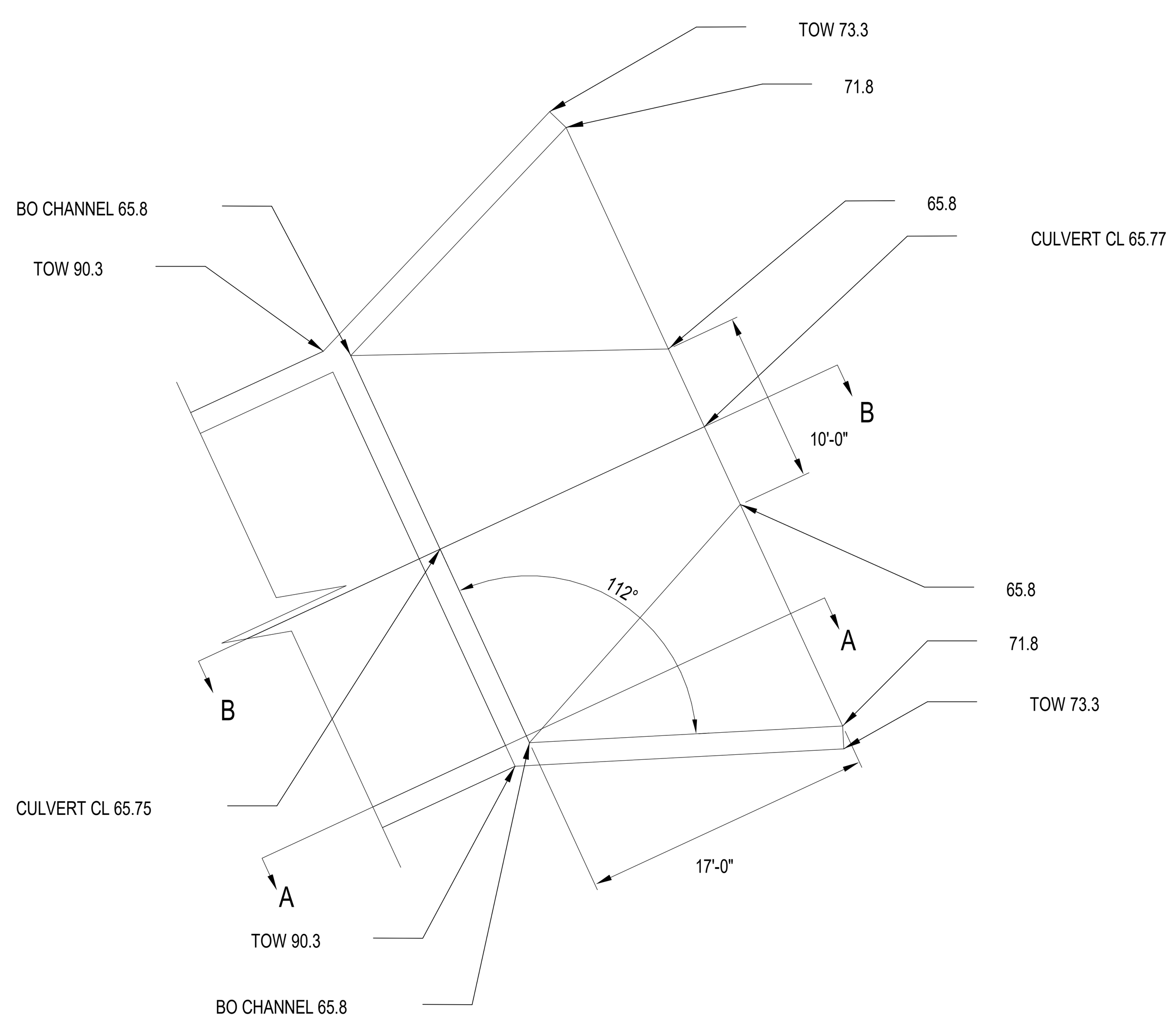
FRONT VIEW



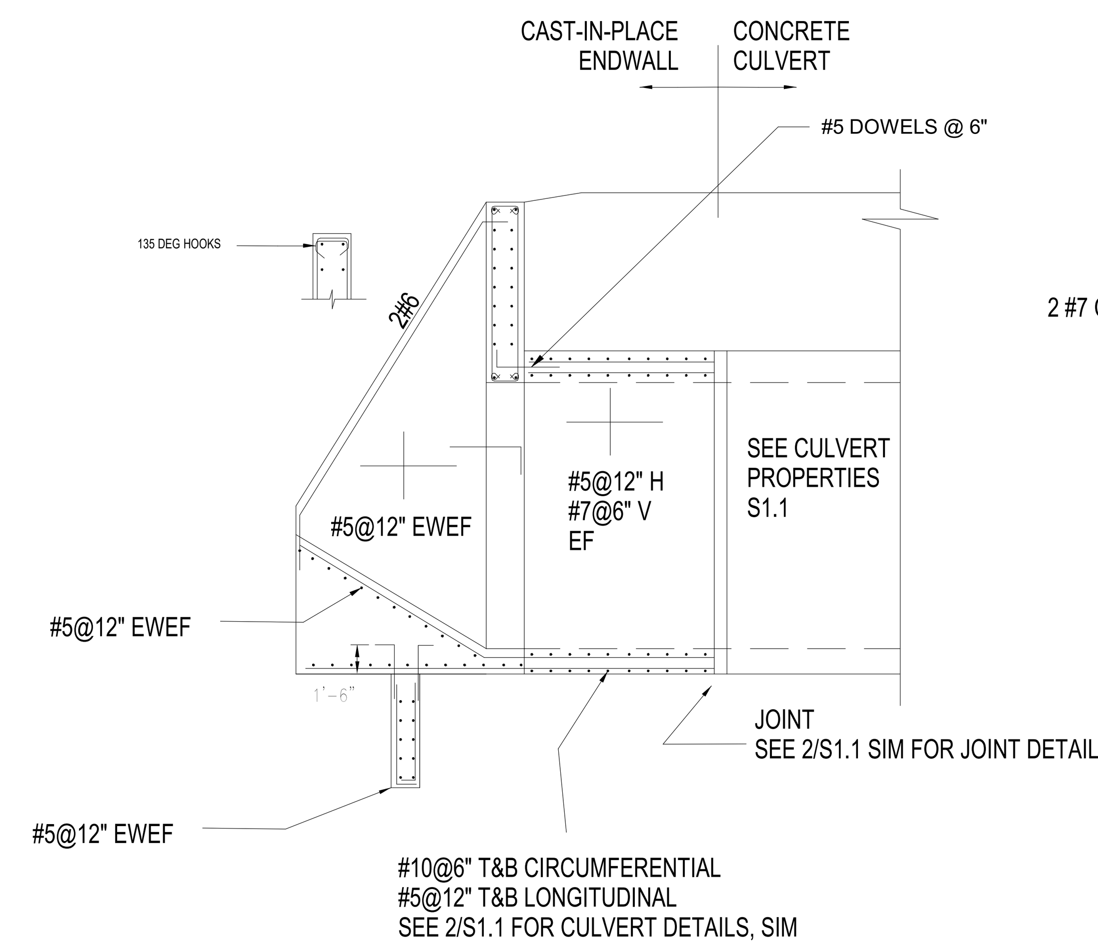
SECTION A-A



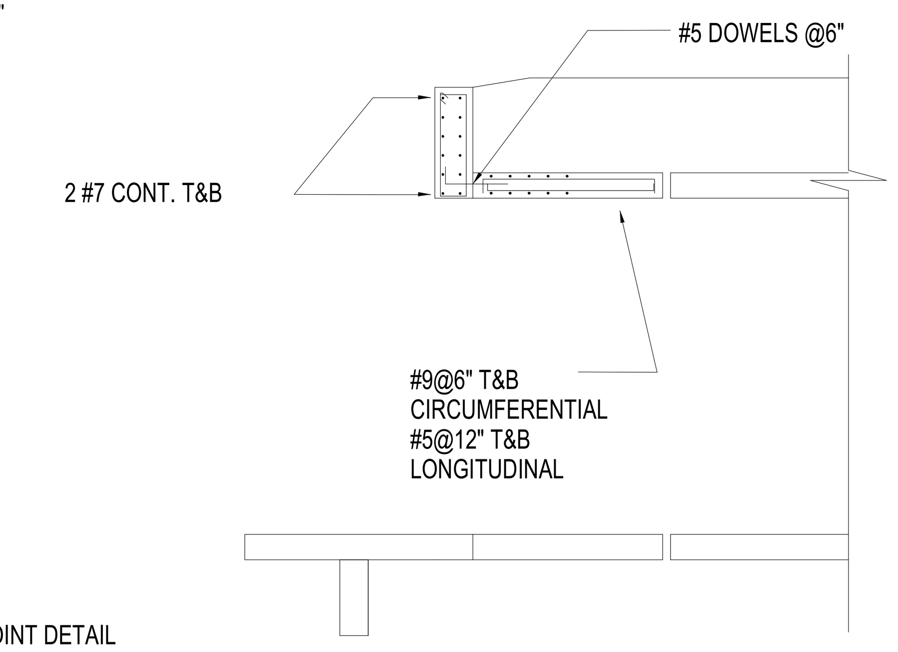
SECTION B-B



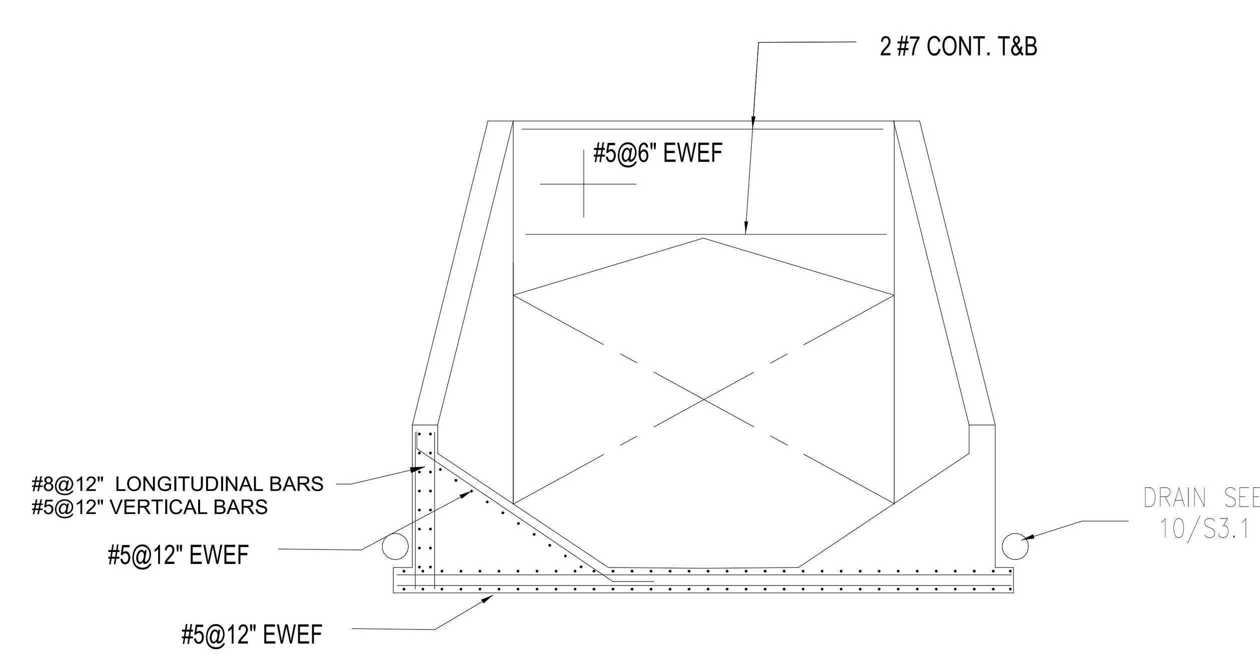
PLAN



SECTION A-A



SECTION B-B



FRONT VIEW

811
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City of Richmond

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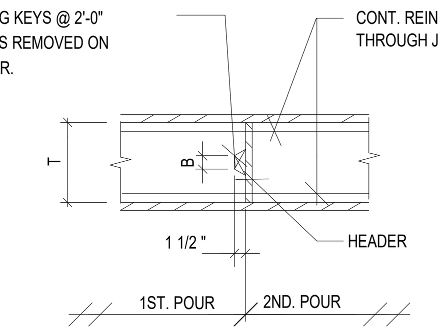
DRAWN BY: QL
CHECKED BY: NR DATE
DATE: 04-18-2019

SHEET TITLE

HEADWALL DETAILS

DRAWING
S2.1

SHEET 29 OF 30

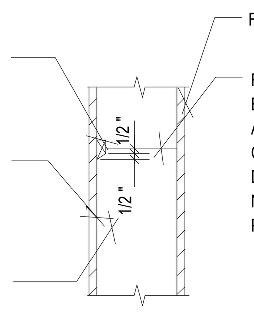


NOTES:

VERTICAL POUR JOINT IN SUSPENDED WALLS SHALL BE WITHIN MIDDLE THIRD OF THE SPAN U.N.O.

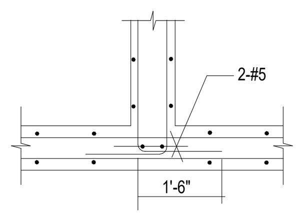
KEY WIDTH	
T	B
8	2 1/2
10	3 1/2
12	5 1/2
>12	T / 2

VERTICAL POUR JOINT

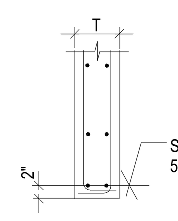


HORIZONTAL POUR JOINT
(USED WHERE CONSTRUCTION JOINT
WILL BE VISIBLE ON FINISHED SURFACE)

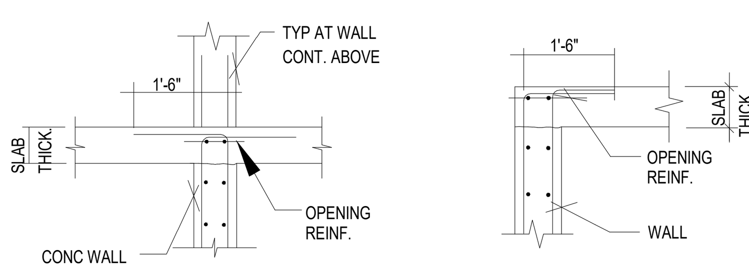
14 DETAIL



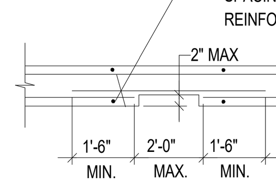
WALL INTERSECTION



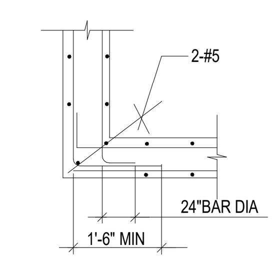
TOP, BOTTOM AND SIDES OF
OPENINGS AND ENDS OF WALL



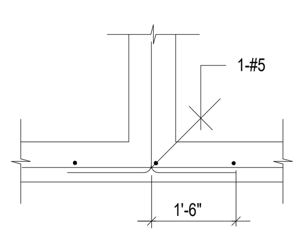
VERTICAL WALL REINF. DETAILS AT SLAB
WHERE WALL IS DISCONTINUOUS



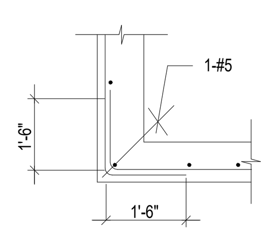
SECTION AT WALL CHASES



CORNER



WALL INTERSECTION
SINGLE REINFORCING



CORNER SINGLE REINF.

16 SECTION

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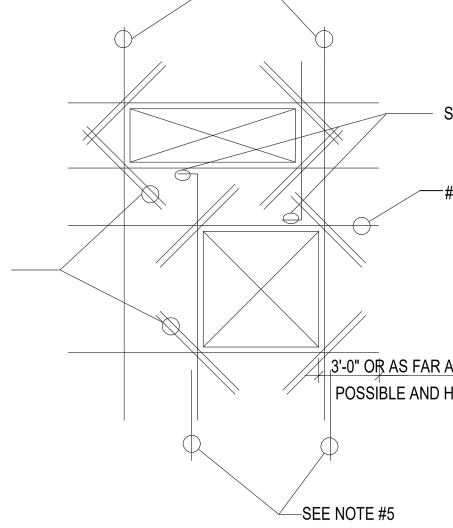
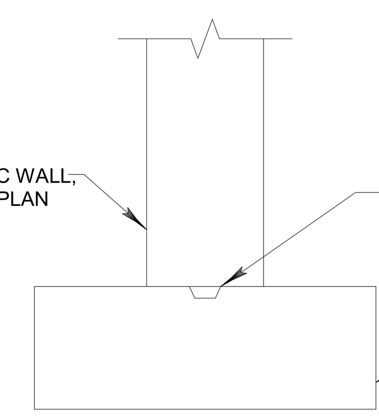


NOTES:

1. WHERE ONE OPENING OCCURS ABOVE ANOTHER, EXTEND ALL SILL AND LINTEL REINF. 3'-0" BEYOND FURTHEST OPENING IN EACH DIRECTION.
2. WHERE OPENINGS IN A HORIZONTAL LINE ARE SPACED LESS THAN THE WIDTH OF THE MAX. ADJACENT OPENING APART, RUN LINTEL AND SILL REINF. CONTINUOUS BETWEEN OPENINGS.
3. EXTEND VERTICAL BARS FROM FLOOR TO FLOOR OR (WHERE OPENING INTERSECTS BAR) FROM FLOOR TO OPENING.
4. TYPICAL WALL REINF. AT TYPICAL SPACING BETWEEN SPECIAL BARS IS TO BE USED. SEE TYPICAL WALL REINF. DETAILS AND WALL SECTIONS.
5. EXTEND VERTICAL BARS 3'-0" PAST FLOOR JOINT OR PROVIDE EQUIVALENT DOWELS.

10 DETAIL

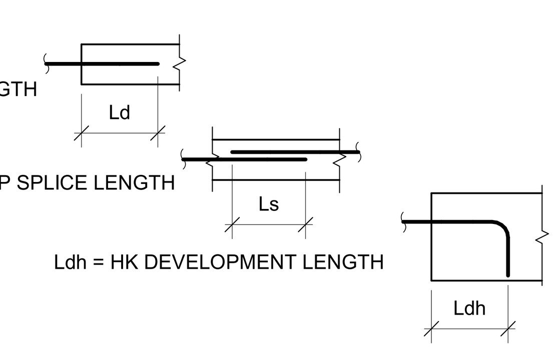


11 SECTION

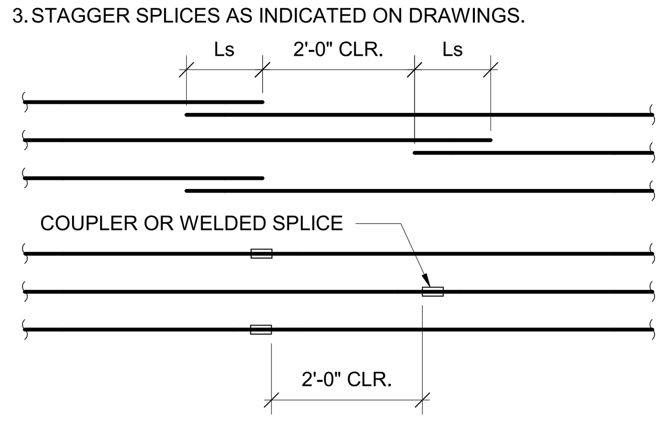
CONCRETE REINFORCING DEVELOPMENT & SPLICE LENGTHS																															
BAR LOCATION	CONCRETE		BAR SIZE																												
			#3			#4			#5			#6			#7			#8			#9			#10			#11			#14		#18	
	TYPE	STRENGTH	Ld	Ls	Ldh	Ld	Ls	Ldh	Ld	Ls	Ldh	Ld	Ls	Ldh	Ld	Ls	Ldh	Ld	Ls	Ldh	Ld	Ls	Ldh	Ld	Ls	Ldh	Ld	Ls	Ldh	Ld	Ldh	Ld	Ldh
VERT WALL BARS, FILL ON METAL DECK, SUSPENDED SLAB	NWC	f'c ≥ 4ksi	12	16	6	14	18	7	21	27	8	23	30	10	38	49	12	36	46	13	44	57	15	54	70	17	64	83	27	68	32	121	43
HORIZ WALL BARS, FOOTING TOP BARS	NWC	f'c ≥ 4ksi	16	20	6	16	20	7	18	24	8	22	29	10	32	42	12	37	48	13	42	54	15	47	61	17	52	68	27	80	32	107	43
BEAM BOTTOM BARS, COLUMN BARS	NWC	f'c ≥ 4ksi	14	18	7	19	25	9	24	31	12	28	37	14	42	54	17	47	62	19	54	70	21	60	78	24	67	87	27	80	32	107	43
FOOTING BOTTOM BARS	NWC	f'c ≥ 4ksi	12	16	6	12	16	7	14	18	8	17	22	10	25	32	12	28	37	13	32	42	15	36	47	17	40	52	27	53	32	88	43
BEAM TOP BARS	NWC	f'c ≥ 4ksi	18	24	7	25	32	9	31	40	12	37	48	14	54	70	17	62	80	19	70	90	21	78	102	24	87	113	27	104	32	139	43
SLAB ON GRADE	NWC	f'c ≥ 4ksi	12	16	6	12	16	7	14	18	8	17	22	10	28	37	12	36	46	13	44	57	15	54	70	17	64	83	27	87	32	138	43
FILL ON METAL DECK	LWC	f'c ≥ 4ksi	16	20	8	18	24	13	27	35	16	30	39	18	49	64	22	46	64	25	57	74	27										

NOTES:

1. Ld = DEVELOPMENT LENGTH



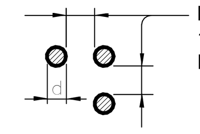
2. WHEN SPLICING BARS OF DIFFERENT SIZE, USE LAP SPLICE LENGTH OF LARGER BAR, UON
3. STAGGER SPLICES AS INDICATED ON DRAWINGS.



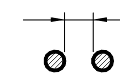
4. TABULATED VALUES ARE BASED ON GRADE 60 REINFORCING BARS. FOR GRADES GREATER THAN 60, UP TO GRADE 80, MULTIPLY THE ABOVE LENGTHS BY THE RATIO OF THE PROPOSED GRADE AND 60.
5. TENSION LAP SPLICES ARE NOT ALLOWED FOR #14 AND #18 BARS.
6. MULTIPLY THE ABOVE Ld AND Ls VALUES BY 1.5 FOR EPOXY COATED REINFORCEMENT. MULTIPLY THE ABOVE Ldh VALUES BY 1.2 FOR EPOXY COATED REINFORCEMENT.
7. FOR LIGHTWEIGHT AGGREGATE CONCRETE, MULTIPLY THE TABULATED VALUES FOR 'NWC' TYPE CONCRETE BY 1.33.

12 REINFORCING DEVELOPMENT & SPLICE LENGTHS

1" = 1'-0"

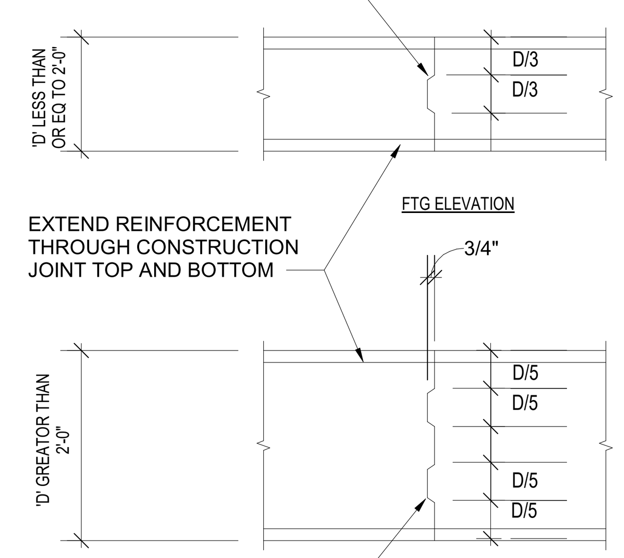


A - BAR SPACING FOR NON-SPLICED BARS



B - BAR SPACING FOR BARS SPLICED W/ NON-CONTACT LAP

5 DETAIL



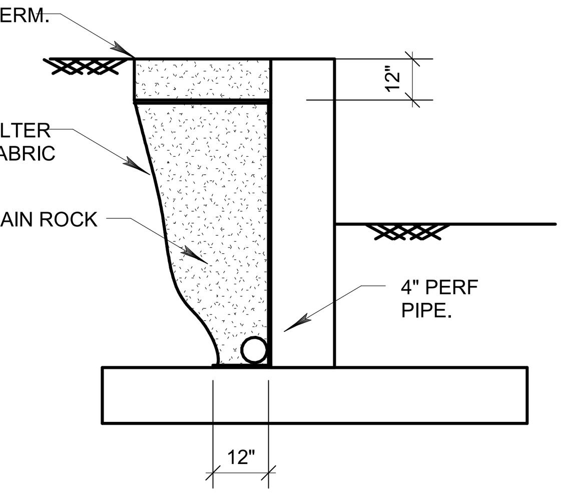
NOTE:
1. 'D' = FOOTING DEPTH
2. 'B' = FOOTING WIDTH
3. TYPICAL KEY IS 1 1/2" DEEP BY 'B'/2 LONG

6 DETAIL

NOTES: WHERE REINF. IS NOT SHOWN OTHERWISE ON SECTIONS, DETAILS OR WALL ELEVATIONS		
MINIMUM REINFORCEMENT IN CONCRETE WALLS		
WALL THICK.	REINFORCING EACH WAY	OPENING REINF. SEE NOTE 2
12"	#4 @ 12" E.F.	2-#6
14"	#4 @ 12" E.F.	2-#7
16"	#5 @ 15" E.F.	2-#7
18"	#5 @ 14" E.F.	2-#8
20"	#5 @ 12" E.F.	2-#8
24"	#6 @ 12" E.F.	2-#8

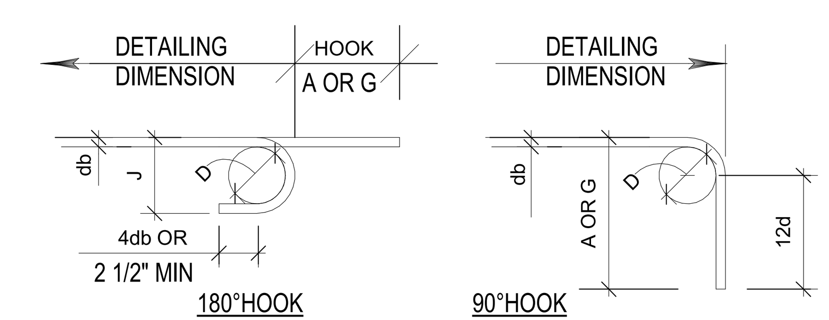
NOTES:
1. FOR PLACEMENT OF VERTICAL BARS RELATIVE TO HORIZONTAL BARS, SEE REINFORCING NOTES IN GENERAL NOTES.
2. MAXIMUM OPENING 8'-0".

1 SCHEDULE



PROVIDE A SUBDRAIN SYSTEM CONSISTING OF A 4-INCH DIAMETER PERFORATED PIPE BEDDED IN 3/4-INCH CLEAN, OPEN-GRADED ROCK. WRAP THE ENTIRE ROCK/PIPE UNIT IN FILTER FABRIC TO PREVENT MIGRATION OF FINES INTO THE DRAINAGE ROCK. THE ROCK AND FABRIC PLACED BEHIND THE WALL WILL BE AT LEAST ONE FOOT IN WIDTH AND EXTEND TO WITHIN ONE FOOT OF FINISHED GRADE. THE UPPER ONE FOOT OF BACKFILL WILL CONSIST OF COMPACTED LOW PERMEABILITY SOIL TO REDUCE SURFACE WATER INFILTRATION. ALTERNATIVELY, PREFABRICATED DRAINAGE PANELS OF LOW COMPRESSIBILITY MAY BE USED INSTEAD OF DRAIN ROCK, WITH THE DRAINAGE PANELS CONNECTED TO A 4-INCH-DIAMETER PERFORATED PIPE AT THE BASE OF THE WALL. SLOPE THE SUBDRAIN PIPE TO DRAIN BY GRAVITY AND CONNECT TO A CLOSED PIPES AS SHOWN ON CIVIL DRAWINGS. CONNECT THE "HIGH" END AND ALL 90 DEGREE BENDS OF THE SUBDRAIN PIPE TO A RISER WHICH EXTENDS TO THE SURFACE AND ACTS AS A CLEANOUT.

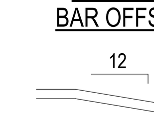
2 S3.1_02

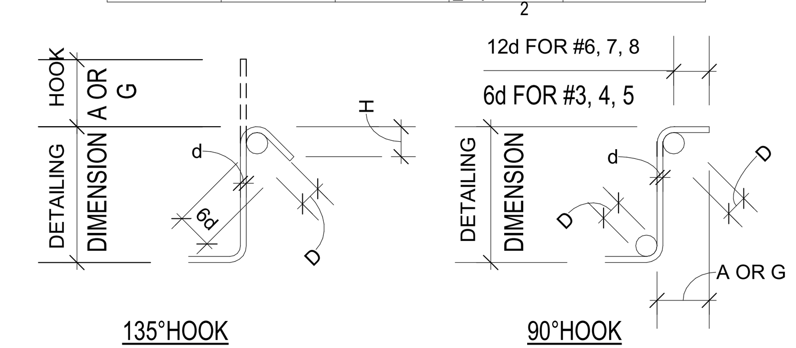


180°HOOK
90°HOOK

STANDARD HOOK DETAILS				
BAR SIZE	D	180° HOOKS		90° HOOKS
		A OR G	J	A OR G
#3	2 1/4"	5"	3"	6"
#4	3"	6"	4"	8"
#5	3 3/4"	7"	5"	10"
#6	4 1/2"	8"	6"	1'-0"
#7	5 1/4"	10"	7"	1'-2"
#8	6"	11"	8"	1'-4"
#9	9 1/2"	1'-3"	11 3/4"	1'-7"
#10	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
#11	12"	1'-7"	1'-2 3/4"	2'-0"
#14	18 1/4"	2'-3"	1'-9 3/4"	2'-7"
#18	24"	3'-0"	2'-4 1/2"	3'-5"

MAXIMUM BAR OFFSET





135°HOOK
90°HOOK

TYPICAL TIE OR STIRRUP HOOKS					SEISMIC TIE/STIRR	
BAR SIZE	D	135° HOOKS		90° HOOKS	135° HOOKS	
		A OR G	H	A OR G	A OR G	H
#3	1 1/2"	4"	2 1/2"	4"	4 1/4"	3"
#4	2"	4 1/2"	3"	4 1/2"	4 1/2"	3"
#5	2 1/2"	5 1/2"	3 3/4"	6"	5 1/2"	3 3/4"
#6	4 1/2"	8"	4 1/2"	1'-0"	8"	4 1/2"
#7	5 1/4"	9"	5 1/4"	1'-2"	9"	5 1/4"
#8	6"	10 1/2"	6"	1'-4"	10 1/2"	6"

4 REBAR BENDS

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City of Richmond

NO.	DATE	DESCRIPTION

PROJECT NO: B8425021.00
DESIGNED BY: NR
DRAWN BY: QL
CHECKED BY: NR DATE
DATE: 04-18-2019

SHEET TITLE

MISCELLANEOUS DETAILS

DRAWING

S3.1

SHEET 30 OF 30

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Appendix C

ALTERNATIVES ANALYSIS

Alternatives Analysis

Additional material provided in accordance with
Section 404(b)(1) for Individual Permit Applications

Via Verdi Slope Stabilization Project

City of Richmond, Contra Costa County, California

Corps File No. 2010-00171S

September 2018

Prepared by:
Johnson Marigot Consulting (JMC), LLC
and NCE

On behalf of:
Yader Bermudez, Engineering Director
City of Richmond
450 Civic Center Plaza, 2nd Floor
Richmond, California 94804

CONTENTS

LIST OF TABLES

LIST OF FIGURES (APPENDIX A)

LIST OF APPENDICIES

LIST OF ATTACHMENTS

Attachment A. Waters of the U.S. Delineation Report
Attachment B. Biological Assessment
Attachment C. Memo of NMFS correspondence
Attachment D. Geotechnical Evaluation Repair Alternatives
Attachment E. FEMA Approval for Emergency Work and Current Project Report
Attachment F. Cultural Resources Report

LIST OF ACRONYMS

AMSL	Above Mean Sea Level
C.F.R.	Code of Federal Regulations
CFS	Cubic Feet per Second
CNDDB	California Natural Diversity Database
Corps	U.S. Army Corps of Engineers
CRLF	California red-legged frog
CWA	Clean Water Act
CY	Cubic Yards
EPA	Environmental Protection Agency
Guidelines	Section 404(b)(1) Guidelines
LF	Linear Feet
MTC	Metropolitan Transportation Commission
NMFS	National Marine Fisheries Service
LEDPA	Least Environmentally Damaging Practicable Alternative
PG&E	Pacific Gas and Electric
RWQCB	Regional Water Quality Control Board
U.S.C.	United States Code

INTRODUCTION

The purpose of this document is to present an analysis that objectively evaluates off- and onsite alternatives to the Via Verdi Slope Stabilization Project providing the U.S. Army Corps of Engineers (Corps), and the San Francisco Regional Water Quality Control Board (RWQCB) with documentation to be used in evaluating the proposed project in compliance with Section 404(b)(1) of the Clean Water Act.

On February 20, 2017 the City of Richmond became aware of roadway distress within the Via Verdi roadway area just north of El Portal Drive (Figures 1 and 2). Via Verdi is a residential street just east of Interstate 80 (I-80) that serves as <u>the only access</u> to 85 single family homes and 100 apartment units in a residential area known as the Sobrante Glen neighborhood. Based on our site visit with the City on February 28th, 2017 it was determined that that over 200 feet of the Via Verdi road embankment had moved down towards San Pablo Creek as part of a larger landslide with settling of the roadway and buckling of concrete flatwork. The location of the project site showing the approximate extent of the landslide scarp is shown on **Plate 1, Site Plan**. Given the landslide movement affecting the Via Verdi roadway and utilities, an Emergency Access Road and temporary utilities were constructed through a vacant land parcel to maintain safe access for Sobrante Glen residents.

This event was proclaimed by the City as a local emergency with implications to street infrastructure and access to nearby communities through Via Verdi, local utilities (sanitary sewer, water supply, gas, electricity, and telecom), San Pablo Creek, the San Pablo Reservoir located upstream, and the nearby apartment structures. The City has secured FEMA funding administered by Cal OES for Presidential Major Disaster Declaration: FEMA-4308-DR-CA for winter storm events occurring in February/March 2017.

The Basic Project Purpose is to repair an existing linear transportation system (Via Verdi roadway); the Basic Project Purpose is not water dependent. The overall project purpose (40 C.F.R. §230.10(a) and 40 C.F.R. § 1508.9(b)) is to repair Via Verdi to provide safe vehicle access to the residential development and to prevent the further collapse of Via Verdi.

Since the portion of Via Verdi needing repair, and the proposed culvert is located directly on and over a portion of San Pablo Creek, the repair project "requires[s] access or proximity to or sitting within" the creek and, thus, in that sense is water dependent under the Guidelines (40 C.F.R. §230.10(a)(3)). Alternatives that reroute the road to upland areas also require stabilizing and/or re-grading the creek and its banks.

This Alternatives Analysis was prepared for the proposed Via Verdi Slope Stabilization Project. This report describes the regulatory background of the federal Clean Water Act (CWA) Section 404 (b) (1) analysis process, the purpose and need for the project, the proposed project and alternatives, and provides analyses of the potential environmental impacts, costs, and the practicability of each alternative. The report ends with a conclusion and a list of references.

The objectives of this alternatives analysis report include the following:

- Define the purpose and need for the project, including a summary of the current potential risks and impacts to both public safety and the environment should the project not be constructed in a timely way.
- Describe the background of the project site and the complexities of land use, infrastructure, and environmental resources in the immediate vicinity, and the physical challenges and constraints associated with the project site and urban context
- Describe stabilization alternatives that were considered for the project
- Provide an analysis of each alternative considering Corps evaluation criteria for practicability and potential environmental impact
- Provide the rationale for the selection of the preferred alternative

SECTION 1. REGULATORY FRAMEWORK OF SECTION 404(B)(1) ANALYSIS

1.1 DOCUMENT PURPOSE

This document is provided in supplement to an application to the Corps for an Individual Permit to discharge dredged and/or fill materials into waters of the U.S. under authority of the Corps pursuant to Section 404 of the Clean Water Act (CWA) (33 United States Code (U.S.C.) §1344), its implementing regulations (33 U.S.C. §1311, et seq.; 33 Code of Federal Regulations (C.F.R.), Parts 320-330; 40 C.F.R., Part 230), and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403). The application has been provided on behalf of the City of Richmond.

1.2 PURPOSE OF THE ALTERNATIVES ANALYSIS

The purpose of this document is to present an analysis that objectively evaluates several alternatives, including the proposed project, and to provide the Corps and RWQCB with documentation to be used in the evaluation of the proposed project permit application in compliance with the Section 404(b)(1) Guidelines (40 C.F.R. § 230.12).

1.3 ALTERNATIVE ANALYSIS REQUIREMENTS

The CWA, Section 404(b)(1) guidelines (Guidelines) were published by the Environmental Protection Agency (EPA) in the C.F.R. on December 24, 1980. These guidelines provide substantive criteria that the Corps uses to determine whether a proposed project meets requirements to be permitted pursuant to the CWA, (i.e., whether the Corps can issue a permit for discharge of dredged or fill material into a jurisdictional water of the U.S.).

The Guidelines state that:

> *…no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences (40 Code of Federal Regulations [40 CFR 230.10(a)].*

The Guidelines further state:

> *Where the activity associated with a discharge which is proposed for a special aquatic site (e.g., wetlands) does not require access or proximity to or siting within the special aquatic site in question to fulfill its basic purpose (i.e., is not "water dependent"), practicable alternatives that do not involve special aquatic sites are presumed to be available, unless clearly demonstrated otherwise. In addition, where a discharge is*

proposed for a special aquatic site, all practicable alternatives to the proposed discharge, which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise [40 C.F.R. 230.10(a)(3)].

Thus, the first test of qualification is relative to the Basic Project Purpose and determines whether the proposed project *has to occur* within a regulated water. Projects proposed for qualification pursuant to the CWA that are determined to be "water dependent" are not presumed to have alternatives that "do not involve a discharge", and the analysis is therefore focused on alternative methods which may minimize the volume or quality of the discharge. The effort is intended to reduce the adverse impact to the environment, but it is presumed that the project is limited to in-water siting in order to meet the Basic Project Purpose. Projects that are determined to be "not water dependent" are presumed to have alternatives with reduced (or no) aquatic impacts, and applicants are required to present evidence to support the conclusion that the proposed project is the *Least Environmentally Damaging Practicable Alternative* (LEDPA). The burden of proving that the proposed project represents the LEDPA falls upon the applicant, but must be analyzed by the Corps pursuant to the guidelines. Further the Corps can *only* approve the LEDPA, and the LEDPA must be found to be *not contrary to the public interest* pursuant to National Environmental Policy Act review.

The Guidelines further clarify that:

An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of Overall Project Purpose [40 C.F.R. 230.10(a)(2)].

To comply with the Guidelines, a project applicant must identify alternatives to the proposed project, and then evaluate whether those alternatives are practicable *and* whether they would have a reduced impact on the aquatic ecosystem. An applicant must also evaluate whether those alternatives have other significant adverse environmental impacts. The evaluation of LEDPA is therefore not one, but a series of tests specifically because the evaluation of *Least Environmentally Damaging* primarily includes environmental effects related to wetlands and waters, but may also include other environmental considerations such as effects to endangered species or cultural resources. Further, the tests of *Practicable* include availability, capability, cost, technology, and logistics *in light of* the Overall Project Purpose. In other words, in order for an alternative to be determined to be the LEDPA, the alternative must be the Least Environmentally

Damaging of the alternatives that *also meets* the Overall Project Purpose *and* is Practicable as outlined in Table 1 below.

<table>
<tr><th colspan="8">Table 1. Levels of Analysis for the LEDPA Determination</th></tr>
<tr><td colspan="8">The Overall Project Purpose is to repair Via Verdi to provide safe vehicle access to the residential development and to prevent the further collapse of Via Verdi.</td></tr>
<tr><td rowspan="2">LEDPA Components</td><td colspan="7"><u>Least Environmentally Damaging</u> <u>Practicable</u> <u>Alternative</u></td></tr>
<tr><td colspan="3">Least Environmentally Damaging</td><td colspan="4">Practicable</td></tr>
<tr><td rowspan="2">Filters / Tests</td><td>Impact to Jurisdictional Waters</td><td colspan="2">Other Environmental Impacts</td><td>Available</td><td colspan="3">Capable</td></tr>
<tr><td>Waters / Wetlands</td><td>Federally Listed Species</td><td>Other</td><td>Sale / Timing</td><td>Costs</td><td>Logistics</td><td>Technology</td></tr>
</table>

Least Environmentally Damaging. Where a discharge is proposed in wetlands, practicable alternatives that do not involve discharge into wetlands are presumed to have less adverse impact on the aquatic ecosystem, unless the analysis clearly demonstrates otherwise (40 C.F.R. 230(a)(10)(3)). A practicable alternative that would have less adverse impact on the aquatic ecosystem, however, is not the least environmentally damaging alternative if it would have *other significant adverse environmental consequences* (40 C.F.R. 230.10(a)). As such, it is not appropriate to identify an alternative as the least environmentally damaging if it would avoid minor impacts to the aquatic environment at the cost of significant impacts to other natural environmental resources or values. Analysis of additional environmental factors typically includes effects to sensitive (state or federally listed) species, cultural resources, or other factors such as compatibility of the proposed project within a larger setting (land use conflicts).

Practicability. As an initial requirement, the definition of practicability specifies that an alternative must be available to the applicant. Availability may include considerations such as whether a site is reasonably obtainable from the owner, whether an alternative site is "available" to the type of project being proposed (i.e., whether the site is compatible with the proposed project and is consistent with applicable laws and regulations, and whether it is permittable within reasonable time constraints). For example, rural land may be immediately available to meet agricultural purposes, but may be expected to become available to residential development purposes at some point during the future. Equally important, an alternative may be determined to be impracticable due to capability of the applicant to achieve the Overall Project Purpose. Capability is directly tied to costs, logistics, and existing technology. If an alternative is unreasonably expensive to the applicant, it is not practicable because the applicant cannot reasonably be expected to be capable of meeting the Overall Project Purpose (45 C.F.R. 85,343 [1980]), this renders a project infeasible. Logistics may also affect the capability of the applicant to develop an alternative, including requirements such as safety, the availability of suitable transportation access, proximity to existing utility and services, physical site attributes such as geology and topography, the availability of adequate space for project components, and whether the site configuration would support the proposed project. Where safety, access, or site space or configuration is inadequate, for instance, the alternative is considered logistically impracticable. With respect to technology, there must be existing technology, which has been demonstrated to perform its specified functions successfully at the same scale and under similar circumstances. Alternatives that do not meet the Overall Project Purpose are not considered to be practicable.

SECTION 2. METHODS

2.1 ALTERNATIVES

2.1.1 SELECTION CRITERIA

In effort to identify the LEDPA, eight (8) alternatives for slope stabilization repairs were analyzed for providing safe vehicular and pedestrian access to the Sobrante Glen Neighborhood, protecting San Pablo Creek habitat, safe conveyance of stormwater from watershed areas in San Pablo Creek as well as releases from the upstream San Pablo reservoir, and restoring permanent utilities. The most important factors that were considered in formulating the alternatives to be analyzed were:

- The physical constraints of the site, such as steep slopes, slope stability, high groundwater levels, seasonally high flows in San Pablo Creek, and seismicity;
- The locations of sensitive flora and fauna and their habitats, including San Pablo Creek and its riparian corridor;
- The built environment, including the Sobrante Glen Neighborhood, the Cemetery Trust Property, the locations of essential utilities, and vital vehicular and pedestrian access provided by Via Verdi as the only ingress/egress for the Sobrante Glen Neighborhood;
- The availability of public and privately owned land; and
- Overall project costs.

Various versions of the alternatives considered for this project are described in detail and analyzed in terms of achieving the overall project purpose, time to complete, constructability, practicability, advantages/disadvantages, environmental impacts, and cost are summarized below. Due to the fact that Via Verdi is the only access point for the existing neighborhood as shown on **Plate 1**, and the additional fact that the project seeks to repair an existing linear roadway, all analyzed alternatives are limited to those that could provide the same function and are therefore limited primarily to "on-site" alternatives (i.e. those with similar alignment to the existing roadway). An "off-site" alternative including 3 options for providing new access is also included (Alternative 2). The alternatives that were considered are shown at a conceptual level in Plates 2 through 8 and included the following:

- Alternative 1 – Toe Buttress With Culvert (Proposed)
- Alternative 2 – Abandon Via Verdi and Construct New Access Road (3 options for new access: via Fariss Lane, Foster Lane, or Garden Road)

- Alternative 3 – Retaining Wall
- Alternative 4 & 5 – Excavate Slide Mass and Reconstruct Slope (with or without geogrid reinforcement)
- Alternative 6 – Concrete Bridge
- Alternative 7 – Realign Via Verdi
- Alternative 8 – Drainage Gallery

2.1.2 Evaluation Criteria

Once selected, alternative slope stabilization repairs were evaluated to determine the LEDPA location among the repairs. Each alternative was evaluated based on the following criteria:

Least Environmentally Damaging

1) What is the expected quantitative impact (acres) of the project on jurisdictional (regulated) waters of the U.S.?

As the applicant does not have the ability to physically investigate properties that are not within contractual control (or ownership), the analysis is limited to use of publicly available aerial photography only for the offsite alternative. The limitations of aerial photography are clear; without the ability to sample sites in accordance with the 1987 Corps of Engineers wetland delineation manual, the mapping is limited to only visible signatures on the aerial photographs. These may include such features as readily identifiable flowing features (bed and bank), or vegetation associations, or shifts in vegetation color or hue. Field investigators, prior to going into the field to confirm findings, routinely utilize this methodology. Use of aerial photography alone should be considered a good approximation of field conditions, but should not be confused with a verification of field conditions by the Corps (i.e., interpretation of aerial photography is not the same as a Jurisdictional Determination) or other trained biologist. Mapping of waters and wetlands based on interpretation of aerial photography only should be viewed as a map of "*possible* waters of the U.S".

The applicant has provided a delineation of jurisdictional waters of the U.S., in accordance with the 1987 Corps of Engineers wetland delineation manual for use in analyses of all on-site alternatives (Attachment A). Analyses of effects to jurisdictional waters was based on this mapping effort.

2) What is the potential impact of the project on federally listed species?

In May, 2018, NCE completed a Biological Assessment for the Via Verdi Slope Stabilization Project to determine the extent to which the project may affect any federally threatened or endangered species and/or designated critical habitat. California red-legged frog (CRLF) and the Alameda whipsnake (AWS) may occur incidentally on this site. The nearest critical habitat for the CRLF is approximately 2.25 miles east of the project area and the nearest recorded observations of CRLF are about three miles east of the project area. The Biological Assessment concludes that the Proposed Project may adversely affect either species (Attachment B).

On May 9, 2011, NCE contacted National Marine Fisheries Service (NMFS) to discuss the presence of Central California Coast Steelhead within San Pablo Creek. Mr. Gary Stern of NMFS said that there is no presence of steelhead in San Pablo Creek due to the obstructions within the creek (Attachment C). Additionally, given its location in the lower watershed, and the relatively high flows that can occur (circa 990 cfs in a flow event with a two year return interval), spawning gravels for anadromous fish are unlikely to be present for any amount of time. For the same reason, breeding habitat for CRLF breeding habitat does not occur within this reach.

Analysis of each alternative was therefore conducted to quantify potential effects to CRLF (non-breeding habitat), and AWS.

3) Are there any other known or likely environmental constraints?

These constraints are limited only to commonly known instances of environmental concerns. Concerns may include: commonly known bird nesting areas or rookeries, potential presence of cultural resources, or impacts on riparian or areas of trees visible on aerial photography. Analysis is limited to use of common maps only (e.g., Google Earth and 7.5-minute quads).

Practicable

Practicability is defined as:

“[I]t is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant which could reasonably be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity may be considered" (40 C.F.R. §230.10(a)(2).).

To address practicability of the described alternatives, project cost, technical and logistical factors need to be considered. The **Table 2** matrix below summarizes the factors and determines the practicability of the alternative. The following tests are designed to represent components of practicability.

4) Is the site available for purchase or long-term lease?

Alternatives 2 (Abandon Via Verdi and Construct New Access Road) and 7 (Realign Via Verdi) require land acquisition with Alterative 2 requiring acquisition of five to six private properties with demolition of two to six homes, while Alternative 7 requires acquisition of land from the Cemetery Trust Property. These alternatives are shown on **Plates 3 and 7**, respectively. These alternatives were selected based on adjacent parcels that could provide potential areas for rerouting Via Verdi or the abandonment of Via Verdi for a new access road and therefore potentially meet the Overall Project Purpose. The remaining alternatives do not require land acquisition but in some cases require improvements/restoration within private land parcels.

5) Could the site be developed within a reasonable timeframe?

Time is an essential element of the logistics in light of overall project purposes for this project. Delays to the project could result in further movement of the landslide with additional serious consequences including:

a) Flooding of the local community from creek waters;
b) Additional flooding should the upstream San Pablo Reservoir need to concurrently release waters;
c) Impacts and delays to Via Verdi, El Portal Drive, and nearby I-80 on/off ramps should more extensive flooding occur;
d) Potential damage to relocated utilities should additional landslide movement translate behind the current active landslide and affect power lines, rupture sewer lines, or rupture gas lines;
e) Release of substantial sediment into San Pablo Creek and San Pablo Bay (San Pablo Bay is designated Critical Habitat for Central California Coast steelhead (*Oncorhynchus mykiss*), a species that is federally listed as Threatened);

f) Stranded residents unable to access their homes and significant services disruptions to the local community.

g) Damage to valuable creek riparian system, threatened species, and habitat;

h) Threatened emergency access.

All of these risks are first and foremost, an endangerment to public safety, health, and the environment, but would also result in substantial costs to the City and local community.

6) Is the property available and developable at a reasonable cost to the project proponent?

Table 3 below provides preliminary planning level costs associated with each of the alternatives and associated preliminary factor of safety for the slide plane. The major costs include construction, land acquisition and legal costs, and design, permitting, regulatory compliance, and administrative costs.

7) Is it logistically possible (or practical) to construct the proposed project alternatives?

The primary test of logistics in this case is related to whether a proposed solution to stabilization of the existing slope would be expected prevent further collapse. Collapse of the slope could result in unsafe conditions, including potential complete blockage of San Pablo Creek, damage to the existing (previous project) downstream culvert, and localized flooding. The stability of the soil mass within the landslide area for the various alternatives is measured (calculated) as the factor of safety. The factor of safety is defined as the available shear strength (capacity or resistance of soil materials) divided by the shear stress (demand) along the defined slip surface. A value of factor of safety greater than 1.0 indicates that capacity exceeds demand and therefore the slope will be stable with respect to sliding along the assumed particular slip surface analyzed. The analysis was completed using the computer program SLOPE/W based on limit equilibrium methods. The intent of the analysis was to check the effectiveness of the alternatives with respect to increasing the factor of safety. Generally, an acceptable long-term factor of safety for the purposes of this analysis was 1.5.

8) Does the proposed alternative meet the Overall Project Purpose?

In many cases, alternative projects may be found to have reduced environmental impacts, and have the capacity to be constructed, but do not meet the purpose of the project. In order to meet the requirement of Practicability (and to be considered the LEDPA) the alternative must meet the Overall Project Purpose.

SECTION 3. PROJECT PURPOSE

3.1 Basic Project Purpose

The Basic Project Purpose (40 C.F.R. Sec. 230.10(a)(3)) is to repair an existing linear transportation system; Via Verdi. The proposed project is not water dependent.

3.2 Overall Project Purpose

The Overall Project Purpose (40 C.F.R. §230.10(a) and 40 C.F.R. § 1508.9(b)) is to repair Via Verdi to provide safe vehicle access to the residential development and to prevent the further collapse of Via Verdi.

Since the portion of Via Verdi needing repair, and the proposed culvert is located directly on and over a portion of San Pablo Creek, the repair project "requires[s] access or proximity to or sitting within" the creek and, thus, in that sense is water dependent under the Guidelines (40 C.F.R. §230.10(a)(3). We have interpreted this as "site-dependent", but not water dependent.

3.3 Overall Project Purpose Rationale

The following summarizes the rationale in support of the key components included in the Overall Project Purpose.

Alternatives that bridge the creek or reroute the road to upland areas also require stabilizing or re-grading the creek and its banks. An essential element of the project purpose is to stabilize the site in the near future. Delay of the construction would entail large risks to the community, environment, and public safety regarding the compromised nature of the creek bank and Via Verdi.

The purpose and need of the Via Verdi Slope Stabilization Project, is to:

- To provide safe conveyance of San Pablo Creek in a highly urbanized setting and maintain infrastructure needs and services to the local community
- Address the public safety issue and provide service to the community by maintaining safe access and egress to the existing residential neighborhood
- Stabilize the failing creek bank to prevent further landslide and potential for complete blockage and fill of San Pablo Creek in the event of bank collapse
- Reconstruct Via Verdi, the only access road in to the Sobrante Glen neighborhood
- Reconstruct affected utilities with the collapse area including sewer, gas, electrical, telecom, and drinking water supply to provide safe and reliable service

- Protect the riparian environment and creek corridor habitat from significant sediment releases and potential utility spills with respect to potential collapse of the creek bank and Via Verdi.
- Maintain current creek flows and capacities, water quality, and habitat functions

SECTION 4. EXISTING CONDITIONS

4.1 PROJECT LOCATION

The project area is located in Contra Costa County, California and includes the City of Richmond (City) rights-of-way and portions of adjacent private parcels (Figures 1 and 2). The project overlaps or is located adjacent to portions of the following APNs: : (414-340-002-8, 414-340-001-8, 420-021-039-3, 420-021-040-1, and 420-021-041-9). The project also includes San Pablo Creek and occupies portions of the *Richmond, California* 7.5 minute USGS quadrangle. The project area covers approximately 4.80 acres, which includes the reconstruction of Via Verdi, the revegetation of the soil stockpile area, the demolition of the emergency access road and revegetation north of Via Verdi, and the construction of the culvert and placement of the engineered fill. The approximate area of focus, where the proposed project includes work within San Pablo Creek, is approximately 350 feet long, 10 feet wide based on ordinary high water mark (OHWM), and will have a fill height of approximately 22 feet where the culvert and engineered fill will be constructed (Figures 3, 4 and 5). The project area along the creek ranges between 9% and 30% slopes.

According to the Contra Costa County Land Use Map, the Via Verdi Slope Stabilization Project area includes both commercial and open space land use designations (CCC 2008). The commercial designation is a broad category and includes smaller scale neighborhoods, community and thoroughfare commercial districts including retail and personal service facilities. Most of the area surrounding the project is included in this designation. The open space land use designation includes publicly owned spaces such as wetlands, tidelands, and other area of significant ecological resources, or geologic hazards. The San Pablo Creek Riparian corridor is included in this land use designation.

Depending on the alternative, the project area includes the City of Richmond (City) right-of-way and portions of adjacent private parcels along San Pablo Creek in the vicinity of El Portal Drive and Via Verdi as shown on the Site Plan, **Plate 1** and subsequent alternative concept drawings, **Plates 2 through 8**.

The subject landslide defines much of the project area and consists of the location with the landslide scarp shown as a dashed line affecting approximately 250 feet of the Via Verdi roadway, as shown on **Plate 1**. It is important to note that this landslide is just upstream from the previous Via Verdi Culvert Replacement Project (culvert replacement project) that was permitted through the USACE as an Individual Permit (Permit No. 2010-00171S). Via Verdi serves as a collector street and is the only point of access for an entire community of 85 single family homes and several apartment buildings (known as the Sobrante Glen) and access for the Creek View Condominiums. Other key site features shown on **Plate 1** include the Emergency Access Road for Via Verdi through the adjacent Cemetery Trust Property, local streets and roads, proximity to Interstate 80 (I-80) existing utilities, the Rolling Hills Cemetery, and private property parcels.

4.2 PROJECT HISTORY

In April of 2010, the City responded to an emergency "sinkhole" that collapsed unexpectedly at Via Verdi near El Portal Drive. Subsequently, the street known as Via Verdi was closed due to the collapse of a portion of Via Verdi into the "sinkhole". This is the only street access for a community of single family homes and several apartment buildings (known as the Sobrante Glen) and serves as a point of access for an apartment complex located at Via Verdi and El Portal Drive. The collapsed area was approximately 130 feet long, 30 to 50 feet in width, and 30 feet in depth. It became evident that the collapse occurred within a portion of a culvert for San Pablo Creek with the upstream headwall adjacent to the collapsed portion of culvert still in place.

Based on as-built plans of the culvert constructed in 1978, the culvert was constructed of large oval shape corrugated metal pipe, approximately 22 feet 6 inches in width and 19 feet 8 inches in height. The grading plans for the adjacent subdivision also included placement of a large engineered fill terrace adjacent to El Portal Drive, with approximately 2:1 (H:V) slopes as high as 30 feet. This fill terrace is undeveloped grassland on the property of the Rolling Hills Memorial Park Cemetery (Cemetery Trust Property). In addition, buttress fill details were called for to address shallow slide debris in an area northwest of the collapse area further uphill along Via Verdi.

Starting at the upstream end, the original culvert alignment ran in a southwesterly direction adjacent to the Creek View Condominiums, underneath Via Verdi, under the southeastern corner of the engineered fill terrace, and then turns south (perpendicular to El Portal Drive) under El Portal Drive to the downstream end wall at the southern edge of El Portal Drive. The bottom of the culvert is approximately 30 to 36 feet below El Portal Drive and Via Verdi respectively, and as much as 56 feet below the engineered fill terrace.

4.3 2012 VIA VERDI REPAIR PROJECT

Various versions of alternatives were considered for the 2012 project. These alternatives were described in detail and analyzed in the Via Verdi Repair Project, San Pablo Creek Culvert Replacement, CWA Section 404 (b) (1) Alternatives Analysis prepared by NCE for the City of Richmond on December 9, 2011. The alternatives were analyzed in terms of achieving the overall project purpose, time to complete, constructability, costs, advantages/disadvantages, environmental impacts, and practicability.

The 2012 preferred project, Culvert Reconstruction and Replacement with Limited Daylighting of San Pablo Creek, was determined to be the Least Environmentally Damaging Practicable Alternative and was implemented. The City replaced a portion of the collapsed culvert and replaced the remaining original portion of the culvert by designing and constructing a new reinforced concrete box culvert as shown on **Plate 1**. The repair included a reinforced concrete headwall at the upstream end of the new culvert and the endwall at the downstream end of the new culvert. In addition to the reconstruction of the culvert, the project included:

- Design related to utilities (temporary bypasses for sanitary sewer and water service, utility reconstruction)
- Restoration of creek areas adjacent to the headwall and endwall
- Re-vegetation of areas disturbed by construction
- Pavement rehabilitation and road reconstruction for Via Verdi and El Portal Drive
- Daylighting creek to extent feasible, approximately 30 linear feet
- Utility reconstruction in Via Verdi
- Demolition of the temporary bypass road and restoration of the adjacent impacted Cemetery Trust Property to its general former condition

Underground utilities that failed during the collapse of 2010, including water supply and sanitary sewer, were reconstructed in the approximate original alignment in Via Verdi. Impacts to natural resources on the site including the riparian area, flora and fauna within the riparian woodland, and the water quality of San Pablo Creek, were avoided and minimized by implementing mitigation measures. These measures included the design of the replacement culvert to safely convey the design storm and provide fish passage for 90% of the year, as well as the avoidance of impacts to special status species beyond the previous footprint of the original culvert. The previous project daylighted an additional approximately 30 linear feet of riparian area, which was replanted with native willow tree and shrub species.

4.4 SURFACE CONDITIONS

The site is located within an urban area (adjacent to I-80) at lower reaches of the Richmond Hills that transition down into the more heavily urbanized Richmond flatlands bordering San Pablo Bay. The area is primarily comprised of a mixture of residential and commercial properties, along with undeveloped watershed areas generally associated with San Pablo Creek and its tributary drainages. Moderately steep grass covered hillsides to the north of the site slope down to the south into the creek drainage, where creek banks are heavily vegetated with groundcovers, shrubs, and large trees.

Much of the project area surface is defined by the relatively flat Via Verdi roadway fill embankment that was constructed as part of the Sobrante Glen Neighborhood and within Via Verdi roadway grades of Elev. 100 to Elev. 105 feet, Datum: NAVD 83. The Via Verdi roadway is located between the Cemetery Trust Property and San Pablo Creek. The roadway is approximately 33 to 40 feet above San Pablo Creek (Elev. 65 to Elev. 67) with creek bank slopes of approximately 2:1 (H:V). Slopes continue above Via Verdi up through the Cemetery Trust Property to the Rolling Hills Cemetery about 100 feet above the roadway (~Elev. 200 feet). The culvert that was part of the previous culvert replacement project with the USACE is located at the western edge of this project with the culvert continuing underneath the southeast corner of the Cemetery Trust Property fill terrace (an undeveloped grass covered parcel of land) and then underneath El Portal Drive with the culvert endwall located at the southern edge of El Portal Drive.

The landslide is within the Via Verdi roadway fill embankment with the top of the head scarp north or above Via Verdi extending in an arcuate shape from down through Via Verdi and into the creek bank. The landslide currently affects approximately 250 feet of the Via


Surface Conditions at Landslide Late February/Early March

Verdi roadway with the extent of the scarp approximately shown on the **Plate 1, Site Plan.** In late February the landslide was observable as undulations/settlement with some cracking in the asphalt pavement and concrete sidewalk as shown in the photos above with a vertical offset at the developing scarp. In addition, there was damage to utilities including water, stormwater, and sewer requiring temporary repairs. By late March the landslide scarp had become more pronounced and the pavement had settled up to several feet with the pavement requiring frequent patching by the City to maintain the roadway driving surface, as shown in the photo above.

The site currently is bypassed by an emergency access road as shown in the photo to the left serving as the only point of access for the Sobrante Glen Neighborhood. Utilities are temporarily rerouted in the shoulder areas. The previous Via Verdi roadway has been closed to traffic due to ongoing landslide movement and utilities have been abandoned. The landslide scarp has now been mostly obscured by earthwork and grading to construct the emergency access road and appropriate erosional control measures but is still evident within Via Verdi with several feet of settlement.

Surface Conditions at Landslide Late March

4.5 Geologic Setting

The site is located in the eastern portion of the San Francisco Bay Area, which lies within the Coast Ranges geomorphic province. The San Francisco Bay is generally a northwest trending wide depression that is bounded by similarly trending ridges that comprise the Berkeley Hills to the east and the San Francisco and Marin Peninsulas to the west. This bay trough and ridge structure was formed as a result of a combination of faulting and warping related to the San Andreas Fault system whereby the bay is underlain by a down-dropped or tilted block (California Division of Mines and Geology [CDMG], 1969). The oldest and most widespread rocks in the San Francisco Bay Area are comprised of the Jurassic-Cretaceous age Franciscan Formation. The Franciscan Formation can be fault contacted with other Mesozoic sedimentary rocks and is then in turn overlain by Tertiary and Quaternary age sedimentary and volcanic rock units. Within the San Francisco region many of the valleys have been in-filled with quaternary age sediments (i.e. alluvium and bay deposits) and include marine and non-marine clays, silts, sands, and gravels.

Studies by the U.S. Geological Survey (USGS) show that the creek at the lower reaches of the Richmond Hills is underlain by deposits of alluvium associated with San Pablo Creek. A review was also completed of the grading plans provided by the City for the original culvert project and the Sobrante Glen Subdivision by KCA Engineers, Inc. titled *Grading Plan Subdivision 4593 "Sobrante Glen"* originally dated December 6, 1977 and later modified with *"As built"* dated February 26, 1983 (KCA 1977/1983). The geotechnical investigation that was completed as part of the Sobrante Glen Subdivision improvements by Harding Lawson Associates (HLA) was also reviewed and is titled *Geotechnical Investigation, Sobrante Glen Subdivision, Richmond, California,* dated October 11, 1977 (HLA 1977). Based on these documents, historical site grading with fill thicknesses just over 30 feet were planned for construction of the original Via Verdi road and fill buttress to stabilize a previously mapped shallow to intermediate landslide identified by both CDMG 1973 maps and the HLA 1997 geotechnical report. Within the fill buttress, plans called for keying into firm soil and/or rock below the slide debris and installation of subdrains. Areas further upslope beyond the limits of historical site grading may still be underlain by shallow slide debris associated with mapped shallow and shallow/intermediate landslides. The underlying rock is of the Orinda Formation (Miocene Age), consisting of poorly consolidated sedimentary rock, including conglomerate, sandstone, siltstone, and claystone (USGS, 1994 and USGS, 1980).

4.6 SEISMICITY AND FAULTING

The site is within a seismically active region, and historically numerous moderate to strong earthquakes related to the San Andreas system of faults have occurred in this region. Active faults are considered to be those that have moved during the past 11,000 years, and generally only active faults are considered in evaluating seismic risk for building construction. The nearest active fault is the Hayward fault, approximately 3,000 feet to the southwest of the site (CDMG, Earthquake Fault Zones, 1994). Other major faults which could cause significant shaking at the project site are the, Concord, Calaveras, San Andreas, Greenville, West Napa, San Gregorio, and Rodgers Creek faults.

4.7 Subsurface and Landslide Conditions

In general, the landslide area is underlain by fill placed by grading for Sobrante Glen Subdivision including the construction of the Via Verdi roadway. Based on exploratory borings completed as part of the preliminary geotechnical investigation by Hultgren-Tillis Engineers, the thickness of the fill locally varies from 31 feet to 35 feet along the Via Verdi roadway and shoulder and decreases in thickness toward the Cemetery Trust Property. The fill generally consists of fine-grained material which is predominately lean clay and fat clay. The clayey fill contained varying amounts of course grained material including sand and gravel. The consistency of the fill varied from medium stiff to hard. The moisture content of the fill varied from moist to wet. During exploratory work, several of the borings encountered underneath the fill a stiff to very stiff fat clay top soil layer underlain by an elastic silt as well as older landslide debris. As identified and previously mentioned, the grading plans for Via Verdi and El Sobrante (KCA 1977/1983) and the geotechnical investigation report (HLA 1977) both indicated that there was older slide debris at the site, which was observed in one of the exploratory borings north of the mapped head scarp.

Orinda Formation material was encountered below the fill and below the silt and/or older landslide debris. The Orinda Formation consists of interbedded claystone, siltstone and sandstone at the boring locations. The rock is intensely fractured to crushed with low hardness. The rock is generally friable with some of the upper portion being plastic. The rock is moderately to deeply weathered.

In addition to exploratory borings, inclinometers were installed within the slide mass to approximate the depth of the landslide movement or landslide plane. The depth of the landslide movement ranges from approximately 38 to 53 feet below existing grade, with movement direction towards San Pablo Creek. The deepest part of the landslide plane is, on a relative basis, below the bottom of the creek, which is shown in the idealized subsurface cross-section on **Plate 1, Site Plan.** Prior to inclinometers shearing off from landslide movements during the spring of 2017, movements were on the order of ¼ to ½-inch per day. Although the landslide movements have slowed over the summer months and during dryer weather, the landslide continues to show movement.

4.8 Groundwater Conditions

To estimate groundwater conditions, nested piezometers were installed in the spring of 2017 at two locations within the landslide and one location up slope of the landslide. Groundwater levels during the spring months up slope of the landslide were within a few feet of the ground surface, which was consistent with observed ponding of water at the surface. The groundwater within the slide mass was between Elevation 71 feet and 89 feet (NAVD 88) or about 17.5 feet to 31.5 feet below existing grade. Fluctuations in the groundwater level may occur due to variations in rainfall, subsurface soil layer characteristics, temperature and other factors not evident at the time the measurements were made.

4.9 CLIMATE

The climate in Contra Costa County (CCC) varies depending on the location and topography. Western CCC experiences cool summers and mild winters due to its proximity to San Francisco and San Pablo Bays. Elevation and proximity to the sea have a direct effect on the average annual precipitation across the County. The City of Richmond, in western CCC, receives an average of 22.28 inches of precipitation annually. Most precipitation falls in the form of rain across the County (NRCS 1977).

4.10 AQUATIC RESOURCES

Jurisdictional waters are defined by the laws that protect them, including the federal CWA and the California Fish and Game Code, Sections 1601 through 1603 (Section 1600). The CWA regulates waters of the United States (WOUS), which typically includes rivers, creeks, and drainages that have a defined bed and bank and which, at the very least, carry ephemeral flows. WOUS may also include lakes, ponds, reservoirs, and wetlands, if these waters have a significant nexus with a Traditional Navigable Water. The WOUS located on the site are: San Pablo Creek and an ephemeral drainage which is culverted under Via Verdi. The ephemeral drainage culvert is located north of San Pablo Creek. The culvert outfall discharges onto San Pablo Creek's right bank approximately 27 feet above San Pablo Creek.

A total of 0.125 acres of WOUS were identified on the site during the wetland delineation conducted in 2018 (see wetland delineation map, included as Figure 5).

The San Pablo Creek watershed has all of the challenges typically associated with urban watersheds. These include culverts and other structures that may block or impede fish passage, including the culvert downstream extending under Via Verdi and El Portal Drive (previous culvert replacement project with a fish baffle for low flows) and a very long culvert under Interstate 80 just downstream of the project site. Other factors include:

- a prevalence of nonnative vegetation in the riparian areas;

- urban stormwater runoff conveying excessive amounts of sediment and toxicants to the creek;
- litter, concrete, and other debris in the creek channel;
- exotic animals (i.e., cats and dogs) preying on native wildlife;
- the San Pablo Reservoir located upstream of the project site.

Even in its present condition, San Pablo Creek does provide important functions and values, including habitats for fish and wildlife. These watershed functions can be protected, and in some cases, enhanced. However, it will always be a highly urbanized watershed with limited potential for anadromous fish and other sensitive species that rely on clean water and intact native habitats.

The project site is located on the main stem of San Pablo Creek and is downstream of the San Pablo dam. The 1973 USACE report "Wildcat-San Pablo Creeks, Contra Costa County, California, Feasibility Report for Water Resources Development" identifies peak flows at 23rd Street on San Pablo Creek. This location is approximately 1.5 mile downstream of the Via Verdi culvert structure. This report provides estimates of peak flows of 990 cubic feet per second (cfs), 2,100 cfs, 2,670 cfs, 4,000 cfs, and 5,100 cfs for the 2-year, 10-year, 20-year, 50-year and 100-year, respectively (USACE, 1973).

The results of this report show that the reach of San Pablo Creek on the project site provides potential migration habitat for any anadromous fish that may be present, but not spawning habitat. Given that the peak flows of a 2-year event are 990 cfs at the downstream gauge location, the flows in the reach at the site would frequently be sufficient to scour out any spawning gravels that may accumulate.

The capacity of the project site to provide migration habitat for anadromous fish is limited by the presence of the I-80 stream crossing, the San Pablo dam, and limited water quality. The I-80 stream crossing is approximately 300 to 400 feet in length and is located approximately 2,000 feet downstream of the site. The San Pablo dam is located approximately 3.5 miles upstream on the main stem of San Pablo Creek.

4.11 HABITATS

Three distinct habitat types were identified on the project site. These are ruderal/developed, riparian woodland, and annual grassland (Sawyer and Keeler-Wolf, 1995). Additional details on the flora and fauna of the site and vicinity are found in the report "Via Verdi Slope Stabilization Project, Biological Assessment" (NCE, May 2018).

Ruderal and developed areas are characterized by pavement or heavily compacted soil. Annual grassland areas are vegetated with mostly non-native species including; wild oat (*Avena fatua*), Canada thistle (*Cirsium arvense*), California poppy (*Eschscholzia californica*), black mustard (*Brassica nigra*), English plantain (*Plantago lanceolata*), vetch (*Vicia* sp.), blessed milkthistle (*Silybum marianum*), field sowthistle (*Sonchus arvensis*), and lupine (*Lupinus* sp.). Riparian woodland species included maple, willow (*Salix* sp.), California buckeye (*Aesculus californica*), and poison oak (*Toxicodendrom diversilobum*).

The habitats within and surrounding the project site support a varied assemblage of wildlife, which may move up and down the riparian corridor along San Pablo Creek from time to time. Overhanging riparian vegetation protects pools up to 3 feet deep upstream from the project site. Stream conditions downstream include well developed riparian cover and a shallow, gravely stream bed. These areas may provide dispersal habitat for California red-legged frog (*Rana draytonii*), a federally threatened species and California Species of Special Concern. No special status species were identified on site during field visits con ducted by NCE during May, August, and September 2011 or on April, 20, 2018.

The riparian and upland vegetation in the vicinity provides foraging habitat and cover for several common mammal species. These include western gray squirrel (*Sciurus griseus*), coyote (*Canis latrans*), and mule deer (*Odocoileus hemionus*). These habitats also provide habitat for a number of resident and migratory birds. These and other birds may nest, forage, or winter in habitats on or adjacent to the site.

4.12 Special Status Species

The Sacramento Fish and Wildlife Office were contacted on December 7, 2017 to develop a species list via the ECOS-IPaC website (USFWS 2017).

Site specific references and background information reviewed include:

- *California Natural Diversity Database* (CNDDB). 2017. California Department of Fish and Wildlife, Sacramento, CA. Accessed online.
- Information for Planning and Conservation (IPaC). 2017. United States Fish and Wildlife Service. Accessed online.
- California Native Plant Society. 2017. *Inventory of Rare and Endangered Vascular Plants of California*. Accessed online.
- National Marine Fisheries Service protected species list. 2017. Accessed Online.

The database searches identified 11 federally-listed fish and wildlife species and 3 federally-listed plant species with potential to occur within the Action Area.

Of the identified species, the CRLF and the AWS may incidentally occur on the project site. The nearest critical habitat for the CRLF is approximately 2.25 miles east of the project area and the nearest recorded observations of CRLF are about three miles east of the project area. The nearest recorded observation of AWS was in 2006 and is about 3.8 miles south east of the project area. The proposed project alternative will result in temporary effects on approximately 4.2 acres of suitable dispersal habitat for the AWS and CRLF, permanently impact 0..08 acre of jurisdictional WOUS in San Pablo Creek, and temporarily effect 0.004 acre of ephemeral drainage culvert.

4.13 Cultural Resources

A cultural records archival database search was conducted by NCE on March 13, 2018. The search indicates that the site contains a cultural resource site recorded as P-07-98.
The project has assumed preservation of the recorded site through avoidance.

SECTION 5. ALTERNATIVES ANALYZED

Each of the eight (8) questions presented in Section 2 are considered for the eight (8) Project Alternatives. Results are summarized in Table 3 (Project Alternatives).

5.1 ALTERNATIVE 1 – TOE BUTTRESS WITH CULVERT (PROPOSED ALTERNATIVE)

Least Environmentally Damaging

1) What is the expected quantitative impact (acres) of the project on jurisdictional (regulated) waters of the U.S.?

This alternative proposes to permanently impact approximately 0.08 acre of jurisdictional WOUS in San Pablo Creek and temporarily effect approximately 0.004 acre of ephemeral drainage culvert (extending under Via Verdi).

This alternative envisions buttressing the landslide by filling a portion of San Pablo Creek, which would be conveyed in a new concrete culvert connected with the current downstream section. The concrete culvert would be approximately 350 feet long and would be similar in geometry and dimensions to the one installed underneath El Portal Drive and Via Verdi as shown on **Plate 2**.

2) What is the potential impact of the project on federally listed species?

California red-legged frog (CRLF) and the Alameda whipsnake (AWS) may occur incidentally on this site. The nearest critical habitat for the CRLF is approximately 2.25 miles east of the project area and the nearest recorded observations of CRLF are about three miles east of the project area. The nearest recorded observation of AWS was in 2006 and is about 3.8 miles south east of the project area. The project will result in temporary effects on approximately 4.2 acres of suitable dispersal habitat for the AWS and CRLF and permanent impacts to .08acres of suitable aquatic habitat for CRLF.

Essentially, this reach is only suitable as a migration corridor. Given its location in the lower watershed and the relatively high flows that can occur (circa 990 cfs in a flow event with a two year return interval), breeding habitat for California red-legged frogs does not occur within this reach. This alternative similar to the other alternatives in that it includes impacts to the bed and bank of the creek and the associated riparian vegetation.

3) Are there any other known or likely environmental constraints?

This alternative would allow for utility alignments to be restored to their original locations within Via Verdi right of way. The chain link fence to the north of the Via Verdi emergency access road, between the fire lane access to the cemetery and the first residence on Mozart Drive, would be replaced next to the curb and gutter along Via Verdi.

The portion of the Cemetery Trust Property affected by the construction of the Via Verdi emergency access road would be restored to conditions similar to what existed before the Via Verdi emergency access road was constructed. The restoration requires demolition of the Via Verdi emergency access road structure, grading, and removal of any temporary features and utilities constructed. Soil material that was excavated and stockpiled on the Cemetery Trust Property would be removed and used as fill. Revegetation of all areas disturbed by construction would be included as part of the scope for this alternative.

Practicable

4) Is the site available for purchase or long-term lease?

This alternative would allow for the project to be in the original location within the Via Verdi right of way. This property is in current City ownership and is therefore available.

5) Could the site be developed within a reasonable timeframe?

This alternative would commence in 2019, which is a reasonable development timeframe. Delaying construction could introduce additional negative consequences for public safety, the environment, utility services, and the overall condition and safety of local infrastructure.

6) Is the property available and developable at a reasonable cost to the project proponent?

The proposed project is available as it is already owned by the City. The costs are estimated at $11.36M (See Table 2), which is considered to be a reasonable cost by the applicant.

7) Is it logistically possible (or practical) to construct the proposed project alternate?

The corresponding slope stability factor of safety would be approximately 1.68, which is an acceptable long-term factor of safety (acceptable factors of safety should be greater than

1.5). Via Verdi would be reconstructed along the existing alignment and no major earthwork to the slide mass itself would be required. Temporary utilities (i.e. gas, electrical, water, sewer) constructed as part of the Via Verdi emergency access road would be removed. All utilities would be restored within Via Verdi right of way.

This alternative places San Pablo Creek into an approximately 350 linear feet of concrete culvert (H=17'; W=20'). Fill would be placed around and over the culvert to buttress the land slide and achieve an acceptable factor of safety for the slide plane. Erosion control measures and slope protection including bioengineered slope protection and riprap with pole plantings would be placed at the headwall of the new culvert. Construction would occur during the summer months to convey creek flows in a bypass system consisting of a coffer dam, pumps, piping, sedimentation, and siltation control.

8) Does the proposed alternative meet the Overall Project Purpose?

This alternatives for slope stabilization repair were meets the Overall Project Purpose by providing safe vehicular and pedestrian access to the Sobrante Glen Neighborhood, protecting San Pablo Creek habitat, safe conveyance of stormwater from watershed areas in San Pablo Creek as well as releases from the upstream San Pablo reservoir, and restoring permanent utilities.

5.2 ALTERNATIVE 2 - ABANDON VIA VERDI AND CONSTRUCT NEW ACCESS ROAD

Least Environmentally Damaging

1) What is the expected quantitative impact (acres) of the project on jurisdictional (regulated) waters of the U.S.?

All disturbed areas would be revegetated. Disturbances to the creek and riparian habitat would be mitigated by limiting the slope excavation to upper portion of the land slide. However new access points at Garden Road and Foster Lane would introduce additional disturbances to habitat and riparian areas with bridge crossings over potential federal and/or State of California jurisdictional drainages and the Fariss Lane access would introduce ground disturbance with the construction of a new road on the hillside area. Option 1, which envisions access through Fariss Lane, would require grading the hillside to accommodate roadway construction. Option 2, which envisions access through Foster Lane, would require construction of an approximately 230-foot-long bridge over a potential State and Federal jurisdictional drainage area. The bridge would be approximately 45-feet wide by 230-ft long and would be expected to permanently impact as much as approximately 10,350 square feet (0.24-acre) of riparian habitat and jurisdictional waters. Option 3, which envisions access through Garden Road, would require constructing an approximately 325-foot-long, 2-lane roadway, and an approximately 45-feet wide by 160-foot-long bridge would be expected to permanently impact 7,200 square feet (0.17-acre) of riparian habitat and jurisdictional WOUS. All three of these access options will temporarily effect approximately 0.004 acre of ephemeral drainage culvert (extending under Via Verdi)

2) What is the potential impact of the project on federally listed species?

The permanent impact to suitable aquatic habitat function for CRLF would be approximately 0-acre for Option 1, 0.24-acre for Option 2, or 0.17-acre for Option 3. Expected temporary effects to suitable dispersal habitat for AWS and CRLF from earthwork and revegetation would be approximately 6.1 acres for Options 1 and 2, and 4.1 acres for Option 3. In addition, the construction of Options 1 and 2 would create new roadway in currently undeveloped land and therefore would result in approximately 1 acre of permanent impacts to suitable dispersal habitat for AWS and CRLF for each option.

3) Are there any other known or likely environmental constraints?

A cultural resource is present and could be impacted by Alternative 2.

Practicable

4) Is the site available for purchase or long-term lease?

Plate 3 shows the three options that would establish new access to the Sobrante Glen Neighborhood. Option 1, which envisions access through Fariss Lane, would require constructing an approximately 975-foot-long, 2-lane roadway to connect Fariss Lane to Mozart Drive, acquiring five properties, demolishing two homes, and grading the hillside to accommodate roadway construction. Option 2, which envisions access through Foster Lane, would require acquiring the same five properties and demolishing two homes, constructing an approximately 745-foot-long, 2-lane roadway, grading the hillside to accommodate roadway construction, and construction of an approximately 230-foot-long bridge over a potential state of California jurisdictional drainage area. Option 3, which envisions access through Garden Road, would require constructing an approximately 325-

foot-long, 2-lane roadway, and an approximately 160-foot-long bridge, acquiring six properties and demolishing six homes to connect Garden Road to Mozart Drive.

These properties are not currently available and would likely need to be acquired through condemnation of personal property. They are not considered available for purchase or through long-term lease.

5) Could the site be developed within a reasonable timeframe?

Acquisition of land and properties could not be achieved within the desired time frame for construction, which is summer 2019. Additional time to condemn and secure private property and homes would delay the project.

6) Is the property available and developable at a reasonable cost to the project proponent?

Option 1, which envisions access through Fariss Lane, would require constructing an approximately 975-foot-long, 2-lane roadway to connect Fariss Lane to Mozart Drive, acquiring five properties, demolishing two homes, and grading the hillside to accommodate roadway construction. Option 2, which envisions access through Foster Lane, would require acquiring the same five properties and demolishing two homes, constructing an approximately 745-foot-long, 2-lane roadway, grading the hillside to accommodate roadway construction, and construction of an approximately 230-foot-long bridge over a potential state of California jurisdictional drainage area. Option 3, which envisions access through Garden Road, would require constructing an approximately 325-foot-long, 2-lane roadway, and an approximately 160-foot-long bridge, acquiring six properties and demolishing six homes to connect Garden Road to Mozart Drive. It is unclear what the cost of going through a condemnation procedure would be, but it is expected to result in unreasonable costs of acquisition and legal fees. Estimates are: Option 1 $11.04M, Option 2 $14.65M, and Option 3 $13.69M.

7) Is it logistically possible (or practical) to construct the proposed project alternate?

In general, this alternative envisions demolishing the portion of Via Verdi that is impacted by the landslide and creating a new access route to the Sobrante Glen neighborhood via extending neighboring streets to the east (see **Plate 3**). This new access route would connect the Sobrante Glen neighborhood by means of road extensions either via Fariss Lane, Foster Lane, or Garden Road. Two of the proposed three options for extensions (i.e.; Foster Lane, Garden Road) would require bridge crossings over drainages. Via Verdi would be permanently closed between El Portal Drive and Mozart Drive to through traffic. Only a short segment of Via Verdi, off of El Portal Drive, would stay open to access the Cemetery Trust Property fire lane.

Stabilization of the landslide would be attempted by excavation and disposal of the upper portion of the slide mass and grading of the resulting embankment to a maximum slope of 3:1 or 4:1 (H:V) and and/or removal of the upper 10 feet of the slide mass to reduce slope driving mass as shown on **Plate 3**. The corresponding preliminary slope stability factors of safety would range from approximately 0.97 to 1.18 for laying back the slope at 4:1 (H:V) and removal of the upper 10 feet of the slide mass, respectively. <u>This preliminary analysis indicates that these alternatives are not effective in improving the factor of safety of the landslide to an acceptable level</u> (acceptable factors of safety should be greater than 1.5) <u>and therefore are not viable</u>.

Underground utilities (water, sanitary sewer, gas) and aboveground electrical serving the Sobrante Glen neighborhood would need to be brought in through the alignment of the new access road (Fariss Lane, Foster Lane, or Garden Road). Utility alignments along Via Verdi or behind the landslide would not be advised/feasible due to insufficient stability afforded by slope stabilization measures. Upgrades to the existing sewer line would be needed (e.g. deep trenching or pump stations).

Once a new access point has been selected and constructed, the Cemetery Trust Property would be restored to conditions that existed before the Via Verdi emergency access road was constructed on the property. The restoration requires demolition of the Via Verdi emergency access road structure, grading, and removal of any temporary features and utilities constructed. Soil material that was excavated and stockpiled on the Cemetery Trust Property would be removed and used as fill. Revegetation of all areas disturbed by construction would be included as part of the scope for these alternatives.

8) Does the proposed alternative meet the Overall Project Purpose?

These alternatives do meet the stated Overall Project Purpose statement, specifically because they cannot be safely constructed due to insufficient slope stability, and therefore cannot provide the required access for existing homeowners. Additionally, acquisition of land and properties could not be achieved within the desired time frame for construction, which is summer 2019. Additional time to secure private property and homes would delay the project and could result in additional significant risks to the community, creek habitat, and the built environment if the landslide was to continue to move into the creek. These alternatives are similar to the other alternatives that have impacts to the creek and drainage habitat, and although the impacts would be less with grading at the landslide location, new roadway construction for new access roads would introduce disturbances to the hillside and drainage areas associated with the various points of access.

5.3 ALTERNATIVE 3 - RETAINING WALL

Environment

1) What is the expected quantitative impact (acres) of the project on jurisdictional (regulated) waters of the U.S.?

Via Verdi would be reconstructed along the existing alignment and no major earthwork within the landslide area and San Pablo Creek be required. There are no impacts to jurisdictional regulated WOUS of San Pablo Creek, however 0.004 acre of ephemeral drainage culvert (extending under Via Verdi) will be temporarily affected.

2) What is the potential impact of the project on federally listed species?

This alternative is not expected to result in permanent impacts to aquatic habitat for CRLF. However, earthwork and revegetation would result in temporary impacts. The project will result in temporary effects on approximately 2.9 acres of suitable dispersal habitat for the AWS and CRLF.

3) Are there any other known or likely environmental constraints?

No, this alternative would allow for the project to be in the original location within the Via Verdi right of way.

Practicable

4) Is the site available for purchase or long-term lease?

This alternative would allow for the project to be in the original location within the Via Verdi right of way.

5) Could the site be developed within a reasonable timeframe?

Yes, this project could be developed within a reasonable timeframe.

6) Is the property available and developable at a reasonable cost to the project proponent?

This alternative would allow for the project to be in the original location within the Via Verdi right of way. The project is expected to cost approximately $12.29M.

7) Is it logistically possible (or practical) to construct the proposed project alternate?

This alternative would construct a buried secant pile retaining wall with reinforcement and tie-back type system to further resist the landslide movement as shown on **Plate 4**. The retaining wall would be placed on the downslope (south) side of Via Verdi. The length of the retaining wall would be determined by the location of the scarp and extent of the landslide. The tiebacks would extend into the Cemetery Trust Property and would require coordination with underground utilities. Via Verdi would be reconstructed along the existing alignment and no major earthwork within the landslide area would be required.

The drilled secant pile wall would need to be heavily reinforced along with multiple rows of tie-backs to resist the large landslide forces. The relatively deep landslide, which is greater than 50 feet in depth, would require at least a 50-foot high retaining wall or higher.

Reconstruction of Via Verdi to its original alignment, with minor changes, would allow for utility alignments (water, sanitary sewer, gas and electric) to be restored to their original locations. The chain link fence to the north of the Via Verdi emergency access road, between the fire lane access to the cemetery and the first residence on Mozart Drive, would be replaced next to the curb and gutter along Via Verdi.

The portion of the Cemetery Trust Property affected by the construction of the Via Verdi emergency access road would be restored to conditions similar to what existed before the Via Verdi emergency access road was constructed. The restoration requires demolition of the Via Verdi emergency access road structure, grading, and removal of any temporary features and utilities constructed. Soil material that was excavated and stockpiled on the Cemetery Trust Property would be removed and used as fill. Revegetation of all areas disturbed by construction would be included as part of the scope for this alternative. No major earthwork slope stabilization would be required for this alternative.

This alternative is not recommended nor practicable. It would require tie-backs to resist the large landslide forces and the tie-backs cannot be installed from the ground surface and excavation in front of the wall could compromise the stability of the wall and further activate the landslide by removing toe support materials that help resist landslide movement.

8) Does the proposed alternative meet the Overall Project Purpose?

This project does not meet the Overall Project Purpose because it has been determined to be unstable. We conclude that this option is not feasible to support the landslide with a buried wall installed from existing grade.

5.4 Alternative 4 and 5 - Excavate slide Mass and Reconstruct Slope

Environment

1) What is the expected quantitative impact (acres) of the project on jurisdictional (regulated) waters of the U.S.?

Via Verdi would be reconstructed along the existing alignment and extensive earthwork/ grading would extend down into San Pablo Creek requiring dewatering and temporary diversion of creek water during construction.. This alternative proposes to temporarily effect approximately 0.05 acre of jurisdictional WOUS in San Pablo Creek and temporarily effect approximately 0.004 acre of ephemeral drainage culvert (extending under Via Verdi).

2) What is the potential impact of the project on federally listed species?

This alternative is not expected to result in permanent impacts to aquatic habitat for CRLF. However, earthwork and revegetation would result in temporary impacts. The project will result in temporary effects on approximately 4.9 acres of suitable dispersal habitat for the AWS and CRLF.

3) Are there any other known or likely environmental constraints?

No, this alternative would allow for the project to be in the original location within the Via Verdi right of way.

Practicable

4) Is the site available for purchase or long-term lease?

This alternative would allow for the project to be in the original location within the Via Verdi right of way.

5) Could the site be developed within a reasonable timeframe?

Yes, this project could be developed within a reasonable timeframe.

6) Is the property available and developable at a reasonable cost to the project proponent?

This alternative would allow for the project to be in the original location within the Via Verdi right of way. Cost of Alternative 4 is estimated to be $15.18M, and Alternative 5 is $14.78M.

7) Is it logistically possible (or practical) to construct the proposed project alternate?

Alternatives 4 and 5, as shown on **Plate 5,** envision the removal of the entire slide mass to beyond the lateral and vertical extent of the existing slide plane and replacement as stabilized compacted engineered fill. These alternatives remove the slide plane to construct a stable roadway embankment to restore Via Verdi. A significant volume of earthwork excavation, approximately 75,000 cubic yards, hauling, temporary stockpiling, and compaction of engineered fill would be needed to implement these alternatives. Alternative 4 is different from Alternative 5 to the extent that Alternative 4 includes the installation of layers of geogrid to reinforce the slope mass. Importing soil would not be needed for these alternatives, however removal of the entire slide mass will require substantial stockpiling of soils onsite. After completion of the engineered fill, Via Verdi would be reconstructed along its original alignment.

The excavation for these alternatives would be benched into the undisturbed soil with drainage pipes placed at the back of each bench. The drainage pipes would be connected to drain towards San Pablo Creek. The anticipated height of the benches would be 5 feet or less. The excavated soil would be moisture conditioned and replaced as compacted engineered fill. The depth of the excavation would likely need to be in excess of 55 feet and extend below San Pablo Creek. A portion of San Pablo Creek would need to be bypassed and groundwater levels reduced by dewatering to work around and below the creek.

Reconstruction of Via Verdi to its original alignment, with minor changes, would allow for utility alignments (water, sanitary sewer, gas and electric) to be restored within Via Verdi right of way. The chain link fence to the north of Via Verdi between the fire lane access to the cemetery and the first residence on Mozart Drive would be replaced next to the curb and gutter.

The Cemetery Trust Property would be restored to conditions similar to those that existed before the Via Verdi emergency access road was constructed on the property as shown on **Plate 5**. The restoration requires demolition of the Via Verdi emergency access road and any temporary features and utilities installed to complement the road. Soil material that was excavated and stockpiled on the Cemetery Trust property would be removed and used as fill. Revegetation of all areas disturbed by construction would be included as part of the scope for these alternatives.

The slope above the subject landslide is still underlain by old landslide debris. During the excavation of the slide mass for these alternatives the potential for additional movement and damage to both, the emergency access road and the slope areas above, belonging to the Cemetery Trust, would be high. The emergency access road and temporary utilities located within or along the road need to remain functional and operational during construction.

8) Does the proposed alternative meet the Overall Project Purpose?

The removal of the active landslide debris during construction could trigger another landslide upslope from the excavation, endangering workers, stranding residents from their homes, damaging utilities with impacts to residents and the local environment, damaging private property, and resulting in additional cost and time to mitigate during construction. Therefore, these alternatives are not practicable nor meet the Overall Project Purpose.

5.5 ALTERNATIVE 6 - CONCRETE BRIDGE

Environment

1) What is the expected quantitative impact (acres) of the project on jurisdictional (regulated) waters of the U.S.?

Via Verdi would be reconstructed along the existing alignment with earthwork required within the landslide area but not within San Pablo Creek. In summary there are no impacts to jurisdictional regulated WOUS, however 0.004 acre of ephemeral drainage culvert (extending under Via Verdi) would be temporarily affected.

2) What is the potential impact of the project on federally listed species?

This alternative is not expected to result in permanent impacts to aquatic habitat for CRLF, however, falsework associated with bridge construction and earthwork and revegetation would result in temporary impacts. The project will result in temporary effects on approximately 3.6 acres of suitable dispersal habitat for the AWS and CRLF.

3) Are there any other known or likely environmental constraints?

No, this alternative would allow for the project to be in the original location within the Via Verdi right of way.

Practicable

4) Is the site available for purchase or long-term lease?

This alternative would allow for the project to be in the original location within the Via Verdi right of way.

5) Could the site be developed within a reasonable timeframe?

Yes, this project could be developed within a reasonable timeframe.

6) Is the property available and developable at a reasonable cost to the project proponent?

This alternative would allow for the project to be in the original location within the Via Verdi right of way. Estimated cost for this alternative is $11.82M.

7) Is it logistically possible (or practical) to construct the proposed project alternate?

A concrete bridge over the landslide area coupled with slope excavation and stabilization similar to the second alternative constitutes Alternative 6.

A 2-lane concrete bridge, approximately 350 feet long with a sidewalk on the south side would be constructed in place of the existing road. The bridge would have a similar alignment as Via Verdi but a narrower cross section because of the removal of parking lanes. The abutments would be constructed approximately 30 feet outside of the slide area and the bridge would also include multiple mid-span supports (e.g. bridge piers) extending at least 50 feet deep to beyond the slide plane. The road section, curb & gutter, and sidewalk at the approaches to the bridge would need to be reconstructed to serve as a transition and to match existing grades, as shown on **Plate 6**.

Stabilization of the landslide would be attempted by excavation and disposal of the upper portion of the slide mass and grading of the resulting embankment to a maximum slope of 3:1 or 4:1 (H:V) and and/or removal of the upper 10 feet of the slide mass to reduce slope driving mass as shown on Plate 6. The corresponding preliminary slope stability factors of safety would range from approximately .97 to 1.18 for laying back the slope at 4:1 (H:V) and removal of the upper 10 feet of the slide mass, respectively, similar to Alternative 2. This preliminary analysis indicates that these alternatives are not effective in improving the factor of safety of the landslide to an acceptable level and therefore are not viable. The creek bank would be laid back beginning at the top of the vegetated area of the creek channel, in order to preserve existing riparian habitat. After stabilizing the slope, additional riparian habitat could be established through grading and revegetation. Significant off-haul and disposal of excavated soils would be required.

Underground utilities (water, sanitary sewer, gas and electric) serving the Sobrante Glen Neighborhood would have to be relocated. The most practical solution would be to hang the utilities from the underside of the bridge. The temporary aboveground EBMUD and sewer lines would be abandoned or removed.

The Cemetery Trust property would be restored similar to conditions that existed before the Via Verdi emergency access road was constructed on the property as shown on **Plate 6;** however, the finished grades would be different due to the removal of the upper portions of the slide mass. The restoration requires demolition of the Via Verdi emergency access road and any temporary features and utilities installed to complement the emergency access road. Soil material that was excavated and stockpiled on the Cemetery Trust Property would be removed and disposed of off-site. Revegetation of all areas disturbed by construction would be included as part of the scope for this alternative.

8) Does the proposed alternative meet the Overall Project Purpose?

This alternative does not meet the Overall Project Purpose. This alternative is neither practical nor viable as the bridge with mid-span supports requires a stable slide area. The analysis indicates that the slope stabilization would have an insufficient long-term factor of safety that would not result in a stable slope. A bridge with mid-span supports would be at risk of damage from future landslide movement. A bridge that would span the landslide such as a suspension type bridge would be cost prohibitive for the City as FEMA seeks to fund the most economical, long lasting, and preventative solution.

5.6 Alternative 7 - Realign Via Verdi

Environment

1) What is the expected quantitative impact (acres) of the project on jurisdictional (regulated) waters of the U.S.?

Via Verdi would be reconstructed along a new alignment north of the existing Via Verdi roadway (similar to the Emergency Access Road) within private property requiring earthwork within the landslide area and new roadway, however not within San Pablo Creek. There would be no impacts to jurisdictional regulated WOUS of San Pablo Creek, however 0.004 acre of ephemeral drainage culvert (extending under Via Verdi) will be temporarily affected.

2) What is the potential impact of the project on federally listed species?

This alternative is not expected to result in permanent impacts to aquatic habitat for CRLF. However, earthwork and revegetation would result in temporary impacts. The project will result in temporary effects on approximately 3.0 acres of suitable dispersal habitat for the AWS and CRLF. In addition, the construction of a new roadway in currently undeveloped land would result in approximately .5 acre of permanent impacts to suitable dispersal habitat for AWS and CRLF.

3) Are there any other known or likely environmental constraints?

No, this alternative would allow for the project to be in and immediately adjacent to the Via Verdi right of way.

Practicable

4) Is the site available for purchase or long-term lease?

To design and implement this alternative the City would have to acquire/purchase a portion of the Cemetery Trust Property or purchase an easement to construct the 2-lane roadway and regrade the slope. This alternative may not be feasible based on past conversations with the owner. As part of the culvert reconstruction project under Via Verdi and El Portal Drive in 2012, NCE explored the option of purchasing portions of the Cemetery Trust Property. Correspondence with the owner indicated he was unwilling to sell his property; which makes this alternative challenging.

5) Could the site be developed within a reasonable timeframe?

Yes, this project could be developed within a reasonable timeframe.

6) Is the property available and developable at a reasonable cost to the project proponent?

This alternative, if made available by the owner, could potentially be developable at a reasonable cost (estimate $4.21M).

7) Is it logistically possible (or practical) to construct the proposed project alternate?

Alternative 7 realigns Via Verdi behind the scarp similar to the existing Via Verdi emergency access road. Unlike Alternative 2, this option aims to keep Sobrante Glen Neighborhood access through Via Verdi without substantially lengthening residents' drive time. To design and implement this alternative the City would have to acquire/purchase a portion of the Cemetery Trust Property or purchase an easement to construct the 2-lane roadway and regrade the slope.

Plate 7 illustrates how Via Verdi would be realigned and constructed as a 2-lane roadway with curb & gutter and a sidewalk along the southern edge of the roadway. This alternative would upgrade the existing Via Verdi emergency access road by having smoother transitions at the tie-in points to the original Via Verdi and a wider cross section. Site constraints would have to be taken into consideration with the realignment of Via Verdi. Two of the major site constraints that are considered at this time are; (1) constructing new Via Verdi without cutting into the hill north of the Via Verdi emergency access road and, (2) narrowing a portion of the road to reconstruct Via Verdi behind the landslide. This alternative would keep the cemetery's emergency fire lane access functional after the completion of the project.

Stabilization of the landslide would be attempted by laying back the slope from the creek to the emergency access road. The corresponding slope stability factor of safety would be approximately 1.16. <u>This analysis indicates that this alternative is not effective in improving the factor of safety of the landslide to an acceptable level and therefore is not viable</u>. Excavation, geared towards slope stabilization, would begin upslope from the riparian trees and shrubs of the creek channel in order to preserve existing riparian habitat, and end adjacent to the realigned Via Verdi, as shown on **Plate 7**. After stabilizing the slope, the slope would be revegetated to create additional riparian habitat.

With the realignment of Via Verdi there would be a need to realign underground utilities within the right of way of new Via Verdi. Such realignment of the existing sewer line would either require deep trenching or a pump station.

To construct the realigned Via Verdi, the Via Verdi emergency access road and a portion of the original Via Verdi would need to be demolished, including pavement, curb & gutter, and sidewalk. Access to the Sobrante Glen neighborhood during construction would be provided using the existing alignment of Via Verdi, which would require roadwork and grading to establish a safe corridor. The areas that would be demolished and stabilized would ultimately get revegetated.

8) Does the proposed alternative meet the Overall Project Purpose?

This alternative does not improve the factor of safety of the landslide to an acceptable level therefore it does not meet the Overall Project Purpose.

5.7 Alternative 8 - Drainage Gallery

Environment

1) What is the expected quantitative impact (acres) of the project on jurisdictional (regulated) waters of the U.S.?

Via Verdi would be reconstructed along the existing alignment with minor earthwork and grading within the landslide area but no major earthwork within San Pablo Creek. There would be no impacts to jurisdictional regulated WOUS of San Pablo Creek, however 0.004 acre of ephemeral drainage culvert (extending under Via Verdi) will be temporarily affected.

2) What is the potential impact of the project on federally listed species?

3) This alternative is not expected to result in permanent impacts to aquatic habitat for CRLF. However, earthwork and revegetation would result in temporary impacts. The project will result in temporary effects on approximately 3.0 acres of suitable dispersal habitat for the AWS and CRLF. Are there any other known or likely environmental constraints?

No, this alternative would allow for the project to be in the original location within the Via Verdi right of way.

Practicable

4) Is the site available for purchase or long-term lease?

This alternative would allow for the project to be in the original location within the Via Verdi right of way.

5) Could the site be developed within a reasonable timeframe?

Yes, this project could be developed within a reasonable timeframe.

6) Is the property available and developable at a reasonable cost to the project proponent?

This alternative would allow for the project to be in the original location within the Via Verdi right of way. A pump station could be used to drain the water to San Pablo Creek but the City would incur a higher cost (estimated to be $5.57M).

7) Is it logistically possible (or practical) to construct the proposed project alternate?

Alternative 8 proposes installing a deep drainage gallery to lower the groundwater level to improve the overall slope stability. The drainage gallery would need to be constructed behind the active landslide on the Cemetery Trust Property. Via Verdi would be reconstructed along the existing alignment.

The purpose of the drainage gallery is to intercept groundwater upgradient of the slide to maintain groundwater at a lower level. The gallery would consist of a series of large diameter wells filled with permeable material (e.g. drain rock), interconnected near the base with drain pipes, and drained by a gravity outlet(s) to the creek. A pump station could be used to drain the water to San Pablo Creek but the City would incur a higher cost. The bypass road and utilities may need to be relocated when the excavation for the wells occur. Alternative 8 would also keep the cemetery's emergency fire lane access functional after the completion of the project.

The effectiveness of the drainage gallery is limited in that water could only practically be lowered down to the creek water elevation, but the slide plane reaches below the creek level. The approximate factor of safety of this alternative is 1.20 and therefore it is not effective in increasing the factor of safety to a sufficient level.

The earthwork required to install the large diameter wells and drain pipe is shown conceptually on **Plate 8.** The excavation for the wells and the surface soil would be sloped 1:1 and 3:1 maximum, respectively. The limits of the drainage gallery would encompass the entire scarp.

Utility alignments would be restored to their original locations. No upgrades to the lines or system would be necessary. The chain link fence to the north of the Via Verdi emergency access road, between the fire lane access to the cemetery and the first residence on Mozart Drive, would be replaced next to the curb and gutter along Via Verdi.

Via Verdi emergency access road and any temporary road features would be demolished prior to installing the drainage gallery. The Cemetery Trust Property would not be restored to its original condition but would be revegetated and sloped to drain toward San Pablo Creek. A construction and maintenance easement on the Cemetery Trust Property would be required for the drainage gallery.

8) Does the proposed alternative meet the Overall Project Purpose?

Overall this alternative has limited effectiveness, does not result in a long term stable slope, and therefore does not meet the Overall Project Purpose.

5.8 ALTERNATIVE COST COMPARISON

The proposed project; Toe Buttress with Culvert (Alternative 1) is one of the more cost effective solutions and the only alternative that provides an acceptable long term factor of safety and can be viably constructed. **Table 2** below provides preliminary planning level costs associated with each of the alternatives and associated preliminary factor of safety for the slide plane. The major costs include construction, land acquisition and legal costs, design, permitting, regulatory compliance, and administrative costs.

Table 2 – Summary of Alternative Projects and Evaluation Criteria

Table 2. Summary of Alternative Projects and Evaluation Criteria								
		Alternative 1 Proposed	**Alternative 2**	**Alternative 3**	**Alternatives 4 & 5**	**Alternative 6**	**Alternative 7**	**Alternative 8**
		Toe Buttress with Culvert	**Abandon Via Verdi Construct New Road**	**Retaining Wall**	**Excavate Slide Mass Reconstruct Slope**	**Concrete Bridge**	**Realign Via Verdi**	**Drainage Gallery**
Environmental	**Impacts to Waters of the U.S. (T) Temporary (P) Permanent**	0.08 ac (P) .004 Ephem. Drain. (T)	O1 -0.00 ac (P) O2 - 0.24 ac (P) O3 – 0.17 ac (P)	.004 Ephem. Drain. (T)	.05 ac (P) .004 Ephem. Drain. (T)	.00 ac (P) .004 Ephem. Drain. (T)	00 ac (P) .004 Ephem. Drain. (T)	00 ac (P) .004 Ephem. Drain. (T)
	Federally Listed Species (T) Temporary (P) Permanent	CRLF- 0.08-ac (P) AWS and CRLF – 4.2-ac (T)	O1 – CRLF- 0.00-ac (P) O1 -AWS and CRLF – 6.1-ac (T) O2 – CRLF- 0.24-ac (P) O2 -AWS and CRLF – 6.1-ac (T) O2 – CRLF- 0.17-ac (P) O2 -AWS and CRLF – 4.1-ac (T)	CRLF- 0.00-ac (P) AWS and CRLF – 2.9-ac (T)	CRLF- 0.00-ac (P) AWS and CRLF – 4.9-ac (T)	CRLF- 0.00-ac (P) AWS and CRLF – 3.6-ac (T)	CRLF Aquatic- 0.00-ac (P) AWS and CRLF – 3.0-ac (T) AWS and CRLF - .5 ac (P) Dispersal	CRLF- 0.00-ac (P) AWS and CRLF – 3.0-ac (T)
	Other Environmental Constraints	No	Cultural Resources	No	No	No	No	No
Practicable	**Available for Purchase**	Purchased	No	Purchased	Purchased	Purchased	No	Purchased
	Timeframe for Development	Acceptable	Unacceptable	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable
	Logistically Developable	Yes	No	No	No	No	No	No
	Overall Purpose	Yes	No	No	No	No	No	No

Table 3 - Alternatives Cost Comparison

Alternative	Preliminary Factor of Safety	Construction Cost	Land Acquisition/Easement Costs	Design, Permitting, CM, Administrative Costs, Permitting, CEQA/NEPA	Total Cost
1. Proposed Project - Toe Buttress with Culvert	1.68	$8.85 Million	$70,000	$2.44 Million	$11.36 Million
2. Abandon Via Verdi and Construct New Access Road (3 Options)	.97-1.18	Option 1: $5.79 Million Option 2: $8.71 Million Option 3: $6.63 Million	Option 1: $3.48 Million Option 2: $3.48 Million Option 3: $5.08 Million	Option 1: $1.77 Million Option 2: $2.46 Million Option 3: $1.98 Million	Option 1: $11.04 Million Option 2: $14.65 Million Option 3: $13.69 Million
3. Retaining Wall	NA	$9.70 Million	$10,000	$2.58 Million	$12.29 Million
4. & 5. Excavate Slide Mass and Reconstruct Slope	Alternative 4: 1.85 Alternative 5: 1.75	Alternative 4: $11.95 Million Alternative 5: $11.64 Million	Alternative 4: $30,000 Alternative 5: $30,000	Alternative 4: $3.20 Million Alternative 5: $3.11 Million	Alternative 4: $15.18 Million Alternative 5: $14.78 Million
6. Concrete Bridge	.97-1.18	$9.27 Million	$20,000	$2.53 Million	$11.82 Million
7. Realign Via Verdi	1.16	$2.87 Million	$0.23 Million	$1.11 Million	$4.21 Million
8. Drainage Gallery	1.20	$4.17 Million	$10,000	$1.39 Million	$5.57 Million

SECTION 7. CONCLUSION

This 404 (b) (1) alternatives analysis discusses the environmental impacts, practicability, as well as the additional time and costs that would be incurred for the alternatives to the preferred project.

The Via Verdi landslide occurred in an area that is highly constrained by not only urban development (essential roads, utilities, houses and apartments, and nearby I-80), but site characteristics that include a creek, steep creek slopes, and regional seismicity. In combination with the topography and land acquisition complexities, this urban development and associated major infrastructure limit the practicable options for the site. With exception to the preferred alternative (Alternative 1) all other alternatives introduce potential serious risks and impacts to public safety and the environment as they do not adequately stabilize the landslide and/or are or cannot be practically constructed.

The Via Verdi Slope Stabilization Project requires construction in San Pablo Creek and its associated riparian area. Two special status species have the potential to use these habitats, the CRLF and AWS. The project will result in temporary effects on approximately 4.2 acres of suitable dispersal habitat for the AWS and CRLF and permanent impacts to 0.08 acre of suitable aquatic habitat for CRLF. However, the project has been designed to allow fish passage through most flows, avoid sensitive species with timing and pre-construction surveys, implement BMPs for avoiding impacts to water quality, and restores areas where vegetation is unavoidably removed. These mitigation measures will allow this essential public infrastructure to be re-constructed and stabilized, while avoiding significant impacts to the natural resources of the site.

Based on this analysis of alternatives and in consideration of public health and safety, achieving an acceptable level of slope stability, the environment, the lack of reasonably obtainable land, and the substantial costs to the City, the only practicable alternative is the proposed project to buttress the slide with a new culvert section. Delaying construction beyond 2019 could introduce additional negative consequences for public safety, the environment, utility services, and the overall condition and safety of local infrastructure.

A review of alternatives was performed in an effort to determine if the Preferred Project constituted the LEDPA. This analysis was founded upon a legitimate and reasonably defined overall project purpose and considered a meaningful number of alternatives.

Pursuant to the Guidelines, this analysis also takes into consideration the factors listed in 40 C.F.R. § 230.10 (b) and (c) to identify the least environmentally damaging practicable alternative. In identifying the Preferred Project as the LEDPA, it was determined that the proposed Preferred Project is not likely to jeopardize the continued existence of any endangered or threatened species (or destroy or adversely modify critical habitat of such species), cause or contribute to violations of any applicable state water quality standard, or cause or contribute to violations of any applicable state water quality standard, or cause or contribute to any degradation of Waters of the United States.

SECTION 8. REFERENCES

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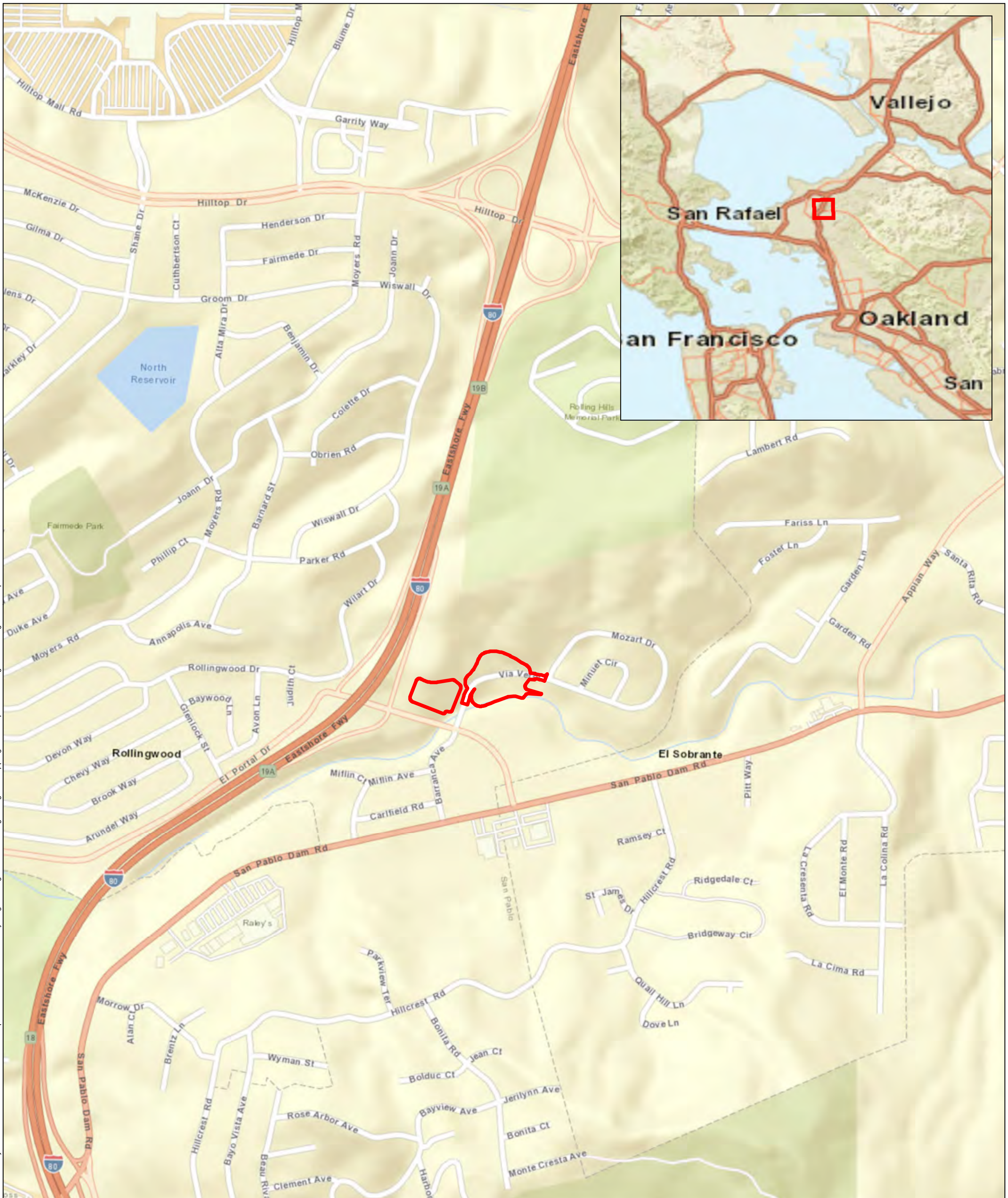


Legend

Project Area

NCE

Richmond

Via Verdi Slope Stabilization Project

Site and Vicinity Map

N

1 in. = 1,000 ft.

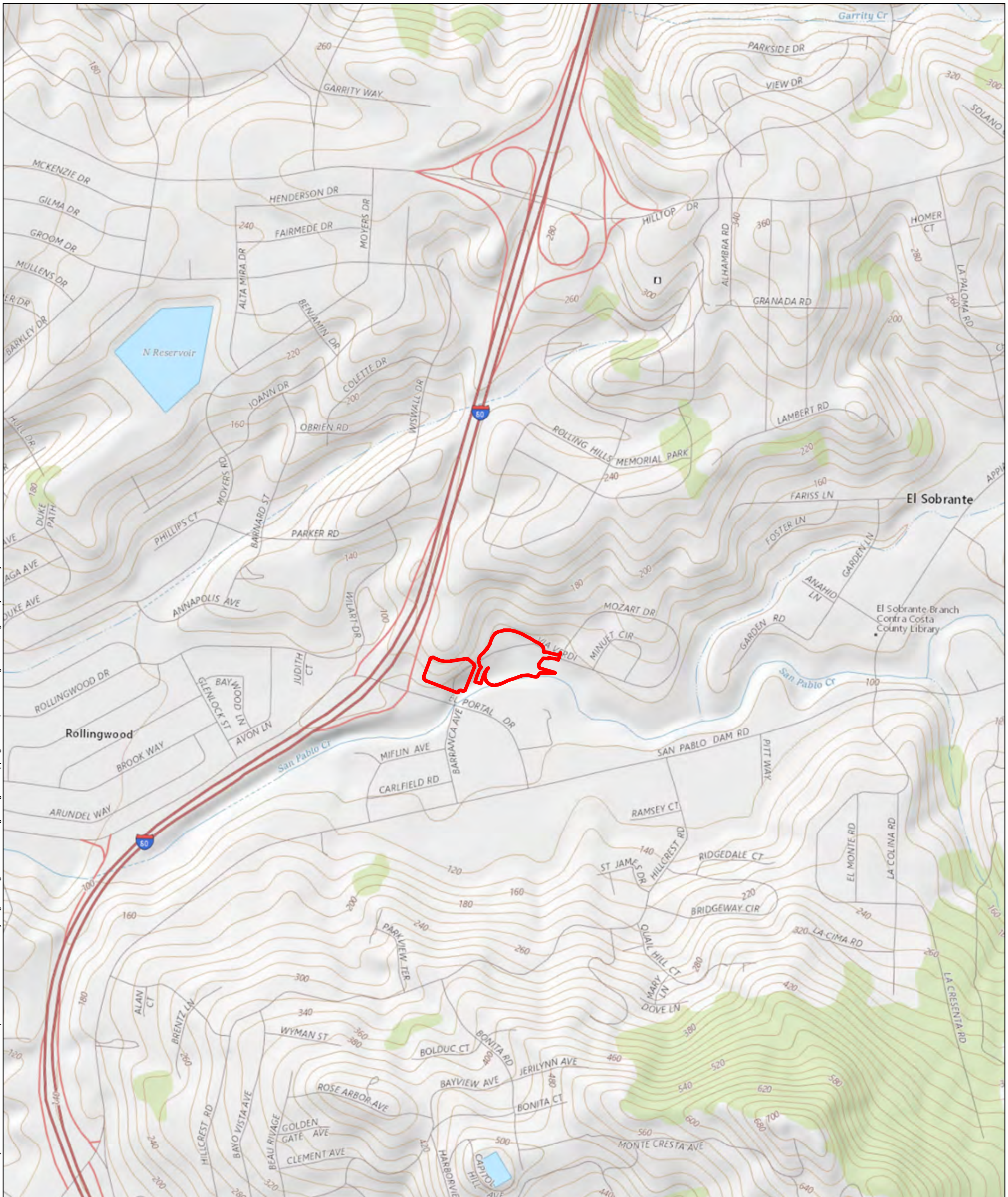
0 500 1,000 ft.

FIGURE

1

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
NCE, ESRI USGS National Topography Basemap	568.41.55	danderson	4/20/2018	n/a	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\WOUS Figures\VV Fig 1 Site Map.mxd



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Legend

Project Area - 5.1 ac

NCE

Via Verdi Slope Stabilization Project

Project Study Area with USGS Quadrangle

N

1 in. = 1,000 ft.

0 500 1,000 ft.

FIGURE

2

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
NCE, ESRI USGS National Topography Basemap	568.41.55	danderson	4/20/2018	n/a	drios

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NCE

City of Richmond

Via Verdi Slope Stabilization Project

Soils in Project Study Area

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE 3

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI, NCE, NRCS Soil Survey	568.41.55	danderson	4/20/2018	n/a	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\WOUS Figures\VV Fig 4 National Wetland Inventory.mxd

Legend
Project Area
National Wetland Inventory
Riverine

NCE
Richmond

Via Verdi Slope Stabilization Project

National Wetlands Inventory

N

1 in. = 200 ft.

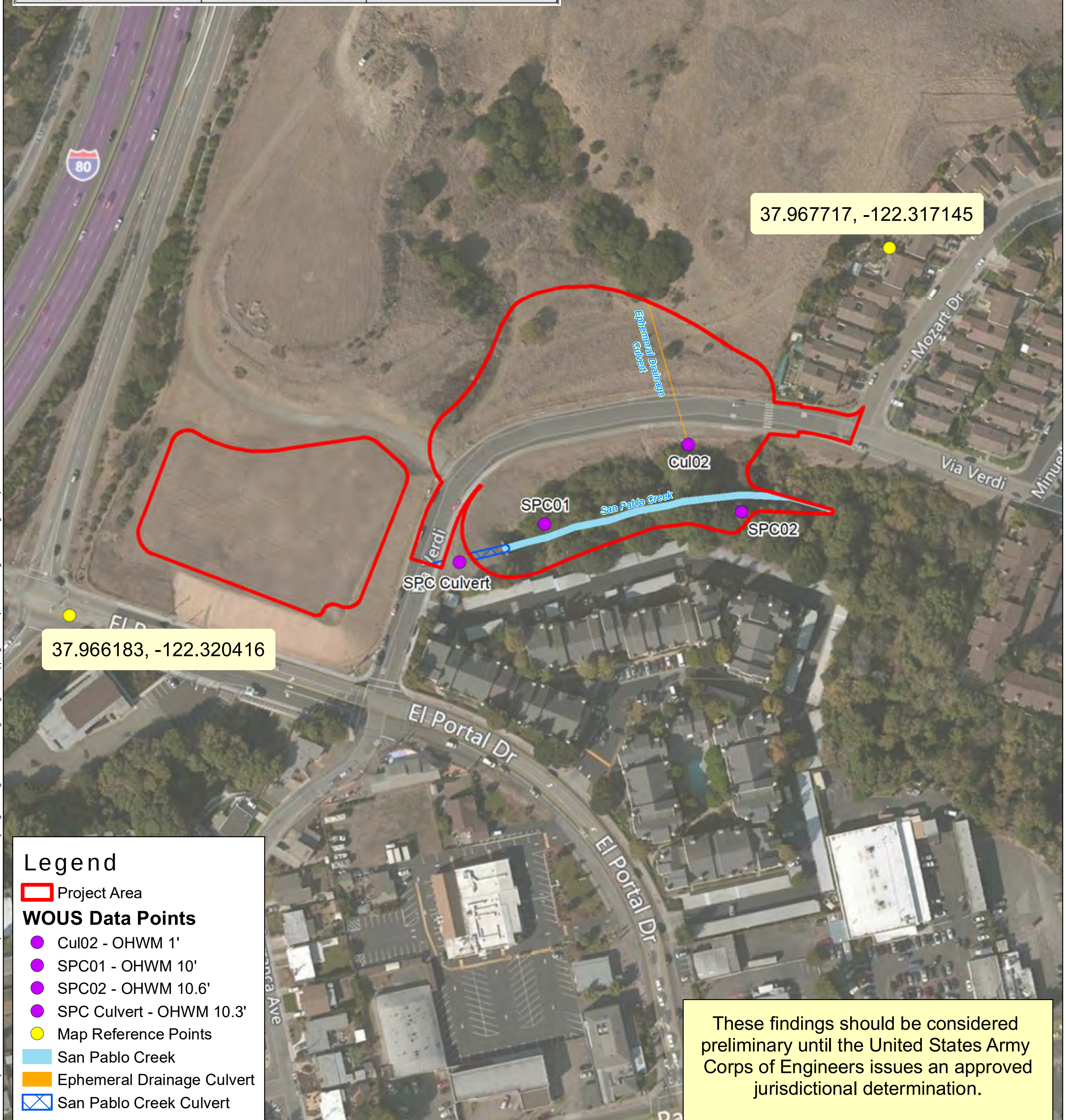
0 100 200 ft.

FIGURE

4

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI Basemaps, NCE, NWI October 2015	568.41.55	danderson	4/20/2018	n/a	drios

Feature	Proposed Jurisdictional Waters (Acres)	Proposed Non-Jurisdictional Waters (Acres)
San Pablo Creek	0.11	
San Pablo Creek Culvert	0.020	
Ephemeral Drainage Culvert	0.004	
TOTAL	**0.134**	**0.0**



These findings should be considered preliminary until the United States Army Corps of Engineers issues an approved jurisdictional determination.

NCE
Richmond

Via Verdi Slope Stabilization Project

Proposed Delineation Map

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE

5

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI Basemaps, NCE, NHD, USGS WBD, LSA 2009	568.41.55	danderson	4/20/2018	n/a	drios

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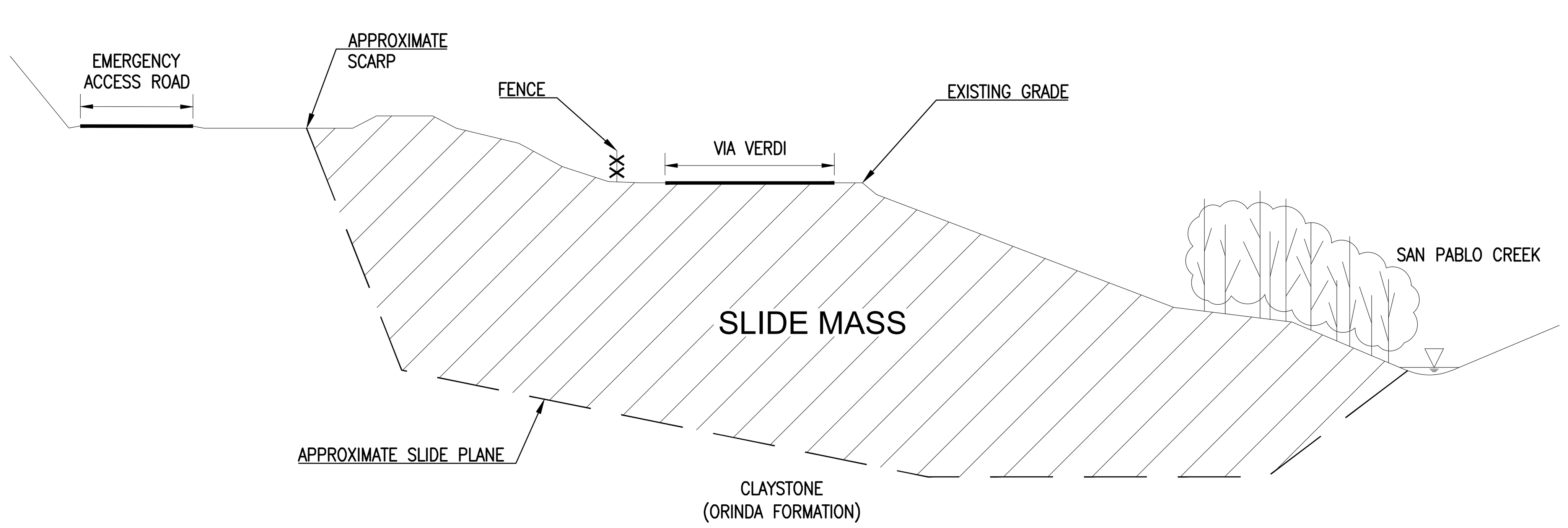
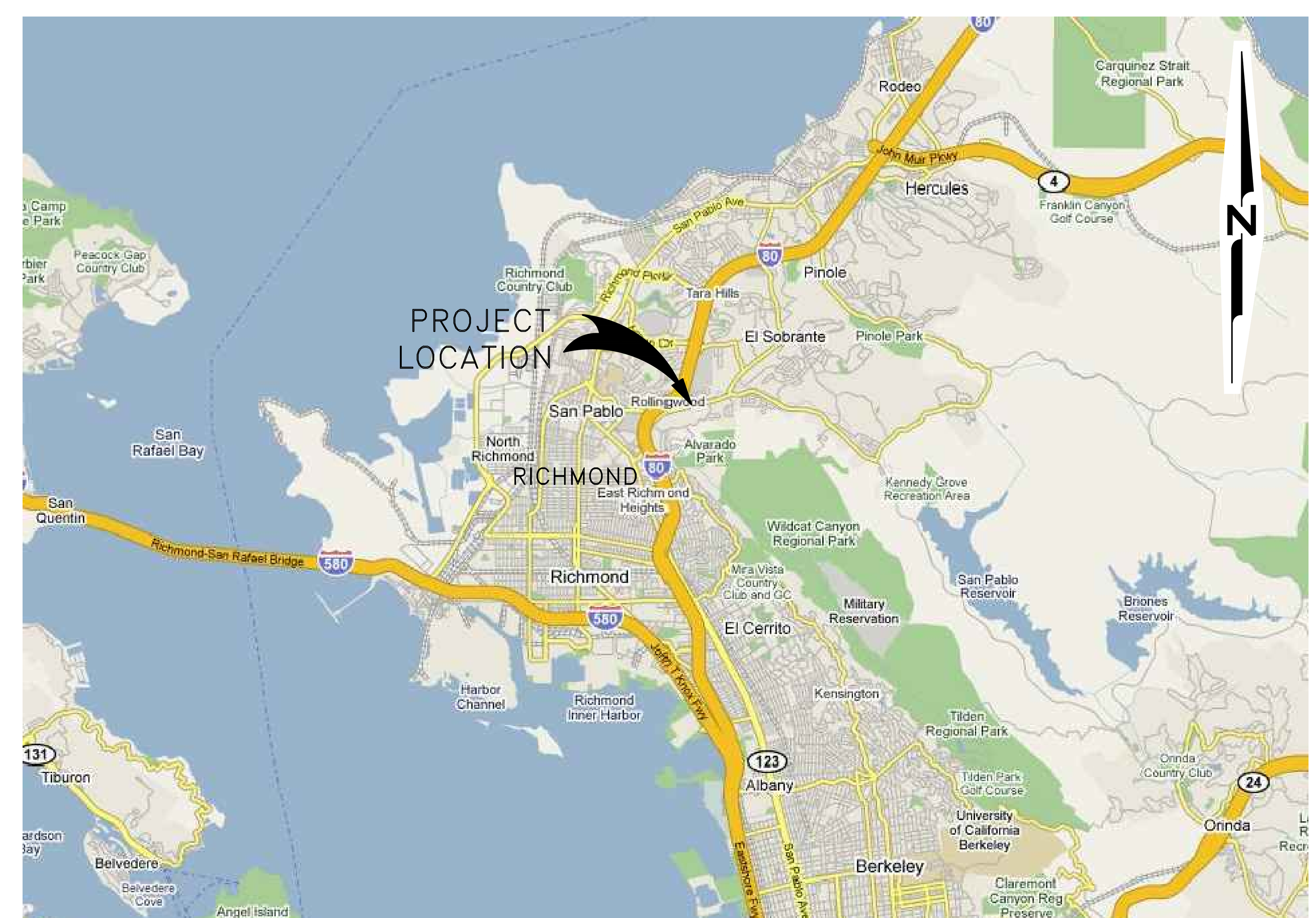


1/1 CROSS SECTION VIEW

N.T.S.

*DATUM: NAD83 (HORIZONTAL) NAVD88 (VERTICAL)



LOCATION MAP
(NOT TO SCALE)

NCE
501 Canal Blvd., Suite I
Richmond, Ca. 94804
(510) 215-3620 * Fax (510) 215-2898

REGISTERED PROFESSIONAL ENGINEER FRANZ G. HALDIMANN NO. C 64725 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION ALTERNATIVES ANALYSIS

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO: 568.41.55
DESIGNED BY: JH, VL
DRAWN BY: VL
CHECKED BY: JRS DATE: 01/03/2018
DATE: 01/17/2018

SHEET TITLE

SITE PLAN

PLATE

1

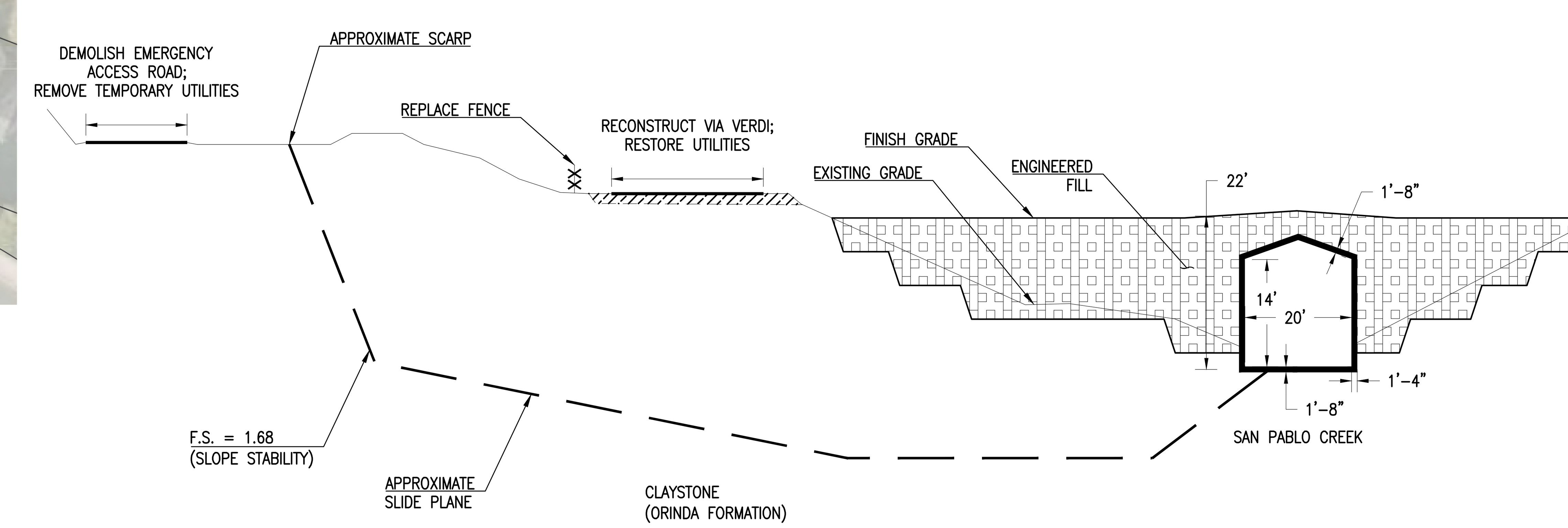
NCE
501 Canal Blvd., Suite I
Richmond, Ca. 94804
(510) 215-3620 * Fax (510) 215-2898

REGISTERED PROFESSIONAL ENGINEER
FRANZ G. HAIDINGER
NO. C 64725
EXP. 06/30/19
CIVIL
STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION ALTERNATIVES ANALYSIS

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804



1/2 CROSS SECTION VIEW
N.T.S.

LEGEND:

- STREET RECONSTRUCTION
- DEMOLISH ROAD
- ENGINEERED FILL
- REVEGETATION AREA
- PROPERTY LINE
- EXISTING EMERGENCY ACCESS ROAD
- VIA VERDI LIMITS OF WORK
- APPROXIMATE SCARP

*DATUM: NAD83 (HORIZONTAL) NAVD88 (VERTICAL)

NO.	DATE	DESCRIPTION

PROJECT NO: 568.41.55
DESIGNED BY: JH, VL
DRAWN BY: VL
CHECKED BY: JRS DATE: 01/03/2018
DATE: 01/17/2018

SHEET TITLE

ALTERNATIVE 1 - TOE BUTTRESS WITH CULVERT

PLATE

2

NCE
501 Canal Blvd., Suite I
Richmond, Ca. 94804
(510) 215-3620 * Fax (510) 215-2898

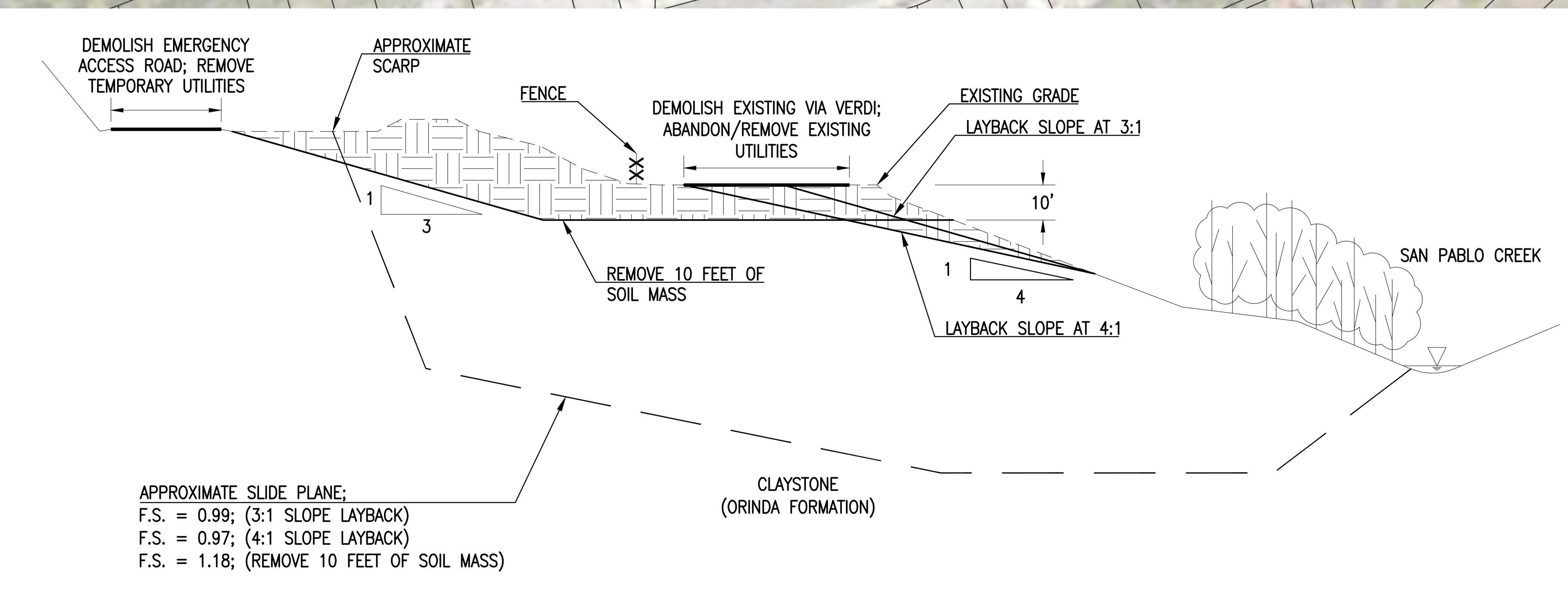
REGISTERED PROFESSIONAL ENGINEER FRANZ G. HALDINGER No. C 64725 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

VIA VERDI SLOPE STABILIZATION ALTERNATIVES ANALYSIS

LEGEND:

- PROPERTY ACQUISITION AREA
- DEMOLISH ROAD
- SLOPE EXCAVATION AND STABILIZATION
- ALTERNATIVE ROUTE
- PROPERTY LINE
- CHAIN LINK FENCE
- APPROXIMATE SCARP
- NEW ACCESS TRAVEL ROUTE TO SOBRANTE GLEN NEIGHBORHOOD
- REVEGETATION AREA

*DATUM: NAD83 (HORIZONTAL) NAVD88 (VERTICAL)



1/3 CROSS SECTION VIEW
N.T.S.

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO:	568.41.55
DESIGNED BY:	JH, VL
DRAWN BY:	VL
CHECKED BY: JRS	DATE: 01/03/2018
DATE:	01/17/2018

SHEET TITLE

ALTERNATIVE 2 - ABANDON VIA VERDI AND CONSTRUCT NEW ACCESS ROAD

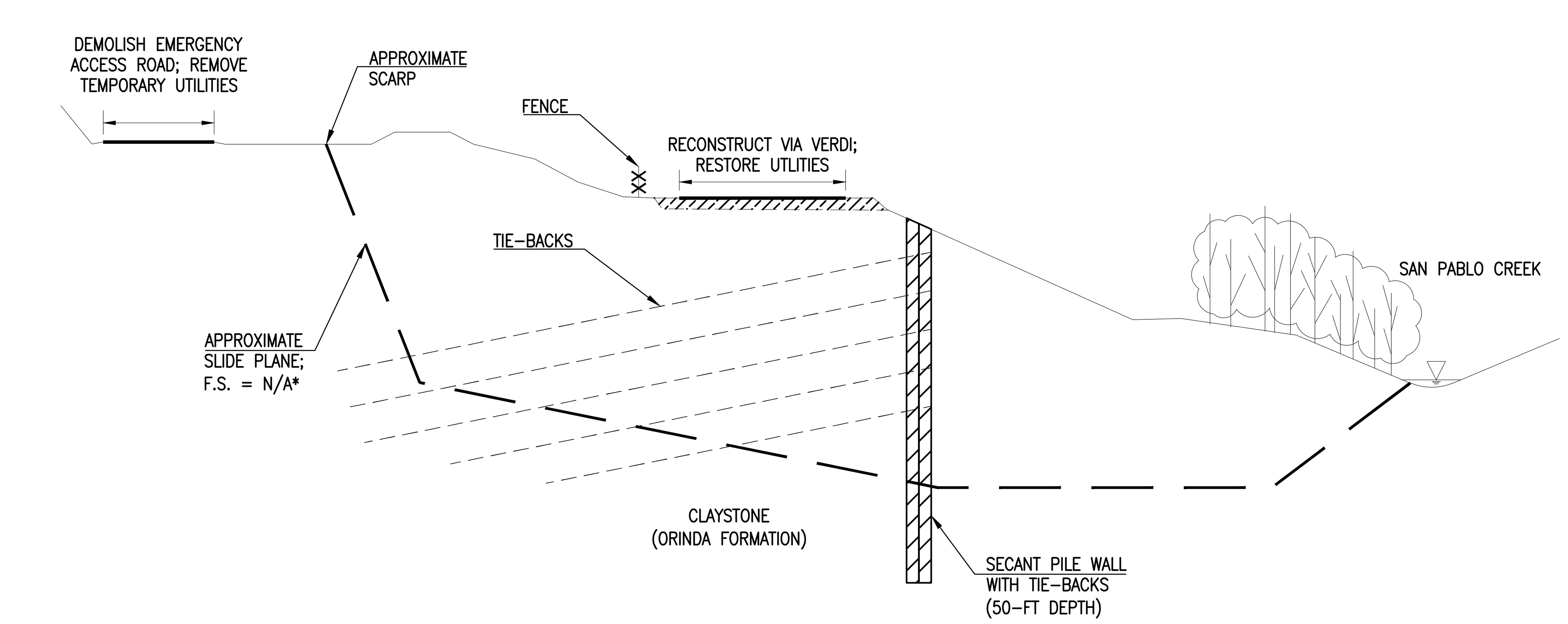
PLATE

3

LEGEND:

(grey fill)	STREET RECONSTRUCTION
(cross-hatch)	DEMOLISH ROAD
(green fill)	REVEGETATION AREA
	PROPERTY LINE
	CHAIN LINK FENCE
	EXISTING EMERGENCY ACCESS ROAD
	VIA VERDI LIMITS OF WORK
	APPROXIMATE SCARP
	TIE-BACKS
	SECANT PILE WALL

*DATUM: NAD83 (HORIZONTAL) NAVD88 (VERTICAL)



1/4 CROSS SECTION VIEW
N.T.S.

* A FACTOR OF SAFETY COULD NOT BE DETERMINED DUE TO THE INFEASIBILITY OF CONSTRUCTING THE WALL.

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VIA VERDI
SLOPE STABILIZATION
ALTERNATIVES
ANALYSIS

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

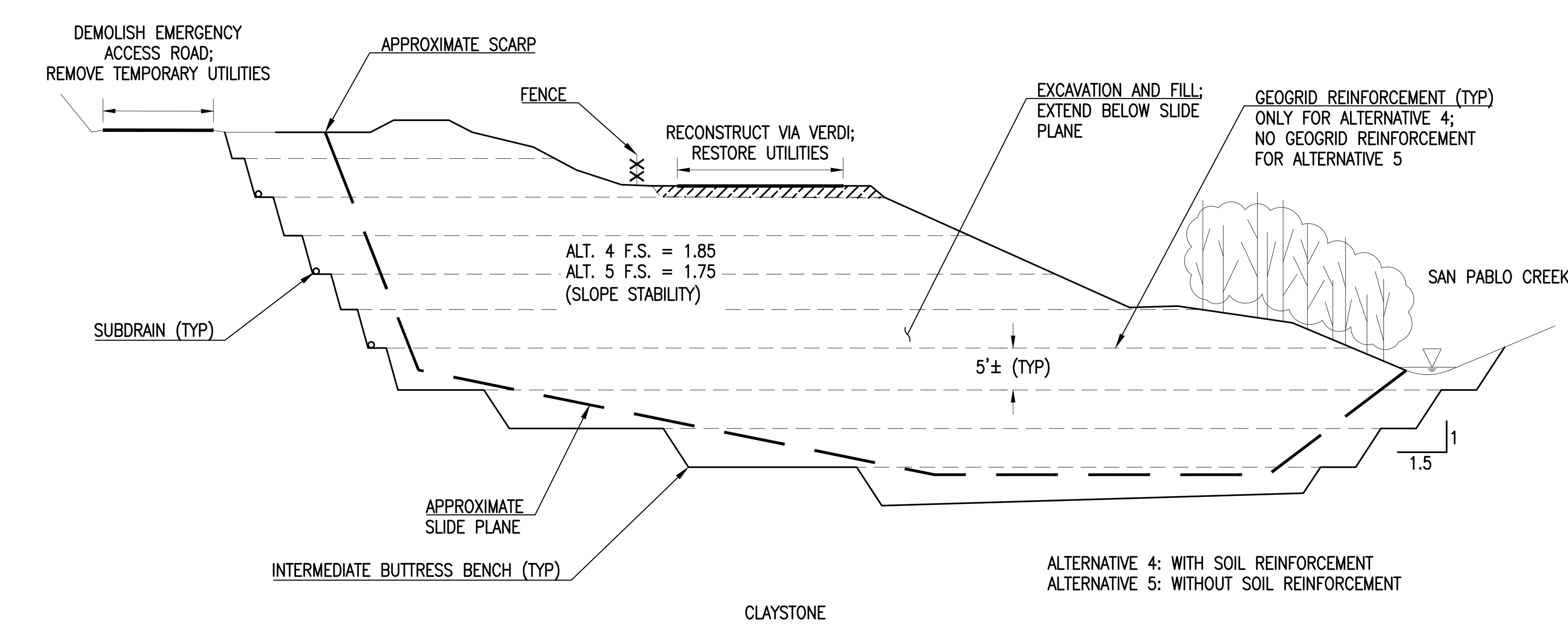
NO.	DATE	DESCRIPTION

PROJECT NO: 568.41.55
DESIGNED BY: JH, VL
DRAWN BY: VL
CHECKED BY: JRS DATE: 01/03/2018
DATE: 01/17/2018

SHEET TITLE

ALTERNATIVE 3 -
RETAINING WALL

PLATE
4



1/5 CROSS SECTION VIEW
N.T.S.

LEGEND:

STREET RECONSTRUCTION	PROPERTY LINE
DEMOLISH ROAD	EXISTING EMERGENCY ACCESS ROAD
EXCAVATION AND FILL	VIA VERDI LIMITS OF WORK
REVEGETATION AREA	APPROXIMATE SCARP

*DATUM: NAD83 (HORIZONTAL) NAVD88 (VERTICAL)

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VIA VERDI SLOPE STABILIZATION ALTERNATIVES ANALYSIS

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO: 568.41.55
DESIGNED BY: JH, VL
DRAWN BY: VL
CHECKED BY: JRS DATE: 01/03/2018
DATE: 01/17/2018

SHEET TITLE

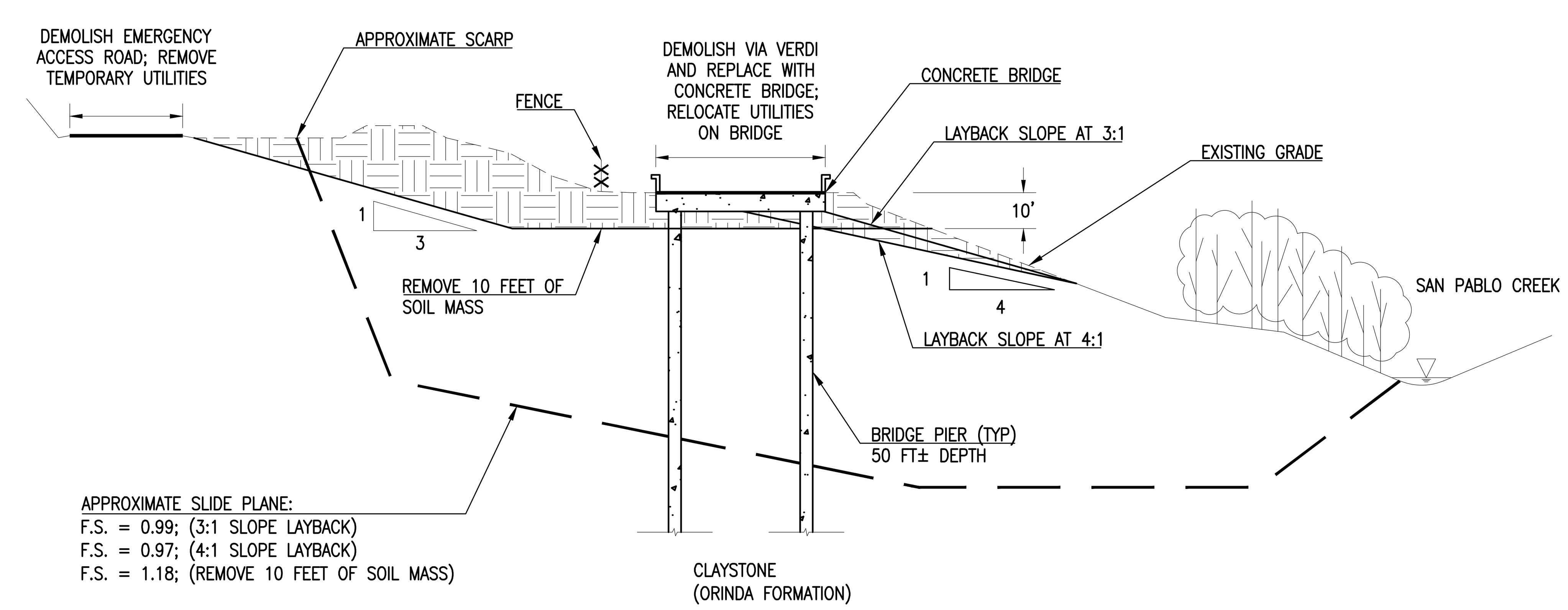
ALTERNATIVES 4 & 5 - EXCAVATE SLIDE MASS AND RECONSTRUCT SLOPE

PLATE
5

LEGEND:

STREET RECONSTRUCTION	REVEGETATION AREA
DEMOLISH ROAD	PROPERTY LINE
	EXISTING EMERGENCY BYPASS ROAD
SLOPE EXCAVATION AND STABILIZATION	VIA VERDI LIMITS OF WORK
	APPROXIMATE SCARP
CONCRETE BRIDGE	

*DATUM: NAD83 (HORIZONTAL) NAVD88 (VERTICAL)



1/6 CROSS SECTION VIEW

N.T.S.

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VIA VERDI SLOPE STABILIZATION ALTERNATIVES ANALYSIS

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

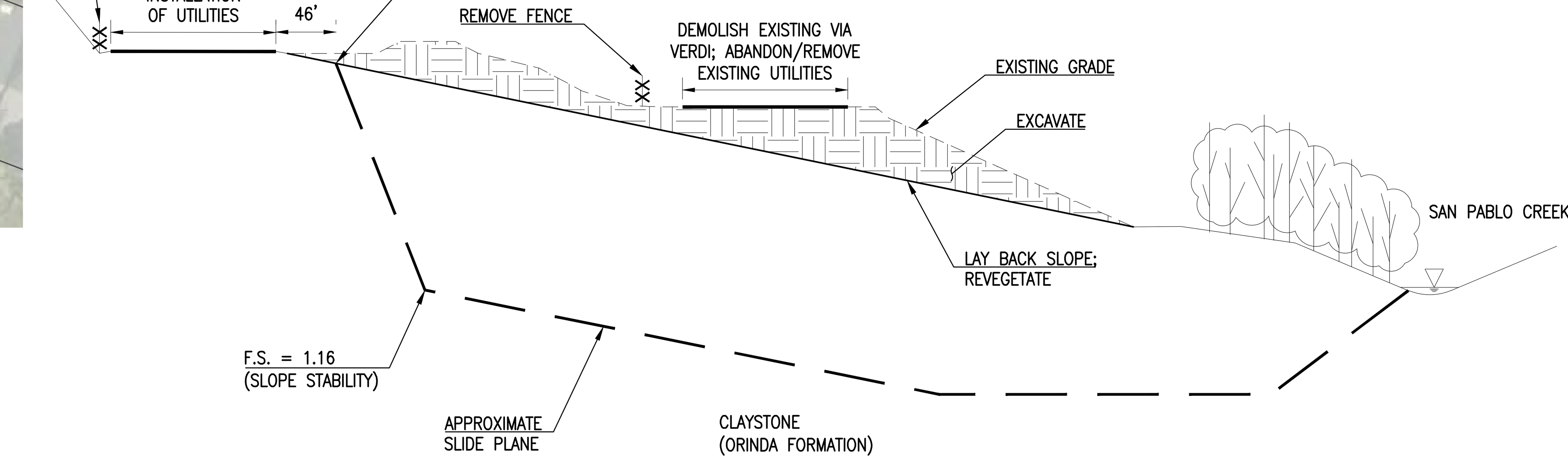
PROJECT NO:	568.41.55
DESIGNED BY:	JH, VL
DRAWN BY:	VL
CHECKED BY: JRS	DATE: 01/03/2018
DATE:	01/17/2018

SHEET TITLE

ALTERNATIVE 6 - CONCRETE BRIDGE

PLATE

6



1/7 CROSS SECTION VIEW
N.T.S.

LEGEND:

STREET RECONSTRUCTION	REVEGETATION AREA
DEMOLISH ROAD	PROPERTY LINE
	EXISTING ROAD
SLOPE EXCAVATION AND STABILIZATION	VIA VERDI LIMITS OF WORK
	APPROXIMATE SCARP

*DATUM: NAD83 (HORIZONTAL) NAVD88 (VERTICAL)

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VIA VERDI SLOPE STABILIZATION ALTERNATIVES ANALYSIS

OWNER
CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

Richmond

NO.	DATE	DESCRIPTION

PROJECT NO: 568.41.55
DESIGNED BY: JH, VL
DRAWN BY: VL
CHECKED BY: JRS DATE: 01/03/2018
DATE: 01/17/2018

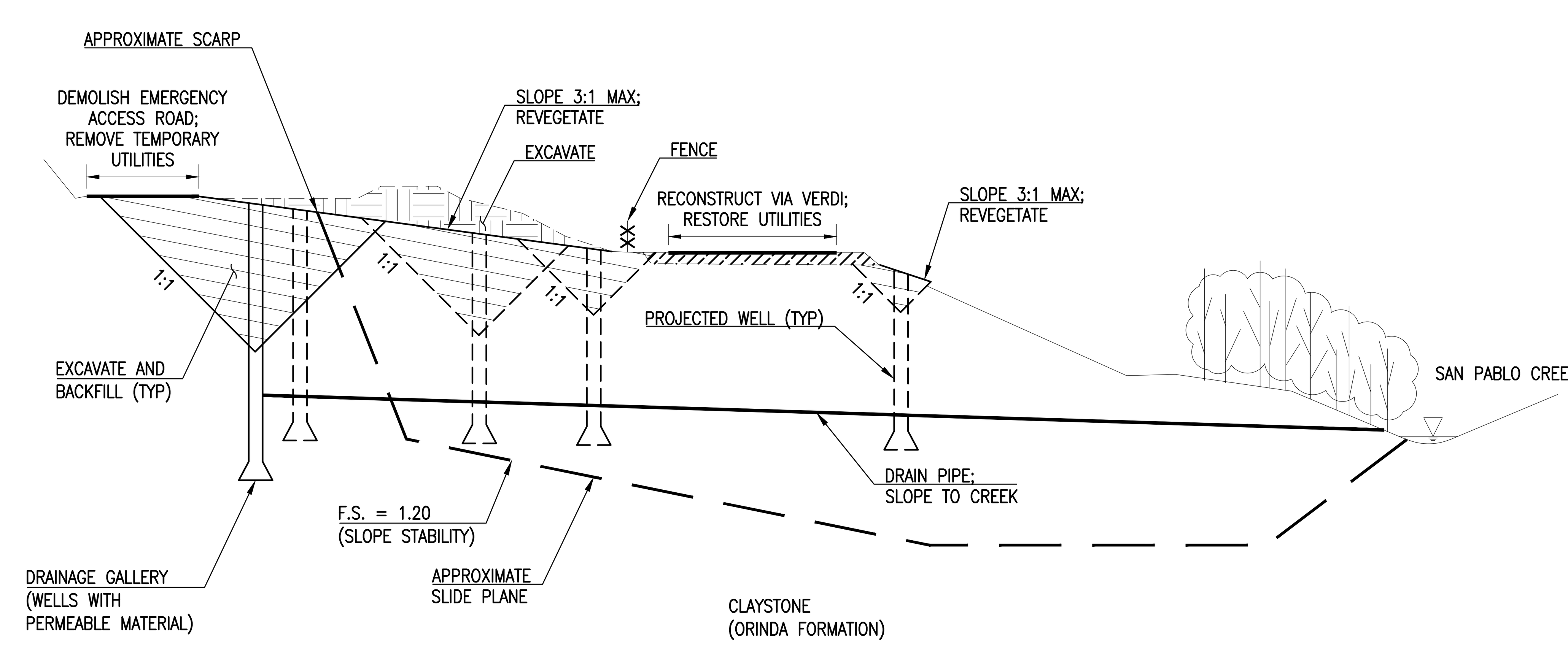
SHEET TITLE
ALTERNATIVE 7 - REALIGN VIA VERDI

PLATE
7

LEGEND:

- STREET RECONSTRUCTION
- DEMOLISH ROAD
- SLOPE EXCAVATION AND STABILIZATION
- REVEGETATION AREA
- PROPERTY LINE
- EXISTING EMERGENCY ACCESS ROAD
- VIA VERDI LIMITS OF WORK
- APPROXIMATE SCARP
- GALLERY PIPE CONNECTIONS

*DATUM: NAD83 (HORIZONTAL) NAVD88 (VERTICAL)



1/8 CROSS SECTION VIEW
N.T.S.

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REGISTERED PROFESSIONAL ENGINEER FRANZ G. HAIDINGER No. C 64725 EXP. 06/30/19 CIVIL STATE OF CALIFORNIA

VIA VERDI
SLOPE STABILIZATION
ALTERNATIVES
ANALYSIS

OWNER

CITY OF RICHMOND
450 CIVIC CENTER PLAZA
RICHMOND, CA 94804

NO.	DATE	DESCRIPTION

PROJECT NO: 568.41.55
DESIGNED BY: JH, VL
DRAWN BY: VL
CHECKED BY: JRS DATE: 01/03/2018
DATE: 01/17/2018

SHEET TITLE

ALTERNATIVE 8 - DRAINAGE GALLERY

PLATE
8

Delineation of Waters of the United States

Via Verdi Slope Stabilization

April 2018

NCE

Richmond, CA

501 Canal Blvd., Suite I

Richmond, CA 94804

City of Richmond

Yader Bermudez, Engineering and CIP Director

450 Civic Center Plaza

Richmond, CA 94804

NCE

Collaboration. Commitment. Confidence.℠

Report for:

DELINEATION OF WATERS OF THE UNITED STATES

Via Verdi Slope Stabilization Project
Contra Costa County, California

Prepared for:

Yader Bermudez, Engineering and CIP Director
City of Richmond
450 Civic Center Plaza
Richmond, CA 94804

Prepared by:

Debra Lemke, PWS, CPESC
Senior Scientist

Reviewed by:

J. Ryan Shafer, PE, GE
Project Manager

NCE
501 Canal Boulevard, Suite I
Richmond, CA 94804

NCE Project Number:
568.41.55

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

City	City of Richmond
CWA	Clean Water Act
I-80	Interstate 80
NAVD	North American Vertical Datum
NWI	National Wetlands Inventory
NRCS	Natural Resource Conservation Service
OHWM	Ordinary High Water Mark
project	Via Verdi Slope Stabilization Project
Rapanos	*Rapanos* v. *United States* and *Carabell* v. *United States*, 126 S. Ct. 2208
SWANCC	*Solid Waste Agency of Northern Cook County* v. *the U.S. Army Corps of Engineers*, 531 U.S. 159
TNW	Traditional Navigable Water
USDA	U.S. Department of Agriculture
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WETS	Wetlands Climate Table
WOUS	Waters of the United States, including wetlands

1.0 EXECUTIVE SUMMARY

NCE performed a field investigation on December 18, 2017, evaluating the potential jurisdictional status of waters of the United States (WOUS) for the Via Verdi Slope Stabilization Project (project). The project is located in Richmond, Contra Costa County, California.

Within the project study area, San Pablo Creek is mapped by the United States Geological Survey. The United States Fish and Wildlife Service, National Wetlands Inventory's online database shows San Pablo Creek and one portion of an ephemeral drainage north of San Pablo Creek within the project study area.

NCE surveyed a total of approximately 5.1 acres. NCE delineated three features (San Pablo Creek, San Pablo Creek Culvert, and a culverted ephemeral drainage) within the project study area. A total of 0.134 acres are potentially jurisdictional WOUS due to the presence of ordinary high water mark indicators, adjacency, and a hydrological connection to a traditional navigable water. The potentially jurisdictional WOUS are:

- San Pablo Creek - approximately 0.11 acres
- San Pablo Creek Culvert - approximately 0.020 acres
- Ephemeral Drainage Culvert - approximately 0.004 acres.

The project area is hydrologically connected to the San Pablo Bay through San Pablo Creek.

The delineation was conducted in accordance with the:

- 1987 Corps of Engineers Wetland Delineation Manual;
- Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0), May 2010; and
- A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States, August 2008.

These findings should be considered preliminary until the United States Army Corps of Engineers makes a final approved jurisdictional determination.

2.0 INTRODUCTION

The City of Richmond (City) contracted NCE to conduct a formal United States Army Corps of Engineers (USACE) delineation of waters of the United States, including wetlands (WOUS) for the Via Verdi Slope Stabilization Project (project). The project is located in Richmond, Contra Costa County, California. The project study area is located east of Interstate 80 (I-80), north of El Portal Drive, and on both the east and west sides of Via Verdi road. To access the project study area from I-80 east, exit 19A El Portal Drive. Next, travel east on El Portal Drive, and then north on Via Verdi road. A site and vicinity map is located in Appendix A, Figure 1.

The City proposes to stabilize a significant slope failure affecting a portion of a roadway named Via Verdi in Richmond, California. Via Verdi is a residential street just east of I-80 that serves as the only access to 85 single family homes and 100 apartment units in a residential area known as the Sobrante Glen neighborhood. During the week of February 20th 2017, a landslide occurred along the existing Via Verdi road alignment. By March the damage to the roadway was significant and the decision was made by the City to close the damaged section of Via Verdi due to safety concerns and to bypass the damaged road section with an emergency access road. Residents are currently accessing their homes via an approximately 650-foot long emergency access road that was constructed in April/March of 2017. Along with slope stabilization, the proposed project would construct a new permanent access road to the Sobrante Glen neighborhood.

The project study area includes approximately 5.1 acres (Appendix A, Figure 2) for the construction of the preferred slope stabilization alternative, placing a toe buttress and concrete culvert within the San Pablo Creek channel. The proposed construction footprint is much smaller than the project study area; the project study area is being used to determine the potential for indirect impacts. This WOUS delineation used the same project study area that was used during the preparation of the biological resource study.

The latitude and longitude of the project study area corners are: 37.966183, -122.320416 (southwest corner) and 37.967717, -122.317145 (northeast corner).

The project intersects the following Assessor's Parcel Numbers: 414-202-128, 414-340-001, 414-340-002, 414-360-041, and 420-021-038.

The project study area is located in Section 2, Township 1 North, Range 4 West of the Mt. Diablo Meridian. The project study area is shown on United States Geological Survey (USGS) Richmond, California 7.5-minute series topographic quadrangle (Appendix A, Figure 2).

This report presents the regulatory guidance, methodology, and results of NCE's review of available literature, aerial photographs, soil surveys, and WOUS delineation for the project study area.

The results are summarized on Figure 5, depicting the proposed jurisdictional WOUS following the technical guidelines provided in the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual, supplemental manuals, and regulatory guidance for identifying WOUS and distinguishing them from aquatic habitats and other non-wetlands.

3.0 REGULATORY FRAMEWORK

The USACE regulates discharge of dredged or fill material into waters of the United States under Section 404 of the Clean Water Act (CWA). "Discharges of fill material" are defined as the addition of fill material into WOUS, including, but not limited to the following: placement of fill that is necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; and fill for intake and outfall pipes and subaqueous utility lines [33 C.F.R. §328.2(f)].

Section 404 of the CWA requires approval prior to discharging dredged or fill material into the WOUS. Typical activities requiring Section 404 permits are:

- Depositing of fill or dredged material in waters of the U.S. or adjacent wetlands.
- Site development fill for residential, commercial, or recreational developments.
- Construction of revetments, groins, breakwaters, levees, dams, dikes, and weirs.
- Placement of riprap and road fills.

Section 401 of the CWA (33 U.S.C. 1341) requires any applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into WOUS to obtain a certification that the discharge will comply with the applicable effluent limitations and water quality standards.

Section 10 of the Rivers and Harbors Act of 1899 requires approval prior to the accomplishment of any work in or over navigable waters of the United States, or which affects the course, location, condition, or capacity of such waters. Typical activities requiring Section 10 permits are:

- Construction of piers, wharves, bulkheads, dolphins, marinas, ramps, floats intake structures, and cable or pipeline crossings.
- Dredging and excavation.

Any person, firm, or agency (including federal, state, and local government agencies) planning to work in navigable WOUS, or dump or place dredged or fill material in WOUS, must first obtain a permit from the USACE. Permits, licenses, variances, or similar authorizations may also be required by other federal, state, and local statutes.

3.1 WATERS OF THE UNITED STATES

Waters of the United States include essentially all surface waters such as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters. Navigable WOUS are defined as waters that have been used in the past, are now used, or are susceptible to use as a means to transport interstate or foreign commerce up to the head of navigation. Section 10 and/or Section 404 permits are required for construction activities in these waters. Boundaries between jurisdictional waters and uplands are determined in a variety of ways depending on which type of water is present. Methods for delineating wetlands and non-tidal waters are described below.

Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" [33 C.F.R. §328.3(b)]. Presently, to be a wetland, a site must exhibit positive indicators of three wetland criteria: hydrophytic vegetation, hydric soils, and wetland hydrology existing under the "normal circumstances" for the site.

The lateral regulatory extent of non-tidal waters is determined by delineating the ordinary high water mark (OHWM) [33 C.F.R. §328.4(c)(1)]. The OHWM is defined by the USACE as "that line on shore established by the fluctuations of water and indicated by physical character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" [33 C.F.R. §328.3(e)].

3.2 THE SOLID WASTE AGENCY OF NORTHERN COOK COUNTY (SWANCC) DECISION

The *Solid Waste Agency of Northern Cook County v. the U.S. Army Corps of Engineers*, 531 U.S. 159 (2001), is more commonly referred to as the SWANCC decision. The decision involved a challenge to CWA jurisdiction over certain isolated, intrastate, non-navigable ponds in Illinois that formerly had been gravel mine pits, but which, over time, provided habitat for migratory birds. Although these ponds served as migratory bird habitat, they were non-navigable and isolated from the tributary system of other waters regulated under the CWA. In the SWANCC decision, the Supreme Court held that the USACE had exceeded its authority in asserting CWA jurisdiction pursuant to § 404(a) over the waters at issue based on their use as habitat for migratory birds, pursuant to preamble language, commonly referred to as the Migratory Bird Rule (51 Fed. Reg. 41217 [1986]).

The SWANCC decision eliminates CWA jurisdiction over isolated waters that are intrastate and non-navigable, where the sole basis for asserting CWA jurisdiction is the actual or potential use of the waters as habitat for migratory birds that cross state lines in their migrations. CWA jurisdiction extends to waters, including wetlands, which are adjacent to navigable waters pursuant to the Supreme Court holding in Riverside Bayview Homes, which was endorsed in SWANCC as controlling law. The USACE and EPA regulations currently define the term 'adjacent' as "bordering, contiguous, or neighboring" [33 C.F.R. § 328.3(b)]. The case law on the precise scope of federal CWA jurisdiction since SWANCC is still developing.

3.3 THE RAPANOS DECISION

The consolidated cases *Rapanos v. United States* and *Carabell v. United States*, 126 S. Ct. 2208 (2006) are referred to as Rapanos. The Supreme Court's decision in these consolidated cases addressed where the federal government can apply the CWA, specifically by determining whether a wetland or tributary is a "water of the United States." The justices issued five separate opinions in Rapanos, with no single opinion commanding a majority of the Court.

The plurality of the Court concluded that the USACE's regulatory authority should extend only to "relatively permanent, standing, or continuously flowing bodies of water" connected to traditional navigable waters (TNWs), and to "wetlands with a continuous surface connection to" such relatively permanent waters (USACE and U.S. EPA 2007). Justice Kennedy concluded that wetlands are Waters of the United States "if the wetlands, either alone or in combination with similarly situated lands in the region, significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as *navigable*. When, in contrast, a wetland's effects on water quality are speculative or insubstantial, they fall outside the zone fairly encompassed by the statutory term "*navigable waters*" (USACE and U.S. EPA 2007).

When there is no majority opinion in a Supreme Court case, controlling legal principles may be derived from those principles espoused by five or more justices. Thus, regulatory jurisdiction under the CWA exists over a “water” if either the plurality or Justice Kennedy’s standard is satisfied (USACE and U.S. EPA 2007).

As a result of the Rapanos decision, the USACE will assert jurisdiction over the following waters:

- Traditional navigable waters
- Wetlands adjacent to traditional navigable waters
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months)
- Wetlands that directly abut such tributaries

The agencies will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:

- Non-navigable tributaries that are not relatively permanent
- Wetlands adjacent to non-navigable tributaries that are not relatively permanent
- Wetlands adjacent to but that do not directly abut a relatively permanent non-navigable tributary

The USACE generally will not assert jurisdiction over the following features:

- Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow)
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water

The USACE will apply the significant nexus standard as follows:

- A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of downstream traditional navigable waters
- Significant nexus includes consideration of hydrologic and ecologic factors

4.0 METHODS

4.1 RESEARCH AND FIELD METHODOLOGY

Prior to the field investigation, USGS topographic maps and National Hydrologic Dataset mapping, aerial photographs, United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping, and a Natural Resource Conservation Service (NRCS) custom soil report of the project study area were reviewed for indications of ephemeral, intermittent, and perennial drainages as well as mapped wetlands and spring locations.

NCE has been visiting the project study area since February 2017. NCE visited the project study area on December 18, 2017 and conducted a formal field investigation to identify possible jurisdictional WOUS. NCE personnel traversed the project study area and identified one drainage (San Pablo Creek), and two culverts (San Pablo Creek Culvert and a culverted ephemeral drainage).

San Pablo Creek, San Pablo Creek culvert, and a culverted ephemeral drainage were identified within the project study area. Upstream of the culverted ephemeral drainage is a non-culverted ephemeral drainage, however, this drainage is not within the project study area. San Pablo Creek, San Pablo Creek culvert, and the culverted ephemeral drainage were assessed for the presence of OHWM indicators and some evidence that the drainage experiences surface water flows on a frequent and regular basis. Also, a connection to a TNW was determined. These characteristics were considered to be indicative of a jurisdictional WOUS.

Arid West Ephemeral and Intermittent Stream OHWM Datasheets were completed at representative drainage locations with the presence of OHWM indicators. Where the drainage exhibited OHWM indicators, width measurements were taken to be used in determining an average width of the drainage and height measurements from the OHWM to the drainage bottom were taken. When drainages with OHWM indicators left the project study area, an attempt was made to follow the drainage to determine if OHWM indicators terminated or if there was a connection to a TNW. OHWM indicator locations were recorded with a Trimble Geo7x GPS unit and representative photographs were taken. Representative photographs are provided in Appendix B. The Arid West OHWM data sheets are provided in Appendix C.

4.2 SURVEY DATA INTEGRATION

Boundaries of WOUS within the project study area were field mapped using a Trimble Geo7x GPS unit. Figures were developed in ESRI ArcGIS 10.5 software and present aerial imagery and 10-foot contour topographic basemaps.

5.0 FINDINGS

5.1 SURVEY AREA DESCRIPTION

5.1.1 Survey Area Location

The project study area is located in Section 2, Township 1 North, Range 4 West of the Mt. Diablo Meridian in Contra Costa County, California.

5.1.2 Land Use

According to the Contra Costa County, General Plan, Land Use Element figure, the project study area includes Open Space, Multiple Family Residential, and Single Family Residential General Plan Designations for Land.

5.2 PHYSICAL FEATURES

5.2.1 Soils and Wetlands Climate Table

Soils within the project study area have been mapped by the NRCS (NRCS, 2018a). The custom NRCS Soil Resource Report includes three soil types: Los Osos clay loam, 15 to 30 percent slopes, Conejo clay loam, 0 to 2 percent slopes and Cut and fill land-Los Osos complex, 9 to 30 percent slopes. The NRCS descriptions of the soil types are described below, shown on Table 1, and are depicted on Appendix A, Figure 3.

Soil Unit: Los Osos clay loam, 15 to 30 percent slopes

This soil until is typically found at elevations between 100 to 2,500 feet above mean sea level. The components of this soil type are 85% Los Osos and similar soils, and 13% minor (Alo, Millsholm, Lodo, Diablo, and Tierra). The frequency of flooding and ponding are none and the available water capacity is low.

This soil type is found near the northern portion of the project area. Los Osos clay loam, 15 to 30 percent slopes is not classified as hydric on the National Hydric Soils List for Contra Costa County, California (NRCS, 2018b).

Soil Unit: Conejo clay loam, 0 to 2 percent slopes

This soil unit is typically found at elevations between 10 to 1,000 feet above mean sea level. The components of this soil type are 85% Conejo and similar soils and 15% minor (Unnamed, Botella, and Clear lake). The frequency of flooding and ponding are none and the available water capacity is high.

This soil type is found near the southern portion of the project area. Conejo clay loam, 0 to 2 percent slopes is classified as hydric on the National Hydric Soils List for Contra Costa County, California (NRCS, 2018b).

Soil Unit: Cut and fill land-Los Osos complex, 9 to 30 percent slopes

This soil until is typically found at elevations between 100 to 2,500 feet above mean sea level. The components of this soil type are 70% cut and fill land, 15% Los Osos and similar soils, and 15% minor (Alo and Sehorn). The frequency of flooding and ponding are none and the available water capacity is low.

This soil type is found on a small portion of the western side of the project area. Cut and fill land-Los Osos complex, 9 to 30 percent slopes is not classified as hydric on the National Hydric Soils List for Contra Costa County, California (NRCS, 2018b).

Table 1. Soils in the Project Study Area

Soil Series/Soil	Map Symbol	Drainage Class	% of Project Boundary (Per NRCS Custom Soil Report)
Los Osos clay loam, 15 to 30 percent slopes	LhE	Well Drained	47.8%
Conejo clay loam, 0 to 2 percent slopes	CeA	Well Drained	49.7%
Cut and fill land-Los Osos complex, 9 to 30 percent slopes	CnE	Well Drained	2.5%

The Wetlands Climate Table (WETS) (NRCS, 2018c) is located in Appendix D. The WETS table reflects data from the period of record of 1995-2017 from the station that is the closest to the project area (Richmond).

5.2.2 Topography

Topography in the vicinity of the site ranges from rolling to steep. Elevations of the project site range from approximately 70 feet to 120 feet (21.34 meters to 36.58 meters) above mean sea level.

5.2.3 Project Study Area Hydrology/NWI

San Pablo Creek is an USGS topography blue line drainage within the project study area; the ephemeral drainage that has been culverted is not an USGS topography blue line drainage (USGS Richmond Quadrangle 7.5 Minute Series).

San Pablo Creek is located near the southern project study area boundary, and the creek flows from east to west. San Pablo Creek is identified as perennial per the USGS. The San Pablo dam is located approximately 3.5 miles upstream of the project study area. Approximately 2,000 feet downstream of the project study area is the I-80 culverted stream crossing. San Pablo Creek ultimately discharges into the San Pablo Bay.

The ephemeral drainage culvert is north of San Pablo Creek. The drainage was dry at the time of the WOUS delineation. The ephemeral drainage travels from the north to the south, and into a culvert upstream (north) of Via Verdi. The drainage is culverted under Via Verdi and there is a culvert outfall on the south side of Via Verdi, approximately 27 feet above San Pablo Creek. There is no defined channel from the culvert outfall to San Pablo Creek.

The USFWS NWI shows two riverine segments (San Pablo Creek and an unnamed ephemeral drainage) in the project area (Appendix A, Figure 4). San Pablo Creek is the only riverine segment present. The ephemeral drainage segment is culverted underground and to the east of the NWI mapped segment. The ephemeral drainage culvert outfall is located approximately 27 feet above the second riverine segment (San Pablo Creek).

5.3 HABITATS

Five general habitat types were identified on the project site. These are native-nonnative ornamental, California annual grassland, coyote brush chaparral, broadleaf deciduous riparian woodland, and mixed broadleaf woodland (Sawyer and Keeler-Wolf, 1995).

5.4 CLASSIFICATION OF WATERS OF THE UNITED STATES

One drainage and two culverts were identified within the project study area. A description of the feature types delineated is below.

5.4.1 Drainages and Culverts

One drainage was identified within the project study area: San Pablo Creek. Two culverts were identified within the project study area: San Pablo Creek Culvert and Ephemeral Drainage Culvert.

<u>San Pablo Creek</u>
San Pablo Creek is located near the southern project boundary; flow was present during the WOUS delineation. Ordinary high water mark datasheets were completed at two representative locations for San Pablo Creek within the project study area. Data point SPC01 was taken near the western project boundary and data point SPC02 was taken near the eastern project boundary.

At data point SPC01, San Pablo's Creek OHWM width was 10 feet and the OWHM depth was 18 inches.

At data point SPC02, San Pablo's Creek OHWM width was 10 feet 6 inches and the OWHM depth was 18 inches.

The dominant vegetation along the banks of San Pablo Creek consisted of blackberries, ivy, grasses, and mature willows.

Near the western project boundary, San Pablo Creek flows into a culvert, the culvert is under Via Verdi road, and then the culvert continues off of the project study area. San Pablo Creek eventually discharges into the San Pablo Bay, a traditional navigable water.

<u>San Pablo Creek Culvert</u>
San Pablo Creek flows into the San Pablo Creek Culvert near the western project boundary. Due to safety concerns the WOUS delineation team did not enter the culvert to measure the diameter of the culvert. Therefore, the OHWM of the culvert was determined by averaging the two upstream OHWM widths. The OHWM for the San Pablo Creek Culvert was determined to be 10 feet and 3 inches.

<u>Ephemeral Drainage Culvert</u>
North of the project boundary is an unnamed ephemeral drainage; this drainage is not within the project study area. The drainage was dry at the time of the WOUS delineation. Within the project study area the drainage is culverted, and the culvert outfall is located on the southern side of Via Verdi road. The culvert outfall (data point Cul02) had a diameter of 12 inches.

The culvert outfall is approximately 27 feet above San Pablo Creek. There was no evidence that the culvert outfall experiences surface water flows on a frequent and regular basis; there was no defined bed and bank below the culvert outfall upstream of San Pablo Creek.

Appendix A, Figure 5 depicts the locations of San Pablo Creek, San Pablo Creek Culvert, and the Ephemeral Drainage Culvert, as well as the data points SPC01, SPC02, and CUL02.

Representative photographs are in Appendix B.

Appendix A, Figure 6 presents the spatial location and camera orientation of the ground photographs.

Tables 2a and 2b summarize the data collected at San Pablo Creek, San Pablo Creek Culvert, and the Ephemeral Drainage Culvert, including the lengths of culverts within the project study area and the drainage photograph summary.

Table 2a. Drainage and Culvert Data Summary

Location	OHWM Indicators Present	Estimated Length of Drainage (feet)	Width of Drainage at Data Point (inches)	Acreage	Jurisdictional / Connection to a TNW
San Pablo Creek	Yes	482	123.5	0.11	Hydrologic connection to San Pablo Bay
San Pablo Creek Culvert	Yes	85	123.5	0.020	Hydrologic connection to San Pablo Bay
Ephemeral Drainage Culvert	Yes	213	12	0.004	Adjacent to San Pablo Creek

Table 2b. Drainage Ground Photograph Summary

Location	Data Point	Photograph (P) Number	Camera Direction	Latitude & Longitude	Description
San Pablo Creek	SPC01	P-1	Looking northeast	37.966449 & -122.319151	Looking upstream (Appendix B)
San Pablo Creek	SPC01	P-2	Looking southwest	37.966449 & -122.319151	Looking downstream (Appendix B)
San Pablo Creek	SPC02	P-3	Looking east	37.966499 & -122.318168	Looking upstream (Appendix B)
San Pablo Creek	SPC02	P-4	Looking west	37.966499 & -122.318168	Looking downstream (Appendix B)
Ephemeral Drainage Culvert	Cul02	P-5	Looking south	37.966761 & -122.318432	Looking directly at culvert outfall (Appendix B)
Ephemeral Drainage Culvert	Cul02	P-6	Looking northeast	37.966761 & -122.318432	Standing on right bank, looking upstream at riparian corridor (Appendix B)

A total of 0.134 acres of potential WOUS were delineated at the project study area.

The Ephemeral Drainage Culvert outlet is approximately 27 feet above Pablo Creek. If and when the ephemeral drainage carries flow and discharges into the uplands above San Pablo Creek, the discharge has the potential to flow into San Pablo Creek. This flow could affect the integrity of the water quality of San Pablo Creek.

San Pablo Creek flows through the San Pablo Creek Culvert, and eventually flows into the San Pablo Bay. San Pablo Creek has the potential to affect the integrity of the water quality of San Pablo Bay, a traditional navigable water.

San Pablo Creek, San Pablo Creek Culvert, and the Ephemeral Drainage Culvert are proposed as jurisdictional and subject to regulation under the CWA.

6.0 CONCLUSION

Application of routine WOUS delineation techniques and SWANCC and Rapanos guidelines revealed the presence of features that appear to conform to the definition of WOUS pursuant to Section 404 of the federal CWA.

A total of 0.136 acres of WOUS which include culverts were delineated within the project study area and are proposed jurisdictional and subject to regulation under the CWA.

Table 3 below provides acreage per feature and summarizes the total acreage of proposed WOUS in the project study area. Appendix A, Figure 5 depicts the proposed delineation map. Appendix A, Figure 7 depicts the proposed jurisdictional determination analysis map.

Table 3. Summary of Drainage and Culverted WOUS in the Project Study Area

Feature	Proposed Jurisdictional Waters (Acres)	Proposed Non-Jurisdictional Waters (Acres)
San Pablo Creek	0.11	
San Pablo Creek Culvert	0.020	
Ephemeral Drainage Culvert	0.004	
TOTAL	**0.134**	**0.0**

This report and the Aquatic Resources Table are located on a CD in Appendix E.

The above findings should be considered preliminary until the USACE makes a final approved jurisdictional determination. Areas deemed jurisdictional will then be subject to the regulatory requirements of the CWA.

7.0 SIGNIFICANT NEXUS

The U.S Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook (USACE 2007) was consulted to aid the preliminary determination whether an area would be subject to USACE jurisdiction under Section 404 of the Clean Water Act. The significant nexus test, outlined in a memorandum jointly authored by the U.S. Environmental Protection Agency and USACE, was applied to each potentially jurisdictional habitat type (Grumbles and Woodley 2008). To facilitate jurisdictional determination consistent with the guidance, each water body delineated was evaluated as a Traditional Navigable Water (TNW), Relatively Permanent Water (RPW), or non-RPW, based on the following definitions:

- TNWs include all waters subject to the ebb and flow of the tide, or waters that are presently used, have been used in the past, or may be used in the future to transport interstate or foreign commerce, and all waters that are navigable in fact under federal law for any purpose.
- RPWs are waters that flow continuously at least seasonally (typically at least 3 months of the year) and are not TNWs.
- Non-RPWs are waters that do not have continuous flow at least seasonally.

The following types of water bodies are subject to Clean Water Act jurisdiction:

- All TNWs and adjacent wetlands;
- Relatively permanent tributaries of TNWs and wetlands with a continuous surface connection to such tributaries; and
- Non-relatively permanent tributaries of TNWs and adjacent wetlands if they have a significant nexus to a TNW. Non-RPWs and adjacent wetlands are determined to have a significant nexus to a TNW if they significantly affect the chemical, physical, or biological integrity of a downstream TNW.

NCE’s professional opinion is that during storm events the Ephemeral Drainage Culvert outfall could discharge storm water to the uplands adjacent to San Pablo Creek; this storm water could sheet flow into San Pablo Creek. San Pablo Creek possess a hydrological connection to the San Pablo Bay, a traditional navigable water. During a storm event, the Ephemeral Drainage Culvert outfall has the ability to affect the chemical, physical, and/or biological integrity of San Pablo Creek, resulting in a significant nexus to San Pablo Bay.

8.0 CONTACT INFORMATION

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Prepared by:

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501 Canal Boulevard, Suite I
Richmond, California 94804
Phone: (510) 215-3620

9.0 REFERENCES

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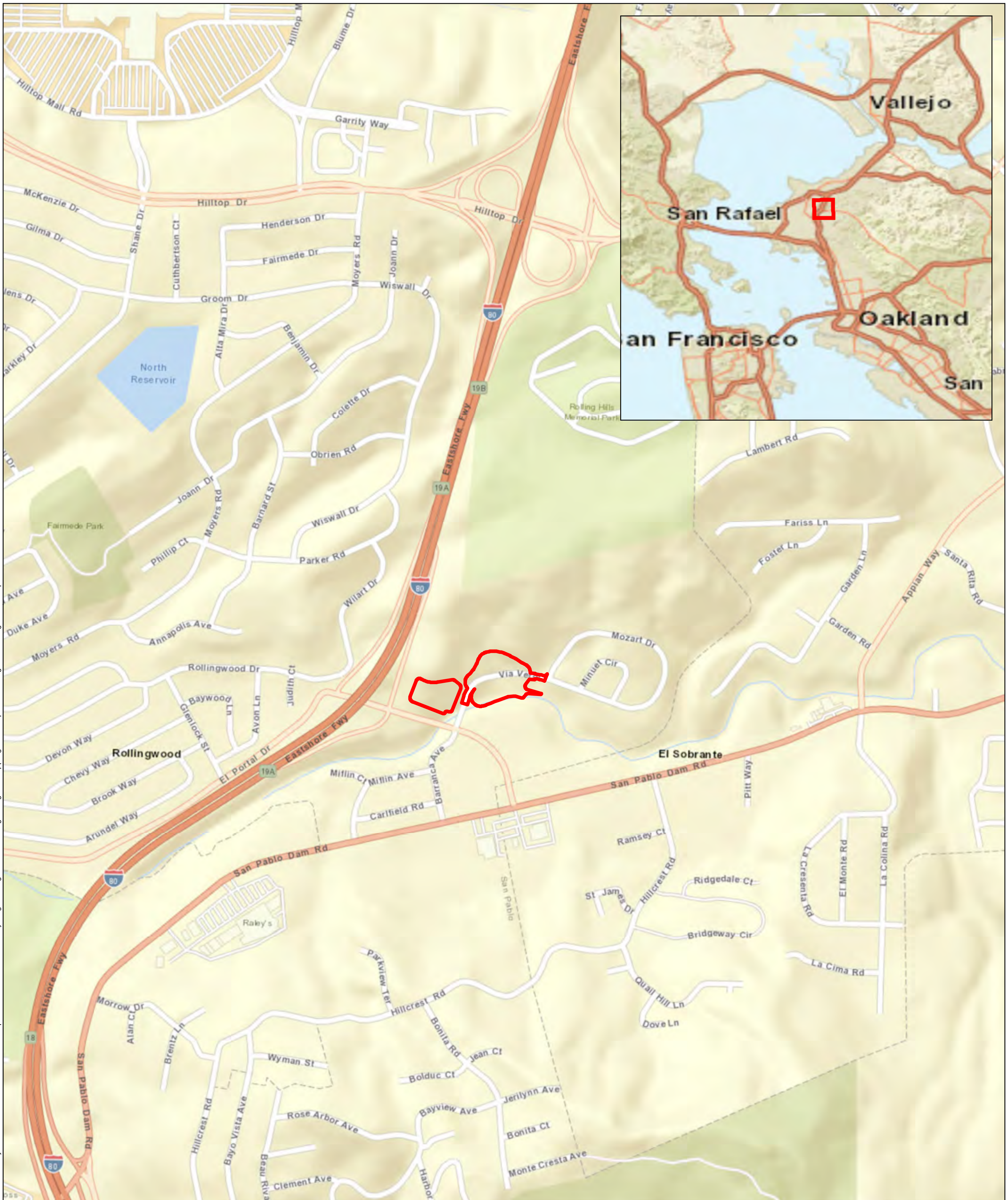
U.S. Geological Survey. Richmond, California. 7.5-minute series topographic quadrangle. U.S. Department of the Interior.

Appendix A

Figures



Legend

Project Area

Via Verdi Slope Stabilization Project

Site and Vicinity Map

N

1 in. = 1,000 ft.

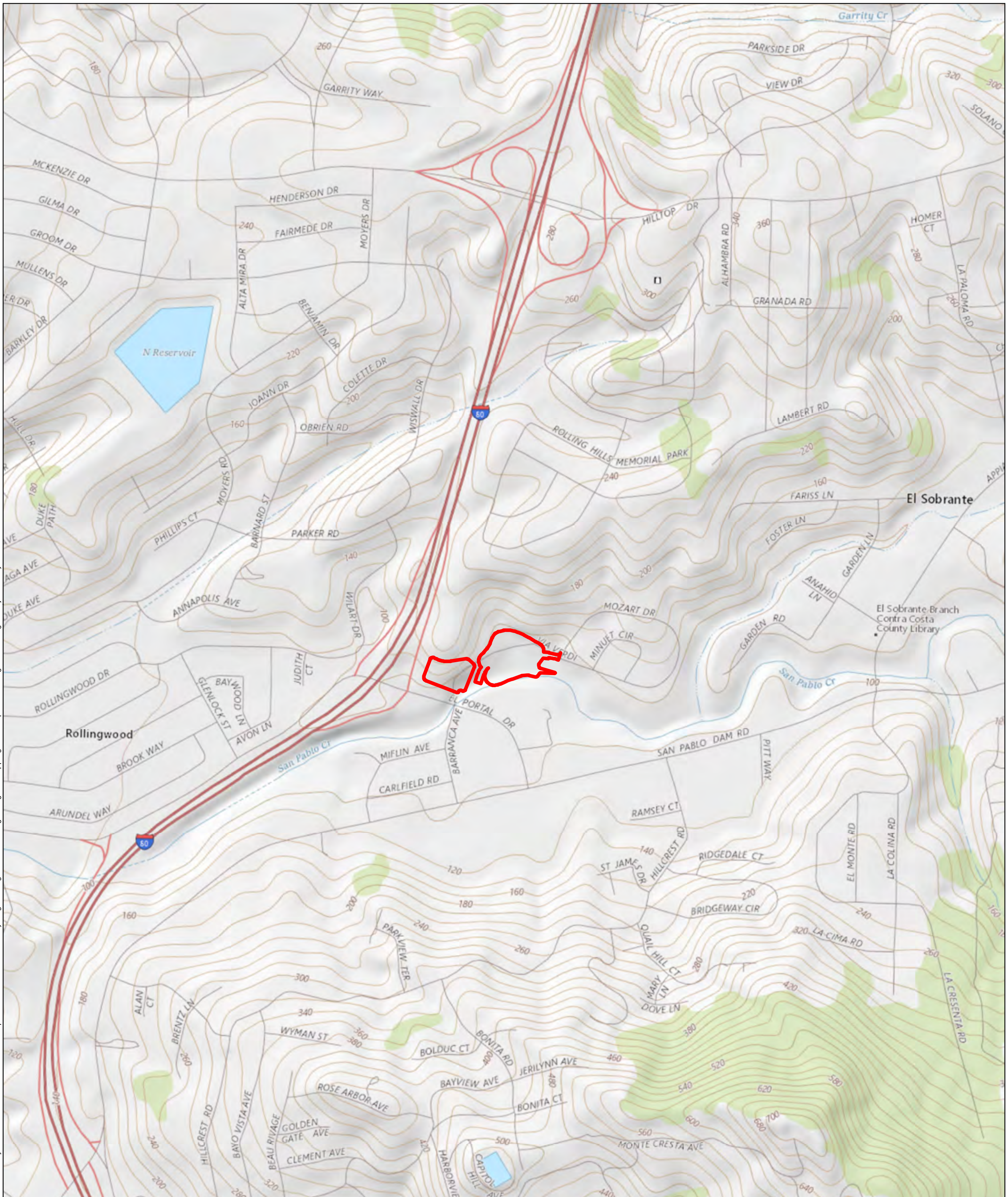
0 500 1,000 ft.

FIGURE

1

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
NCE, ESRI USGS National Topography Basemap	568.41.55	danderson	4/20/2018	n/a	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\WOUS Figures\VV Fig 1 Site Map.mxd



Legend

Project Area - 5.1 ac

Via Verdi Slope Stabilization Project

Project Study Area with USGS Quadrangle

N

1 in. = 1,000 ft.

0 500 1,000 ft.

FIGURE 2

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
NCE, ESRI USGS National Topography Basemap	568.41.55	danderson	4/20/2018	n/a	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\WOUS Figures\VV Fig 2 Project Study Area.mxd

Via Verdi Slope Stabilization Project

Soils in Project Study Area

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE 3

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI, NCE, NRCS Soil Survey	568.41.55	danderson	4/20/2018	n/a	drios

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Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\WOUS Figures\VV Fig 4 National Wetland Inventory.mxd

Legend
Project Area
National Wetland Inventory
Riverine

NCE
Richmond

Via Verdi Slope Stabilization Project

National Wetlands Inventory

N
1 in. = 200 ft.
0 100 200 ft.

FIGURE
4

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI Basemaps, NCE, NWI October 2015	568.41.55	danderson	4/20/2018	n/a	drios

Feature	Proposed Jurisdictional Waters (Acres)	Proposed Non-Jurisdictional Waters (Acres)
San Pablo Creek	0.11	
San Pablo Creek Culvert	0.020	
Ephemeral Drainage Culvert	0.004	
TOTAL	**0.134**	**0.0**

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\WOUS Figures\VV Fig 5 Proposed delineation.mxd

NCE | Richmond

Via Verdi Slope Stabilization Project

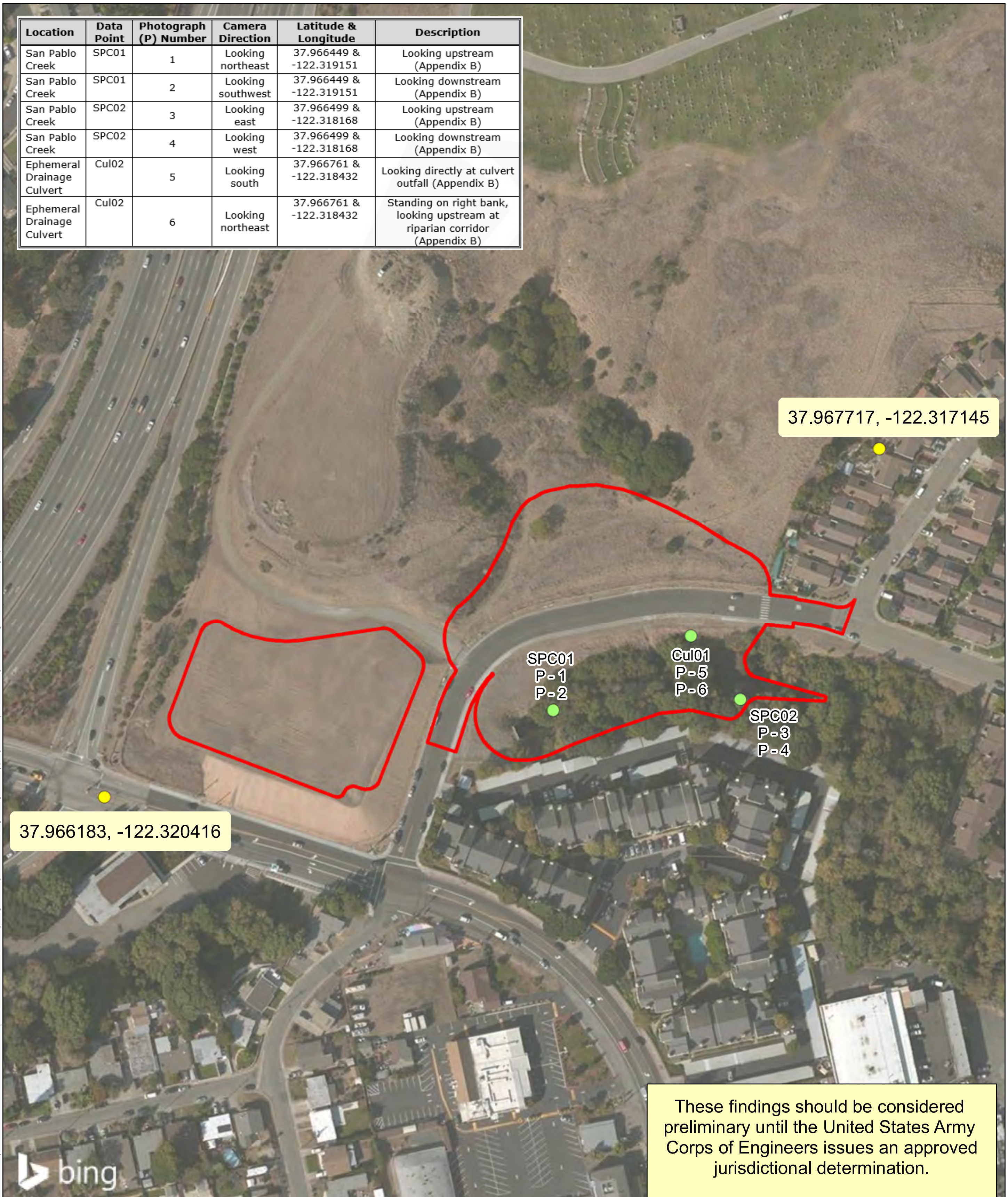
Proposed Delineation Map

N
1 in. = 200 ft.
0 100 200 ft.

FIGURE 5

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI Basemaps, NCE, NHD, USGS WBD, LSA 2009	568.41.55	danderson	4/20/2018	n/a	drios

Location	Data Point	Photograph (P) Number	Camera Direction	Latitude & Longitude	Description
San Pablo Creek	SPC01	1	Looking northeast	37.966449 & -122.319151	Looking upstream (Appendix B)
San Pablo Creek	SPC01	2	Looking southwest	37.966449 & -122.319151	Looking downstream (Appendix B)
San Pablo Creek	SPC02	3	Looking east	37.966499 & -122.318168	Looking upstream (Appendix B)
San Pablo Creek	SPC02	4	Looking west	37.966499 & -122.318168	Looking downstream (Appendix B)
Ephemeral Drainage Culvert	Cul02	5	Looking south	37.966761 & -122.318432	Looking directly at culvert outfall (Appendix B)
Ephemeral Drainage Culvert	Cul02	6	Looking northeast	37.966761 & -122.318432	Standing on right bank, looking upstream at riparian corridor (Appendix B)



These findings should be considered preliminary until the United States Army Corps of Engineers issues an approved jurisdictional determination.

Legend
- Project Area
- WOUS Photo Points
- Map Reference Points

NCE
Richmond

Via Verdi Slope Stabilization Project

Ground Level Photograph Locations and Directions

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE

6

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI Basemaps, NCE	568.41.55	danderson	4/20/2018	n/a	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\WOUS Figures\VV Fig 6 Ground Photographs.mxd

NCE

Richmond

Via Verdi Slope Stabilization Project

Proposed Jursidictional Determination Analysis

N

1 in. = 5,000 ft.

0 2,500 5,000 ft.

FIGURE

7

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI Basemaps, NCE, NHD, USGS WBD, LSA 2009	568.41.55	danderson	4/20/2018	n/a	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\WOUS Figures\VV Fig 7 Proposed Jurisdictional Determination Analysis V02.mxd

Appendix B

REPRESENTATIVE PHOTOGRAPHS

Photograph 1 (P-1). San Pablo Creek, SPC01, looking upstream.

Photograph 2 (P-2). San Pablo Creek, SPC01, looking downstream.

Photograph 3 (P-3). San Pablo Creek, SPC02, looking upstream.

Photograph 4 (P-4). San Pablo Creek, SPC02, looking downstream.

Photograph 5 (P-5). Ephemeral Drainage Culvert, CUL02, looking directly at culvert outfall.

Photograph 6 (P-6). Ephemeral Drainage Culvert, CUL02, looking upstream at riparian corridor.

Appendix C

Data Sheets

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Via Verdi Slope Stabilization
Date: 12/18/17
Time: 10:15
Project Number: 568.41.55
Town: Richmond
State: CA
Stream: Ephemeral - 01 (E01)
Photo begin file#:
Photo end file#:
Investigator(s): Deb LeMke, Marcy Kameram (DL & MK)

Y ☒ / N ☐ Do normal circumstances exist on the site?

Location Details: 122° 19 7.8827 sec. West
Via Verdi 37°58 3.782 Lat north

Y ☐ / N ☒ Is the site significantly disturbed?

Projection:
Datum:
Coordinates:

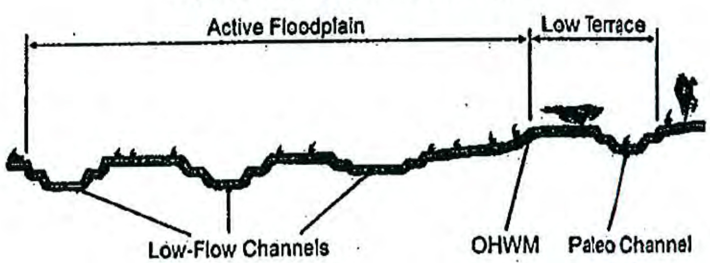
Potential anthropogenic influences on the channel system:
upstream cementary, downstream road network, housing developments.
Hillside slope movement exists.

Brief site description:
Bay oak woodlands, urban emphemeral drainage. Annual grasslands w/ the presence of invasive weeds.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ☐ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☐ Global positioning system (GPS)
- ☐ Other studies
- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☐ Digitized on computer
   - ☒ GPS
   - ☐ Other:

Project ID: **Cross section ID:** E01 **Date:** 12/18/17 **Time:** 10:15

Cross section drawing:

Incised
17" width
10" depth

Highly incised, then flattens to About 15" wide. 4" deep

OHWM

~~wide~~ wide - ft 13' x 30' long } Basin

GPS point: E01

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [ ] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: ____________
- [ ] Other: ____________

Back to a swale - 29" wide o Hum 2" deep

Culvert - 18" HDP

Comments:

Incised location (photos- downstream. maybe 2 of the same.
~~upste~~ upstream. two of the drainages.
photo of culvert
" upstream towards "Back to swale

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: Cul 01 - culvert for E01

Characteristics of the floodplain unit:

Average sediment texture: ____________

Total veg cover: ____ % Tree: ____ % Shrub: ____ % Herb: ____ %

Community successional stage:

- [ ] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [ ] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: ____________
- [ ] Other: ____________
- [ ] Other: ____________

Comments:

12" - Cul 02 - outfall culvert from E01. outfall into San Pablo Creek. Approximately 200' from Creek.

37° 58 0.3685 Lat

122° 19 Min 6.4083 Long

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Via Verdi Slope Stabilization **Project Number:** **Stream:** San Pablo Creek **Investigator(s):** DL + MK	**Date:** 12/18/17 **Town:** Richmond **Photo begin file#:**	**Time:** 10:45 **State:** CA **Photo end file#:**
Y [X] / N [ ] Do normal circumstances exist on the site?	**Location Details:**	
Y [ ] / N [X] Is the site significantly disturbed?	**Projection:** **Coordinates:** 37° N 57 min 58.9424 Lat	**Datum:**

Potential anthropogenic influences on the channel system: Long.
housing, cementary, road ~~net~~ network, culvert w/ fish passage.

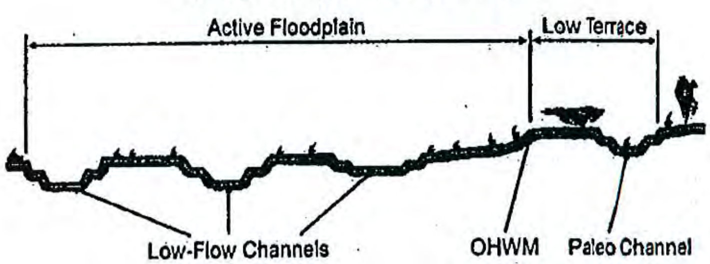
Brief site description:
perenial drainage. Steep slopes to drainage. datapoint is upstream of culvert - Archwl fish passage - road crossing = via verde.

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [ ] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [ ] Global positioning system (GPS)
- [ ] Other studies

- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

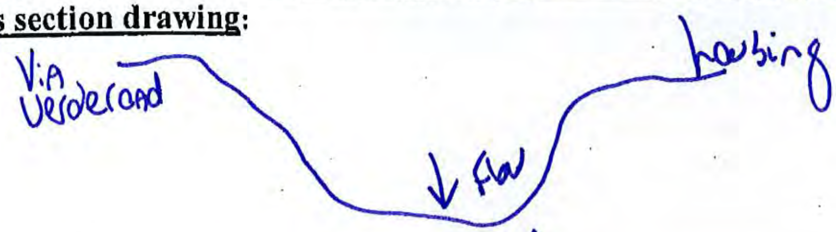


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [ ] Mapping on aerial photograph
   - [ ] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: **Cross section ID:** SPC01 **Date:** 12/18/17 **Time:** 10:45

Cross section drawing:



OHWM

GPS point: SPC01

10' wide
18" deep

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☒ Break in bank slope
- ☐ Other: ____________
- ☐ Other: ____________

Comments: photos: upstream
downstream

veg. Salix species mature
Annual grasses.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: ____________

Characteristics of the floodplain unit:

Average sediment texture: ____________

Total veg cover: ____ % Tree: ____ % Shrub: ____ % Herb: ____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: ____________
- ☐ Other: ____________
- ☐ Other: ____________

Comments:

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Via Verdi Slope Stabilization
Project Number:
Stream: San Pablo
Investigator(s): DL & MK

Date: 12/18/17 **Time:** 11:16
Town: Richmond **State:** CA
Photo begin file#: **Photo end file#:**

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details: 37° 57 59.5302 sec. Lat. 122° 19 5.4392 Long

Projection: **Datum:**
Coordinates:

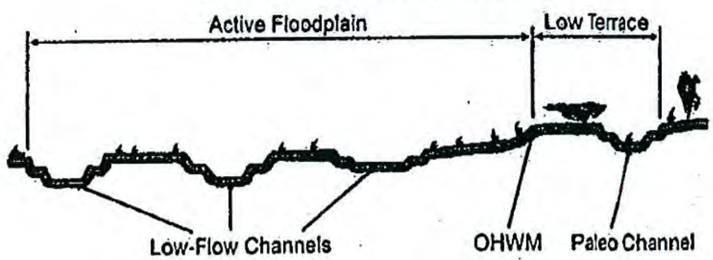
Potential anthropogenic influences on the channel system:
urban road network, housing

Brief site description:
perennial drainage, right bank - blackberries, ivy; left bank less invasives, native salix

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☐ Vegetation maps
- ☐ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☐ Global positioning system (GPS)
- ☐ Other studies
- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

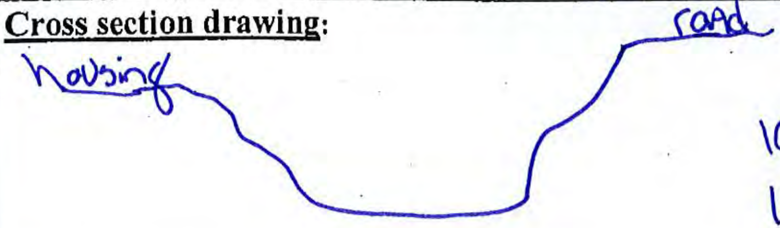


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☐ Digitized on computer
   - ☒ GPS
   - ☐ Other:

Project ID: **Cross section ID:** SPC02 **Date:** 12/18/17 **Time:** 11:16

Cross section drawing:



10' 6" wide
18" deep

OHWM

GPS point: SPC 02

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [ ] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: ______
- [ ] Other: ______

Comments: upstream
downstream; right bank-
left bank-downstream facing.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: ______

Characteristics of the floodplain unit:

Average sediment texture: ______
Total veg cover: ____ % Tree: ____ % Shrub: ____ % Herb: ____ %
Community successional stage:

- [ ] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [ ] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: ______
- [ ] Other: ______
- [ ] Other: ______

Comments:

Appendix D

WETS Table

WETS Table

WETS Station: RICHMOND, CA								
Requested years: 1995 - 2017								
Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	58.1	44.4	51.3	5.37	2.58	6.40	8	-
Feb	61.3	46.7	54.0	-	-	-	-	-
Mar	64.4	47.7	56.0	3.27	1.37	3.86	6	-
Apr	67.0	49.5	58.2	1.86	0.89	2.27	4	-
May	69.1	52.2	60.6	0.81	0.25	0.79	2	-
Jun	71.8	54.2	63.0	0.24	0.00	0.14	1	-
Jul	-	-	-	0.00	0.00	0.00	0	-
Aug	71.8	56.3	64.1	0.05	0.00	0.00	0	-
Sep	-	-	-	0.02	0.00	0.00	0	-
Oct	72.3	54.0	63.2	1.33	0.54	1.45	2	-
Nov	-	-	-	2.48	1.12	3.02	4	-
Dec	-	-	-	-	-	-	-	-
Annual:					-	-		
Average	-	-	-	-	-	-	-	-
Total	-	-	-	-			-	-

GROWING SEASON DATES			
Years with missing data:	24 deg = 12	28 deg = 12	32 deg = 12
Years with no occurrence:	24 deg = 11	28 deg = 11	32 deg = 11
Data years used:	24 deg = 11	28 deg = 11	32 deg = 11
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	Insufficient data	Insufficient data	Insufficient data
70 percent *	Insufficient data	Insufficient data	Insufficient data
* Percent chance of the growing season occurring between the Beginning and Ending dates.			

STATS TABLE - total precipitation (inches)													
Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1950												M7.53	7.53
1951	M4.56	2.53	1.08	0.86	0.90	0.00	0.00	0.10	T	0.95	M3.34	8.80	23.12
1952	9.79	2.22	3.77	0.96	0.18	0.63	0.00	0.00	T	0.06	2.68	10.35	30.64
1953	4.60	T	2.32	3.62	0.30	0.00	0.00	0.12	0.00	0.45	M2.08	0.39	13.88
1954	4.57	2.60	4.58	1.46	0.07	0.16	T	0.15	0.00	0.07	2.81	5.86	22.33
1955	4.19	1.29	0.42	1.96	0.07	0.00	0.00	0.00	T	0.02	2.18	14.25	24.38
1956	M7.45	2.77	M0.04	1.42	0.69	0.02	0.00	0.00	0.54	M1.88	0.09	0.18	15.08
1957	2.87	4.73	M2.02	1.87	3.16	0.02	M0.00	M0.00	M1.71	3.32	0.33	3.72	23.75
1958	6.19	10.39	6.89	5.54	0.81	0.40	0.03	0.00	0.04	0.16	0.03	1.74	32.22
1959	4.15	5.39	0.77	M0.51	MT	0.00	0.00	T	2.74	0.00	0.00	1.93	15.49

1960	4.32	4.14	2.55	1.29	0.37	0.00	T	0.00	0.00	0.26	3.43	2.61	18.97
1961	1.91	1.51	2.79	1.14	0.35	T	0.00	0.05	0.29	0.05	4.20	2.32	14.61
1962	1.39	7.18	3.76	0.24	T	0.00	0.00	0.10	0.08	7.38	0.99	3.48	24.60
1963	4.20	3.47	4.20	5.14	0.50	0.00	0.00	0.03	0.13	1.82	3.81	0.49	23.79
1964	3.90	0.23	1.40	0.37	0.22	0.79	T	0.01	0.00	1.60	4.10	6.93	19.55
1965	4.53	1.24	1.61	3.47	0.00	0.00	0.00	0.36	0.00	0.10	4.99	3.70	20.00
1966	4.76	3.01	0.51	0.37	0.17	0.06	0.05	0.08	0.14	0.00	5.93	4.64	19.72
1967	8.21	0.38	5.32	5.14	0.07	1.15	0.00	0.00	0.02	0.38	1.02	2.40	24.09
1968	5.20	3.21	3.60	0.46	0.18	0.00	T	0.13	0.00	1.07	3.05	5.69	22.59
1969	8.19	6.53	1.50	2.05	T	T	0.00	0.00	0.00	2.44	0.67	7.63	29.01
1970	10.72	1.75	1.89	0.29	0.01	0.44	0.00	0.00	0.00	1.00	7.01	6.29	29.40
1971	2.19	0.23	2.26	0.88	0.08	0.00	0.00	0.00	0.15	0.03	1.83	4.41	12.06
1972	1.18	1.79	0.26	1.38	0.00	0.18	0.00	0.00	0.66	4.57	6.48	3.37	19.87
1973	11.68	6.58	2.53	0.14	0.02	T	0.00	0.00	0.30	1.79	10.55	3.92	37.51
1974	3.75	2.01	4.67	2.62	0.00	0.04	1.41	0.00	0.00	1.11	0.67	2.06	18.34
1975	1.71	5.27	6.49	2.00	0.01	0.01	0.18	0.04	T	3.09	0.56	0.71	20.07
1976	0.31	2.04	1.07	1.05	0.00	0.00	0.00	0.94	0.57	0.55	0.92	2.43	9.88
1977	1.50	0.94	2.03	0.35	0.59	0.00	0.00	0.00	1.27	0.30	3.66	5.26	15.90
1978	8.23	4.42	6.01	3.39	0.01	0.00	0.00	0.00	0.50	0.00	1.82	0.74	25.12
1979	7.00	5.49	2.30	0.87	0.30	0.00	0.20	0.00	0.01	2.07	4.53	6.33	29.10
1980	5.69	7.40	1.20	1.51	0.11	0.03	0.18	0.00	0.00	0.12	0.23	2.43	18.90
1981	5.75	1.68	4.04	0.18	0.31	0.00	0.00	0.00	0.15	2.08	8.38	6.32	28.89
1982	11.23	3.57	6.60	4.98	0.00	0.11	T	0.00	0.63	3.52	7.17	3.11	40.92
1983	6.42	8.81	12.24	3.41	0.46	0.00	0.00	0.22	0.83	0.45	7.16	7.49	47.49
1984	0.30	1.65	2.29	1.18	0.01	0.12	0.00	0.16	0.05	1.81	7.26	1.97	16.80
1985	0.80	2.29	4.37	0.20	0.02	0.10	0.08	0.00	0.35	1.23	4.85	3.49	17.78
1986	5.56	10.17	5.84	1.25	0.16	0.00	0.04	0.00	0.59	0.11	0.12	1.07	24.91
1987	3.01	4.56	2.37	0.10	0.00	0.00	0.00	0.00	0.00	1.28	2.41	3.25	16.98
1988	3.89	0.36	0.01	1.61	0.42	0.71	0.00	0.00	0.00	0.28	2.42	3.32	13.02
1989	1.04	0.70	5.17	0.48	0.03	0.04	0.00	0.00	1.65	1.42	2.24	0.00	12.77
1990	3.65	3.14	1.05	0.15	2.70	0.00	0.00	0.00	0.12	0.16	0.44	1.68	13.09
1991	0.47	4.05	7.77	0.46	0.10	0.16	0.00	0.24	0.03	1.41	0.86	1.91	17.46
1992	1.75	6.50		0.67	0.00	0.56	0.00		0.00	1.97	0.22	5.92	17.59
1993	9.47	4.33	0.97	0.85	0.68	1.46	0.00	0.00	0.00	0.42	1.81	2.82	22.81

1994	1.79	M4.13	0.24	1.10	1.21	0.00	0.00	0.00	0.00	0.50	7.98	1.73	18.68
1995	10.67	0.17	11.31	M0.91	0.28	1.03	0.00		0.00	0.00	0.12	8.02	32.51
1996	7.76	6.90	2.12	2.19	3.38	0.00	0.00	0.00	0.00	2.07	3.25	9.71	37.38
1997	9.39	0.29	0.42	0.26	0.42	0.38	0.00	1.10	0.00	1.92	7.48	2.78	24.44
1998	11.26	16.40	2.52	2.14	3.74	0.02	0.00	0.00	0.10	0.75	4.97	1.03	42.93
1999	3.76	7.30	2.56	2.60	0.00	0.02	0.00	0.00	0.09	0.56	2.84	M0.95	20.68
2000	M6.13	M10.96	2.34	1.58	1.27	0.20	0.00	0.00	0.04	6.29	0.77	0.78	30.36
2001	7.10	8.27	1.43	1.10	0.00	0.26	0.00	0.00	0.00	0.60	6.70	11.86	37.32
2002	2.51	M1.33	M1.30	0.33	0.91	0.00	0.00	0.00	0.00	M0.00	2.94	15.40	24.72
2003	1.98	1.28	1.93	3.04	1.41	M0.00	0.00	M0.00	0.00	0.00	2.08	9.82	21.54
2004	3.20	6.17	0.73	0.26	M0.00	0.00	0.00	0.00	0.00	2.68	0.90	3.90	17.84
2005	4.14	M4.09	M3.79	M2.33	M1.51	M0.89	0.00	0.00	M0.00	0.93	M0.27	8.33	26.28
2006	M4.14	1.69	M8.47	M6.78	0.28	0.00	0.00	0.00	0.00	0.40	M2.30	M2.27	26.33
2007	0.53	M3.78	0.41	M1.57	0.51	0.00	0.00	0.00	M0.00	M1.31	0.91	4.04	13.06
2008	8.80	3.00	M0.00	0.27	0.00	0.00	0.00	0.00	0.00	M0.23	3.20	M0.81	16.31
2009	M0.28	M5.68	3.37	0.55	1.24	M0.00	0.00	0.00	M0.00	M3.38	M0.12	M0.33	14.95
2010	M6.40	3.95	2.79	3.83	1.18	0.00	0.00	M0.00	0.00	M1.76	M2.09	M5.50	27.50
2011	M0.99	M5.08	M8.75	M0.52	M0.67	M2.09	M0.00	M0.00		M1.66	M1.18	M0.08	21.02
2012	M3.31	M1.21	M9.68	M2.34	M0.03		0.00	M0.00	M0.00	M1.88	M4.20	M8.51	31.16
2013	M0.64	0.60	M0.71	M1.60	M0.03	M0.70	M0.00	M0.00	M0.53	M0.00	M1.66	M0.00	6.47
2014	M0.33	M5.79	M3.73	M1.36	M0.00	M0.00	M0.00	M0.00	0.14	M0.55	M2.43	M11.36	25.69
2015	M0.00	M2.28	M0.29	M1.37	M0.00	M0.16	0.00	0.00	M0.04	0.03	M1.59	5.03	10.79
2016	M9.07	1.14	M8.35	M1.45	M0.22	M0.00	M0.00	M0.00	M0.00	M2.31	M2.06	M5.90	30.50
2017	M11.65	10.47	M3.49	M3.80	M0.00	M0.06	M0.00	M0.00	M0.00	M0.10	2.92	M0.05	32.54
Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.													
Data missing for all days in a month or year is blank.													
Creation date: 2016-07-22													

Appendix E

CD WITH REPORT AND AQUATIC RESOURCES EXCEL SPREADSHEET

Collaboration. Commitment. Confidence.SM

Report for:

BIOLOGICAL ASSESSMENT

Via Verdi Slope Stabilization Project

Prepared for:

City of Richmond
450 Civic Center Plaza
Richmond, CA 94804

Prepared by:

Mack Casterman
Staff Scientist

Reviewed by:

Dave Rios
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NCE
501 Canal Boulevard, Suite I
Richmond, CA 94804

NCE Project Number:
568.41.55

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LIST OF TABLES

APPENDICES

1.0 INTRODUCTION

The City of Richmond (City) proposes to stabilize an eroding slope along Via Verdi in Richmond, California. Via Verdi is a residential street just east of Interstate 80 (I-80) that serves as the only access to 85 single family homes and 100 apartment units in a residential area known as the Sobrante Glen neighborhood. During the week of February 20th, 2017 a landslide occurred along the existing Via Verdi road alignment that damaged the road to the point of making vehicle access unsafe. Residents are currently accessing their homes via an approximately 650-foot-long emergency access road that was built in the days following the landslide. Along with slope stabilization, the proposed project would construct a new permanent access road to the Sobrante Glen neighborhood.

The project includes the reconstruction of a 0.65 acre section of Via Verdi Road and the associated utilities that pass under the roadway. In order to stabilize the eroding slope, a section of San Pablo Creek south of the roadway reconstruction area will be culverted and engineered fill will be installed above the culvert on an approximately 1.0 acre area to stabilize soils on the eroding hillside. Once the reconstruction of Via Verdi Road is complete, the temporary emergency access road will be demolished and all work areas including the approximately 1.5 acre staging pad will be revegetated. The total area of disturbance, including revegetation areas will be approximately 4.85 acres.

The purpose of this BA is to review the proposed Via Verdi Slope Stabilization Project (project) in sufficient detail to determine the extent to which the project may affect any federally threatened or endangered species (Special Status Species) and/or designated critical habitat. This biological assessment is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)).

In 2012, a Biological Opinion was issued by the United States Fish and Wildlife Service (USFWS) for a similar culvert repair project in the same location as this project. The Biological Opinion is attached as **Appendix G** to serve as a reference document for this review.

Based on a literature review, and a habitat assessment of the action area, the BA considers the following species:

- Alameda whipsnake (Masticophis lateralis euryxanthus) (AWS)
- California red-legged Frog (Rana draytonii) (CRLF)

The project will result in temporary effects to approximately 5.1 acres of potential habitat for both the AWS and CRLF. The project will not result in any permanent loss of habitat for AWS. No loss of CRLF breeding habitat will occur as a result of the project.

The City will minimize the potential to adversely affect AWS and CRLF through avoidance and minimization measures but may also employ species specific mitigation if impacts are anticipated. These measures will be developed through consultation with the regulatory and permitting agencies. Conservation measures identified in the 2012 Biological Opinion are listed as recommended measures for this project in Section 6 of this document.

Other federally listed special status species may be present near the project alignment; however, the project area does not fall within any Critical Habitat Areas for any USFWS species and as a result the project is not anticipated to affect other federally listed special status species.

1.1 Consultation to Date

The Sacramento Fish and Wildlife Office was contacted on December 7, 2017 to develop a species list via the ECOS-IPaC website (USFWS 2017).

Site specific references and background information reviewed include:

- *California Natural Diversity Database* (CNDDB). 2017. California Department of Fish and Wildlife, Sacramento, CA. Accessed online.
- Information for Planning and Conservation (IPaC). 2017. United States Fish and Wildlife Service. Accessed online.
- California Native Plant Society. 2017. *Inventory of Rare and Endangered Vascular Plants of California*. Accessed online.
- National Marine Fisheries Service protected species list. 2017. Accessed Online.

2.0 PROJECT DESCRIPTION

2.1 PROJECT OVERVIEW

The project is located along Via Verdi in Richmond, California in Contra Costa County. Surrounding land consists of residential housing developments and undeveloped private land. **Figure 1** presents the Action Area and surrounding residential communities. The Action is area is defined in **Section 2.2**.

2.1.1 Project Components

The project includes the following construction activities:

- Reconstruct a 0.6 acre area of Via Verdi road and sidewalk and restore underground utilities.
- Demolish temporary emergency access road and revegetate 1.2 acre area where roadway was installed.
- Install 350 linear foot culvert for section of San Pablo Creek within project area. Cover culvert with 9,650 cubic yards of engineered fill to stabilize eroding slope, covering an approximately 1.5 acre area.
- Revegetate all work areas including 1.5 acre staging area

2.1.2 Project Work Areas

The project is made up of two temporary work areas and a staging area. The culvert and fill work along San Pablo Creek is located in and adjacent to the San Pablo Creek Channel, and the Via Verdi roadway reconstruction is located in an adjacent area to the north in approximately the same location as the current Via Verdi Road footprint.

Staging will occur on the approximately 1.5 acre graded and compacted pad on the west side of the site.

Access to the construction site will occur via the existing Via Verdi roadway where it meets the project area.

2.1.3 Schedule

Construction will begin in April 2019 and will end in October 2019.

2.1.4 Work Area Dimensions

The project activities would require an area totaling approximately 5.1 acres. The dimensions of each project component are provided in **Table 1**.

Table 1: Work Area Dimensions

Work Area	Work Plan	Approximate Total Acreage
Roadway Realignment	Reconstruct Via Verdi Roadway and sidewalk and restore underground utilities.	0.6
Demolish Emergency Access Road and Revegetate Hillside	Demolish temporary road used for emergency access and associated utilities and revegetate.	1.2
Install culvert for San Pablo Creek, and cover with engineered fill	Install new culvert for San Pablo Creek including new headwall at east end of project area. Cover culvert with engineered fill.	1.5
Staging Area	Staging will occur on the compacted and graded pad on the west side of the site. Area will be revegetated after project completion.	1.5
Revegetation Areas	All work areas besides new Via Verdi Road alignment and sidewalk will be revegetated at the end of construction.	4.5
Total	This number is the sum of the Revegetation area number and the Roadway Realignment number. Together they represent the total work area of the project.	5.1

2.2 ACTION AREA

The action area is defined as "all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (Code of Federal Regulations Title 50, Section 402.02). The project footprint, which includes the roadway work area, slope stabilization work area, construction staging yard, and access routes, represents the limits of the action area (**Figure 1**). This action area is based on a conservative approach that considers the total area of impacts from all project alternatives being considered by the City of Richmond with the exception of Alternative 2 which was not considered due to lack of feasibility and due to being outside of the City of Richmond's preferred project area. All construction activity would be confined to the previously identified work area limits, and no additional impacts to habitat for special status species would occur as a result of this project.

3.0 SPECIES / CRITICAL HABITAT CONSIDERED

3.1 Literature Review and Database Queries

A query of federally listed wildlife species for the U.S. Geological Survey (USGS) 7.5-minute quadrangle encompassing the action area was obtained from the USFWS's Sacramento Endangered Species Office IPaC website on December 7, 2017 (USFWS 2017).

Additional information about the distribution of special status species with the potential to occur within the Action Area was compiled from the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) for occurrences of special status species within a 1-mile radius of the proposed project alignment (CDFW 2017); from aerial photographs of the project area; and from USGS 7.5-minute quadrangle maps of the project area. Information on the distribution of special status species with potential to occur in the project region also was compiled from published literature. The results of the database searches were supplemented with past biological reports for 2012 San Pablo Creek culvert replacement project which was completed in 2012 and which studied a very similar project area (**Appendix A**).

The database searches identified 11 federally-listed fish and wildlife species and 3 federally-listed plant species with potential to occur within the Action Area. The official list is provided in **Appendix C**.

3.2 Field Surveys

NCE Biologist Mack Casterman conducted a reconnaissance-level survey of the action area on April 20, 2018. This survey was focused on identifying the presence of special status species or their habitat within the project vicinity.

4.0 AFFECTED ENVIRONMENT

The action area encompasses three distinct habitat types: ruderal/developed, riparian woodland, and annual grassland. General descriptions of these natural communities that occur within the action area are provided below. **Figure 2** presents the locations of the different habitat types present at the site.

4.1 Ruderal / Developed

Ruderal and developed areas still exhibit the impacts of development – often characterized by pavement of heavily compacted soil. Plants are mostly non-native invasive with few native species present and are characterized by the ability to thrive in areas of frequent disturbance.

Within the action area, ruderal vegetation is located on the west side of the project site where previous construction resulted in a graded and compacted pad approximately 2.0 acres in area.

4.2 Annual Grassland

Annual grassland areas are composed of mostly non-native grasses and weedy annual and perennial forbs. Some native grasses and forbs may be present in sparse areas where competition from non-natives is low.

Annual grassland is present throughout the project area. In the area north of the temporary access road, annual grasses are growing through erosion control blanket that was installed to control erosion during the rainy season from 2017-2018.

An approximately 0.25 acre area of annual grassland on the south side of Via Verdi road has been planted with sapling oaks as part of a habitat restoration effort resulting from the 2012 culvert project. This area is noted in **Figure 2**.

4.3 Riparian Woodland

Riparian woodland dominated by boxelder (*acer negrundo*), red willow (*Salix laevigata*), California buckeye (*Aesculus californica*), and poison oak (*Toxicodendron diversilobum*) is present along the banks of San Pablo Creek.

4.4 Coast Live Oak Woodland

Oak Woodland is typically dominated by coast live oak (*Quercus agrifolia*). The shrub layer at this site is composed of elderberry (*Sambucus sp.*) and poison oak (*Toxicodendron diversilobum*). Also present in the understory were wild cucumber (*Marah fabacea*), Himalayan blackberry (*Rubus armeniacus*), and *Vinca major*.

Coast live oak woodland is present on the south-eastern border of the project area along San Pablo Creek.

4.5 Coyote Brush Scrub

Coyote brush scrub is present in an isolated patch on a South-east facing slope within the project area. This plant community is dominated by poison oak (*Toxicodendron diversilobum*) with some coyote brush (*Baccharis pilularis*) individuals scattered throughout.

A stand of coyote brush scrub is present in the approximate center of the Action Area adjacent to the temporary access road.

5.0 EFFECTS ANALYSIS

The following section provides a discussion of special status species that may be affected by the project. This section includes a description of the status, distribution, and habitat affects for the special status species that have potential to be affected as a result of this project. **Appendix D** contains a comprehensive list of special status species evaluated for the proposed project, and includes species on which the project was determined to have no effect, and the reason for each determination. Areas in which temporary and permanent project impacts to special status species habitat will occur are shown in **Figure 3**. The species listed in this section are considered possibly present based on existing occurrence data and the presence of habitat within the project action area.

5.1 CALIFORNIA RED-LEGGED FROG

5.1.1 Status and Distribution

The CRLF is listed as federally threatened (USFWS 1996) and is considered a Species of Special Concern by CDFW. Critical habitat was designated in 2006 and revised in 2010 (USFWS 2006, 2010). The project is located outside of designated critical habitat for the CRLF and the nearest critical habitat unit is CCS-1, located in Contra Costa County, approximately 2.25 miles east of the action area.

The CRLF typically breeds during or shortly after large rainfall events in late winter or early spring (Hayes and Miyamoto 1984, USFWS 1996). The species usually occurs in or near still or slow-moving sources of water that remain inundated long enough for larvae to complete metamorphosis, which typically occurs from 3.5 to 7 months after hatching (Fellers et al. 2001). During summer, CRLF may take refuge in cool, moist areas, including small mammal burrows, leaf litter, or other moist sites within a few hundred feet of riparian areas (Rathbun et al. 1993, cited by USFWS 1996). Adult CRLF tend to be most active at night during wet weather, but they may make forays through upland areas at any time during the year (Hayes and Tennant 1985).

The nearest recorded observations of CRLF in the CNDDB are from the area around San Pablo Dam, located three miles east of the project area. Based on personal communication with Bert Mulchaey from the East Bay Municipal Utility District and Steve Bobzien from the East Bay Regional Park District, CRLF adults and CRLF tadpoles have been observed at the following locations upstream of the project site: Appian and/or Wilkie Creeks, Castro Creek, and Kennedy Grove.

5.1.2 Assessment Results

The velocity of water flow with the San Pablo Creek channel combined with shaded conditions, a lack of emergent vegetation and the likely presence of fish that could prey on CRLF eggs make it unlikely that CRLF successfully breed within San Pablo Creek where it passes through the action area. It is unlikely that any CRLF would be using this portion of San Pablo Creek as foraging habitat or as a refuge due to its distance from known population occurrences and the physical barriers to upland foraging habitat. However, CRLF presence is possible as CRLF may use San Pablo Creek as a dispersal corridor.

5.1.3 Project Effects to CRLF Habitat

The proposed project will result in temporary disturbance of 5.1 acres of potential CRLF habitat during the April to October construction period. This will result in a temporary loss of riparian and upland habitat for CRLF. The construction of the 350 foot long culvert in San

Pablo Creek will result in permanent impacts to approximately 0.1 acres of aquatic habitat for CRLF.

5.2 ALAMEDA WHIPSNAKE

5.2.1 Status and Distribution

The AWS is listed as threatened under both federal (USFWS 1997) and California state endangered species laws. Critical habitat was designated in 2000 and revised in 2006 (USFWS 2000, 2006). The project is not located within designated critical habitat for the AWS. The nearest critical habitat to the action area is Unit 1: Tilden-Briones, a 34,119-acre area unit with represents the northwestern portion of the subspecies' range (USFWS 2006) located 0.5 miles southeast of the action area. The primary constituent elements (PCEs) of AWS critical habitat include 1) scrub/shrub communities with a mosaic of open and closed canopy; 2) woodland or annual grasslands contiguous to lands containing PCE1; and 3) lands containing rock outcrops, talus, and small mammal burrows within or adjacent to PCE 1 and/or PCE 2.

AWS are generally found in chaparral (northern coastal sage scrub and coastal sage). Recent telemetry data indicate that AWS can venture up to 500 feet into habitats adjacent to chaparral including grassland, oak savanna, and occasionally oak-bay woodland (USFWS 2005).

5.2.2 Assessment Results

The nearest recorded observation of AWS in the CNDDB was recorded in 2006 about 3.8 miles south east of the project area. The next closest observation occurred five miles away in 1951, also south east of the project area (CDFW 2017).

The action area predominantly occurs in open grasslands, closed canopy oak woodland and urban suburban areas. The action area is bordered on three sides by paved roadways including a highway to the west. High quality AWS habitat consisting of areas with open or partially-open canopy scrub or adjacent grassland habitats is absent from the action area. High quality basking sites and natural rock outcrops that provide habitat for AWS prey species are also absent. The action area is not adjacent to high-quality scrub habitat, or situated between areas containing scrub habitat where snakes would potentially disperse. The action area is located at the extreme edge of the species' known range and given the lack of suitable habitat in the urbanized area surrounding the project, it is unlikely that individual AWS might use the action area as a dispersal corridor. However, incidental presence of AWS is possible within the action area as AWS may be found during dispersal or foraging activities.

5.2.3 Project Effects to AWS Habitat

The proposed project will result in temporary disturbance of 5.1 acres of AWS habitat during construction activities. This will result in a temporary loss of potential foraging and dispersal habitat for AWS.

5.3 INDIRECT EFFECTS

Indirect effects are defined by USFWS as effects that are caused by the action and occur later in time, but are still reasonably certain to occur. No indirect effects on CRLF or AWS populations within the action area are anticipated as a result of project action. The project will not change the existing land-use of the project area and will not result in less suitable habitat for the CRLF and AWS after construction is complete. Therefore, no indirect effects to CRLF or AWS are anticipated.

5.4 CUMULATIVE EFFECTS ANALYSIS

No future State, Tribal, local or private actions were identified that are anticipated to occur within the action area. Therefore, no cumulative effects arising from future non-federal actions are anticipated.

6.0 CONSERVATION MEASURES

The following conservations measures were identified in the 2012 Biological Opinion and will be considered for implementation, if applicable, as part of the proposed project to avoid and/or minimize the risk of potential impacts to special status species and their habitats:

1. Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the Service has been received that the biologist(s) is qualified to conduct the work. The Service-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.

2. Before any construction activities begin, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the Alameda whipsnake and the California red-legged frog and its habitat, the importance of the Alameda whipsnake and the California red-legged frog and their respective habitats, the general measures that are being implemented to conserve the Alameda whipsnake and the California red-legged frog as they relate to the project, the penalties for non-compliance, and the boundaries within which the project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers will sign a form stating that they attended the program and understand all protection measures for the Alameda whipsnake and the California red-legged frog.

3. Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a Service-approved biologist to ensure that no Alameda whipsnakes or California red-legged frogs are present. This survey is not intended to be a protocol level survey, but rather one designed to verify that no Alameda whipsnakes or California red-legged frogs are present within the construction area before construction activities begin. Two preconstruction surveys for California red-legged frog and Alameda whipsnake will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any California red-legged frogs are found, the Service will be contacted and the Service approved biologist will be allowed sufficient time to move any California red-legged frogs from the work site before work activities begin. If any Alameda whipsnakes are found, all activities will cease, the Service will be immediately contacted, and no other actions will be taken without authorization from the Service. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs. Any biologist involved with the surveying/handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.

4. Immediately after the second survey, construction fencing and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The Service-approved biologist will supervise the installation of

the fencing around the work area. Access routes, tum-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.

5. A Service-approved biologist will monitor all ground disturbing construction activities. After ground disturbing project activities are complete, the Service-approved biologist will train an individual to act as the on-site biological monitor. The Service-approved biological monitor will have attended the training described in Conservation Measure 2 above. Both the Service-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The Service approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly and quarterly summaries will be placed on a file sharing website that is accessible to regulatory staff at any time.

6. A Service-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of Alameda whipsnakes or California red-legged frogs. These site inspections will take place each morning before the start of construction activities.

7. If any Alameda whipsnakes or California red-legged frogs are found, all activities will cease, the Service will be immediately contacted. and no other actions will be taken without authorization from the Service. Construction will be halted until all Alameda whipsnakes or California red-legged frogs depart on their own or are removed from the work area by the Service-approved biologist. Actions taken to relocate Alameda whipsnakes or California red-legged frogs will be conducted under the guidance of the Service and California Department of Fish and Game (CDFG). The Service-approved biologist may relocate any Alameda whipsnakes or California red-legged frogs that are in danger of immediate harm from project-related activities, to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The Service-approved biologist will monitor any California red-legged frogs or Alameda whipsnakes that have been relocated until it is determined that it is not imperiled by predators or other dangers.

8. Construction will take place during daylight hours only.

9. Prior to being brought on site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on site.

10. A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no Alameda whipsnakes, California red-legged frogs, or other amphibians and reptiles are taken at the pump.

11. Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.

12. Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for California red-legged frogs) (April 15 to October 15).

13. All areas disturbed as a result of project related activities will be re-vegetated with native plant species only.

14. Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water onsite. These devices will be placed at all locations where the likelihood of sediment input exists.

15. The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to insure that it is not becoming clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.

16. All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side-casting of material into any waterway.

17. During project activities, all trash that may attract predators will be properly contained, removed from the work site and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be managed to minimize the provision of cover for frogs by removing all surface construction debris daily except that required for construction.

18. To mitigate for erosion impacts, best management practices for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.

19. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The Corps and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the Corps will ensure that the applicant will prepare a plan to allow 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.

20. The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project areas will be removed.

21. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in preconstruction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

22. Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that Alameda whipsnakes do not become entangled in the mesh. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control.

23. To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fending or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.

24. Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.

25. All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.

26. A post-construction survey will be conducted the night before the cofferdams are removed to make sure no Alameda whipsnakes or California red-legged frogs have occupied the temporary pool created upstream of the site. If any Alameda whipsnakes or California red-legged frogs are present, they will be captured by hand and removed upstream of the pond to prevent them being potentially stranded when the dams are removed during the daylight hours and the water levels drop.

7.0 DETERMINATION OF EFFECTS FOR EACH PROTECTED RESOURCE

7.1 NO EFFECT

Species for which the action was determined to have no effect include the salt marsh harvest mouse (*Reithrodontomys raviventris*), California clapper rail (*Rallus longirostris obsoletus*), California least tern (*Sterna antillarum browni*), western snowy plover (*Charadrius alexandrines nivosus*), yellow-billed cuckoo (*Coccyzuz americanus*), Delta smelt (*Hypomesus transpacificus*), tidewater goby (*Eucyclogobius newberryi*), Callippe silverspot butterfly (*Speyeria callippe callippe*), San Bruno elfin butterfly (*Callophrys mossii bayensis*), California seablite (*Suaeda californica*), pallid manzanita (*Arctostaphylos pallida*), and Santa Cruz tarplant (*Holocarpha macradenia*). Suitable habitat for these species is absent from the action area; therefore, no effects on these species are expected to occur as a result of project activities. The project is expected to have no effect on Central California Coast Steelhead (*Oncorhynchus mykiss*) based on a phone conversation with Gary Stern at National Marine Fisheries Service on May 9, 2011 (**Appendix B**) – due to existing obstructions to the historical spawning habitat in San Pablo Creek including the San Pablo dam. Furthermore, project construction will not take place during spawning season.
An official special status species list for the project, generated from the USFWS IPaC website is provided in **Appendix C**. A list of all special status species evaluated in this BA and the reasons for this determination are provided in **Appendix D**.

7.2 MAY AFFECT, LIKELY TO ADVERSELY AFFECT

Based on this assessment and the conclusions of the 2012 Biological Opinion, potential effects to CRLF and AWS are possible as a result of project activities. Due to the presence of habitat for AWS and CRLF within and adjacent to the action area, there is potential for AWS and CRLF to occur within the action area. If AWS or CRLF were to occur within the action area during project activities, the project may affect and would be likely to adversely affect both species. Conservation measures recommended in this document will minimize any adverse effects.

7.3 RESTORATION AND MITIGATION TO OFFSET EFFECTS ON SPECIES

The project will incorporate measures to avoid, minimize, and compensate for effects on special status species and their habitats. Effects on habitat will be minimized through the implementation of the avoidance and minimization measures described in Section 6 of this biological assessment that have been incorporated into the project. Following the completion of project activities, all construction material and debris will be removed and disposed of appropriately. Work areas will be restored with native plants.

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Appendix A

RELEVANT BIOLOGICAL REPORTS FROM 2012 VIA VERDI CULVERT REPLACEMENT PROJECT

Swaim Biological Incorporated
4435 First Street PMB #312 *22 Battery Suite 802*
Livermore, CA 94551 *San Francisco, CA 94111*

To: John Heal
Senior Scientist, Watershed Science and Planning Group
Nichols Consulting Engineers, Chtd

From: Sam Young
Wildlife Biologist
Swaim Biological, Inc.

Date: May 1, 2012

Re: Results of visual surveys for California Red-legged Frog (*Rana draytonii*) and Alameda Whipsnake (*Masticophis lateralis euryxanthus*) within the Via Verdi culvert project footprint, Richmond, CA.

John,

This memo summarizes the results of our visual survey for California red-legged frog (CRLF) and Alameda Whipsnake (AWS) performed on Monday April 30th, 2012.

CRLF

I met with Karen Swaim, Senior Wildlife Biologist at 1300, April 30th, 2012 on Bypass Rd. just north from the culvert. The area within the San Pablo Creek channel and along the banks within the high water mark was surveyed for CRLF from approximately 200ft upstream from the day-lighted culvert area to 100ft downstream from the remaining culvert under El Portal Rd. Wildlife observed within the survey area included numerous three-spined sticklebacks (*Gaterosteus aculeatus*), one dead mole (*Scapanus sp.*), and one dead pocket gopher (*Thomomys bottae*). Both the mole and the gopher were observed in the creek channel and were apparently drowned. No CRLF adults, larvae, or egg masses were observed. The survey was concluded at approximately 1345.

AWS

I surveyed upland areas within the project foot print for incidental sightings of AWS between 1400 and 1500 with John Heal. Habitat was low quality for AWS in these areas, consisting primarily of black mustard (*Brassica nigra*), Italian thistle (*Carduus pychnocephalus*), raddish (*Raphanus sativus*), and European annual grasses with scattered stands of coyote brush (*Baccharis pilularis*). No burrows were observed in any of the surveyed areas. There were several debris piles through the upland portions of the project footprint which may provide habitat for wildlife. The only terrestrial vertebrate observed during the survey was an alligator lizard (*Elgaria multicarinata*), and was found underneath one of these debris piles. No AWS were detected during the survey effort.

Photo 1. San Pablo Creek upstream from the culvert beneath El Portal Rd. Photo taken on April 30th, 2012.

Photo 2. Day-lighted culvert area. Photo taken on April 30th, 2012.

Photo 3. San Pablo Creek downstream form the culvert beneath El Portal Rd. Photo taken on April 30th, 2012.

Photo 4. Access road at the north end of the project foot print looking south. Photo taken on April 30th, 2012.

Photo 5. Debris piles in upland habitat at the north end of the project foot print viewed looking north. Photo taken on April 30th, 2012.

Photo 6. Upland habitat at the west end of the project footprint viewed looking south. Photo taken on April 30th, 2012.

Photo 7. Upland habitat at the west end of the project footprint viewed looking north. Photo taken on April 30th, 2012.

Photo 8. Upland habitat at the west end of the project area viewed looking east. Photo taken on April 30th, 2012.

Photo 9. Upland habitat adjacent to the San Pablo Creek riparian corridor viewed looking to the south. Photo taken on April 30th, 2012.

Swaim Biological Incorporated
4435 First Street PMB #312 *Livermore, CA 94551*
22 Battery Suite 802 *San Francisco, CA 94111*

To: John Heal
Senior Scientist
Nichols Consulting Engineers

From: Jeff Mitchell
Project Manager / Senior Biologist
Swaim Biological Inc.

Date: January 23, 2012

Re: Via Verdi Culvert Replacement Project - AWS Site Assessment

Dear Mr. Heal:

At your request SBI conducted a site assessment for the Alameda whipsnake (*Masticophis lateralis euryxanthus*) (AWS) at the Via Verdi Culvert Replacement Project site, a culvert replacement project located in the City of Richmond, Contra Costa County, California. The purpose of this memorandum is to present the results of that assessment and to discuss the potential for the AWS to occur at the site.

In August 2011 Nichols Consulting Engineers prepared a Biological Resources Assessment (BRA) to identify major regulatory constraints associated with the project.[1] Their assessment determined that the AWS may occur incidentally at the site and that it may use the adjacent grassy habitat for foraging, but in general was unlikely to occur. The California red-legged frog was identified as potentially occurring at the site based on the presence of suitable non-breeding habitat in San Pablo Creek and a recorded occurrence of the frog less than one half mile from the site. No federally or state listed herptile species other than the AWS and CRF were identified as having the potential to occur.

This report is intended to supplement the BRA by providing additional information with regard to the suitability of the project area for AWS. The results of our assessment suggest that the AWS is not expected to occur within the project area. This finding is based on a combination of factors including the absence of habitat characteristics associated with AWS, its location at the northwestern edge of the species known range, and the presence of barriers to dispersal surrounding the site.

Introduction

Project Description

The project includes the replacement of a 130-foot section of culvert within San Pablo Creek extending from an area east of Via Verdi Drive across El Portal Drive. The collapse of the culvert had resulted in the formation of a sinkhole at Via Verdi in April 2010. A portion of San Pablo Creek was

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[1] Nichols Consulting Engineers. *Via Verdi Repair Project, San Pablo Creek Culvert Replacement. Preliminary Biological Resources Assessment*. Report prepared for the City of Richmond, Contra Costa County, California. August 25, 2011.

excavated and stabilized with shoring to allow the creek to flow through the collapsed section, and a temporary bypass road was constructed west of Via Verdi to allow vehicle traffic to and from the residential area serviced by the road. Reconstruction of the collapsed culvert will include the construction of a new reinforced box culvert, installation of a reinforced concrete headwall and endwall, restoration of the creek areas adjacent to them. Related project activities will include revegetation, road repaving, daylighting an additional 30 feet of the creek at the headwall area, utility reconstruction in Via Verdi, removal of the temporary bypass road, and restoration of the impacted portions of the cemetery property.

Study Area

The study area lies within the East Bay Terraces and Alluvium Subsection of the Central California Coast Section as described in the *Ecological Subregions of California* (USDA 1997), and is located within the Richmond USGS 7.5-minute quadrangle. It is located on an alluvial plain extending from San Pablo Bay southeast to the Santa Clara Valley, separated from the East Bay hills by the Hayward Fault. The climate of the area is hot and subhumid with a heavy marine influence and a mean annual precipitation ranging from 20 to 30 inches. Within the project area landcover is predominantly annual grassland, but also includes riparian woodland, mixed broadleaf woodland, coyote brush scrub, ornamental, and developed areas. The majority of the project area ranges from approximately 50 to 150 feet elevation above mean sea level.

Land use in the vicinity includes residential, commercial, and open space areas (**Figure 1**). The study area is bounded on the west by Interstate 80 and by the Rolling Hills Memorial Park, a privately-owned cemetery to the north. The eastern portion of the area includes a portion of Via Verdi Drive a two-land residential street connected to a neighborhood located approximately 300 feet further east. Also within the eastern portion of the study area is San Pablo Creek, a northwest-trending creek that flows from near Orinda to San Pablo Bay. The southern portion of the study area abuts the parking lot of a nearby apartment complex, as well as a portion of El Portal Drive and a residential/commercial area to its south. Further to the south El Portal connects to San Pablo Dam Road, a major expressway linking the cities of Richmond and Orinda. Beyond that Wildcat Canyon Regional Park, a 2,500-acre open space area administered by the East Bay Regional Park District is located partially within critical habitat for the AWS.

Figure 1. Aerial photograph showing the project area and surrounding areas.

Alameda Whipsnake

The Alameda whipsnake is listed as threatened under both federal (USFWS 1997) and California state endangered species legislation. Critical habitat was designated in 2006 (USFWS 2006). The AWS is most frequently found in chaparral, Diablan sage scrub, northern coyote brush scrub, and riparian scrub, but also uses the mosaic of adjacent habitats in Alameda and Contra Costa Counties, including oak woodland, grassland (grazed and ungrazed), riparian, and even mixed evergreen forest. Swaim (1994) found that the home ranges of six radio-telemetry transmitter-equipped AWS were centered within scrub communities, and habitat use was concentrated into core areas that consisted of open or partially open canopy scrub on east, southeast, south, and southwest facing slopes, or in nearby grassland habitats that were within 500 feet (236 meters) of scrub with similar aspects. Rock outcrops were also typically abundant in core areas at the two sites where radio telemetry was used. Rock outcrops provide protective cover and are associated with high densities of lizards, a major prey item of the AWS (Swaim 1994).

Adult AWS are most active in late summer and early fall, although they may move above ground during any period in the year, including winter. In general they inhabit winter retreats from November through March. Winter retreats may consist of crevices in rock outcrops or rodent burrows which provide protection from temperature extremes (Swaim 1994). Rodent burrows may also be used for egg-laying sites (Swaim 1994).

Studies of AWS equipped with radio-telemetry transmitters have shown that they also extensively utilize grassland and oak woodland/savanna habitats adjacent to chaparral and scrub communities (Swaim 1994). The majority of AWS locations during these studies were within 100 feet of scrub habitat. However, AWS also ranged into the surrounding grassland to distances of greater than 500 feet (Swaim 1994). Subsequent studies have shown that observations of free-ranging AWS have been made beyond 500 feet and up to four miles from scrub habitat (Swaim 2000, 2002, 2003).

Methods

Prior to conducting field surveys information on the distribution of special status species in the area were compiled from searches of the California Department of Fish and Game California Natural Diversity Data Base (CNDDB) for the Richmond U.S. Geological Survey (USGS) 7.5-minute quadrangle and surrounding quadrangles (CDFG 2012). An online search also was conducted of the U.C. Berkeley Museum of Vertebrate Zoology holdings website. Habitat that could support AWS and barriers that could deter or prevent movement were identified to the extent possible on topographic maps and aerial photographs.

On January 8, 2012 biologist Jeff Mitchell performed a reconnaissance-level survey of the project area. Biologist Karen Swaim examined GIS-based maps of the culvert line, examined aerial photographs of the area, and provided expertise based on personal knowledge of the project vicinity.

Results

The following section discusses the results of the database search and habitat assessment, including a field survey and desktop-level analysis. No listed species were observed during the field survey.

Recorded Observations

The database search resulted in no records for the AWS in the immediate project vicinity. The nearest recorded observation of AWS was located on East Bay Municipal Utility District (EBMUD) property, just under four miles from the site (**Table 1**). **Figure 2** shows the nearest recorded observations of AWS, as well as designated critical habitat for the species in relation to the project area.

Table 1. Descriptions of nearest recorded observations of AWS in the project vicinity

Distance and Direction from Project Area	Record Description	Source and or Observer
3.8 mi. ESE	AWS observed north of San Pablo Reservoir on October 30, 2006.	EBMUD (2006)
5.0 mi. SE	AWS observed on Plateau Drive in Kensington. Reported to RCS by local resident on July 2, 1951.	Harris (1951)
5.5 mi. E	Multiple AWS captured during a trapping study on EBMUD property, including one gravid female.	Swaim K. (2010)
5.6 mi. E	Multiple AWS captured during a trapping study on private mitigation parcel.	Swaim, K. (2005)
6.1 mi. SE	One AWS found dead on road on the west edge of Tilden Park, Berkeley.	CNDDB Macey, J.R. (2003)

Habitats

The project area is located outside of critical habitat designated for the AWS (USFWS 2006). Critical Habitat Unit 1: Tilden-Briones, is the nearest unit to the project area, and is located approximately 0.5 miles to the southeast. This 34,119-acre unit lies within Alameda and Contra Costa Counties and primarily includes land owned by East Bay Regional Parks and under private ownership. It represents the northwest portion of the subspecies' range (USFWS 2006).

The southern and eastern portions of the project site are dominated by paved portions of Via Verdi and El Portal, and riparian areas associated with San Pablo Creek. These areas lack the habitat elements associated with core AWS habitat including scrub/shrub communities with a mosaic of open and closed canopy, and are not contiguous to areas with these habitat elements. These areas also lack rock outcrops, talus and other features associated with the presence of AWS when within or adjacent to core habitat areas. The portion of the study area north of El Portal and south of the bypass road contained a small amount of coyote brush (*Baccharis pilularis*) but not in sufficient quantity to significantly improve habitat in the area for the AWS.

North of the bypass road, the existing stockpile area and the proposed stockpile area further to the north have similar habitat characteristics. Both areas are dominated by annual grasses and lack any significant amount of scrub/shrub habitat suitable for AWS. Other habitat features associated with use by AWS also are lacking. Few rodent burrows were observed, and rock outcrops were absent. Patches of ground devoid of vegetation which may have appeared to be rock piles from an examination of aerial photos were actually disturbed soil areas, presumably associated with grading and landscaping activities by the cemetery (see **Appendix A** for representative site photos).

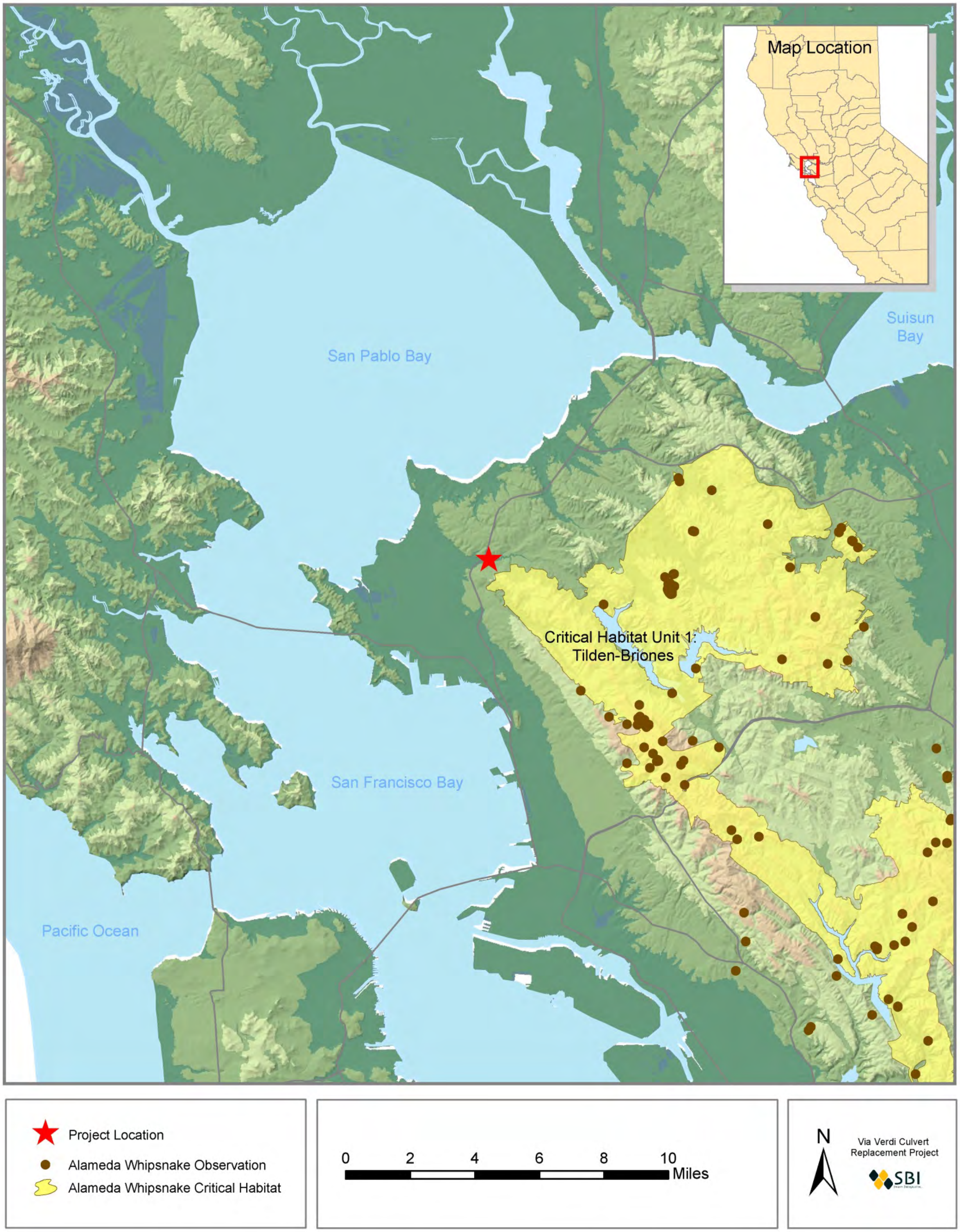

Figure 2. Project location, critical habitat, and nearest recorded observations of AWS

Summary and Conclusion

Our analysis of habitat characteristics and conditions on and near the site combined with the distribution of known observations of the species suggests that the AWS is not expected to occur within the project area. The nearest known AWS occurrence record is located just less than four miles from the project site and is separated from the project area by residential development and heavily traveled roads.

The Tilden-Briones critical habitat unit is located approximately one half mile from the site, however the presence of urban development including heavily traveled roads between it and the project area make the dispersal of AWS from this area extremely unlikely. The location of the site at the extreme edge of the species known range combined with the lack of additional suitable habitat in the isolated block of undeveloped land or nearby reduce the likelihood that individual AWS might disperse through the area *en route* to another location. Further, the lack of suitable core habitat on-site would make it extremely unlikely that AWS that may disperse to the area by chance would remain within the project area. It is therefore our conclusion that the risk of encountering AWS during construction is negligible and that any implementation of physical, on-the-ground avoidance and minimization measures (AMMs) is not needed to avoid take of AWS habitat. The only recommended action is to include AWS identification and acknowledge its protected status in the project tailboard associated with the work.

Please feel free to contact me should you have any questions regarding the content of this memorandum.

Sincerely,

Jeff Mitchell

Jeff Mitchell
Project Manager/Senior Biologist

Literature Cited

California Department of Fish and Game (CDFG). 2011. California Natural Diversity Database (CNDDB) query for the Richmond USGS 7.5-minute quadrangles. January 6, 2012.

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_____. 2002. Alameda whipsnake habitat assessment for the Equilon Pipeline Marsh Creek Replacement Project, Contra Costa County, California. Prepared for Essex Environmental, Inc. 30

September 2002.

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Swaim, K. E. 1994. Aspects of the ecology of the Alameda whipsnake (*Masticophis lateralis euryxanthus*) Masters Thesis, California State University, Hayward, CA. 140 pp.

U.S. Department of Agriculture (USDA). 1997. *Ecological subregions of California: section and subsection descriptions*. USDA, Forest Service Pacific Southwest Region. R5-EM-TP-005. September.

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_____. 2006. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Alameda Whipsnake. Federal Register. 71:58176-58231.

Appendix A. Representative Site Photos

Photo 1. Excavated portion of San Pablo Creek with closed section of Via Verdi Dr. and its junction with El Portal in the background. Photo taken facing south.

Photo 2. Northern end of the existing excavation with San Pablo Creek riparian zone beyond the chain link fence. Via Verdi Dr. is visible on the left. Photo taken facing east.

Photo 3. Junction of the temporary bypass road with Via Verdi. Oaks located on cemetery property near the top of the photo are outside of the proposed project area. Photo taken facing north.

Photo 4. Cemetery property immediately north of Via Verdi located outside of the proposed project area. Photo taken facing northwest.

Photo 5. Cemetery property located north of Via Verdi. This area is just north of the eastern extent of the project area and would not be directly affected by project activities.

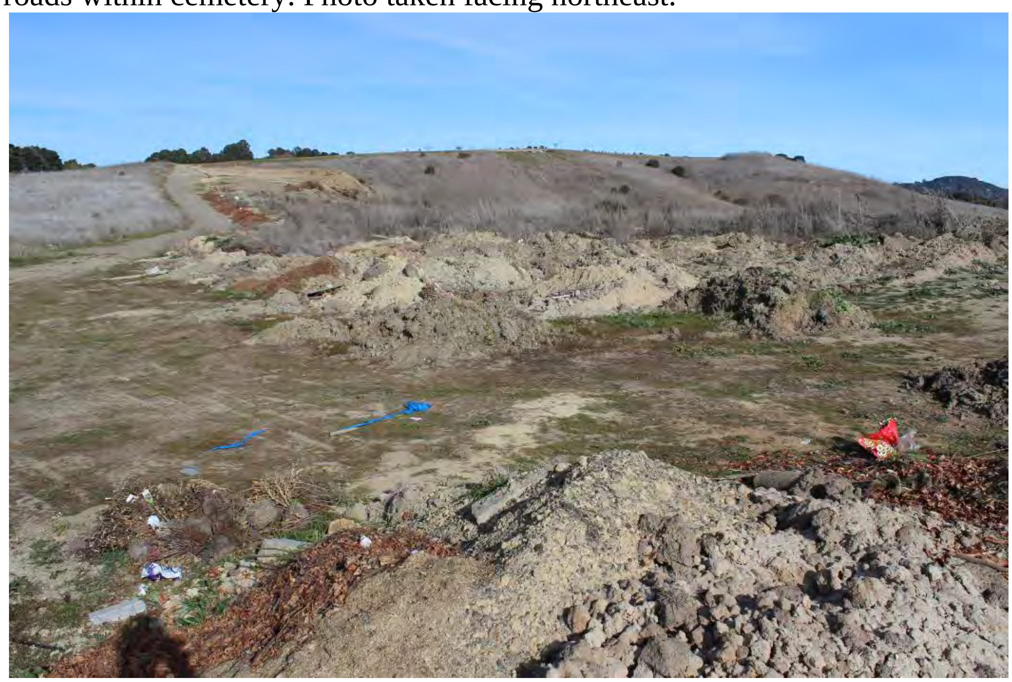
Photo 6. Spoils pile from bypass road construction located on cemetery property between bypass road (left) and I-80 onramp (right). This area would be subject to disturbance from project activities. Photo taken facing south.

Photo 7. Via Verde viewed from cemetery property at the southern edge of the project area. Trees at the left of the photo are outside of the project area. Photo taken facing east.

Photo 8. Proposed additional stockpile area located on cemetery property. Photo taken facing south.

Photo 9. Proposed additional stockpile area located within cemetery property. Photo taken facing southwest.

Photo 10. Proposed additional stockpile area. Access road (left) connects paved roads within cemetery. Photo taken facing northeast.



Appendix B

RECORD OF PHONE CONVERSATION WITH GARY STERN (NMFS) REGARDING STEELHEAD

NICHOLS CONSULTING ENGINEERS, Chtd.
Engineering and Environmental Services

P.O. Box 1760 • Zephyr Cove, NV 89448 • 775.588.2505 • FAX 775.588.2607

NMFS Phone Conversation Log

On May 9, 2011 Liz Lundholm had a phone conversation with Gary Stern at the NMFS out of the Santa Rosa office regarding the Via Verde project. Upon giving him a verbal description of the proposed project and requesting which permits are appropriate to apply for considering there may be the presence of special status species on site and there would be work in the waterway; Gary informed that there is no real presence of Steelhead in the San Pablo Creek due to all the obstructions in the Creek. He referred to the Center for Ecosystem Management and Restoration. On their website, he referenced the SF Bay Steelhead Report that would provide a detailed description of Steelhead habitat in the Bay Area. (http://www.cemar.org/publications.html)

Gary Stern also said that typically, the applicant applies for a 404 Permit with the ACOE and if there are any special status species that NMFS would be a stakeholder, the ACOE would seek their expertise in reviewing the 404 permit application. Although Mr. Stern did not think it would be important for NMFS to attend the on-site initial agency consultation meeting (no Steelhead on site), NCE would send an official request and he would respond.

Gary Stern:
707.575.6060
Gary.stern@noaa.gov

Appendix C

OFFICIAL USFWS LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN PROJECT AREA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: December 07, 2017
Consultation Code: 08ESMF00-2018-SLI-0598
Event Code: 08ESMF00-2018-E-01669
Project Name: Via Verde Slope Stabilization Project

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2018-SLI-0598

Event Code: 08ESMF00-2018-E-01669

Project Name: Via Verde Slope Stabilization Project

Project Type: TRANSPORTATION

Project Description: Project will result in new road and stabilization of landslide-prone slope along Via Verde Road in Richmond. Work will begin during the summer of 2018.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/37.968027872030234N122.31473002991012W

Counties: Contra Costa, CA

Endangered Species Act Species

There is a total of 14 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
Salt Marsh Harvest Mouse *Reithrodontomys raviventris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/613	Endangered

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered
Western Snowy Plover *Charadrius alexandrinus nivosus* Population: Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8035	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Alameda Whipsnake (=striped Racer) *Masticophis lateralis euryxanthus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5524	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened
Tidewater Goby *Eucyclogobius newberryi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/57	Endangered

Insects

NAME	STATUS
Callippe Silverspot Butterfly *Speyeria callippe callippe* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3779	Endangered
San Bruno Elfin Butterfly *Callophrys mossii bayensis* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3394	Endangered

Flowering Plants

NAME	STATUS
California Seablite *Suaeda californica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6310	Endangered
Pallid Manzanita *Arctostaphylos pallida* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8292	Threatened
Santa Cruz Tarplant *Holocarpha macradenia* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6832	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Appendix D

SPECIAL STATUS SPECIES CONSIDERED FOR ANALYSIS

Species	Status	Habitat	Occurrence in the Study Area
Plant Species			
Pallid manzanita (*Arctostaphylos pallida*)	FT, SE, CNPS 1B.1	Found in siliceous shale, sandy or gravely soils. Habitats include broadleaved upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, and coastal scrub. 185 - 465 meters. Blooms December - March.	**None**. Does not occur on the site. Potential habitat does not exist on site.
Santa Cruz tarplant (*Holocarpha macradenia*)	FT, SE, CNPS 1B.1	Coastal prairie, coastal scrub, and valley and foothill grassland. Light, sandy soil or sandy clay; often with nonnatives, 10 - 220 meters. Blooms June - October.	**Unlikely**. Species distribution limited to specific areas. Potential habitat does not exist on site.
California seablite (*Suaeda californica)*	FE, CNPS 1B.1	Coastal Salt Marsh, wetland-riparian with salt influence	**None**. Does not occur on the site. Potential habitat does not exist on site.
Avian Species			
Western snowy plover (*Charadrius alexandrines nivosus)*	FT, SSC	Above high tide line on coastal beaches, sand spits, salt pans at lagoons and estuaries	**None.** Does not occur on the site. Potential habitat does not exist on site.
Yellow-billed cuckoo (*Coccyzuz americanus*)	FT	Large patches (25-100 acres) of willows or cottonwoods	**None**. Does not occur on the site. Potential habitat does not exist on site.
California clapper rail *(Rallus longirostris obsoletus*)	FE, SE	Salt or brackish marsh	**None**. Does not occur on the site. Potential habitat does not exist on site.
California least tern *(Sterna antillarum browni*)	FE, SE	Nests colonially on bare or gravelly substrate near water	**None**. Does not occur on the site. Potential habitat does not exist on site.
Mammal Species			
Salt-marsh harvest mouse (*Reithrodontomys raviventris*)	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	**None**. Does not occur on the site. Potential habitat does not exist on site.

Species	Status	Habitat	Occurrence in the Study Area
Herptile Species			
Alameda whipsnake (*Masticophis lateralis euryxanthus*)	FT, ST	Common in scrublands broken by scattered grassy patches, rocky hillsides, gullies, canyons, or stream courses.	**Possible**. The Alameda whipsnake may occur incidentally on the site. They may use the grassland habitat adjacent to the site to forage; however, no breeding habitat is present on site.
California red-legged frog (*Rana draytonii*)	FT, SSC	A pond frog that inhabits humid forests, woodlands, grasslands, and streamsides; however, frequents otherwise permanent sources of water. Breeds January-April and can be found in damp woods during non-breeding periods.	**Possible**. California red-legged frog may occur incidentally on the site. No breeding habitat is present within the action area, but suitable non-breeding habitat for this species is present on the site.
Fish Species			
Tidewater goby (*Eucyclogobius newberryi*)	FE	Lagoons formed by streams running into the sea. The tidewater goby prefers salinities of less than 10 ppt.	**None.** Habitat not present.
Delta smelt (*Hypomesus transpacificus*)	FT	Estuary of Sacramento River. Brackish and fresh water.	**None.** Habitat not present.
Central California Coast Steelhead (*Oncorhynchus mykiss*)	FT	Require cool freshwater for spawning and rearing sites. Adult runs occur during the winter, while the amount of time spent in fresh versus salt water varies considerably. Typically steelhead enter the streams and rivers between late December-April while spawning occurs in late spring.	**Unlikely.** Based on a phone conversation with Gary Stern at National Marine Fisheries Service on May 9, 2011 – due to existing obstructions to the historical spawning habitat including the San Pablo dam. Furthermore, project construction will not take place during spawning season.

Species	Status	Habitat	Occurrence in the Study Area
Invertebrate Species			
San Bruno elfin butterfly (*Callophrys mossii bayensis*)	FE	Occurs in coastal grassy mountainous areas near San Francisco Bay. Located on steep north-facing slopes above 500' elevation that contain populations of host plant *Sedum spathulifolium*.	**Unlikely**. Species distribution is limited to particular areas. Potential habitat does not exist on site.
Callippe silverspot Butterfly (*Speyeria callippe callippe*)	FE	Occurs in native grasslands and adjacent habitats surrounding the San Francisco Bay. Females lay their eggs on host plant *Viola pedunculata.*	**Unlikely**. Species distribution is limited to particular areas. Potential habitat does not exist on site.

Status codes are defined as follows:
Federal status: USFWS Listing
FE = Listed as endangered under the Federal Endangered Species Act
FT = Listed as threatened under the Federal Endangered Species Act
California State Status: CDFW Listing
SE = Listed as endangered under California Endangered Species Act
ST = Listed as threatened under California Endangered Species Act
CSC = Species of Special Concern
California Native Plant Society (CNPS) Ranking
1A = Plants Presumed Extinct in California
1B = Plants Rare, Threatened, or Endangered in California and elsewhere
0.1 = Seriously threatened in California (over 80% of occurrences threatened/high degree and Immediacy of threat)

Appendix E

REPRESENTATIVE PHOTOGRAPHS

Staging Area looking south

Looking south at planted coast live oak saplings in annual grassland on south side of Via Verdi Road

San Pablo Creek Channel looking upstream

Existing Via Verdi Road alignment looking northeast – note: plastic erosion barrier between Via Verdi Road and temporary emergency access road to the north.

Temporary emergency access road and annual grassland growing through erosion control blanket at northern end of action area. Photo looking southwest.

Black mustard (*Brassica nigra*) dominated annual grassland on north side of action area.

Appendix F

FIGURES

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\Bio Maps\BA Figure 1 Project Location v02.mxd

Action Area

NCE

Richmond

Via Verdi Slope Stabilization Project

Action Area

N

1 in. = 500 ft.

0 250 500 ft.

FIGURE

1

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI World Imagery basemap	568.41.55	mcasterman	12/1/2017	4/27/2018	drios

NCE

Richmond

Via Verdi Slope Stabilization Project

Habitat Map

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE 2

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI World Imagery basemap	568.41.55	mcasterman	12/1/2018	4/27/2018	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\Bio Maps\BA Figure 2 Veg Map.mxd

		Via Verdi Slope Stabilization Project		FIGURE
Work Area Temporary Impact Area	NCE / Richmond	Via Verdi Slope Stabilization Project Habitat Impact Areas	N 1 in. = 200 ft. 0 100 200 ft.	FIGURE 3

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI World Imagery basemap	568.41.55	mcasterman	12/1/2017	4/27/2018	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\Bio Maps\BA Figure 3 Habitat Impacts.mxd

Appendix G

USFWS BIOLOGICAL OPINION FOR 2012 VIA VERDI CULVERT PROJECT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
08ESMF00-2011-F-0875

MAR 2 1 2012

Ms. Jane M. Hicks
Chief, Regulatory Division
Attn: Ms. Christina Cavett-Cox
San Francisco District
U. S. Army Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Subject: Biological Opinion on the Via Verdi Culvert Repair Project, Contra Costa County, California (Corps File # 2010-00171S)

Dear Ms. Hicks:

This is in response to the U.S. Army Corps of Engineers (Corps) September 26, 2011, letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) on the Via Verdi Culvert Repair Project, located in the City of Richmond, Contra Costa County, California. Your request was received in our office on September 27, 2011. This document represents the Service's biological opinion on the effects of the action on the threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*) and the threatened California red-legged frog (*Rana draytonii*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq) (Act). Critical habitat for the Alameda whipsnake and the California red-legged frog has been designated but does not occur within the proposed Via Verdi Culvert Repair Project action area.

This biological opinion is based on: (1) *Via Verdi Repair Project, San Pablo Creek, Replacement, Preliminary Biological Resource Assessment*, dated August 25, 2011; (2) San Francisco Bay Area, Joint Aquatic Resource Permit Application; (3) *Via Verdi Repair Project San Pablo Creek Culvert Replacement CWA Section 404 (b) (1) Alternatives Analysis*, dated December 9, 2011; (4) *Alameda Whipsnake Site Assessment for the Via Verdi Culvert Replacement Project, Swaim Biological Incorporated*, dated January 13, 2012; and (5) other information available to the Service.

Consultation History

September 26, 2011	The Service received the biological assessment and request for formal consultation for the Via Verdi Culvert Repair Project from the Corps.
January 3, 2012	The Service sent an electronic mail request to the Corps for further information regarding the Via Verdi Culvert Repair Project.
January 4, 2012	The Service participated in a meeting regarding the Via Verdi Culvert Repair Project with the Corps. The Service requested information regarding the Via Verdi Culvert Repair Project during the meeting.
January 13, 2012	The Service received electronic mail from the Corps with responses to our requests for further information.

BIOLOGICAL OPINION

Description of the Proposed Action

Project Background

In April 2010, the City of Richmond responded to an emergency "sinkhole" that collapsed unexpectedly at Via Verdi near El Portal Drive. Subsequently, the street known as Via Verdi was closed due to the collapse of a portion of Via Verdi into the "sinkhole". This is the only street access for a community of single family homes and several apartment buildings (known as the Sobrante Glen) and serves as a point of access for an apartment complex located at Via Verdi and El Portal Drive. This event was proclaimed by the City of Richmond as a local state of emergency with implications to street infrastructure and access to nearby communities through Via Verdi, local utilities (sanitary sewer and water supply), San Pablo Creek, the upstream San Pablo Reservoir, and the nearby apartment structures.

The project site also intersects San Pablo Creek and occupies portions of the Richmond, California 7.5 minute USGS quadrangle. The project area covers approximately 10 acres while the approximate area of focus, where a culvert collapsed, is 130 feet long, 30 to 50 feet in width, and 30 feet in depth.

Based on as-built plans of the culvert, this 33-year old culvert was constructed of large oval shape corrugated metal pipe, approximately 22-foot, 6-inch width and 15-foot, 8-inch height. The grading plans for the subdivision above also included placement of a large engineering fill terrace adjacent to El Portal Drive, with approximately 2:1 (horizontal: vertical) slopes as high as 30 feet. This fill terrace is currently undeveloped grassland and is the property of the Rolling Hills Memorial Park Cemetery (Cemetery Property). In addition, buttress fill details were called for to address shallow slide debris in an area northwest of the collapse area further uphill along Via Verdi.

Starting at the upstream end, the culvert alignment runs in a southwesterly direction adjacent to an apartment complex, underneath Via Verdi, under the south-eastern corner of the engineered fill terrace, and then turns south (perpendicular to El Portal Drive) under El Portal Drive to the downstream headwall at the southern edge of El Portal Drive. The bottom of culvert is 35 feet long and 30 feet below existing grade at Via Verdi and El Portal Drive respectively, with even greater overburden as the culvert passes underneath the engineered fill terrace.

Project Overview

Initial completed site work included developing access for residents by constructing a temporary bypass road through the adjacent Cemetery Property, and design and permitting for a temporary shored channel to restore San Pablo Creek flow at the collapsed culvert section.

The City of Richmond will reconstruct the collapsed culvert by designing and constructing a new reinforced concrete box culvert. The design of the repair will include a reinforced concrete headwall at the upstream end of the new culvert and the endwall at the downstream end of the new culvert. In addition to the restoration of the culvert itself, there will be design related to utilities (i.e. stormwater tie-ins), restoration of creek areas adjacent to the headwall and endwall, revegetation, pavement and road rehabilitation, road design for Via Verdi and restoration of the Creekview Apartment Complex (i.e. parking area and entrance to parking area) affected by the culvert collapse, day lighting as much of the creek as feasible at the previous headwall area (approximately 30 feet), utility re-construction in Via Verdi, demolition of the temporary bypass road, and restoration of the adjacent impacted cemetery property to its general former condition. The replacement of the remaining intact culvert will be done with open cut methods to minimize shoring and facilitate construction given the limited construction window and that El Portal will be closed during construction to provide adequate construction space and laydown areas. The design of the repair will include a reinforced concrete headwall at the upstream end of the new culvert and the endwall at the downstream end of the new culvert. This work will require pavement removal, excavation, vegetation removal, and the relocation of underground utilities. It is also anticipated that during construction, shoring will be required at various locations where site constraints from private properties and the shored channel do not allow for sloping back of the excavation.

Utility service providers (i.e., East Bay Municipal Utility District, Pacific Gas & Electric, and Comcast) will conduct construction of temporary bypasses and relocation of their facilities as related to the culvert repair work prior to the start of culvert repair construction. The bypasses/relocation required for the sanitary sewers owned by the West County Sanitary District will be carried out by the contractor for the project. Underground utilities that failed during the catastrophic collapse, including water supply and sanitary sewer, will be reconstructed more or less in their original alignment in Via Verdi.

Conservation Measures

The project proponent proposes to avoid and minimize for affects to listed species through the following conservation measures:

1. Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the Service has been received that the biologist(s) is qualified to conduct the work. The Service-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.

2. Before any construction activities begin, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the Alameda whipsnake and the California red-legged frog and its habitat, the importance of the Alameda whipsnake and the California red-legged frog and their respective habitats, the general measures that are being implemented to conserve the Alameda whipsnake and the California red-legged frog as they relate to the project, the penalties for non-compliance, and the boundaries within which the project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers will sign a form stating that they attended the program and understand all protection measures for the Alameda whipsnake and the California red-legged frog.

3. Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a Service-approved biologist to ensure that no Alameda whipsnakes or California red-legged frogs are present. This survey is not intended to be a protocol-level survey, but rather one designed to verify that no Alameda whipsnakes or California red-legged frogs are present within the construction area before construction activities begin. Two preconstruction surveys for California red-legged frog and Alameda whipsnake will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any California red-legged frogs are found, the Service will be contacted and the Service-approved biologist will be allowed sufficient time to move any California red-legged frogs from the work site before work activities begin. If any Alameda whipsnakes are found, all activities will cease, the Service will be immediately contacted, and no other actions will be taken without authorization from the Service. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs. Any biologist involved with the surveying/handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.

4. Immediately after the second survey, construction fencing and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The Service-approved biologist will supervise the installation of the fencing around the work area. Access routes, turn-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.

5. A Service-approved biologist will monitor all ground disturbing construction activities. After ground disturbing project activities are complete, the Service-approved biologist will train an individual to act as the on-site biological monitor. The Service-approved biological monitor will have attended the training described in *Conservation Measure 2* above. Both the Service-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The Service-approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly and quarterly summaries will be placed on a file sharing website that is accessible to regulatory staff at any time.

6. A Service-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of Alameda whipsnakes or California red-legged frogs. These site inspections will take place each morning before the start of construction activities.

7. If any Alameda whipsnakes or California red-legged frogs are found, all activities will cease, the Service will be immediately contacted, and no other actions will be taken without authorization from the Service. Construction will be halted until all Alameda whipsnakes or California red-legged frogs depart on their own or are removed from the work area by the Service-approved biologist. Actions taken to relocate Alameda whipsnakes or California red-legged frogs will be conducted under the guidance of the Service and California Department of Fish and Game (CDFG). The Service-approved biologist may relocate any Alameda whipsnakes or California red-legged frogs that are in danger of immediate harm from project-related activities, to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The Service-approved biologist will monitor any California red-legged frogs or Alameda whipsnakes that have been relocated until it is determined that it is not imperiled by predators or other dangers.

8. Construction will take place during daylight hours only.

9. Prior to being brought on site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on site.

10. A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no Alameda whipsnakes, California red-legged frogs, or other amphibians and reptiles are taken at the pump.

11. Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.

12. Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for California red-legged frogs) (April 15 to October 15).

13. All areas disturbed as a result of project related activities will be re-vegetated with native plant species only.

14. Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water onsite. These devices will be placed at all locations where the likelihood of sediment input exists.

15. The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to insure that it is not becoming clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.

16. All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side-casting of material into any waterway.

17. During project activities, all trash that may attract predators will be properly contained, removed from the work site and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be managed to minimize the provision of cover for frogs by removing all surface construction debris daily except that required for construction.

18. To mitigate for erosion impacts, best management practices for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.

19. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The Corps and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the Corps will ensure that the applicant will prepare a plan to allow 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.

20. The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project areas will be removed.

21. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in preconstruction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

22. Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that Alameda whipsnakes do not become entangled in the mesh. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control.

23. To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fending or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.

24. Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.

25. All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.

26. A post-construction survey will be conducted the night before the cofferdams are removed to make sure no Alameda whipsnakes or California red-legged frogs have occupied the temporary pool created upstream of the site. If any Alameda whipsnakes or

California red-legged frogs are present, they will be captured by hand and removed upstream of the pond to prevent them being potentially stranded when the dams are removed during the daylight hours and the water levels drop.

27. The applicant, the City of Richmond, will restore approximately 1,000 square feet (0.023 acres) or approximately 30 linear feet of riparian area along San Pablo Creek at the project site. This restored habitat will compensate for temporary impacts to California red-legged frog habitat during construction. No permanent loss of habitat for the Alameda whipsnake and the California red-legged frog is anticipated. Habitat restoration will include, but is not limited to, replanting native vegetation, removal of non-native invasive vegetation, and removal of all currently existing erosion control materials that contain plastic monofilament and replace with them with coconut fiber products where necessary. The applicant will coordinate habitat restoration activities with the Service and the CDFG.

Analytical Framework for the Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the Alameda whipsnake and California red-legged frog range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the Alameda whipsnake and California red-legged frog in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of Alameda whipsnake and California red-legged frog; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on Alameda whipsnake and California red-legged frog; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on Alameda whipsnake and California red-legged frog.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the Alameda whipsnake and the California red-legged frog current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the Alameda whipsnake and the California red-legged frog in the wild. The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the Alameda whipsnake and the California red-legged frog and the role of the action area in the survival and recovery of the Alameda whipsnake and the California red-legged frog as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of the effects assessment, the action area includes the Via Verdi Culvert Repair Project area footprint and lands surrounding the Via Verdi Culvert Repair Project area footprint, including the project footprint and potential habitat for the Alameda whipsnake and the California red-legged frog for a total of 10 acres.

Status of the Species

Alameda whipsnake

For the most recent status of this species please refer to the 5-Year Review published in 2011 (Service 2011).

California red-legged frog

Listing Status: The California red-legged frog was listed as a threatened species on May 23, 1996 (61 FR 25813) (Service 1996). Critical habitat was designated for this species on April 13, 2006 (71 FR 19244) (Service 2006b) and revisions to the critical habitat designation were published on March 17, 2010 (75 FR 12816) (Service 2010). At this time, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer et al. 2010). A Recovery Plan was published for the California red-legged frog on September 12, 2002 (Service 2002b).

Description: The California red-legged frog is the largest native frog in the western United States (Wright and Wright 1949), ranging from 1.5 to 5.1 inches in length (Stebbins 2003). The abdomen and hind legs of adults are largely red, while the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins 2003), and dorsolateral folds are prominent on the back. Larvae (tadpoles) range from 0.6 to 3.1 inches in length, and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

Distribution: The historic range of the California red-legged frog extended from the vicinity of Elk Creek in Mendocino County, California, along the coast inland to the vicinity of Redding in Shasta County, California, and southward to northwestern Baja California, Mexico (Fellers 2005; Jennings and Hayes 1985: Hayes and Krempels 1986). The species was historically documented in 46 counties but the taxa now remains in 238 streams or drainages within 23 counties, representing a loss of 70 percent of its former range (Service 2002b). California red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the Central California Coast. Isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse Ranges. The species is believed to be extirpated from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico.

Status and Natural History: California red-legged frogs predominately inhabit permanent water sources such as streams, lakes, marshes, natural and manmade ponds, and ephemeral drainages in valley bottoms and foothills up to 4,921 feet in elevation (Jennings and Hayes 1994, Bulger et al. 2003, Stebbins 2003). However, they also inhabit ephemeral creeks, drainages and ponds with minimal riparian and emergent vegetation. California red-legged frogs breed from November to April, although earlier breeding records have been reported in southern localities. Breeding generally occurs in still or slow-moving water often associated with emergent vegetation, such as cattails, tules, or overhanging willows (Storer 1925, Hayes and Jennings 1988). Female frogs deposit egg masses on emergent vegetation so that the egg mass floats on or near the surface of the water (Hayes and Miyamoto 1984).

Habitat includes nearly any area within 1-2 miles of a breeding site that stays moist and cool through the summer including vegetated areas with coyote brush, California blackberry thickets, and root masses associated with willow and California bay trees (Fellers 2005). Sheltering habitat for California red-legged frogs potentially includes all aquatic, riparian, and upland areas within the range of the species and includes any landscape feature that provides cover, such as animal burrows, boulders or rocks, organic debris such as downed trees or logs, and industrial debris. Agricultural features such as drains, watering troughs, spring boxes, abandoned sheds, or hay stacks may also be used. Incised stream channels with portions narrower and depths greater than 18 inches also may provide important summer sheltering habitat. Accessibility to sheltering habitat is essential for the survival of California red-legged frogs within a watershed, and can be a factor limiting frog population numbers and survival.

California red-legged frogs do not have a distinct breeding migration (Fellers 2005). Adults are often associated with permanent bodies of water. Some individuals remain at breeding sites year-round, while others disperse to neighboring water features. Dispersal distances are typically less than 0.5-mile, with a few individuals moving up to 1-2 miles (Fellers 2005). Movements are typically along riparian corridors, but some individuals, especially on rainy nights, move directly from one site to another through normally inhospitable habitats, such as heavily grazed pastures or oak-grassland savannas (Fellers 2005).

In a study of California red-legged frog terrestrial activity in a mesic area of the Santa Cruz Mountains, Bulger et al. (2003) categorized terrestrial use as migratory and non-migratory. The latter occurred from one to several days and was associated with precipitation events. Migratory movements were characterized as the movement between aquatic sites and were most often associated with breeding activities. Bulger et al. (2003) reported that non-migrating frogs typically stayed within 200 feet of aquatic habitat 90 percent of the time and were most often associated with dense vegetative cover, i.e., California blackberry, poison oak and coyote brush. Dispersing frogs in northern Santa Cruz County traveled distances from 0.25-mile to more than two miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger et al. 2003).

In a study of California red-legged frog terrestrial activity in a xeric environment in eastern Contra Costa County, Tatarian (2008) noted that a 57 percent majority of frogs fitted with radio transmitters in the Round Valley study area stayed at their breeding pools, whereas 43 percent moved into adjacent upland habitat or to other aquatic sites. Her study reported a peak seasonal terrestrial movement occurring in the fall months associated with the first 0.2-inch of precipitation and tapering off into spring. Upland movement activities ranged from 3 to 233 feet, averaging 80 feet, and were associated with a variety of refugia including grass thatch, crevices, cow hoof prints, ground squirrel burrows at the base of trees or rocks, logs, and under man-made structures; others were associated with upland sites lacking refugia (Tatarian 2008). The majority of terrestrial movements lasted from 1 to 4 days; however, one adult female was reported to remain in upland habitat for 50 days (Tatarian 2008). Upland refugia closer to aquatic sites were used more often and were more commonly associated with areas exhibiting higher object cover, e.g., woody debris, rocks, and vegetative cover. Subterranean cover was not significantly different between occupied upland habitat and non-occupied upland habitat.

California red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto 1984). Egg masses containing 2,000 to 5,000 eggs are attached to vegetation below the surface and hatch after 6 to 14 days (Storer 1925, Jennings and Hayes 1994). In coastal lagoons, the most significant mortality factor in the pre-hatching stage is water salinity (Jennings et al. 1992). Eggs exposed to salinity levels greater than 4.5 parts per thousand resulted in 100 percent mortality (Jennings and Hayes 1990). Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae undergo metamorphosis 3½ to 7 months following hatching and reach sexual maturity 2 to 3 years of age (Storer 1925; Wright and Wright 1949; Jennings and Hayes 1985, 1990, 1994). Of the various life stages, larvae probably experience the highest mortality rates, with less than 1 percent of eggs laid reaching metamorphosis (Jennings et al. 1992). California red-legged frogs may live 8 to 10 years (Jennings et al. 1992). Populations can fluctuate from year to year; favorable conditions allow the species to have extremely high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of occupied sites. In contrast, the animal may temporarily disappear from an area when conditions are stressful (e.g., during periods of drought, disease, etc.).

The diet of California red-legged frogs is highly variable and changes with the life history stage. The diet of the larvae is not well studied, but is likely similar to that of other ranid frogs, which feed on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Fellers 2005; Kupferberg 1996a, 1996b, 1997). Hayes and Tennant (1985) analyzed the diets of California red-legged frogs from Cañada de la Gaviota in Santa Barbara County and found invertebrates (comprising 42 taxa) to be the most common prey item consumed; however, they speculated that this was opportunistic and varied based on prey availability. They ascertained that larger frogs consumed larger prey and were recorded to have preyed on Pacific chorus frogs, three-spined stickleback, and, to a limited extent, California mice, which were abundant at the study site (Hayes and Tennant 1985, Fellers 2005). Although larger vertebrate prey was consumed less frequently, it represented over half of the prey mass eaten by larger frogs suggesting that such prey may play an energetically important role in their diets (Hayes and Tennant 1985). Juvenile and subadult/adult frogs varied in their feeding activity periods; juveniles fed for longer periods throughout the day and night, while subadult/adults fed nocturnally (Hayes and Tennant 1985). Juveniles were significantly less successful at capturing prey and all life history stages exhibited poor prey discrimination, feeding on several inanimate objects that moved through their field of view (Hayes and Tennant 1985).

Recovery Plan: The Recovery Plan for the California red-legged frog identifies eight recovery units (Service 2002b). The establishment of these recovery units is based on the determination that various regional areas of the species' range are essential to its survival and recovery. These recovery units are delineated by major watershed boundaries as defined by U.S. Geological Survey hydrologic units and the limits of its range. The goal of the Recovery Plan is to protect the long-term viability of all extant populations within each recovery unit. Within each recovery unit, core areas have been delineated and represent contiguous areas of moderate to high California red-legged frog densities that are relatively free of exotic species such as bullfrogs. The goal of designating core areas is to protect metapopulations. This, when combined with suitable dispersal habitat, will allow for the long term viability within existing populations. The management strategy identified within the Recovery Plan will allow for the recolonization of habitats within and adjacent to core areas that are naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of California red-legged frogs

Threats: Habitat loss, non-native species introduction, and urban encroachment are the primary factors that have adversely affected the California red-legged frog throughout its range. Several researchers in central California have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish, signal crayfish, and several species of warm water fish including sunfish, goldfish, common carp, and mosquitofish (Moyle 1976; Barry 1992; Hunt 1993; Fisher and Schaffer 1996). This has been attributed to predation, competition, and reproduction interference. Twedt (1993) documented bullfrog predation of juvenile northern red-legged frogs, and suggested that bullfrogs could prey on subadult California red-legged frogs as well. Bullfrogs may also have a competitive advantage over California red-legged frogs. For instance, bullfrogs are larger and possess more generalized food habits (Bury and Whelan 1984). In addition, bullfrogs have an extended breeding season (Storer 1933) during which an individual female can produce as many as 20,000 eggs (Emlen 1977). Furthermore, bullfrog larvae are unpalatable to predatory fish (Kruse and Francis 1977). Predation by bullfrogs on California red-legged frogs may result in uneven sex ratios and increase the potential for Allee effects. Both California and northern red-legged frogs have been observed in amplexus (mounted on) with both male and female bullfrogs (Jennings and Hayes 1990; Twedt 1993; Jennings 1993). Thus bullfrogs are able to prey upon and out-compete California red-legged frogs, especially in sub-optimal habitat.

The urbanization of land within and adjacent to California red-legged frog habitat has also affected the threatened amphibian. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks dispersal, and the introduction of predatory fishes and bullfrogs. Diseases may also pose a significant threat, although the specific effects of disease on the California red-legged frog are not known. Pathogens are suspected of causing global amphibian declines (Davidson et al. 2003). Chytridiomycosis and ranaviruses are a potential threat because these diseases have been found to adversely affect other amphibians, including the listed species (Davidson et al. 2003; Lips et al. 2006). Mao et al. (1999 cited in Fellers 2005) reported northern red-legged frogs infected with an iridovirus, which was also presented in sympatric threespine sticklebacks in northwestern California. Non-native species, such as bullfrogs and non-native tiger salamanders that live within the range of the California red-legged frog have been identified as potential carriers of these diseases (Garner et al. 2006). Humans can facilitate the spread of disease by encouraging the further introduction of non-native carriers and by acting as carriers themselves (i.e., contaminated boots, waders or fishing equipment). Human activities can also introduce stress by other means, such as habitat fragmentation, that results in the listed species being more susceptible to the effects of disease.

Environmental Baseline

Five general habitat types were identified on the project site. These are native-nonnative ornamental, California annual grassland, coyote brush chaparral, broadleaf deciduous riparian woodland, and mixed broadleaf woodland (Sawyer and Keeler-Wolf, 1995). Plant species found in native-nonnative ornamental included maple, pacific madrone, eucalyptus, pine, oak, poison oak, and clover. Species found in the California annual grassland included wild oat, Canada thistle, California poppy, black mustard, English plantain, vetch, blessed milkthistle, field sowthistle, and lupine. The coyote brush chaparral vegetation consists of coyote brush and poison oak. Broadleaf deciduous riparian woodland species included maple, willow, California buckeye, and poison oak. Oak, red willow, and poison oak were found in the mixed broadleaf woodland.

The habitats within and surrounding the project site support a varied assemblage of wildlife, which may move up and down the riparian corridor along San Pablo Creek from time to time. The riparian and upland vegetation in the vicinity provides foraging habitat and cover for several mammal species. These include western gray squirrel, coyote, and mule deer.

Land use in the vicinity includes residential, commercial, and open space areas. The project action area is bounded on the west by Interstate 80 and by the Rolling Hills Memorial Park, a privately-owned cemetery to the north. The eastern portion of the area includes a portion of Via Verdi Drive, a two-land residential street connected to a neighborhood located approximately 300 feet further east. Also within the eastern portion of the project action area is San Pablo Creek, a northwest-trending creek that flows from near Orinda to San Pablo Bay. The southern portion of the project action area abuts the parking lot of a nearby apartment complex, as well as a portion of El Portal Drive and a residential/commercial area to its south. Further to the south El Portal connects to San Pablo Dam Road, a major expressway linking the cities of Richmond and Orinda.

Alameda whipsnake

Existing threats in the action area include loss and modification of habitat, disturbance from artificial lighting, noise, vehicular-caused injury or mortality, and predation or harassment by domestic pets. Urbanization and development continues to encroach upon existing suitable habitat. There is limited suitable habitat for Alameda whipsnakes for foraging, breeding, basking, and finding cover and hibernacula within the project footprint and action area. The southern and eastern portions of the project site are dominated by paved portions of Via Verdi and El Portal, and riparian areas associated with San Pablo Creek. These areas lack habitat elements typically associated with core Alameda whipsnake habitat including scrub/shrub communities with a mosaic of open and closed canopy, and are not contiguous to areas with these habitat elements. There are no rock outcrops or talus within the project action area. However, Alameda whipsnakes may be drawn to paved areas within the project site for basking.

The portion of the study area north of El Portal and south of the bypass road contains a small amount of coyote brush. North of the bypass road, the existing stockpile area and the proposed stockpile area further to the north have similar habitat characteristics. Both areas are dominated by annual grasses, but lack significant scrub/shrub habitat suitable for the Alameda whipsnake. There are few rodent burrows within the project action area. There are also patches of ground devoid of vegetation and disturbed soil area, which may a product of grading and landscaping activities by the cemetery.

The project area is located 0.5 mile northwest of Critical Habitat Unit AWS-1 (Tilden-Briones). There are multiple documented occurrences (> 50) of Alameda whipsnakes within AWS-1. Several of these are located within 3.8 to 6.1 miles of the project site (California Natural Diversity Database (CNDDB) 2012; Swaim Biological Incorporated (SBI) 2012). There are no recorded occurrences of Alameda whipsnake within or in close proximity to the project action areas. No Alameda whipsnakes were observed during reconnaissance field surveys (SBI 2012). However, the Service believes that Alameda whipsnakes may be present in the project action area because of the close proximity of highly suitable habitat to the project site, some grassland habitat is available within the action area, Alameda whipsnakes may be drawn to paved areas within the site for basking, and Alameda whipsnakes may also utilize the San Pablo Creek riparian corridor for foraging and dispersal.

California red-legged frog

Existing threats are similar to those described above for the Alameda whipsnake. There is suitable habitat to support California red-legged frogs within the project action area. The project action area provides all the necessary habitat features to support breeding, foraging, and cover for the California red-legged frog. Overhanging riparian vegetation protects pools up to three-feet deep in the upstream portion of the project site. Stream conditions downstream include well-developed riparian cover and a shallow, gravely stream bed. These areas may provide habitat for California red-legged frog.

The project action area is located about 3.6 miles from Critical Habitat Unit CCS-1 for the California red-legged frog. The nearest documented occurrence of California red-legged frogs is less than one half-mile from the project action area, on a tributary to San Pablo Creek (Nichols Consulting Engineers (NCE) 2011). There are several other documented occurrences of California red-legged frogs within 3.4 to 5.5 miles of the project site (NCE 2011; CNDDB 2012).

Therefore, based on the biology and ecology of this species, it is reasonable to conclude that California red-legged frogs would utilize the San Pablo Creek riparian corridor for breeding, foraging, and dispersal.

Effects of the Proposed Action

Mortality, injury, or harassment of the Alameda whipsnake and California red-legged frog could occur from being crushed by project related equipment or vehicles, construction debris, and worker foot traffic within the action area. The collapse of small mammal burrows could expose individuals to predation or adverse environmental conditions. Individuals of these two listed species also could fall into trenches, pits, or other excavations, and then be directly killed or unable to escape and be killed due to desiccation, entombment, or starvation. Work activities may cause individuals to leave the work site, and surrounding areas within 300 feet of the worksite, which could subject the individuals to increased predation or adverse environmental conditions. This disturbance and displacement may increase the potential for predation, desiccation, competition for food and shelter, or strike by vehicles on roadways.

Various conservation measures such as minimizing the total area disturbed by project activities, collapsing burrows to make sure individuals are not crushed, providing escape ramps in trenches, and properly constructed exclusionary fencing may reduce mortality, injury, or harassment. Preconstruction surveys and the relocation of Alameda whipsnakes and California red-legged frogs may reduce injury or mortality. However, the capturing and handling of Alameda whipsnake and California red-legged frogs to remove them from the work area may result in the harassment, mortality or injury of individuals. Improper handling, containment, or transport of individuals should be reduced or prevented by use of a Service-approved biologist, and by limiting the duration of handling, and requiring the proper transport of these species to suitable habitat, as determined by the Service-approved biologist, located a minimum of 500 feet from the project action area.

Other work activities associated with the Via Verdi Culvert Repair Project also may adversely affect Alameda whipsnakes and California red-legged frogs. Trash left during or after project activities could attract predators to work sites, which could subsequently harass or prey on the animals. For example, raccoons, crows, and ravens are attracted to trash and also prey opportunistically on amphibians and reptiles. Accidental spills of hazardous materials or careless fueling or oiling of vehicles or equipment could degrade water quality or habitat to a degree where snakes and frogs are adversely affected.

Some potential also exists for disturbance of habitat which could result in the spread or establishment of non-native invasive plant species. However, additional conservation measures such as removing trash at the end of each work day, conducting biological resources awareness training for all project personnel, and including measures to prevent spills may reduce mortality, injury, or harassment of these listed species.

Biologists working in different areas and with different species may transmit diseases by introducing contaminated equipment. The chance of a disease being introduced into a new area is greater today than in the past due to the increasing occurrences of disease throughout amphibian populations in California and the United States. It is possible that chytrid fungus may exacerbate the effects of other diseases on California red-legged frogs or increase the sensitivity of this amphibian to environmental changes (e.g., water pH) that reduce normal immune response capabilities (Bosch et al. 2001). Implementation of the *Declining Amphibian Populations Task Force Fieldwork Code of Practice* (Service 2005b) during any aquatic survey activity will likely prevent transfer of diseases through contaminated equipment or clothing.

The proposed project will result in temporary disturbance of 10 acres of habitat over an eight-month construction period from March 2012 to October 2012. This will result in a temporary loss of riparian habitat for the Alameda whipsnake and the California red-legged frog. Construction activities for the proposed project will include grading, excavation, vegetation removal, and relocation of underground utilities. These proposed construction activities may result in habitat degradation, decreased water quality, which may adversely affect any Alameda whipsnakes or California red-legged frogs that may be within the project action area.

Work in the riparian corridor is expected to occur over a five to six month period from April 15, 2012 to October 15, 2012. During construction it is anticipated that there will be shoring required for construction along and within the creek. Alameda whipsnakes and California red-legged frogs will be excluded from the riparian corridor during this time, resulting in a temporary loss of riparian habitat. This temporary loss of riparian habitat may result in decreased breeding opportunities for California red-legged frogs and limited foraging and cover for both species. The riparian corridor upstream and downstream of the construction site is relatively intact willow riparian forest. Approximately 9,000 square feet of this riparian woodland will have to be cleared upstream of the culvert and approximately 2,500 square feet will need to be cleared downstream of the culvert. To the extent practicable, the clearing of these riparian areas will be minimized and avoided. After construction is complete, cleared areas will be restored through revegetation with native willow cuttings and other native species from the local vicinity.
Implementation of the proposed conservation measures will significantly reduce adverse effects to Alameda whipsnakes and California red-legged frogs during project construction. Revegetation with native plants will restore riparian habitat for Alameda whipsnakes and California red-legged frogs.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Habitat loss, fragmentation, development, and urbanization pose the greatest conservation threats to Alameda whipsnake and the California red-legged frog. Encroachment from residential developments could result in further habitat loss and fragmentation for the Alameda whipsnake and the California red-legged frog.

The global average temperature has risen by approximately 0.6 degrees Celsius during the 20th Century (Intergovernmental Panel on Climate Change 2001, 2007; Adger et al. 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (Intergovernmental Panel on Climate Change 2001, 2007; Adger et al. 2007), and that it is "very likely" that it is largely due to manmade emissions of carbon dioxide and other greenhouse gases (Adger et al. 2007). Ongoing climate change (Inkley et al. 2004; Kerr 2007; Adger et al. 2007; Kanter 2007) likely imperils these listed species and the resources necessary for their survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitat and/or prey, and/or increased numbers of their predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction, with range shifts precluded by lack of habitat.

Conclusion

Alameda whipsnake and California red-legged frog

After reviewing the current status of the Alameda whipsnake and the California red-legged frog, the environmental baseline for the project area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the Via Verdi Culvert Repair Project, as proposed, is not likely to jeopardize the continued existence of these two listed species because a limited number of Alameda whipsnakes and California red-legged frogs will be taken as a result of the project, relative to the status of the species in and around the action area and range-wide. However, even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of these listed species.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.
The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps: (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement

through enforceable terms that are added to the permit or grant document, and/or; (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

The Service anticipates that incidental take of the Alameda whipsnake and California red-legged frog will be difficult to detect because of their life histories. Specifically, when California red-legged frogs are not in their breeding ponds, they inhabit the burrows of ground squirrels or other rodents or may be moving from one location to another, and may be difficult to locate due to their cryptic appearance and behavior; they may be located a distance from the breeding ponds; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Losses of these species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. In addition, Alameda whipsnakes may be difficult to detect because of their cryptic appearance and behavior. Therefore, the Service anticipates that all Alameda whipsnakes and California red-legged frogs inhabiting 10 acres comprising the project area will be subject to incidental take in the form of harm and harassment.

In addition, the Service anticipates that one Alameda whipsnake and one California red-legged frog inhabiting 10 acres comprising the permanent effects associated with the Via Verdi Culvert Repair Project will be subject to incidental take in the form of capture, injury, or death. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the Via Verdi Culvert Repair Project in the form of harm, harassment, capture, injury, and death of the Alameda whipsnake and California red-legged frog caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to Alameda whipsnake or California red-legged frog.

Reasonable and Prudent Measure

The Service has determined that the following reasonable and prudent measure is necessary and appropriate to minimize the effects of the Via Verdi Culvert Repair Project on the Alameda whipsnake and California red-legged frog:

Adverse effects to Alameda whipsnakes and California red-legged frogs and their habitat shall be minimized to the extent possible.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. All of the conservation measures described in this biological opinion shall be fully implemented and adhered to. Further, these conservation measures shall be supplemented by the terms and conditions below:

   a. The Corps will incorporate the requirement to fully implement all the proposed conservation measures as a condition of its permit to the applicant for this project.

   b. The Corps will condition its permit to require compliance with the reporting requirements of this biological opinion, including a post construction report outlining how the Conservation Measures were implemented for this project.

   c. To avoid transferring disease or pathogens while handling California red-legged frogs, the Corps shall require all applicants to follow the Declining Amphibian Populations Task Force Fieldwork Code of Practice.

   d. The Corps will condition its permit to require the City of Richmond to submit a monitoring plan and success criteria for the proposed revegetation plan to the Service for review and approval prior to implementation.

Reporting Requirements

The Service and the CDFG must be notified within one (1) working day of the finding of any injured or dead Alameda whipsnake, California red-legged frog, or any unanticipated damage to their habitats associated with the proposed project. Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Notification must include the date, time, and precise location of the individual/incident clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. Dead individuals must be sealed in a Zip-lock® plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site. The Service contact persons are the Coast Bay / Forest Foothills Division Chief at (916) 414-6600; and the Resident Agent-in-Charge of the Service's Division of Law Enforcement, 2800 Cottage Way, Room W-2928, Sacramento, California 95825, at (916) 414-6660. The Department of Fish and Game contact is John Krause at (707) 944-5500. The applicant shall submit a post-construction compliance report prepared by the Service-approved biologist to the Sacramento Fish and Wildlife Office within thirty (30) calendar days of the date of the completion of construction activity. This report shall detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the project in meeting conservation measures; (iii) an explanation of failure to meet such measures, if any;

(iv) known project effects on the Alameda whipsnake and California red-legged frog, if any; (v) occurrences of incidental take of Alameda whipsnakes and California red-legged frogs if any; (vi) documentation of employee environmental education; and (vii) other pertinent information.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Service recommends the Corps develop and implement the appropriate restoration measures in areas designated in the *Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, California* (Service 2002a), and the *Recovery Plan for the California Red-legged Frog* (Service 2002b).

2. The Corps should encourage or require the use of appropriate California native species in vegetation and habitat enhancement efforts.

3. The Corps should incorporate "environmentally friendly" erosion and stabilization techniques whenever possible in this project.

4. To avoid transferring disease or pathogens while handling amphibians, the Corps should encourage all applicants to follow the Declining Amphibian Populations Task Force Fieldwork Code of Practice (Service 2005b).

5. Sightings of any listed or sensitive animal species should be reported to the CNDDB of the CDFG. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the Via Verdi Culvert Repair Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the action agency must immediately request reinitiation of formal consultation. Please contact Florence Gardipee or Ryan Olah, Coast Bay / Forest Foothills Division Chief, of this office at (916) 414-6600, or by email (Flo_Gardipee@fws.gov or Ryan_Olah@fws.gov).

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
John Heal, Nichols Consulting Engineers, Richmond, California

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NMFS Phone Conversation Log

On May 9, 2011 Liz Lundholm had a phone conversation with Gary Stern at the NMFS out of the Santa Rosa office regarding the Via Verde project. Upon giving him a verbal description of the proposed project and requesting which permits are appropriate to apply for considering there may be the presence of special status species on site and there would be work in the waterway; Gary informed that there is no real presence of Steelhead in the San Pablo Creek due to all the obstructions in the Creek. He referred to the Center for Ecosystem Management and Restoration. On their website, he referenced the SF Bay Steelhead Report that would provide a detailed description of Steelhead habitat in the Bay Area. (http://www.cemar.org/publications.html)

Gary Stern also said that typically, the applicant applies for a 404 Permit with the ACOE and if there are any special status species that NMFS would be a stakeholder, the ACOE would seek their expertise in reviewing the 404 permit application. Although Mr. Stern did not think it would be important for NMFS to attend the on-site initial agency consultation meeting (no Steelhead on site), NCE would send an official request and he would respond.

Gary Stern:
707.575.6060
Gary.stern@noaa.gov

A California Corporation
Specializing in Geotechnical Engineering

Hultgren-Tillis Engineers

January 11, 2018
(Revised: August 17, 2018)
Project No. 867.01

NCE
501 Canal Blvd. Suite I
Richmond, CA 94804

Attention: Mr. Ryan Shafer

Geotechnical Evaluation
Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Dear Mr. Shafer:

INTRODUCTION

This letter presents our evaluation of the planned alternatives for the Via Verdi Slope Stabilization Project. A vicinity map showing the approximate location of the site is presented on Plate 1. A map showing the topography at the site and location is shown on the Site Plan, Plate 2. We presented the results of a geotechnical investigation for the landslide in a report dated May 1, 2018.

Via Verdi is the only access road for the Sobrante Glen Subdivision which consists of single family homes and apartment buildings. The road was constructed in the late 1970's as part of Sobrante Glen development. The Via Verdi right-of-way (ROW) also serves as the alignment for local utilities including water, sanitary sewer, gas, electricity and telecommunications.

An emergency access road has been constructed upslope of the existing road on land owned by Rolling Hills Memorial Park (Cemetery) and some of the utilities have been relocated.

LANDSLIDE

The Via Verdi landslide began in late February 2017 after intense rainfall in January and February. The landslide is approximately 300 feet wide and extends up to 53 feet below the ground surface. The approximate landslide volume of soil within the active landslide is 80,000 cubic yards. The landslide damaged Via Verdi Road and disrupted several of the underground utilities including the sanitary sewer and the water main. The landslide extends upslope of Via Verdi onto Cemetery property. The landslide has moved toward San Pablo Creek and has displaced the road. The landslide is still active, and likely will continue to move toward the creek. Via Verdi will continue to be distressed from landslide movement and the creek may be affected including the potential for movement into the creek and potentially affecting flow.

The piezometer data indicates that the slide area has high groundwater levels. At the time of the landslide, the groundwater in the area above Via Verdi was only a few feet below the existing grade.

CONSTRAINTS

The site has many constraints that make repair of the slide area difficult. The constraints include the depth of the slide and the presence of San Pablo Creek at the toe of the landslide. Another constraint is that the Sobrante Glen subdivision only has one access route into it (Via Verdi). The repair of the landslide needs to be implemented while maintaining access for the residents and keeping the utilities intact. The City of Richmond has a limited ROW for the roadway and the landslide extends onto private property above the ROW.

ALTERNATIVES

The project has developed eight alternatives for consideration. We have evaluated each alternative to check the feasibility of implementation from a geotechnical perspective and to evaluate slope stability. We evaluated some of the alternatives in our report dated May 1, 2018.

Each alternative is discussed below. We performed slope stability analysis to check the effectiveness of the alternatives to increase the factor of safety. Generally, an acceptable long-term factor of safety for the purposes of this analysis is 1.5. The landslide is moving and we used a factor of safety of 1.0 for the existing condition. The existing condition is shown on Plate 3. The slope stability results are shown on the Plates and in Table 1.

Table 1: Slope Stability Results

Condition	Factor of Safety
Existing	1.00
Alternative 1	1.68
Alternative 2, 3:1 Slope	0.99
Alternative 2, 4:1 Slope	0.97
Alternative 2, Remove 10 feet of Soil	1.18
Alternative 4	1.85
Alternative 5	1.75
Alternative 7	1.16
Alternative 8	1.20

The factor of safety is defined as the available shear strength divided by the shear stress along the slip surface. The analysis was performed using computer program SLOPE/W based on limit equilibrium methods.

Only alternatives 2, 4 and 5 bring the factor of safety up to 1.5 or higher. Although Alternatives 4 and 5 could be effective, other constraints make these alternatives infeasible. The main limitation is that the existing temporary emergency access road could be undermined during construction. The residents of Sobrante Glen Subdivision would lose their access to their homes.

<u>Alternative 1 – Toe Buttress with Culvert</u>

This alternative consists of placing fill in the existing creek to buttress the toe of the landslide. This alternative is shown on Plate 4. We performed an analysis for placement of about 22 feet of fill (and a culvert) in the creek. The factor of safety increased to 1.68. We conclude that this alternative is feasible for the landslide repair. Of the alternatives, this is the most reliable technical approach.

Alternative 2 – Abandon Via Verdi and Construct New Access Road
The intent is to provide an alternative access road to the subdivision, but utilities would still be located along or near Via Verdi. The slide is active, and some remediation is needed to keep the landslide from moving into the creek and disrupting flow and to protect utilities. The current slide movement has affected the cemetery property located above Via Verdi. Continued movement of the landslide could negatively affect a portion of the property above the slide.

We considered various geometric changes including flattening the slope to 3:1 (horizontal to vertical) or 4:1, and excavating and lowering the current grade of Via Verdi.

The slope stability analysis for these three cases are shown on Plates 5 through 7. The analysis indicates that the alternatives are not effective in improving the factor of safety of the landslide to an acceptable level.

We conclude that this is not a viable alternative because the landslide could still move and disrupt the adjacent properties and the underground utilities.

Alternative 3 – Retaining Wall
The intent of the retaining wall option is to support the road and land above the road with a buried retaining wall. A typical detail is shown on Plate 8. The landslide is relatively deep (greater than 50 feet). The wall would need to retain the slide mass to these depths resulting in a 50 feet high retaining wall structure. The 50 feet high wall would need some type of tiebacks to be feasible. Multiple rows of tiebacks would be needed. We conclude that it is not feasible to support the landslide with a buried wall installed from existing grade. It is not possible to install the tiebacks from the ground surface. Excavating in front of the wall for tie-back installation could compromise the stability of the wall and further activate the landslide by removing toe-support material.

Alternative 4 and 5 – Excavate Slide Mass and Reconstruct Slope
This alternative is presented on Plate 9. This alternative includes removal of the material within the landslide footprint, keyways into competent material, installation of subdrains at the base of the excavation, and then replacement of the material as a compacted engineered fill. Alternative 4 includes geogrid reinforcement and Alternative 5 does not use reinforcement. This alternative is effective, increasing the factor of safety to 1.85 for Alternative 4 and 1.75 for Alternative 5. This alternative includes using the existing Emergency Access road located above Via Verdi. The potential for movement of this access road is high. Should this repair be attempted, movement above the slide is likely during construction. The existing utilities are also at risk. The utilities cannot be reliable left in or near the current alignment for this alternative. Both the emergency access road and the existing utilities would have to be relocated prior to construction. The new access road considered for Alternative 2 would need to be installed first to provide reliable access.

Alternative 6 – Bridge Over Slide Area
The plan is to construct a bridge across the landslide. The bridge alternative includes mid-span supports within the footprint of the existing landslide. The feasibility of this alternative with mid-span supports is dependent on a stable slide area. This alternative is not feasible because the

grading alternatives noted for Alternative 2 are not effective in stabilizing the landslide area. A bridge with mid-span supports would be at high risk of damage from future landslide movement. A bridge that spans the landslide would be needed for this to be viable.

Alternative 7 – Re-Align Via Verdi

The intent is to place Via Verdi upslope of the existing landslide. The slope regrading planned for this alternative is shown on Plate 10. The slope alterations, similar to those for Alternative 2, are not effective in increasing the factor of safety. This alternative does not provide sufficient increase in the landslide safety factor to be viable.

Alternative 8 – Drainage Gallery

This alternative includes provisions to lower the water table to near the creek flow line (the lowest possible reduction in the water table). This alternative is presented on Plate 11. The factor of safety is only increased to about 1.2 for this alternative. The alternative is not effective in increasing the factor of safety to sufficient levels to be viable and can only practically lower the water level down to the creek water elevation.

SUMMARY

The depth of the landslide limits options to repair it. The lack of two access ways into the subdivision also limits options for repair. To maintain access to the subdivision and to maintain the utilities required for the residents, we conclude that the only viable technical option is to fill the creek to buttress the slope and landslide. The other earthwork options cannot be relied upon to maintain the utilities and access.

It was a pleasure working with you on this project. If you have any questions, please call.

Sincerely,

Hultgren – Tillis Engineers

R. Kevin Tillis

REGISTERED PROFESSIONAL ENGINEER
R. KEVIN TILLIS
NO. GE 2160
GEOTECHNICAL
STATE OF CALIFORNIA

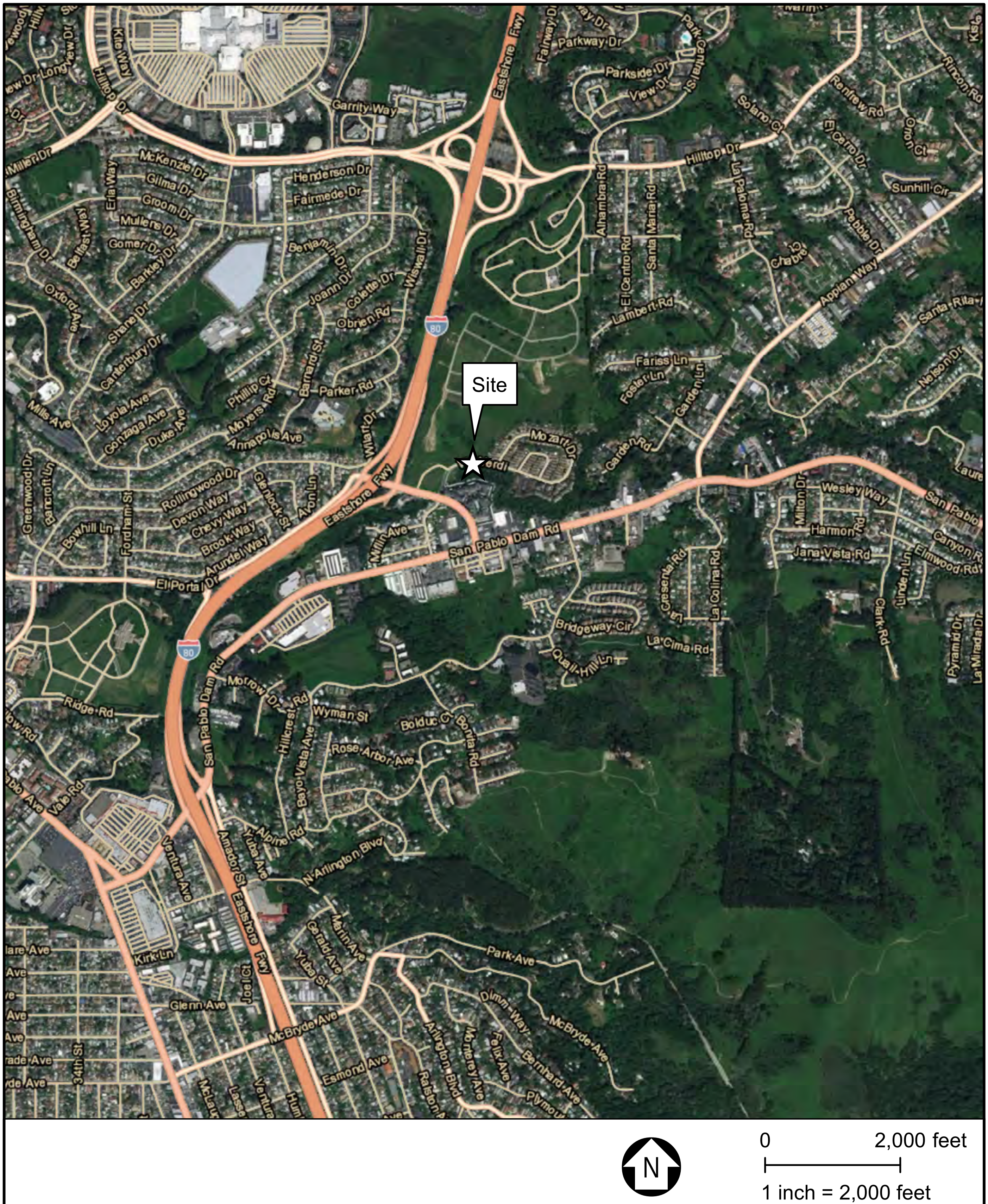
R. Kevin Tillis
Geotechnical Engineer

RKT:lm:la

Attachments: Plates 1 through 11

2 copies submitted

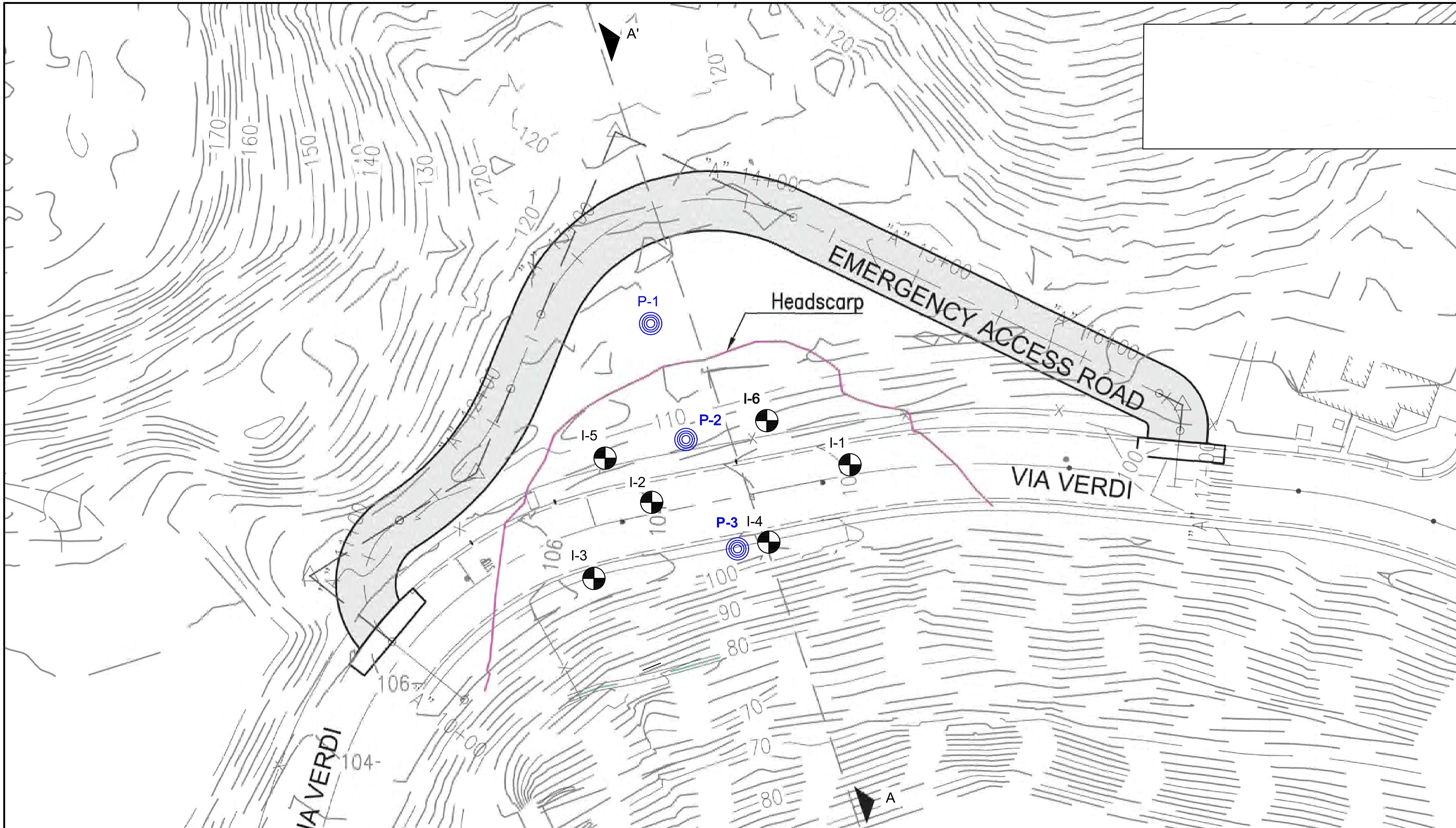
File Name. 86701L01 r1



Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Vicnity Map

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 1



Approximate Location of Inclinometer

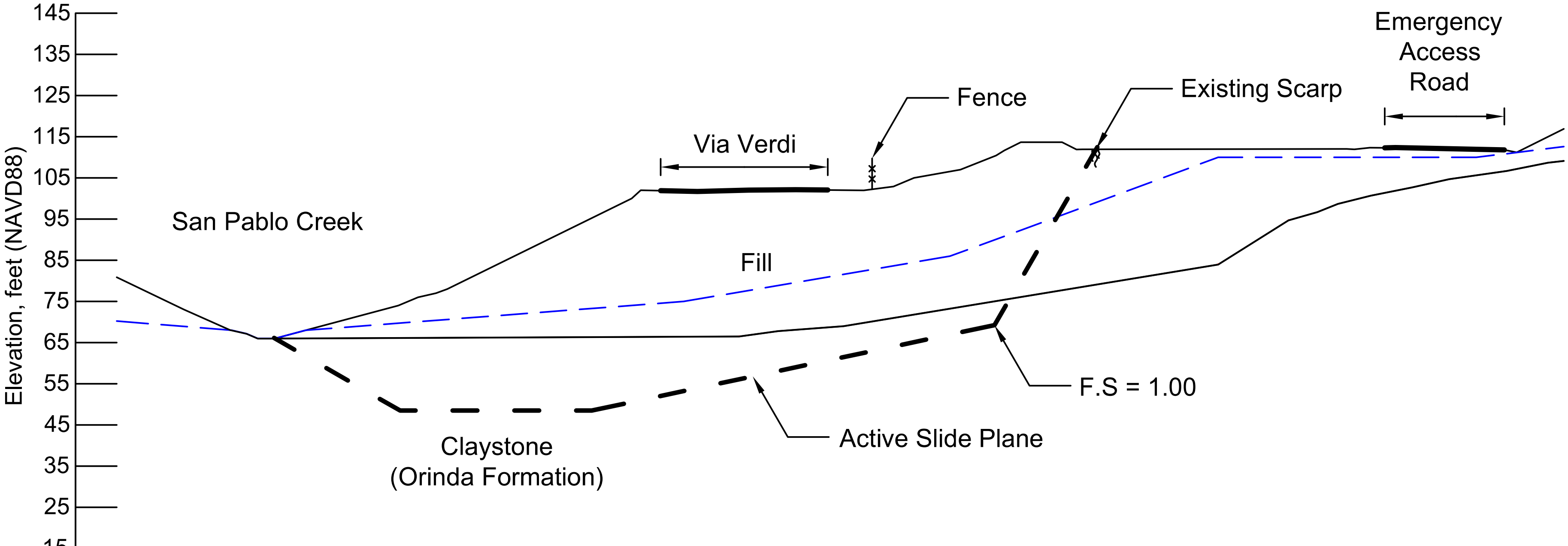
Approximate Location of Piezometer

N

SCALE
0 50 feet
1 inch = 50 feet

Repair Alternatives Via Verdi Slope Stabilization Project Richmond, California	**Site Plan**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 2



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE
0 40 feet
1 inch = 40 feet

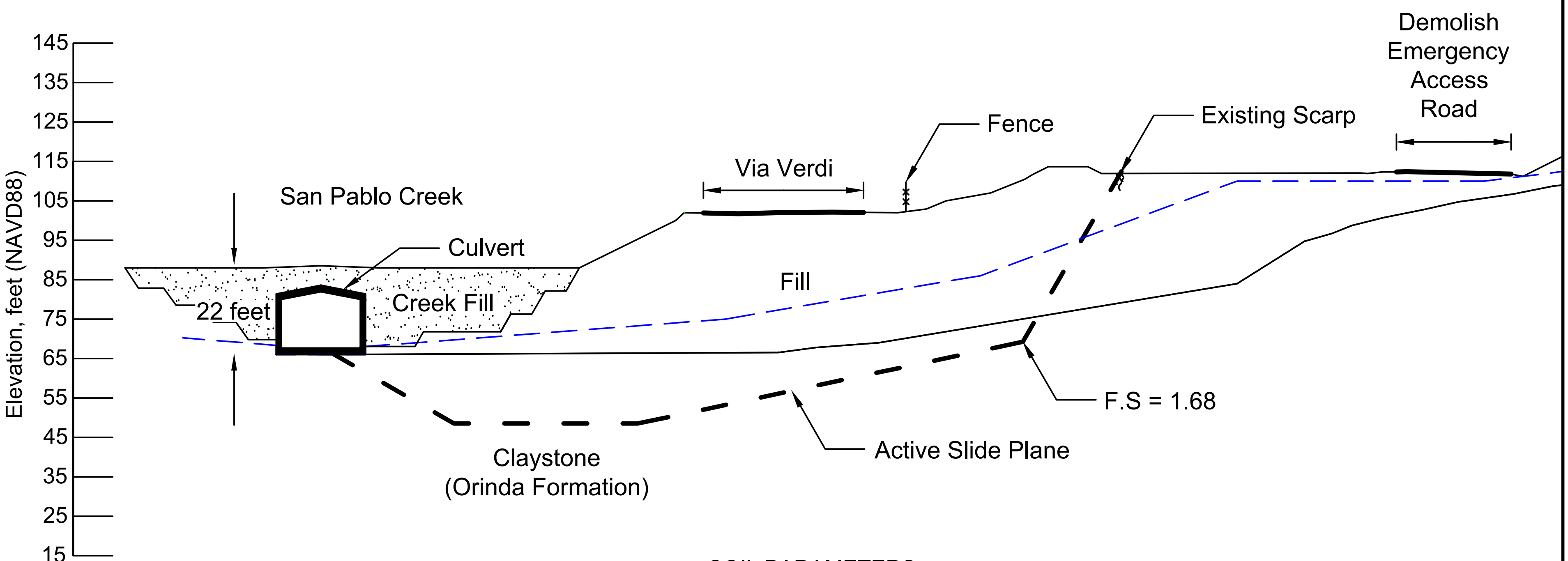
Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Existing Condition

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 3



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-
Creek Fill	80	50	24	-	-

Notes:

1. Unit weight of Creek Fill is weighted to include the empty culvert.

SCALE

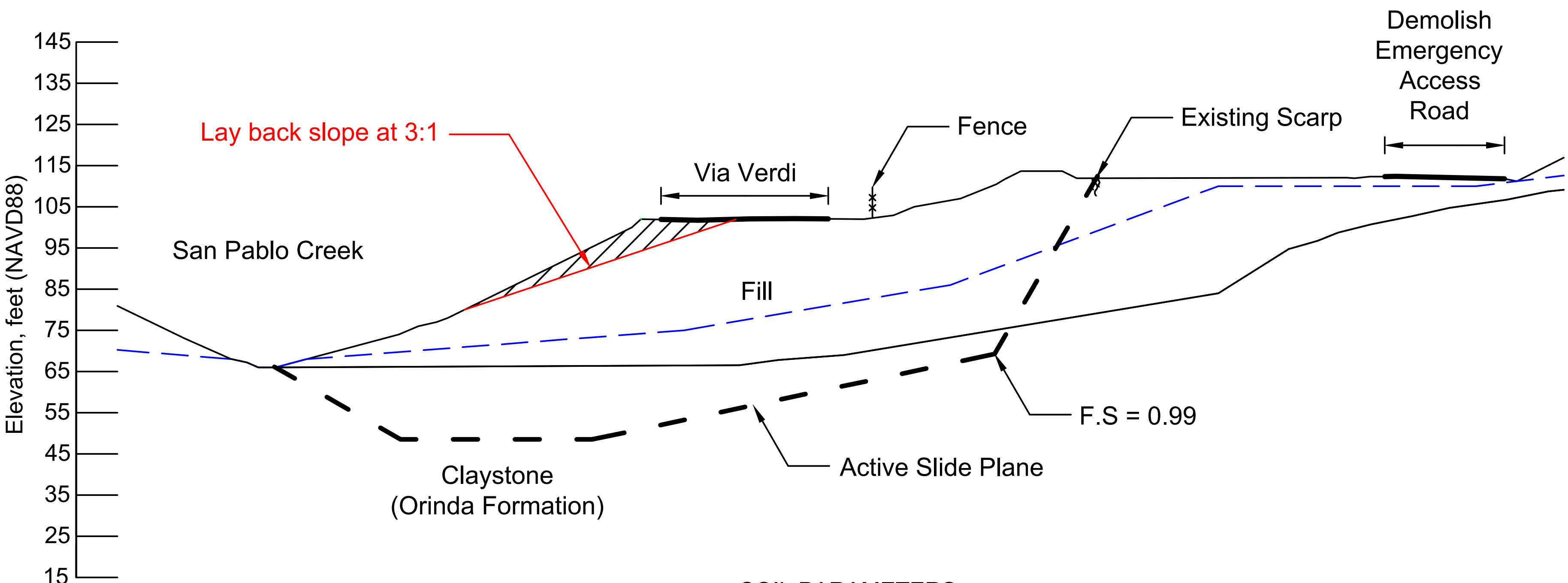
0 40 feet

1 inch = 40 feet

Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Alternative 1
Toe Buttress with Culvert

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. 4



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE

0 40 feet

1 inch = 40 feet

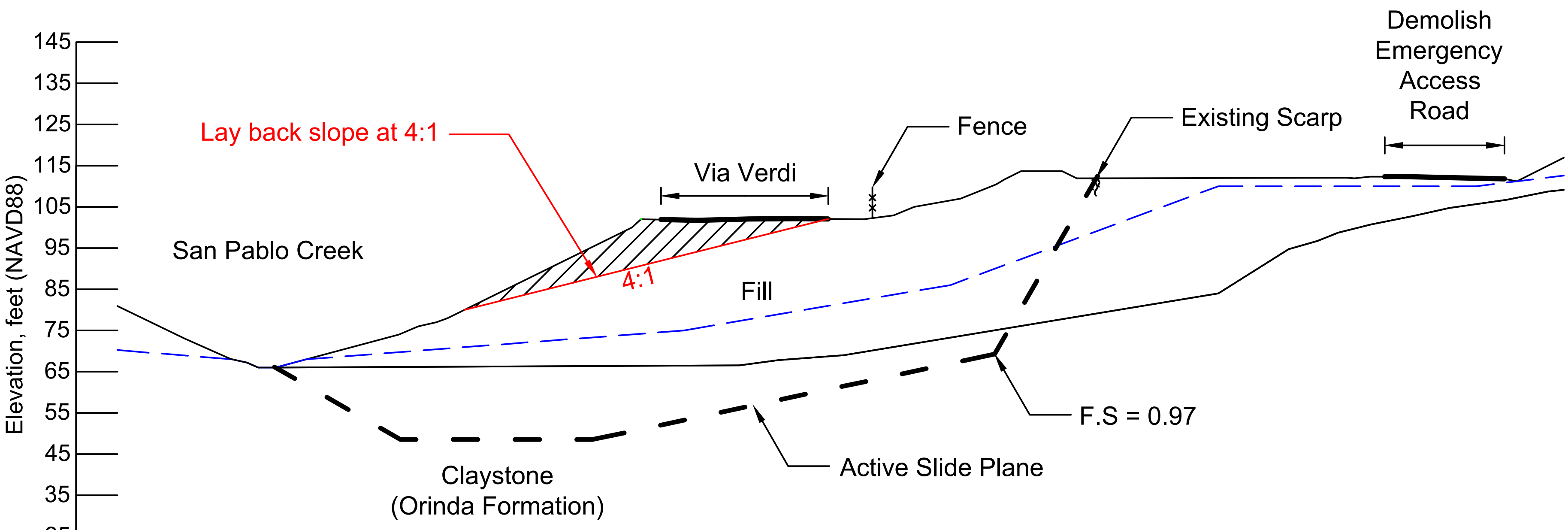
Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Alternative 2
3:1 Slope

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 5



SOIL PARAMETERS

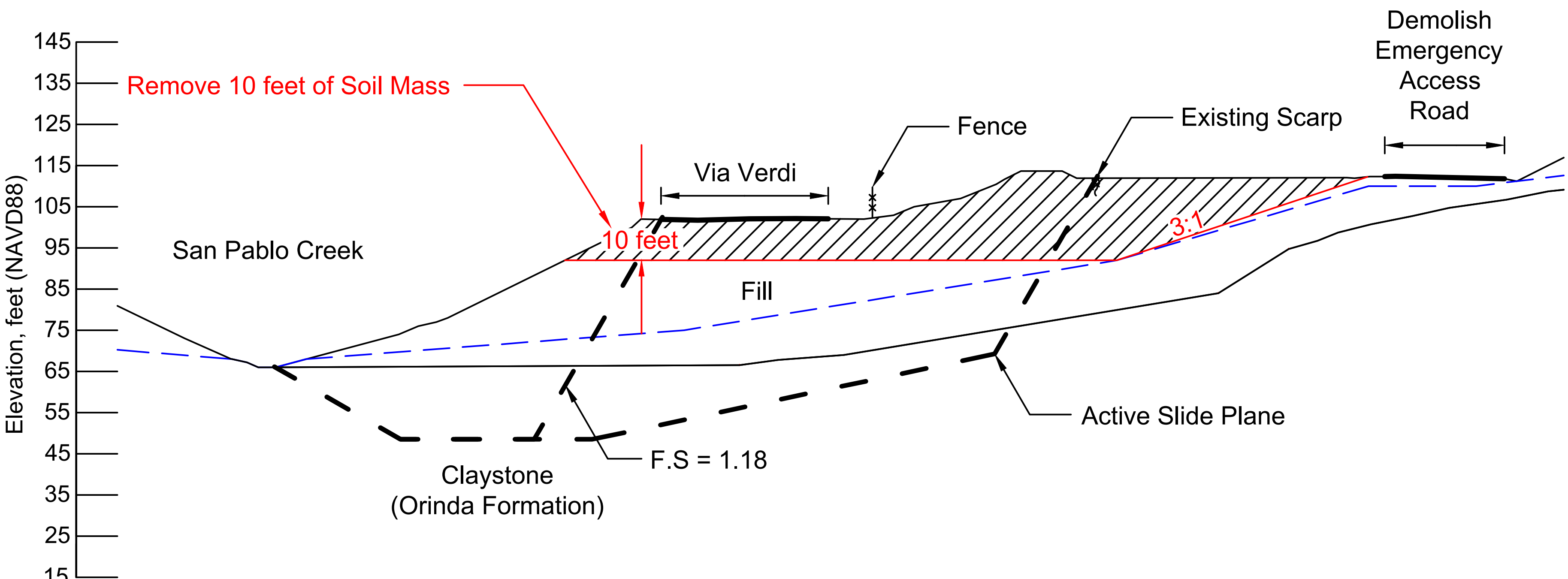
Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE
0 40 feet
1 inch = 40 feet

Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Alternative 2
4:1 Slope

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. 6



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE
0 40 feet
1 inch = 40 feet

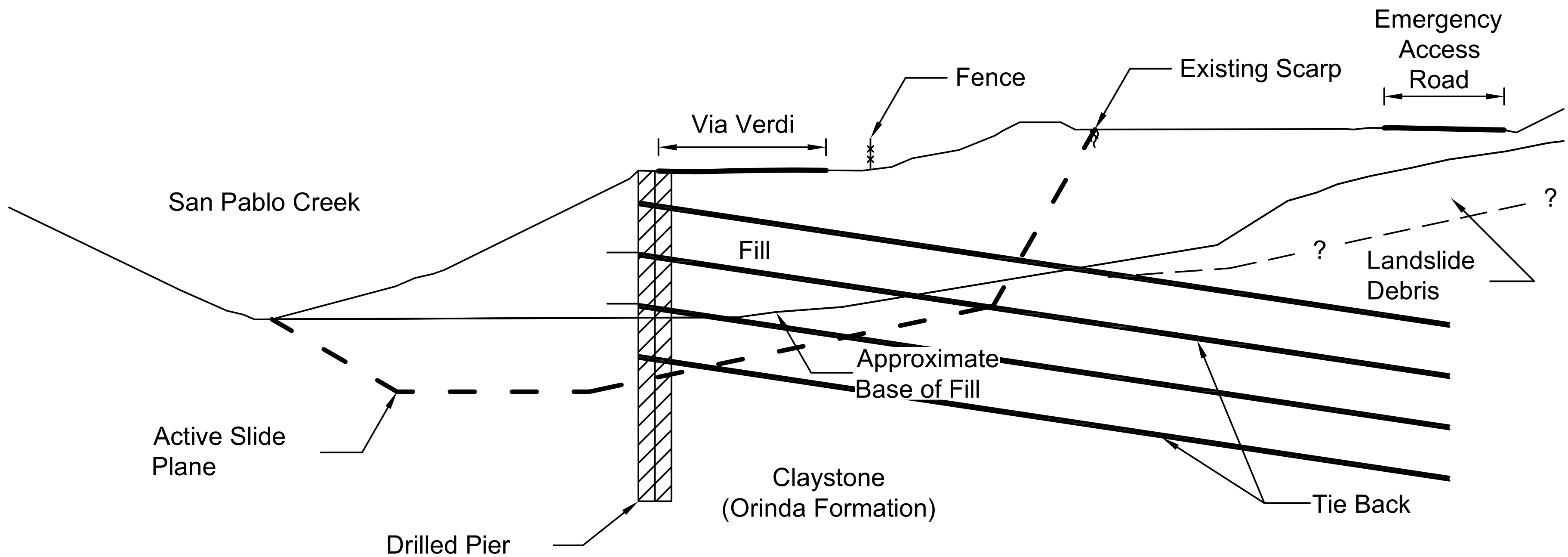
Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Alternative 2
Remove 10 Feet of Soil Mass

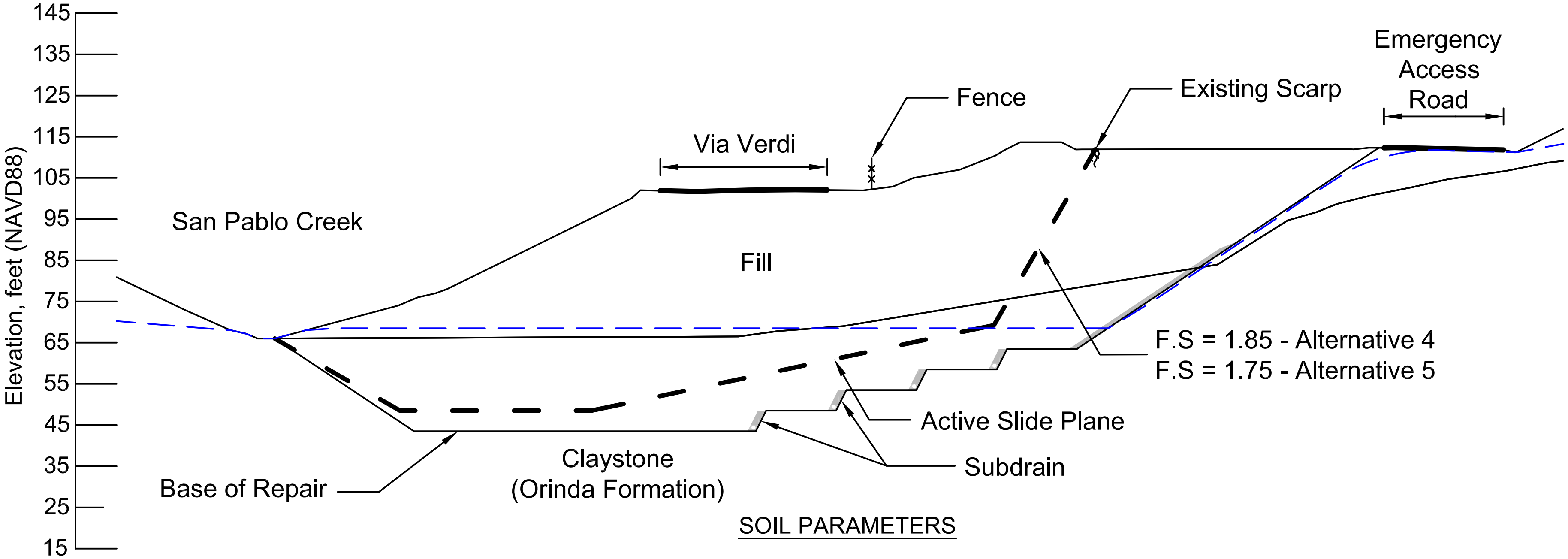
Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 7



NOT TO SCALE	Repair Alternatives Via Verdi Slope Stabilization Project Richmond, California		**Alternative 3** **Retaining Wall**
	Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 8



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

Notes:

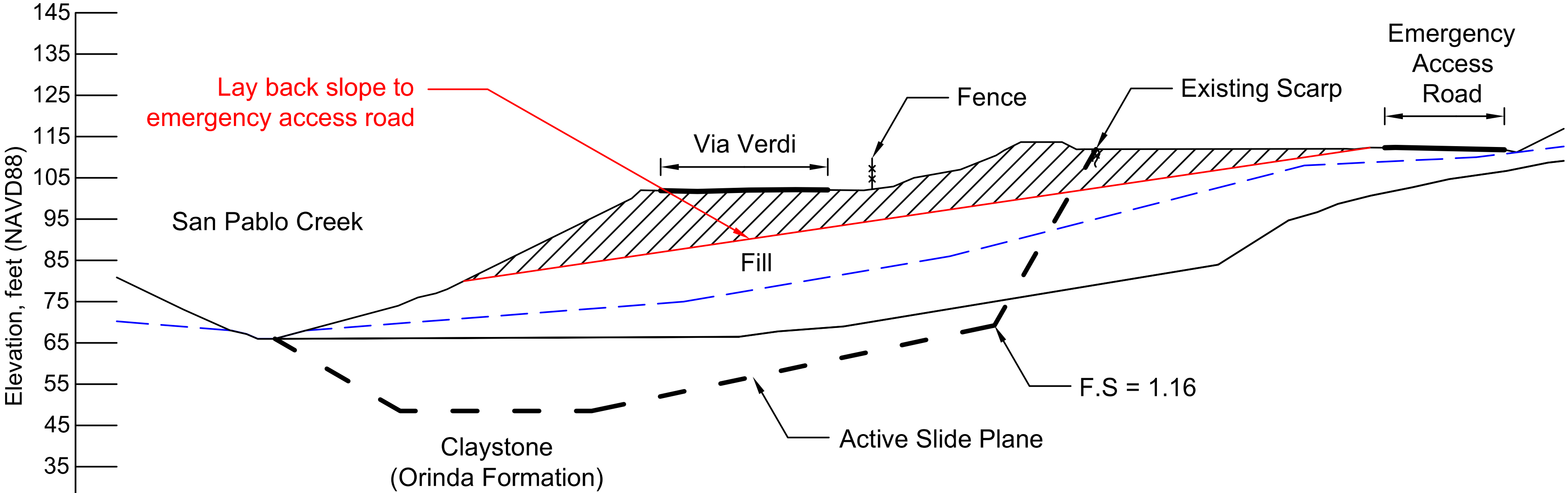
1. Alternative 4 includes horizontal layer of geogrid (not shown).
2. Earthwork slope buttress repair includes excavating below slide plane.
3. Install subdrains and backfill with excavated material.
4. Risk of backcut failure and expansion of upslope slide during repair.

SCALE
0 40 feet
1 inch = 40 feet

Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Alternatives 4 and 5
Excavate Slide Mass
And Reconstruct Slope

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. 9



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE

0 40 feet

1 inch = 40 feet

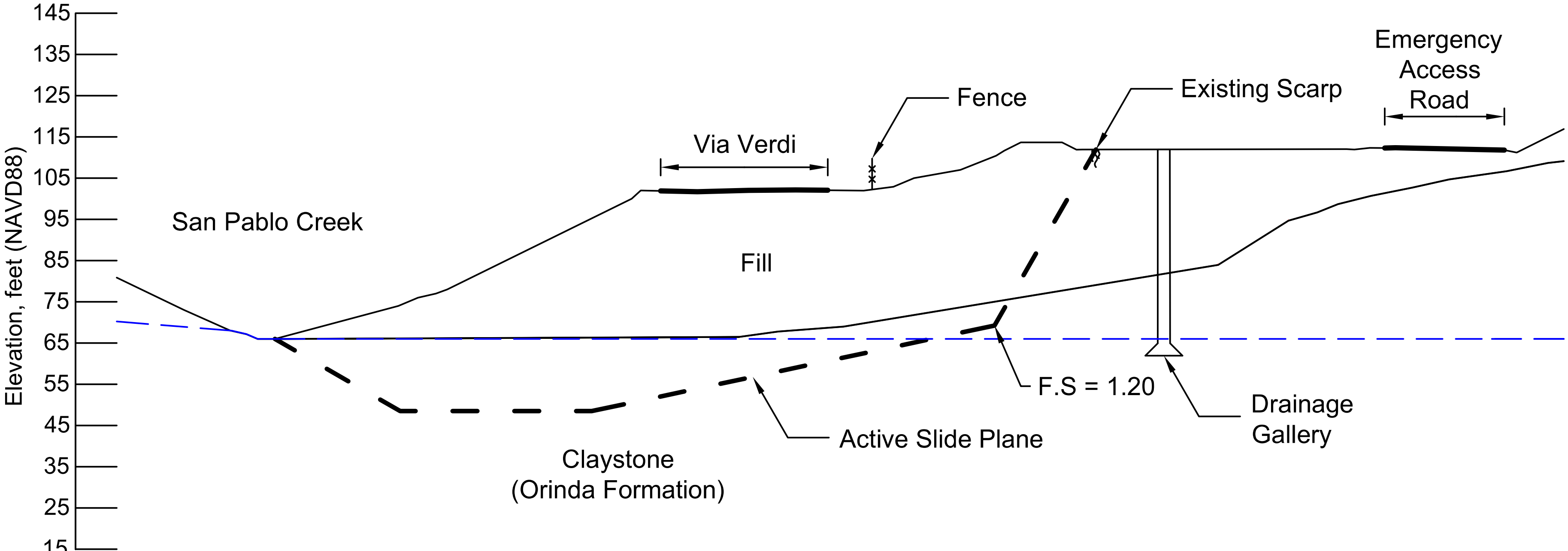
Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Alternative 7
Re-Align Via Verdi

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 10



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE
0 40 feet
1 inch = 40 feet

Repair Alternatives
Via Verdi Slope Stabilization Project
Richmond, California

Alternative 8
Drainage Gallery

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 11

Yadov / Trafic

EDMUND G. BROWN JR.
GOVERNOR

MARK S. GHILARDUCCI
DIRECTOR

Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

June 5, 2018

Bill Lindsay
City Manager
Richmond, City of
450 Civic Center Plaza
Richmond, California 94804

RECEIVED
CITY MANAGER'S OFFICE
CITY OF RICHMOND
18 JUN -8 AM 10:00

Subject: Notification of Obligation
Public Assistance and CDAA Grant Programs
FEMA-4308-DR-CA, Cal OES ID: 013-60620

Dear Mr. Lindsay:

Obligation Notification The California Governor's Office of Emergency Services has attached the Grant Summary and the Project Application Summary for Federal Package #1090, and the Exhibit C for State Supplement #2. Please see the table below for further obligation details.

Obligation Details	Package/Supplement Obligation Amount	Cumulative Amount Obligated
Federal-Public Assistance	$611,448	$1,604,392
State-California Disaster Assistance Act (CDAA)	$168,148	$441,208
Total	**$779,596**	**$2,045,600**

Payment Process For this disaster, funds will be paid in accordance with the following disbursement table:

Project Status	Federal Funds Disbursement Process	State Funds Disbursement Process
Small Projects less than 100% complete	Automatic advance of federal share and administrative allowance	Automatic advance of state share and administrative allowance. Retention held until 100% complete
Small Projects 100% complete	Automatic payment of federal share and administrative allowance	Automatic payment of state share and administrative allowance
Large Projects less than 100% complete	Advance administrative allowance only. All other funds (less retention) will be paid on a reimbursement basis	Advance administrative allowance only. All other funds (less retention) will be paid on a reimbursement basis
Large Projects 100% complete	Automatic payment of federal share and administrative allowance for entire project	Automatic payment of state share and administrative allowance

Payment Process-Continued

For this particular Package/Supplement, payment will be automatically disbursed as follows:

Payment Details	Amount Automatically Paid
Federal-Public Assistance	$611,448
State-CDAA	$168,148
Total	**$779,596**

For those large projects with a work completion of less than 100 percent, a Large Project Reimbursement Request form has also been included with this Package/Supplement.

Federal and State funds will be issued separately by the State Controller's Office. Please be advised that state warrants have a one-year period of negotiability.

Required Documents

In order to receive funds, the following forms must be on file with our office:

Form	Received by Cal OES?
Project Application for Federal Assistance (OES 89)	Yes
Designation of Applicants Agent Resolution (OES 130)	Yes
Payee Data Record (STD. 204) - Private non profit organizations only	N/A

Program Requirements-General

As a requirement of this program, a special fund for the deposit of the state warrant must be established upon receipt of any advance funding. Under no circumstances are expenditures to be made for any damages other than those approved in this application. Any funds received in excess of current needs or approved amounts, or those found owed as a result of an audit or final inspection, must be refunded to the State within 30 days upon receipt of an invoice from the California Governor's Office of Emergency Services.

Federal Program Audit Requirements

As a recipient of federal funds, your organization is subject to the Federal Single Audit Act of 1984 and the Single Audit Act Amendments of 1996. Part of your report requirements under the Act and Amendments include the preparation of a Schedule of Expenditures of Federal awards. The following information is provided to assist in the accurate completion of the Schedule:

Federal Program Audit Requirements- Continued	Federal Grantor Agency	U.S. Department of Homeland Security - Federal Emergency Management Agency
	Pass-Through Agency	California Governor's Office of Emergency Services
	Program Title	Public Assistance Grants
	Federal CFDA Number	97.036
	Pass-Through Grantor's Number	FEMA-4308-DR-CA, Cal OES ID: 013-60620

Appeal Process

Please compare the enclosed obligated Project Worksheet(s) (PW) with your copy of the original PW(s). In accordance with Title 44 Code of Federal Regulations, Section 206.206(a), if you disagree with FEMA's obligated amount(s) or scope of work for the Version 0 PW(s) addressed in this Package, you must appeal FEMA's determination within 60 days from receipt of this letter. The appeal must contain documented justification supporting your position and be addressed to the Assistant Director of Recovery. Please submit your letter of appeal to the following mailing address:

California Governor's Office of Emergency Services
Recovery Division, Public Assistance
3650 Schriever Avenue
Mather, California 95655

Please note, for all other PW versions, you will receive notification under separate cover from Cal OES's Public Assistance Section.

Questions and Inquiries

For appeal assistance, contact Public Assistance at (916) 845-8200. For assistance regarding this letter, contact the Grants Processing Unit's main line at (916) 845-8110.

GRANTS PROCESSING UNIT

Enclosures
c: Disaster Recovery Manager, FEMA
Applicant's Federal File
Applicant's State File

PROJECT PAYMENT REPORT

Decl#: 4308 OES ID#: 013-60620 Federal Pkg#: 1090 / CDAA Supp#: 2

Small Project Amt.: 123,101 Applicant Name: Richmond, City of

Payment ID#: 36497

OES Proj#	PW#	PW Ref#	Total Project Obligations to Date (Fed&CDAA)	Project Payments to Date (Fed&CDAA)	Reported Project Exp. to Date	Authorized Payment Amounts Federal Amount	CDAA Amount	Total Amount
OES#: 013-60620-00 Department: Richmond, City of								
56483	857	CCCRB80	764,310	0	815,264	611,448	152,862	764,310
					Total Project Payments for Richmond, City of:	611,448	152,862	764,310
					Total Project Payments:	611,448	152,862	764,310
					Total Admin Allowance:	0	15,286	15,286
					Total Authorized Payments:	**611,448**	**168,148**	779,596

Marina Lisovsky, SEM I

Please Note: This report only includes projects for which payment has been approved - for a complete listing of PWs in this obligation package, please refer to the attached obligation report

APPLICANT HISTORY REPORT - FEDERAL OBLIGATION

Decl Num: **4308** Cal OES ID#: **013-60620** Applicant Name: **Richmond, City of**

Pkg. Num: 1090 *Fema Share: 75%*

Department: Richmond, City of Cal OES ID#: 013-60620-00

OES Project#	PW #	PW Ref#	Cat.	100% Elig.	FEMA Share	Ret %	Retention	Admin. Allowance	Available Amt.	% Complete
56483	857-0	CCCRB80	B	815,264	611,448	0	0	0	611,448	100
Department Total:				815,264	611,448		0	0	611,448	
Package 1090 Total:				*815,264*	*611,448*		*0*	*0*	*611,448*	
Grand Total to Date:				**2,139,189**	**1,604,392**		**97,814**	**0**	**1,506,578**	

Total Obligation: 1,604,392

Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

Cal OES ID:	**013-60620**
Supplement Number:	**2**
Disaster Number:	**4308**

PROJECT APPLICATION APPROVAL
CALIFORNIA DISASTER ASSISTANCE ACT PROGRAM

1. SUBGRANTEE'S NAME AND ADDRESS

Richmond, City of
450 Civic Center Plaza
Richmond, CA 94804

2. AUTHORIZED AGENT

Bill Lindsay
City Manager

3. PROJECT SUMMARY CATEGORY OF WORK	**AMOUNT APPROVED BY STATE**
A - DEBRIS REMOVAL	$0
B - EMERGENCY PROTECTIVE MEASURES	$152,862
C - ROAD SYSTEMS REPAIRS	$0
D - DIKES, LEVEES & FLOOD CONTROL WORKS	$0
E - PUBLIC BUILDINGS	$0
F - UTILITIES	$0
G - OTHER	$0
H - FIRE SUPPRESSION	$0
Z - FEDERAL ADMINISRATIVE COSTS	$0
ADMINISTRATIVE ALLOWANCE	$15,286
TOTAL THIS SUPPLEMENT	$168,148
TOTAL NOW APPROVED FOR APPLICATION	$441,208

4. Cal OES APPROVAL (Approved in accordance with attached Exhibit "C".)

SIGNATURE Marina Lisovskiy **DATE APPROVED** **May 18, 2018**
TITLE: MANAGER, GRANTS PROCESSING UNIT

CDAA Obligation Summary (Exhibit "C")

CDAA No.: 013-60620
Applicant: Richmond, City of
FEMA-4308-DR-CA, FIPS# 013-60620

St.Supplement Date 05/16/18

St.Sup.#	Dam.Cat.	CDAA DSR#/PW#	FEMA DSR#/PW#	Total Obligation
2	B	3	857-0	152,862
	Desc:			

Subtotal for Category B	152,862
Subtotal for Supplement No. 2	152,862
Administrative Allowance (10%)	15,286
Total Supplement No. 2	168,148
Sup.2 Eligible Amount	152,862
Sup.2 Administrative Allowance(10%)	15,286
Total Sup.2	168,148
Application Eligible Amount	401,098
Application Administrative Allowance(10%)	40,110
Total Application	441,208

PA-09-CA-4308-PW-00858(0) P	
Applicant Name:	Application Title:
RICHMOND	CCCRC80 - Via Verdi Road Repair
Period of Performance Start:	Period of Performance End:
04-01-2017	10-01-2018

Bundle Reference # (Amendment #)	Date Awarded

Subgrant Application - FEMA Form 90-91

Note: The Effective Cost Share for this application is 75%

FEDERAL EMERGENCY MANAGEMENT AGENCY

PROJECT WORKSHEET

DISASTER	PROJECT NO.	PA ID NO.	DATE	CATEGORY
FEMA 4308 - DR -CA	CCCRC80	013-60620-00	10-19-2017	C

APPLICANT: RICHMOND	WORK COMPLETE AS OF: 08-06-2018 : 0 %
Site 1 of 1	
DAMAGED FACILITY: Via Verdi Drive	COUNTY: Contra Costa

LOCATION:	LATITUDE:	LONGITUDE:
Current Version: Via Verdi Drive, In City of Richmond CA	37.96656 37.96688	-122.31962 -122.31822

DAMAGE DESCRIPTION AND DIMENSIONS:

Current Version:
This PW address the Applicants List of Projects No. 1.

During the incident period of February 1st to February 23rd, heavy rains and overland flooding saturated the slope supporting Via Verdi Road causing a landslide that encompassed 570 LF of the road. This slope failure was estimated to have initiated on or about February 23rd, 2017. Extent of the landslide extended from approximately 60 ft upslope of Via Verdi Rd. to San Pablo Creek 95 ft down slope of the road. See attached landslide extent map.

A Geotechnical assessment of the site was performed after the incident. Inclinometers installed at the site showed near continuous movement of the landslide mass during the evaluation period. This evaluation confirmed that the integral ground of the road remains unstable.

Specific damages include the following:

1. Displacement of 570 LF of Asphalt road, 34 ft wide by 6 inches thick.

2. Displacement of Class II road base, with dimensions of 570 LF x 34 ft by 10 inches deep.

3. Displacement of 578 LF of concrete curb and gutter on north side of road (outside curve) and 560 LF of curb and gutter along the south side to the road (inside curve).

4. Displacement of 560 LF x 4 ft of 4 inch concrete sidewalk.

5. Movement of the slope also damaged a 24-inch x 36 LF CMP storm water cross drain. Erosion around the damaged CMP created a 4 ft x 3 ft x 3 ft sinkhole within the road way.

Via Verdi Drive has the functional classification of a local road, which provides the sole access to the Via Verdi residential housing development which includes 90 single family homes and 10 multifamily housing buildings, together providing residential housing for approximately 600 people. A temporary access road was constructed around the landslide extent as an emergency protective measure since it was determined that the damaged road could not be used safely. Refer to PW-00857 DR-4308 for details and cost of this temporary road.

SCOPE OF WORK:

Current Version:
WORK TO BE COMPLETED

In order to restore the damaged section of Via Verdi Road to its predisaster function along the same alignment, the applicant proposes to stabilize the integral ground of the damaged section of road by installing a box culvert at the toe of the slide. This box culvert will act as a buttress to prevent further movement of the landslide mass and sufficiently stabilize the failed slope. The applicant is expected to contract repairs of this project when designs are finalized.

The flowing are anticipated work items expected to restore Via Verde Road to its predisaster function:

1. Removal and restoration of temporary by-pass road includes:
-- Remove 1,882 SY of temporary asphalt road (605 LF x 28 x ft 3-inch).
-- Remove 4 temporary street light poles.
-- Regrade affected area for estimated 3,750 SY.
-- Revegetate area for erosion control for estimated 5,700 SY (area north of Via Verde Road).

2. Site preparation for installation of Box culvert includes:
-- Clear the grub area for estimated 8,478 SY.
-- Removal of 15 trees.
-- Excavate/bench 5,667 CY. Refer to drawing. Estimated 450 SF x 340 LF.
-- Remove concrete end section walls of existing culvert for tie-in with new culvert. Wall are 14 ft high x 20 ft long x 8 inches thick for 7 CY of reinforced structural concrete.
-- Provide traffic Control around construction zone.
-- Install erosion control, silt fencing and straw bales.
-- Install dewatering temporary diversion of creek.

3. Installation of cast-in-place Box Culvert. In order for the box culvert to act as a toe buttress against the landslide, the box culvert needs to be constructed to withstand the lateral forces of the landslide mass. The preliminary design is for a 20 ft wide x 16 ft high box culvert with side walls 16 inches thick and a sloped top (gable shape) 20 inches thick. Items of work associated with the box culvert include:
-- Excavation of 756 CY under base of culvert (340 LF x 20 ft x 3 ft).
-- Installation of sub-drainage system, including bedding material and drainage piping.
-- Cast in place reinforced concrete slab for base of culvert. Dimensions of 340 LF x 20 ft wide x 20 inches thick.
-- Cast in place reinforced concrete walls with dimensions of 340 LF x 14 ft high x 16 inches thick.
-- Cast in place reinforced concrete top with dimensions of 340 LF x 24 ft (total length) x 20 inches thick.
-- One Tie-in to existing box culvert.
-- Cast in Place concrete end section (flared walls and foot) with dimensions of 14 ft high x 20 ft long x 6 inches thick for walls and 20 ft x 20 ft x 6 inches for the footer.
-- Installation of 34 baffles and 252 CY of natural stream sediment (for environmental compliance).
-- Fill excavated area to enclose box culvert with 9,650 CY of structural fill. Compact to roadway standard. Fill is anticipated to come from designated soil stockpile located at the site (see drawing).

4. Restoration 440 LF of Via Verde Road. Damage due to installation of temporary road and utilities extended section to be replaced by 50 ft on either side. Repairs to include:
-- Remove and replace asphalt road with dimensions of 440 LF x 34 ft x 6 inches, includes grading as necessary and centerline stripe.
-- Remove and replace 880 LF of concrete curb and gutter.
-- Remove and replace 440 LF of 4-foot wide x 4 inch concrete sidewalk.
-- Remove and replace 24-inch x 36 LF CMP.
-- Regrade roadway for 440 Lf x 34 ft.
-- Install 500 LF of 5-foot chain-link fence.
-- Restore underground public utilities, water, sewer, and gas.

COSTS: The applicant's consulting engineer provided a cost estimate based on a similar project that was completed on Via Verde Road in 2009. These work item costs were used in Part A of the CEF. Total cost of the CEF, including geotechnical and engineering costs, is estimated at $ 9,841,695.

The Applicant has identified 73.2 hours of DAC for this project to date. The Applicant intends to include DAC for Work To Be Completed. These DAC hours and costs will be finalized and reconciled at project closeout.

NOTES:

As a USACE permit requirement for this proposed work, the applicant was required to analyze eight alternative repair options. The applicant's preferred option, the box culvert buttress, is pending approval by the USACE. See the attached "Slope Stabilization Alternative Analysis" for details of this analysis, including relative cost differences. The design and scope of work presented in this PW are preliminary and subject to change before construction. The applicant has been instructed to notify Cal OES of any scope of work changes.

DIRECT ADMINISTRATIVE COSTS: The Sub-recipient requested Direct Administrative Costs (DAC) that are directly chargeable to this project. Partial DAC has been submitted with remaining yet to be submitted. Associated eligible work is related administration of the PA project only and in accordance with 2 CFR 200.413. These costs are treated consistently and uniformly as direct costs in all federal awards and other Sub-recipient activities and are not included in any approved indirect cost rates.

ENVIRONMENTAL AND HISTORIC: All necessary Federal, State, and local permits are required for Federal Funding. Noncompliance with this requirement may jeopardize the receipt of Federal funds. Any change to the approved scope of work will require re-evaluation by the Environmental and Historic Preservation section for compliance with environmental and historic preservation considerations under the National Environmental Policy Act. Non-compliance with this requirement may jeopardize the receipt of federal funding.

LARGE PROJECTS, ANY CATEGORY: When Project Worksheets are written as large projects ($123,100.00), an adjustment must be made during the closeout process to reconcile with the actual eligible dollars spent. This will require an amendment to be written in EMMIE to capture the over-run/under-run. For large projects, payment is made on the basis of actual costs determined after the project is completed, although interim payments may be made as necessary, or on the basis of an agreed upon estimate. The eligible applicant has the choice of how it wishes to receive the federal grant. Once FEMA obligates funds to the grantee, further management of the grant, including disbursement to sub-grantees, is the responsibility of the grantee. FEMA will continue to monitor the recovery progress to ensure the timely delivery of eligible assistance and compliance with the law and regulations.

CHANGES TO SCOPE OF WORK DESCRIBED IN THIS PW: The Sub-recipient shall comply with all applicable codes and standards in the completion of eligible work to repair or replace damaged public facilities. Any change to the approved scope of work on a Project Worksheet (PW) must be reported and approved before work begins. Failure to report changes may jeopardize Federal and State funding. In the case of change in "Scope of Work", the applicant should immediately notify the California Office of Emergency Services (Cal OES) prior to starting work.

RECORDS RETENTION: As described in 2 C.F.R. § 200.333, Sub-recipient must maintain all work-related records for a period of three (3) years from Sub-recipient closure (final payment), and all records relative to this project worksheet are subject to examination and audit by the State, FEMA, and the Comptroller General of the United States and must reflect work related to disaster specific costs.

INSURANCE REQUIREMENTS: As a condition for receiving Public Assistance for permanent work, an applicant must obtain and maintain insurance to cover that facility for the hazard that caused the damage. Such coverage must, at a minimum, be in the amount of the estimated eligible damages for that structure prior to any reduction. The costs of Section 406 hazard mitigation measures are included in the amount of insurance required. If the requirement to purchase all insurance is not met, FEMA will not provide assistance for damage sustained in the current or a future disaster of the same type. If the applicant does not maintain all required insurance, FEMA will not provide any assistance for that facility in future disasters of the same type. An applicant is exempt from this requirement for:
-- Projects where the eligible damage (before any reductions) is less than $5,000; or.
-- Facilities for which, in the determination of the State insurance commissioner, the type and/or extent of insurance being required by FEMA is not reasonable. (This exemption does not apply to facilities insurable under the NFIP because insurance is both available and reasonable.)

PROCUREMENT: The Applicant has been advised by FEMA PAC and/or Project Specialist that in the seeking of proposals and letting of contracts for eligible work, the Applicant must comply with its Local, State and/or Federal procurement laws, regulations, and procedures. The federal regulations at 2 C.F.R. §§ 200.317 to 326 set forth various procurement standards that a non-Federal entity must follow when using FEMA Public Assistance funding to finance procurements of property and services to perform the scope of work under a Public Assistance award. As detailed in those regulations, a state must use the same policies and procedures that it uses for procurements from its non-Federal funds. 2 C.F.R. §200.317. A state must also comply with 2 C.F.R. § 200.322 (Procurement of Recovered Materials), must ensure that every purchase order or other contract included any clauses required by 2 C.F.R. § 200.326 (Contract Provisions), and must follow all applicable federal laws, executive orders, and implementing regulations. All other non-Federal entities, including non-state sub-recipients of a state, must follow the regulations at 2 C.F.R. § 200.318 (General Procurement Standards) through 2 C.F.R. § 200.326 (Contract provisions). A non-Federal entity, however, may continue to apply with the former procurement standards applicable to FEMA awards formerly located at 44 C.F.R. Part 13 (for states, local, and Indian tribal governments) or 2 C.F.R. Part 215 {for institutions of higher education, hospitals, and other nonprofit organizations) until the completion of one additional fiscal year after December 26, 2014. 2 C.F.R. § 200. lO(a). This is an elective grace period and, if a non-Federal entity chooses to use the previous procurement standards before adopting the procurement standards in 2 C.F.R. pt. 200, must document this decision in its internal procurement policies.

Does the Scope of Work change the pre-disaster conditions at the site? ☑ Yes ☐ No	Special Considerations included? ☑ Yes ☐ No
Hazard Mitigation proposal included? ☐ Yes ☑ No	Is there insurance coverage on this facility? ☐ Yes ☑ No

PROJECT COST

ITEM	CODE	NARRATIVE	QUANTITY/UNIT	UNIT PRICE	COST
		*** Version 0 ***			
		Direct Subgrantee Admin Cost			
1	9901	Direct Administrative Costs (Subgrantee)	1/LS	$ 7,278.00	$ 7,278.00
		CEF			

2	9000	CEF Cost Estimate (See Attached Spreadsheet)	1/LS	$ 9,841,695.00	$ 9,841,695.00
				TOTAL COST	$ 9,848,973.00

PREPARED BY Chris Veneman	TITLE Technical Specialist	SIGNATURE
APPLICANT REP. Yader Bermudez	TITLE Director of Engineering & Capital Projects	SIGNATURE

View Application

NCE

Collaboration. Commitment. Confidence.SM

March 13, 2018

Cameron Johnson
Principal and Owner
Johnson Marigot Consulting, LLC
88 North Hill Drive, Suite C
Brisbane, CA 94005

Re: Via Verdi Slope Stabilization Alternatives Analysis, Cultural Records Archival Database Search Results

This memo fulfils Task 3D (cultural resources archival database search) for the emergency soils investigation and design services for the Via Verdi Drive landslide project (Project). The purpose of the archival database search is to inform the slope stabilization alternatives analysis with respect to avoiding or minimizing impacts to known cultural resources within or adjacent to the Project.

A records search request was sent to the Northwest Information Center on December 12, 2017 and results were received January 9, 2018 (records search results attached). Those results indicate 10 cultural resources are within a quarter mile of the Project and one intersects with a portion of the Project. Figure 1 illustrates an area of cultural resource sensitivity intersecting with a portion of the Project associated with Alternative 2. If possible and to avoid complication associated with construction, it is recommended to avoid Alternative 2. If avoidance is not possible, further investigation will be required to understand the nature, condition, and extent of the cultural resource mapped in the area.

Sincerely,

Jeremy Hall
GIS Administrator | GIS Specialist
NCE
775-588-2505 x22
jhall@ncenet.com

Attachments: Figure 1 – Cultural Resources Sensitivity Map
Records Search Results

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\AGP\Via Verdi v02.aprx

Legend

Project Area

Sensitive Area

NCE

Richmond

Via Verdi Slope Stabilization Alternatives Analysis

Cultural Resource Sensitivity Map

N

1 in. = 400 ft.

0 200 400 ft.

FIGURE

1

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
Bing Hybrid Base map	568.41.55	jhall	3/13/2018	-	danderson

CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

ALAMEDA
COLUSA
CONTRA COSTA
DEL NORTE
HUMBOLDT
LAKE
MARIN
MENDOCINO
MONTEREY
NAPA
SAN BENITO
SAN FRANCISCO
SAN MATEO
SANTA CLATA
SANTA CRUZ
SOLANO
SONOMA
YOLO

Northwest Information Center
Sonoma State University
150 Professional Center Drive, Suite E
Rohnert Park, California 94928-3609
Tel: 707.588.8455
nwic@sonoma.edu
http://www.sonoma.edu/nwic

1/9/2018

NWIC File No.: 17-1628

Jeremy Hall
NCE
P.O. Box 1760
Zephyr Cove, NV 89448

re: Via Verde Road Slope Stabilization Project

The Northwest Information Center received your record search request for the project area referenced above, located on the Richmond USGS 7.5' quad. The following reflects the results of the records search for the project area and a 0.25 mile radius:

Resources within project area:	P-07-98.
Resources within 0.25 mile radius:	P-07-4605, 4606, 4607, 4608, 4609, 4610, 4611, 97, & 839.
Reports within project area:	S-14541, 13803, & 38237.
Reports within 0.25 mile radius:	S-43527, 38251, 4950, 7573, 6214, 1475, 7894, 1581, 8186, 7988, 8100, 10228, 11534, 12297, 22273, 6592, 7131, & 27935.
Other Reports within records search radius:	S-595, 848, 1978, 2458, 9462, 9583, 9795, 15529, 16660, 17835, 18217, 20395, 30204, 32596, 33545, & 33600. These reports are classified as Other Reports; reports with little or no field work or missing maps. The electronic maps do not depict study areas for these reports, however a list of these reports has been provided. In addition, you have not been charged any fees associated with these studies.

Resource Database Printout (list): ☒ enclosed ☐ not requested ☐ nothing listed

Resource Database Printout (details): ☒ enclosed ☐ not requested ☐ nothing listed

Resource Digital Database Records: ☒ enclosed ☐ not requested ☐ nothing listed

Report Database Printout (list): ☒ enclosed ☐ not requested ☐ nothing listed

Report Database Printout (details): ☒ enclosed ☐ not requested ☐ nothing listed

Report Digital Database Records: ☒ enclosed ☐ not requested ☐ nothing listed

Resource Record Copies: ☒ enclosed ☐ not requested ☐ nothing listed

Report Copies: ☐ enclosed ☒ not requested ☐ nothing listed

OHP Historic Properties Directory: ☒ enclosed ☐ not requested ☐ nothing listed

Archaeological Determinations of Eligibility:	☐ enclosed	☐ not requested	☒ nothing listed
CA Inventory of Historic Resources (1976):	☐ enclosed	☐ not requested	☒ nothing listed
Caltrans Bridge Survey:	☐ enclosed	☒ not requested	☐ nothing listed
Ethnographic Information:	☐ enclosed	☒ not requested	☐ nothing listed
Historical Literature:	☐ enclosed	☒ not requested	☐ nothing listed
Historical Maps:	☐ enclosed	☒ not requested	☐ nothing listed
Local Inventories:	☐ enclosed	☒ not requested	☐ nothing listed
GLO and/or Rancho Plat Maps:	☐ enclosed	☒ not requested	☐ nothing listed
Shipwreck Inventory:	☐ enclosed	☒ not requested	☐ nothing listed

*Notes:

** Current versions of these resources are available on-line:

Caltrans Bridge Survey: http://www.dot.ca.gov/hq/structur/strmaint/historic.htm

Soil Survey: http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=CA

Please forward a copy of any resulting reports from this project to the office as soon as possible. Due to the sensitive nature of archaeological site location data, we ask that you do not include resource location maps and resource location descriptions in your report if the report is for public distribution. If you have any questions regarding the results presented herein, please contact the office at the phone number listed above.

The provision of CHRIS Data via this records search response does not in any way constitute public disclosure of records otherwise exempt from disclosure under the California Public Records Act or any other law, including, but not limited to, records related to archeological site information maintained by or on behalf of, or in the possession of, the State of California, Department of Parks and Recreation, State Historic Preservation Officer, Office of Historic Preservation, or the State Historical Resources Commission.

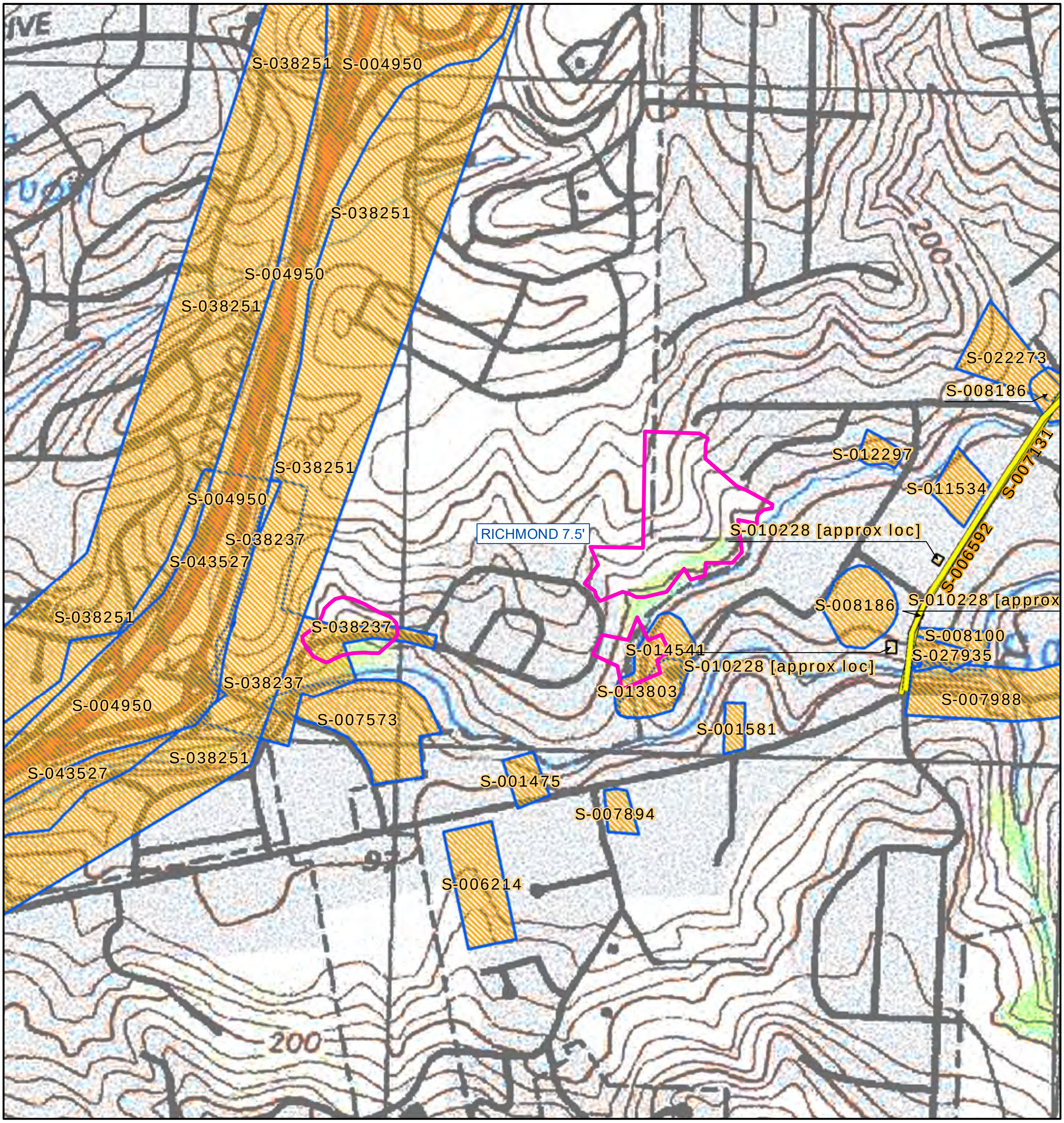
Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the Office of Historic Preservation are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area. Additionally, Native American tribes have historical resource information not in the CHRIS Inventory, and you should contact the California Native American Heritage Commission for information on local/regional tribal contacts.

Should you require any additional information for the above referenced project, reference the record search number listed above when making inquiries. Requests made after initial invoicing will result in the preparation of a separate invoice.

Thank you for using the California Historical Resources Information System (CHRIS).

Sincerely,
Lisa C. Hagel
Researcher

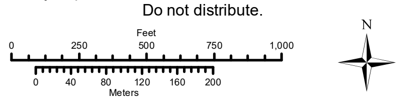
Via Verde Road Slope Stabilization Project
Report Map



Northwest Information Center

File #17-1628, 9 January 2018, L. Hagel

May depict confidential cultural resource locations.
Do not distribute.



Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-001475	Other - County File #3065-78	1979	Randy Milliken	County File #3065-78, cultural resource field reconnaissance conducted on a 0.79 acre parcel at 3741 San Pablo Dam Road in El Sobrante, Contra Costa County (letter report)	Cultural Resources Facility, Sonoma State University	
S-001581		1979	Paul E. Amaroli	An Archaeological Reconnaissance of Two Acres in El Sobrante, Contra Costa County, California.	The Cultural Resources Facility, Sonoma State University	
S-004950	Caltrans - 04209-400211; Voided - S-5750	1982	Margaret Buss	Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from Bay Bridge to Carquinez Bridge, 04-ALA/CC-80 2.0/8.0, 0.0/14.1, 04209-400211	Caltrans, District 4	01-000081, 01-000082, 01-000087, 07-000179, 07-000180, 07-000318, 07-000672
S-004950a		1982	Mara Melandry	First Addendum Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge in Alameda and Contra Costa Counties 04-Ala/CC 80 2.0/8.0; 0.0/14.1, 04209-400211	Caltrans, District 4	
S-006214		1983	C. Michael Elling	An Archaeological Survey of the Triplett Property, 3640 San Pablo Dam Road, El Sobrante, Contra Costa County, California.	Elling and Associates	
S-006592		1984	Peter M. Banks	An Archaeological Reconnaissance of the Appian Way Widening Project, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.	
S-007131		1985	Peter Banks	An Archaeological Reconnaissance of the Appian Way Widening Project: Phase II, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.	07-000097, 07-000276
S-007573		1985	Peter M. Banks	An Archaeological Reconnaissance of the Rancho Plaza Project, Richmond, Contra Costa County, California.	California Archaeological Consultants, Inc.	
S-007894		1986	Maureen Steiner	Archeological Investigations of Assessor's Parcel Nos. 420-150-13, 22 and 23 in Contra Costa County (letter report)	Woodward-Clyde Consultants	
S-007988		1986	Robert I. Orlins	A Cultural Resource Investigation for the San Pablo Dam Road Widening Project, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.	07-000068
S-008100		1986	Suzanne Baker	Archaeological Reconnaissance of the Tyson Property, Parcel #425-170-025, El Sobrante, Contra Costa County.	Archaeological Consultants	

Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-008186		1986	Peter Banks	Subsurface Archaeological Investigations for the Appian Way Widening Project, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.	07-000097, 07-000276
S-010228		1988	Alice F. Wood	The Archaeological Monitoring of Excavations for Three Electrical Vaults on Appian Way, El Sobrante, Contra Costa County, California	California Archaeological Consultants, Inc.	
S-011534	Submitter - ARS 88-65	1988	Katherine Flynn	Archaeological survey of property located at 4247 Appian Way, El Sobrante, Contra Costa County (letter report)	Archaeological Resource Service	
S-012297	Submitter - ARS 90-73	1991	Katherine Flynn	Archaeological evaluation of 4201 Garden Lane, El Sobrante, Contra Costa Co., Project No. MS 192-90 (letter report)	Archaeological Resource Service	
S-013803		1991	Miley Paul Holman	Archaeological Field Inspection of the Property at 3995 Garden Road, El Sobrante, Contra Costa County, California (letter report)	Holman & Associates	07-000098
S-014541		1992	Suzanne Baker, Eric Wohlgemuth, and Cindy Desgrandchamp	Archaeological Test Excavations at CA-CCO-156, El Sobrante, California	Archaeological/Historical Consultants	07-000098
S-022273	Submitter - Project 50001-109/99	1999	Stacey Schneyder	A Cultural Resources Study of 4439 Appian Way (APN# 425-110-021), El Sobrante, Contra Costa County, California	Anthropological Studies Center, Sonoma State University	07-000839
S-027935		2004	John Holson	Archaeological Survey and Record Search Results for 4150 Appian Way, El Sobrante (APN 425-170-030) (letter report)	Pacific Legacy, Inc.	
S-038237	Other - LSA Project No. NCE1001	2011	Heather Blind	Cultural Resources Study for the Via Verde Sinkhole Repair Project, Richmond, Contra Costa County, California	LSA Associates, Inc.	
S-038251	Caltrans - EA 3A7761; Caltrans - EA 3A7771	2011	Jack Meyer	Buried Archaeological Site Assessment and Extended Phase I Subsurface Explorations for the I-80 Integrated Corridor Mobility Project, Caltrans District 04, Alameda and Contra Costa Counties, California, 04-ALA-CC-80, P.M. ALA 1.99/P.M. ALA 8.04, P.M. CC 0.0/P.M. CC 13.49, EA 3A7761 / EA 3A7771	Far Western Anthropological Research Group, Inc.	

Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-043527	Caltrans - EA 0A0800; Caltrans - EA 0A0811; Other - EFIS 0413000365	2008	Dean Martorana	Archaeological Survey Report Interstate 80/San Pablo Dam Road Interchange Project, Contra Costa County, California, 4-CC-80 PM 3.8/5.3 EA 0A0800	URS Group Inc.	
S-043527a		2008	Stephen Wee	Historical Resources Evaluation Report Interstate 80/San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0800 4-CC-80 PM 3.8/5.3	JRP Historical Consulting, LLC	
S-043527b		2014	Kathleen Kubal	Supplemental Historic Property Survey Report Interstate 80/ San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0811; EFIS 0413000365 4-CC-80, PM 3.8/5.3	URS Group Inc.	

Report Detail: S-001475

Identifiers

Report No.:	S-001475	
Other IDs:	*Type*	*Name*
	Other	County File #3065-78
Cross-refs:		

Citation information

Author(s): Randy Milliken
Year: 1979 (Mar)
Title: County File #3065-78, cultural resource field reconnaissance conducted on a 0.79 acre parcel at 3741 San Pablo Dam Road in El Sobrante, Contra Costa County (letter report)
Affliliation: Cultural Resources Facility, Sonoma State University
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: 0.79 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond

Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3741 San Pablo Dam Road	El Sobrante		

PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	1/8/2018	hagell

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-001581

Identifiers

Report No.:	S-001581
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Paul E. Amaroli
Year:	1979 (Jun)
Title:	An Archaeological Reconnaissance of Two Acres in El Sobrante, Contra Costa County, California.
Affiliation:	The Cultural Resources Facility, Sonoma State University
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c 2 ac
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	7/6/2017	hagell	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-004950

Identifiers

Report No.: S-004950

Other IDs:

Type	*Name*
Caltrans	04209-400211
Voided	S-5750

Cross-refs: See also S-005750

Citation information

Author(s): Margaret Buss

Year: 1982 (May)

Title: Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from Bay Bridge to Carquinez Bridge, 04-ALA/CC-80 2.0/8.0, 0.0/14.1, 04209-400211

Affliliation: Caltrans, District 4

No. pages:

No. maps:

Attributes: Archaeological, Field study

Inventory size: c 20 li mi

Disclosure: Not for publication

Collections: No

Sub-desig.: a

Author(s): Mara Melandry

Year: 1982 (Dec)

Title: First Addendum Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge in Alameda and Contra Costa Counties 04-Ala/CC 80 2.0/8.0; 0.0/14.1, 04209-400211

Affiliation: Caltrans, District 4

Report type(s): Archaeological, Field study

Inventory size:

No. pages:

Disclosure: Not for publication

Collections: No

PDF Pages: 33-35

General notes

The report contains several oversized maps that were not scanned.

Associated resources

Primary No.	*Trinomial*	*Name*
P-01-000081	CA-ALA-000304	Nelson No. 304
P-01-000082	CA-ALA-000305	Nelson No. 305; Barker's El Cerr
P-01-000087	CA-ALA-000310	Nelson's 310
P-07-000179	CA-CCO-000302	Nelson No. 302
P-07-000180	CA-CCO-000303	Nelson No. 303
P-07-000318	CA-CCO-000547	[none]
P-07-000672	CA-CCO-000246	Nelson #432, Loud #432

No. resources: 7

Has informals: No

Location information

County(ies): Alameda, Contra Costa

USGS quad(s): Benicia, Mare Island, Oakland West, Richmond

Address:

PLSS:

Report Detail: S-004950

Database record metadata

	Date	User	
Entered:	4/7/2005	nwic-main	
Last modified:	1/8/2018	hagell	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	3/24/2015	hagell	edited database
	5/25/2017	hagell	edited title & affiliation
	6/2/2017	raelync	Report verified; awaiting verification of 1 resource: P-07-000672.
	11/21/2017	moored	added additional citation 'a'
	12/13/2017	raelync	Final resource verified; set report to 'Verified'.
Record status:	Verified		

Report Detail: S-006214

Identifiers

Report No.:	S-006214
Other IDs:	
Cross-refs:	

Citation information

Author(s):	C. Michael Elling
Year:	1983 (Oct)
Title:	An Archaeological Survey of the Triplett Property, 3640 San Pablo Dam Road, El Sobrante, Contra Costa County, California.
Affliliation:	Elling and Associates
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c 2 ac
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3640 San Pablo Dam Road	El Sobrante		
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	4/11/2016	mikulikc	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-006592

Identifiers

Report No.:	S-006592
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Peter M. Banks
Year:	1984 (May)
Title:	An Archaeological Reconnaissance of the Appian Way Widening Project, El Sobrante, Contra Costa County, California.
Affiliation:	California Archaeological Consultants, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c. 1 li. mi.
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	6/30/2017	neala	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-007131

Identifiers

Report No.: S-007131
Other IDs:
Cross-refs:

Citation information

Author(s): Peter Banks
Year: 1985 (Feb)
Title: An Archaeological Reconnaissance of the Appian Way Widening Project: Phase II, El Sobrante, Contra Costa County, California.
Affliliation: California Archaeological Consultants, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c. 1 li. mi.
Disclosure: Not for publication
Collections: No

General notes

Associated resources

Primary No.	*Trinomial*	*Name*
P-07-000097	CA-CCO-000155	El Sobrante Library Site
P-07-000276	CA-CCO-000505	The Pinella Site

No. resources: 2
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:
PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	6/30/2017	neala

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-007573

Identifiers

Report No.:	S-007573
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Peter M. Banks
Year:	1985 (Aug)
Title:	An Archaeological Reconnaissance of the Rancho Plaza Project, Richmond, Contra Costa County, California.
Affliliation:	California Archaeological Consultants, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c. 7 ac.
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	4/7/2016	mikulikc	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-007894

Identifiers

Report No.: S-007894
Other IDs:
Cross-refs:

Citation information

Author(s): Maureen Steiner
Year: 1986 (Mar)
Title: Archeological Investigations of Assessor's Parcel Nos. 420-150-13, 22 and 23 in Contra Costa County (letter report)
Affliliation: Woodward-Clyde Consultants
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c 0.5 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:

Address	*City*	*Assessor's parcel no.*	*Zip code*
		420-150-13	
		420-150-22	
		420-150-23	

PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	4/7/2016	mikulikc

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-007988

Identifiers

Report No.:	S-007988
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Robert I. Orlins
Year:	1986 (Mar)
Title:	A Cultural Resource Investigation for the San Pablo Dam Road Widening Project, El Sobrante, Contra Costa County, California.
Affliliation:	California Archaeological Consultants, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	0.7 li mi
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000068	CA-CCO-000126	[none]
No. resources:	1		
Has informals:	No		

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	6/30/2017	neala

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	6/30/2017	neala	added resource
Record status:	Verified		

Report Detail: S-008100

Identifiers

Report No.: S-008100
Other IDs:
Cross-refs:

Citation information

Author(s): Suzanne Baker
Year: 1986 (May)
Title: Archaeological Reconnaissance of the Tyson Property, Parcel #425-170-025, El Sobrante, Contra Costa County.
Affliliation: Archaeological Consultants
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c 0.5 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:

Address	City	Assessor's parcel no.	Zip code
	El Sobrante	425-170-025	

PLSS:

Database record metadata

	Date	User
Entered:	4/7/2005	nwic-main
Last modified:	7/6/2017	hagell

IC actions:	Date	User	Action taken
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	7/6/2017	hagell	added month, APN

Record status: Verified

Report Detail: S-008186

Identifiers

Report No.:	S-008186
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Peter Banks
Year:	1986 (Apr)
Title:	Subsurface Archaeological Investigations for the Appian Way Widening Project, El Sobrante, Contra Costa County, California.
Affliliation:	California Archaeological Consultants, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Excavation
Inventory size:	
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000097	CA-CCO-000155	El Sobrante Library Site
	P-07-000276	CA-CCO-000505	The Pinella Site
No. resources:	2		
Has informals:	No		

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	1/12/2016	simsa

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	1/11/2016	poskar	Study is site-specific, boundary changed to better reflect report.
Record status:	Verified		

Report Detail: S-010228

Identifiers

Report No.: S-010228
Other IDs:
Cross-refs:

Citation information

Author(s): Alice F. Wood
Year: 1988 (Aug)
Title: The Archaeological Monitoring of Excavations for Three Electrical Vaults on Appian Way, El Sobrante, Contra Costa County, California
Affliliation: California Archaeological Consultants, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Field study, Monitoring
Inventory size:
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond

Address:

Address	*City*	*Assessor's parcel no.*	*Zip code*
Appian Way	El Sobrante		

PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	7/5/2017	rinerg

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-011534

Identifiers

Report No.:	S-011534	
Other IDs:	*Type*	*Name*
	Submitter	ARS 88-65
Cross-refs:		

Citation information

Author(s):	Katherine Flynn
Year:	1988 (Aug)
Title:	Archaeological survey of property located at 4247 Appian Way, El Sobrante, Contra Costa County (letter report)
Affiliation:	Archaeological Resource Service
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c 0.5 ac
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	4247 Appian Way	El Sobrante		
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	7/3/2017	moored	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-012297

Identifiers

Report No.:	S-012297	
Other IDs:	*Type*	*Name*
	Submitter	ARS 90-73
Cross-refs:		

Citation information

Author(s):	Katherine Flynn
Year:	1991 (Jan)
Title:	Archaeological evaluation of 4201 Garden Lane, El Sobrante, Contra Costa Co., Project No. MS 192-90 (letter report)
Affliliation:	Archaeological Resource Service
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c 0.5 ac
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	4201 Garden Lane	El Sobrante	425-122-007	
			425-122-012	
			425-122-011	
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	7/5/2017	rinerg	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-013803

Identifiers

Report No.:	S-013803
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Miley Paul Holman
Year:	1991 (Feb)
Title:	Archaeological Field Inspection of the Property at 3995 Garden Road, El Sobrante, Contra Costa County, California (letter report)
Affliliation:	Holman & Associates
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c 2 ac
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000098	CA-CCO-000156	Garden Road Cul-de Sac Site
No. resources:	1		
Has informals:	No		

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3995 Garden Road	El Sobrante		
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	1/8/2018	hagell	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-014541

Identifiers

Report No.:	S-014541
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Suzanne Baker, Eric Wohlgemuth, and Cindy Desgrandchamp
Year:	1992 (Oct)
Title:	Archaeological Test Excavations at CA-CCO-156, El Sobrante, California
Affliliation:	Archaeological/Historical Consultants
No. pages:	
No. maps:	
Attributes:	Archaeological, Excavation
Inventory size:	
Disclosure:	Not for publication
Collections:	Yes

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000098	CA-CCO-000156	Garden Road Cul-de Sac Site
No. resources:	1		
Has informals:	No		

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	4/11/2016	mikulikc

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	4/7/2016	hagell	added month, collections info
	4/8/2016	simsa	Updated GIS: expanded shape to the NE to match map in report
Record status:	Verified		

Report Detail: S-022273

Identifiers

Report No.:	S-022273	
Other IDs:	*Type*	*Name*
	Submitter	Project 50001-109/99
Cross-refs:		

Citation information

Author(s):	Stacey Schneyder
Year:	1999 (Oct)
Title:	A Cultural Resources Study of 4439 Appian Way (APN# 425-110-021), El Sobrante, Contra Costa County, California
Affliliation:	Anthropological Studies Center, Sonoma State University
No. pages:	
No. maps:	
Attributes:	Archaeological, Architectural/historical, Field study
Inventory size:	
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000839		Lu Farm Complex
No. resources:	1		
Has informals:	No		

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	4439 Appian Way	El Sobrante	425-110-021	
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	7/7/2017	hagell	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	1/4/2016	castrom	update DB
	1/11/2016	poskar	Report was mapped incorrectly based on the address, APN, and report content. Submitter's map was also incorrect.
Record status:	Verified		

Report Detail: S-027935

Identifiers

Report No.: S-027935
Other IDs:
Cross-refs:

Citation information

Author(s): John Holson
Year: 2004 (Jan)
Title: Archaeological Survey and Record Search Results for 4150 Appian Way, El Sobrante (APN 425-170-030) (letter report)
Affliliation: Pacific Legacy, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c 3 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond

	Address	*City*	*Assessor's parcel no.*	*Zip code*
Address:	4150 Appian Way	El Sobrante	425-170-30	

PLSS: T1N R4W

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	7/3/2017	moored

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-038237

Identifiers

Report No.:	S-038237	
Other IDs:	*Type*	*Name*
	Other	LSA Project No. NCE1001
Cross-refs:		

Citation information

Author(s):	Heather Blind
Year:	2011 (Aug)
Title:	Cultural Resources Study for the Via Verde Sinkhole Repair Project, Richmond, Contra Costa County, California
Affliliation:	LSA Associates, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	10/19/2011	hagell
Last modified:	4/8/2016	simsa
IC actions:		
Record status:	Verified	

Report Detail: S-038251

Identifiers

Report No.:	S-038251	
Other IDs:	*Type*	*Name*
	Caltrans	EA 3A7761
	Caltrans	EA 3A7771
Cross-refs:		

Citation information

Author(s):	Jack Meyer
Year:	2011 (Sep)
Title:	Buried Archaeological Site Assessment and Extended Phase I Subsurface Explorations for the I-80 Integrated Corridor Mobility Project, Caltrans District 04, Alameda and Contra Costa Counties, California, 04-ALA-CC-80, P.M. ALA 1.99/P.M. ALA 8.04, P.M. CC 0.0/P.M. CC 13.49, EA 3A7761 / EA 3A7771
Affliliation:	Far Western Anthropological Research Group, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Excavation, Field study
Inventory size:	
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Alameda, Contra Costa
USGS quad(s):	Benicia, Mare Island, Oakland West, Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	10/19/2011	jordanl
Last modified:	9/28/2017	moored
IC actions:		
Record status:	Verified	

Report Detail: S-043527

Identifiers

Report No.:	S-043527	
Other IDs:	*Type*	*Name*
	Caltrans	EA 0A0811
	Other	EFIS 0413000365
	Caltrans	EA 0A0800
Cross-refs:		

Citation information

Author(s): Dean Martorana
Year: 2008 (Jul)
Title: Archaeological Survey Report Interstate 80/San Pablo Dam Road Interchange Project, Contra Costa County, California, 4-CC-80 PM 3.8/5.3 EA 0A0800
Affliliation: URS Group Inc.
No. pages:
No. maps:
Attributes: Archaeological, Architectural/historical, Evaluation, Field study
Inventory size:
Disclosure: Not for publication
Collections: No

Sub-desig.: a
Author(s): Stephen Wee
Year: 2008 (Jul)
Title: Historical Resources Evaluation Report Interstate 80/San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0800 4-CC-80 PM 3.8/5.3
Affiliation: JRP Historical Consulting, LLC
Report type(s): Architectural/historical, Evaluation
Inventory size:
No. pages: 156
Disclosure: Not for publication
Collections: No
PDF Pages: 257-398

Sub-desig.: b
Author(s): Kathleen Kubal
Year: 2014 (Jan)
Title: Supplemental Historic Property Survey Report Interstate 80/ San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0811; EFIS 0413000365 4-CC-80, PM 3.8/5.3
Affiliation: URS Group Inc.
Report type(s): Architectural/historical, Evaluation
Inventory size:
No. pages: 40
Disclosure: Not for publication
Collections: No
PDF Pages: 399-438

General notes

The 2008 Historic Property Survey was not included in the submission packet and is not on file at the NWIC.

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa

Report Detail: S-043527

USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	4/22/2014	intern2
Last modified:	1/8/2018	hagell

IC actions:	*Date*	*User*	*Action taken*
	6/20/2014	castrom	metadata form - partial printed copy of the report.
Record status:	Verified		

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-000595		1974	R.F. King	A Report on the Status of Generally Available Data Regarding Archaeological, Ethnographic, and Historical Resources Within a Five Mile Wide Corridor Through Portions of Colusa, Yolo, Solano, and Contra Costa Counties, California		07-000091, 48-000009, 48-000010, 48-000011, 48-000012, 48-000013, 48-000018, 48-000020, 57-000130, 57-000131
S-000848	Agency Nbr - Contract AA550-CT6-52	1977	David A. Fredrickson	A Summary of Knowledge of the Central and Northern California Coastal Zone and Offshore Areas, Vol. III, Socioeconomic Conditions, Chapter 7: Historical & Archaeological Resources	The Anthropology Laboratory, Sonoma State College; Winzler & Kelly Consulting Engineers	
S-001978		1960	Anthony V. Aiello	The Islands of Contra Costa		

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-002458		1981	Neil Ramiller, Suzanne Ramiller, Roger Werner, and Suzanne Stewart	Overview of Prehistoric Archaeology for the Northwest Region, California Archaeological Sites Survey: Del Norte, Humboldt, Mendocino, Lake, Sonoma, Napa, Marin, Contra Costa, Alameda	Anthropological Studies Center, Sonoma State University	01-000080, 01-000084, 01-000086, 01-000104, 01-000119, 01-000124, 01-000125, 01-000126, 01-000127, 01-000137, 01-000139, 01-002053, 01-002104, 07-000047, 07-000079, 07-000080, 07-000081, 07-000082, 07-000083, 07-000092, 07-000093, 07-000105, 07-000131, 07-000146, 07-000147, 07-000148, 07-000149, 07-000150, 07-000151, 07-000168, 07-000173, 07-000175, 07-000177, 07-000185, 07-000186, 07-000190, 07-000323, 07-000440, 07-000447, 07-000448, 07-000449, 07-000462, 07-000470, 07-000474, 07-000476, 07-000481, 07-000674, 07-000710, 07-000724, 07-004621, 08-000015, 08-000018, 08-000021, 08-000090, 12-000125, 12-000175, 12-000186, 12-000194, 12-000199, 12-000202, 12-000207, 12-000209, 12-000210, 12-000211, 12-000263, 12-000264, 12-000266, 12-000336, 12-000442, 12-000445, 12-000458, 17-000006, 17-000026, 17-000035, 17-000072, 17-000114, 17-000177, 17-000286, 17-000287, 17-000289, 17-000290, 17-000307, 17-000320, 17-000392, 17-000407, 17-000437, 17-000446, 17-000470, 17-000531, 17-000535, 17-000546, 17-000550, 17-000551, 17-000554, 17-000572, 17-000610, 17-000639, 17-000640, 17-000673, 17-000787, 17-000812, 21-000017, 21-000034, 21-000039, 21-000051, 21-000053, 21-000057, 21-000058, 21-000106, 21-000143, 21-000163, 21-000177, 21-000217, 21-000221, 21-000235, 21-000242, 21-000245, 21-000252, 21-000262, 21-000283, 21-000290, 21-000291, 21-000295, 21-000332, 21-000335, 21-000342, 21-000346, 21-000347, 21-000368, 21-000369, 21-000370, 21-000651, 21-000653, 21-002539, 23-000143, 23-000450, 23-000475, 23-000478,

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
						23-000492, 23-000534, 23-000535, 23-000536, 23-000537, 23-000539, 23-000590, 23-000786, 23-000789, 23-000790, 23-000791, 23-000792, 23-000793, 23-000796, 23-000835, 23-001034, 23-001060, 23-001063, 23-001520, 23-002898, 23-002915, 23-002936, 23-002945, 28-000015, 28-000027, 28-000028, 28-000029, 28-000032, 28-000045, 28-000061, 28-000063, 28-000066, 28-000077, 28-000088, 28-000092, 28-000093, 28-000097, 28-000123, 28-000125, 28-000150, 28-000199, 28-000209, 28-000218, 28-000222, 28-000310, 28-000311, 28-000329, 28-000330, 28-000362, 28-000418, 28-000419, 28-000420, 28-000421, 28-000422, 28-000428, 28-000828, 28-000912, 49-000073, 49-000079, 49-000112, 49-000135, 49-000194, 49-000228, 49-000264, 49-000265, 49-000271, 49-000291, 49-000292, 49-000295, 49-000318, 49-000329, 49-000330, 49-000340, 49-000342, 49-000360, 49-000362, 49-000363, 49-000369, 49-000371, 49-000423, 49-000424, 49-000434, 49-000483, 49-000512, 49-000521, 49-000548, 49-000620, 49-000653, 49-000671, 49-000682, 49-000683, 49-000730, 49-000731, 49-000732, 49-000733, 49-000846, 49-000860, 49-000887, 49-000913, 49-000914, 49-000915, 49-000916, 49-000917, 49-000959, 49-000970, 49-000976, 49-000978, 49-000981, 49-000982, 49-000983, 49-000990, 49-000992, 49-001081, 49-001082, 49-001083, 49-001084, 49-001085, 49-001086, 49-001087, 49-001109, 49-001121
S-002458a		1982	Suzanne Ramiller	Prehistoric Archaeology Overview Northwest Region; California Archaeological Inventory, Volume I: Humboldt and Del Norte Counties	Anthropological Studies Center, Sonoma State University	

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-002458b		1982	Roger H. Werner	Archaeological Overview of Mendocino and Lake Counties	Anthropological Studies Center, Sonoma State University	
S-002458c		1982	Suzanne Stewart	Prehistoric Archaeology Overview Northwest Region; California Archaeological Inventory, Volume I: Napa and Sonoma Counties	Anthropological Studies Center, Sonoma State University	
S-002458d		1982	Suzanne B. Stewart	Archaeological Overview of Alameda, Contra Costa, and Marin Counties	Anthropological Studies Center, Sonoma State University	
S-002458e		1982	Neil Ramiller	Environmental Overview of The Northwest Region	Anthropological Studies Center, Sonoma State University	
S-009462		1977	Teresa Ann Miller	Identification and Recording of Prehistoric Petroglyphs in Marin and Related Bay Area Counties	San Francisco State University	07-000323, 21-000087, 21-000376, 21-000378, 21-000379, 21-000380, 21-000381, 21-000382, 21-000383, 21-000384, 21-000386, 21-000387, 21-000388, 21-000389, 21-000390, 21-000391, 21-000392, 21-000393, 21-000394, 21-000395, 21-000396, 21-000397, 21-000398, 21-000399, 21-000400, 21-000401, 21-000402, 21-000546, 23-000434, 23-000789, 23-000790, 49-000629, 49-000785, 49-000787
S-009583		1978	David W. Mayfield	Ecology of the Pre-Spanish San Francisco Bay Area	San Francisco State University	
S-009795		1986	Thomas Lynn Jackson	Late Prehistoric Obsidian Exchange in Central California	Stanford University	06-000025, 07-000047, 07-000080, 07-000188, 07-000440, 17-000320, 17-000601, 21-000163, 21-000218, 21-000235, 21-000242, 21-000283, 21-000290, 21-000368, 21-000423, 21-000628, 23-001589, 23-001659, 23-003068, 23-003119, 28-000015, 28-000068, 28-000199, 28-000205, 28-000828, 49-000135, 49-000360, 49-000423, 49-000424, 49-000518, 49-000521, 49-000533, 49-000536, 49-000558, 49-000801, 57-000114

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-015529		1993	Robert L. Gearhart II, Clell L. Bond, Steven D. Hoyt, James H. Cleland, James Anderson, Pandora Snethcamp, Gary Wesson, Jack Neville, Kim Marcus, Andrew York, and Jerry Wilson	California, Oregon, and Washington: Archaeological Resource Study	Espey, Huston & Associates, Inc.; Dames & Moore	01-000033, 01-000034, 01-000084, 01-000086, 01-000104, 07-000133, 07-000173, 07-000175, 07-000177, 17-000072, 17-000392, 21-000048, 21-001915, 23-001704, 27-000100, 27-000236, 27-000335, 27-000356, 27-000386, 27-000485, 38-000028, 38-000072, 38-000085, 38-000098, 41-000080, 41-000265, 44-000179
S-016660		1992	Jeffrey B. Fentress	Prehistoric Rock Art of Alameda and Contra Costa Counties, California	California State University, Hayward	01-000035, 01-000039, 01-000071, 01-000080, 01-000128, 01-000137, 01-000138, 01-000144, 01-000195, 01-000198, 01-000199, 01-002112, 07-000029, 07-000094, 07-000189, 07-000193, 07-000212, 07-000216, 07-000219, 07-000230, 07-000242, 07-000255, 07-000260, 07-000271, 07-000301, 07-000302, 07-000323, 07-000344, 07-000345, 07-000346, 07-000347, 07-000348, 07-000356, 07-000362, 07-000374, 07-000725, 07-000726, 07-000727, 07-000730, 07-000734, 07-000736, 07-000738, 07-000739
S-017835		1975	Judy Myers Suchey	Biological Distance of Prehistoric Central California Populations Derived from Non-Metric Traits of the Cranium	University of California, Riverside	01-000086, 01-000104, 01-000105, 06-000025, 07-000080, 07-000081, 07-000083, 07-000087, 21-000017, 21-000193, 21-000242, 21-000252, 48-000010, 57-000145
S-018217		1996	Glenn Gmoser	Cultural Resource Evaluations for the Caltrans District 04 Phase 2 Seismic Retrofit Program, Status Report	California Department of Transportation	01-000014, 01-000023, 01-000227, 07-000108, 07-000119, 38-000002, 38-000004, 41-000273, 43-000106, 43-000297, 43-000624, 43-001078, 44-000010, 44-000201, 44-000300, 49-000195

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-020395		1998	Donna L. Gillette	PCNs of the Coast Ranges of California: Religious Expression or the Result of Quarrying?	California State University, Hayward	07-000094, 07-000323, 12-000050, 17-000071, 17-001315, 21-000087, 21-000376, 21-000378, 21-000379, 21-000381, 21-000382, 21-000383, 21-000384, 21-000386, 21-000387, 21-000388, 21-000389, 21-000390, 21-000391, 21-000392, 21-000393, 21-000394, 21-000395, 21-000396, 21-000397, 21-000398, 21-000399, 21-000400, 21-000401, 21-000402, 21-000419, 21-000433, 21-000546, 21-000620, 21-000621, 21-000624, 21-000661, 23-000434, 23-000809, 23-000810, 23-001698, 23-001725, 23-001792, 23-001798, 23-001799, 23-001803, 23-001804, 23-001930, 23-001942, 23-001950, 23-001963, 35-000013, 43-000067, 43-000080, 43-000287, 43-000289, 43-000504, 49-000046, 49-000240, 49-000533, 49-000550, 49-000629, 49-000785, 49-000787, 49-000868, 49-000960, 49-000975, 49-001004, 49-001087, 49-001239, 49-002121
S-030204		2003	Donna L. Gillette	The Distribution and Antiquity of the California Pecked Curvilinear Nucleated (PCN) Rock Art Tradition.	University of California, Berkeley	01-002148, 21-000384, 23-000810
S-032596	Caltrans - EA No. 447600; Other - Contract #04A2098	2006	Randall Milliken, Jerome King, and Patricia Mikkelsen	The Central California Ethnographic Community Distribution Model, Version 2.0, with Special Attention to the San Francisco Bay Area, Cultural Resources Inventory of Caltrans District 4 Rural Conventional Highways	Consulting in the Past; Far Western Anthropological Research Group, Inc.	
S-033545		1994		Draft Comprehensive Management and Use Plan and Environmental Impact Statement, Juan Bautista de Anza National Historic Trail, Arizona and California	National Park Service	38-002967, 41-002192, 43-002628

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-033600	Agency Nbr - Contract No. 04A2098; Caltrans - EA No. 447600	2007	Jack Meyer and Jeff Rosenthal	Geoarchaeological Overview of the Nine Bay Area Counties in Caltrans District 4	Far Western Anthropological Research Group, Inc.	01-000001, 01-000002, 01-000014, 01-000063, 01-000064, 01-000067, 01-000080, 01-000124, 01-000139, 01-000140, 01-001795, 01-002110, 01-002160, 01-002162, 01-002245, 07-000019, 07-000024, 07-000037, 07-000047, 07-000075, 07-000079, 07-000088, 07-000089, 07-000108, 07-000182, 07-000185, 07-000186, 07-000217, 07-000239, 07-000401, 07-000721, 21-000010, 21-000048, 21-002615, 28-000009, 28-000028, 28-000301, 28-000967, 38-000006, 38-000028, 38-000101, 38-000102, 38-000119, 41-000080, 41-000284, 43-000016, 43-000189, 43-000296, 43-000308, 43-000310, 43-000423, 43-000424, 43-000448, 43-000451, 43-000485, 43-000561, 43-000604, 43-000608, 43-000614, 43-000623, 43-001015, 43-001058, 43-001080, 43-001163, 43-001194, 43-001576, 48-000007, 48-000157

Resource List

Primary No.	Trinomial	Other IDs	Type	Age	Attribute codes	Recorded by	Reports
P-07-000097	CA-CCO-000155	Resource Name - El Sobrante Library Site	Site	Prehistoric	AP15	1950 (T. Bolt, [none]); 1985 (Peter Banks, [none])	S-007131, S-008186
P-07-000098	CA-CCO-000156	Resource Name - Garden Road Cul-de Sac Site	Site	Prehistoric	AP09; AP15	1950 (T. Bolt, [none]); 1985 (Peter Banks, [none]); 1988 (Richard Schwartz, [none])	S-013803, S-014541
P-07-000839		Resource Name - Lu Farm Complex; Other - 4439 Appian Way	Building, Structure	Historic	HP33	1999 (Mike Newland, Stacy Schneyder, Noelle Storey, Anthropological Studies Center, Sonoma State University)	S-022273
P-07-004605		Resource Name - Map Reference #7; Other - 3058 Judith Court	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	
P-07-004606		Resource Name - Map Reference #6; Other - 3066 Judith Court	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	
P-07-004607		Resource Name - Map Reference #5; Other - 3072 Judith Court	Building	Historic	HP02	2008 (Bryan Larson, JRP Historical Consulting)	
P-07-004608		Resource Name - Map Reference #4; Other - 3144 Rollingwood Drive	Building	Historic	HP02	2008 (Bryan Larson, JRP Historical Consulting)	
P-07-004609		Resource Name - Map Reference #3; Other - 3152 Rollingwood Drive	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	
P-07-004610		Resource Name - Map Reference #2; Other - 3160 Rollingwood Drive	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	
P-07-004611		Resource Name - Map Reference #1; Other - 3168 Rollingwood Drive	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	

Resource Detail: P-07-000097

Identifying information

Primary No.: P-07-000097
Trinomial: CA-CCO-000155
Name: El Sobrante Library Site
Other IDs:

Type	Name
Resource Name	El Sobrante Library Site

Cross-refs:

Attributes

Resource type: Site
Age: Prehistoric
Information base: Survey
Attribute codes: AP15 (Habitation debris)
Disclosure: Not for publication
Collections: No
Accession no(s):
Facility:

General notes

Recording events

	Date	Recorder(s)	Affiliation	Notes
a	3/25/1950	T. Bolt	[none]	
b	2/21/1985	Peter Banks	[none]	

Associated reports

Report No.	Year	Title	Affiliation
S-007131	1985	An Archaeological Reconnaissance of the Appian Way Widening Project: Phase II, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.
S-008186	1986	Subsurface Archaeological Investigations for the Appian Way Widening Project, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.

Location information

County: Contra Costa
USGS quad(s): Richmond
Address:
PLSS:
UTMs: Zone 10 560700mE 4202220mN NAD27

Management status

Database record metadata

	Date	User	
Entered:	4/1/2005	icrds	
Last modified:	2/20/2017	grahams	
IC actions:	*Date*	*User*	*Action taken*
	2/17/2017	moored	Updated GIS, remapped into approximate
	4/1/2005	jay	Appended records from discontinued ICRDS.
Record status:	Verified		

Resource Detail: P-07-000098

Identifying information

Primary No.:	P-07-000098	
Trinomial:	CA-CCO-000156	
Name:	Garden Road Cul-de Sac Site	
Other IDs:	*Type*	*Name*
	Resource Name	Garden Road Cul-de Sac Site
Cross-refs:		

Attributes

Resource type:	Site
Age:	Prehistoric
Information base:	Survey
Attribute codes:	AP09 (Burials); AP15 (Habitation debris)
Disclosure:	Not for publication
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	*Recorder(s)*	*Affiliation*	*Notes*
a	3/25/1950	T. Bolt	[none]	
b	2/21/1985	Peter Banks	[none]	
c	5/7/1988	Richard Schwartz	[none]	

Associated reports

Report No.	*Year*	*Title*	*Affiliation*
S-013803	1991	Archaeological Field Inspection of the Property at 3995 Garden Road, El Sobrante, Contra Costa County, California (letter report)	Holman & Associates
S-014541	1992	Archaeological Test Excavations at CA-CCO-156, El Sobrante, California	Archaeological/Historical Consultants

Location information

County:	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	
UTMs:	Zone 10 560400mE 4202160mN NAD27

Management status

Database record metadata

	Date	*User*	
Entered:	4/1/2005	icrds	
Last modified:	4/4/2016	paganob	
IC actions:	*Date*	*User*	*Action taken*
	4/1/2005	jay	Appended records from discontinued ICRDS.
Record status:	Verified		

Resource Detail: P-07-000839

Identifying information

Primary No.:	P-07-000839	
Trinomial:		
Name:	Lu Farm Complex	
Other IDs:	*Type*	*Name*
	Resource Name	Lu Farm Complex
	Other	4439 Appian Way
Cross-refs:		

Attributes

Resource type:	Building, Structure
Age:	Historic
Information base:	Survey
Attribute codes:	HP33 (Farm/ranch)
Disclosure:	Not for publication
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	*Recorder(s)*	*Affiliation*	*Notes*
a	10/20/1999	Mike Newland, Stacy Schneyder, Noelle Storey	Anthropological Studies Center, Sonoma State University	

Associated reports

Report No.	*Year*	*Title*	*Affiliation*
S-022273	1999	A Cultural Resources Study of 4439 Appian Way (APN# 425-110-021), El Sobrante, Contra Costa County, California	Anthropological Studies Center, Sonoma State University

Location information

County:	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	4439 Appian Way	El Sobrante	425-110-021	94803
PLSS:				
UTMs:	Zone 10 561125mE 4202750mN NAD83			

Management status

Database record metadata

	Date	*User*	
Entered:	4/1/2005	icrds	
Last modified:	1/12/2016	simsa	
IC actions:	*Date*	*User*	*Action taken*
	1/11/2016	poskar	Boundary changed 1-11-2016 based off parcel layer.
	7/10/2001	AOLPJ	Primary number 07-000839 assigned.
	4/1/2005	jay	Appended records from discontinued ICRDS.
Record status:	Verified		

Resource Detail: P-07-004605

Identifying information

Primary No.:	P-07-004605	
Trinomial:		
Name:	Map Reference #7	
Other IDs:	*Type*	*Name*
	Resource Name	Map Reference #7
	Other	3058 Judith Court
Cross-refs:		

Attributes

Resource type:	Building
Age:	Historic
Information base:	Survey
Attribute codes:	HP02 (Single family property)
Disclosure:	Unrestricted
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	Recorder(s)	Affiliation	Notes
a	8/1/2007	Cheryl Brookshear, Damany Fisher	JRP Historical Consulting	

Associated reports

Location information

County:	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3058 Judith Court	San Pablo	416-013-021	94806
PLSS:				
UTMs:				

Management status

Database record metadata

	Date	User
Entered:	7/8/2015	simsa
Last modified:	8/10/2015	rinerg
IC actions:		
Record status:	Verified	

Resource Detail: P-07-004606

Identifying information

Primary No.:	P-07-004606	
Trinomial:		
Name:	Map Reference #6	
Other IDs:	*Type*	*Name*
	Resource Name	Map Reference #6
	Other	3066 Judith Court
Cross-refs:		

Attributes

Resource type:	Building
Age:	Historic
Information base:	Survey
Attribute codes:	HP02 (Single family property)
Disclosure:	Unrestricted
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	*Recorder(s)*	*Affiliation*	*Notes*
a	8/1/2007	Cheryl Brookshear, Damany Fisher	JRP Historical Consulting	

Associated reports

Location information

County:	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3066 Judith Court	San Pablo	416-013-011	94806
PLSS:				
UTMs:				

Management status

Database record metadata

	Date	*User*
Entered:	7/8/2015	simsa
Last modified:	8/10/2015	rinerg
IC actions:		
Record status:	Verified	

Resource Detail: P-07-004607

Identifying information

Primary No.:	P-07-004607	
Trinomial:		
Name:	Map Reference #5	
Other IDs:	*Type*	*Name*
	Resource Name	Map Reference #5
	Other	3072 Judith Court
Cross-refs:		

Attributes

Resource type:	Building
Age:	Historic
Information base:	Survey
Attribute codes:	HP02 (Single family property)
Disclosure:	Unrestricted
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	*Recorder(s)*	*Affiliation*	*Notes*
a	3/18/2008	Bryan Larson	JRP Historical Consulting	

Associated reports

Location information

County:	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3072 Judith Court	San Pablo	416-013-012	95806
PLSS:				
UTMs:				

Management status

Database record metadata

	Date	*User*
Entered:	7/8/2015	simsa
Last modified:	8/10/2015	rinerg
IC actions:		
Record status:	Verified	

Resource Detail: P-07-004608

Identifying information

Primary No.:	P-07-004608	
Trinomial:		
Name:	Map Reference #4	
Other IDs:	*Type*	*Name*
	Resource Name	Map Reference #4
	Other	3144 Rollingwood Drive
Cross-refs:		

Attributes

Resource type:	Building
Age:	Historic
Information base:	Survey
Attribute codes:	HP02 (Single family property)
Disclosure:	Unrestricted
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	*Recorder(s)*	*Affiliation*	*Notes*
a	3/10/2008	Bryan Larson	JRP Historical Consulting	

Associated reports

Location information

County:	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3144 Rollingwood Drive	San Pablo	416-013-014	94806
PLSS:				
UTMs:				

Management status

Database record metadata

	Date	*User*
Entered:	7/8/2015	simsa
Last modified:	8/10/2015	rinerg
IC actions:		
Record status:	Verified	

Resource Detail: P-07-004609

Identifying information

Primary No.:	P-07-004609	
Trinomial:		
Name:	Map Reference #3	
Other IDs:	*Type*	*Name*
	Resource Name	Map Reference #3
	Other	3152 Rollingwood Drive
Cross-refs:		

Attributes

Resource type:	Building
Age:	Historic
Information base:	Survey
Attribute codes:	HP02 (Single family property)
Disclosure:	Unrestricted
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	*Recorder(s)*	*Affiliation*	*Notes*
a	8/1/2007	Cheryl Brookshear, Damany Fisher	JRP Historical Consulting	

Associated reports

Location information

County:	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3152 Rollingwood Drive	San Pablo	416-013-023	94806
PLSS:				
UTMs:				

Management status

Database record metadata

	Date	*User*
Entered:	7/8/2015	simsa
Last modified:	8/10/2015	rinerg
IC actions:		
Record status:	Verified	

Resource Detail: P-07-004610

Identifying information

Primary No.:	P-07-004610	
Trinomial:		
Name:	Map Reference #2	
Other IDs:	*Type*	*Name*
	Resource Name	Map Reference #2
	Other	3160 Rollingwood Drive
Cross-refs:		

Attributes

Resource type:	Building
Age:	Historic
Information base:	Survey
Attribute codes:	HP02 (Single family property)
Disclosure:	Unrestricted
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	*Recorder(s)*	*Affiliation*	*Notes*
a	8/1/2007	Cheryl Brookshear, Damany Fisher	JRP Historical Consulting	

Associated reports

Location information

County:	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3160 Rollingwood Drive	San Pablo	416-013-020	94806
PLSS:				
UTMs:				

Management status

Database record metadata

	Date	*User*
Entered:	7/8/2015	simsa
Last modified:	8/10/2015	rinerg
IC actions:		
Record status:	Verified	

Resource Detail: P-07-004611

Identifying information

Primary No.:	P-07-004611	
Trinomial:		
Name:	Map Reference #1	
Other IDs:	*Type*	*Name*
	Resource Name	Map Reference #1
	Other	3168 Rollingwood Drive
Cross-refs:		

Attributes

Resource type:	Building
Age:	Historic
Information base:	Survey
Attribute codes:	HP02 (Single family property)
Disclosure:	Unrestricted
Collections:	No
Accession no(s):	
Facility:	

General notes

Recording events

	Date	*Recorder(s)*	*Affiliation*	*Notes*
a	8/1/2007	Cheryl Brookshear, Damany Fisher	JRP Historical Consulting	

Associated reports

Location information

County:	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3168 Rollingwood Drive	San Pablo	416-013-024	94806
PLSS:				
UTMs:				

Management status

Database record metadata

	Date	*User*
Entered:	7/8/2015	simsa
Last modified:	8/10/2015	rinerg
IC actions:		
Record status:	Verified	

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS.............	NAMES............................	CITY.NAME........	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
155420		550 SAN PABLO AVE		RODEO	P	1947	PROJ.REVW.	HUD050822C	09/26/05	6Y	
106577	07-001916	3801 SR 4	BARRY RANCH	RODEO	P	1923	HIST.RES.	DOE-07-97-0003-0000	01/17/97	6Y	
							PROJ.REVW.	FHWA961211A	01/17/97	6Y	
171850		311 VALLEJO AVE		RODEO		1941	PROJ.REVW.	HUD080609H	06/13/08	6Y	
106758	07-001919		RODEO CREEK BRIDGE, BRIDGE #28-003	(VIC) RODEO			HIST.RES.	DOE-07-97-0005-0000	01/17/97	6Y	
							PROJ.REVW.	FHWA961211A	01/17/97	6Y	
010625	07-001132	SR 80	OLEUM	(VIC) RODEO	P	1895	HIST.SURV.	4572-0002-0000		7R	
129337	07-002539	3200 11TH ST		SAN PABLO	P	1949	HIST.RES.	DOE-07-02-0003-0000	01/14/02	6Y	
							PROJ.REVW.	HUD020110N	01/14/02	6Y	
147279		3409 11TH ST		SAN PABLO	P	1954	HIST.RES.	DOE-07-04-0010-0000	01/23/04	6Y	
							PROJ.REVW.	HUD031231D	01/23/04	6Y	
146036		1816 14TH ST		SAN PABLO	P	1924	HIST.RES.	DOE-07-04-0002-0000	02/03/04	6Y	
							PROJ.REVW.	HUD040130C	02/03/04	6Y	
141058		1614 15TH ST		SAN PABLO	P	1935	HIST.RES.	DOE-07-03-0028-0000	07/03/03	6Y	
							PROJ.REVW.	HUD030606A	07/03/03	6Y	
135837		1875 15TH ST		SAN PABLO	P	1952	HIST.RES.	DOE-07-02-0075-0000	12/16/02	6Y	
							PROJ.REVW.	HUD021203B	12/16/02	6Y	
169781		2759 15TH ST		SAN PABLO	P	1951	PROJ.REVW.	HUD071213L	01/08/08	6Y	
129257	07-002534	1740 16TH ST		SAN PABLO	P	1934	HIST.RES.	DOE-107-01-0037-0000	12/31/01	6Y	
							PROJ.REVW.	HUD011226J	12/31/01	6Y	
132825		1881 16TH ST		SAN PABLO	P	1953	HIST.RES.	DOE-07-02-0061-0000	08/05/02	6Y	
							PROJ.REVW.	HUD020729C	08/05/02	6Y	
138782		1958 16TH ST		SAN PABLO	P	1946	HIST.RES.	DOE-07-03-0021-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411A	04/15/03	6Y	
131423		2721 18TH ST		SAN PABLO	P		HIST.RES.	DOE-07-02-0017-0000	06/06/02	6Y	
							PROJ.REVW.	HUD020522K	06/06/02	6Y	
161654		2972 19TH ST		SAN PABLO	P	1953	PROJ.REVW.	HUD060317A	03/21/06	6Y	
136783		2024 20TH ST		SAN PABLO	P	1948	HIST.RES.	DOE-07-03-0014-0000	02/03/03	6Y	
							PROJ.REVW.	HUD030128J	02/03/03	6Y	
166216		2996 20TH ST		SAN PABLO	P	1954	PROJ.REVW.	HUD070529E	06/04/07	6Y	
132819		2331 22ND ST		SAN PABLO	P	1929	HIST.RES.	DOE-07-02-0060-0000	08/05/02	6Y	
							PROJ.REVW.	HUD020729D	08/05/02	6Y	
012818	07-001191	ALVARADO SQUARE	BLUME HOUSE	SAN PABLO	P	1905	HIST.SURV.	4806-0011-0000		7R	
012808	07-001181	ALVARADO SQUARE	TEXIERA HOME	SAN PABLO	M	1890	HIST.SURV.	4806-0001-0000		7R	
171428		1524 AMADOR ST		SAN PABLO	P	1948	PROJ.REVW.	HUD080421D	04/25/08	6Y	
132457		2900 ARUNDEL WY		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0001-0000	07/19/02	6Y	
							PROJ.REVW.	HUD020705Q	07/19/02	6Y	
136070		2445 BANCROFT LANE		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0006-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216M	01/06/03	6Y	
132190		6211 BAYVIEW AVE		SAN PABLO	P	1951	HIST.RES.	DOE-07-02-0024-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702D	07/10/02	6Y	
161955		150 BONNIE DR		SAN PABLO	P	1954	PROJ.REVW.	HUD060428A	05/03/06	6Y	
166244		321 BONNIE DR		SAN PABLO	P	1954	PROJ.REVW.	HUD070702S	07/06/07	6Y	
146035		1300 BROOKSIDE AVE		SAN PABLO	P	1949	HIST.RES.	DOE-07-04-0001-0000	02/03/04	6Y	
							PROJ.REVW.	HUD040120B	02/03/04	6Y	
134262		1811 BUSH AVE		SAN PABLO	P	1940	HIST.RES.	DOE-07-02-0067-0000	10/01/02	6Y	
							PROJ.REVW.	HUD020926I	10/01/02	6Y	
170080		2600 CASTRO RD	ORGANIZATIONAL MANTAINANCE SHOP	SAN PABLO	F	1952	PROJ.REVW.	USA070613A	07/16/07	6Y	
170079		2600 CASTRO RD	COLONIAL HUNTER HALL USAR CENTER	SAN PABLO	F	1952	PROJ.REVW.	USA070613A	07/16/07	6Y	
182102		468 CHRISTINE DR		SAN PABLO	P	1963	PROJ.REVW.	HUD110309F	03/16/11	6Y	
012809	07-001182	1825 CHURCH LANE	ST PAULS CATHOLIC CHURCH & GRAVEYA	SAN PABLO	P	1863	HIST.SURV.	4806-0002-0000		7N	
012819	07-001192	1901 CHURCH LANE	OLD RECTORY	SAN PABLO	P	1875	HIST.RES.	DOE-07-97-0011-0000	07/17/97	2S2	C

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS	NAMES	CITY.NAME	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
							PROJ.REVW.	HUD950522F	07/17/97	2S2	C
							HIST.SURV.	4806-0014-0000	05/30/80	3S	
							HIST.SURV.	4806-0012-0000		7N	
184209		1845 CHURCH LN	ST PAUL CHURCH	SAN PABLO	P	1931	PROJ.REVW.	FCC091123E	02/25/10	6Y	
131422		1501 COLIN ST		SAN PABLO	P		HIST.RES.	DOE-07-02-0016-0000	06/06/02	6Y	
							PROJ.REVW.	HUD020522E	06/06/02	6Y	
012814	07-001187	930 CR 20	RUMRILL HELMS HOUSE	SAN PABLO	P	1884	HIST.SURV.	4806-0007-0000		3S	
147278		2009 CR 20		SAN PABLO	P	1951	HIST.RES.	DOE-07-04-0009-0000	01/23/04	6Y	
							PROJ.REVW.	HUD031231B	01/23/04	6Y	
012815	07-001188	2022 CR 20	STANLEY ALTER HOME	SAN PABLO	P		HIST.SURV.	4806-0008-0000		7R	
169728		1401 DOVER AVE		SAN PABLO	P	1948	PROJ.REVW.	HUD071213K	01/07/08	6Y	
134260		2418 DOVER AVE		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0066-0000	10/01/02	6Y	
							PROJ.REVW.	HUD020926J	10/01/02	6Y	
129336	07-002538	1514 EMERIC AVE		SAN PABLO	P	1941	HIST.RES.	DOE-07-02-0002-0000	01/14/02	6Y	
							PROJ.REVW.	HUD020110M	01/14/02	6Y	
138783		1807 EMERIC AVE		SAN PABLO	P	1935	HIST.RES.	DOE-07-03-0022-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411B	04/15/03	6Y	
136544		2201 EMERIC AVE		SAN PABLO	P	1930	HIST.RES.	DOE-07-03-0013-0000	01/27/03	6Y	
							PROJ.REVW.	HUD030115A	01/27/03	6Y	
182264		179 JENNIFER DR		SAN PABLO	P	1946	PROJ.REVW.	HUD110419E	04/25/11	6Y	
136071		1108 JOHN AVE		SAN PABLO	P	1942	HIST.RES.	DOE-07-03-0007-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021210B	01/06/03	6Y	
158312		1439 KAREN RD		SAN PABLO	P	1954	PROJ.REVW.	HUD051216M	12/30/05	6Y	
171431		1110 LETTIA RD		SAN PABLO	P	1953	PROJ.REVW.	HUD080410A	04/25/08	6Y	
144729		240 LINDA DR		SAN PABLO	P	1953	HIST.RES.	DOE-07-03-0037-0000	10/20/03	6Y	
							PROJ.REVW.	HUD031003B	10/20/03	6Y	
179036		2664 MACARTHUR AVE		SAN PABLO	P	1943	PROJ.REVW.	HUD100330G	04/23/10	6Y	
137730		1601 MANOR DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-03-0017-0000	03/07/03	6Y	
							PROJ.REVW.	HUD030303E	03/07/03	6Y	
012810	07-001183	2650 MARKET AVE	1906 EARTHQUAKE CAMP SITE	SAN PABLO	P	1906	HIST.SURV.	4806-0003-0000		7N	
138784		1830 MASON ST		SAN PABLO	P	1951	HIST.RES.	DOE-07-03-0023-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411C	04/15/03	6Y	
012811	07-001184	5739 MCBRYDE AVE	BOUQUET CHATEAU	SAN PABLO	P	1911	HIST.SURV.	4806-0004-0000		7R	
178682		2639 MERRITT AVE		SAN PABLO	P	1944	PROJ.REVW.	HUD100203A	02/03/10	6Y	
132191		24 MONTALVIN DR		SAN PABLO	P	1950	HIST.RES.	DOE-07-02-0025-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702I	07/10/02	6Y	
136069		2584 O'HARTE RD		SAN PABLO	P	1952	HIST.RES.	DOE-07-03-0005-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216E	01/06/03	6Y	
137729		2596 O'HARTE RD		SAN PABLO	P	1952	HIST.RES.	DOE-07-03-0016-0000	03/07/03	6Y	
							PROJ.REVW.	HUD030303F	03/07/03	6Y	
161880		2634 OHARE AVE		SAN PABLO	P	1943	PROJ.REVW.	HUD060403C	04/05/06	6Y	
180163		941 PALMER AVE		SAN PABLO	P	1945	PROJ.REVW.	HUD101004H	10/28/10	6Y	
147571		1919 PINE AVE		SAN PABLO	P	1951	HIST.RES.	DOE-07-04-0013-0000	02/23/04	6Y	
							PROJ.REVW.	HUD040213B	02/23/04	6Y	
012812	07-001185	1841 PULLMAN ST	PULLMAN STREET RECTORY	SAN PABLO	P	1875	HIST.SURV.	4806-0005-0000		3S	
012813	07-001186	918 RANDY LANE	ANDRATA HOUSE	SAN PABLO	P	1900	HIST.SURV.	4806-0006-0000		3S	
150832		2009 RD 20		SAN PABLO	P	1950	HIST.RES.	DOE-07-04-0022-0000	07/29/04	6Y	
							PROJ.REVW.	HUD040712B	07/29/04	6Y	
150539		2778 ROLLINGWOOD DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-04-0020-0000	07/12/04	6Y	
							PROJ.REVW.	HUD040301C	07/12/04	6Y	
136068		2797 ROLLINGWOOD DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-03-0004-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216I	01/06/03	6Y	
164754		2807 ROLLINGWOOD DR		SAN PABLO	P	1943	PROJ.REVW.	HUD070126A	01/30/07	6Y	
012816	07-001189	SAN PABLO AVE	ALVARADO ADOBE	SAN PABLO	M	1826	HIST.SURV.	4806-0009-0000		7N	
							HIST.RES.	SHL-0512-0000	11/06/53	7L	

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS............	NAMES............................	CITY.NAME........	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
012817	07-001190	14006 SAN PABLO AVE	MELLO RESIDENCE	SAN PABLO	P	1875	HIST.SURV.	4806-0010-0000		7R	
129138	07-002520	1230 SANFORD AVE		SAN PABLO	P	1950	HIST.RES.	DOE-07-01-0023-0000	12/03/01	6Y	
							PROJ.REVW.	HUD011127H	12/03/01	6Y	
160410		1914 SANFORD AVE		SAN PABLO	P	1940	PROJ.REVW.	HUD060201DD	02/02/06	6Y	
183810		SHAMROCK DR	PG&E UTILITY TOWER	SAN PABLO	P	1958	PROJ.REVW.	FCC100505C	05/31/10	6Y	
163418		1748 SUTTER AVE		SAN PABLO	P	1944	PROJ.REVW.	HUD061027B	10/27/06	6Y	
129335	07-002537	1845 TRUMAN ST		SAN PABLO	P	1950	HIST.RES.	DOE-07-02-0001-0000	01/14/02	6Y	
							PROJ.REVW.	HUD020110L	01/14/02	6Y	
171375		2734 VALE RD		SAN PABLO	P	1948	PROJ.REVW.	HUD080523D	06/12/08	6Y	
180742		9885 ALCOSTA BLVD	PGE TOWER 21/84-PITTSBURG-SAN MATE	SAN RAMON	P	1963	PROJ.REVW.	FCC100730G	12/20/10	6Y	
010667	07-001135	CROW CANYON RD	WILLIAM LYNCH HOME	SAN RAMON	P		HIST.SURV.	4583-0003-0000		7R	
010668	07-001136	FINLEY RD	TASSAJARA SCHOOL	SAN RAMON	M	1888	HIST.SURV.	4583-0004-0000		7R	
010669	07-001137	3686 NORRIS CANYON RD	CHRISTIAN WIEDEMANN RANCH	SAN RAMON	P	1860	HIST.SURV.	4583-0005-0000		7R	
010666	07-001134	19251 SAN RAMON BLVD	EL NIDO, THE NES	SAN RAMON	P	1852	HIST.SURV.	4583-0002-0000		3S	
010665	07-001133	19600 SAN RAMON VALLEY BLVD	DAVID GLASS HOME	SAN RAMON	P	1859	HIST.RES.	NPS-02000677-0020	06/28/02	1D	AC
							HIST.SURV.	4583-0001-0000	06/28/02	7R	
132530		19953 SAN RAMON VALLEY BLVD		SAN RAMON	M		HIST.RES.	NPS-02000677-0007	06/28/02	1D	AC
132529		19953 SAN RAMON VALLEY BLVD	BOONE HOUSE	SAN RAMON	M	1900	HIST.RES.	NPS-02000677-0001	06/28/02	1D	AC
132546		19953 SAN RAMON VALLEY BLVD	MACHINE STORAGE SHED	SAN RAMON	M		HIST.RES.	NPS-02000677-0013	06/28/02	1D	AC
132547		19953 SAN RAMON VALLEY BLVD	CISTERN	SAN RAMON	M		HIST.RES.	NPS-02000677-0019	06/28/02	1D	AC
132542		19953 SAN RAMON VALLEY BLVD	BARN	SAN RAMON	M		HIST.RES.	NPS-02000677-0012	06/28/02	1D	AC
132532		19953 SAN RAMON VALLEY BLVD	GROTTO	SAN RAMON	M		HIST.RES.	NPS-02000677-0003	06/28/02	1D	AC
132533		19953 SAN RAMON VALLEY BLVD	GARDENING SHED	SAN RAMON	M		HIST.RES.	NPS-02000677-0004	06/28/02	1D	AC
132548		19953 SAN RAMON VALLEY BLVD	MEN'S OUTHOUSE	SAN RAMON	M		HIST.RES.	NPS-02000677-0017	06/28/02	1D	AC
132541		19953 SAN RAMON VALLEY BLVD	HORSE BARN	SAN RAMON	M		HIST.RES.	NPS-02000677-0008	06/28/02	1D	AC
132540		19953 SAN RAMON VALLEY BLVD	WALNUT PROCESSING SHED #3	SAN RAMON	M		HIST.RES.	NPS-02000677-0016	06/28/02	1D	AC
132531		19953 SAN RAMON VALLEY BLVD	PERGOLA	SAN RAMON	M	1938	HIST.RES.	NPS-02000677-0002	06/28/02	1D	AC
132534		19953 SAN RAMON VALLEY BLVD	MEAT LOCKER	SAN RAMON	M		HIST.RES.	NPS-02000677-0006	06/28/02	1D	AC
132536		19953 SAN RAMON VALLEY BLVD	CARPORT	SAN RAMON	M		HIST.RES.	NPS-02000677-0005	06/28/02	6X	
132545		19953 SAN RAMON VALLEY BLVD	FUEL SHED	SAN RAMON	M		HIST.RES.	NPS-02000677-0011	06/28/02	1D	AC
132538		19953 SAN RAMON VALLEY BLVD	WALNUT PROCESSING SHED #1	SAN RAMON	M		HIST.RES.	NPS-02000677-0014	06/28/02	1D	AC
132544		19953 SAN RAMON VALLEY BLVD	MACHINE SHOP	SAN RAMON	M		HIST.RES.	NPS-02000677-0009	06/28/02	1D	AC
132543		19953 SAN RAMON VALLEY BLVD	GRANARY	SAN RAMON	M		HIST.RES.	NPS-02000677-0010	06/28/02	1D	AC
132535		19953 SAN RAMON VALLEY BLVD	GLASS TANK HOUSE	SAN RAMON	M		HIST.RES.	NPS-02000677-0021	06/28/02	1D	AC
132549		19953 SAN RAMON VALLEY BLVD	WOMEN'S OUTHOUSE	SAN RAMON	M		HIST.RES.	NPS-02000677-0018	06/28/02	1D	AC
128072	07-000340	19953 SAN RAMON VALLEY BLVD	FOREST HOME FARMS	SAN RAMON	M	1850	HIST.RES.	NPS-02000677-9999	06/28/02	1S	AC
							NAT.REG.	07-0041	08/13/01	3S	AC
132539		19953 SAN RAMON VALLEY BLVD	WALNUT PROCESSING SHED #2	SAN RAMON	M		HIST.RES.	NPS-02000677-0015	06/28/02	1D	AC
174089			SAN CARLOS BRIDGE	WALNUT CREEK	M	1960	PROJ.REVW.	BUR081001A	10/16/08	6Y	
065080	07-001218	1500 BANCROFT RD	BANCROFT RANCH PROPERTY	WALNUT CREEK	U		HIST.RES.	DOE-07-87-0001-0000	02/17/87	6Y	
							PROJ.REVW.	FHWA860908A	02/17/87	6Y	
010680	07-001140	1500 BANCROFT RD	BANCROFT RESIDENCE	WALNUT CREEK	P	1922	HIST.SURV.	4596-0003-0000	11/14/88	7N	
							NAT.REG.	07-0001	11/14/88	7J	
010681	07-001141	30 BRUBAKER DR	HERITAGE TREE, BRUBAKER RESIDENCE	WALNUT CREEK	P		HIST.SURV.	4596-0004-0000		5S2	
010682	07-001142	CARMEL DR	WALNUT CREEK WOMEN'S CLUB	WALNUT CREEK	P		HIST.SURV.	4596-0005-0000		7R	
154815		1800 CARMEL DR	WALNUT CREEK ARMORY	WALNUT CREEK	S	1955	PROJ.REVW.	USA030317K	02/26/03	6Y	
010678	07-001138	1035 CASTLEROCK RD	BORGES RANCH/OLD BORGES RANCH	WALNUT CREEK	C	1901	ST.FND.PRG	619.0-HP-88-07-004	12/14/88	3	
							ST.FND.PRG	619.0-84-HP-07-004	12/03/84	3	
							HIST.RES.	NPS-81000147-0000	07/07/81	1S	
							HIST.SURV.	4596-0001-0000	01/01/81	1S	
010699	07-001159	CIVIC PARK DR N	CIVIC PARK BRIDGE	WALNUT CREEK	U		HIST.SURV.	4596-0023-0000	01/01/84	2S2	
							PROJ.REVW.	65000714	06/07/84	2S	

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS	NAMES	CITY.NAME	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
							HIST.RES.	SPHI-CCO-008	10/04/89	7L	
							ST.PT.INT.	07-0010	10/04/89	7L	
							NAT.REG.	07-0007	10/04/89	7W	
183124		811 SAN RAMON BLVD		DANVILLE	P	1948	PROJ.REVW.	FCC100419C	05/30/10	6Y	
010088	07-000982	SAN RAMON VALLEY BLVD	CHARLES GOOLD HOME, DEARDORFF HOME	DANVILLE	P	1880	HIST.SURV.	4526-0012-0000		5S2	
010092	07-000986	BLACKHAWK RD	BLACKHAWK RANCH QUARRY	DIABLO	P		HIST.SURV.	4528-0004-0000		5S2	
010089	07-000983	SUMMIT RD	MONTE DEL DIABLO / MOUNT DIABLO	DIABLO	S		HIST.SURV.	4528-0001-0000	05/21/91	3S	
							HIST.RES.	SHL-0905-0000	12/07/76	1CL	
010090	07-000984	SUMMIT RD	MOUNT DIABLO OBSERVATION TOWER	DIABLO	S	1941	HIST.SURV.	4528-0002-0000		7N	
010091	07-000985	SUMMIT RD	MOUNTAIN HOUSE SITE	DIABLO	S	1873	HIST.SURV.	4528-0003-0000		5S2	
010093	07-000987	ARLINGTON BLVD	JOAQUIN MURIETA ROCK SITE	EL CERRITO	P		HIST.SURV.	4530-0001-0000		5S2	
010107	07-001001	1101 ARLINGTON BLVD	GEORGE FRIEND ESTATE	EL CERRITO	P		HIST.SURV.	4530-0015-0000		7R	
096096	07-001828	1520 ARLINGTON BLVD	EL CERRITO FIRE STATION #2	EL CERRITO	M	1934	HIST.RES.	DSA-07-SPS-3273	05/17/95	6J	C
150502		5804 AVILA AVE		EL CERRITO		1954	HIST.RES.	DOE-07-04-0018-0000	09/09/04	6Y	
							PROJ.REVW.	HUD040811A	09/09/04	6Y	
010094	07-000988	801 BATES AVE	GILL ESTATE	EL CERRITO	P	1920	HIST.SURV.	4530-0002-0000		7N	
010095	07-000989	5810 CHARLES AVE	DOWNER HOUSE	EL CERRITO	P		HIST.SURV.	4530-0003-0000		7R	
074333	07-001362	5815 CUTTING BLVD	SAVE DEPARTMENT STORE	EL CERRITO	U	1942	HIST.RES.	DOE-07-92-0001-0000	01/22/92	6Y	
							PROJ.REVW.	FHWA911216A	01/22/92	6Y	
185588		6630 CUTTING BLVD		EL CERRITO	P		PROJ.REVW.	HUD100601E	06/25/10	6Y	
163283		7311 DONAL AVE		EL CERRITO	P	1948	PROJ.REVW.	HUD060928A	09/29/06	6Y	
171852		2302 EDITH ST		EL CERRITO			PROJ.REVW.	HUD080527A	06/13/08	6Y	
010096	07-000990	1 EL CERRITO PLAZA	VICTOR CASTRO ADOBE; VICTOR CASTRO	EL CERRITO	P	1839	HIST.SURV.	4530-0004-0000		5S2	
							HIST.RES.	SHL-0356-0000	10/09/39	7L	
132280		1314 EVERETT ST		EL CERRITO	P	1951	HIST.RES.	DOE-07-02-0026-0000	07/18/02	6Y	
							PROJ.REVW.	HUD020717B	07/18/02	6Y	
010097	07-000991	6317 FAIRMONT AVE	LEE HOUSE	EL CERRITO	P	1924	HIST.SURV.	4530-0005-0000		7R	
010098	07-000992	7209 FAIRMONT AVE	CURTIN HOUSE	EL CERRITO	P	1910	HIST.SURV.	4530-0006-0000		3S	
010099	07-000993	ISABEL ST	POINT ISABEL	EL CERRITO	C		HIST.SURV.	4530-0007-0000		5S2	
010108	07-001002	609 KEARNEY ST	ALLINIO HOME	EL CERRITO	P	1908	HIST.SURV.	4530-0016-0000		7R	
136074		825 KEARNEY ST		EL CERRITO	P	1945	HIST.RES.	DOE-07-03-0010-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216L	01/06/03	6Y	
010100	07-000994	1710 LIBERTY ST	BONINNI HOUSE	EL CERRITO	P	1907	HIST.SURV.	4530-0008-0000		7R	
010101	07-000995	1332 NAVELLIER ST	NAVELLIER HOME	EL CERRITO	P	1897	HIST.RES.	SPHI-CCO-011	02/09/96	7L	
							ST.PT.INT.	07-0028		7L	
							HIST.SURV.	4530-0009-0000		7R	
070053	07-001296	557 NORVELL ST		EL CERRITO	U	1930	PROJ.REVW.	HUD910131D	03/07/91	6Y	
135842		754 NORVELL ST		EL CERRITO	P	1940	HIST.RES.	DOE-07-02-0074-0000	12/16/02	6Y	
							PROJ.REVW.	HUD021203C	12/16/02	6Y	
010102	07-000996	10057 SAN PABLO AVE	PASTIME BUILDING	EL CERRITO	P		HIST.SURV.	4530-0010-0000		7R	
010103	07-000997	10086 SAN PABLO AVE	510 034 022, KIEFERT BUILDING	EL CERRITO	P		HIST.SURV.	4530-0011-0000		7R	
010104	07-000998	10102 SAN PABLO AVE	IT CLUB	EL CERRITO	P		HIST.SURV.	4530-0012-0000		7R	
010109	07-001003	10116 SAN PABLO AVE	CONCRETE HOUSE	EL CERRITO	P		HIST.SURV.	4530-0017-0000		7R	
010105	07-000999	11337 SAN PABLO AVE	CISI DRY GOODS STORE	EL CERRITO	P	1926	HIST.SURV.	4530-0013-0000		7R	
010106	07-001000	11440 SAN PABLO AVE	SOLDAVINI HOME	EL CERRITO	P	1912	HIST.SURV.	4530-0014-0000		7R	
074334	07-001363	11915 SAN PABLO AVE	BERRY HOUSE	EL CERRITO	U	1914	HIST.RES.	DOE-07-92-0002-0000	01/22/92	6Y	
							PROJ.REVW.	FHWA911216A	01/22/92	6Y	
070052	07-001295	2617 SONOMA AVE		EL CERRITO	U	1932	PROJ.REVW.	HUD910131C	03/07/91	6Y	
152548		6830 STOCKTON AVE	EL CERRITO UNITED METHODIST CHURCH	EL CERRITO	P	1927	HIST.RES.	DOE-07-05-0001-0000	03/05/05	6Y	
							PROJ.REVW.	FCC041228B	03/05/05	6Y	
132460		854 ALLVIEW AVE		EL SOBRANTE	P	1942	HIST.RES.	DOE-07-02-0002-0000	07/19/02	6Y	
							PROJ.REVW.	HUD020618G	07/19/02	6Y	
131294		994 ALLVIEW AVE		EL SOBRANTE	P	1949	HIST.RES.	DOE-07-02-0013-0000	04/24/02	6Y	

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS............	NAMES..............................	CITY.NAME........	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
							PROJ.REVW.	HUD020417E	04/24/02	6Y	
147140		4653 CANYON RD		EL SOBRANTE	P	1950	HIST.RES.	DOE-07-04-0007-0000	03/01/04	6Y	
							PROJ.REVW.	HUD040223C	03/01/04	6Y	
165977		5530 CIRCLE DR		EL SOBRANTE	P	1964	PROJ.REVW.	HUD070419D	04/25/07	6Y	
131191		3957 COLINA RD		EL SOBRANTE	P		HIST.RES.	DOE-07-02-0007-0000	04/30/02	6Y	
							PROJ.REVW.	HUD020417H	04/30/02	6Y	
152780		4526 ELMWOOD RD		EL SOBRANTE	P	1949	HIST.RES.	DOE-07-05-0002-0000	02/04/05	6Y	
							PROJ.REVW.	HUD050127A	02/04/05	6Y	
176961		4638 HILLTOP DR		EL SOBRANTE	P	1952	PROJ.REVW.	HUD090928J	10/23/09	6Y	
090697	07-001775	KENNEDY GROVE PARK	CALIFORNIA AND NEVADA RAILROAD	EL SOBRANTE	D		HIST.RES.	SPHI-CCO-004	05/19/71	7L	
132188		3974 LA COLINA RD		EL SOBRANTE	P	1946	HIST.RES.	DOE-07-02-0022-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702J	07/10/02	6Y	
162864		3905 SAN PABLO DAM RD		EL SOBRANTE	P	1955	PROJ.REVW.	HUD060814J	08/16/06	6Y	
144855		4736 SAN PABLO DAM RD		EL SOBRANTE	P	1941	HIST.RES.	DOE-07-03-0038-0000	11/18/03	6Y	
							PROJ.REVW.	HUD031022A	11/18/03	6Y	
153969		4139 SANTA RITA RD		EL SOBRANTE	P	1939	PROJ.REVW.	HUD050429A	05/19/05	6Y	
144857		4056 ST JAMES DR		EL SOBRANTE	P	1955	HIST.RES.	DOE-07-03-0040-0000	11/26/03	6Y	
							PROJ.REVW.	HUD031110A	11/26/03	6Y	
155126		435 VALLEY VIEW DR		EL SOBRANTE	P	1949	PROJ.REVW.	FCC050614B	07/07/05	6Y	
115891	07-002064		WINDMILL	HERCULES	P		HIST.RES.	DOE-07-97-0007-0000	01/17/97	6Y	
							PROJ.REVW.	FHWA961211A	01/17/97	6Y	
091636	07-001785	7 BAY ST	7 BAY ST	HERCULES	P		HIST.SURV.	4547-0001-0009	08/22/80	1D	
010220	07-001005	HERCULES AVE	ELLERHORST HOME	HERCULES	P	1860	HIST.SURV.	4547-0002-0000		3S	
091662	07-001803	54 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0028	08/22/80	1D	
091663	07-001804	56 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0029	08/22/80	1D	
091670	07-001811	135 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0036	08/22/80	1D	
091671	07-001812	160 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0037	08/22/80	1D	
091627	07-001777	8100 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0001	08/22/80	1D	
091628	07-001778	8101 KINGS AVE	LABORATORY	HERCULES	P		HIST.SURV.	4547-0001-0002	08/22/80	1D	
091630	07-001779	8103 KINGS AVE	HERCULES CLUB HOUSE	HERCULES	U		HIST.SURV.	4547-0001-0003	08/22/80	1D	
091631	07-001780	8111 KINGS AVE	GUARD HOUSE	HERCULES	F		HIST.SURV.	4547-0001-0004	08/22/80	1D	
091632	07-001781	8118 KINGS AVE	OFFICE ANNEX	HERCULES	M		HIST.SURV.	4547-0001-0005	08/22/80	1D	
091633	07-001782	9302 LOW LEVEL PLANT RD	STORE / SHED	HERCULES	U		HIST.SURV.	4547-0001-0006	08/22/80	1D	
091634	07-001783	9701 LOW LEVEL PLANT RD	STORE / SHED	HERCULES	U		HIST.SURV.	4547-0001-0007	08/22/80	1D	
091654	07-001798	34 PARK ST	34 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0022	08/22/80	1D	
091657	07-001799	37 PARK ST	37 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0023	08/22/80	1D	
091658	07-001800	38 PARK ST	38 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0024	08/22/80	1D	
091659	07-001801	39 PARK ST	39 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0025	08/22/80	1D	
091660	07-001802	47 PARK ST	47 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0026	08/22/80	1D	
091661	07-002541	48 PARK ST	48 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0039	08/22/80	1D	
091635	07-001784	4 PINOLE ST	4 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0008	08/22/80	1D	
091638	07-001786	10 PINOLE ST	10 PINOLE ST -	HERCULES	P		HIST.SURV.	4547-0001-0010	08/22/80	1D	
091639	07-001787	12 PINOLE ST	12 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0011	08/22/80	1D	
091644	07-001788	16 PINOLE ST	16 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0012	08/22/80	1D	
091645	07-001789	17 PINOLE ST	17 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0013	08/22/80	1D	
091646	07-001790	18 PINOLE ST	18 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0014	08/22/80	1D	
091665	07-001806	69 RAILROAD AVE	69 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0031	08/22/80	1D	
091666	07-001807	102 RAILROAD AVE	102 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0032	08/22/80	1D	
091667	07-001808	129 RAILROAD AVE	129 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0033	08/22/80	1D	
091668	07-001809	132 RAILROAD AVE	132 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0034	08/22/80	1D	
091669	07-001810	133 RAILROAD AVE	133 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0035	08/22/80	1D	
010219	07-001004	SANTA FE AVE	HERCULES VILLAGE	HERCULES	FSP	1890	ST.FND.PRG	619.0-84-HP-07-003	12/31/84	3	
							TAX.CERT.	537.9-07-0004	06/18/84	2S3	
							HIST.RES.	NPS-80007999-9999	08/22/80	1S	A

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Appendix D

Restoration Planting Plan

Via Verdi Slope Stabilization Project

Conceptual Restoration Planting Plan for Rheem Creek Mitigation Area

Date:	6/10/19	Project Number:	568.41.55
To:	Yader Bermudez, Engineering and CIP Director		
From:	Mack Casterman		
Subject:	Conceptual Restoration Planting Plan for Rheem Creek Mitigation Site		

Dear Mr. Bermudez,

This technical memorandum (tech memo) presents a conceptual restoration planting plan for the proposed Rheem Creek mitigation site for the Via Verdi Slope Stabilization Project.

The tech memo was prepared consistent with Task 12 of NCE's scope of work dated September 20, 2018.

The Rheem Creek mitigation site is an 800 foot section of Rheem Creek fronting the Contra Costa College parking lot and college facilities near Mills Avenue and Shane Drive (**Figure 1**). The site was visited on November 13 in 2018 and April 17 in 2019. During the visits, tree surveys were completed and trees with diameter at breast-height (DBH) of 4 inches or greater were identified and mapped. Vegetation community types were classified and every vegetation species observed within the project area was recorded. The results of the site visits are detailed in the *Rheem Creek Mitigation Site Technical Memo* submitted to the city as part of this effort.

Existing Habitat Within Project Area

The habitat within the Rheem Creek mitigation site is characterized by a non-native tree overstory including blackwood acacia (*Acacia melanoxylon*), privet (*Ligustrum sp.*), eucalyptus (*Eucalyptus* globulus) and wild plum (*Prunus cerasifera*). The understory is dominated by English ivy (*Hedera helix*), non-native annual grasses and Himalayan blackberry (*Rubus armeniacus*) with a large, approximately 60 foot by 20 foot patch of giant reed (*Arundo donax*) in the southern half of the proposed mitigation site. Rheem creek passes through the center of the site.

Non-Native Plant Treatment

Non-native plant treatment shall target English ivy (*Hedera helix*), giant reed (*Arundo donax*) and Himalayan blackberry (*Rubus armeniacus*). These species are

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all rated "High" risk invasive species in California by the California Invasive Plant Council.

Non-native trees within the mitigation area, with the exception of the mature eucalyptus in the northern half of the site, shall be completely removed. This may include the stump and root ball of the tree.

Tree Protection for Native trees

Native trees with DBH of 4 inches or greater shall be preserved in the final restoration design. These trees will help stabilize soils and will provide some shade cover for seedling plants that will be planted during revegetation activities.

At the Rheem Creek mitigation site, 7 native trees were identified and 63 non-native trees were identified (**Table 1**). Of the native trees recorded within the project area, 6 are black walnut (*Juglans hindsii*) (ID Numbers 137, 152, 154, 155, 156, and 175 in **Figure 2**) and the other is coast live oak (*Quercus agrifolia*) (ID Number 139 in **Figure 2**).

To ensure that the established native trees are not damaged during revegetation activities, the following actions shall be taken:

1) Tree protection best management practices shall be utilized for native trees including batter boards around tree trunks and/or protective fencing around tree driplines.
2) Construction materials, debris, and stockpiles shall not be stored within the drip line or protective fencing area under any tree.
3) Vehicles shall not be parked under any tree within the drip line or protective fencing area.

Table 1. Rheem Creek Tree Information – Note: Tree ID numbers correspond with Figure 2

ID #	DBH (inch)	Species	Notes	Native: Y/N
133	6	Acacia		N
134	6	Acacia		N
135	6	Acacia		N
136	6	Acacia		N
137	30	Black Walnut	2 Trunk	Y

Table 1. Rheem Creek Tree Information – Note: Tree ID numbers correspond with Figure 2

ID #	DBH (inch)	Species	Notes	Native: Y/N
138	11	Acacia		N
139	15	Live Oak		Y
140	5	Acacia		N
141	8	Acacia		N
142	5	Acacia		N
143	5	Acacia	2 Trunk	N
144	10	Privet	3 Trunk	N
145	15	Privet	2 Trunk	N
146	10	Privet	Many Trunk	N
147	10	Privet		N
148	8	Wild Plum	Many Trunk	N
149	8	Wild Plum		N
150	10	Wild Plum	Many Trunk	N
151	9	Wild Plum	Many Trunk	N
152	8	Black Walnut		Y
153	4	Wild Plum		N
154	4	Black Walnut	2 Trunk	Y
155	5	Black Walnut	Many Trunk	Y
156	5	Black Walnut		Y
157	7	Acacia	2 Trunk	N
158	5	Acacia		N
159	4	Acacia		N

Table 1. Rheem Creek Tree Information – Note: Tree ID numbers correspond with Figure 2

ID #	DBH (inch)	Species	Notes	Native: Y/N
160	7	Wild Plum		N
161	15	Acacia		N
162	20	Wild Plum	Many Trunk	N
163	10	Acacia		N
164	10	Acacia	5 Trunk	N
165	6	Wild Plum	Many Trunk	N
166	6	Acacia		N
167	9	Privet		N
168	6	Acacia		N
169	6	Acacia		N
170	8	Ash	5 Trunk	N
171	9	Acacia		N
172	8	Privet		N
173	7	Privet		N
174	10	Willow	5 Trunk	N
175	8	Black Walnut		y
176	10	Ash	Many Trunk	N
177	6	Chinese tallow tree	DBH Estimated, tree inaccessible	N
178	8	Acacia		N
179	5	Acacia		N
180	7	Wild plum		N
181	10	Plum	multi trunk	N

Table 1. Rheem Creek Tree Information – Note: Tree ID numbers correspond with Figure 2

ID #	DBH (inch)	Species	Notes	Native: Y/N
182	5	Acacia		N
183	8	Acacia		N
184	9	Ash		N
185	5	Plum		N
186	8	Ash	multi trunk	N
187	48	Eucalyptus		N
188	37	Eucalyptus		N
189	36	Eucalyptus		N
190	40	Eucalyptus		N
191	46	Eucalyptus		N
192	24	Eucalyptus	multi trunk	N
193	12	Chinese tallow tree		N
194	12	Chinese tallow tree		N
195	6	Ash	multi trunk	N
196	8	Acacia	multi trunk	N
197	30	Eucalyptus		N
198	48	Eucalyptus		N
199	45	Eucalyptus		N
200	20	Eucalyptus		N
201	40	Eucalyptus		N
202	36	Eucalyptus		N

Restoration Planting Plan

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Soils left barren of vegetation due to work activities will be re-vegetated with native plants or seeded with a native seed palette based on locally sourced native seed that is known to provide effective ground cover. Any alterations in materials or methods from those specified in this document shall be subject to review and approval by the ENGINEER prior to their use. All required certificates and samples shall be submitted prior to performing revegetation treatments. The revegetation work shall consist of all site preparation associated with the revegetation treatments, and shall include site preparation, seeding, application of mulch, and temporary irrigation.

B. Genetic material for all mitigation plantings shall be collected from the project region, preferably within 50 miles of the project location, although seeds and genetic material may have been cultivated outside that radius. Seed will be supplied on a basis of Pure Live Seed (PLS), and not contain more than one percent (1%) of weed seed.

1.2 SUBMITTALS

A. Unless directed otherwise by the ENGINEER, CONTRACTOR shall submit to the ENGINEER proof that orders for all materials (seed, mulch) have been received and accepted by the supplier(s). The statement(s) shall include product specifications and quantity of product(s) to be delivered and the estimated date(s) of delivery. Submit seed labels a minimum of twenty (20) working days prior to application for approval and acceptance. Labels shall show seed vendor's certification for required seed mixtures and all requirements listed in **Section 2.2**. Any proposed substitutes for unavailable materials shall be included in this submittal for acceptance or rejection by the ENGINEER. Submit the following:

1. Seed mix labels with required certifications
2. Mulch material samples
3. Fertilizer (if required)
4. Compost soil amendment
5. Tackifier binder material
6. Tackifier mulch material
7. Erosion control blankets
8. Irrigation system components

1.3 INSPECTIONS

A. The CONTRACTOR shall contact the ENGINEER seventy-two (72) hours prior to beginning any revegetation work to arrange for required inspections.

1.4 APPLICATION PERIOD

A. Seed will be applied prior to the winter rainy season (prior to December

1).

B. Grass and herb plugs, and any tree seedlings (if used) should be installed during the start of the wet season from mid-November through mid-January.

Part 2 – PRODUCTS

2.1 Compost

A. Compost shall be sourced locally (within 50 miles of project site). Compost should be ordered from the supplier at least two (2) months in advance.

2.2 SEED MIX/ PLANTING PALLETTE

A. The seed mix may include seed, dye, fertilizer, mulch, and a synthetic binder.

B. Mulch does not need to be added to the seed mix if an erosion control blanket will be installed on top of the seed mix area.

C. Seed shall be of a quality which has a Pure Live Seed (PLS) as specified. Seed shall be ordered pre-mixed and be certified weed-free. Seed shall come from local sources whenever possible. Any changes to the seed mix described in the tables above must be approved in writing by the ENGINEER.

D. Seed Mix:

Table 1: Seed Mix

Species (Botanical Name)	Species (Common Name)	PLS* (lb/acre)
Bromus carinatus	Brome, California	5
Elymus glaucus	Wildrye, Blue	5
Lupinus latifolius	Broad leaf lupine	1
Elymus triticoides	Beardless wild rye	5
Danthonia californica	*California oatgrass*	5
Hordeum brachyantherum	Meadow Barley	3
	Total PLS lb/acre Rate	**24**

*PLS is "pure live seed" and represents the amount of seed that is expected to grow. PLS is calculated by determining the germination percentage and the purity of the seed.

E. Trees and shrubs (listed in Section F, G, and H below) shall be installed and supplementary irrigation will be provided to ensure plant establishment and survival during the summer dry season.

F. Trees and Shrubs (Upland)

1. Coast Live Oak: *Quercus Agrifolia*
2. Juglans hindsii: Northern California black walnut
3. Spreading gooseberry: *Ribes divaricatum*
4. Narrow leaf milkweed: *Asclepias fascicularis*

G. Trees and Shrubs (Transition Zone)

1. Boxelder: *Acer negrundo*
2. California buckeye: *Aesculus californica*
3. Elderberry: *Sambucus nigra*
4. California blackberry: *Rubus ursinus*

H. Trees and Shrubs (Edge of Bank)

1. Red willow: *Salix laevigata*

2.3 Erosion Control Blanket (if applicable)

A. Erosion control blanket shall be non-woven and made of coconut fiber. Monofilament or woven plastic strands are not permitted.

B. Wooden stakes shall be used to secure blanket to the slope; stakes shall be 1” x 1” hardwood, eight to ten inches (8-10”) long. Stakes shall be installed at the frequency and spacing prescribed by the manufacturer for the given slope.

Part 3 – EXECUTION

3.1 REMOVAL OF INVASIVE SPECIES

A. Existing invasive species within and adjacent to the project area, including staging areas, shall be removed prior to any grading or revegetation (hydroseeding grass species or planting trees or shrubs). All removed materials shall be disposed off site according to state and local regulations.

B. English Ivy: English Ivy shall be cut down with vines and roots removed.

C. Giant reed: Giant reed shall be cut down and debris removed. Herbicide application to cut stumps for multiple seasons will likely be necessary for long-lasting control. Herbicides may be applied to giant reed by a cut-stump method or by foliar application. A cut-stump treatment with herbicide may be used from October through December. If herbicide treatment is not feasible, the plants and their root systems shall be excavated entirely and debris shall be immediately removed from the site. Follow up treatments will likely be necessary for multiple years to ensure that the plant does not re-sprout from remaining roots or from the existing seedbank in the soil.

D. Himalayan Blackberry: mechanically removed by hand pulling or with hand tools. Emerging small plants shall be hand pulled. Established plants shall be cut and rootballs grubbed out of soil or the cut stumps shall be treated with herbicide. Repeat treatment in multiple growing seasons will likely be necessary to ensure that Himalayan blackberry does not complete with species planted for revegetation.

E. Non-native trees and tree saplings shall be cut to a stump. Stumps shall be dug out and removed or will have a glyphosate herbicide applied to prevent re-sprouting.

F. All removed materials shall be disposed off site according to state and local regulations.

3.2 Site Preparation

A. Prior to the commencement of revegetation activities, invasive and non-native species will be cleared from the site.
B. All initial invasive plant removal will be conducted prior to the onset of winter rains in November.
C. Follow-up invasive plant treatment will occur the following spring to treat re-sprouted plants.

3.3 Soil Amendment Application

A. Compost shall be applied to a depth of four inches to top soil and approved fill material blend.

3.4 Surface Preparation

B. Prior to seed application, revegetation areas shall be lightly smoothed by rake in such a way that some surface roughness is attained. The result will be a soil surface that mimics natural conditions, with relief between three and six inches (3-6") over a twenty-four inch (24") distance. The ENGINEER will inspect and approve raked areas prior to any further revegetation activities.

3.5 HYDROSEEDING

A. Grass species shall be planted via hydroseeding.
B. Seeding shall be conducted at the beginning of the growing season (prior to December 1) unless otherwise approved by the ENGINEER.
C. Soils shall be moist to two inches unless otherwise approved by the ENGINEER.
D. Seed shall not be planted unless the seed mix (and soil preparation activities) have been approved by the ENGINEER

3.6 EROSION CONTROL BLANKET

A. If erosion potential and slope angle require it, erosion control blanket will be installed over the seed mix to provide slope stabilization.
B. The material of the erosion control blanket shall consist of a machine-produced 100% biodegradable mat with a 100% coconut fiber matrix.
C. Prior to erosion control blanket installation, any rocks or large soil clods which obstruct the erosion control blanket from making contact with the ground shall be removed.
D. Blankets shall be installed from the top to the bottom of the slope.
E. Blanket should overlap six to twelve inches with the adjacent blanket
F. Blanket shall be keyed in according to manufacturer instruction

3.7 PLANTING TREES AND SHRUBS

A. Trees and shrubs shall be planted and supplemental irrigation will be installed to ensure plant establishment and survival during the summer dry season.
B. A list of recommended planting materials is provided in **Section 2.2.**
C. Because site conditions may change over time, final planting densities shall be "field fit" during installation.

D. Plantings shall be from pots and shall be placed in a random pattern on the slope surface. Plantings should not be placed on a fixed grid. If an erosion control blanket is used, trees and shrubs shall be planted through holes in the erosion control blanket.

E. Following plant installation, pin flags will be installed to facilitate locating planted species for survivorship monitoring.

F. Minimum planting densities are recommended to be a minimum of 0.5 feet on-center to encourage rapid establishment of dense vegetative cover of native species to shade out competitive non-native species.

G. Shrub plug plantings shall be placed in groups of 3 to 7 on 0.5 to 1 foot centers.

H. Willow cuttings: Willow pole cuttings will be planted in groups of 1-3 on 1 foot centers.

I. Trees and shrubs shall be irrigated for at least the first two years.

3.8 Revegetation Maintenance and Success Criteria

A. Work under this item shall consist of maintaining all revegetation areas for two years following completion of construction so that there is no evidence of erosion, such as rills or gullies, or sheet erosion. This re-treatment may include re-application of seed, mulches, tackifiers, and erosion control blankets

B. The project must achieve 70% total plant cover before revegetation will be considered successful. Large bare sections, defined as two feet by three feet (2' x 3') or larger where vegetation establishment was unsuccessful will not be accepted even if 70% of plant cover is established across the entire project area.

C. Invasive weeds shall not represent more than 10% of the vegetation cover after the 1st year and not more than 10% after the 2nd year. If these criteria are not met, weeds must be removed to achieve these standards.

D. The maintenance period start date and end date will be as follows:
   1. Start Date = final payment
   2. End Date = 2 years after final payment

E. All of the revegetation will have final acceptance upon completion of all aspects of the associated work. The ENGINEER will not accept portions of the revegetation work nor will it "stagger" the start of the two year maintenance period.

F. A Maintenance Bond shall be supplied by the Contractor prior to acceptance of the revegetation work by the ENGINEER. The Maintenance Bond shall be in the amount of 25% of the total costs of all work associated with this section and shall remain in force for a length of two years from the date of final payment.

Attachments:
Figure 1: Rheem Creek Project Area
Figure 2: Tree Survey Results, Rheem Creek

Legend

Mitigation Area

Via Verdi Slope Stabilization Project

Rheem Creek Mitigation Area Map

N

1 in. = 100 ft.

0 50 100 ft.

FIGURE

1

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
Bing Aerial Basemap	568.41.55	mcasterman	2/13/19	4/23/19	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\AGP\Via Verdi - mcasterman.aprx

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Legend

Project Area

Tree Point

NCE

Richmond

Via Verdi Slope Stabilization Project

Tree Survey Results, Rheem Creek

N

1 in. = 100 ft.

0 60 120 ft.

FIGURE
2

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
Bing Aerial Basemap	568.41.55	mcasterman	11/29/18	4/23/19	dlemke

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Appendix E

Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

In Reply Refer to:
08ESMF00-
2019-F-0974

MAR 0 6 2019

Rick M. Bottoms, Ph.D.
Attn: Naomi Schowalter
Department of the Army
San Francisco District, Corps of Engineers
450 Golden Gate Avenue, 4th Floor, Suite 0134
San Francisco, California 94102-3406

Subject: Formal Consultation on the Via Verdi Slope Stabilization Project in the City of Richmond, Contra Costa County, California (U.S. Army Corps of Engineers [Corps] file number 2010-00171S)

Dear Dr. Bottoms:

This letter is in response to the Corps' December 17, 2018, request for initiation of formal consultation with the U.S. Fish and Wildlife Service (Service) on the proposed Via Verdi Slope Stabilization Project (proposed project) in the City of Richmond, Contra Costa County, California. Your request was received by the Service on January 28, 2019. At issue are the proposed project's effects on the federally threatened California red-legged frog (*Rana draytonii*) and threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*). Critical habitat has been designated for the California red-legged frog and Alameda whipsnake but does not occur within the action area for the proposed project. This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

The federal action on which we are consulting is the Corps' issuance of a permit to the City of Richmond (City) pursuant to Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. § 1344 *et seq.*) to stabilize an eroding slope along Via Verdi, a residential street adjacent to San Pablo Creek. Pursuant to 50 CFR 402.12(j), you submitted a biological assessment for our review and requested concurrence with the findings presented therein. These findings conclude that the proposed project may affect, and is likely to adversely affect the California red-legged frog and Alameda whipsnake.

In considering your request, we based our evaluation on the following: (1) your letter requesting formal consultation dated December 17, 2018; (2) the July 2018 *Biological Assessment Via Verdi Slope Stabilization Project* (NCE 2018); (3) electronic mail and conversations among the Corps and the Service; and (4) other information available to the Service.

The remainder of this document provides our biological opinion on the effects of the proposed project on the California red-legged frog and Alameda whipsnake.

Consultation History

January 28, 2019: The Service received from the Corps the request for formal consultation.

BIOLOGICAL OPINION

Description of the Action

The City will stabilize an eroding slope along Via Verdi in the City of Richmond, Contra Costa County, California. Via Verdi is a residential street just east of Interstate 80 that serves as the only access to 85 single family homes and 100 apartment units in a residential area known as the Sobrante Glen neighborhood. During the week of February 20th, 2017, a landslide occurred along the existing Via Verdi road alignment that damaged the road to the point of making vehicle access unsafe. Residents are currently accessing their homes via an approximately 650-foot-long emergency access road that was built in the days following the landslide. Along with slope stabilization, the proposed project will construct a new permanent access road to the Sobrante Glen neighborhood.

The proposed project includes the reconstruction of a 0.65-acre section of Via Verdi Road and the associated utilities that pass under the roadway. In order to stabilize the eroding slope, a section of San Pablo Creek south of the roadway reconstruction area will be culverted, and engineered fill will be installed above the culvert on an approximately 1.0-acre area to stabilize soils on the eroding hillside. Once the reconstruction of Via Verdi Road is complete, the temporary emergency access road will be demolished and all work areas including the approximately 1.5-acre staging pad will be revegetated. The total area of disturbance, including revegetation areas will be approximately 4.85 acres (Figure 1 and Table 1).

The proposed project includes the following construction activities (Table 1):

1. Reconstruct a 0.6-acre area of Via Verdi road and sidewalk and restore underground utilities;
2. Demolish a temporary emergency access road and revegetate a 1.2-acre area where roadway was installed;
3. Install a 340-linear foot culvert for a section of San Pablo Creek within the project area;
4. Cover culvert with 9,650 cubic yards of engineered fill to stabilize eroding slope, covering an approximately 1.5-acre area; and
5. Revegetate all work areas including a 1.5-acre staging area.

The proposed project is made up of two temporary work areas and a staging area. The culvert and fill work along San Pablo Creek is located in and adjacent to the San Pablo Creek Channel, and the Via Verdi roadway reconstruction is located in an adjacent area to the north in approximately the same location as the current Via Verdi Road footprint. Staging will occur on the approximately 1.5-acre graded and compacted pad on the west side of the site. Access to the construction site will occur via the existing Via Verdi roadway where it meets the project area. Construction is estimated to begin in April 2019 and end in October 2019.

Figure 1. Proposed project area and surrounding areas (copied from Figure 1 in NCE 2018).

Table 1. Work area dimensions (copied from Table 1 in NCE 2018).

Work Area	Work Plan	Approximate Total Acreage
Roadway Realignment	Reconstruct Via Verdi Roadway and sidewalk and restore underground utilities.	0.6
Demolish Emergency Access Road and Revegetate Hillside	Demolish temporary road used for emergency access and associated utilities and revegetate.	1.2
Install culvert for San Pablo Creek, and cover with engineered fill	Install new culvert for San Pablo Creek including new headwall at east end of project area. Cover culvert with engineered fill.	1.5
Staging Area	Staging will occur on the compacted and graded pad on the west side of the site. Area will be revegetated after project completion.	1.5
Revegetation Areas	All work areas besides new Via Verdi Road alignment and sidewalk will be revegetated at the end of construction.	4.5
Total	This number is the sum of the Revegetation area number and the Roadway Realignment number. Together they represent the total work area of the project.	5.1

Conservation Measures

The City and its contractors will implement the following conservation measures to avoid and minimize the effects of the proposed project on the California red-legged frog, Alameda whipsnake, and their habitats:

1. Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the Service has been received that the biologist(s) is qualified to conduct the work. The Service-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.

2. Before any construction activities begin, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the Alameda whipsnake and the California red-legged frog and their habitats, the importance of the Alameda whipsnake and the California red-legged frog and their respective habitats, the general measures that are being implemented to conserve the Alameda whipsnake and the California red-legged frog as they relate to the proposed project, the penalties for non-compliance, and the boundaries within which the proposed project may be accomplished. Brochures, books, and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers

will sign a form stating that they attended the program and understand all protection measures for the Alameda whipsnake and the California red-legged frog.

3. Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a Service-approved biologist to ensure that no Alameda whipsnakes or California red-legged frogs are present. This survey is not intended to be a protocol-level survey, but rather one designed to verify that no Alameda whipsnakes or California red-legged frogs are present within the construction area before construction activities begin. Two preconstruction surveys for the California red-legged frog and Alameda whipsnake will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any California red-legged frogs are found, the Service will be contacted and the Service-approved biologist will be allowed sufficient time to move any California red-legged frogs from the work site before work activities begin. If any Alameda whipsnakes are found, all activities will cease, the Service will be immediately contacted, and no other actions will be taken without authorization from the Service. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs. Any biologist involved with the surveying/handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.

4. Immediately after the second survey, construction fencing and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The Service-approved biologist will supervise the installation of the fencing around the work area. Access routes, turn-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.

5. A Service-approved biologist will monitor all ground disturbing construction activities. After ground disturbing project activities are complete, the Service-approved biologist will train an individual to act as the on-site biological monitor. The Service-approved biological monitor will have attended the training described in Conservation Measure 2 above. Both the Service-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the proposed project. The Service-approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly, and quarterly summaries will be placed on a file sharing website that is accessible to regulatory staff at any time.

6. A Service-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of Alameda whipsnakes or California red-legged frogs. These site inspections will take place each morning before the start of construction activities.

7. If any Alameda whipsnakes or California red-legged frogs are found, all activities will cease, the Service will be immediately contacted, and no other actions will be taken without authorization from the Service. Construction will be halted until all Alameda whipsnakes or California red-legged frogs depart on their own or are removed from the work area by the Service-approved biologist. Actions taken to relocate Alameda whipsnakes or California red-

legged frogs will be conducted under the guidance of the Service and California Department of Fish and Wildlife (CDFW). The Service-approved biologist may relocate any Alameda whipsnakes or California red-legged frogs that are in danger of immediate harm from project-related activities, to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The Service-approved biologist will monitor any California red-legged frogs or Alameda whipsnakes that have been relocated until it is determined that it is not imperiled by predators or other dangers.

8. Construction will take place during daylight hours only.

9. Prior to being brought on site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on site.

10. A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no Alameda whipsnakes, California red-legged frogs, or other amphibians and reptiles are taken at the pump.

11. Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.

12. Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for California red-legged frogs) (April 15 to October 15).

13. All areas disturbed as a result of project-related activities will be re-vegetated with native plant species only.

14. Erosion control and sediment detention devices (*e.g.*, well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water onsite. These devices will be placed at all locations where the likelihood of sediment input exists.

15. The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to insure that it is not becoming clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.

16. All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side-casting of material into any waterway.

17. During project activities, all trash that may attract predators will be properly contained, removed from the work site and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be

managed to minimize the provision of cover for Alameda whipsnakes and California red-legged frogs by removing all surface construction debris daily except that required for construction.

18. To mitigate for erosion impacts, best management practices (BMPs) for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.

19. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The Corps and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the Corps will ensure that the applicant will prepare a plan to allow 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.

20. The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project areas will be removed.

21. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in preconstruction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

22. Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that Alameda whipsnakes and California red-legged frogs do not become entangled in the mesh. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control.

23. To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fencing or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.

24. Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.

25. All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.

26. A post-construction survey will be conducted the night before the cofferdams are removed to make sure no Alameda whipsnakes or California red-legged frogs have occupied the temporary pool created upstream of the site. If any Alameda whipsnakes or California red-legged frogs are present, they will be captured by hand and removed upstream of the pond to prevent them being potentially stranded when the dams are removed during the daylight hours and the water levels drop.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." For the proposed project, the action area encompasses the 5.1-acre work area (Figure 1) including the roadway work area, slope stabilization work area, construction staging yard, and access routes.

Analytical Framework for the Jeopardy Determination

Section 7(a)(2) of the Act requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

The jeopardy analysis in this biological opinion considers the effects of the proposed federal action, and any cumulative effects, on the rangewide survival and recovery of the listed species. It relies on four components: (1) the *Status of the Species*, which describes the rangewide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the *Environmental Baseline*, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the species; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-federal activities in the action area on the species.

Status of the Species

California Red-Legged Frog

<u>Listing Status:</u> The California red-legged frog was listed as a threatened species on May 23, 1996 (Service 1996). Critical habitat was designated for this species on April 13, 2006 (Service 2006a), with revisions to the critical habitat designation published on March 17, 2010 (Service 2010). At that time, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer et al. 2010). A recovery plan was published for the California red-legged frog on September 12, 2002 (Service 2002a).

<u>Description</u>: The California red-legged frog is the largest native frog in the western United States (Wright and Wright 1949), ranging from 1.5 to 5.1 inches in length (Stebbins 2003). The abdomen and hind legs of adults are largely red, while the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins 2003); dorsolateral folds are prominent on the back. The California red-legged frog is sexually dimorphic; the females are larger than the males (Dodd 2013a, b). California red-legged frog tadpoles range from 0.6 inch to 3.1 inches in length and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

<u>Current Status and Distribution:</u> The historical range of the California red-legged frog extended from central Mendocino County and western Tehama County south in the California Coast Range to northern Baja California, Mexico, and in the Sierra Nevada/Cascade Ranges from Shasta County south to Madera County (Jennings and Hayes 1994). The species historically occurred from sea level

to elevations of about 5,200 feet in 46 counties; however, currently the taxon is extant in 238 streams or drainages within only 22 counties, representing a loss of 70 percent of its former range (Service 2002a). Isolated populations persist in several Sierra Nevada foothill locales and in Riverside County (Barry and Fellers 2013; Backlin et al. 2017; CDFW 2019; Gordon, R. and J. Bennett, pers. comm., 2017). The species is no longer considered extant in California's Central Valley due to significant declines caused by habitat modifications and exotic species (Fisher and Shaffer 1996). Currently, the California red-legged frog is widespread in the San Francisco Bay nine-county area (CDFW 2019). They are still locally abundant within the California coastal counties from Mendocino County to Los Angeles County and presumed extirpated in Orange and San Diego counties (CDFW 2019; Yang, D. and J. Martin, pers. comm., 2017; Gordon, R. and J. Bennett, pers. comm., 2017). Baja California represents the southernmost edge of the species' current range (Peralta-García et al. 2016).

Barry and Fellers (2013) conducted a comprehensive study to determine the current range of the California red-legged frog in the Sierra Nevada, concluding that it differs little from its historical range; however, the current Sierra Nevada populations appear to be small and tend to fluctuate. Since 1991, eleven California red-legged frog populations have been discovered or confirmed, including eight probable breeding populations (Barry and Fellers 2013; Mabe, J., pers. comm., 2017). Microsatellite and mitochondrial DNA analysis by Richmond et al. (2014) confirmed the Sierra Nevada populations of the California red-legged frog are genetically distinct from each other, as well as from other populations throughout the range of this species. The research concluded that the Sierra Nevada populations are persisting at low levels of genetic diversity and no contemporary gene flow across populations exist. On a larger geographic scale, range contraction has left a substantial gap between Sierra Nevada and Coast Range populations, similar to the gap separating the Southern California and Baja California populations (Richmond et al. 2014).

Habitat and Life History:

Habitat

The California red-legged frog generally breeds in still or slow-moving water associated with emergent vegetation, such as cattails, tules (hardstem bulrush), or overhanging willows (Storer 1925; Fellers 2005). Aquatic breeding habitat predominantly includes permanent water sources such as streams, marshes, and natural and manmade ponds in valley bottoms and foothills (Jennings and Hayes 1994; Bulger et al. 2003; Stebbins 2003). Since the 1850's, manmade ponds may actually supplement stream pool breeding habit and can be capable of supporting large populations of this species. Breeding sites may hold water only seasonally, but sufficient water must persist at the beginning of the breeding season and into late summer or early fall for tadpoles to successfully complete metamorphosis. Breeding habitat does not include deep lacustrine water habitat (e.g., deep lakes and reservoirs 50 acres or larger in size) (Service 2010). Within the coastal lagoon habitats, salinity is a significant factor on embryonic mortality or abnormalities (Jennings and Hayes 1990). Jennings and Hayes (1990) conducted laboratory studies and field observations concluding salinity levels above 4.5 parts per thousand detrimentally affected the California red-legged frog embryos. Aquatic breeding habitat does not need to be available every year, but it must be available at least once within the frog's lifespan for breeding to occur (Service 2010).

Non-breeding aquatic habitat consists of shallow (non-lacustrine) freshwater features not suitable as breeding habitat, such as seasonal streams, small seeps, springs, and ponds that dry too quickly to support breeding. Non-breeding aquatic and riparian habitat is essential for providing the space, food, and cover necessary to sustain the California red-legged frog. Riparian habitat consists of vegetation growing nearby, but not typically in, a body of water on which it depends, and usually extends from the bank of a pond or stream to the margins of the associated floodplain (Service 2010). Adult California red-legged frogs may avoid coastal habitat with salinity levels greater than 6.5 parts per thousand (Jennings and Hayes 1990).

Cover and refugia are important habitat characteristic preferences for the species (Halstead and Kleeman 2017). Refugia may include vegetation, organic debris, animal burrows, boulders, rocks, logjams, industrial debris, or any other object that provides cover. Agricultural features such as watering troughs, spring boxes, abandoned sheds, or haystacks may also be utilized by the species. Incised stream channels with portions narrower and depths greater than 18 inches may also provide important summer sheltering habitat. During periods of high water flow, California red-legged frogs are rarely observed; individuals may seek refuge from high flows in pockets or small mammal burrows beneath banks stabilized by shrubby riparian growth (Jennings and Hayes 1994). Accessibility to cover habitat is essential for the survival of California red-legged frogs within a watershed and can be a factor limiting frog population numbers and survival.

Breeding

The California red-legged frog typically breeds between November and April; however, breeding may occur later in the Sierra Nevada Range (Barry 2002). Females deposit their egg masses on emergent vegetation, floating on or near the surface of the water. The California red-legged frog is often a prolific breeder, laying eggs during or shortly after large rainfall events in late winter and early spring. Egg masses containing 300-4,000 eggs hatch after six to fourteen days (Storer 1925; Jennings and Hayes 1994; Fellers 2005). Historically, the California red-legged frog in the Sierra Nevada likely bred within stream pools, which tend to be small with limited forage, constraining the size and number of populations (Barry and Fellers 2013).

California red-legged frog tadpoles undergo metamorphosis three to seven months following hatching. Most males reach sexual maturity in two years, while it takes approximately three years for females (Jennings and Hayes 1985; Fellers 2005). Under favorable conditions, California red-legged frogs may live eight to ten years (Jennings et al. 1992). Of the various life stages, tadpoles likely experience the highest mortality rates; only one percent of each egg mass completes metamorphosis (Jennings et al. 1992).

Diet

The California red-legged frog has a variable diet that changes with each of its life history stages. The feeding habits of the early stages are likely similar to other ranids, whose tadpoles feed on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Fellers 2005). Hayes and Tennant (1985) found invertebrates to be the most common food items of adult California red-legged frogs collected in southern California; however, they speculated that this was opportunistic and varied based on prey availability. Vertebrates, such as Pacific tree frogs (*Hyla regilla*) and California mice (*Peromyscus californicus*), represented over half of the prey mass eaten by larger frogs, although invertebrates were the most numerous food items. Feeding typically occurs along the shoreline and on the surface of the water; juveniles appear to forage during both daytime and nighttime, whereas adults appear to feed at night (Hayes and Tennant 1985).

Movement

California red-legged frogs do not have a distinct breeding migration (Fellers 2005), rather they may move seasonally from non-breeding pools or refugia to breeding pools. Some individuals remain at breeding sites year-round while others disperse to neighboring water features or moist upland sites when breeding is complete and/or when breeding pools dry (Service 2002a; Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). Studies in the several San

Francisco Bay counties showed movements are typically along riparian corridors (Fellers and Kleeman 2007; Tatarian 2008). Although, some individuals, especially on rainy nights and in more mesic areas, travel without apparent regard to topography, vegetation type, or riparian corridors, and can move directly from one site to another through normally inhospitable habitats such as heavily grazed pastures or oak-grassland savannas (Bulger et al 2003).

California red-legged frogs show high site fidelity (Tatarian and Tatarian 2008) and typically do not move significant distances from breeding sites (Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). When traveling between aquatic sites, California red-legged frogs typically travel less than 0.31 miles (Fellers and Kleeman 2007; Tatarian and Tatarian 2008), although they have been documented to move more than two miles in Santa Cruz County (Bulger et al. 2003). Various studies have found that the frogs typically do not make terrestrial forays further than 200 feet from aquatic habitat (Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian and Tatarian 2008; Tatarian 2008). Upland movements are typically associated with precipitation events and usually last for one to four days (Tatarian 2008).

<u>Threats:</u> Factors associated with declining populations of the California red-legged frog throughout its range include degradation and loss of habitat through agriculture, urbanization, mining, overgrazing, recreation, timber harvesting, non-native species, impoundments, water diversions, erosion and siltation altering upland and aquatic habitat, degraded water quality, use of pesticides, and introduced predators (Service 2002a, 2010). Urbanization often leaves isolated habitat fragments and creates barriers to frog dispersal.

Non-native species pose a major threat to the recovery of California red-legged frogs. Several researchers have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish, signal crayfish, and several species of warm water fish including sunfish, goldfish, common carp, and mosquitofish (Moyle 1976; Barry 1992; Hunt 1993; Fisher and Shaffer 1996). The decline of the California red-legged frog due to these non-native species has been attributed to predation, competition, and reproduction interference (Twedt 1993; Bury and Whelan 1984; Storer 1933; Emlen 1977; Kruse and Francis 1977; Jennings and Hays 1990; Jennings 1993).

Chytridiomycosis, an infectious disease caused by the chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*), has been found to adversely affect amphibians globally (Davidson et al. 2003; Lips et al. 2006). While *Bd* prevalence in wild amphibian populations in California is unknown (Fellers et al. 2011), chytrid is expected to be widespread throughout much of the California red-legged frog's range. The chytrid fungus has been documented within the California red-legged frog populations at Point Reyes National Seashore, two properties in Santa Clara County, Yosemite National Park, Hughes Pond, Sailor Flat, Big Gun Diggings, and Spivey Pond (Padgett-Flohr and Hopkins 2010; Tatarian and Tatarian 2010; Fellers et al. 2011; Barry and Fellers 2013). However, no chytrid-related mortality has been reported in these populations, suggesting that California red-legged frogs are less vulnerable to the pathogenic effects of chytrid infection than other amphibian species (Tatarian and Tatarian 2010; Barry and Fellers 2013; Fellers et al. 2017). While chytrid infection may not directly lead to mortality in California red-legged frogs, Padgett-Flohr (2008) states that this infection may reduce overall fitness and could lead to long-term effects. Therefore, it is difficult to estimate the full extent and risk of chytridiomycosis to the California red-legged frog populations.

<u>Recovery Plan:</u> The Recovery Plan for the California red-legged frog identifies eight recovery units (Service 2002a). Based on various regional areas of the species' range, the establishment of these recovery units are essential to its survival and recovery. The goal of the recovery plan is to protect

the long-term viability of all extant populations within each recovery unit. Within each recovery unit, delineated core areas, designed to protect metapopulations, represent contiguous areas of moderate to high California red-legged frog densities. The management strategy identified within this Recovery Plan will allow for the recolonization of habitats within and adjacent to core areas naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of California red-legged frogs.

Alameda Whipsnake

For the most recent comprehensive assessment of the species' range-wide status, please refer to the Alameda Whipsnake 5-year Review (https://ecos.fws.gov/docs/five_year_review/doc3886.pdf, Service 2011). No change in the species' listing status was recommended in this 5-year review. Threats evaluated during that review and discussed in the final document have continued to act on the species since the September 28, 2011, 5-year review was finalized, with loss of habitat being the most significant effect. While there have been continued losses of Alameda whipsnake habitat throughout the various recovery units, including the Tilden-Briones unit (Unit 1) where the proposed project is located near, to date no project has proposed a level of effects for which the Service has issued a biological opinion of jeopardy for the species. The Service is in the process of finalizing its most current 5-year review for the species.

Environmental Baseline

The action area encompasses three distinct habitat types: ruderal/developed, riparian woodland, and annual grassland.

Ruderal and developed areas still exhibit the impacts of development – often characterized by pavement or heavily compacted soil. Plants are mostly non-native invasive with few native species present and are characterized by the ability to thrive in areas of frequent disturbance. Within the action area, ruderal vegetation is located on the west side of the project site where previous construction resulted in a graded and compacted pad approximately 2.0 acres in area.

Annual grassland areas are composed of mostly non-native grasses and weedy annual and perennial forbs. Some native grasses and forbs may be present in sparse areas where competition from non-natives is low. Annual grassland is present throughout the project area. In the area north of the temporary access road, annual grasses are growing through an erosion control blanket that was installed to control erosion during the rainy season from 2017-2018. An approximately 0.25-acre area of annual grassland on the south side of Via Verdi road has been planted with sapling oaks as part of a habitat restoration effort resulting from the 2012 culvert project.

Riparian woodland dominated by boxelder, red willow, California buckeye, and poison oak is present along the banks of San Pablo Creek.

Oak woodland is typically dominated by coast live oak. The shrub layer within the action area is composed of elderberry and poison oak. Also present in the understory are wild cucumber, Himalayan blackberry, and bigleaf periwinkle. Coast live oak woodland is present on the southeastern border of the project area along San Pablo Creek.

Coyote brush scrub is present in an isolated patch on a southeast facing slope within the project area. This plant community is dominated by poison oak with some coyote brush individuals scattered throughout. A stand of coyote brush scrub is present in the approximate center of the action area adjacent to the temporary access road.

California Red-legged Frog

There are three recorded observations of the California red-legged frog in the California Natural Diversity Database (CNDDB) within 5 miles of the action area (CNDDB occurrences 124, 754, and 1113; CDFW 2019). The nearest recorded observation of the California red-legged frog is in the area around San Pablo Dam, located 3.3 miles east (upstream) of the action area (CNDDB occurrence 1113; CDFW 2019). Based on personal communication with Bert Mulchaey from the East Bay Municipal Utility District and Steve Bobzien from the East Bay Regional Park District, California red-legged frog adults and California red-legged frog tadpoles have been observed at the following locations upstream of the action area: Appian and/or Wilkie Creeks, Castro Creek, and Kennedy Grove (NCE 2018).

The velocity of water flow with the San Pablo Creek channel combined with shaded conditions, a lack of emergent vegetation, and the likely presence of fish that could prey on California red-legged frog eggs make it unlikely that California red-legged frogs successfully breed within San Pablo Creek within the action area. However, California red-legged frogs may disperse along San Pablo Creek from occupied habitat upstream near San Pablo Dam. San Pablo Creek and the adjacent riparian and upland areas provide suitable foraging, sheltering, and dispersal habitat for the California red-legged frog. Therefore, the Service believes that the California red-legged frog is likely to occur within the action area.

The action area is located within the South and East San Francisco Bay recovery unit for the California red-legged frog (Service 2002a). The recovery status for this unit is high, with many existing populations and many areas of high habitat suitability. The action area does not occur within a core area for the California red-legged frog. The nearest core area for the California red-legged frog is the Jameson Canyon-Lower Napa River core area located across the Carquinez Strait about 9.3 miles northeast of the action area (Service 2002a). The nearest critical habitat unit for the California red-legged frog is the CCS-1 unit located about 4 miles to the east of the action area (Service 2010).

Alameda Whipsnake

The nearest recorded observation of the Alameda whipsnake in the CNDDB was recorded in 2006 near San Pablo Dam about 3.8 miles southeast (upstream) of the action area (CNDDB occurrence number 156, CDFW 2019). The next closest observation of the Alameda whipsnake is at Oursan Ridge about 5.5 miles east of the action area (CNDDB occurrence number 72, CDFW 2019). The action area predominantly occurs in open grasslands, closed canopy oak woodland, and urban/suburban areas. Habitat quality is low for Alameda whipsnake in the action area, consisting primarily of invasive black mustard, Italian thistle, radish, and European annual grasses with scattered stands of coyote brush. No burrows were observed in any of the surveyed areas. Several debris piles occur in the upland portions of the action area that provide suitable habitat for the Alameda whipsnake and its prey species. The only terrestrial vertebrate observed during the survey was an alligator lizard and was found underneath one of these debris piles.

The action area is bordered on three sides by paved roadways including a highway to the west (Figure 1). High quality Alameda whipsnake habitat consisting of areas with open or partially-open canopy scrub adjacent to grasslands is absent from the action area. The nearest high-quality core scrub habitat to the action area is located with designated critical habitat about 0.5 mile to the south (Figure 1). High quality basking sites and natural rock outcrops that provide habitat for Alameda whipsnake prey species are also absent, but debris piles in the action area provide alternative basking sites. The riparian corridor along San Pablo Creek provides a dispersal corridor for Alameda whipsnakes from occupied habitat upstream near San Pablo Dam, and the grasslands and riparian areas provide suitable dispersal and foraging habitat for the Alameda whipsnake. Therefore, the Service believes that Alameda whipsnakes are likely to disperse and forage within the action area.

Effects of the Action

California Red-legged Frog and Alameda Whipsnake

Habitat Disturbance

The proposed project will result in temporary disturbance of 5.1 acres of suitable California red-legged frog and Alameda whipsnake habitat during the April to October construction period. This will result in a temporary loss riparian and upland habitat for the California red-legged frog and foraging and dispersal habitat for the Alameda whipsnake. The disturbance of riparian and upland habitat will temporarily remove habitat the California red-legged frog and Alameda whipsnake utilize for foraging, sheltering, and dispersing. The City will restore all areas temporarily disturbed within the action area under a Service-approved revegetation and monitoring plan.

Riparian and stream foraging habitat in San Pablo Creek for the California red-legged frog and Alameda whipsnake could be degraded if the proposed project resulted in a spill of fuel or other hazardous materials. The City and its contractors will minimize the potential for the degradation of riparian and stream foraging habitat from a spill by implementing water quality BMPs, a Storm Water Pollution Prevention Plan, fueling equipment away from suitable aquatic habitat, implementing a spill prevention plan, and avoiding work during rainy periods.

Direct Effects to Individuals

The level of disturbance of individual California red-legged frogs and Alameda whipsnakes may vary depending on the type of equipment being used; different pieces of equipment have different noise levels and, thus, cause more or less disturbance. Noise and vibrations may result in displacement of California red-legged frogs and Alameda whipsnakes from protective cover and their territories. These disturbances are likely to disrupt normal behavior patterns of breeding, foraging, sheltering, and dispersal. Individual California red-legged frogs and Alameda whipsnakes that are displaced from suitable cover may be more susceptible to predation, and displaced California red-legged frogs may be more susceptible to desiccation. Individual California red-legged frogs and Alameda whipsnakes that are found during pre-activity surveys and relocated to suitable habitat outside of the action area may be subjected to physiological stress and greater risk of predation, or may undergo increased competition with California red-legged frogs and Alameda whipsnakes already present in the area to which they are relocated. California red-legged frogs could be exposed to amphibian diseases unless proper decontamination procedures are taken during handling any California red-legged frogs and working within aquatic habitat. California red-legged frogs and Alameda whipsnakes could be injured or killed if they were run over by construction-related vehicles or heavy equipment.

The City and its contractors will minimize the potential for injury and mortality of California red-legged frogs and Alameda whipsnakes during construction of the proposed project by: having a

Service-approved biologist supervise the work; providing training to all construction staff in the identification of the California red-legged frog and Alameda whipsnake and the implementation of the avoidance and minimization measures; stopping work if a California red-legged frog or Alameda whipsnakes is observed near the work area; relocating California red-legged frogs and Alameda whipsnakes from the work area; installing temporary wildlife exclusion fencing around all work and staging areas; avoiding work at dawn, dusk, and night and during rainy periods when the California red-legged frog is most likely to disperse through the work area; restricting work to the active period for the Alameda whipsnake (April – October) will avoid the potential for crushing any hibernating Alameda whipsnakes; and using existing access roads. All foods and food-related trash items will be enclosed in sealed trash containers and/or removed from the site at the end of each workday to prevent attracting predators to the work site.

Cumulative Effects

Cumulative effects include the effects of future state, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. During this consultation, the Service did not identify any future non-federal actions that are reasonably certain to occur in the action area of the proposed project.

Conclusion

After reviewing the current status of the California red-legged frog and Alameda whipsnake, the environmental baseline for the action area, the effects of the proposed Via Verdi Slope Stabilization Project, and the cumulative effects, it is the Service's biological opinion that the Via Verdi Slope Stabilization Project, as proposed, is not likely to jeopardize the continued existence of the California red-legged frog and Alameda whipsnake. The Service reached this conclusion because the project-related effects to the species, when added to the environmental baseline and analyzed in consideration of all potential cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of the species based on the following: (1) successful implementation of the conservation measures described in this biological opinion will minimize the adverse effects on individual California red-legged frogs and Alameda whipsnakes; (2) only 5.1 acre of foraging/dispersal habitat and no breeding habitat for the California red-legged frog and Alameda whipsnake would be temporarily disturbed; (3) all foraging/dispersal habitat will be restored within the action area under a Service-approved revegetation plan; and (4) no suitable habitat would be permanently removed.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by Service regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps or the City must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

Amount or Extent of Take

California Red-legged Frog

The Service anticipates incidental take of individual California red-legged frogs will be difficult to detect or quantify because of the variable, unknown size of any resident population over time, their elusive and cryptic behavior, and the difficulty of finding killed or injured animals. Due to the difficulty in quantifying the number of California red-legged frogs that will be taken as a result of the proposed project, the Service is quantifying take incidental to the proposed project as the following:

1. The harm and capture of all adult, sub-adult, and juvenile California red-legged frogs within the 5.1 acres of habitat temporarily disturbed during construction of the proposed project.

2. The injury or mortality of one (1) adult, sub-adult, or juvenile California red-legged frog.

Alameda Whipsnake

The Service anticipates that incidental take of the Alameda whipsnake will be difficult to detect for the following reasons: the cryptic nature and behavior of the species; losses may be masked by seasonal fluctuations in numbers or other causes. Due to the difficulty in quantifying the number of Alameda whipsnakes that will be taken as a result of the proposed project, the Service is quantifying take incidental to the proposed project as the following:

1. The harm and capture of all Alameda whipsnakes within the 5.1 acres of habitat temporarily disturbed during construction of the proposed project.

2. The injury or mortality of one (1) Alameda whipsnake.

Upon implementation of the following reasonable and prudent measures, incidental take of the California red-legged frog and Alameda whipsnake associated with the Via Verdi Slope Stabilization Project will become exempt from the prohibitions described in section 9 of the Act. No other forms of take are exempted under this opinion.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the California red-legged frog and Alameda whipsnake.

Reasonable and Prudent Measures

All necessary and appropriate measures to avoid or minimize effects on the California red-legged frog and Alameda whipsnake resulting from implementation of this project have been incorporated into the project's proposed conservation measures. Therefore, the Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of the California red-legged frog and Alameda whipsnake:

1. All conservation measures, as described in the biological assessment and restated here in the Description of the Action section of this biological opinion, shall be fully implemented and adhered to. Further, this reasonable and prudent measure shall be supplemented by the terms and conditions below.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. The Corps shall include full implementation and adherence to the conservation measures as a condition of any permit or contract issued for the project.

Monitoring

a. For those components of the action that will result in habitat degradation or modification whereby incidental take in the form of harm is anticipated, the Corps or the City shall provide a precise accounting of the total acreage of habitat impacted to the Service after completion of construction.

b. The Corps or the City shall immediately contact the Service's Sacramento Fish and Wildlife Office (SFWO) at (916) 414-6623 to report direct encounters between listed species and project workers and their equipment whereby incidental take in the form of harassment, harm, injury, or death occurs. If the encounter occurs after normal working hours, the Corps or the City shall contact the SFWO at the earliest possible opportunity the next working day. When injured or killed individuals of the listed species are found, the Corps or the City shall follow the steps outlined in the Salvage and Disposition of Individuals section below.

c. For those components of the action that will require the capture and relocation of any listed species, the Corps or the City shall immediately contact the SFWO at (916) 414-6623 to report the action. If capture and relocation need to occur after normal working hours, the Corps or the City shall contact the SFWO at the earliest possible opportunity the next working day.

d. A post-project completion report shall be provided to the Service documenting with photographs the successful restoration of all areas temporarily disturbed within the action area.

Salvage and Disposition of Individuals:

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact person is the Coast/Bay Division Chief of the Endangered Species Program at the SFWO at (916) 414-6623.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. The Corps should include in their permits the control of bullfrogs, non-native tiger salamanders, and other invasive species and predators within suitable breeding habitat for the California red-legged frog.
2. Control feral cats within suitable Alameda whipsnake habitat.
3. Control eucalyptus and French broom encroaching into core scrub habitat for the Alameda whipsnake.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION—CLOSING STATEMENT

This concludes formal consultation on the Via Verdi Slope Stabilization Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required and shall be requested by the federal agency or by the Service where discretionary federal agency involvement or control over the action has been retained or is authorized by law and:

(a) If the amount or extent of taking specified in the incidental take statement is exceeded;
(b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
(c) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or
(d) If a new species is listed or critical habitat designated that may be affected by the identified action.

If you have any questions regarding this biological opinion, please contact Joseph Terry, Senior Biologist (joseph_terry@fws.gov) or Ryan Olah, Coast/Bay Division Chief (ryan_olah@fws.gov), at the letterhead address or at (916) 943-6721 or (916) 414-6623.

Sincerely,

for

Jennifer M. Norris, Ph.D.
Field Supervisor

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Appendix F

EMISSIONS CALCULATIONS

The maximum pounds per day in row 11 is summed over overlapping phases, but the maximum tons per phase in row 34 is not summed over overlapping phases.

Road Construction Emissions Model, Version 9.0.0

Daily Emission Estimates for -> Via Verdi Slope Stabilization Project

Project Phases (Pounds)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	Total PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	Total PM2.5 (lbs/day)	Exhaust PM2.5 (lbs/day)	Fugitive Dust PM2.5 (lbs/day)	SOx (lbs/day)	CO2 (lbs/day)	CH4 (lbs/day)	N2O (lbs/day)	CO2e (lbs/day)
Grubbing/Land Clearing	1.28	10.23	14.41	30.60	0.60	30.00	6.77	0.53	6.24	0.02	2,383.44	0.58	0.09	2,423.86
Grading/Excavation	6.06	46.50	69.46	32.97	2.97	30.00	8.95	2.71	6.24	0.10	9,294.26	2.86	0.13	9,404.60
Drainage/Utilities/Sub-Grade	3.63	30.24	37.31	31.79	1.79	30.00	7.90	1.66	6.24	0.06	5,655.59	1.20	0.10	5,715.03
Paving	1.80	17.94	18.13	1.03	1.03	0.00	0.92	0.92	0.00	0.03	3,164.57	0.75	0.12	3,217.78
Maximum (pounds/day)	7.34	56.73	83.87	63.57	3.57	60.00	15.73	3.25	12.48	0.12	11,677.71	3.44	0.22	11,828.46
Total (tons/construction project)	0.06	0.50	0.69	0.48	0.03	0.45	0.12	0.03	0.09	0.00	98.54	0.03	0.00	99.69

Notes:

Project Start Year ->	2020
Project Length (months) ->	7
Total Project Area (acres) ->	3
Maximum Area Disturbed/Day (acres) ->	3
Water Truck Used? ->	Yes

	Total Material Imported/Exported Volume (yd^3/day)		Daily VMT (miles/day)			
Phase	Soil	Asphalt	Soil Hauling	Asphalt Hauling	Worker Commute	Water Truck
Grubbing/Land Clearing	20	10	30	30	200	40
Grading/Excavation	20	0	30	0	200	40
Drainage/Utilities/Sub-Grade	20	0	30	0	400	40
Paving	20	40	30	60	400	40

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

Total Emission Estimates by Phase for -> Via Verdi Slope Stabilization Project

Project Phases (Tons for all except CO2e. Metric tonnes for CO2e)	ROG (tons/phase)	CO (tons/phase)	NOx (tons/phase)	Total PM10 (tons/phase)	Exhaust PM10 (tons/phase)	Fugitive Dust PM10 (tons/phase)	Total PM2.5 (tons/phase)	Exhaust PM2.5 (tons/phase)	Fugitive Dust PM2.5 (tons/phase)	SOx (tons/phase)	CO2 (tons/phase)	CH4 (tons/phase)	N2O (tons/phase)	CO2e (MT/phase)
Grubbing/Land Clearing	0.00	0.02	0.03	0.07	0.00	0.07	0.01	0.00	0.01	0.00	5.24	0.00	0.00	4.84
Grading/Excavation	0.03	0.26	0.38	0.18	0.02	0.17	0.05	0.01	0.03	0.00	51.12	0.02	0.00	46.92
Drainage/Utilities/Sub-Grade	0.03	0.22	0.27	0.23	0.01	0.21	0.06	0.01	0.04	0.00	40.44	0.01	0.00	37.07
Paving	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.74	0.00	0.00	1.61
Maximum (tons/phase)	0.03	0.26	0.38	0.23	0.02	0.21	0.06	0.01	0.04	0.00	51.12	0.02	0.00	46.92
Total (tons/construction project)	0.06	0.50	0.69	0.48	0.03	0.45	0.12	0.03	0.09	0.00	98.54	0.03	0.00	90.44

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns G and H. Total PM2.5 emissions shown in Column I are the sum of exhaust and fugitive dust emissions shown in columns J and K.

CO2e emissions are estimated by multiplying mass emissions for each GHG by its global warming potential (GWP), 1 , 25 and 298 for CO2, CH4 and N2O, respectively. Total CO2e is then estimated by summing CO2e estimates over all GHGs.

The CO2e emissions are reported as metric tons per phase.

Via Verdi Slope Stability Project

Contra Costa County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
City Park	3.50	Acre	3.50	152,460.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	58
Climate Zone	5			**Operational Year**	2020
Utility Company	Sacramento Municipal Utility District				
CO2 Intensity (lb/MWhr)	590.31	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Architectural Coating - no architectural coating associated with project

Grading - ok

Trips and VMT - ok

Vehicle Trips - No operational sources

Land Use Change - trees replanted at a minimum 1:1 ratio

Landscape Equipment - no operational

Area Coating - no operational

Consumer Products - no operational

Water And Wastewater - No operational

Solid Waste - No operational

Operational Off-Road Equipment - No operational

Stationary Sources - Emergency Generators and Fire Pumps - No operational

Road Dust - no operational

Construction Phase - ok

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_EF_Nonresidential_Exterior	150	0
tblAreaCoating	Area_EF_Nonresidential_Interior	100	0
tblAreaCoating	Area_EF_Parking	150	0
tblAreaCoating	Area_EF_Residential_Exterior	150	0
tblAreaCoating	Area_EF_Residential_Interior	100	0
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstructionPhase	NumDays	18.00	5.00
tblConstructionPhase	NumDays	230.00	30.00
tblConstructionPhase	NumDays	8.00	20.00

tblConstructionPhase	NumDays	18.00	10.00
tblConstructionPhase	NumDays	5.00	20.00
tblConstructionPhase	PhaseEndDate	5/24/2021	10/7/2020
tblConstructionPhase	PhaseEndDate	4/2/2021	8/4/2020
tblConstructionPhase	PhaseEndDate	5/15/2020	6/23/2020
tblConstructionPhase	PhaseEndDate	4/28/2021	10/14/2020
tblConstructionPhase	PhaseEndDate	5/5/2020	5/26/2020
tblConstructionPhase	PhaseStartDate	4/29/2021	10/1/2020
tblConstructionPhase	PhaseStartDate	5/16/2020	6/24/2020
tblConstructionPhase	PhaseStartDate	5/6/2020	5/27/2020
tblConstructionPhase	PhaseStartDate	4/3/2021	10/1/2020
tblGrading	AcresOfGrading	10.00	4.00
tblGrading	AcresOfGrading	0.00	4.00
tblSolidWaste	LandfillCaptureGasFlare	94.00	0.00
tblSolidWaste	LandfillNoGasCapture	6.00	0.00
tblSolidWaste	SolidWasteGenerationRate	0.30	0.00
tblTripsAndVMT	HaulingTripNumber	0.00	1.00
tblTripsAndVMT	VendorTripNumber	25.00	2.00
tblTripsAndVMT	WorkerTripLength	10.80	25.00
tblTripsAndVMT	WorkerTripLength	10.80	25.00
tblTripsAndVMT	WorkerTripLength	10.80	25.00
tblTripsAndVMT	WorkerTripLength	10.80	25.00
tblTripsAndVMT	WorkerTripLength	10.80	25.00
tblTripsAndVMT	WorkerTripLength	10.80	25.00
tblTripsAndVMT	WorkerTripNumber	15.00	1.00
tblTripsAndVMT	WorkerTripNumber	18.00	5.00
tblTripsAndVMT	WorkerTripNumber	15.00	10.00

tblTripsAndVMT	WorkerTripNumber	64.00	3.00
tblTripsAndVMT	WorkerTripNumber	20.00	2.00
tblTripsAndVMT	WorkerTripNumber	13.00	1.00
tblVehicleTrips	CC_TL	7.30	0.00
tblVehicleTrips	CC_TTP	48.00	0.00
tblVehicleTrips	CNW_TL	7.30	0.00
tblVehicleTrips	CNW_TTP	19.00	0.00
tblVehicleTrips	CW_TL	9.50	0.00
tblVehicleTrips	CW_TTP	33.00	0.00
tblVehicleTrips	DV_TP	28.00	0.00
tblVehicleTrips	PB_TP	6.00	0.00
tblVehicleTrips	PR_TP	66.00	0.00
tblVehicleTrips	ST_TR	22.75	0.00
tblVehicleTrips	SU_TR	16.74	0.00
tblVehicleTrips	WD_TR	1.89	0.00
tblWater	AerobicPercent	87.46	50.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	ElectricityIntensityFactorForWastewaterTreatment	1,911.00	0.00
tblWater	ElectricityIntensityFactorToDistribute	1,272.00	0.00
tblWater	ElectricityIntensityFactorToSupply	2,117.00	0.00
tblWater	ElectricityIntensityFactorToTreat	111.00	0.00
tblWater	OutdoorWaterUseRate	4,170,184.72	0.00
tblWater	SepticTankPercent	10.33	50.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.1380	1.3758	0.9241	1.6200e-003	0.2493	0.0716	0.3210	0.1340	0.0664	0.2004	0.0000	141.3191	141.3191	0.0401	0.0000	142.3204
Maximum	**0.1380**	**1.3758**	**0.9241**	**1.6200e-003**	**0.2493**	**0.0716**	**0.3210**	**0.1340**	**0.0664**	**0.2004**	**0.0000**	**141.3191**	**141.3191**	**0.0401**	**0.0000**	**142.3204**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.1380	1.3758	0.9241	1.6200e-003	0.2493	0.0716	0.3210	0.1340	0.0664	0.2004	0.0000	141.3189	141.3189	0.0401	0.0000	142.3203
Maximum	**0.1380**	**1.3758**	**0.9241**	**1.6200e-003**	**0.2493**	**0.0716**	**0.3210**	**0.1340**	**0.0664**	**0.2004**	**0.0000**	**141.3189**	**141.3189**	**0.0401**	**0.0000**	**142.3203**

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

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**4-1-2020**	**6-30-2020**	1.1740	1.1740
2	**7-1-2020**	**9-30-2020**	0.2697	0.2697
		Highest	1.1740	1.1740

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.4400e-003	0.0000	3.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	6.0000e-005	6.0000e-005	0.0000	0.0000	7.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.4400e-003**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**6.0000e-005**	**6.0000e-005**	**0.0000**	**0.0000**	**7.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.4400e-003	0.0000	3.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	6.0000e-005	6.0000e-005	0.0000	0.0000	7.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**1.4400e-003**	**0.0000**	**3.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**6.0000e-005**	**6.0000e-005**	**0.0000**	**0.0000**	**7.0000e-005**

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

2.3 Vegetation

Vegetation

	CO2e
Category	MT
Vegetation Land Change	0.0000
Total	**0.0000**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	4/1/2020	4/28/2020	5	20	
2	Site Preparation	Site Preparation	4/29/2020	5/26/2020	5	20	
3	Grading	Grading	5/27/2020	6/23/2020	5	20	
4	Building Construction	Building Construction	6/24/2020	8/4/2020	5	30	
5	Paving	Paving	10/1/2020	10/14/2020	5	10	
6	Architectural Coating	Architectural Coating	10/1/2020	10/7/2020	5	5	

Acres of Grading (Site Preparation Phase): 4

Acres of Grading (Grading Phase): 4

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Paving	Cement and Mortar Mixers	2	6.00	9	0.56
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Excavators	3	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Grading	Excavators	1	8.00	158	0.38
Paving	Pavers	1	8.00	130	0.42
Paving	Rollers	2	6.00	80	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Generator Sets	1	8.00	84	0.74
Grading	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Paving	Paving Equipment	2	6.00	132	0.36
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	1.00	0.00	0.00	25.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	5.00	0.00	0.00	25.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	6	10.00	0.00	0.00	25.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	3.00	2.00	0.00	25.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	8	2.00	0.00	0.00	25.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	1.00	0.00	1.00	25.00	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0331	0.3320	0.2175	3.9000e-004		0.0166	0.0166		0.0154	0.0154	0.0000	33.9986	33.9986	9.6000e-003	0.0000	34.2386
Total	**0.0331**	**0.3320**	**0.2175**	**3.9000e-004**		**0.0166**	**0.0166**		**0.0154**	**0.0154**	**0.0000**	**33.9986**	**33.9986**	**9.6000e-003**	**0.0000**	**34.2386**

3.2 Demolition - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	5.0000e-005	5.2000e-004	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1584	0.1584	0.0000	0.0000	0.1585
Total	**7.0000e-005**	**5.0000e-005**	**5.2000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.1584**	**0.1584**	**0.0000**	**0.0000**	**0.1585**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0331	0.3320	0.2175	3.9000e-004		0.0166	0.0166		0.0154	0.0154	0.0000	33.9986	33.9986	9.6000e-003	0.0000	34.2385
Total	**0.0331**	**0.3320**	**0.2175**	**3.9000e-004**		**0.0166**	**0.0166**		**0.0154**	**0.0154**	**0.0000**	**33.9986**	**33.9986**	**9.6000e-003**	**0.0000**	**34.2385**

3.2 Demolition - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	5.0000e-005	5.2000e-004	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1584	0.1584	0.0000	0.0000	0.1585
Total	**7.0000e-005**	**5.0000e-005**	**5.2000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.1584**	**0.1584**	**0.0000**	**0.0000**	**0.1585**

3.3 Site Preparation - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1828	0.0000	0.1828	0.0995	0.0000	0.0995	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0408	0.4242	0.2151	3.8000e-004		0.0220	0.0220		0.0202	0.0202	0.0000	33.4307	33.4307	0.0108	0.0000	33.7010
Total	**0.0408**	**0.4242**	**0.2151**	**3.8000e-004**	**0.1828**	**0.0220**	**0.2048**	**0.0995**	**0.0202**	**0.1198**	**0.0000**	**33.4307**	**33.4307**	**0.0108**	**0.0000**	**33.7010**

3.3 Site Preparation - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.3000e-004	2.6000e-004	2.5800e-003	1.0000e-005	9.2000e-004	1.0000e-005	9.2000e-004	2.4000e-004	1.0000e-005	2.5000e-004	0.0000	0.7919	0.7919	2.0000e-005	0.0000	0.7924
Total	**3.3000e-004**	**2.6000e-004**	**2.5800e-003**	**1.0000e-005**	**9.2000e-004**	**1.0000e-005**	**9.2000e-004**	**2.4000e-004**	**1.0000e-005**	**2.5000e-004**	**0.0000**	**0.7919**	**0.7919**	**2.0000e-005**	**0.0000**	**0.7924**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1828	0.0000	0.1828	0.0995	0.0000	0.0995	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0408	0.4242	0.2151	3.8000e-004		0.0220	0.0220		0.0202	0.0202	0.0000	33.4306	33.4306	0.0108	0.0000	33.7009
Total	**0.0408**	**0.4242**	**0.2151**	**3.8000e-004**	**0.1828**	**0.0220**	**0.2048**	**0.0995**	**0.0202**	**0.1198**	**0.0000**	**33.4306**	**33.4306**	**0.0108**	**0.0000**	**33.7009**

3.3 Site Preparation - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.3000e-004	2.6000e-004	2.5800e-003	1.0000e-005	9.2000e-004	1.0000e-005	9.2000e-004	2.4000e-004	1.0000e-005	2.5000e-004	0.0000	0.7919	0.7919	2.0000e-005	0.0000	0.7924
Total	**3.3000e-004**	**2.6000e-004**	**2.5800e-003**	**1.0000e-005**	**9.2000e-004**	**1.0000e-005**	**9.2000e-004**	**2.4000e-004**	**1.0000e-005**	**2.5000e-004**	**0.0000**	**0.7919**	**0.7919**	**2.0000e-005**	**0.0000**	**0.7924**

3.4 Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0623	0.0000	0.0623	0.0333	0.0000	0.0333	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0243	0.2639	0.1605	3.0000e-004		0.0127	0.0127		0.0117	0.0117	0.0000	26.0588	26.0588	8.4300e-003	0.0000	26.2694
Total	**0.0243**	**0.2639**	**0.1605**	**3.0000e-004**	**0.0623**	**0.0127**	**0.0751**	**0.0333**	**0.0117**	**0.0451**	**0.0000**	**26.0588**	**26.0588**	**8.4300e-003**	**0.0000**	**26.2694**

3.4 Grading - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.5000e-004	5.2000e-004	5.1600e-003	2.0000e-005	1.8300e-003	1.0000e-005	1.8500e-003	4.9000e-004	1.0000e-005	5.0000e-004	0.0000	1.5838	1.5838	4.0000e-005	0.0000	1.5847
Total	**6.5000e-004**	**5.2000e-004**	**5.1600e-003**	**2.0000e-005**	**1.8300e-003**	**1.0000e-005**	**1.8500e-003**	**4.9000e-004**	**1.0000e-005**	**5.0000e-004**	**0.0000**	**1.5838**	**1.5838**	**4.0000e-005**	**0.0000**	**1.5847**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0623	0.0000	0.0623	0.0333	0.0000	0.0333	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0243	0.2639	0.1605	3.0000e-004		0.0127	0.0127		0.0117	0.0117	0.0000	26.0587	26.0587	8.4300e-003	0.0000	26.2694
Total	**0.0243**	**0.2639**	**0.1605**	**3.0000e-004**	**0.0623**	**0.0127**	**0.0751**	**0.0333**	**0.0117**	**0.0451**	**0.0000**	**26.0587**	**26.0587**	**8.4300e-003**	**0.0000**	**26.2694**

3.4 Grading - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.5000e-004	5.2000e-004	5.1600e-003	2.0000e-005	1.8300e-003	1.0000e-005	1.8500e-003	4.9000e-004	1.0000e-005	5.0000e-004	0.0000	1.5838	1.5838	4.0000e-005	0.0000	1.5847
Total	**6.5000e-004**	**5.2000e-004**	**5.1600e-003**	**2.0000e-005**	**1.8300e-003**	**1.0000e-005**	**1.8500e-003**	**4.9000e-004**	**1.0000e-005**	**5.0000e-004**	**0.0000**	**1.5838**	**1.5838**	**4.0000e-005**	**0.0000**	**1.5847**

3.5 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0318	0.2878	0.2527	4.0000e-004		0.0168	0.0168		0.0158	0.0158	0.0000	34.7415	34.7415	8.4800e-003	0.0000	34.9534
Total	**0.0318**	**0.2878**	**0.2527**	**4.0000e-004**		**0.0168**	**0.0168**		**0.0158**	**0.0158**	**0.0000**	**34.7415**	**34.7415**	**8.4800e-003**	**0.0000**	**34.9534**

3.5 Building Construction - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2000e-004	3.4400e-003	8.8000e-004	1.0000e-005	2.0000e-004	2.0000e-005	2.1000e-004	6.0000e-005	2.0000e-005	7.0000e-005	0.0000	0.7826	0.7826	4.0000e-005	0.0000	0.7835
Worker	2.9000e-004	2.3000e-004	2.3200e-003	1.0000e-005	8.3000e-004	1.0000e-005	8.3000e-004	2.2000e-004	0.0000	2.2000e-004	0.0000	0.7127	0.7127	2.0000e-005	0.0000	0.7131
Total	**4.1000e-004**	**3.6700e-003**	**3.2000e-003**	**2.0000e-005**	**1.0300e-003**	**3.0000e-005**	**1.0400e-003**	**2.8000e-004**	**2.0000e-005**	**2.9000e-004**	**0.0000**	**1.4953**	**1.4953**	**6.0000e-005**	**0.0000**	**1.4966**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0318	0.2878	0.2527	4.0000e-004		0.0168	0.0168		0.0158	0.0158	0.0000	34.7415	34.7415	8.4800e-003	0.0000	34.9534
Total	**0.0318**	**0.2878**	**0.2527**	**4.0000e-004**		**0.0168**	**0.0168**		**0.0158**	**0.0158**	**0.0000**	**34.7415**	**34.7415**	**8.4800e-003**	**0.0000**	**34.9534**

3.5 Building Construction - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2000e-004	3.4400e-003	8.8000e-004	1.0000e-005	2.0000e-004	2.0000e-005	2.1000e-004	6.0000e-005	2.0000e-005	7.0000e-005	0.0000	0.7826	0.7826	4.0000e-005	0.0000	0.7835
Worker	2.9000e-004	2.3000e-004	2.3200e-003	1.0000e-005	8.3000e-004	1.0000e-005	8.3000e-004	2.2000e-004	0.0000	2.2000e-004	0.0000	0.7127	0.7127	2.0000e-005	0.0000	0.7131
Total	**4.1000e-004**	**3.6700e-003**	**3.2000e-003**	**2.0000e-005**	**1.0300e-003**	**3.0000e-005**	**1.0400e-003**	**2.8000e-004**	**2.0000e-005**	**2.9000e-004**	**0.0000**	**1.4953**	**1.4953**	**6.0000e-005**	**0.0000**	**1.4966**

3.6 Paving - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.9200e-003	0.0590	0.0614	9.0000e-005		3.2500e-003	3.2500e-003		3.0000e-003	3.0000e-003	0.0000	8.1860	8.1860	2.5700e-003	0.0000	8.2503
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.9200e-003**	**0.0590**	**0.0614**	**9.0000e-005**		**3.2500e-003**	**3.2500e-003**		**3.0000e-003**	**3.0000e-003**	**0.0000**	**8.1860**	**8.1860**	**2.5700e-003**	**0.0000**	**8.2503**

3.6 Paving - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	5.0000e-005	5.2000e-004	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1584	0.1584	0.0000	0.0000	0.1585
Total	**7.0000e-005**	**5.0000e-005**	**5.2000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.1584**	**0.1584**	**0.0000**	**0.0000**	**0.1585**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	5.9200e-003	0.0590	0.0614	9.0000e-005		3.2500e-003	3.2500e-003		3.0000e-003	3.0000e-003	0.0000	8.1860	8.1860	2.5700e-003	0.0000	8.2503
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**5.9200e-003**	**0.0590**	**0.0614**	**9.0000e-005**		**3.2500e-003**	**3.2500e-003**		**3.0000e-003**	**3.0000e-003**	**0.0000**	**8.1860**	**8.1860**	**2.5700e-003**	**0.0000**	**8.2503**

3.6 Paving - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	7.0000e-005	5.0000e-005	5.2000e-004	0.0000	1.8000e-004	0.0000	1.8000e-004	5.0000e-005	0.0000	5.0000e-005	0.0000	0.1584	0.1584	0.0000	0.0000	0.1585
Total	**7.0000e-005**	**5.0000e-005**	**5.2000e-004**	**0.0000**	**1.8000e-004**	**0.0000**	**1.8000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.1584**	**0.1584**	**0.0000**	**0.0000**	**0.1585**

3.7 Architectural Coating - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.1000e-004	4.2100e-003	4.5800e-003	1.0000e-005		2.8000e-004	2.8000e-004		2.8000e-004	2.8000e-004	0.0000	0.6383	0.6383	5.0000e-005	0.0000	0.6396
Total	**6.1000e-004**	**4.2100e-003**	**4.5800e-003**	**1.0000e-005**		**2.8000e-004**	**2.8000e-004**		**2.8000e-004**	**2.8000e-004**	**0.0000**	**0.6383**	**0.6383**	**5.0000e-005**	**0.0000**	**0.6396**

3.7 Architectural Coating - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	1.5000e-004	3.0000e-005	0.0000	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0379	0.0379	0.0000	0.0000	0.0380
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.3000e-004	0.0000	5.0000e-005	0.0000	5.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0396	0.0396	0.0000	0.0000	0.0396
Total	**2.0000e-005**	**1.6000e-004**	**1.6000e-004**	**0.0000**	**6.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0775**	**0.0775**	**0.0000**	**0.0000**	**0.0776**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	6.1000e-004	4.2100e-003	4.5800e-003	1.0000e-005		2.8000e-004	2.8000e-004		2.8000e-004	2.8000e-004	0.0000	0.6383	0.6383	5.0000e-005	0.0000	0.6396
Total	**6.1000e-004**	**4.2100e-003**	**4.5800e-003**	**1.0000e-005**		**2.8000e-004**	**2.8000e-004**		**2.8000e-004**	**2.8000e-004**	**0.0000**	**0.6383**	**0.6383**	**5.0000e-005**	**0.0000**	**0.6396**

3.7 Architectural Coating - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	1.5000e-004	3.0000e-005	0.0000	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0379	0.0379	0.0000	0.0000	0.0380
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.0000e-005	1.0000e-005	1.3000e-004	0.0000	5.0000e-005	0.0000	5.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0396	0.0396	0.0000	0.0000	0.0396
Total	**2.0000e-005**	**1.6000e-004**	**1.6000e-004**	**0.0000**	**6.0000e-005**	**0.0000**	**6.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0775**	**0.0775**	**0.0000**	**0.0000**	**0.0776**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

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

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.577244	0.040114	0.186710	0.126359	0.018084	0.005120	0.010527	0.023222	0.001588	0.001850	0.005513	0.002759	0.000910

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

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

5.2 Energy by Land Use - NaturalGas

Unmitigated

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

5.2 Energy by Land Use - NaturalGas

Mitigated

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

5.3 Energy by Land Use - Electricity

Unmitigated

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

5.3 Energy by Land Use - Electricity

Mitigated

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

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.4400e-003	0.0000	3.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	6.0000e-005	6.0000e-005	0.0000	0.0000	7.0000e-005
Unmitigated	1.4400e-003	0.0000	3.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	6.0000e-005	6.0000e-005	0.0000	0.0000	7.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.4300e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	3.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	6.0000e-005	6.0000e-005	0.0000	0.0000	7.0000e-005
Total	**1.4300e-003**	**0.0000**	**3.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**6.0000e-005**	**6.0000e-005**	**0.0000**	**0.0000**	**7.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.4300e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	3.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	6.0000e-005	6.0000e-005	0.0000	0.0000	7.0000e-005
Total	**1.4300e-003**	**0.0000**	**3.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**6.0000e-005**	**6.0000e-005**	**0.0000**	**0.0000**	**7.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

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

7.2 Water by Land Use

Unmitigated

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

7.2 Water by Land Use

Mitigated

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

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

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

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

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

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

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

Boilers

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

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

	Total CO2	CH4	N2O	CO2e
Category	MT			
Unmitigated	0.0000	0.0000	0.0000	0.0000

11.1 Vegetation Land Change

Vegetation Type

	Initial/Final	Total CO2	CH4	N2O	CO2e
	Acres	MT			
Trees	1 / 1	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

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Appendix G

Biological Assessment

Biological Assessment

Via Verdi Slope Stabilization Project
July 2018

NCE
Richmond, CA
501 Canal Blvd., Suite I
Richmond, CA 94804

City of Richmond
450 Civic Center Plaza
Richmond, CA 94804

Collaboration. Commitment. Confidence.℠

Report for:

BIOLOGICAL ASSESSMENT

Via Verdi Slope Stabilization Project

Prepared for:

City of Richmond
450 Civic Center Plaza
Richmond, CA 94804

Prepared by:

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NCE Project Number:
568.41.55

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APPENDICES

1.0 INTRODUCTION

The City of Richmond (City) proposes to stabilize an eroding slope along Via Verdi in Richmond, California. Via Verdi is a residential street just east of Interstate 80 (I-80) that serves as the only access to 85 single family homes and 100 apartment units in a residential area known as the Sobrante Glen neighborhood. During the week of February 20th, 2017 a landslide occurred along the existing Via Verdi road alignment that damaged the road to the point of making vehicle access unsafe. Residents are currently accessing their homes via an approximately 650-foot-long emergency access road that was built in the days following the landslide. Along with slope stabilization, the proposed project would construct a new permanent access road to the Sobrante Glen neighborhood.

The project includes the reconstruction of a 0.65 acre section of Via Verdi Road and the associated utilities that pass under the roadway. In order to stabilize the eroding slope, a section of San Pablo Creek south of the roadway reconstruction area will be culverted and engineered fill will be installed above the culvert on an approximately 1.0 acre area to stabilize soils on the eroding hillside. Once the reconstruction of Via Verdi Road is complete, the temporary emergency access road will be demolished and all work areas including the approximately 1.5 acre staging pad will be revegetated. The total area of disturbance, including revegetation areas will be approximately 4.85 acres.

The purpose of this BA is to review the proposed Via Verdi Slope Stabilization Project (project) in sufficient detail to determine the extent to which the project may affect any federally threatened or endangered species (Special Status Species) and/or designated critical habitat. This biological assessment is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (16 U.S.C. 1536 (c)).

In 2012, a Biological Opinion was issued by the United States Fish and Wildlife Service (USFWS) for a similar culvert repair project in the same location as this project. The Biological Opinion is attached as **Appendix G** to serve as a reference document for this review.

Based on a literature review, and a habitat assessment of the action area, the BA considers the following species:

- Alameda whipsnake (Masticophis lateralis euryxanthus) (AWS)
- California red-legged Frog (Rana draytonii) (CRLF)

The project will result in temporary effects to approximately 5.1 acres of potential habitat for both the AWS and CRLF. The project will not result in any permanent loss of habitat for AWS. No loss of CRLF breeding habitat will occur as a result of the project.

The City will minimize the potential to adversely affect AWS and CRLF through avoidance and minimization measures but may also employ species specific mitigation if impacts are anticipated. These measures will be developed through consultation with the regulatory and permitting agencies. Conservation measures identified in the 2012 Biological Opinion are listed as recommended measures for this project in Section 6 of this document.

Other federally listed special status species may be present near the project alignment; however, the project area does not fall within any Critical Habitat Areas for any USFWS species and as a result the project is not anticipated to affect other federally listed special status species.

1.1 CONSULTATION TO DATE

The Sacramento Fish and Wildlife Office was contacted on December 7, 2017 to develop a species list via the ECOS-IPaC website (USFWS 2017).

Site specific references and background information reviewed include:

- *California Natural Diversity Database* (CNDDB). 2017. California Department of Fish and Wildlife, Sacramento, CA. Accessed online.
- Information for Planning and Conservation (IPaC). 2017. United States Fish and Wildlife Service. Accessed online.
- California Native Plant Society. 2017. *Inventory of Rare and Endangered Vascular Plants of California*. Accessed online.
- National Marine Fisheries Service protected species list. 2017. Accessed Online.

2.0 PROJECT DESCRIPTION

2.1 PROJECT OVERVIEW

The project is located along Via Verdi in Richmond, California in Contra Costa County. Surrounding land consists of residential housing developments and undeveloped private land. **Figure 1** presents the Action Area and surrounding residential communities. The Action is area is defined in **Section 2.2**.

2.1.1 Project Components

The project includes the following construction activities:

- Reconstruct a 0.6 acre area of Via Verdi road and sidewalk and restore underground utilities.
- Demolish temporary emergency access road and revegetate 1.2 acre area where roadway was installed.
- Install 350 linear foot culvert for section of San Pablo Creek within project area. Cover culvert with 9,650 cubic yards of engineered fill to stabilize eroding slope, covering an approximately 1.5 acre area.
- Revegetate all work areas including 1.5 acre staging area

2.1.2 Project Work Areas

The project is made up of two temporary work areas and a staging area. The culvert and fill work along San Pablo Creek is located in and adjacent to the San Pablo Creek Channel, and the Via Verdi roadway reconstruction is located in an adjacent area to the north in approximately the same location as the current Via Verdi Road footprint.

Staging will occur on the approximately 1.5 acre graded and compacted pad on the west side of the site.

Access to the construction site will occur via the existing Via Verdi roadway where it meets the project area.

2.1.3 Schedule

Construction will begin in April 2019 and will end in October 2019.

2.1.4 Work Area Dimensions

The project activities would require an area totaling approximately 5.1 acres. The dimensions of each project component are provided in **Table 1**.

Table 1: Work Area Dimensions

Work Area	Work Plan	Approximate Total Acreage
Roadway Realignment	Reconstruct Via Verdi Roadway and sidewalk and restore underground utilities.	0.6
Demolish Emergency Access Road and Revegetate Hillside	Demolish temporary road used for emergency access and associated utilities and revegetate.	1.2
Install culvert for San Pablo Creek, and cover with engineered fill	Install new culvert for San Pablo Creek including new headwall at east end of project area. Cover culvert with engineered fill.	1.5
Staging Area	Staging will occur on the compacted and graded pad on the west side of the site. Area will be revegetated after project completion.	1.5
Revegetation Areas	All work areas besides new Via Verdi Road alignment and sidewalk will be revegetated at the end of construction.	4.5
Total	This number is the sum of the Revegetation area number and the Roadway Realignment number. Together they represent the total work area of the project.	5.1

2.2 ACTION AREA

The action area is defined as "all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (Code of Federal Regulations Title 50, Section 402.02). The project footprint, which includes the roadway work area, slope stabilization work area, construction staging yard, and access routes, represents the limits of the action area (**Figure 1**). This action area is based on a conservative approach that considers the total area of impacts from all project alternatives being considered by the City of Richmond with the exception of Alternative 2 which was not considered due to lack of feasibility and due to being outside of the City of Richmond's preferred project area. All construction activity would be confined to the previously identified work area limits, and no additional impacts to habitat for special status species would occur as a result of this project.

3.0 SPECIES / CRITICAL HABITAT CONSIDERED

3.1 LITERATURE REVIEW AND DATABASE QUERIES

A query of federally listed wildlife species for the U.S. Geological Survey (USGS) 7.5-minute quadrangle encompassing the action area was obtained from the USFWS's Sacramento Endangered Species Office IPaC website on December 7, 2017 (USFWS 2017).

Additional information about the distribution of special status species with the potential to occur within the Action Area was compiled from the California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) for occurrences of special status species within a 1-mile radius of the proposed project alignment (CDFW 2017); from aerial photographs of the project area; and from USGS 7.5-minute quadrangle maps of the project area. Information on the distribution of special status species with potential to occur in the project region also was compiled from published literature. The results of the database searches were supplemented with past biological reports for 2012 San Pablo Creek culvert replacement project which was completed in 2012 and which studied a very similar project area (**Appendix A**).

The database searches identified 11 federally-listed fish and wildlife species and 3 federally-listed plant species with potential to occur within the Action Area. The official list is provided in **Appendix C**.

3.2 FIELD SURVEYS

NCE Biologist Mack Casterman conducted a reconnaissance-level survey of the action area on April 20, 2018. This survey was focused on identifying the presence of special status species or their habitat within the project vicinity.

4.0 AFFECTED ENVIRONMENT

The action area encompasses three distinct habitat types: ruderal/developed, riparian woodland, and annual grassland. General descriptions of these natural communities that occur within the action area are provided below. **Figure 2** presents the locations of the different habitat types present at the site.

4.1 RUDERAL/ DEVELOPED

Ruderal and developed areas still exhibit the impacts of development – often characterized by pavement of heavily compacted soil. Plants are mostly non-native invasive with few native species present and are characterized by the ability to thrive in areas of frequent disturbance.

Within the action area, ruderal vegetation is located on the west side of the project site where previous construction resulted in a graded and compacted pad approximately 2.0 acres in area.

4.2 ANNUAL GRASSLAND

Annual grassland areas are composed of mostly non-native grasses and weedy annual and perennial forbs. Some native grasses and forbs may be present in sparse areas where competition from non-natives is low.

Annual grassland is present throughout the project area. In the area north of the temporary access road, annual grasses are growing through erosion control blanket that was installed to control erosion during the rainy season from 2017-2018.

An approximately 0.25 acre area of annual grassland on the south side of Via Verdi road has been planted with sapling oaks as part of a habitat restoration effort resulting from the 2012 culvert project. This area is noted in **Figure 2**.

4.3 RIPARIAN WOODLAND

Riparian woodland dominated by boxelder (*acer negrundo*), red willow (*Salix laevigata*), California buckeye (*Aesculus californica*), and poison oak (*Toxicodendron diversilobum*) is present along the banks of San Pablo Creek.

4.4 COAST LIVE OAK WOODLAND

Oak Woodland is typically dominated by coast live oak (*Quercus agrifolia*). The shrub layer at this site is composed of elderberry (*Sambucus sp.*) and poison oak (*Toxicodendron diversilobum*). Also present in the understory were wild cucumber (*Marah fabacea*), Himalayan blackberry (*Rubus armeniacus*), and *Vinca major*.

Coast live oak woodland is present on the south-eastern border of the project area along San Pablo Creek.

4.5 COYOTE BRUSH SCRUB

Coyote brush scrub is present in an isolated patch on a South-east facing slope within the project area. This plant community is dominated by poison oak (*Toxicodendron diversilobum*) with some coyote brush (*Baccharis pilularis*) individuals scattered throughout.

A stand of coyote brush scrub is present in the approximate center of the Action Area adjacent to the temporary access road.

5.0 EFFECTS ANALYSIS

The following section provides a discussion of special status species that may be affected by the project. This section includes a description of the status, distribution, and habitat affects for the special status species that have potential to be affected as a result of this project. **Appendix D** contains a comprehensive list of special status species evaluated for the proposed project, and includes species on which the project was determined to have no effect, and the reason for each determination. Areas in which temporary and permanent project impacts to special status species habitat will occur are shown in **Figure 3**. The species listed in this section are considered possibly present based on existing occurrence data and the presence of habitat within the project action area.

5.1 California Red-Legged Frog

5.1.1 Status and Distribution

The CRLF is listed as federally threatened (USFWS 1996) and is considered a Species of Special Concern by CDFW. Critical habitat was designated in 2006 and revised in 2010 (USFWS 2006, 2010). The project is located outside of designated critical habitat for the CRLF and the nearest critical habitat unit is CCS-1, located in Contra Costa County, approximately 2.25 miles east of the action area.

The CRLF typically breeds during or shortly after large rainfall events in late winter or early spring (Hayes and Miyamoto 1984, USFWS 1996). The species usually occurs in or near still or slow-moving sources of water that remain inundated long enough for larvae to complete metamorphosis, which typically occurs from 3.5 to 7 months after hatching (Fellers et al. 2001). During summer, CRLF may take refuge in cool, moist areas, including small mammal burrows, leaf litter, or other moist sites within a few hundred feet of riparian areas (Rathbun et al. 1993, cited by USFWS 1996). Adult CRLF tend to be most active at night during wet weather, but they may make forays through upland areas at any time during the year (Hayes and Tennant 1985).

The nearest recorded observations of CRLF in the CNDDB are from the area around San Pablo Dam, located three miles east of the project area. Based on personal communication with Bert Mulchaey from the East Bay Municipal Utility District and Steve Bobzien from the East Bay Regional Park District, CRLF adults and CRLF tadpoles have been observed at the following locations upstream of the project site: Appian and/or Wilkie Creeks, Castro Creek, and Kennedy Grove.

5.1.2 Assessment Results

The velocity of water flow with the San Pablo Creek channel combined with shaded conditions, a lack of emergent vegetation and the likely presence of fish that could prey on CRLF eggs make it unlikely that CRLF successfully breed within San Pablo Creek where it passes through the action area. It is unlikely that any CRLF would be using this portion of San Pablo Creek as foraging habitat or as a refuge due to its distance from known population occurrences and the physical barriers to upland foraging habitat. However, CRLF presence is possible as CRLF may use San Pablo Creek as a dispersal corridor.

5.1.3 Project Effects to CRLF Habitat

The proposed project will result in temporary disturbance of 5.1 acres of potential CRLF habitat during the April to October construction period. This will result in a temporary loss of riparian and upland habitat for CRLF. The construction of the 350 foot long culvert in San

Pablo Creek will result in permanent impacts to approximately 0.1 acres of aquatic habitat for CRLF.

5.2 Alameda Whipsnake

5.2.1 Status and Distribution

The AWS is listed as threatened under both federal (USFWS 1997) and California state endangered species laws. Critical habitat was designated in 2000 and revised in 2006 (USFWS 2000, 2006). The project is not located within designated critical habitat for the AWS. The nearest critical habitat to the action area is Unit 1: Tilden-Briones, a 34,119-acre area unit with represents the northwestern portion of the subspecies' range (USFWS 2006) located 0.5 miles southeast of the action area. The primary constituent elements (PCEs) of AWS critical habitat include 1) scrub/shrub communities with a mosaic of open and closed canopy; 2) woodland or annual grasslands contiguous to lands containing PCE1; and 3) lands containing rock outcrops, talus, and small mammal burrows within or adjacent to PCE 1 and/or PCE 2.

AWS are generally found in chaparral (northern coastal sage scrub and coastal sage). Recent telemetry data indicate that AWS can venture up to 500 feet into habitats adjacent to chaparral including grassland, oak savanna, and occasionally oak-bay woodland (USFWS 2005).

5.2.2 Assessment Results

The nearest recorded observation of AWS in the CNDDB was recorded in 2006 about 3.8 miles south east of the project area. The next closest observation occurred five miles away in 1951, also south east of the project area (CDFW 2017).

The action area predominantly occurs in open grasslands, closed canopy oak woodland and urban suburban areas. The action area is bordered on three sides by paved roadways including a highway to the west. High quality AWS habitat consisting of areas with open or partially-open canopy scrub or adjacent grassland habitats is absent from the action area. High quality basking sites and natural rock outcrops that provide habitat for AWS prey species are also absent. The action area is not adjacent to high-quality scrub habitat, or situated between areas containing scrub habitat where snakes would potentially disperse. The action area is located at the extreme edge of the species' known range and given the lack of suitable habitat in the urbanized area surrounding the project, it is unlikely that individual AWS might use the action area as a dispersal corridor. However, incidental presence of AWS is possible within the action area as AWS may be found during dispersal or foraging activities.

5.2.3 Project Effects to AWS Habitat

The proposed project will result in temporary disturbance of 5.1 acres of AWS habitat during construction activities. This will result in a temporary loss of potential foraging and dispersal habitat for AWS.

5.3 Indirect Effects

Indirect effects are defined by USFWS as effects that are caused by the action and occur later in time, but are still reasonably certain to occur. No indirect effects on CRLF or AWS populations within the action area are anticipated as a result of project action. The project will not change the existing land-use of the project area and will not result in less suitable habitat for the CRLF and AWS after construction is complete. Therefore, no indirect effects to CRLF or AWS are anticipated.

5.4 CUMULATIVE EFFECTS ANALYSIS

No future State, Tribal, local or private actions were identified that are anticipated to occur within the action area. Therefore, no cumulative effects arising from future non-federal actions are anticipated.

6.0 CONSERVATION MEASURES

The following conservations measures were identified in the 2012 Biological Opinion and will be considered for implementation, if applicable, as part of the proposed project to avoid and/or minimize the risk of potential impacts to special status species and their habitats:

1. Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the Service has been received that the biologist(s) is qualified to conduct the work. The Service-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.

2. Before any construction activities begin, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the Alameda whipsnake and the California red-legged frog and its habitat, the importance of the Alameda whipsnake and the California red-legged frog and their respective habitats, the general measures that are being implemented to conserve the Alameda whipsnake and the California red-legged frog as they relate to the project, the penalties for non-compliance, and the boundaries within which the project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers will sign a form stating that they attended the program and understand all protection measures for the Alameda whipsnake and the California red-legged frog.

3. Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a Service-approved biologist to ensure that no Alameda whipsnakes or California red-legged frogs are present. This survey is not intended to be a protocol level survey, but rather one designed to verify that no Alameda whipsnakes or California red-legged frogs are present within the construction area before construction activities begin. Two preconstruction surveys for California red-legged frog and Alameda whipsnake will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any California red-legged frogs are found, the Service will be contacted and the Service approved biologist will be allowed sufficient time to move any California red-legged frogs from the work site before work activities begin. If any Alameda whipsnakes are found, all activities will cease, the Service will be immediately contacted, and no other actions will be taken without authorization from the Service. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs. Any biologist involved with the surveying/handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.

4. Immediately after the second survey, construction fencing and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The Service-approved biologist will supervise the installation of

the fencing around the work area. Access routes, tum-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.

5. A Service-approved biologist will monitor all ground disturbing construction activities. After ground disturbing project activities are complete, the Service-approved biologist will train an individual to act as the on-site biological monitor. The Service-approved biological monitor will have attended the training described in Conservation Measure 2 above. Both the Service-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The Service approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly and quarterly summaries will be placed on a file sharing website that is accessible to regulatory staff at any time.

6. A Service-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of Alameda whipsnakes or California red-legged frogs. These site inspections will take place each morning before the start of construction activities.

7. If any Alameda whipsnakes or California red-legged frogs are found, all activities will cease, the Service will be immediately contacted. and no other actions will be taken without authorization from the Service. Construction will be halted until all Alameda whipsnakes or California red-legged frogs depart on their own or are removed from the work area by the Service-approved biologist. Actions taken to relocate Alameda whipsnakes or California red-legged frogs will be conducted under the guidance of the Service and California Department of Fish and Game (CDFG). The Service-approved biologist may relocate any Alameda whipsnakes or California red-legged frogs that are in danger of immediate harm from project-related activities, to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The Service-approved biologist will monitor any California red-legged frogs or Alameda whipsnakes that have been relocated until it is determined that it is not imperiled by predators or other dangers.

8. Construction will take place during daylight hours only.

9. Prior to being brought on site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on site.

10. A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no Alameda whipsnakes, California red-legged frogs, or other amphibians and reptiles are taken at the pump.

11. Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.

12. Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for California red-legged frogs) (April 15 to October 15).

13. All areas disturbed as a result of project related activities will be re-vegetated with native plant species only.

14. Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water onsite. These devices will be placed at all locations where the likelihood of sediment input exists.

15. The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to insure that it is not becoming clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.

16. All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side-casting of material into any waterway.

17. During project activities, all trash that may attract predators will be properly contained, removed from the work site and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be managed to minimize the provision of cover for frogs by removing all surface construction debris daily except that required for construction.

18. To mitigate for erosion impacts, best management practices for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.

19. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The Corps and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the Corps will ensure that the applicant will prepare a plan to allow 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.

20. The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project areas will be removed.

21. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in preconstruction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

22. Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that Alameda whipsnakes do not become entangled in the mesh. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control.

23. To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fending or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.

24. Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.

25. All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.

26. A post-construction survey will be conducted the night before the cofferdams are removed to make sure no Alameda whipsnakes or California red-legged frogs have occupied the temporary pool created upstream of the site. If any Alameda whipsnakes or California red-legged frogs are present, they will be captured by hand and removed upstream of the pond to prevent them being potentially stranded when the dams are removed during the daylight hours and the water levels drop.

7.0 DETERMINATION OF EFFECTS FOR EACH PROTECTED RESOURCE

7.1 NO EFFECT

Species for which the action was determined to have no effect include the salt marsh harvest mouse (*Reithrodontomys raviventris*), California clapper rail (*Rallus longirostris obsoletus*), California least tern (*Sterna antillarum browni*), western snowy plover (*Charadrius alexandrines nivosus*), yellow-billed cuckoo (*Coccyzuz americanus*), Delta smelt (*Hypomesus transpacificus*), tidewater goby (*Eucyclogobius newberryi*), Callippe silverspot butterfly (*Speyeria callippe callippe*), San Bruno elfin butterfly (*Callophrys mossii bayensis*), California seablite (*Suaeda californica*), pallid manzanita (*Arctostaphylos pallida*), and Santa Cruz tarplant (*Holocarpha macradenia*). Suitable habitat for these species is absent from the action area; therefore, no effects on these species are expected to occur as a result of project activities. The project is expected to have no effect on Central California Coast Steelhead (*Oncorhynchus mykiss*) based on a phone conversation with Gary Stern at National Marine Fisheries Service on May 9, 2011 (**Appendix B**) – due to existing obstructions to the historical spawning habitat in San Pablo Creek including the San Pablo dam. Furthermore, project construction will not take place during spawning season.
An official special status species list for the project, generated from the USFWS IPaC website is provided in **Appendix C**. A list of all special status species evaluated in this BA and the reasons for this determination are provided in **Appendix D**.

7.2 MAY AFFECT, LIKELY TO ADVERSELY AFFECT

Based on this assessment and the conclusions of the 2012 Biological Opinion, potential effects to CRLF and AWS are possible as a result of project activities. Due to the presence of habitat for AWS and CRLF within and adjacent to the action area, there is potential for AWS and CRLF to occur within the action area. If AWS or CRLF were to occur within the action area during project activities, the project may affect and would be likely to adversely affect both species. Conservation measures recommended in this document will minimize any adverse effects.

7.3 RESTORATION AND MITIGATION TO OFFSET EFFECTS ON SPECIES

The project will incorporate measures to avoid, minimize, and compensate for effects on special status species and their habitats. Effects on habitat will be minimized through the implementation of the avoidance and minimization measures described in Section 6 of this biological assessment that have been incorporated into the project. Following the completion of project activities, all construction material and debris will be removed and disposed of appropriately. Work areas will be restored with native plants.

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Appendix A

RELEVANT BIOLOGICAL REPORTS FROM 2012 VIA VERDI CULVERT REPLACEMENT PROJECT

Swaim Biological Incorporated
4435 First Street PMB #312 ***22 Battery Suite 802***
Livermore, CA 94551 ***San Francisco, CA 94111***

To: John Heal
Senior Scientist, Watershed Science and Planning Group
Nichols Consulting Engineers, Chtd

From: Sam Young
Wildlife Biologist
Swaim Biological, Inc.

Date: May 1, 2012

Re: Results of visual surveys for California Red-legged Frog (*Rana draytonii*) and Alameda Whipsnake (*Masticophis lateralis euryxanthus*) within the Via Verdi culvert project footprint, Richmond, CA.

John,

This memo summarizes the results of our visual survey for California red-legged frog (CRLF) and Alameda Whipsnake (AWS) performed on Monday April 30th, 2012.

CRLF

I met with Karen Swaim, Senior Wildlife Biologist at 1300, April 30th, 2012 on Bypass Rd. just north from the culvert. The area within the San Pablo Creek channel and along the banks within the high water mark was surveyed for CRLF from approximately 200ft upstream from the day-lighted culvert area to 100ft downstream from the remaining culvert under El Portal Rd. Wildlife observed within the survey area included numerous three-spined sticklebacks (*Gaterosteus aculeatus*), one dead mole (*Scapanus sp.*), and one dead pocket gopher (*Thomomys bottae*). Both the mole and the gopher were observed in the creek channel and were apparently drowned. No CRLF adults, larvae, or egg masses were observed. The survey was concluded at approximately 1345.

AWS

I surveyed upland areas within the project foot print for incidental sightings of AWS between 1400 and 1500 with John Heal. Habitat was low quality for AWS in these areas, consisting primarily of black mustard (*Brassica nigra*), Italian thistle (*Carduus pychnocephalus*), raddish (*Raphanus sativus*), and European annual grasses with scattered stands of coyote brush (*Baccharis pilularis*). No burrows were observed in any of the surveyed areas. There were several debris piles through the upland portions of the project footprint which may provide habitat for wildlife. The only terrestrial vertebrate observed during the survey was an alligator lizard (*Elgaria multicarinata*), and was found underneath one of these debris piles. No AWS were detected during the survey effort.

Photo 1. San Pablo Creek upstream from the culvert beneath El Portal Rd. Photo taken on April 30th, 2012.

Photo 2. Day-lighted culvert area. Photo taken on April 30th, 2012.

Photo 3. San Pablo Creek downstream form the culvert beneath El Portal Rd. Photo taken on April 30th, 2012.

Photo 4. Access road at the north end of the project foot print looking south. Photo taken on April 30th, 2012.

Photo 5. Debris piles in upland habitat at the north end of the project foot print viewed looking north. Photo taken on April 30th, 2012.

Photo 6. Upland habitat at the west end of the project footprint viewed looking south. Photo taken on April 30th, 2012.

Photo 7. Upland habitat at the west end of the project footprint viewed looking north. Photo taken on April 30th, 2012.

Photo 8. Upland habitat at the west end of the project area viewed looking east. Photo taken on April 30th, 2012.

Photo 9. Upland habitat adjacent to the San Pablo Creek riparian corridor viewed looking to the south. Photo taken on April 30th, 2012.

Swaim Biological Incorporated
4435 First Street PMB #312 *22 Battery Suite 802*
Livermore, CA 94551 *San Francisco, CA 94111*

To: John Heal
Senior Scientist
Nichols Consulting Engineers

From: Jeff Mitchell
Project Manager / Senior Biologist
Swaim Biological Inc.

Date: January 23, 2012

Re: Via Verdi Culvert Replacement Project - AWS Site Assessment

Dear Mr. Heal:

At your request SBI conducted a site assessment for the Alameda whipsnake (*Masticophis lateralis euryxanthus*) (AWS) at the Via Verdi Culvert Replacement Project site, a culvert replacement project located in the City of Richmond, Contra Costa County, California. The purpose of this memorandum is to present the results of that assessment and to discuss the potential for the AWS to occur at the site.

In August 2011 Nichols Consulting Engineers prepared a Biological Resources Assessment (BRA) to identify major regulatory constraints associated with the project.[1] Their assessment determined that the AWS may occur incidentally at the site and that it may use the adjacent grassy habitat for foraging, but in general was unlikely to occur. The California red-legged frog was identified as potentially occurring at the site based on the presence of suitable non-breeding habitat in San Pablo Creek and a recorded occurrence of the frog less than one half mile from the site. No federally or state listed herptile species other than the AWS and CRF were identified as having the potential to occur.

This report is intended to supplement the BRA by providing additional information with regard to the suitability of the project area for AWS. The results of our assessment suggest that the AWS is not expected to occur within the project area. This finding is based on a combination of factors including the absence of habitat characteristics associated with AWS, its location at the northwestern edge of the species known range, and the presence of barriers to dispersal surrounding the site.

Introduction

Project Description

The project includes the replacement of a 130-foot section of culvert within San Pablo Creek extending from an area east of Via Verdi Drive across El Portal Drive. The collapse of the culvert had resulted in the formation of a sinkhole at Via Verdi in April 2010. A portion of San Pablo Creek was

[1] Nichols Consulting Engineers. *Via Verdi Repair Project, San Pablo Creek Culvert Replacement. Preliminary Biological Resources Assessment*. Report prepared for the City of Richmond, Contra Costa County, California. August 25, 2011.

excavated and stabilized with shoring to allow the creek to flow through the collapsed section, and a temporary bypass road was constructed west of Via Verdi to allow vehicle traffic to and from the residential area serviced by the road. Reconstruction of the collapsed culvert will include the construction of a new reinforced box culvert, installation of a reinforced concrete headwall and endwall, restoration of the creek areas adjacent to them. Related project activities will include revegetation, road repaving, daylighting an additional 30 feet of the creek at the headwall area, utility reconstruction in Via Verdi, removal of the temporary bypass road, and restoration of the impacted portions of the cemetery property.

Study Area

The study area lies within the East Bay Terraces and Alluvium Subsection of the Central California Coast Section as described in the *Ecological Subregions of California* (USDA 1997), and is located within the Richmond USGS 7.5-minute quadrangle. It is located on an alluvial plain extending from San Pablo Bay southeast to the Santa Clara Valley, separated from the East Bay hills by the Hayward Fault. The climate of the area is hot and subhumid with a heavy marine influence and a mean annual precipitation ranging from 20 to 30 inches. Within the project area landcover is predominantly annual grassland, but also includes riparian woodland, mixed broadleaf woodland, coyote brush scrub, ornamental, and developed areas. The majority of the project area ranges from approximately 50 to 150 feet elevation above mean sea level.

Land use in the vicinity includes residential, commercial, and open space areas (**Figure 1**). The study area is bounded on the west by Interstate 80 and by the Rolling Hills Memorial Park, a privately-owned cemetery to the north. The eastern portion of the area includes a portion of Via Verdi Drive a two-land residential street connected to a neighborhood located approximately 300 feet further east. Also within the eastern portion of the study area is San Pablo Creek, a northwest-trending creek that flows from near Orinda to San Pablo Bay. The southern portion of the study area abuts the parking lot of a nearby apartment complex, as well as a portion of El Portal Drive and a residential/commercial area to its south. Further to the south El Portal connects to San Pablo Dam Road, a major expressway linking the cities of Richmond and Orinda. Beyond that Wildcat Canyon Regional Park, a 2,500-acre open space area administered by the East Bay Regional Park District is located partially within critical habitat for the AWS.

Figure 1. Aerial photograph showing the project area and surrounding areas.

Alameda Whipsnake

The Alameda whipsnake is listed as threatened under both federal (USFWS 1997) and California state endangered species legislation. Critical habitat was designated in 2006 (USFWS 2006). The AWS is most frequently found in chaparral, Diablan sage scrub, northern coyote brush scrub, and riparian scrub, but also uses the mosaic of adjacent habitats in Alameda and Contra Costa Counties, including oak woodland, grassland (grazed and ungrazed), riparian, and even mixed evergreen forest. Swaim (1994) found that the home ranges of six radio-telemetry transmitter-equipped AWS were centered within scrub communities, and habitat use was concentrated into core areas that consisted of open or partially open canopy scrub on east, southeast, south, and southwest facing slopes, or in nearby grassland habitats that were within 500 feet (236 meters) of scrub with similar aspects. Rock outcrops were also typically abundant in core areas at the two sites where radio telemetry was used. Rock outcrops provide protective cover and are associated with high densities of lizards, a major prey item of the AWS (Swaim 1994).

Adult AWS are most active in late summer and early fall, although they may move above ground during any period in the year, including winter. In general they inhabit winter retreats from November through March. Winter retreats may consist of crevices in rock outcrops or rodent burrows which provide protection from temperature extremes (Swaim 1994). Rodent burrows may also be used for egg-laying sites (Swaim 1994).

Studies of AWS equipped with radio-telemetry transmitters have shown that they also extensively utilize grassland and oak woodland/savanna habitats adjacent to chaparral and scrub communities (Swaim 1994). The majority of AWS locations during these studies were within 100 feet of scrub habitat. However, AWS also ranged into the surrounding grassland to distances of greater than 500 feet (Swaim 1994). Subsequent studies have shown that observations of free-ranging AWS have been made beyond 500 feet and up to four miles from scrub habitat (Swaim 2000, 2002, 2003).

Methods

Prior to conducting field surveys information on the distribution of special status species in the area were compiled from searches of the California Department of Fish and Game California Natural Diversity Data Base (CNDDB) for the Richmond U.S. Geological Survey (USGS) 7.5-minute quadrangle and surrounding quadrangles (CDFG 2012). An online search also was conducted of the U.C. Berkeley Museum of Vertebrate Zoology holdings website. Habitat that could support AWS and barriers that could deter or prevent movement were identified to the extent possible on topographic maps and aerial photographs.

On January 8, 2012 biologist Jeff Mitchell performed a reconnaissance-level survey of the project area. Biologist Karen Swaim examined GIS-based maps of the culvert line, examined aerial photographs of the area, and provided expertise based on personal knowledge of the project vicinity.

Results

The following section discusses the results of the database search and habitat assessment, including a field survey and desktop-level analysis. No listed species were observed during the field survey.

Recorded Observations

The database search resulted in no records for the AWS in the immediate project vicinity. The nearest recorded observation of AWS was located on East Bay Municipal Utility District (EBMUD) property, just under four miles from the site (**Table 1**). **Figure 2** shows the nearest recorded observations of AWS, as well as designated critical habitat for the species in relation to the project area.

Table 1. Descriptions of nearest recorded observations of AWS in the project vicinity

Distance and Direction from Project Area	Record Description	Source and or Observer
3.8 mi. ESE	AWS observed north of San Pablo Reservoir on October 30, 2006.	EBMUD (2006)
5.0 mi. SE	AWS observed on Plateau Drive in Kensington. Reported to RCS by local resident on July 2, 1951.	Harris (1951)
5.5 mi. E	Multiple AWS captured during a trapping study on EBMUD property, including one gravid female.	Swaim K. (2010)
5.6 mi. E	Multiple AWS captured during a trapping study on private mitigation parcel.	Swaim, K. (2005)
6.1 mi. SE	One AWS found dead on road on the west edge of Tilden Park, Berkeley.	CNDDB Macey, J.R. (2003)

Habitats

The project area is located outside of critical habitat designated for the AWS (USFWS 2006). Critical Habitat Unit 1: Tilden-Briones, is the nearest unit to the project area, and is located approximately 0.5 miles to the southeast. This 34,119-acre unit lies within Alameda and Contra Costa Counties and primarily includes land owned by East Bay Regional Parks and under private ownership. It represents the northwest portion of the subspecies' range (USFWS 2006).

The southern and eastern portions of the project site are dominated by paved portions of Via Verdi and El Portal, and riparian areas associated with San Pablo Creek. These areas lack the habitat elements associated with core AWS habitat including scrub/shrub communities with a mosaic of open and closed canopy, and are not contiguous to areas with these habitat elements. These areas also lack rock outcrops, talus and other features associated with the presence of AWS when within or adjacent to core habitat areas. The portion of the study area north of El Portal and south of the bypass road contained a small amount of coyote brush (*Baccharis pilularis*) but not in sufficient quantity to significantly improve habitat in the area for the AWS.

North of the bypass road, the existing stockpile area and the proposed stockpile area further to the north have similar habitat characteristics. Both areas are dominated by annual grasses and lack any significant amount of scrub/shrub habitat suitable for AWS. Other habitat features associated with use by AWS also are lacking. Few rodent burrows were observed, and rock outcrops were absent. Patches of ground devoid of vegetation which may have appeared to be rock piles from an examination of aerial photos were actually disturbed soil areas, presumably associated with grading and landscaping activities by the cemetery (see **Appendix A** for representative site photos).

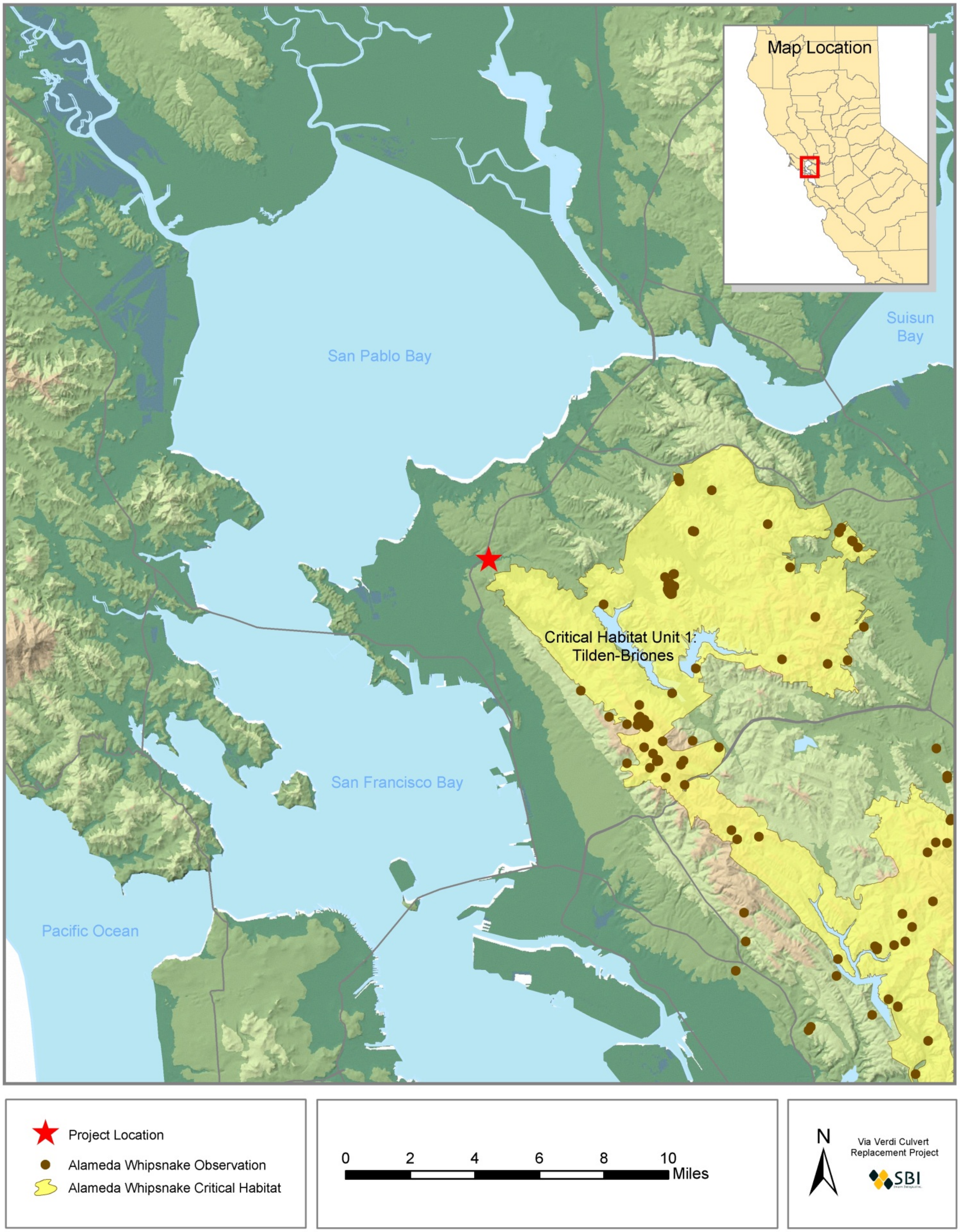

Figure 2. Project location, critical habitat, and nearest recorded observations of AWS

Summary and Conclusion

Our analysis of habitat characteristics and conditions on and near the site combined with the distribution of known observations of the species suggests that the AWS is not expected to occur within the project area. The nearest known AWS occurrence record is located just less than four miles from the project site and is separated from the project area by residential development and heavily traveled roads.

The Tilden-Briones critical habitat unit is located approximately one half mile from the site, however the presence of urban development including heavily traveled roads between it and the project area make the dispersal of AWS from this area extremely unlikely. The location of the site at the extreme edge of the species known range combined with the lack of additional suitable habitat in the isolated block of undeveloped land or nearby reduce the likelihood that individual AWS might disperse through the area *en route* to another location. Further, the lack of suitable core habitat on-site would make it extremely unlikely that AWS that may disperse to the area by chance would remain within the project area. It is therefore our conclusion that the risk of encountering AWS during construction is negligible and that any implementation of physical, on-the-ground avoidance and minimization measures (AMMs) is not needed to avoid take of AWS habitat. The only recommended action is to include AWS identification and acknowledge its protected status in the project tailboard associated with the work.

Please feel free to contact me should you have any questions regarding the content of this memorandum.

Sincerely,

Jeff Mitchell

Jeff Mitchell
Project Manager/Senior Biologist

Literature Cited

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_____. 2002. Alameda whipsnake habitat assessment for the Equilon Pipeline Marsh Creek Replacement Project, Contra Costa County, California. Prepared for Essex Environmental, Inc. 30

September 2002.

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Swaim, K. E. 1994. Aspects of the ecology of the Alameda whipsnake (*Masticophis lateralis euryxanthus*) Masters Thesis, California State University, Hayward, CA. 140 pp.

U.S. Department of Agriculture (USDA). 1997. *Ecological subregions of California: section and subsection descriptions*. USDA, Forest Service Pacific Southwest Region. R5-EM-TP-005. September.

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_____. 2006. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Alameda Whipsnake. Federal Register. 71:58176-58231.

Appendix A. Representative Site Photos

Photo 1. Excavated portion of San Pablo Creek with closed section of Via Verdi Dr. and its junction with El Portal in the background. Photo taken facing south.

Photo 2. Northern end of the existing excavation with San Pablo Creek riparian zone beyond the chain link fence. Via Verdi Dr. is visible on the left. Photo taken facing east.

Photo 3. Junction of the temporary bypass road with Via Verdi. Oaks located on cemetery property near the top of the photo are outside of the proposed project area. Photo taken facing north.

Photo 4. Cemetery property immediately north of Via Verdi located outside of the proposed project area. Photo taken facing northwest.

Photo 5. Cemetery property located north of Via Verdi. This area is just north of the eastern extent of the project area and would not be directly affected by project activities.

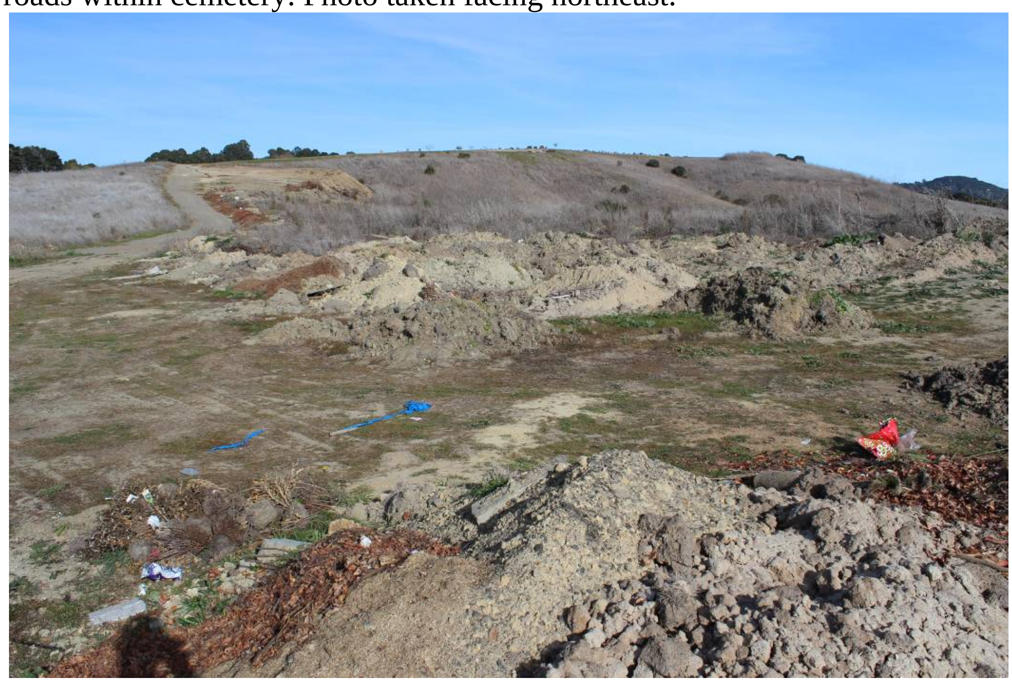
Photo 6. Spoils pile from bypass road construction located on cemetery property between bypass road (left) and I-80 onramp (right). This area would be subject to disturbance from project activities. Photo taken facing south.

Photo 7. Via Verde viewed from cemetery property at the southern edge of the project area. Trees at the left of the photo are outside of the project area. Photo taken facing east.

Photo 8. Proposed additional stockpile area located on cemetery property. Photo taken facing south.

Photo 9. Proposed additional stockpile area located within cemetery property. Photo taken facing southwest.

Photo 10. Proposed additional stockpile area. Access road (left) connects paved roads within cemetery. Photo taken facing northeast.



Appendix B

RECORD OF PHONE CONVERSATION WITH GARY STERN (NMFS) REGARDING STEELHEAD

NICHOLS CONSULTING ENGINEERS, Chtd.
Engineering and Environmental Services

P.O. Box 1760 • Zephyr Cove, NV 89448 • 775.588.2505 • FAX 775.588.2607

NMFS Phone Conversation Log

On May 9, 2011 Liz Lundholm had a phone conversation with Gary Stern at the NMFS out of the Santa Rosa office regarding the Via Verde project. Upon giving him a verbal description of the proposed project and requesting which permits are appropriate to apply for considering there may be the presence of special status species on site and there would be work in the waterway; Gary informed that there is no real presence of Steelhead in the San Pablo Creek due to all the obstructions in the Creek. He referred to the Center for Ecosystem Management and Restoration. On their website, he referenced the SF Bay Steelhead Report that would provide a detailed description of Steelhead habitat in the Bay Area. (http://www.cemar.org/publications.html)

Gary Stern also said that typically, the applicant applies for a 404 Permit with the ACOE and if there are any special status species that NMFS would be a stakeholder, the ACOE would seek their expertise in reviewing the 404 permit application. Although Mr. Stern did not think it would be important for NMFS to attend the on-site initial agency consultation meeting (no Steelhead on site), NCE would send an official request and he would respond.

Gary Stern:
707.575.6060
Gary.stern@noaa.gov

Appendix C

OFFICIAL USFWS LIST OF SPECIAL STATUS SPECIES WITH POTENTIAL TO OCCUR IN PROJECT AREA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: December 07, 2017
Consultation Code: 08ESMF00-2018-SLI-0598
Event Code: 08ESMF00-2018-E-01669
Project Name: Via Verde Slope Stabilization Project

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2018-SLI-0598

Event Code: 08ESMF00-2018-E-01669

Project Name: Via Verde Slope Stabilization Project

Project Type: TRANSPORTATION

Project Description: Project will result in new road and stabilization of landslide-prone slope along Via Verde Road in Richmond. Work will begin during the summer of 2018.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/37.968027872030234N122.31473002991012W

Counties: Contra Costa, CA

Endangered Species Act Species

There is a total of 14 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
Salt Marsh Harvest Mouse *Reithrodontomys raviventris* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/613	Endangered

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered
Western Snowy Plover *Charadrius alexandrinus nivosus* Population: Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast) There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8035	Threatened
Yellow-billed Cuckoo *Coccyzus americanus* Population: Western U.S. DPS There is **proposed** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

Reptiles

NAME	STATUS
Alameda Whipsnake (=striped Racer) *Masticophis lateralis euryxanthus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5524	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/321	Threatened
Tidewater Goby *Eucyclogobius newberryi* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/57	Endangered

Insects

NAME	STATUS
Callippe Silverspot Butterfly *Speyeria callippe callippe* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3779	Endangered
San Bruno Elfin Butterfly *Callophrys mossii bayensis* There is **proposed** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/3394	Endangered

Flowering Plants

NAME	STATUS
California Seablite *Suaeda californica* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6310	Endangered
Pallid Manzanita *Arctostaphylos pallida* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8292	Threatened
Santa Cruz Tarplant *Holocarpha macradenia* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6832	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Appendix D

SPECIAL STATUS SPECIES CONSIDERED FOR ANALYSIS

Species	Status	Habitat	Occurrence in the Study Area
Plant Species			
Pallid manzanita (*Arctostaphylos pallida*)	FT, SE, CNPS 1B.1	Found in siliceous shale, sandy or gravely soils. Habitats include broadleaved upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, and coastal scrub. 185 - 465 meters. Blooms December - March.	**None**. Does not occur on the site. Potential habitat does not exist on site.
Santa Cruz tarplant (*Holocarpha macradenia*)	FT, SE, CNPS 1B.1	Coastal prairie, coastal scrub, and valley and foothill grassland. Light, sandy soil or sandy clay; often with nonnatives, 10 - 220 meters. Blooms June - October.	**Unlikely**. Species distribution limited to specific areas. Potential habitat does not exist on site.
California seablite (*Suaeda californica)*	FE, CNPS 1B.1	Coastal Salt Marsh, wetland-riparian with salt influence	**None**. Does not occur on the site. Potential habitat does not exist on site.
Avian Species			
Western snowy plover (*Charadrius alexandrines nivosus)*	FT, SSC	Above high tide line on coastal beaches, sand spits, salt pans at lagoons and estuaries	**None.** Does not occur on the site. Potential habitat does not exist on site.
Yellow-billed cuckoo (*Coccyzuz americanus*)	FT	Large patches (25-100 acres) of willows or cottonwoods	**None**. Does not occur on the site. Potential habitat does not exist on site.
California clapper rail *(Rallus longirostris obsoletus*)	FE, SE	Salt or brackish marsh	**None**. Does not occur on the site. Potential habitat does not exist on site.
California least tern *(Sterna antillarum browni*)	FE, SE	Nests colonially on bare or gravelly substrate near water	**None**. Does not occur on the site. Potential habitat does not exist on site.
Mammal Species			
Salt-marsh harvest mouse (*Reithrodontomys raviventris*)	SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	**None**. Does not occur on the site. Potential habitat does not exist on site.

Species	Status	Habitat	Occurrence in the Study Area
Herptile Species			
Alameda whipsnake (*Masticophis lateralis euryxanthus*)	FT, ST	Common in scrublands broken by scattered grassy patches, rocky hillsides, gullies, canyons, or stream courses.	**Possible**. The Alameda whipsnake may occur incidentally on the site. They may use the grassland habitat adjacent to the site to forage; however, no breeding habitat is present on site.
California red-legged frog (*Rana draytonii*)	FT, SSC	A pond frog that inhabits humid forests, woodlands, grasslands, and streamsides; however, frequents otherwise permanent sources of water. Breeds January-April and can be found in damp woods during non-breeding periods.	**Possible**. California red-legged frog may occur incidentally on the site. No breeding habitat is present within the action area, but suitable non-breeding habitat for this species is present on the site.
Fish Species			
Tidewater goby (*Eucyclogobius newberryi*)	FE	Lagoons formed by streams running into the sea. The tidewater goby prefers salinities of less than 10 ppt.	**None.** Habitat not present.
Delta smelt (*Hypomesus transpacificus*)	FT	Estuary of Sacramento River. Brackish and fresh water.	**None.** Habitat not present.
Central California Coast Steelhead (*Oncorhynchus mykiss*)	FT	Require cool freshwater for spawning and rearing sites. Adult runs occur during the winter, while the amount of time spent in fresh versus salt water varies considerably. Typically steelhead enter the streams and rivers between late December-April while spawning occurs in late spring.	**Unlikely.** Based on a phone conversation with Gary Stern at National Marine Fisheries Service on May 9, 2011 – due to existing obstructions to the historical spawning habitat including the San Pablo dam. Furthermore, project construction will not take place during spawning season.

Species	Status	Habitat	Occurrence in the Study Area
Invertebrate Species			
San Bruno elfin butterfly (*Callophrys mossii bayensis*)	FE	Occurs in coastal grassy mountainous areas near San Francisco Bay. Located on steep north-facing slopes above 500′ elevation that contain populations of host plant *Sedum spathulifolium*.	**Unlikely**. Species distribution is limited to particular areas. Potential habitat does not exist on site.
Callippe silverspot Butterfly (*Speyeria callippe callippe*)	FE	Occurs in native grasslands and adjacent habitats surrounding the San Francisco Bay. Females lay their eggs on host plant *Viola pedunculata.*	**Unlikely**. Species distribution is limited to particular areas. Potential habitat does not exist on site.

Status codes are defined as follows:
Federal status: USFWS Listing
FE = Listed as endangered under the Federal Endangered Species Act
FT = Listed as threatened under the Federal Endangered Species Act
California State Status: CDFW Listing
SE = Listed as endangered under California Endangered Species Act
ST = Listed as threatened under California Endangered Species Act
CSC = Species of Special Concern
California Native Plant Society (CNPS) Ranking
1A = Plants Presumed Extinct in California
1B = Plants Rare, Threatened, or Endangered in California and elsewhere
0.1 = Seriously threatened in California (over 80% of occurrences threatened/high degree and Immediacy of threat)

Appendix E

REPRESENTATIVE PHOTOGRAPHS

Staging Area looking south

Looking south at planted coast live oak saplings in annual grassland on south side of Via Verdi Road

San Pablo Creek Channel looking upstream

Existing Via Verdi Road alignment looking northeast – note: plastic erosion barrier between Via Verdi Road and temporary emergency access road to the north.

Temporary emergency access road and annual grassland growing through erosion control blanket at northern end of action area. Photo looking southwest.

Black mustard (*Brassica nigra*) dominated annual grassland on north side of action area.

Appendix F

FIGURES

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\Bio Maps\BA Figure 1 Project Location v02.mxd

Action Area

NCE

Richmond

Via Verdi Slope Stabilization Project

Action Area

N

1 in. = 500 ft.

0 250 500 ft.

FIGURE 1

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI World Imagery basemap	568.41.55	mcasterman	12/1/2017	4/27/2018	drios

NCE

Richmond

Via Verdi Slope Stabilization Project

Habitat Map

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE 2

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI World Imagery basemap	568.41.55	mcasterman	12/1/2018	4/27/2018	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\Bio Maps\BA Figure 2 Veg Map.mxd

Work Area

Temporary Impact Area

Via Verdi Slope Stabilization Project

Habitat Impact Areas

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE 3

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI World Imagery basemap	568.41.55	mcasterman	12/1/2017	4/27/2018	drios

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\Maps\Bio Maps\BA Figure 3 Habitat Impacts.mxd

Appendix G

USFWS BIOLOGICAL OPINION FOR 2012 VIA VERDI CULVERT PROJECT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
08ESMF00-2011-F-0875

MAR 2 1 2012

Ms. Jane M. Hicks
Chief, Regulatory Division
Attn: Ms. Christina Cavett-Cox
San Francisco District
U. S. Army Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Subject: Biological Opinion on the Via Verdi Culvert Repair Project, Contra Costa County, California (Corps File # 2010-00171S)

Dear Ms. Hicks:

This is in response to the U.S. Army Corps of Engineers (Corps) September 26, 2011, letter requesting formal consultation with the U.S. Fish and Wildlife Service (Service) on the Via Verdi Culvert Repair Project, located in the City of Richmond, Contra Costa County, California. Your request was received in our office on September 27, 2011. This document represents the Service's biological opinion on the effects of the action on the threatened Alameda whipsnake (*Masticophis lateralis euryxanthus*) and the threatened California red-legged frog (*Rana draytonii*), in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq) (Act). Critical habitat for the Alameda whipsnake and the California red-legged frog has been designated but does not occur within the proposed Via Verdi Culvert Repair Project action area.

This biological opinion is based on: (1) *Via Verdi Repair Project, San Pablo Creek, Replacement, Preliminary Biological Resource Assessment*, dated August 25, 2011; (2) San Francisco Bay Area, Joint Aquatic Resource Permit Application; (3) *Via Verdi Repair Project San Pablo Creek Culvert Replacement CWA Section 404 (b) (1) Alternatives Analysis*, dated December 9, 2011; (4) *Alameda Whipsnake Site Assessment for the Via Verdi Culvert Replacement Project, Swaim Biological Incorporated*, dated January 13, 2012; and (5) other information available to the Service.

Consultation History

September 26, 2011	The Service received the biological assessment and request for formal consultation for the Via Verdi Culvert Repair Project from the Corps.
January 3, 2012	The Service sent an electronic mail request to the Corps for further information regarding the Via Verdi Culvert Repair Project.
January 4, 2012	The Service participated in a meeting regarding the Via Verdi Culvert Repair Project with the Corps. The Service requested information regarding the Via Verdi Culvert Repair Project during the meeting.
January 13, 2012	The Service received electronic mail from the Corps with responses to our requests for further information.

BIOLOGICAL OPINION

Description of the Proposed Action

Project Background

In April 2010, the City of Richmond responded to an emergency "sinkhole" that collapsed unexpectedly at Via Verdi near El Portal Drive. Subsequently, the street known as Via Verdi was closed due to the collapse of a portion of Via Verdi into the "sinkhole". This is the only street access for a community of single family homes and several apartment buildings (known as the Sobrante Glen) and serves as a point of access for an apartment complex located at Via Verdi and El Portal Drive. This event was proclaimed by the City of Richmond as a local state of emergency with implications to street infrastructure and access to nearby communities through Via Verdi, local utilities (sanitary sewer and water supply), San Pablo Creek, the upstream San Pablo Reservoir, and the nearby apartment structures.

The project site also intersects San Pablo Creek and occupies portions of the Richmond, California 7.5 minute USGS quadrangle. The project area covers approximately 10 acres while the approximate area of focus, where a culvert collapsed, is 130 feet long, 30 to 50 feet in width, and 30 feet in depth.

Based on as-built plans of the culvert, this 33-year old culvert was constructed of large oval shape corrugated metal pipe, approximately 22-foot, 6-inch width and 15-foot, 8-inch height. The grading plans for the subdivision above also included placement of a large engineering fill terrace adjacent to El Portal Drive, with approximately 2:1 (horizontal: vertical) slopes as high as 30 feet. This fill terrace is currently undeveloped grassland and is the property of the Rolling Hills Memorial Park Cemetery (Cemetery Property). In addition, buttress fill details were called for to address shallow slide debris in an area northwest of the collapse area further uphill along Via Verdi.

Starting at the upstream end, the culvert alignment runs in a southwesterly direction adjacent to an apartment complex, underneath Via Verdi, under the south-eastern corner of the engineered fill terrace, and then turns south (perpendicular to El Portal Drive) under El Portal Drive to the downstream headwall at the southern edge of El Portal Drive. The bottom of culvert is 35 feet long and 30 feet below existing grade at Via Verdi and El Portal Drive respectively, with even greater overburden as the culvert passes underneath the engineered fill terrace.

Project Overview

Initial completed site work included developing access for residents by constructing a temporary bypass road through the adjacent Cemetery Property, and design and permitting for a temporary shored channel to restore San Pablo Creek flow at the collapsed culvert section.

The City of Richmond will reconstruct the collapsed culvert by designing and constructing a new reinforced concrete box culvert. The design of the repair will include a reinforced concrete headwall at the upstream end of the new culvert and the endwall at the downstream end of the new culvert. In addition to the restoration of the culvert itself, there will be design related to utilities (i.e. stormwater tie-ins), restoration of creek areas adjacent to the headwall and endwall, revegetation, pavement and road rehabilitation, road design for Via Verdi and restoration of the Creekview Apartment Complex (i.e. parking area and entrance to parking area) affected by the culvert collapse, day lighting as much of the creek as feasible at the previous headwall area (approximately 30 feet), utility re-construction in Via Verdi, demolition of the temporary bypass road, and restoration of the adjacent impacted cemetery property to its general former condition. The replacement of the remaining intact culvert will be done with open cut methods to minimize shoring and facilitate construction given the limited construction window and that El Portal will be closed during construction to provide adequate construction space and laydown areas. The design of the repair will include a reinforced concrete headwall at the upstream end of the new culvert and the endwall at the downstream end of the new culvert. This work will require pavement removal, excavation, vegetation removal, and the relocation of underground utilities. It is also anticipated that during construction, shoring will be required at various locations where site constraints from private properties and the shored channel do not allow for sloping back of the excavation.

Utility service providers (i.e., East Bay Municipal Utility District, Pacific Gas & Electric, and Comcast) will conduct construction of temporary bypasses and relocation of their facilities as related to the culvert repair work prior to the start of culvert repair construction. The bypasses/relocation required for the sanitary sewers owned by the West County Sanitary District will be carried out by the contractor for the project. Underground utilities that failed during the catastrophic collapse, including water supply and sanitary sewer, will be reconstructed more or less in their original alignment in Via Verdi.

Conservation Measures

The project proponent proposes to avoid and minimize for affects to listed species through the following conservation measures:

1. Within 15 calendar days, prior to the onset of activities, the applicant will submit the name(s) and credentials of biologists who will conduct activities specified in the following measures. No earthmoving or other project activities will begin until written approval from the Service has been received that the biologist(s) is qualified to conduct the work. The Service-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.

2. Before any construction activities begin, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the Alameda whipsnake and the California red-legged frog and its habitat, the importance of the Alameda whipsnake and the California red-legged frog and their respective habitats, the general measures that are being implemented to conserve the Alameda whipsnake and the California red-legged frog as they relate to the project, the penalties for non-compliance, and the boundaries within which the project may be accomplished. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions. Construction workers will sign a form stating that they attended the program and understand all protection measures for the Alameda whipsnake and the California red-legged frog.

3. Prior to the initiation of excavation, construction, or vehicle operation, the project area will be surveyed by a Service-approved biologist to ensure that no Alameda whipsnakes or California red-legged frogs are present. This survey is not intended to be a protocol-level survey, but rather one designed to verify that no Alameda whipsnakes or California red-legged frogs are present within the construction area before construction activities begin. Two preconstruction surveys for California red-legged frog and Alameda whipsnake will be conducted by a qualified biologist in and adjacent to the project area. The surveys will be conducted within 48 and 24 hours prior to construction. During the pre-construction surveys, the construction area will be inspected and the biologist will also inspect areas of San Pablo Creek both upstream and downstream of the area. If any California red-legged frogs are found, the Service will be contacted and the Service-approved biologist will be allowed sufficient time to move any California red-legged frogs from the work site before work activities begin. If any Alameda whipsnakes are found, all activities will cease, the Service will be immediately contacted, and no other actions will be taken without authorization from the Service. Only Service-approved biologists will participate in activities associated with the capture, handling, and monitoring of California red-legged frogs. Any biologist involved with the surveying/handling will employ sterilization techniques appropriate to avoid the transmission of diseases to and from the site.

4. Immediately after the second survey, construction fencing and silt fencing will be installed around the work area to prevent the disturbance of sensitive habitats and the movement of any reptiles or amphibians into the project area. The bottom of the silt fencing will be buried. The Service-approved biologist will supervise the installation of the fencing around the work area. Access routes, turn-around and parking areas, and staging areas will be limited to the minimum necessary to achieve the project goal.

5. A Service-approved biologist will monitor all ground disturbing construction activities. After ground disturbing project activities are complete, the Service-approved biologist will train an individual to act as the on-site biological monitor. The Service-approved biological monitor will have attended the training described in *Conservation Measure 2* above. Both the Service-approved biologist and the biological monitor will have the authority to stop and/or redirect project activities to ensure protection of resources and compliance with all environmental permits and conditions of the project. The Service-approved biologist or biological monitor will complete a daily log summarizing activities and environmental compliance. The daily log and weekly, monthly and quarterly summaries will be placed on a file sharing website that is accessible to regulatory staff at any time.

6. A Service-approved biologist or construction monitor will conduct daily construction monitoring, making a thorough inspection of the construction site and fences for the presence of Alameda whipsnakes or California red-legged frogs. These site inspections will take place each morning before the start of construction activities.

7. If any Alameda whipsnakes or California red-legged frogs are found, all activities will cease, the Service will be immediately contacted, and no other actions will be taken without authorization from the Service. Construction will be halted until all Alameda whipsnakes or California red-legged frogs depart on their own or are removed from the work area by the Service-approved biologist. Actions taken to relocate Alameda whipsnakes or California red-legged frogs will be conducted under the guidance of the Service and California Department of Fish and Game (CDFG). The Service-approved biologist may relocate any Alameda whipsnakes or California red-legged frogs that are in danger of immediate harm from project-related activities, to a nearby safe location outside the work area that will remain undisturbed throughout the duration of the project. The Service-approved biologist will monitor any California red-legged frogs or Alameda whipsnakes that have been relocated until it is determined that it is not imperiled by predators or other dangers.

8. Construction will take place during daylight hours only.

9. Prior to being brought on site, all vehicles and machinery will be inspected for fluid leaks. No vehicles or machinery exhibiting signs of leaking fluid will be brought on site.

10. A fine mesh screen will be used on the intake to the pump used for the upstream cofferdam to ensure that no Alameda whipsnakes, California red-legged frogs, or other amphibians and reptiles are taken at the pump.

11. Any vegetation to be removed will be hand-cleared. No machinery or vehicles that disturb the ground surface will be allowed in areas in which the ground is not clearly visible.

12. Construction activities in San Pablo Creek and the associated riparian habitat will be timed to occur during the latter part of the dry season (non-breeding season for California red-legged frogs) (April 15 to October 15).

13. All areas disturbed as a result of project related activities will be re-vegetated with native plant species only.

14. Erosion control and sediment detention devices (e.g., well-anchored sandbag cofferdams, straw bales, or silt fences) will be incorporated into the proposed project design and implemented at the time of construction. These devices will be in place during construction activities, and after if necessary, for the purposes of minimizing fine sediment and sediment/water slurry input to flowing water and of detaining sediment laden water onsite. These devices will be placed at all locations where the likelihood of sediment input exists.

15. The biological monitor will inspect the performance of the pumps and the sediment control devices at least once each day during construction to ensure that the devices are functioning properly. The pump intake will be inspected to insure that it is not becoming clogged, and if necessary, debris will be removed regularly. If an erosion control measure is not functioning effectively, the control measure will be immediately repaired or replaced. Additional controls will be installed as necessary.

16. All debris, sediment, rubbish, vegetation, or other material removed from the channel banks, channel bottom, or sediment basins will be disposed of at an approved disposal site. All petroleum products, chemicals, silt, fine soils, and any substance or material deleterious to listed species will not be allowed to pass into, or be placed where it can pass into, the stream channel. There will be no side-casting of material into any waterway.

17. During project activities, all trash that may attract predators will be properly contained, removed from the work site and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas. Construction materials will be managed to minimize the provision of cover for frogs by removing all surface construction debris daily except that required for construction.

18. To mitigate for erosion impacts, best management practices for construction will be implemented during and after construction. These include measures such as installing silt fences, placing rice-straw bales on and directly downstream of exposed soils, and minimizing exposed surfaces.

19. All fueling and maintenance of vehicles and other equipment and staging areas will occur at least 60 feet from any riparian habitat or water body. The Corps and applicant will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the Corps will ensure that the applicant will prepare a plan to allow 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.

20. The biological monitor will ensure that the spread or introduction of invasive exotic plant species will be avoided to the maximum extent possible. When practicable, invasive exotic plants in the project areas will be removed.

21. To minimize temporary disturbances, all project-related vehicle traffic shall be restricted to established roads, construction areas, and specifically designated access areas. These areas also should be included in preconstruction surveys and, to the maximum extent possible, should be established in locations disturbed by previous activities to prevent further adverse effects.

22. Tightly woven fiber netting or similar material shall be used for erosion control or other purposes at the project site to ensure that Alameda whipsnakes do not become entangled in the mesh. Coconut coir matting is an acceptable erosion control material. No plastic mono-filament matting shall be used for erosion control.

23. To avoid entrapment and prevent injury or mortality of listed species resulting from trenching activities, the perimeter of the construction site will be contained with silt fending or similar material that excludes amphibians and reptiles. Approaches to the edge of the trench will be blocked along El Portal with concrete barriers known as K-rails.

24. Pipes that are stored on the site will be inspected for trapped animals before the pipe is used in any way. Pipes in or adjacent to trenches left overnight will be capped.

25. All vehicle parking will be restricted to existing roads. Necessary vehicles belonging to the biological monitors and construction supervisors will be parked at the nearest point on existing access roads. A 15 mile-per-hour speed limit on the dirt access road will be imposed for all vehicles during construction activities.

26. A post-construction survey will be conducted the night before the cofferdams are removed to make sure no Alameda whipsnakes or California red-legged frogs have occupied the temporary pool created upstream of the site. If any Alameda whipsnakes or

California red-legged frogs are present, they will be captured by hand and removed upstream of the pond to prevent them being potentially stranded when the dams are removed during the daylight hours and the water levels drop.

27. The applicant, the City of Richmond, will restore approximately 1,000 square feet (0.023 acres) or approximately 30 linear feet of riparian area along San Pablo Creek at the project site. This restored habitat will compensate for temporary impacts to California red-legged frog habitat during construction. No permanent loss of habitat for the Alameda whipsnake and the California red-legged frog is anticipated. Habitat restoration will include, but is not limited to, replanting native vegetation, removal of non-native invasive vegetation, and removal of all currently existing erosion control materials that contain plastic monofilament and replace with them with coconut fiber products where necessary. The applicant will coordinate habitat restoration activities with the Service and the CDFG.

Analytical Framework for the Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analysis in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the Alameda whipsnake and California red-legged frog range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the Alameda whipsnake and California red-legged frog in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of Alameda whipsnake and California red-legged frog; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on Alameda whipsnake and California red-legged frog; and (4) the *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on Alameda whipsnake and California red-legged frog.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the Alameda whipsnake and the California red-legged frog current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the Alameda whipsnake and the California red-legged frog in the wild. The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the Alameda whipsnake and the California red-legged frog and the role of the action area in the survival and recovery of the Alameda whipsnake and the California red-legged frog as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the purposes of the effects assessment, the action area includes the Via Verdi Culvert Repair Project area footprint and lands surrounding the Via Verdi Culvert Repair Project area footprint, including the project footprint and potential habitat for the Alameda whipsnake and the California red-legged frog for a total of 10 acres.

Status of the Species

Alameda whipsnake

For the most recent status of this species please refer to the 5-Year Review published in 2011 (Service 2011).

California red-legged frog

Listing Status: The California red-legged frog was listed as a threatened species on May 23, 1996 (61 FR 25813) (Service 1996). Critical habitat was designated for this species on April 13, 2006 (71 FR 19244) (Service 2006b) and revisions to the critical habitat designation were published on March 17, 2010 (75 FR 12816) (Service 2010). At this time, the Service recognized the taxonomic change from *Rana aurora draytonii* to *Rana draytonii* (Shaffer et al. 2010). A Recovery Plan was published for the California red-legged frog on September 12, 2002 (Service 2002b).

Description: The California red-legged frog is the largest native frog in the western United States (Wright and Wright 1949), ranging from 1.5 to 5.1 inches in length (Stebbins 2003). The abdomen and hind legs of adults are largely red, while the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins 2003), and dorsolateral folds are prominent on the back. Larvae (tadpoles) range from 0.6 to 3.1 inches in length, and the background color of the body is dark brown and yellow with darker spots (Storer 1925).

Distribution: The historic range of the California red-legged frog extended from the vicinity of Elk Creek in Mendocino County, California, along the coast inland to the vicinity of Redding in Shasta County, California, and southward to northwestern Baja California, Mexico (Fellers 2005; Jennings and Hayes 1985: Hayes and Krempels 1986). The species was historically documented in 46 counties but the taxa now remains in 238 streams or drainages within 23 counties, representing a loss of 70 percent of its former range (Service 2002b). California red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the Central California Coast. Isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse Ranges. The species is believed to be extirpated from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico.

Status and Natural History: California red-legged frogs predominately inhabit permanent water sources such as streams, lakes, marshes, natural and manmade ponds, and ephemeral drainages in valley bottoms and foothills up to 4,921 feet in elevation (Jennings and Hayes 1994, Bulger et al. 2003, Stebbins 2003). However, they also inhabit ephemeral creeks, drainages and ponds with minimal riparian and emergent vegetation. California red-legged frogs breed from November to April, although earlier breeding records have been reported in southern localities. Breeding generally occurs in still or slow-moving water often associated with emergent vegetation, such as cattails, tules, or overhanging willows (Storer 1925, Hayes and Jennings 1988). Female frogs deposit egg masses on emergent vegetation so that the egg mass floats on or near the surface of the water (Hayes and Miyamoto 1984).

Habitat includes nearly any area within 1-2 miles of a breeding site that stays moist and cool through the summer including vegetated areas with coyote brush, California blackberry thickets, and root masses associated with willow and California bay trees (Fellers 2005). Sheltering habitat for California red-legged frogs potentially includes all aquatic, riparian, and upland areas within the range of the species and includes any landscape feature that provides cover, such as animal burrows, boulders or rocks, organic debris such as downed trees or logs, and industrial debris. Agricultural features such as drains, watering troughs, spring boxes, abandoned sheds, or hay stacks may also be used. Incised stream channels with portions narrower and depths greater than 18 inches also may provide important summer sheltering habitat. Accessibility to sheltering habitat is essential for the survival of California red-legged frogs within a watershed, and can be a factor limiting frog population numbers and survival.

California red-legged frogs do not have a distinct breeding migration (Fellers 2005). Adults are often associated with permanent bodies of water. Some individuals remain at breeding sites year-round, while others disperse to neighboring water features. Dispersal distances are typically less than 0.5-mile, with a few individuals moving up to 1-2 miles (Fellers 2005). Movements are typically along riparian corridors, but some individuals, especially on rainy nights, move directly from one site to another through normally inhospitable habitats, such as heavily grazed pastures or oak-grassland savannas (Fellers 2005).

In a study of California red-legged frog terrestrial activity in a mesic area of the Santa Cruz Mountains, Bulger et al. (2003) categorized terrestrial use as migratory and non-migratory. The latter occurred from one to several days and was associated with precipitation events. Migratory movements were characterized as the movement between aquatic sites and were most often associated with breeding activities. Bulger et al. (2003) reported that non-migrating frogs typically stayed within 200 feet of aquatic habitat 90 percent of the time and were most often associated with dense vegetative cover, i.e., California blackberry, poison oak and coyote brush. Dispersing frogs in northern Santa Cruz County traveled distances from 0.25-mile to more than two miles without apparent regard to topography, vegetation type, or riparian corridors (Bulger et al. 2003).

In a study of California red-legged frog terrestrial activity in a xeric environment in eastern Contra Costa County, Tatarian (2008) noted that a 57 percent majority of frogs fitted with radio transmitters in the Round Valley study area stayed at their breeding pools, whereas 43 percent moved into adjacent upland habitat or to other aquatic sites. Her study reported a peak seasonal terrestrial movement occurring in the fall months associated with the first 0.2-inch of precipitation and tapering off into spring. Upland movement activities ranged from 3 to 233 feet, averaging 80 feet, and were associated with a variety of refugia including grass thatch, crevices, cow hoof prints, ground squirrel burrows at the base of trees or rocks, logs, and under man-made structures; others were associated with upland sites lacking refugia (Tatarian 2008). The majority of terrestrial movements lasted from 1 to 4 days; however, one adult female was reported to remain in upland habitat for 50 days (Tatarian 2008). Upland refugia closer to aquatic sites were used more often and were more commonly associated with areas exhibiting higher object cover, e.g., woody debris, rocks, and vegetative cover. Subterranean cover was not significantly different between occupied upland habitat and non-occupied upland habitat.

California red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto 1984). Egg masses containing 2,000 to 5,000 eggs are attached to vegetation below the surface and hatch after 6 to 14 days (Storer 1925, Jennings and Hayes 1994). In coastal lagoons, the most significant mortality factor in the pre-hatching stage is water salinity (Jennings et al. 1992). Eggs exposed to salinity levels greater than 4.5 parts per thousand resulted in 100 percent mortality (Jennings and Hayes 1990). Increased siltation during the breeding season can cause asphyxiation of eggs and small larvae. Larvae undergo metamorphosis 3½ to 7 months following hatching and reach sexual maturity 2 to 3 years of age (Storer 1925; Wright and Wright 1949; Jennings and Hayes 1985, 1990, 1994). Of the various life stages, larvae probably experience the highest mortality rates, with less than 1 percent of eggs laid reaching metamorphosis (Jennings et al. 1992). California red-legged frogs may live 8 to 10 years (Jennings et al. 1992). Populations can fluctuate from year to year; favorable conditions allow the species to have extremely high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of occupied sites. In contrast, the animal may temporarily disappear from an area when conditions are stressful (e.g., during periods of drought, disease, etc.).

The diet of California red-legged frogs is highly variable and changes with the life history stage. The diet of the larvae is not well studied, but is likely similar to that of other ranid frogs, which feed on algae, diatoms, and detritus by grazing on the surface of rocks and vegetation (Fellers 2005; Kupferberg 1996a, 1996b, 1997). Hayes and Tennant (1985) analyzed the diets of California red-legged frogs from Cañada de la Gaviota in Santa Barbara County and found invertebrates (comprising 42 taxa) to be the most common prey item consumed; however, they speculated that this was opportunistic and varied based on prey availability. They ascertained that larger frogs consumed larger prey and were recorded to have preyed on Pacific chorus frogs, three-spined stickleback, and, to a limited extent, California mice, which were abundant at the study site (Hayes and Tennant 1985, Fellers 2005). Although larger vertebrate prey was consumed less frequently, it represented over half of the prey mass eaten by larger frogs suggesting that such prey may play an energetically important role in their diets (Hayes and Tennant 1985). Juvenile and subadult/adult frogs varied in their feeding activity periods; juveniles fed for longer periods throughout the day and night, while subadult/adults fed nocturnally (Hayes and Tennant 1985). Juveniles were significantly less successful at capturing prey and all life history stages exhibited poor prey discrimination, feeding on several inanimate objects that moved through their field of view (Hayes and Tennant 1985).

Recovery Plan: The Recovery Plan for the California red-legged frog identifies eight recovery units (Service 2002b). The establishment of these recovery units is based on the determination that various regional areas of the species' range are essential to its survival and recovery. These recovery units are delineated by major watershed boundaries as defined by U.S. Geological Survey hydrologic units and the limits of its range. The goal of the Recovery Plan is to protect the long-term viability of all extant populations within each recovery unit. Within each recovery unit, core areas have been delineated and represent contiguous areas of moderate to high California red-legged frog densities that are relatively free of exotic species such as bullfrogs. The goal of designating core areas is to protect metapopulations. This, when combined with suitable dispersal habitat, will allow for the long term viability within existing populations. The management strategy identified within the Recovery Plan will allow for the recolonization of habitats within and adjacent to core areas that are naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of California red-legged frogs

Threats: Habitat loss, non-native species introduction, and urban encroachment are the primary factors that have adversely affected the California red-legged frog throughout its range. Several researchers in central California have noted the decline and eventual local disappearance of California and northern red-legged frogs in systems supporting bullfrogs (Jennings and Hayes 1990; Twedt 1993), red swamp crayfish, signal crayfish, and several species of warm water fish including sunfish, goldfish, common carp, and mosquitofish (Moyle 1976; Barry 1992; Hunt 1993; Fisher and Schaffer 1996). This has been attributed to predation, competition, and reproduction interference. Twedt (1993) documented bullfrog predation of juvenile northern red-legged frogs, and suggested that bullfrogs could prey on subadult California red-legged frogs as well. Bullfrogs may also have a competitive advantage over California red-legged frogs. For instance, bullfrogs are larger and possess more generalized food habits (Bury and Whelan 1984). In addition, bullfrogs have an extended breeding season (Storer 1933) during which an individual female can produce as many as 20,000 eggs (Emlen 1977). Furthermore, bullfrog larvae are unpalatable to predatory fish (Kruse and Francis 1977). Predation by bullfrogs on California red-legged frogs may result in uneven sex ratios and increase the potential for Allee effects. Both California and northern red-legged frogs have been observed in amplexus (mounted on) with both male and female bullfrogs (Jennings and Hayes 1990; Twedt 1993; Jennings 1993). Thus bullfrogs are able to prey upon and out-compete California red-legged frogs, especially in sub-optimal habitat.

The urbanization of land within and adjacent to California red-legged frog habitat has also affected the threatened amphibian. These declines are attributed to channelization of riparian areas, enclosure of the channels by urban development that blocks dispersal, and the introduction of predatory fishes and bullfrogs. Diseases may also pose a significant threat, although the specific effects of disease on the California red-legged frog are not known. Pathogens are suspected of causing global amphibian declines (Davidson et al. 2003). Chytridiomycosis and ranaviruses are a potential threat because these diseases have been found to adversely affect other amphibians, including the listed species (Davidson et al. 2003; Lips et al. 2006). Mao et al. (1999 cited in Fellers 2005) reported northern red-legged frogs infected with an iridovirus, which was also presented in sympatric threespine sticklebacks in northwestern California. Non-native species, such as bullfrogs and non-native tiger salamanders that live within the range of the California red-legged frog have been identified as potential carriers of these diseases (Garner et al. 2006). Humans can facilitate the spread of disease by encouraging the further introduction of non-native carriers and by acting as carriers themselves (i.e., contaminated boots, waders or fishing equipment). Human activities can also introduce stress by other means, such as habitat fragmentation, that results in the listed species being more susceptible to the effects of disease.

Environmental Baseline

Five general habitat types were identified on the project site. These are native-nonnative ornamental, California annual grassland, coyote brush chaparral, broadleaf deciduous riparian woodland, and mixed broadleaf woodland (Sawyer and Keeler-Wolf, 1995). Plant species found in native-nonnative ornamental included maple, pacific madrone, eucalyptus, pine, oak, poison oak, and clover. Species found in the California annual grassland included wild oat, Canada thistle, California poppy, black mustard, English plantain, vetch, blessed milkthistle, field sowthistle, and lupine. The coyote brush chaparral vegetation consists of coyote brush and poison oak. Broadleaf deciduous riparian woodland species included maple, willow, California buckeye, and poison oak. Oak, red willow, and poison oak were found in the mixed broadleaf woodland.

The habitats within and surrounding the project site support a varied assemblage of wildlife, which may move up and down the riparian corridor along San Pablo Creek from time to time. The riparian and upland vegetation in the vicinity provides foraging habitat and cover for several mammal species. These include western gray squirrel, coyote, and mule deer.

Land use in the vicinity includes residential, commercial, and open space areas. The project action area is bounded on the west by Interstate 80 and by the Rolling Hills Memorial Park, a privately-owned cemetery to the north. The eastern portion of the area includes a portion of Via Verdi Drive, a two-land residential street connected to a neighborhood located approximately 300 feet further east. Also within the eastern portion of the project action area is San Pablo Creek, a northwest-trending creek that flows from near Orinda to San Pablo Bay. The southern portion of the project action area abuts the parking lot of a nearby apartment complex, as well as a portion of El Portal Drive and a residential/commercial area to its south. Further to the south El Portal connects to San Pablo Dam Road, a major expressway linking the cities of Richmond and Orinda.

Alameda whipsnake

Existing threats in the action area include loss and modification of habitat, disturbance from artificial lighting, noise, vehicular-caused injury or mortality, and predation or harassment by domestic pets. Urbanization and development continues to encroach upon existing suitable habitat. There is limited suitable habitat for Alameda whipsnakes for foraging, breeding, basking, and finding cover and hibernacula within the project footprint and action area. The southern and eastern portions of the project site are dominated by paved portions of Via Verdi and El Portal, and riparian areas associated with San Pablo Creek. These areas lack habitat elements typically associated with core Alameda whipsnake habitat including scrub/shrub communities with a mosaic of open and closed canopy, and are not contiguous to areas with these habitat elements. There are no rock outcrops or talus within the project action area. However, Alameda whipsnakes may be drawn to paved areas within the project site for basking.

The portion of the study area north of El Portal and south of the bypass road contains a small amount of coyote brush. North of the bypass road, the existing stockpile area and the proposed stockpile area further to the north have similar habitat characteristics. Both areas are dominated by annual grasses, but lack significant scrub/shrub habitat suitable for the Alameda whipsnake. There are few rodent burrows within the project action area. There are also patches of ground devoid of vegetation and disturbed soil area, which may a product of grading and landscaping activities by the cemetery.

The project area is located 0.5 mile northwest of Critical Habitat Unit AWS-1 (Tilden-Briones). There are multiple documented occurrences (> 50) of Alameda whipsnakes within AWS-1. Several of these are located within 3.8 to 6.1 miles of the project site (California Natural Diversity Database (CNDDB) 2012; Swaim Biological Incorporated (SBI) 2012). There are no recorded occurrences of Alameda whipsnake within or in close proximity to the project action areas. No Alameda whipsnakes were observed during reconnaissance field surveys (SBI 2012). However, the Service believes that Alameda whipsnakes may be present in the project action area because of the close proximity of highly suitable habitat to the project site, some grassland habitat is available within the action area, Alameda whipsnakes may be drawn to paved areas within the site for basking, and Alameda whipsnakes may also utilize the San Pablo Creek riparian corridor for foraging and dispersal.

California red-legged frog

Existing threats are similar to those described above for the Alameda whipsnake. There is suitable habitat to support California red-legged frogs within the project action area. The project action area provides all the necessary habitat features to support breeding, foraging, and cover for the California red-legged frog. Overhanging riparian vegetation protects pools up to three-feet deep in the upstream portion of the project site. Stream conditions downstream include well-developed riparian cover and a shallow, gravely stream bed. These areas may provide habitat for California red-legged frog.

The project action area is located about 3.6 miles from Critical Habitat Unit CCS-1 for the California red-legged frog. The nearest documented occurrence of California red-legged frogs is less than one half-mile from the project action area, on a tributary to San Pablo Creek (Nichols Consulting Engineers (NCE) 2011). There are several other documented occurrences of California red-legged frogs within 3.4 to 5.5 miles of the project site (NCE 2011; CNDDB 2012).

Therefore, based on the biology and ecology of this species, it is reasonable to conclude that California red-legged frogs would utilize the San Pablo Creek riparian corridor for breeding, foraging, and dispersal.

Effects of the Proposed Action

Mortality, injury, or harassment of the Alameda whipsnake and California red-legged frog could occur from being crushed by project related equipment or vehicles, construction debris, and worker foot traffic within the action area. The collapse of small mammal burrows could expose individuals to predation or adverse environmental conditions. Individuals of these two listed species also could fall into trenches, pits, or other excavations, and then be directly killed or unable to escape and be killed due to desiccation, entombment, or starvation. Work activities may cause individuals to leave the work site, and surrounding areas within 300 feet of the worksite, which could subject the individuals to increased predation or adverse environmental conditions. This disturbance and displacement may increase the potential for predation, desiccation, competition for food and shelter, or strike by vehicles on roadways.

Various conservation measures such as minimizing the total area disturbed by project activities, collapsing burrows to make sure individuals are not crushed, providing escape ramps in trenches, and properly constructed exclusionary fencing may reduce mortality, injury, or harassment. Preconstruction surveys and the relocation of Alameda whipsnakes and California red-legged frogs may reduce injury or mortality. However, the capturing and handling of Alameda whipsnake and California red-legged frogs to remove them from the work area may result in the harassment, mortality or injury of individuals. Improper handling, containment, or transport of individuals should be reduced or prevented by use of a Service-approved biologist, and by limiting the duration of handling, and requiring the proper transport of these species to suitable habitat, as determined by the Service-approved biologist, located a minimum of 500 feet from the project action area.

Other work activities associated with the Via Verdi Culvert Repair Project also may adversely affect Alameda whipsnakes and California red-legged frogs. Trash left during or after project activities could attract predators to work sites, which could subsequently harass or prey on the animals. For example, raccoons, crows, and ravens are attracted to trash and also prey opportunistically on amphibians and reptiles. Accidental spills of hazardous materials or careless fueling or oiling of vehicles or equipment could degrade water quality or habitat to a degree where snakes and frogs are adversely affected.

Some potential also exists for disturbance of habitat which could result in the spread or establishment of non-native invasive plant species. However, additional conservation measures such as removing trash at the end of each work day, conducting biological resources awareness training for all project personnel, and including measures to prevent spills may reduce mortality, injury, or harassment of these listed species.

Biologists working in different areas and with different species may transmit diseases by introducing contaminated equipment. The chance of a disease being introduced into a new area is greater today than in the past due to the increasing occurrences of disease throughout amphibian populations in California and the United States. It is possible that chytrid fungus may exacerbate the effects of other diseases on California red-legged frogs or increase the sensitivity of this amphibian to environmental changes (e.g., water pH) that reduce normal immune response capabilities (Bosch et al. 2001). Implementation of the *Declining Amphibian Populations Task Force Fieldwork Code of Practice* (Service 2005b) during any aquatic survey activity will likely prevent transfer of diseases through contaminated equipment or clothing.

The proposed project will result in temporary disturbance of 10 acres of habitat over an eight-month construction period from March 2012 to October 2012. This will result in a temporary loss of riparian habitat for the Alameda whipsnake and the California red-legged frog. Construction activities for the proposed project will include grading, excavation, vegetation removal, and relocation of underground utilities. These proposed construction activities may result in habitat degradation, decreased water quality, which may adversely affect any Alameda whipsnakes or California red-legged frogs that may be within the project action area.

Work in the riparian corridor is expected to occur over a five to six month period from April 15, 2012 to October 15, 2012. During construction it is anticipated that there will be shoring required for construction along and within the creek. Alameda whipsnakes and California red-legged frogs will be excluded from the riparian corridor during this time, resulting in a temporary loss of riparian habitat. This temporary loss of riparian habitat may result in decreased breeding opportunities for California red-legged frogs and limited foraging and cover for both species. The riparian corridor upstream and downstream of the construction site is relatively intact willow riparian forest. Approximately 9,000 square feet of this riparian woodland will have to be cleared upstream of the culvert and approximately 2,500 square feet will need to be cleared downstream of the culvert. To the extent practicable, the clearing of these riparian areas will be minimized and avoided. After construction is complete, cleared areas will be restored through revegetation with native willow cuttings and other native species from the local vicinity.
Implementation of the proposed conservation measures will significantly reduce adverse effects to Alameda whipsnakes and California red-legged frogs during project construction. Revegetation with native plants will restore riparian habitat for Alameda whipsnakes and California red-legged frogs.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Habitat loss, fragmentation, development, and urbanization pose the greatest conservation threats to Alameda whipsnake and the California red-legged frog. Encroachment from residential developments could result in further habitat loss and fragmentation for the Alameda whipsnake and the California red-legged frog.

The global average temperature has risen by approximately 0.6 degrees Celsius during the 20th Century (Intergovernmental Panel on Climate Change 2001, 2007; Adger et al. 2007). There is an international scientific consensus that most of the warming observed has been caused by human activities (Intergovernmental Panel on Climate Change 2001, 2007; Adger et al. 2007), and that it is "very likely" that it is largely due to manmade emissions of carbon dioxide and other greenhouse gases (Adger et al. 2007). Ongoing climate change (Inkley et al. 2004; Kerr 2007; Adger et al. 2007; Kanter 2007) likely imperils these listed species and the resources necessary for their survival. Since climate change threatens to disrupt annual weather patterns, it may result in a loss of their habitat and/or prey, and/or increased numbers of their predators, parasites, and diseases. Where populations are isolated, a changing climate may result in local extinction, with range shifts precluded by lack of habitat.

Conclusion

Alameda whipsnake and California red-legged frog

After reviewing the current status of the Alameda whipsnake and the California red-legged frog, the environmental baseline for the project area, the effects of the proposed project, and the cumulative effects, it is the Service's biological opinion that the Via Verdi Culvert Repair Project, as proposed, is not likely to jeopardize the continued existence of these two listed species because a limited number of Alameda whipsnakes and California red-legged frogs will be taken as a result of the project, relative to the status of the species in and around the action area and range-wide. However, even with the implementation of the proposed Conservation Measures, the Service still believes that there is a likelihood of take of these listed species.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.
The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps: (1) fails to require the applicant to adhere to the terms and conditions of the incidental take statement

through enforceable terms that are added to the permit or grant document, and/or; (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

The Service anticipates that incidental take of the Alameda whipsnake and California red-legged frog will be difficult to detect because of their life histories. Specifically, when California red-legged frogs are not in their breeding ponds, they inhabit the burrows of ground squirrels or other rodents or may be moving from one location to another, and may be difficult to locate due to their cryptic appearance and behavior; they may be located a distance from the breeding ponds; and the finding of an injured or dead individual is unlikely because of their relatively small body size. Losses of these species also may be difficult to quantify due to seasonal fluctuations in their numbers, random environmental events, changes in water regime at their breeding ponds, or additional environmental disturbances. In addition, Alameda whipsnakes may be difficult to detect because of their cryptic appearance and behavior. Therefore, the Service anticipates that all Alameda whipsnakes and California red-legged frogs inhabiting 10 acres comprising the project area will be subject to incidental take in the form of harm and harassment.

In addition, the Service anticipates that one Alameda whipsnake and one California red-legged frog inhabiting 10 acres comprising the permanent effects associated with the Via Verdi Culvert Repair Project will be subject to incidental take in the form of capture, injury, or death. Upon implementation of the Reasonable and Prudent Measures, these levels of incidental take associated with the Via Verdi Culvert Repair Project in the form of harm, harassment, capture, injury, and death of the Alameda whipsnake and California red-legged frog caused by habitat loss and construction activities will become exempt from the prohibitions described under section 9 of the Act.

Effect of the Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy to Alameda whipsnake or California red-legged frog.

Reasonable and Prudent Measure

The Service has determined that the following reasonable and prudent measure is necessary and appropriate to minimize the effects of the Via Verdi Culvert Repair Project on the Alameda whipsnake and California red-legged frog:

Adverse effects to Alameda whipsnakes and California red-legged frogs and their habitat shall be minimized to the extent possible.

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. All of the conservation measures described in this biological opinion shall be fully implemented and adhered to. Further, these conservation measures shall be supplemented by the terms and conditions below:

   a. The Corps will incorporate the requirement to fully implement all the proposed conservation measures as a condition of its permit to the applicant for this project.

   b. The Corps will condition its permit to require compliance with the reporting requirements of this biological opinion, including a post construction report outlining how the Conservation Measures were implemented for this project.

   c. To avoid transferring disease or pathogens while handling California red-legged frogs, the Corps shall require all applicants to follow the Declining Amphibian Populations Task Force Fieldwork Code of Practice.

   d. The Corps will condition its permit to require the City of Richmond to submit a monitoring plan and success criteria for the proposed revegetation plan to the Service for review and approval prior to implementation.

Reporting Requirements

The Service and the CDFG must be notified within one (1) working day of the finding of any injured or dead Alameda whipsnake, California red-legged frog, or any unanticipated damage to their habitats associated with the proposed project. Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Notification must include the date, time, and precise location of the individual/incident clearly indicated on a USGS 7.5 minute quadrangle and other maps at a finer scale, as requested by the Service, and any other pertinent information. Dead individuals must be sealed in a Zip-lock® plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site. The Service contact persons are the Coast Bay / Forest Foothills Division Chief at (916) 414-6600; and the Resident Agent-in-Charge of the Service's Division of Law Enforcement, 2800 Cottage Way, Room W-2928, Sacramento, California 95825, at (916) 414-6660. The Department of Fish and Game contact is John Krause at (707) 944-5500. The applicant shall submit a post-construction compliance report prepared by the Service-approved biologist to the Sacramento Fish and Wildlife Office within thirty (30) calendar days of the date of the completion of construction activity. This report shall detail (i) dates that construction occurred; (ii) pertinent information concerning the success of the project in meeting conservation measures; (iii) an explanation of failure to meet such measures, if any;

(iv) known project effects on the Alameda whipsnake and California red-legged frog, if any; (v) occurrences of incidental take of Alameda whipsnakes and California red-legged frogs if any; (vi) documentation of employee environmental education; and (vii) other pertinent information.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and data bases.

1. The Service recommends the Corps develop and implement the appropriate restoration measures in areas designated in the *Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, California* (Service 2002a), and the *Recovery Plan for the California Red-legged Frog* (Service 2002b).

2. The Corps should encourage or require the use of appropriate California native species in vegetation and habitat enhancement efforts.

3. The Corps should incorporate "environmentally friendly" erosion and stabilization techniques whenever possible in this project.

4. To avoid transferring disease or pathogens while handling amphibians, the Corps should encourage all applicants to follow the Declining Amphibian Populations Task Force Fieldwork Code of Practice (Service 2005b).

5. Sightings of any listed or sensitive animal species should be reported to the CNDDB of the CDFG. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION--CLOSING STATEMENT

This concludes formal consultation on the Via Verdi Culvert Repair Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the action agency must immediately request reinitiation of formal consultation. Please contact Florence Gardipee or Ryan Olah, Coast Bay / Forest Foothills Division Chief, of this office at (916) 414-6600, or by email (Flo_Gardipee@fws.gov or Ryan_Olah@fws.gov).

Sincerely,

for Susan K. Moore
Field Supervisor

cc:
John Heal, Nichols Consulting Engineers, Richmond, California

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Appendix H

RHEEM CREEK MITIGATION SITE MEMO

Via Verdi Slope Stabilization Project
Rheem Creek Mitigation Site Technical Memo

Date:	5/7/19	Project Number:	568.41.55
To:	Yader Bermudez, Engineering and CIP Director		
From:	Mack Casterman		
Subject:	Results of Special Status Species Database Search and Vegetation Assessment for Rheem Creek Mitigation Site		

Dear Mr. Bermudez,

This technical memorandum (tech memo) presents the results of a special status species database search for species that have the potential to occur within the boundaries of the proposed Rheem Creek mitigation site for the Via Verdi Slope Stabilization Project. This tech memo also includes the results of two tree and vegetation surveys completed on November 13 of 2018 and April 17 of 2019 at the proposed mitigation site.

The tech memo was prepared consistent with Task 12 of NCE's scope of work dated September 20, 2018. Accompanying this tech memo are three tables (**Tables 1, 2, and 3**) and two figures (**Figures 1, and 2**) that summarize the results of the surveys.

The Rheem Creek mitigation site is an 800 foot section of Rheem Creek fronting the Contra Costa College parking lot and college facilities near Mills Avenue and Shane Drive (**Figure 1**).

Survey Methods

The proposed mitigation site was visited on November 13 in 2018 and on April 17 in 2019. During the surveys, trees four inches or greater in diameter at breast height (DBH) within the mitigation site were identified and mapped. For each tree, species, native or non-native status, and DBH was recorded. During the surveys, vegetation community types were classified, and every vegetation species observed within the mitigation site was recorded.

Plant Species and Habitat Observed

The habitat within the Rheem Creek mitigation site is characterized by a non-native tree overstory including blackwood acacia (*Acacia melanoxylon*), privet (*Ligustrum sp.*), eucalyptus (*Eucalyptus* globulus) and wild plum (*Prunus cerasifera*). The understory is dominated by English ivy (*Hedera helix*), non-native annual grasses and Himalayan blackberry (*Rubus armeniacus*) with a large, approximately 60 foot by 20 foot patch of giant reed (*Arundo donax*) in the southern half of the proposed mitigation site. A complete list of plant species observed at the Rheem Creek mitigation site is recorded in **Table 1** below.

Table 1. Plant Species Identified Within the Rheem Creek Mitigation Site, November 2018, April 2019

Scientific Name	Common Name	Native: Y, N
Acacia melanoxylon	Blackwood acacia	N
Allium triquetrum	White flowered onion	N
Arundo donax	Giant reed	N
Avena fatua	Wildoats	N
Centranthus ruber	Jupiter's beard	N
Ehrharta erecta	Upright veldt grass	N
Fraxinus sp.	Ash	N
Foeniculum vulgare	Fennel	N
Galium parisiense	Wall bedstraw	N
Geranium mole	Crane's bill geranium	N
Hedera helix	English ivy	N
Heteromeles arbutifolia	Toyon	Y
Juglans hindsii	Black Walnut	Y
Ligustrum sp.	Privet	N
Malva parviflora	Cheeseweed	N
Marah fabaceus	Wild cucumber	Y
Oxalis pes-caprae	Sourgrass	N
Phoenix canariensis	Canary Island date palm	N
Plantago major	Common plantain	N
Tradica sebifera	Chinese tallowtree	N
Typha latifolia	Broadleaf cattail	Y
Prunus cerasifera	Wild plum	N
Rubus armeniacus	Himalayan blackberry	N
Salix sp.	Willow	Y

Tree Observations

At the Rheem Creek mitigation site, 7 native trees were identified and 63 non-native trees were identified (**Table 2**).

Table 2. Rheem Creek Tree Information – Note: Tree ID numbers correspond with Figure 2

ID #	DBH (inch)	Species	Notes	Native: Y / N
133	6	Acacia		N
134	6	Acacia		N
135	6	Acacia		N
136	6	Acacia		N
137	30	Black Walnut	2 Trunk	Y
138	11	Acacia		N
139	15	Live Oak		Y
140	5	Acacia		N
141	8	Acacia		N
142	5	Acacia		N
143	5	Acacia	2 Trunk	N
144	10	Privet	3 Trunk	N
145	15	Privet	2 Trunk	N
146	10	Privet	Many Trunk	N
147	10	Privet		N
148	8	Wild Plum	Many Trunk	N
149	8	Wild Plum		N
150	10	Wild Plum	Many Trunk	N
151	9	Wild Plum	Many Trunk	N
152	8	Black Walnut		Y
153	4	Wild Plum		N
154	4	Black Walnut	2 Trunk	Y
155	5	Black Walnut	Many Trunk	Y
156	5	Black Walnut		Y

Table 2. Rheem Creek Tree Information – Note: Tree ID numbers correspond with Figure 2				
ID #	**DBH (inch)**	**Species**	**Notes**	**Native: Y/N**
157	7	Acacia	2 Trunk	N
158	5	Acacia		N
159	4	Acacia		N
160	7	Wild Plum		N
161	15	Acacia		N
162	20	Wild Plum	Many Trunk	N
163	10	Acacia		N
164	10	Acacia	5 Trunk	N
165	6	Wild Plum	Many Trunk	N
166	6	Acacia		N
167	9	Privet		N
168	6	Acacia		N
169	6	Acacia		N
170	8	Ash	5 Trunk	N
171	9	Acacia		N
172	8	Privet		N
173	7	Privet		N
174	10	Willow	5 Trunk	N
175	8	Black Walnut		Y
176	10	Ash	Many Trunk	N
177	6	Chinese tallow tree	DBH Estimated, tree inaccessible	N
178	8	Acacia		N

Table 2. Rheem Creek Tree Information – Note: Tree ID numbers correspond with Figure 2

ID #	DBH (inch)	Species	Notes	Native: Y/N
179	5	Acacia		N
180	7	Wild Plum		N
181	10	Wild Plum	multi trunk	N
182	5	Acacia		N
183	8	Acacia		N
184	9	Ash		N
185	5	Wild Plum		N
186	8	Ash	multi trunk	N
187	48	Eucalyptus		N
188	37	Eucalyptus		N
189	36	Eucalyptus		N
190	40	Eucalyptus		N
191	46	Eucalyptus		N
192	24	Eucalyptus	multi trunk	N
193	12	Chinese tallow tree		N
194	12	Chinese tallow tree		N
195	6	Ash	multi trunk	N
196	8	Acacia	multi trunk	N
197	30	Eucalyptus		N
198	48	Eucalyptus		N
199	45	Eucalyptus		N
200	20	Eucalyptus		N

Table 2. Rheem Creek Tree Information – Note: Tree ID numbers correspond with Figure 2				
ID #	**DBH (inch)**	**Species**	**Notes**	**Native: Y/N**
201	40	Eucalyptus		N
202	36	Eucalyptus		N

Results of Special Status Species Database Search

A wide variety of taxa native to the state of California have low population numbers, limited distributions, or are otherwise vulnerable to extinction or extirpation within the state. Although they may include ecologically significant units and sub-species as well as species, these taxa are collectively referred to as “special status species.”

Relevant information was reviewed to assess the likelihood of special status species to occur within the proposed mitigation area and the results are summarized for the Rheem Creek area in **Table 3** below.

The following site-specific references and background information was reviewed:

- *California Natural Diversity Database* (CNDDB). 2019. California Department of Fish and Wildlife, Sacramento, CA. Accessed online.
- California Native Plant Society, Rare Plant Program. 2019. *Inventory of Rare and Endangered Plants of California* (online edition, v8-03). Accessed online.
- Information for Planning and Conservation (IPaC). 2019. United States Fish and Wildlife Service. Accessed online.

Based on the results of the database research and site visits to assess the presence of special status species and their habitats, a determination was made regarding the potential for each species to occur within the mitigation site. These determinations are presented in **Table 3** below. Species that are known to occur in the general region of the project, but which do not have adequate habitat within the mitigation site or that had geographic or constructed barriers blocking migratory corridors between known populations and the mitigation area were listed as “absent” or “unlikely”. Species that were not observed during the site visit but which have suitable habitat present within the mitigation site were listed as “possible”. Any species that was observed within the mitigation site during the survey is listed as “present”.

No special status species were observed within or adjacent to the mitigation site during the site visit. Additionally, based on the assessment described above, it is unlikely that any special status plant or animal species would occur within or adjacent to the mitigation site (**Table 3**).

Table 3. List of Special Status Species that May Occur in the Vicinity of the Rheem Creek Mitigation Site

Species	Status	Habitat	Occurrence in the Project Site
Plant Species			
Alkali milk-vetch (*Astragalus tener* var. *tener*)	CNPS 1B.2	Valley grassland, alkali sink, freshwater wetlands	**Absent.** Potential habitat does not exist on site
California seablite (*Suaeda californica*)	FE, CNPS 1B.1	Marshes and swamps (coastal salt)	**Absent.** Potential habitat does not exist on site
Coast iris (*Iris longipetala*)	CNPS 4.2	Coastal prairie, lower montane coniferous forest, meadows and seeps	**Absent.** Potential habitat does not exist on site
Coastal bluff morning-glory (*Calystegia purpurata* ssp. *saxocola*)	CNPS 1B.2	Coastal bluff scrub, coastal dunes, coastal scrub, north coast coniferous forest	**Absent.** Potential habitat does not exist on site
Diablo helianthella (*Helianthella castanea*)	CNPS 1B.2	Broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland	**Absent.** Potential habitat does not exist on site
Fragrant fritillary (*Fritillaria liliacea*)	CNPS 1B.2	Cismontane woodland, coastal prairie, coastal scrub, valley and foothill grassland	**Absent.** Potential habitat does not exist on site
Lobb's aquatic buttercup (*Ranunculus lobbii*)	CNPS 4.2	Cismontane woodland, north coast coniferous forest, valley and foothill grassland, vernal pools	**Absent.** Potential habitat does not exist on site
Loma Prieta hoita (*Hoita strobilina*)	CNPS 1B.1	Usually serpentinite, mesic habitats including chaparral, cismontane woodland, and riparian woodland	**Absent.** Potential habitat does not exist on site

Table 3. List of Special Status Species that May Occur in the Vicinity of the Rheem Creek Mitigation Site			
Species	**Status**	**Habitat**	**Occurrence in the Project Site**
Long-styled sand-spurrey (*Spergularia macrotheca* var. *longistyla*)	1B.2	Alkaline soils in meadows and seeps, marshes and swamps	**Absent.** Potential habitat does not exist on site
Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*)	CNPS 1B.2	Chaparral, Cismontane woodland, Valley and foothill grassland	**Absent.** Potential habitat does not exist on site
Oakland star-tulip (*Calochortus umbellatus*)	CNPS 4.2	Boradleafed upland forest, chaparral, cismontane woodland, lower montane coniferous forest, valley and foothill grassland	**Absent.** Potential habitat does not exist on site
Oregon meconella (*Meconella oregana*)	CNPS 1B.1	Coatal prairie, coastal scrub	**Absent.** Potential habitat does not exist on site
Pallid manzanita (*Arctostaphylos pallida*)	FT, CE, CNPS 1B.1	Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, coastal scrub	**Absent.** Potential habitat does not exist on site
Point Reyes birds-beak (*Cordylanthus maritimus* ssp. *palutris*)	CNPS 1B.2	Coastal salt marsh, wetland riparian	**Absent.** Potential habitat does not exist on site
Saline clover (*Trifolium hydrophilum*)	CNPS 1B.2	Marshed and swamps, valley and foothill grassland (mesic, alkaline), vernal pools	**Absent.** Potential habitat does not exist on site
Santa Cruz tarplant (*Holocarpha macradenia*)	FT, CNPS 1B.1	Coastal prairie, coastal scrub, valley and foothill grassland	**Absent.** Potential habitat does not exist on site
Western leatherwood (*Dirca occidentalis*)	CNPS 1B.2	Broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, north coast coniferous forest, riparian forest, riparian woodland	**Absent.** Potential habitat does not exist on site

Table 3. List of Special Status Species that May Occur in the Vicinity of the Rheem Creek Mitigation Site			
Species	**Status**	**Habitat**	**Occurrence in the Project Site**
Avian Species			
San Pablo song sparrow (*Melospiza molodia samuelis*)	CSC	Tidal salt marshes along north size of San Francisco and San Pablo Bay	**Absent.** Potential habitat does not exist on site
California least tern (*Sternula antillarum browni*)	FE, SE, FP	Migratory. Feeds in shallow estuaries or lagoons where small fish are abundant. Breeds in abandoned salt ponds and along estuarine shores in San Francisco Bay. Breeding occurs in areas free of human or predatory disturbance from April-August	**Absent.** Potential habitat does not exist on site
California ridgeway's rail (*Rallus obsoletus obsoletus*)	FE, CE, FP	Requires emergent wetlands and tidal sloughs, although occasionally uses transition zone between wetland and adjacent upland habitat. Nesting occurs mid-March to July in lower zones of saline emergent wetlands, where cordgrass (*Spartina* sp.) is abundant and tidal sloughs are nearby	**Absent.** Potential habitat does not exist on site
Western snowy plover (*Charadrius alexandrinus nivosus*)	Ft, CSC, BCC	Sandy beaches, sand spits, dune-backed beaches, sparsely-vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries. Breeding occurs March-September in Shallow scrapes or depressions in the sand	**Absent.** Potential habitat does not exist on site

Table 3. List of Special Status Species that May Occur in the Vicinity of the Rheem Creek Mitigation Site			
Species	**Status**	**Habitat**	**Occurrence in the Project Site**
Yellow-billed cuckoo (*Coccyzuz americanus*)	FT	Canopies of deciduous trees in woodland patches with gaps and clearings. Often found in riparian forests	**Absent.** Potential habitat does not exist on site
Mammal Species			
Salt marsh harvest mouse (*Reithrodontomys raviventris*)	FE, CSC, FP	Salt and brackish marshes with dense cover and a high percentage of pickleweed	**Absent.** Potential habitat does not exist on site
Herptile Species			
Alameda whipsnake (*Masticophis lateralis euryxanthus*)	FT, CT	Common in scrublands broken by scattered grassy patches, rocky hillsides, gullies, canyons, or stream courses	**Absent.** Potential habitat does not exist on site
California red-legged frog (*Rana draytonii*)	FT, CSC	A pond frog that inhabits humid forests, woodlands, grasslands, and streamsides; however, frequents otherwise permanent sources of water. Breeds January-April and can be found in damp woods during non-breeding periods	**Unlikely.** Potential habitat does not exist on site. Rheem Creek is an urbanized watershed with low habitat value for this species. There are no documented occurrences for the species within Rheem Creek.
Fish Species			
Delta smelt (*Hypomesus transpacificus*)	FT, CE	Estuary of Sacramento River. Brackish and fresh water	**Absent.** Habitat not present
Tidewater goby (*Eucyclogobius newberryi*)	FE	Lagoons formed by streams running into the sea. The tidewater goby prefers salinities of less than 10 ppt.	**Absent.** Habitat not present
Invertebrate Species			
Callippe silverspot butterfly (*Speyeria callippe callippe*)	FE	Native grasslands and adjacent habitats. Host plant is Johnny-jump-up (*Viola pedunculata*)	**Absent.** Suitable habitat for this species does not occur within project area

Table 3. List of Special Status Species that May Occur in the Vicinity of the Rheem Creek Mitigation Site

Species	Status	Habitat	Occurrence in the Project Site
San Bruno elfin butterfly (*Callophrys mossii bayensis*)	FE	Rocky outcrops and cliffs in coastal scrub, in the fogbelt of steep north facing slopes that receive little direct sunlight. Host plant is broadleaf stonecrop (*Sedum spathulifolium*)	**Absent.** Suitable habitat for this species does not occur within project area

Sources: CNDDB 2018, USFWS 2018, and CNPS 2018.

Present: Species observed on the sites at time of field surveys or during recent past.
Likely: Species not observed on the site, but it may reasonably be expected to occur there on a regular basis.
Possible: Species not observed on the sites, but it could occur there from time to time.
Unlikely: Species not observed on the sites, and would not be expected to occur there except, perhaps, as a transient.
Absent: Species not observed on the sites, and precluded from occurring there because habitat requirements not met.

STATUS CODES
FE: Federally Endangered
FT: Federally Threatened
FPE: Federally Endangered (Proposed)
FC: Federal Candidate

CE: California Endangered
CT: California Threatened
CR: California Rare
CP: California Protected
CSC: California Species of Special Concern
WL: California Watch List
FP: California Fully Protected

BCC: USFWS Birds of Conservation Concern

California Native Plant Society Listing (CNPS)
1A: Plants Presumed Extinct in California
1B: Plants Rare, Threatened, or Endangered in California and elsewhere
2: Plants Rare, Threatened, or Endangered in California, but more common elsewhere
3: Plants about which we need more information – a review list
4: Plants of limited distribution – a watch list
A2: Locally Rare in Alameda and Contra Costa Counties
.1: Seriously threatened in California
.2: Moderately threatened in California
.3: Not very threatened in California

Attachments:
Figure 1: Rheem Creek Project Area
Figure 2: Tree Survey Results, Rheem Creek

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Appendix I

GEOTECHNICAL REPORT

GEOTECHNICAL INVESTIGATION

VIA VERDI LANDSLIDE
RICHMOND, CALIFORNIA

Project No. 867.01
May 1, 2018

Prepared by

Hultgren – Tillis Engineers

A California Corporation
Specializing in Geotechnical Engineering

Hultgren-Tillis
Engineers

May 1, 2018
Project No. 867.01

NCE
501 Canal Blvd. Suite I
Richmond, CA 94804

Attention: Mr. Ryan Shafer

Geotechnical Investigation
Via Verdi Landslide
Richmond, California

Dear Mr. Shafer:

We performed a geotechnical investigation for the landslide which developed along Via Verdi in Richmond, California in accordance with the proposals dated March 1 and March 28, 2017, the Master Subconsultant Agreement dated March 2, 2017, and the Work Authorization dated March 3, 2017. The results of the investigation are presented in the attached report.

It was a pleasure working with you on this project. If you have any questions, please call.

Sincerely,

Hultgren – Tillis Engineers

Joseph C. Heavin
Geotechnical Engineer

R. Kevin Tillis
Geotechnical Engineer

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APPENDIX B – LABORATORY TESTING

APPENDIX C – INCLINOMETER DATA

APPENDIX D – PIEZOMETER DATA

APPENDIX E – SLOPE STABILITY RESULTS

I. INTRODUCTION

This report presents the results of our geotechnical investigation for the Via Verdi Landslide in Richmond, California. A landslide developed along Via Verdi in late February 2017. The landslide extends upslope of Via Verdi onto Rolling Hills Memorial Park (Cemetery) property. The landslide moved toward San Pablo Creek and displaced the road. A vicinity map showing the approximate location of the site is presented on Plate 1. A map showing the topography at the site is shown on the Site Plan, Plate 2.

Via Verdi is the only access road for the Sobrante Glen Subdivision which consists of single family homes and apartment buildings. The road was constructed in the late 1970's as part of Sobrante Glen development. The Via Verdi right-of-way (ROW) also serves as the alignment for local utilities including water, sanitary sewer, gas, electricity and telecommunications.

An East Bay Municipal Utility District (EBMUD) water main and a sanitary sewer line were damaged from the initial slide movement. Both were replaced with above grade pipes. In late March 2017, the City of Richmond (City) constructed an emergency bypass road above the slide on the Cemetery property. Vehicular traffic was diverted onto the emergency road in early April 2017. Utilities (sanitary sewer, gas and electric) were relocated along the shoulders of the bypass road in mid April.

Our scope of services was outlined in our proposals dated March 1 and March 28, 2017. Our scope of services consisted reviewing geologic maps, drilling borings to collect samples of the underlying materials, installing inclinometers to measure the lateral movement of the landslide, installing piezometers to measure the groundwater conditions, performing laboratory testing to characterize the materials encountered in the borings, and developing repair alternatives based on information from the borings, inclinometers, and piezometers. The results of our geotechnical investigation are presented in this report.

II. FIELD EXPLORATION AND LABORATORY TESTING

The geotechnical field exploration program was divided into two phases. The first phase involved drilling borings and installing inclinometers near and within the Via Verdi roadway and shoulder. The second phase involved drilling borings and installing inclinometers and vibrating wire piezometers above and below the roadway. The approximate locations of the inclinometers and piezometers are shown on the Site Plan, Plate 2. The coordinates are presented in Table 1.

Table 1: Boring and Instrumentation Locations

Name	Latitude	Longitude
Boring 1 – I-1	37.96692	-122.31876
Boring 2 – I-2	37.96683	-122.31910
Boring 3 – I-3	37.96672	-122.31921
Boring 4 – I-4	37.96678	-122.31888
Boring 7 – I-5	37.96690	-122.31919
Boring 8 – I-6	37.96696	-122.31889
Boring 5 – P-1	37.96710	-122.31911
Boring 6 – P-2	37.96693	-122.31904
Boring 9 – P-3	37.96677	-122.31894

We explored subsurface conditions on March 8 through March 10, 2017 by drilling four borings to depths of about 70 feet below existing grade. After the borings were completed, an inclinometer was installed in each of the borings (Inclinometers I-1 through I-4). Our subcontractor drilled the borings with truck-mounted auger drilling equipment and continuous hollow-stem augers. Samples were collected from Inclinometers I-1 and I-2 but not from Inclinometers I-3 and I-4.

We explored subsurface conditions again on March 23, 24, and 27, 2017 by drilling five borings to depths of 63 to 70 feet below existing grade. After Borings 5, 6, and 9 were completed, piezometers were installed in each of the borings (Piezometers P-1 through P-3). After Borings 7 and 8 were completed, an inclinometer was installed in each of the borings (Inclinometers I-5 through I-6). Our subcontractor drilled the borings with track-mounted auger drilling equipment and either continuous hollow-stem augers or continuous solid flight augers. Samples were collected from Piezometers P-1 and P-2 but not from Piezometer P-3 or Inclinometers I-5 and I-6.

We collected samples with a 2.5-inch outside diameter (OD), 1.9-inch inside diameter (ID) split barrel samplers for Borings 1 and 2 (Inclinometers I-1 and I-2) and for Borings 5 and 6 (Piezometers P-1 and P-2). The samplers were driven with 140-pound hammers dropping approximately 30-inches for a penetration depth of up to 18-inches. The hammers utilized automatic trip systems.

Our engineer logged the borings and recorded blow counts from driving the samplers. We recovered samples for further visual classification and for selection of materials for laboratory testing. Our engineer used a pocket penetrometer to evaluate unconfined compressive strength. After the inclinometers and piezometers were installed, the borings were backfilled with bentonite-cement grout.

We converted the field penetration resistance obtained while driving the 2.5-inch sampler to equivalent SPT N-values by multiplying by 0.8 to account for sampler size. Soil descriptions, equivalent SPT N-values and the laboratory test data are shown on the Logs of Boring in Appendix A, Plates A-1 through A-8. The soil descriptions are presented in general accordance with the Soil Classification System presented on Plate A-9 and Physical Properties for Rock Descriptions on Plate A-10. Laboratory test results are presented in the manner described by the Key to Test Data on Plate A-9.

The laboratory testing program consisted of moisture content and dry density measurements, Atterberg limits and sieve analysis. Atterberg limits test results are shown in Appendix B, Plate B-1.

We performed baseline slope inclinometer readings after the casings were installed. Subsequent readings were performed regularly until slope movement exceeded the limits of the inclinometer probe. Four of the six inclinometers have pinched off and additional readings are not possible. The inclinometer readings are presented in Appendix C.

We installed a vibrating wire piezometer at three different elevations at each of the piezometer locations (nine total). We installed a multiple channel data logger at each piezometer location which took readings every 15 minutes. The piezometer readings are presented in Appendix D. The elevations (NAVD88) of the piezometers are presented in the Table 2.

Table 2: Piezometer Elevations

Piezometer Number	Ground Surface Elevation (feet)	Piezometer Elevations (feet)
P-1	112	52, 67, 82
P-2	106.5	39.5, 54.5, 74.5
P-3	102.5	40.5, 65.5, 75.5

III. SITE CONDITIONS

A. Geologic Setting

Via Verdi is located between a hillside slope and San Pablo Creek. The road is located about 50 feet above San Pablo Creek. The slope continues above the road extending up about 100 feet in elevation. The preliminary photointerpretation landslide map prepared by Nilsen (1975) indicates that there is a landslide deposit in the hill to the northwest of the site and there is a colluvial deposit along the hill to the northeast. The landslide deposit is mapped in the southeastern direction. The geology map prepared by Dibblee (2005) indicates the northern portion of the site is underlain by (Tor) described as interbedded terrestrial pebble conglomerate, sandstone and claystone of the Orinda Formation and the southern portion by (Qa) described as alluvial gravel, sand and clay of the valley areas. The geologic map by Nilsen (1975) is presented on Plate 3. The geologic map by Dibble (2005) is presented on Plate 4.

The site was graded to develop the Sobrante Glen subdivision. We reviewed grading plans by KCA Engineers titled "Grading Plan, Subdivision 5493, 'Sobrante Glen'" and originally dated December 6, 1977 and modified to "As built" on February 26, 1983. Extensive filling occurred to raise the grade for Via Verdi within the limits of the landslide. The plans indicate that fill was placed to construct the Via Verdi roadway. The fill thicknesses range from 20 feet to 33 feet below the landslide according to the as-built plans. The plans called for the removal of some slide debris prior to new fill being placed and construction of subdrains at the base of the fill. The "As built" addition to the grading plans indicates that a desilting basin was constructed above the road and a temporary top soil stockpile was placed upslope of the desilting basin. The desilting basin and temporary soil stockpile remain and apparently were not removed.

B. Surface Conditions

Via Verdi is a two lane roadway that generally runs in the east-west direction and serves as the only access to the Sobrante Glen development to the east. The road is located between San Pablo Creek (to the south) and the Cemetery property (to the north). A graded but undeveloped pad lies to the west of the landslide area.

The road is about 40 feet wide with a sidewalk along its southern edge. Dirt shoulders extend to the ROW to the north and to the south beyond the sidewalk. There is a chain link fence about 10 feet north of the road along the property line. The elevation of the road in the landslide area varies from about 106 feet to 99 feet (NAVD 88).

An approximately 2:1 (horizontal to vertical) slope extends down to San Pablo Creek below. The lower portion of the slope is covered in heavy vegetation and trees. The flow line of San Pablo Creek is around Elevation 65 feet below the landslide. San Pablo Creek flows into a large culvert approximately 200 feet downstream of the centerline of the slide.

A 10 to 12 foot tall slope extends above Via Verdi. There is a 12 foot wide bench mid slope. Above the slope is a slightly lower area around Elevation 110 feet (NAVD 88). The low area, called out as the desilting basin on the 1983 as built plans, is about 300 feet wide and extends up to 100 feet away from the edge of slope. Beyond the desilting basin, the ground surface gradually rises about another 10 feet to the base of the Cemetery hillside, about 150 to 200 feet away. The area behind the desilting basin was called out as a temporary top soil stockpile. The desilting basin is covered in grasses with heavy vegetation and trees around the base of the Cemetery hills.

At the time of our investigation, we observed small amounts of standing water in the desilting basin area.

C. Landslide

We performed an initial site visit on February 28, 2017 to observe the area. An EBMUD water line and a sanitary sewer had been damaged. The pipes were located on the northern side of the road. We observed a scarp in the retention basin area above the road. The scarp was up to 12-inches high. The scarp extended down the slope and is about 200 feet wide at the upslope side of the road. We observed some cracking beyond the southern edge of the sidewalk. The road surface, curb and gutter, and sidewalk contained minor cracks, but appeared to be intact otherwise. NCE performed a survey of the head scarp and the approximate location of the head scarp and landslide limits are shown on Plate 2.

The initial slope movement and the crack above the roadway occurred after weeks of intense rain. After the initial slope movement, the EBMUD and sanitary sewer lines were temporarily relocated above grade along the northern shoulder of Via Verdi. Two sinkholes developed along the road and sidewalk on the eastern side of the landslide on March 23rd. The sinkholes occurred above and below the storm drain manhole on the southern edge of Via Verdi. The City conducted a video inspection of the storm drain pipes entering and exiting the manhole and found that they were broken in multiple locations. The sinkholes were subsequently filled with rock.

We installed a total of six inclinometers in the landslide. Inclinometer I-1 moved laterally about ½-inch per day and then sheared off by March 14th. Inclinometers I-2 through I-4 moved laterally up to ¼-inch per day and then sheared off between March 23rd and March 29th. Inclinometers I-5 and I-6 indicated a slower rate of movement up to ¼-inch per day. The landslide continues to move.

A typical section through the site along with the active slide affecting the roadway is shown on Plate 5. The depth to the bottom of the active slide varies from about 39 feet to 53 feet below Via Verdi. The toe of the landslide is not visible and is inferred to be below or within San Pablo Creek.

D. Subsurface Conditions

In general, the landslide area is underlain by fill. The thickness of the fill varies from 31 feet to 35 feet in our borings along the Via Verdi roadway and shoulder and decreases in thickness toward the Cemetery. The fill generally consists of fine grained material which is predominately lean clay and fat clay. The clayey fill contained varying amounts of course grained material including sand and gravel. The consistency of the fill varied from medium stiff to hard. The moisture content of the fill varied from moist to wet.

We encountered topsoil in Inclinometer I-2 and Piezometer P-1 below the fill. The top soil consists of stiff to very stiff fat clay and is 4 to 6.5 feet thick. The topsoil is underlain by elastic silt in Inclinometer I-2 and older landslide debris in Piezometer P-1. The elastic silt is stiff to hard, moist and about 4 feet thick.

The grading plans by KCA Engineering indicate that there was older slide debris at the site. We observed older slide debris in Piezometer P-1. The older slide debris was encountered below the detention basin fill at a depth of about 28 feet which is coincident with the original grade. The thickness of the older slide debris is unknown and has been estimated on our logs. The older slide debris consisted of lean clay, very stiff to hard, and moist.

We encountered Orinda Formation material below the fill and below the silt and/or older landslide debris. The Orinda Formation consists of interbedded claystone, siltstone and sandstone at our boring locations. The rock is intensely fractured to crushed with low hardness. The rock is generally friable with some of the upper portion being plastic. The rock is moderately to deeply weathered.

Our borings were backfilled shortly after completion and groundwater, where encountered, may not represent stabilized conditions. To estimate groundwater conditions, we installed nested piezometers at two locations within the landslide and one location up slope of the slide. Piezometer P-1 indicates that the groundwater level behind the landslide is within a few feet of the ground surface. Piezometer P-2 (upslope portion of the slide) indicates that groundwater was between Elevation 86 feet and 89 feet or about 17.5 feet to 20.5 feet below existing grade. Piezometer P-3 (south side of Via Verdi) indicates that the groundwater is between Elevation 71 feet and 79 feet or about 23.5 feet to 31.5 feet below existing grade. Piezometer P-3 also indicates that there is an elevated groundwater level in the rock.

The above descriptions of soil and groundwater conditions summarize observations at the time of our investigation. Conditions are expected to vary across the site and with time and depend on several factors including changes in moisture content resulting from seasonal precipitation and land use changes.

E. Inclinometer Data

Inclinometer readings were collected periodically until the slope movement exceeded the limits of the inclinometer probe. The direction of landslide movement at the inclinometer locations are shown on Plate C-1. Inclinometer I-1 pinched off five days after the baseline reading and indicates that the landslide movement is 38 feet below existing grade. Inclinometer I-2 pinched off seventeen days after the baseline reading and indicates that the landslide movement is 46 feet below existing grade. Inclinometer I-3 pinched off eighteen days after the baseline reading and indicates that the landslide movement is 48 feet below existing grade. Inclinometer I-4 pinched off twelve days after the baseline reading and indicates that the landslide movement is 53 feet below existing grade. Inclinometer I-5 indicates that the landslide movement is 38 feet below existing grade. Inclinometer I-6 indicates that the landslide movement is 40 feet below grade. The inclinometer readings are presented in Appendix C.

F. Piezometer Data

Piezometer readings were recorded every 15 minutes by a data logger at each piezometer location. The ground surface elevations and the elevations of the piezometers are presented in Table 2. The piezometer readings are presented in Appendix D.

IV. DISCUSSION AND CONCLUSIONS

A. General

The Via Verdi landslide began in late February 2017 after intense rainfall in January and February. The landslide is approximately 300 feet wide and extends up to 53 feet below the ground surface. The approximate landslide volume is 80,000 cubic yards. The landslide is moving toward San Pablo Creek. The data from the inclinometers and borings indicates that the base of landslide is in the Orinda Formation rock.

The piezometer data indicates that the slide area has high groundwater levels. At the time of the landslide, the groundwater in the area above Via Verdi is only a few feet below the existing grade. During our initial site visits, we observed standing water in the desilting basin area.

B. Landslide Repair Scheme Alternatives

We considered various alternatives to repair the landslide including: (1) an earthwork slope repair, (2) an earthwork slope buttress in San Pablo Creek, (3) subsurface dewatering, and (4) structural retaining. Conceptual sketches of each alternative are shown on Plates 6 through 9. Each alternative is discussed below along with constraints to each alternative.

The site has a number of constraints that make repair of the slide area difficult. The constraints include the depth of the slide and the presence of a sensitive environmental area below the slope in San Pablo Creek with considerable impacts to habitat should it be disturbed. Another constraint is that Via Verdi is the only road to the Sobrante Glen subdivision and repair alternatives will need to maintain access to the neighborhood.

1. Earthwork Slope Repair

This repair option would include removal of the entire landslide to below the existing slide plane and replacement as a compacted fill (Plate 6). The slide plane would be eliminated with this option and the water levels around the slide lowered through placement of extensive subsurface drainage. The soil that is removed from the excavation could be processed and placed as fill. The excavation would be benched into the unexcavated material and drainage placed at the back of each bench. Drainage would need to daylight to the creek or storm drain.

The excavation would likely need to be in excess of 55 feet and would extend below the flow line of San Pablo Creek and disrupt flow within the creek. To work around and below the creek, the creek would need to be bypassed and groundwater levels reduced by dewatering. The existing slope, Via Verdi, and the area above Via Verdi would be removed and replaced.

The slope above the scarp is underlain by old landslide debris and there is an increased risk of slope movement during construction. The removal of the active landslide debris during construction could trigger a much larger landslide above the backcut, increasing the cost and time for construction.

The bypass road and temporary utility alignments may need to be relocated to accommodate the excavation. Given that the temporary alignments are above an old landslide, stability of the bypass road would need to be considered prior to implementation of this alternative.

2. Earthwork Slope Buttress in San Pablo Creek

Another repair option is to buttress the toe of the landslide by filling in San Pablo Creek. A conceptual plan is presented on Plate 7. This alternative includes permanently relocating San Pablo Creek into a culvert, similar to the culvert at El Portal Drive. Backfill would be placed around and over the culvert to raise the ground surface to buttress the landslide. To work around and below the creek, the creek may need to be bypassed and groundwater levels reduced by dewatering.

By constructing an earthen buttress in San Pablo Creek, the bypass road and utilities would not need to be relocated and the repair work could be completely within the City's property. The desilting basin could be excavated for use as fill.

This is a reliable method of reducing the hazard of future landslide movement.

3. Slope Drainage Gallery

We also evaluated a slope drainage gallery. Another option is to lower the groundwater level through installation of a deep drainage gallery. The purpose of the drainage gallery is to intercept groundwater upgradient of the slide to maintain groundwater at a lower level. The drainage gallery could consist of a series of shafts interconnected at or near their bases and drained by a gravity outlet to San Pablo Creek. The large diameter drilled shafts would be filled with a permeable material. A conceptual detail for the drainage gallery is presented on Plate 8. The drainage effects would be similar to the earthwork alternative but the slide plane would not be eliminated.

The drainage gallery would need to be constructed behind the active landslide on Cemetery property. Depending on the location of this alternative, the bypass road and utilities may not need to be relocated.

The effectiveness of the drainage gallery is limited by the flow line of San Pablo Creek. The San Pablo Creek flow line is around Elevation 65 feet in the area of the slide.

4. Structural Repair Alternatives

A fourth option is to resist the landslide movement by constructing buried structural elements within the landslide. Drilled piers, with tie backs, are used to resist landslides. Drilled shafts or piles would be installed through the slide plane. Landslide forces are large and the drilled shafts would need to be heavily reinforced. Drilled shafts installed in a row, could be tied together and anchored behind the slide with tie backs. Multiple rows of drilled shafts may be needed. Smaller pin piles could be installed in array around the landslide as an alternative.

Structural solutions can be configured to remain on City property and to avoid utility lines. Tie backs, if used, would need to extend into the Cemetery property and could impact utilities. Because of the depth of the landslide, the cost of the drilled piers will be very high. To resist movement requires constructing the equivalent of a 50 foot high retaining structure.

C. Analysis

1. Slope Stability Analysis

We performed preliminary slope stability analysis using the computer program SLOPE/W 2016 by Geo-Slope to estimate the active landslide shear strength. We chose a selected cross section for analysis, landslide geometry based on the inclinometer measurements and borings, and groundwater conditions based on the piezometer data.

We assumed the Via Verdi roadway fill material had a friction angle of 20 degrees for design. We then calculated the friction angle within the Orinda Formation which produced a factor of safety of 1.0. The analysis yielded a friction angle of 13 degrees for the failure plane in the Orinda Formation. We used this active landslide model for evaluating the repair alternatives. The results for the existing landslide are presented on Plate E-1.

After establishing the landslide models we evaluated the earthwork slope repairs, the slope buttress within the San Pablo Creek, and drainage gallery alternatives. We modeled the earthwork slide repair by increasing the friction angle of the repaired area and by lowering the groundwater table. The factor of safely was increased to 1.75.

We evaluated the slope buttress by placing fill in San Pablo Creek. To account for the lighter weight of the culvert, we reduced the weight of the soil buttress by about 30 percent. The soil buttress increases the factor of safety to 1.68 for the active landslide model.

We modeled the drainage gallery alternative by lowering the groundwater table behind the landslide. The factor of safety was increased to 1.2 by lowering the groundwater level in the active landslide.

The slope stability results indicate that the earthwork slope repair and the option of filling the creek are feasible. The drainage only solution is not effective in increasing the factor of safety. The slope stability analysis results are presented in Appendix E.

REFERENCES

REFERENCES

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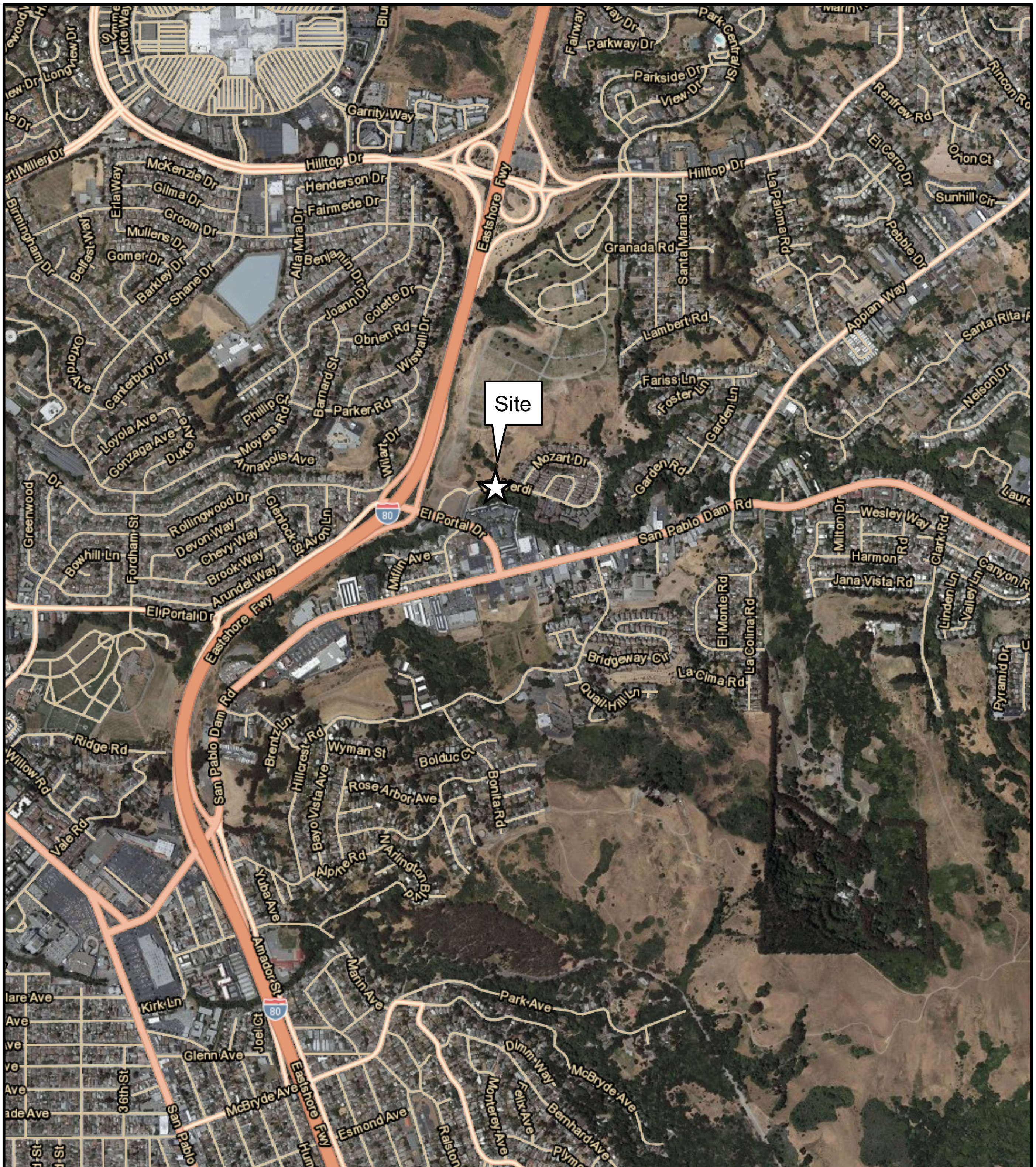
KCA Engineering, 1977 & 1983, Grading Plan, Subdivision 5493, “Sobrante Glen”.

Nilsen, T. H., 1975, Preliminary Photointerpretation Map of Landslide and Other Surficial Deposits of the Richmond 7.5' Quadrangle, Contra Costa County, California: U.S. Geological Survey, Open File Map 75-277-47.

PLATES



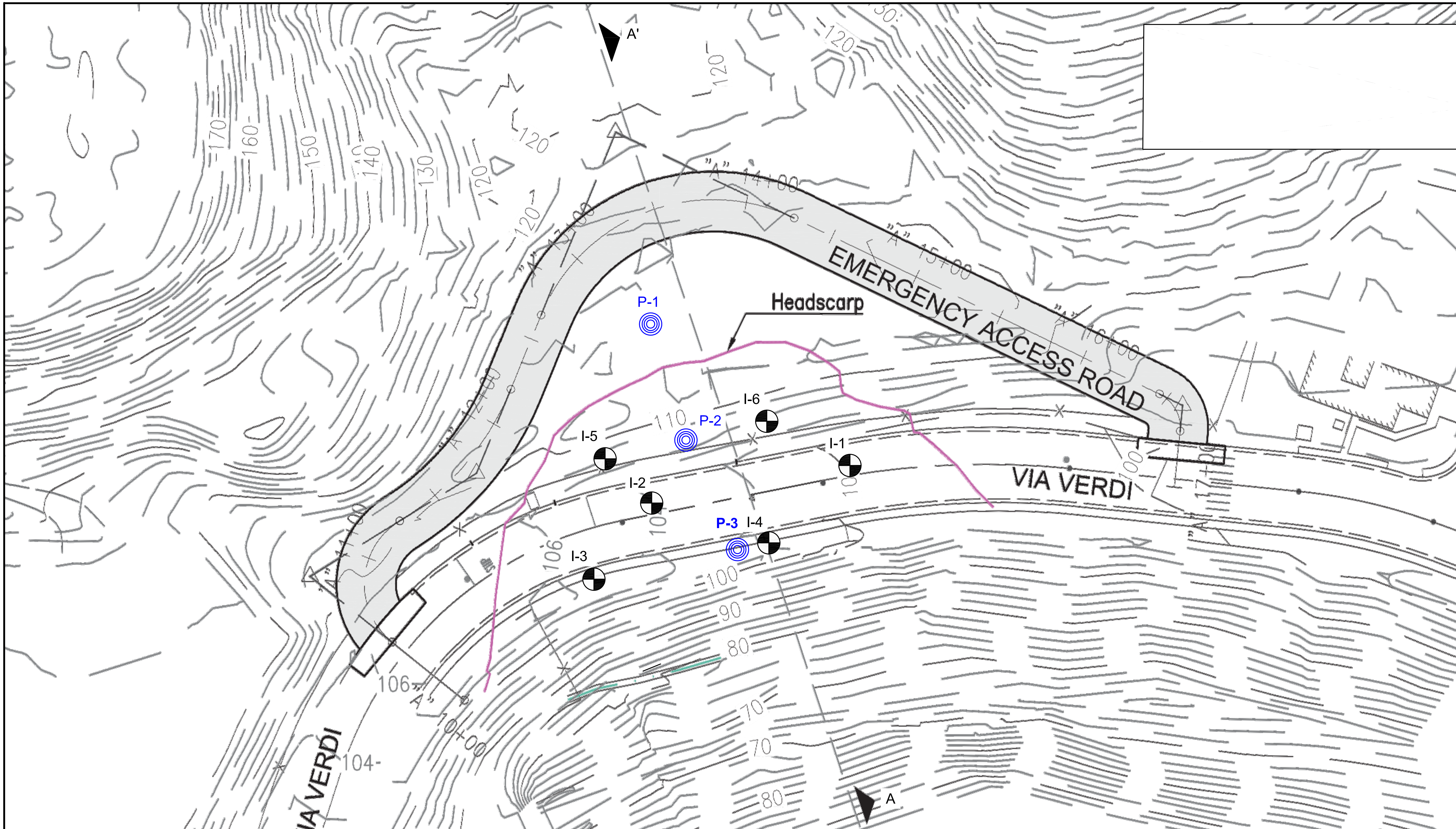
0 2,000 feet

1 inch = 2,000 feet

Via Verdi Landslide
Richmond, California

Vicinity Map

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 1



Approximate Location of Inclinometer

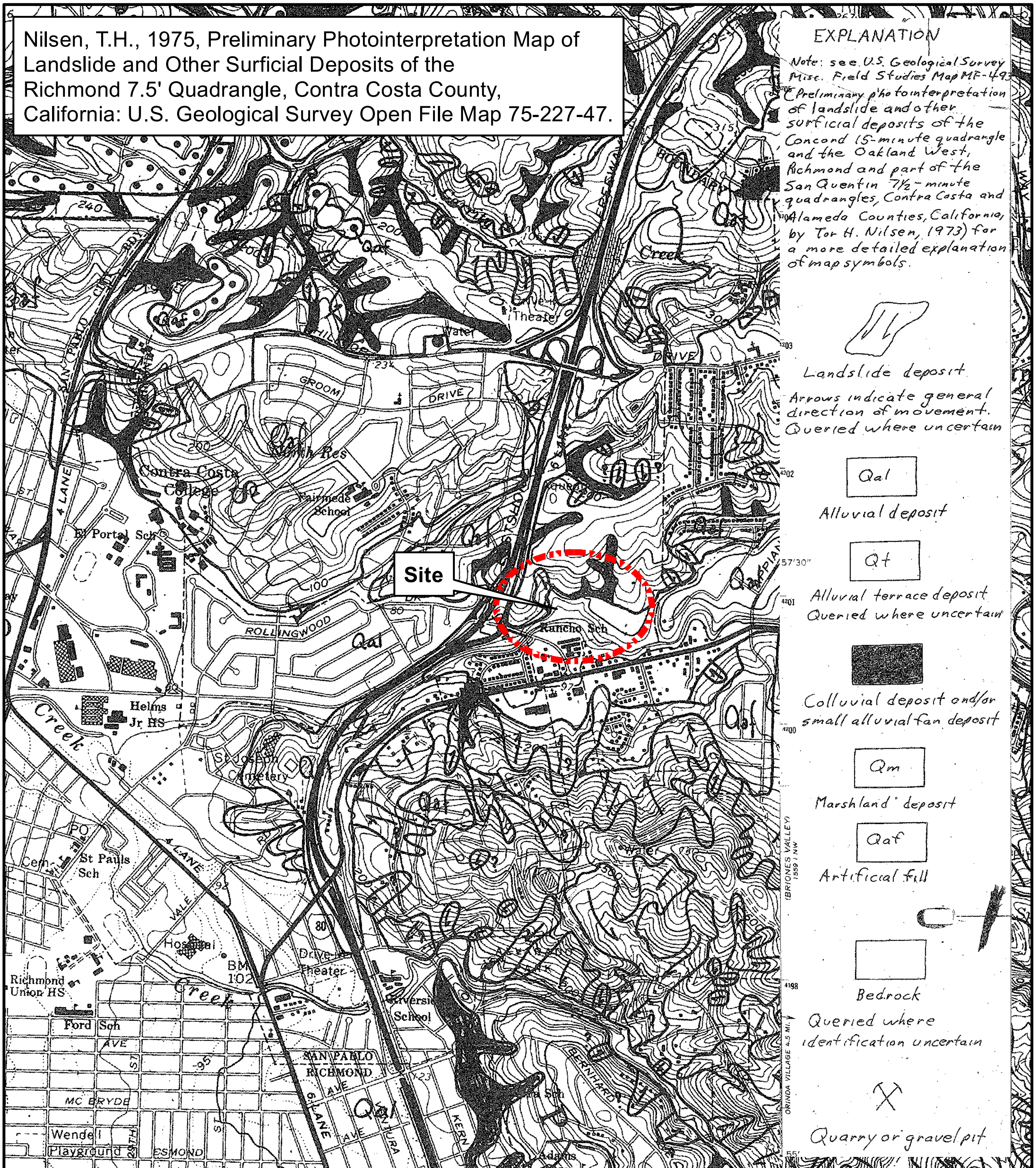
Approximate Location of Piezometer

N

SCALE
0 50 feet
1 inch = 50 feet

Via Verdi Landslide Richmond, California	Site Plan	
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 2

Nilsen, T.H., 1975, Preliminary Photointerpretation Map of Landslide and Other Surficial Deposits of the Richmond 7.5' Quadrangle, Contra Costa County, California: U.S. Geological Survey Open File Map 75-227-47.



0 2,000 feet

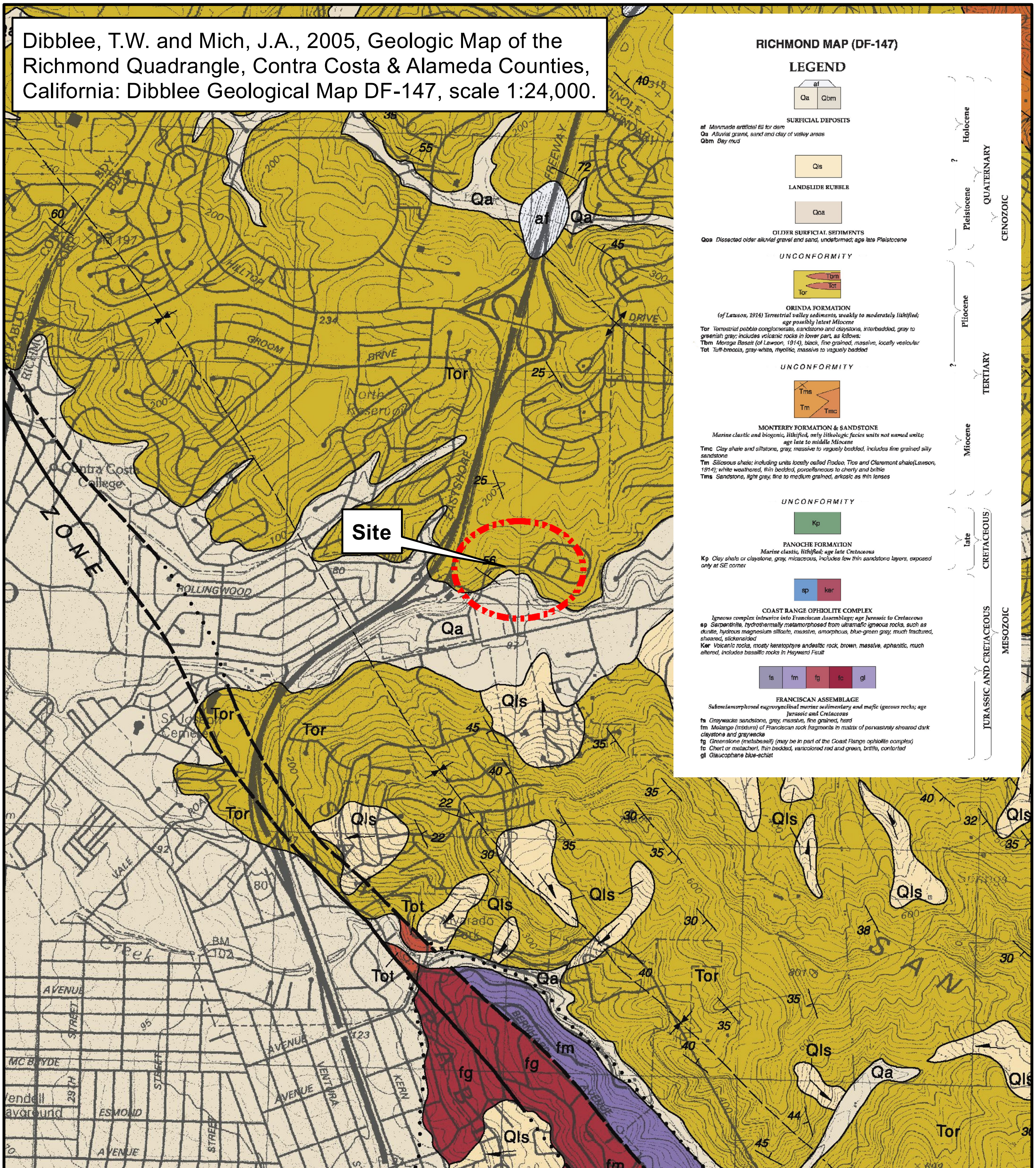
1 inch = 2,000 feet

N

Via Verdi Landslide
Richmond, California

Preliminary Photointerpretation Map

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 3



N

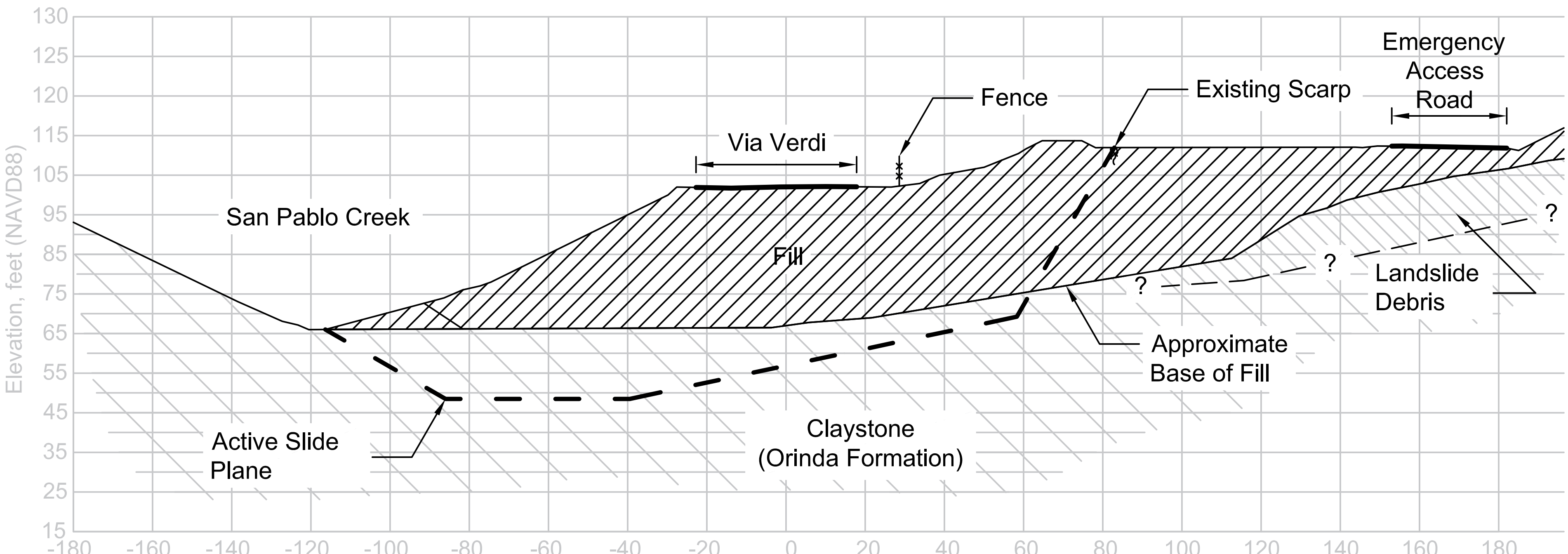
0 2,000 feet

1 inch = 2,000 feet

Via Verdi Landslide
Richmond, California

Geologic Map

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 4

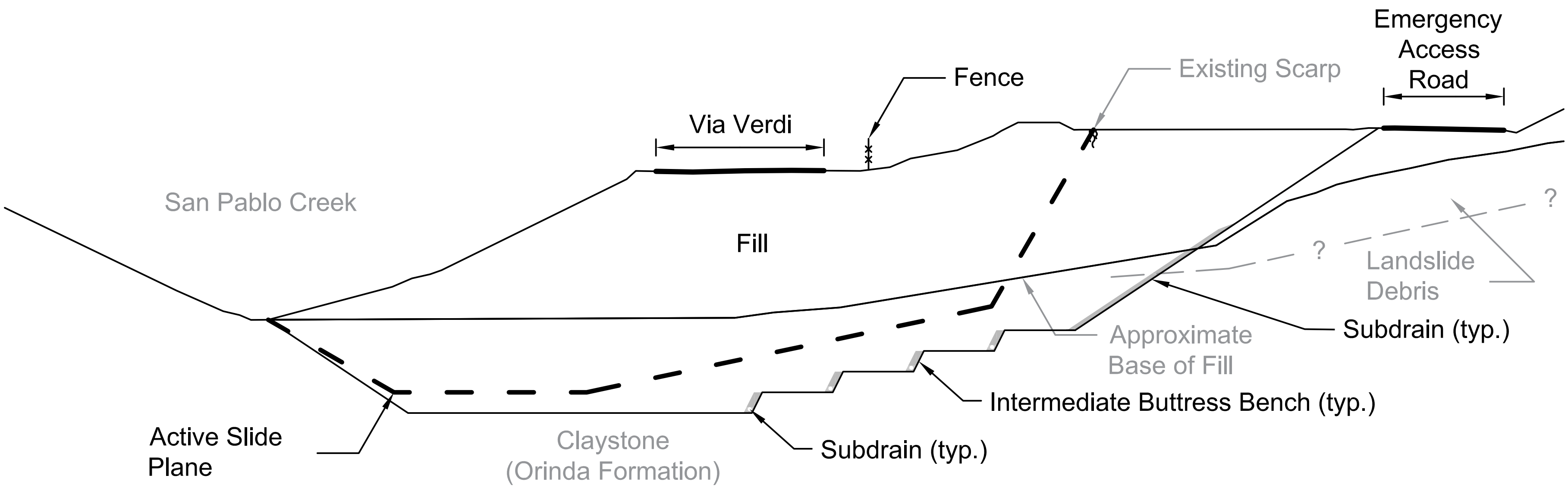


SCALE
0 40 feet
1 inch = 40 feet

Via Verdi Landslide
Richmond, California

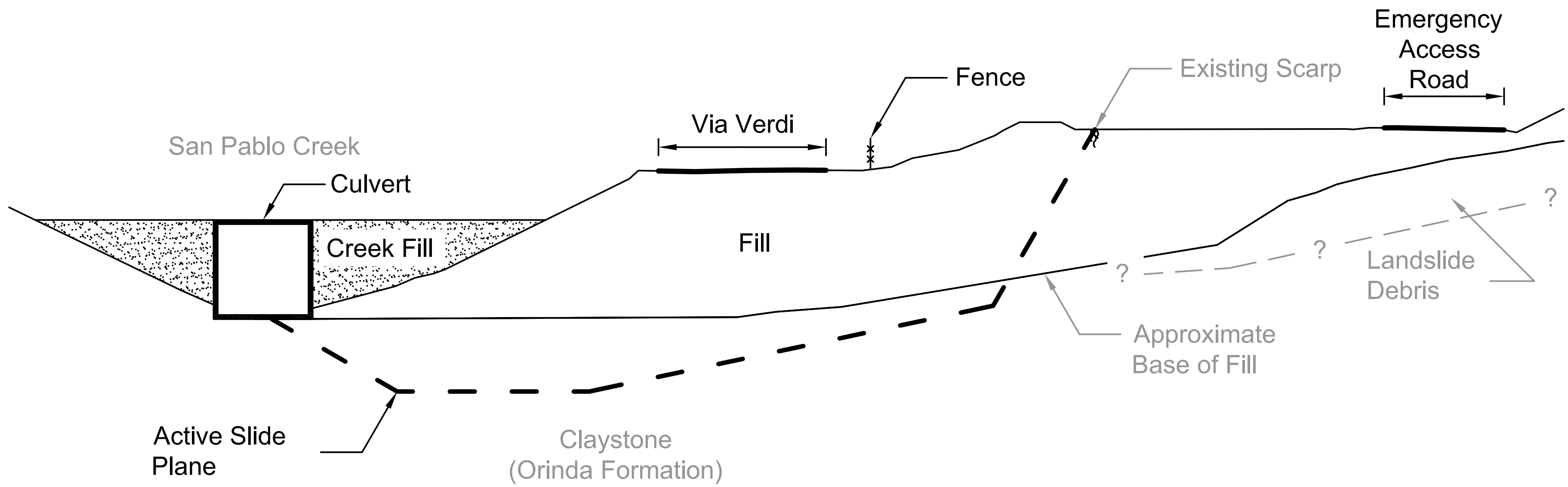
Idealized Subsurface Cross Section

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 5



Notes:
1. Earthwork slope buttress repair includes excavating below slide plane.
2. Install subdrains and backfill with excavated material.
3. Risk of backcut failure and expansion of upslope slide during repair.

NOT TO SCALE	Via Verdi Landslide Richmond, California	**Conceptual Earthwork Slope Repair Alternative**	
	Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 6



NOT TO SCALE

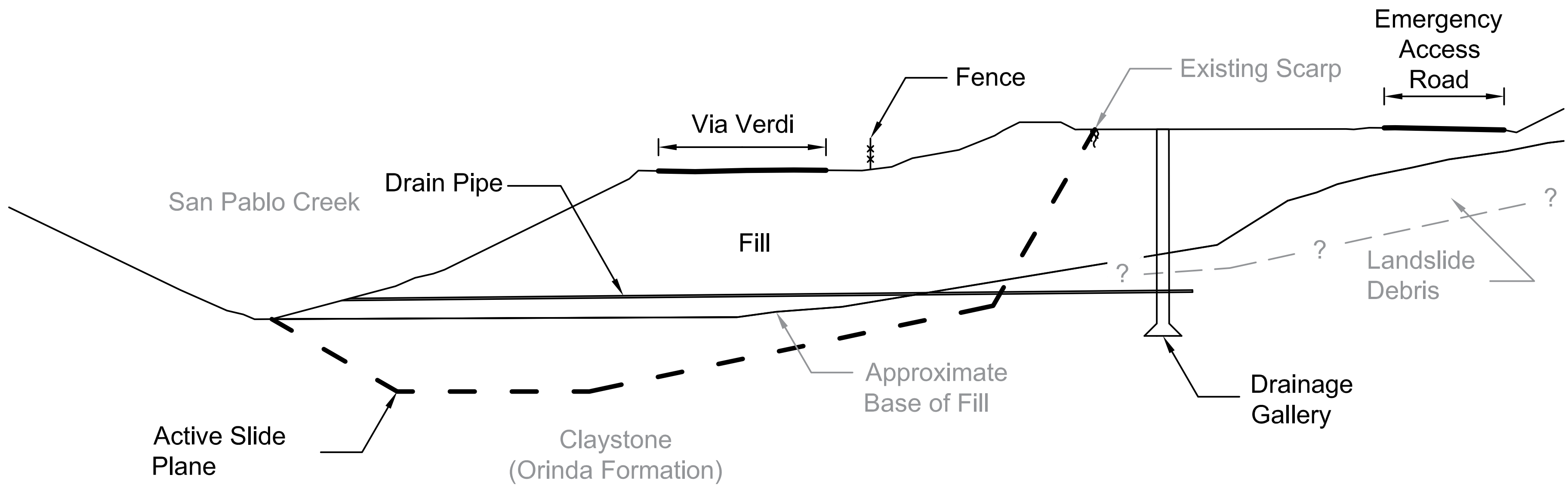
Via Verdi Landslide
Richmond, California

Conceptual Creek Fill Buttress

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 7



NOT TO SCALE

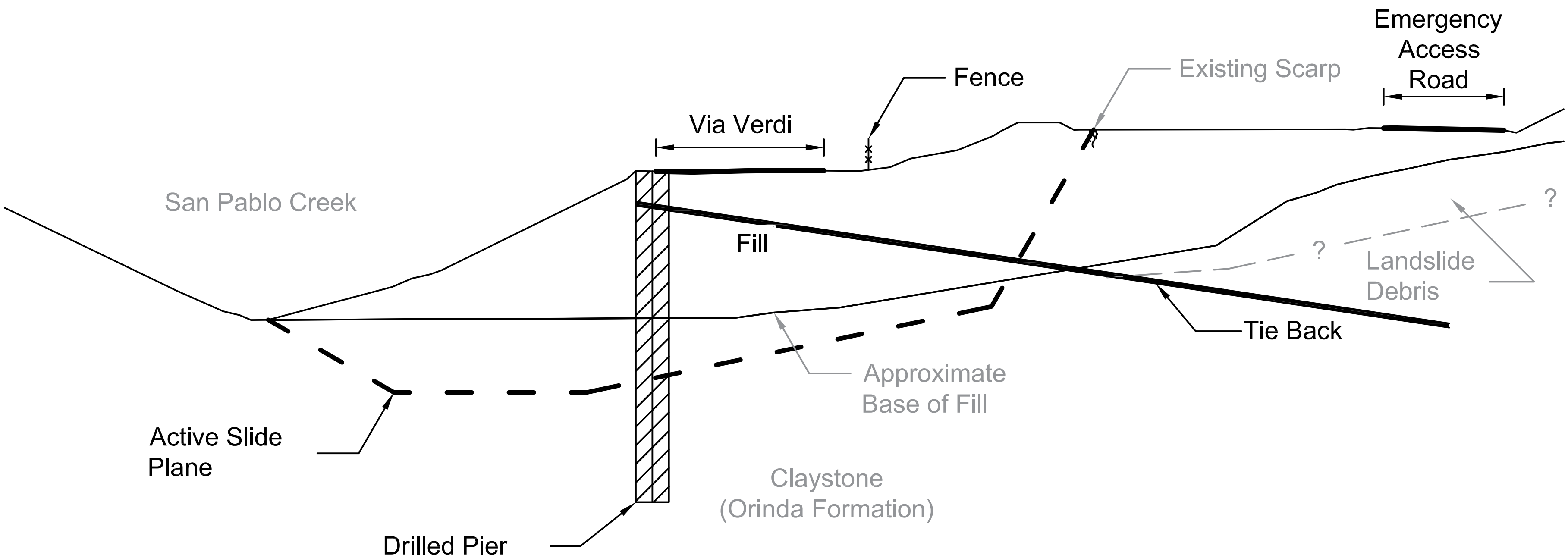
Via Verdi Landslide
Richmond, California

Conceptual Drainage Gallery Alternative

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 8



NOT TO SCALE	Via Verdi Landslide Richmond, California	**Conceptual Structural Alternative**	
	Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 9

APPENDIX A

Date	:	3/8/2017
Drilling Method	:	Hollow-Stem Auger
Elevation (Feet)	:	99.5 (NAVD 88)
Latitude	:	37.96692
Longitude	:	-122.31876

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
						Asphalt concrete (6-inches)					
	B					Lean Clay (CL), gray brown, moist, stiff to very stiff, with some sand and gravel, (fill)					
5	B										
	M	6		CL		Blue gray		2.3 3.0	16	108	LL=42 PI=22
10											
15	M	10						2.3 1.5	20	93	LL=44 PI=26
				CL		Lean Clay (CL), black with gray mottling, moist, stiff, trace sand, (fill)					
20											
	M	14				Lean Clay with Sand (CL), dark gray, moist to wet, stiff, with black inclusions, (fill)		2.3			
25				CL							
	M	15									
30											
	M	14				SANDY CLAYSTONE, gray, crushed, soft to low hardness, plastic to friable, deeply weathered					
35											
	M	10						1.8 2.3			
40											
	M	19				Shear		3.5 4.5+			

Via Verdi Landslide
Richmond, California

Log of Boring 1 (Inclinometer I-1)
(Page 1 of 2)

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. A-1

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Date : 3/8/2017 Drilling Method : Hollow-Stem Auger Elevation (Feet) : 99.5 (NAVD 88) Latitude : 37.96692 Longitude : -122.31876 Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	34				Deeply weathered		4.5+	18	109	LL=40 PI=22
50											
	M	34									
55						SILTSTONE, gray, moist, crushed, low hardness, friable, deeply to moderately weathered					
	M	46						4.5+	21	104	
60											
	M	66				CLAYSTONE, dark gray, moist, intensely fractured to crushed, low hardness, friable to weak, deeply to moderately weathered			19	99	
65						3/8/2017					
					▽	CLAYSTONE, brown gray, moist, intensely fractured to crushed, low hardness, plastic to friable, deeply to moderately weathered					
70	M	29							17	111	

Bottom of boring at 70 feet
Groundwater encounted at 67 feet during drilling
Boring converted to Inclinometer I-1

Via Verdi Landslide
Richmond, California

Log of Boring 1 (Inclinometer I-1)
(Page 2 of 2)

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. A-2

Date	: 3/9/2017
Drilling Method	: Hollow-Stem Auger
Elevation (Feet)	: 104 (NAVD 88)
Latitude	: 37.96683
Longitude	: -122.31910

Depth in Feet	Samples Type/ Recovery	Blow Count	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
					Asphalt concrete (6-inches)					
			CL		Lean Clay (CL), light brown, moist, medium stiff to stiff, occasional sand, (fill)					
	B									
5										
			CL		Gravelly Lean Clay with Sand (CL), reddish brown, moist, stiff, (fill)					
	M	9					4.3 2.8	24	105	LL=55 PI=36
			CH		Fat Clay (CH), brownish gray, moist, very stiff to hard, (fill)					
10										
					Lean Clay (CL), bluish gray, moist, very stiff to hard, with trace gravel, (fill)					
15	M	9					4.5+ 2.5	26	91	
20										
	M	13	CL		Becomes dark gray with occasional gravel, (fill)		2.5 3.3	18	111	
25										
	M	14					2.3			
					Lean Clay with Sand (CL), dark gray, moist, stiff, (fill)					
30										
	M	4	CL				1.3 1.5	28	96	
35										
					Fat Clay (CH), dark gray, moist, stiff to very stiff, trace organics, (topsoil)					
	M	10	CH				2.3	28	92	LL=64 PI=46
40					Elastic Silt (MH), gray, moist, stiff to very stiff, occasional sand					
	M	6	MH		Becomes brown gray		2.0 1.5			
					CLAYSTONE, greenish gray, moist, crushed, low hardness, friable, deeply to moderately					

Via Verdi Landslide
Richmond, California

Log of Boring 2 (Inclinometer I-2)
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-3

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
						Date : 3/9/2017 Drilling Method : Hollow-Stem Auger Elevation (Feet) : 104 (NAVD 88) Latitude : 37.96683 Longitude : -122.31910					
	M	14				weathered Charcoalized leaf fragments		2.0 1.5			
50	M	44				SANDSTONE, greenish gray, moist to wet, crushed, low hardness, friable, moderately weathered, coarse grained sand to fine gravel, (conglomerate)					
55											
60	M	63				SANDSTONE, greenish gray, moist to wet, crushed, low hardness, friable, moderately weathered Gray, moist			22	104	
65						CLAYSTONE, gray, moist, crushed, low hardness, deeply to moderately weathered, gravel up to 1/2-inch					
70	M	62							22	99	

Bottom of boring at 70 feet
No groundwater encountered
Boring converted to Inclinometer I-2

Via Verdi Landslide
Richmond, California

Log of Boring 2 (Inclinometer I-2)
(Page 2 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-4

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Date : 3/23/2017 Drilling Method : Hollow-Stem Auger Elevation (Feet) : 112 Latitude : 37.96710 Longitude : -122.31911 Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CH		Fat Clay (CH), gray, moist, medium stiff, trace organics, (fill)					
5 10	M ▨	9		CL		Lean Clay (CL), brown, moist, medium stiff to stiff, with occasional coarse sand and occasional 3/4 to 1-inch gravel, (fill) Becomes orange brown		1.0 2.5			
15	M ▨	14		CL		Sandy Lean Clay (CL), light blue gray, moist, very stiff, with dark gray mottling, (fill)		3.3 1.0			
20				CH		Fat Clay (CH), dark gray, moist, medium stiff, (fill)					
25	M ▨	12		CH		Fat Clay (CH), dark brown, moist, very stiff, with trace gravel, (topsoil)		2.0 2.3			
30 35	M ▨	28		CL		Lean Clay (CL), olive brown, moist, very stiff to hard, occasional gravel, (landslide debris)					
40						CLAYSTONE, crushed, low hardness, friable, deeply to moderately weathered, mottled light brown gray, moist					

Via Verdi Landslide
Richmond, California

Log of Boring 5 (Piezometer P-1)
(Page 1 of 2)

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. A-5

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Date : 3/23/2017 Drilling Method : Hollow-Stem Auger Elevation (Feet) : 112 Latitude : 37.96710 Longitude : -122.31911 Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	58				Becomes moderately hard					
50											
55						Intensely fractured to crushed, moderately weathered					
60	M	69									

Bottom of boring at 63 feet
No groundwater encountered
Boring converted to Piezometer P-1

Date : 3/24/2017
Drilling Method : Hollow-Stem Auger
Elevation (Feet) : 106.5
Latitude : 37.96693
Longitude : -122.31904

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CL		Lean Clay (CL), grayish brown, moist, medium stiff, trace sand, trace gravel, (fill)					
5											
	M	12		CH		Fat Clay (CH), brownish gray, moist, medium stiff to stiff, trace sand, (fill)		1.3			
10											
15	M	20		CL		Lean Clay (CL), light gray, moist, stiff to very stiff, with trace gravel and interbedded lense of sand		2.3			
				CH		Fat Clay (CH), dark gray, moist, medium stiff to stiff, (fill)					
20											
	M	16		CL		Lean Clay (CL), dark gray, moist, very stiff, with some light gray mottling, trace sand and gravel, (fill)		2.5			
25											
	M	13				CLAYSTONE, olive brown with gray, moist, crushed, plastic, deeply weathered, soft		3.3			
30											
	M	10				Low hardness, friable		2.3			
35											
40											

Via Verdi Landslide
Richmond, California

Log of Boring 6 (Piezometer P-2)
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-7

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Date : 3/24/2017 Drilling Method : Hollow-Stem Auger Elevation (Feet) : 106.5 Latitude : 37.96693 Longitude : -122.31904 Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
50											
	M	38				CLAYSTONE, crushed, low hardness, friable, moderately weathered, dark gray, dry to moist					
55											
60											
65											
	M	54				Deeply weathered					
70											

Bottom of boring at 70 feet
No groundwater encountered
Boring converted to Piezometer P-2

Via Verdi Landslide
Richmond, California

Log of Boring 6 (Piezometer P-2)
(Page 2 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-8

MAJOR DIVISIONS				GROUP NAMES
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	**GRAVELS** MORE THAN 50% OF COARSE FRACTION IS RETAINED ON NO. 4 SIEVE	**CLEAN GRAVELS** WITH LESS THAN 5% FINES	GW	WELL GRADED GRAVEL
			GP	POORLY GRADED GRAVEL
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS 50% OR MORE OF COARSE FRACTION PASSES NO. 4 SIEVE	**CLEAN SANDS** WITH LESS THAN 5% FINES	SW	WELL GRADED SAND
			SP	POORLY GRADED SAND
		SANDS WITH OVER 12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS 50% OR MORE PASSES NO. 200 SIEVE	**SILTS AND CLAYS** LIQUID LIMIT LESS THAN 50		ML	SILT
			CL	LEAN CLAY
			OL	ORGANIC CLAY, ORGANIC SILT
	SILTS AND CLAYS LIQUID LIMIT 50 OR MORE		MH	ELASTIC SILT
			CH	FAT CLAY
			OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			Pt	PEAT

UNIFIED SOIL CLASSIFICATION SYSTEM- ASTM D 2487

S	- SPT	▽	- Water Level at Time of Drilling	P	- Push
		▼	- Water Level after Drilling (with date measured)	Perm	- Permeability
M	- 2.5 inch	Consol	- Consolidation	Sieve	- Particle Size Analysis
		Gs	- Specific Gravity	VS	- Laboratory Vane Shear (psf)
C	- 3.0 inch	LL	- Liquid Limit (%)	-200	- % Passing No. 200 Sieve
		PI	- Plasticity Index (%)		
T	- Shelby Tube	TxUU	- Shear Strength (psf) - Unconsolidated Undrained Triaxial Shear		
		TxCU	- Shear Strength (psf) - Consolidated Undrained Triaxial Shear		
B	- Bag	UC	- Compressive Strength (psf) - Unconfined Compression		

KEY TO TEST DATA

Via Verdi Landslide
Richmond, California

Soil Classification Chart

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. A-9

I. CONSOLIDATION OF SEDIMENTARY ROCKS; usually determined from unweathered samples. Largely dependent on cementation.

U = unconsolidated
P = poorly consolidated
M = moderately consolidated
W = well consolidated

II. BEDDING OF SEDIMENTARY ROCKS

Splitting Property	Thickness	Stratification
Massive	Greater than 4.0 ft	very thick-bedded
Blocky	2.0 to 4.0 ft	thick-bedded
Slabby	0.2 to 2.0 ft	thin-bedded
Flaggy	0.05 to 0.2 ft	very thin bedded
Shaly or platy	0.01 to 0.05 ft	laminated
Papery	less than 0.01 ft	thinly laminated

III. FRACTURING

Intensity	Size of Pieces in Feet
Very Little Fractured	Greater than 4.0
Occasionally Fractured	1.0 to 4.0
Moderately Fractured	0.5 to 1.0
Closely Fractured	0.1 to 0.5
Intensely Fractured	0.05 to 0.1
Crushed	Less than 0.05

IV. HARDNESS

1. Soft - reserved for plastic material alone
2. Low Hardness - can be gouged deeply or carved easily with a knife blade
3. Moderately Hard - can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away
4. Hard - can be scratched with difficulty; scratch produces little powder and is often faintly visible
5. Very Hard - cannot be scratched with knife blade; leaves a metallic streak

V. STRENGTH

1. Plastic - of very low strength
2. Friable - crumbles easily by rubbing with fingers
3. Weak - an unfractured specimen of such material will crumble under light hammer blows.
4. Moderately Strong - specimen will withstand a few heavy hammer blows before breaking
5. Strong - specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments
6. Very Strong - specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments

VI. WEATHERING The physical and chemical disintegration and decomposition of rock and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, and freezing and thawing.

D. Deep - Moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration;
- many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.

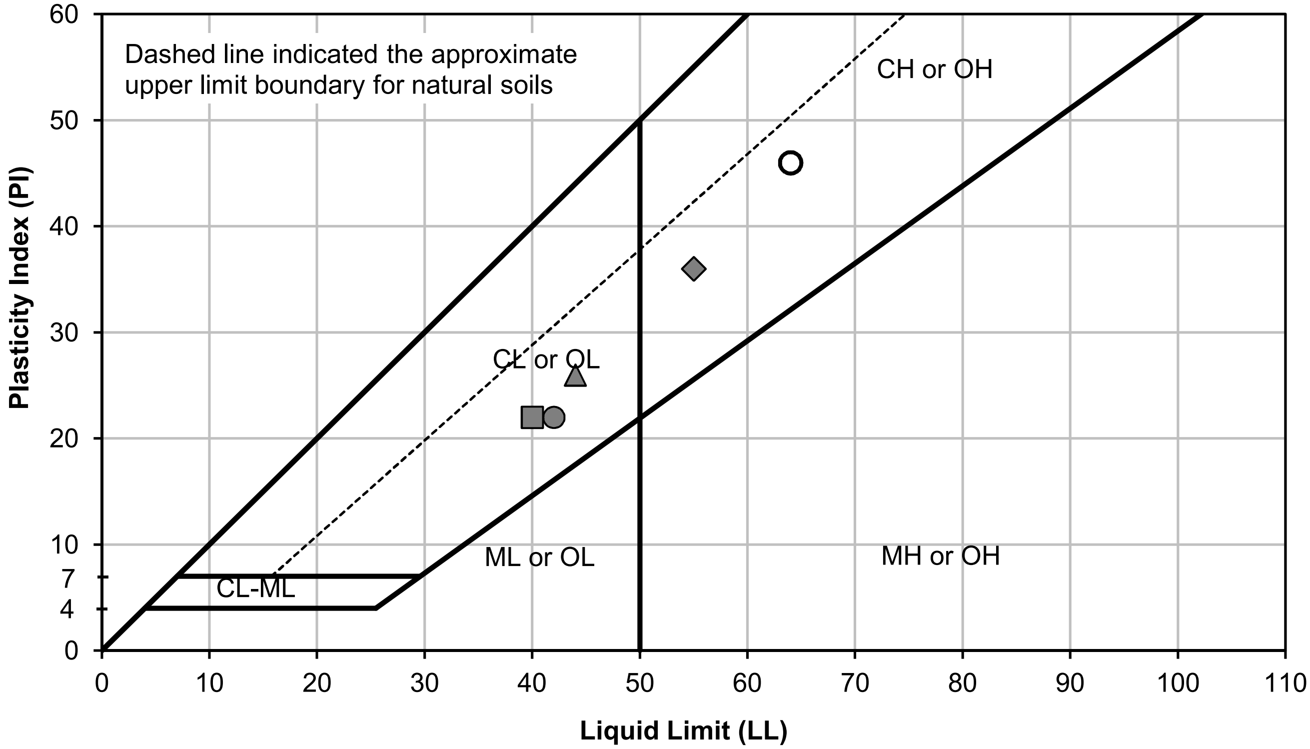
M. Moderate - Slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected.
- Moderate to occasionally intense discoloration. Moderately coated fractures.

L. Little - No megascopic decomposition of minerals; little or no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains on fracture surface.

F. Fresh - Unaffected by weathering agents. No disintegration or discoloration. Fractures usually less numerous than joints.

Via Verdi Landslide Richmond, California	**Physical Properties Criteria for Rock Descriptions**	
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. A-10

APPENDIX B



Symbol	Boring Number	Depth (feet)	Soil Description	LL (%)	PL (%)	PI (%)	Moisture Content (%)
●	1	8 - 8.5	Blue Gray LEAN CLAY	42	20	22	16
▲	1	15 - 15.5	Black with Gray LEAN CLAY	44	18	26	20
■	1	47 - 47.5	Gray Sandy CLAYSTONE	40	18	22	18
◆	2	8 - 8.5	Brownish Gray FAT CLAY	55	19	36	24
○	2	37 - 37.5	Dark Gray FAT CLAY	64	18	46	26

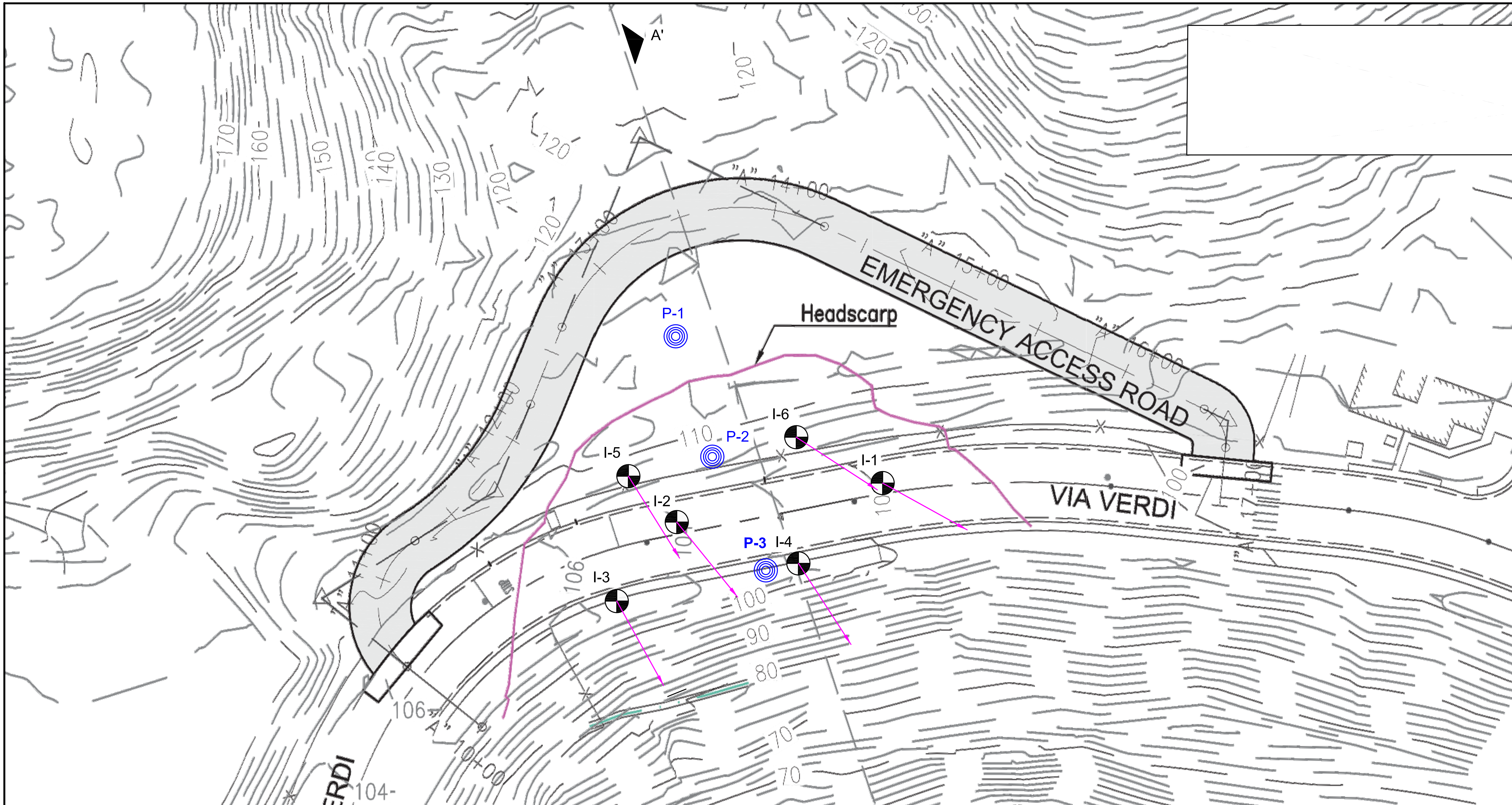
Testing performed by B. Hillebrandt Soils Testing, Inc.

Via Verdi Landslide
Richmond, California

Atterberg Limits

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. B-1

APPENDIX C



Direction of Movement

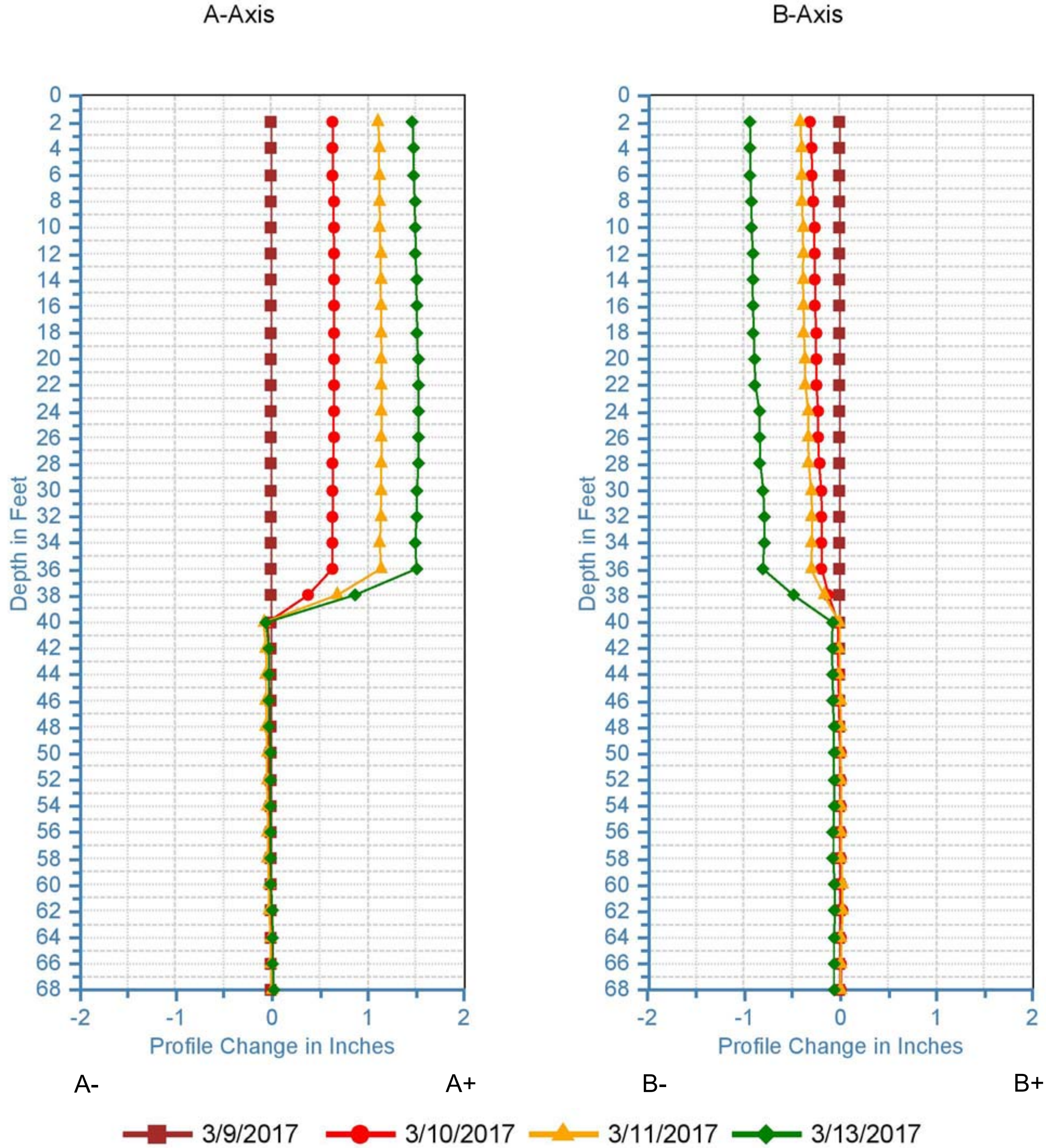
Approximate Location of Inclinometer

Approximate Location of Piezometer

SCALE
0 50 feet
1 inch = 50 feet

Via Verdi Landslide Richmond, California	**Slope Inclinometer Bearing Map**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-1

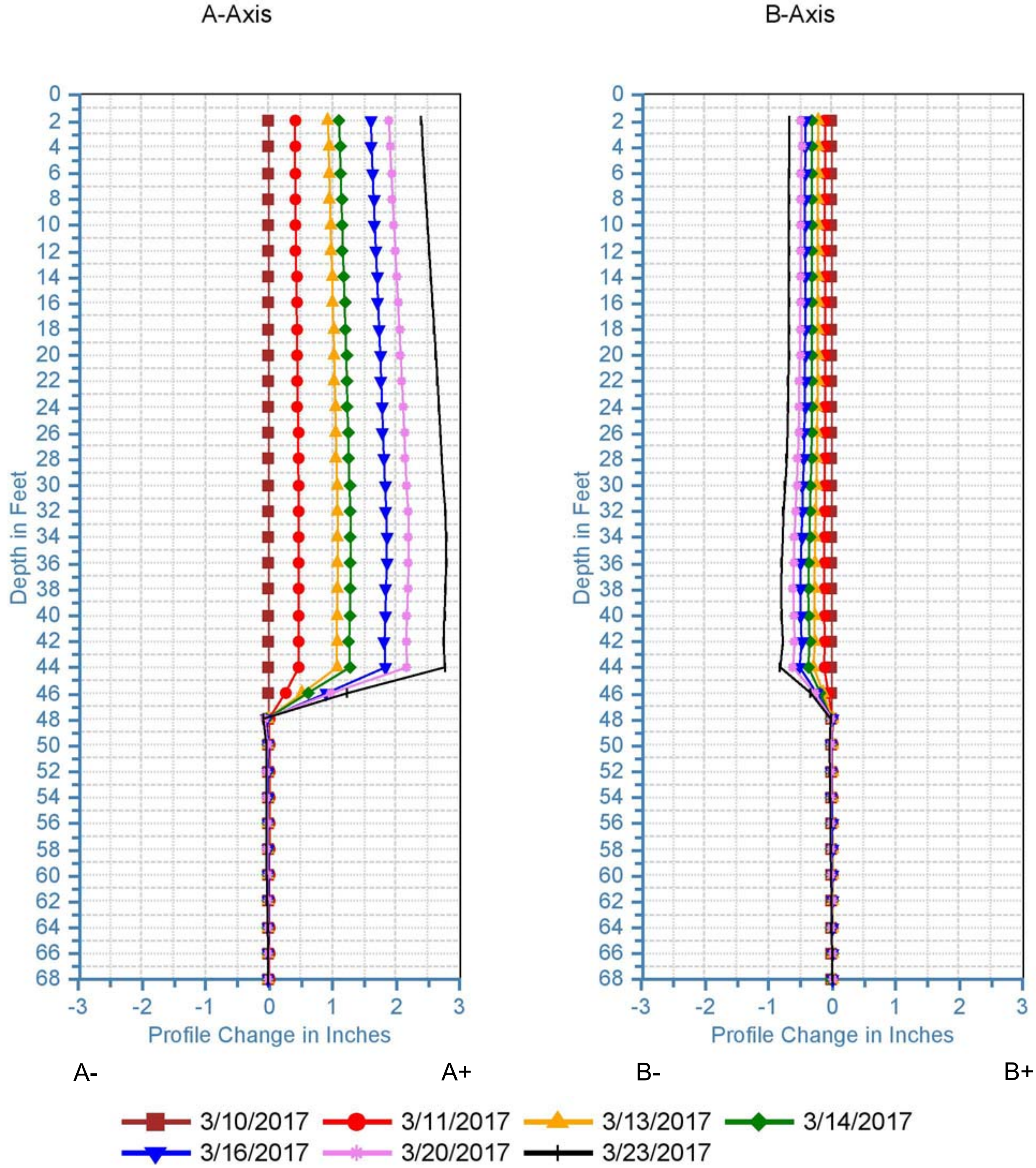


Notes:

Depth referenced to Elevation 98.9 feet.
Ground surface at Elevation 99.5 feet.
Bearing (A+ Direction): 146 degrees

Via Verdi Landslide Richmond, California	**Inclinometer 1**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-2

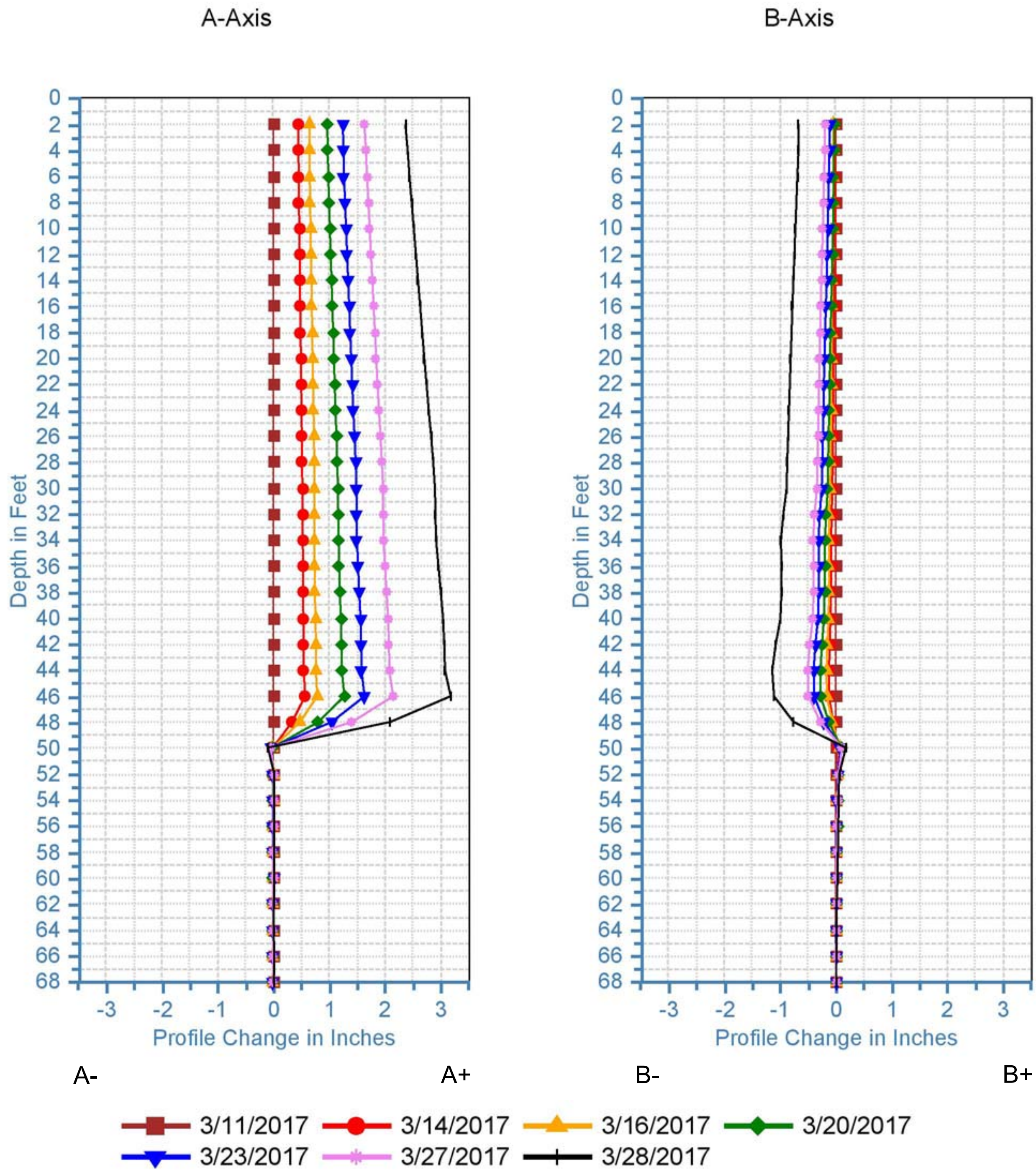


Notes:

Depth referenced to Elevation 103.8 feet.
Ground surface at Elevation 104 feet.
Bearing (A+ Direction): 157degrees

Via Verdi Landslide Richmond, California	**Inclinometer 2**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-3



Notes:

Depth referenced to Elevation 105.3 feet.
Ground surface at Elevation 105.5 feet.
Bearing (A+ Direction): 165 degrees

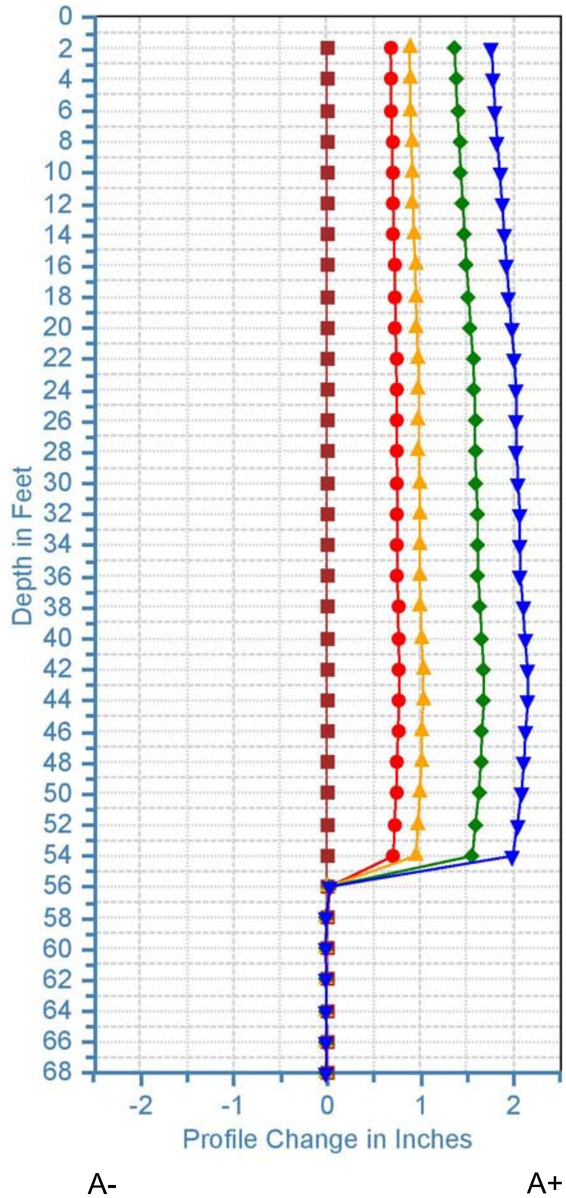
Via Verdi Landslide
Richmond, California

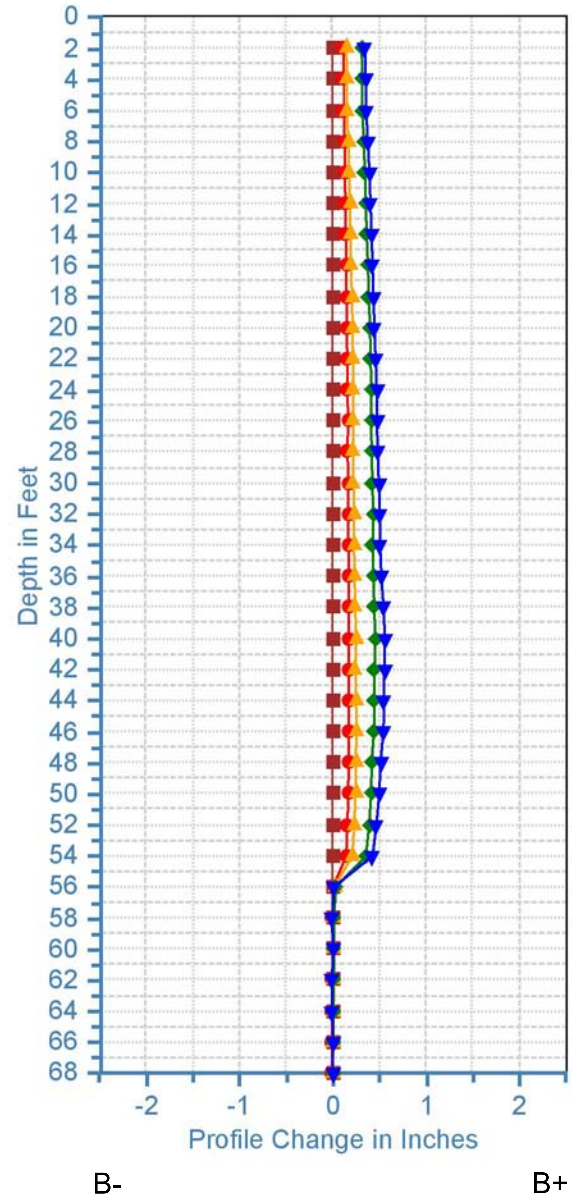
Inclinometer 3

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-4

A-Axis

B-Axis



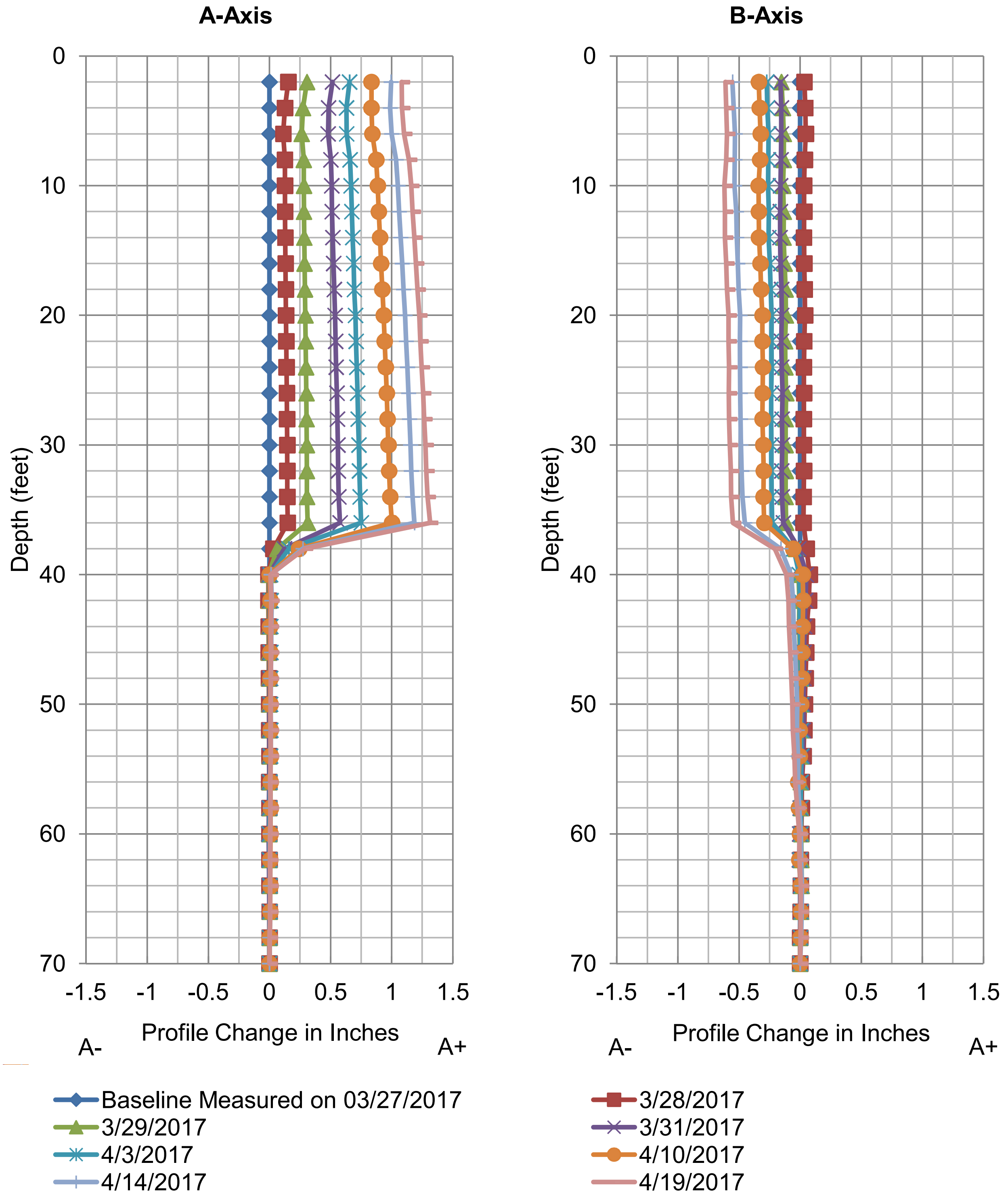


3/11/2017 3/13/2017 3/14/2017
3/16/2017 3/20/2017

Notes:
- Depth referenced to Elevation 101.7 feet.
- Ground surface at Elevation 102.2 feet.
- Bearing (A+ Direction): 135 degrees

Via Verdi Landslide Richmond, California	**Inclinometer 4**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-5



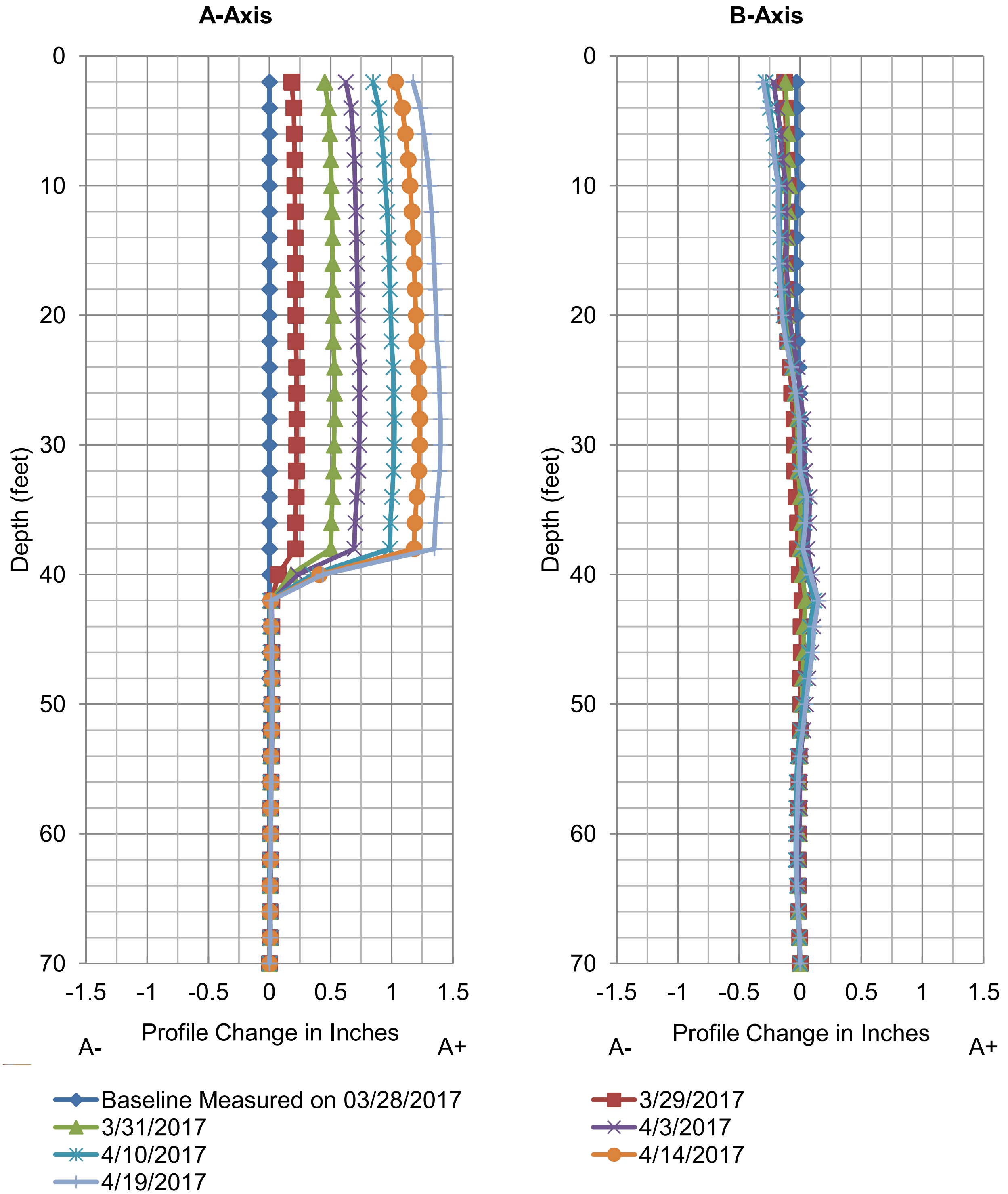
Notes:

Depth referenced to Elevation 107.2 feet.
Ground surface at Elevation 107.5 feet.
Bearing (A+ direction): 163 degrees

Via Verdi Landslide
Richmond, California

Inclinometer 5

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-6



Notes:

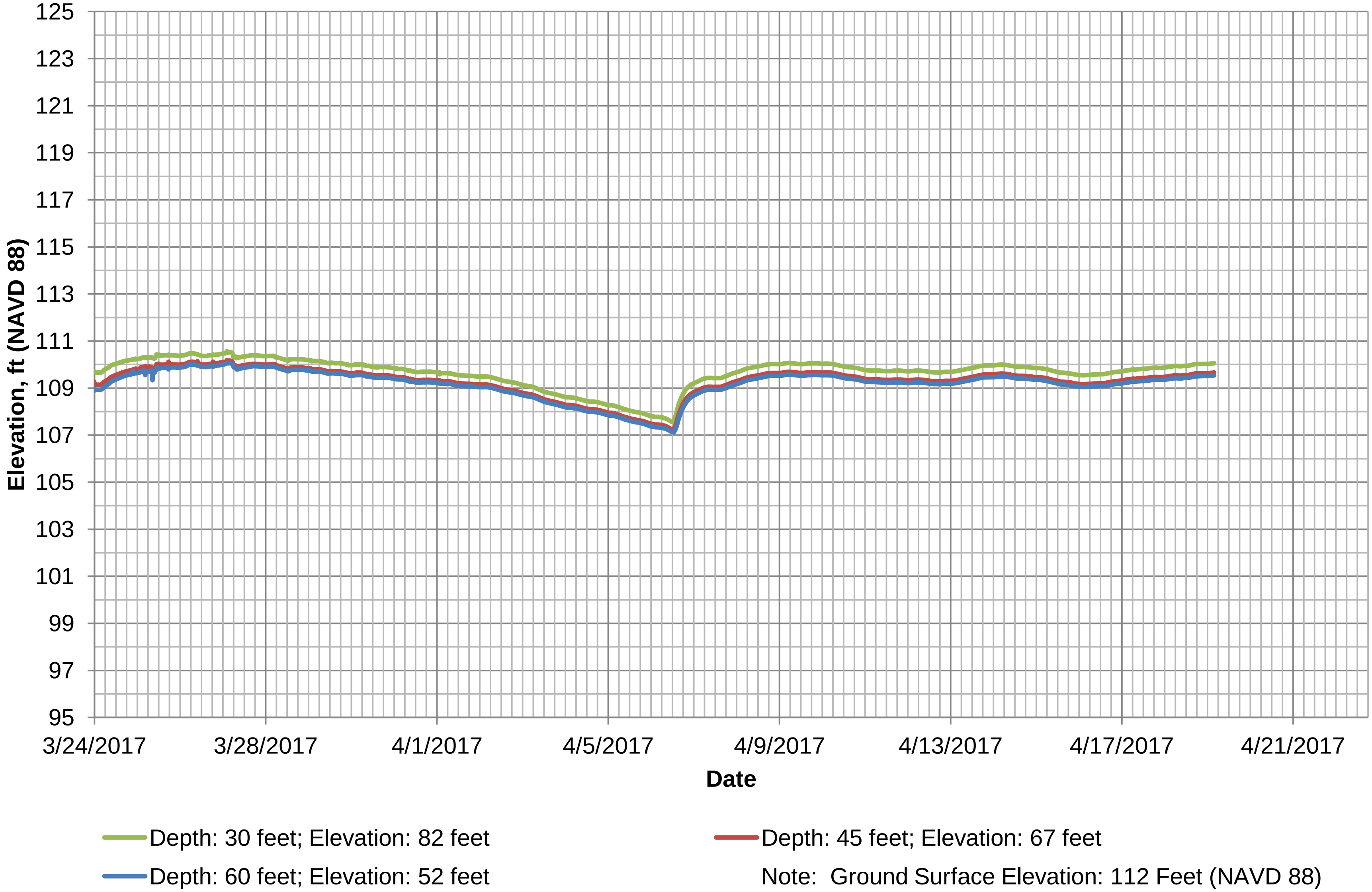
Depth referenced to Elevation 105.2 feet.
Ground surface at Elevation 105.5 feet.
Bearing (A+ direction): 126 degrees

Via Verdi Landslide
Richmond, California

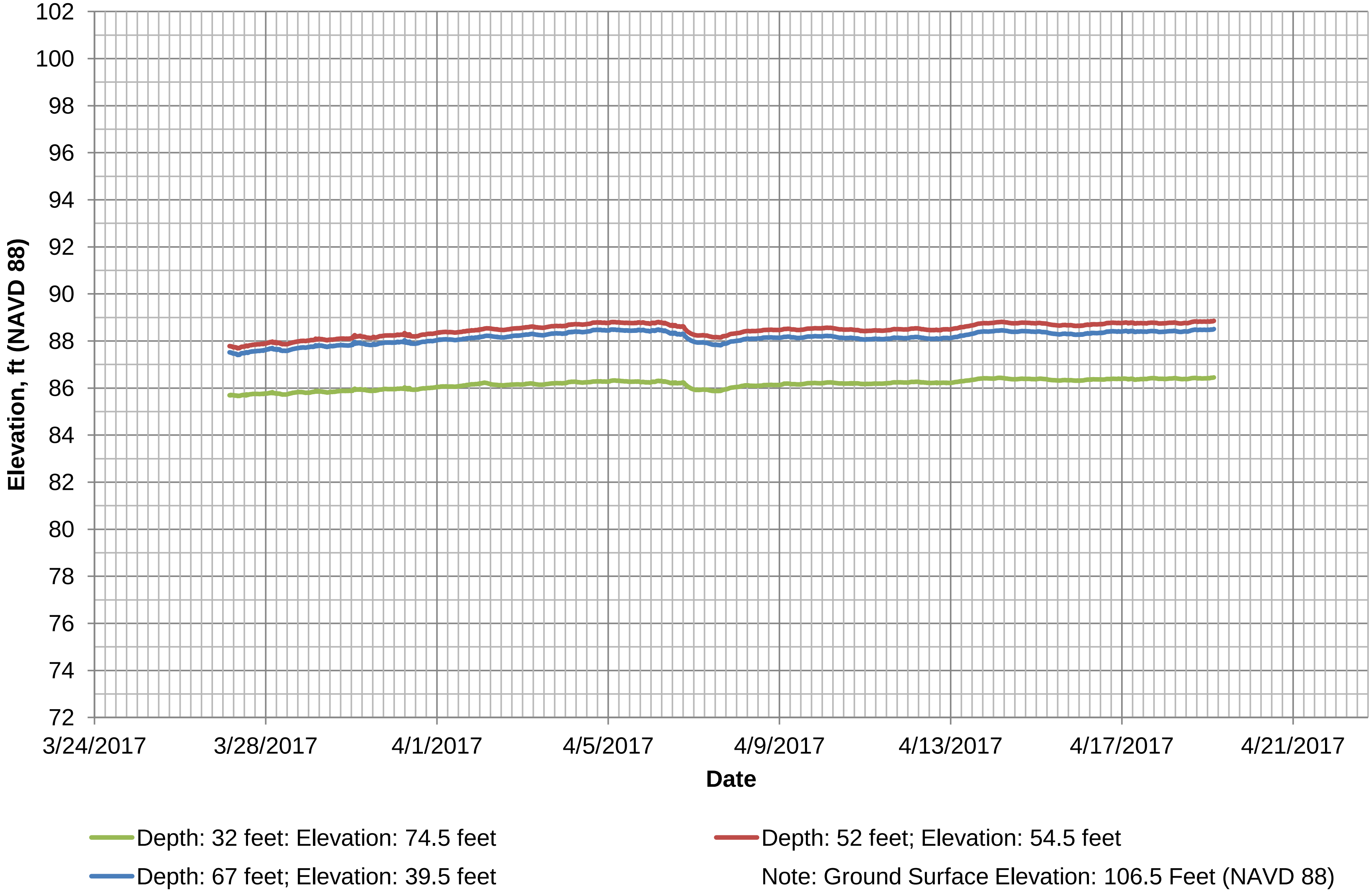
Inclinometer 6

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-7

APPENDIX D



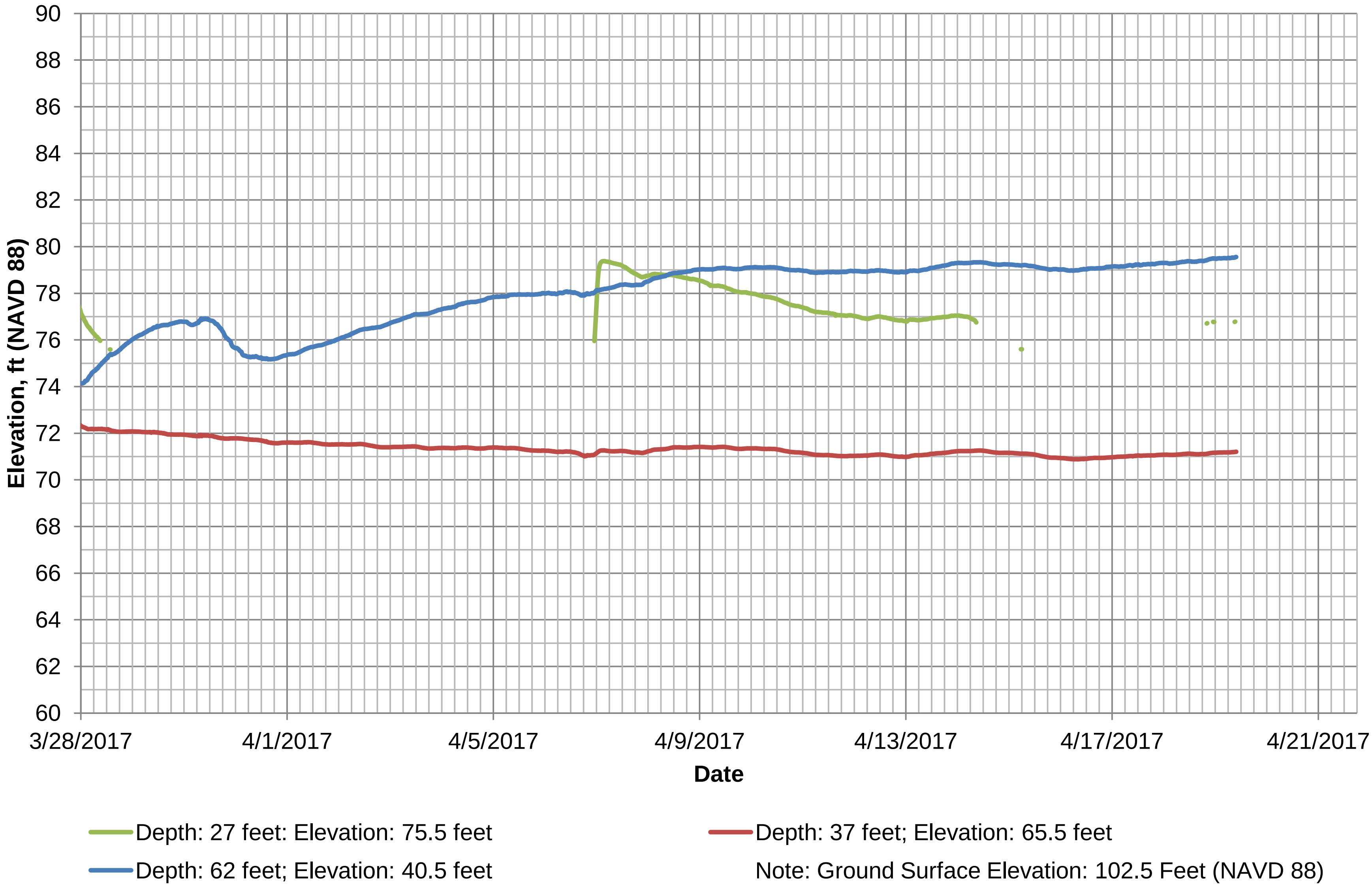
Via Verdi Landslide Richmond, California	**Piezometer Data** **P-1**	
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. D-1



Note: Ground Surface Elevation: 106.5 Feet (NAVD 88)

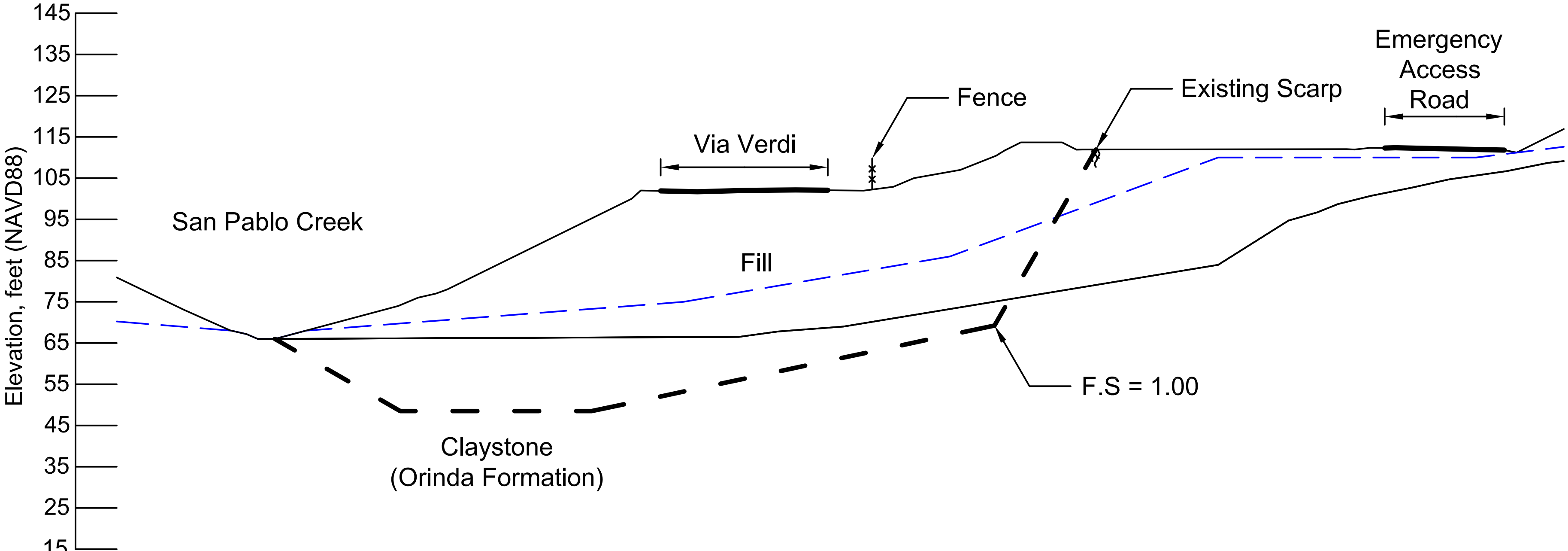
Via Verdi Landslide Richmond, California	**Piezometer Data** **P-2**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. D-2



Via Verdi Landslide Richmond, California		**Piezometer Data** **P-3**
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. D-3

APPENDIX E



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE

0 40 feet

1 inch = 40 feet

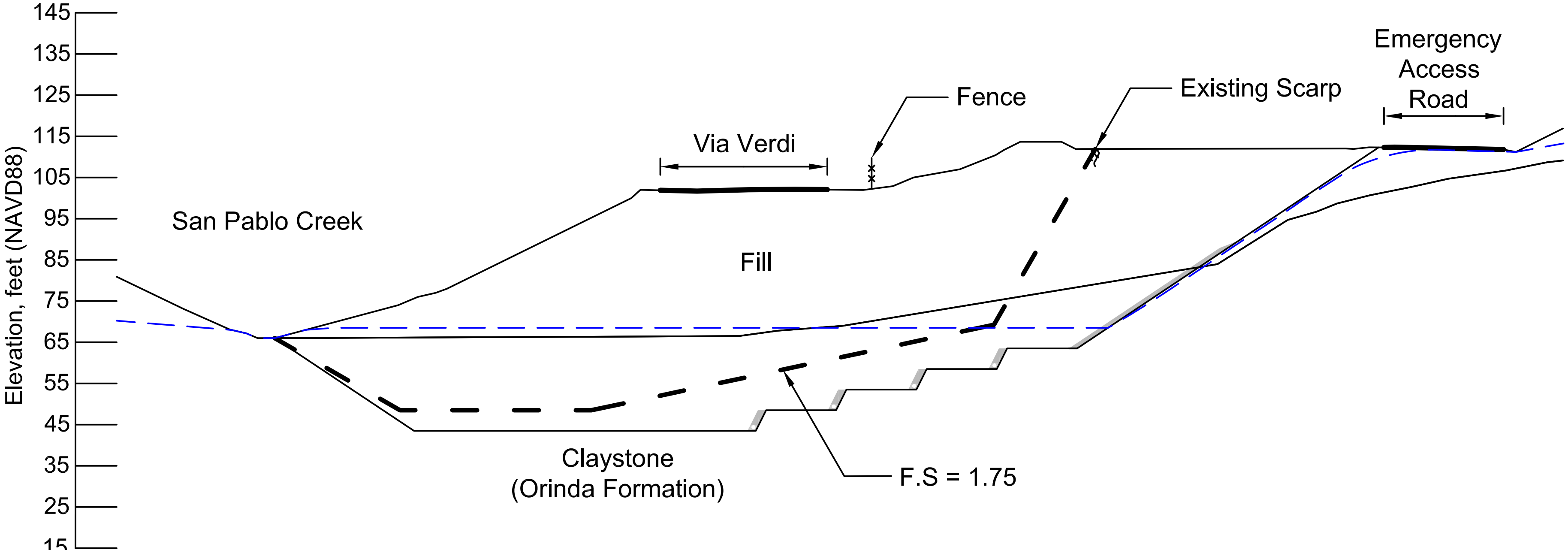
Via Verdi Landslide
Richmond, California

Slope Stability
Existing Condition

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. E-1



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE

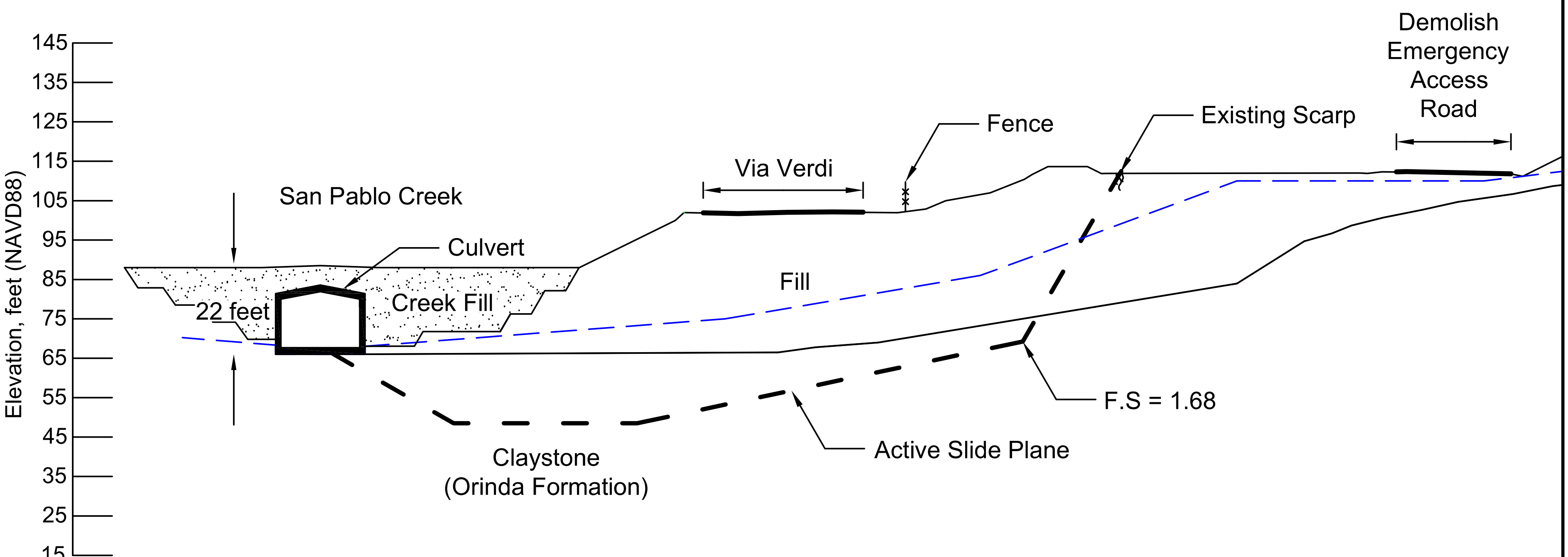
0 40 feet

1 inch = 40 feet

Via Verdi Landslide
Richmond, California

Slope Stability
Earthwork Slope Repair

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. E-2



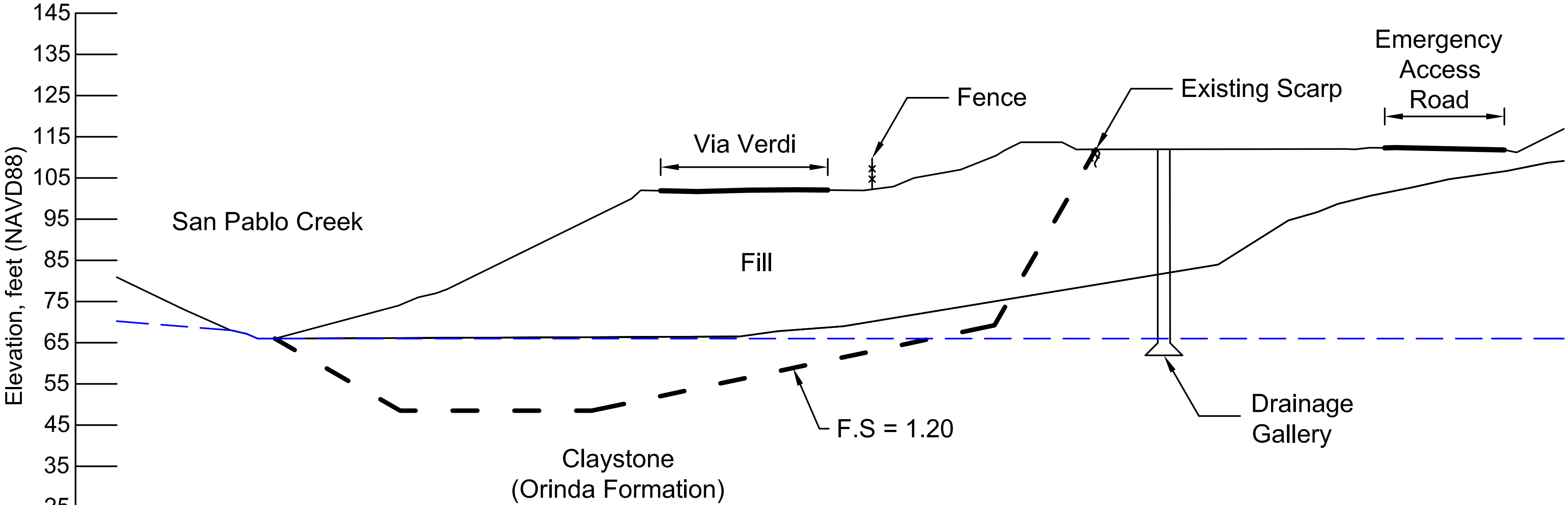
SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-
Creek Fill	80	50	24	-	-

Notes:

1. Unit weight of Creek Fill is weighted to include the empty culvert.

SCALE 0 — 40 feet 1 inch = 40 feet	Via Verdi Landslide Richmond, California		**Slope Stability** **Slope Buttress**
	Hultgren - Tillis Engineers	Project No. 867.01	Plate No. E-3



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE

0 40 feet

1 inch = 40 feet

Via Verdi Landslide
Richmond, California

Slope Stability
Drainage Gallery

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. E-4

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100% Final Geotechnical Investigation
Via Verdi Repair Project
San Pablo Creek Culvert Replacement
Richmond, California

Prepared for

City of Richmond
Engineering Services Department
450 Civic Center Plaza
Richmond, California 94804-1630

NCE Project No. A568.12.20

J. Ryan Shafer, PE, GE
Geotechnical Engineer

Jennifer Crow
Project Engineer

January 30, 2012

100% Final Geotechnical Investigation
Via Verdi Repair Project
San Pablo Creek Culvert Replacement
Richmond, California

NCE Project No. A568.12.20

This 100% final document was prepared by Nichols Consulting Engineers, Chtd. (NCE), for the sole use of the City of Richmond and their design consultant team the only intended beneficiaries of this work. No other party should rely on the information contained herein without the prior written consent of the City of Richmond. This report and the interpretations, conclusions, and recommendations contained within are based in part on information presented in other documents that are cited in the text and/or listed in the references. Therefore, this report is subject to the limitations and qualifications presented in the referenced documents. This report has been prepared for specific application to the proposed project in accordance with accepted geotechnical engineering practices. No other warranty, expressed or implied, is made. In the event that any changes in or additions to the nature, design, or location of the project are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

CONTENTS

FIGURES

APPENDICES

DISTRIBUTION

1.0 INTRODUCTION

NCE is pleased to present the results of our geotechnical investigation for the repair of the culvert at Via Verdi near El Portal Drive in Richmond, California (Site) as shown on the vicinity map and site plan shown on Figures 1 and 3A.

1.1 Project Background

1.1.1 Collapse ("Sinkhole")

On April 15, 2010 the City responded to an emergency "sinkhole" that collapsed unexpectedly at Via Verdi near El Portal Drive. Via Verdi was closed due to the collapse of a portion of Via Verdi into the "sinkhole" shown in the photograph below, which is the only street

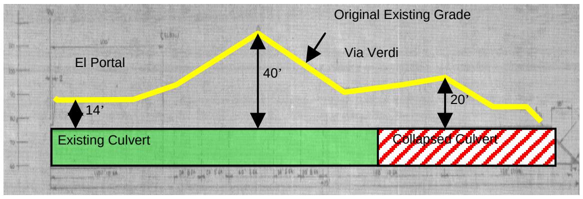
access for a community of single family homes and several apartment buildings (known as the Sobrante Glen Subdivision) and serves as a point of access for an apartment complex located at Via Verdi and El Portal Drive. This event was proclaimed by the City as a local state of emergency with implications to street infrastructure and access to nearby communities through Via Verdi, local utilities (sanitary sewer, gas, electricity, telecom, and water supply), San Pablo Creek, the upstream San Pablo Reservoir, and the nearby apartment structures.

The approximate collapsed area shown in the photograph in the next column was approximately 130 feet long, 30 to 50 feet in width, and approximately 30 feet in depth. It became evident that the collapse occurred within a portion of a culvert for San Pablo Creek with the upstream headwall adjacent to the collapsed portion of culvert still in place.

During NCE's site visit on April 16, 2010, NCE was provided by the City with as-builts of the culvert and the nearby Sobrante Glen Subdivision with two plan sets by KCA Engineers, Inc. titled *Subdivision 4593 "Sobrante Glen" Improvement Plans Via Verdi*, dated December 17, 1977 and *Grading Plan Subdivision 4593 "Sobrante Glen" "As built"* dated December 6, 1977 (1977 As-built). Based on as-built plans of the culvert, this 34-year old culvert was constructed of large oval shape corrugated metal pipe, approximately 22 feet 6-inches in width and 15 feet 8-inches in height. The grading plans for the subdivision also included placement of a large engineered fill terrace adjacent to El Portal Drive, with approximately 2:1 (horizontal: vertical) slopes as high as 30-feet. At the time of the culvert collapse, this fill terrace was undeveloped grassland and is the property of the Rolling Hills Memorial Park Cemetery (Cemetery Property). Since the collapse, a temporary bypass road was constructed by the City on this property in order to serve the residents in the Sobrante Glen Subdivision.

The culvert alignment runs in a southwesterly direction adjacent to the Creek View

Condominiums, underneath Via Verdi, under the south-eastern corner of the engineered fill terrace, and then turns south (perpendicular to El Portal Drive) under El Portal Drive to the downstream endwall at the southern edge of El Portal Drive, also shown on Figure 3A. The bottom of culvert is on the order of 30 to 36 feet below El Portal Drive and Via Verdi respectively, and as much as 56 feet below the engineered fill terrace, as shown below in the schematic profile view below.



1.1.2 Emergency Response

Subsequent to the collapse, the City retained NCE for the initial emergency response and preliminary design professional services. These services generally included:

- assistance in securing the site,
- developing access for residents,
- designing a temporary bypass road through the adjacent Cemetery Property,
- initial site investigation work, and
- design and permitting for the construction of a temporary shored channel to restore San Pablo creek flow at the collapsed culvert section.

The temporary bypass road (as shown in photograph below) was constructed and opened

to the public in the summer of 2010. The temporary shored channel, consisting of drilled soldier piles and lagging with tie-backs, was constructed and completed by the fall of 2010, and is shown in the following photograph with water flowing through from San Pablo Creek.

East Bay Municipal Utility District (EBMUD) also constructed an emergency temporary bypass of their water line that crossed the collapse area that services the Sobrante Glen community with a crossing further upstream.

It is important to note that none of the emergency response actions are permanent solutions, but strictly are temporary interim measures to maintain access and services to the community until the Via Verdi Repair project is completed. These temporary measures were completed with the understanding that a final repair plan would be implemented beginning in March 2012.

1.1.3 Culvert Failure Analysis

Over the pasts 18 months, NCE completed intensive forensic work and gathered field data to evaluate the possible environmental factors that may have contributed to the failure of the culvert. The failure of the culvert could have been influenced by a combination of factors, but in our judgment the likely cause of the failure was flattening of the culvert roof from overburden soils over time, in combination with a groundwater triggering event(s).

The triggering could have been progressive with multiple cycles of high groundwater levels or one event, but eventually the culvert flattened to a point in combination with high groundwater levels and reached a point of failure. The groundwater could be directly from groundwater flow into the creek drainage, creek surface, and/or may have been significantly influenced by groundwater moving through more permeable zones of utility trench backfill materials. It should also be noted that groundwater and creek levels can be significantly influenced by water releases into San Pablo Creek from the EBMUD San Pablo Dam Reservoir located upstream of the site.

As part of our forensic work, other factors that may have played a role in the collapse were investigated and summarized in greater detail in our forensic documents. We concluded that additional environmental factors that could negatively impact the culvert, but played a lesser role in the collapse were as follows:

- Corrosion
- CMP material properties
- Erosion/scouring
- Hydraulic capacity
- Liquefaction
- Seismicity
- Landslides and ground movement
- Utilities

After evaluating the potential causes of failure, the project structural engineer, Certus Consulting, next structurally evaluated the remaining original culvert section underneath the Cemetery Property and El Portal Drive. It was concluded that this remaining section of culvert is only in marginally better condition than the collapsed section was just prior to failure. In addition, the remaining culvert is likely subject to those same factors outlined above that contributed to the culvert collapse. The potential exists that these factors, including high groundwater or seismic activity could result in a similar failure of the remaining original culvert.

Given the marginal capacity to demand ratio (CDR), significant roof deflection, age of the remaining original culvert section, and need to have a culvert meeting current design standards including seismicity, the remaining intact culvert section will need to be replaced.

1.2 Project Description

The repair project will include the replacement of the section of culvert that collapsed and remaining intact culvert with a modern reinforced concrete box culvert. The design of the repair will include a reinforced concrete headwall at the upstream end of the new culvert and the endwall at the downstream end of the new culvert. The headwall is anticipated to be supported on spread footings while the endwall will be supported on a combination of spread footings and drilled piers to accommodate higher overturning moments from higher wall sections and applied seismic loads. In addition to the reconstruction of the culvert itself, the proposed project will include:

- Design related to utilities (temporary bypasses for sanitary sewer and water service, utility reconstruction)
- Restoration of creek areas adjacent to the headwall and endwall
- Re-vegetation of areas disturbed by construction
- Pavement rehabilitation and road reconstruction for Via Verdi and El Portal Drive
- Daylighting as much of the creek as feasible at the original headwall area (approximately 30 linear feet)
- Utility re-construction in Via Verdi
- Demolition of the temporary bypass road, appropriately benching and keying the bypass road cut to receive fill, and

restoration of the adjacent impacted Cemetery Property to its general former condition including necessary erosion control to establish re-vegetation

- Backfilling of shored channel with remaining solder beams, lagging, and tie-backs remaining in-place in accordance with project plans and specifications

Given the limited construction window within the summer months during lower creek flows, the limited time frame for closing El Portal Drive, and to provide adequate construction space and laydown areas, the replacement of the remaining original culvert will be completed with open cut methods to minimize shoring and facilitate ease of construction. This work will require pavement removal, excavation, vegetation removal, and the relocation of underground utilities. It is also anticipated that during construction, temporary shoring will be required at various locations where site constraints from private properties and the shored channel do not allow for sloping back of the excavation. Temporary shoring is not part of the design documents and will be left to the contractor's means and methods and sole responsibility for design of these structures.

As previously mentioned, utility service providers (i.e., EBMUD, AT&T, PG&E, and Comcast) will conduct construction of temporary bypasses and relocation of their facilities as related to the culvert repair work prior to the start of culvert repair construction. The bypasses/relocation required for the sanitary sewers owned by the West County Sanitary District will be carried out by the contractor for the project. Underground utilities that failed during the catastrophic collapse, including water supply and sanitary sewer, will be reconstructed more or less in their original alignment in Via Verdi.

1.3 Purpose and Scope

The purpose of our geotechnical services was to provide subsurface conditions and develop geotechnical conclusions and recommendations in support of the culvert repair project. As detailed in our initial draft proposal dated June 16, 2010 and final proposal dated April 19, 2011 to accomplish this stated purpose, our scope of work included the following:

1. We reviewed other readily available geotechnical reports and geologic/seismic references.

2. Explore the subsurface conditions by drilling seven (7) exploratory borings with a typical depth of 60 feet (with exception to B-3 drilled to a deeper depth of 80 to 90 feet to penetrate through the Cemetery Property fill terrace) located the approximate perimeter of the culvert, and installation of three (3) piezometers to monitor seasonal groundwater level fluctuations.

3. Laboratory testing of selected samples for moisture content, dry density, compaction (to assess compaction within fill soils), gradation, Atterberg Limits (plasticity), strength, consolidation, corrosion, and R-value, as deemed appropriate.

4. Analyze field and laboratory data to develop geotechnical conclusions and recommendations for the following:

   - Subsurface and groundwater conditions
   - Earthwork and site preparation
   - Permanent and temporary cut slopes
   - Foundation design criteria including differential and total settlements
   - Lateral earth pressures and resistance to lateral loads
   - Seismic design parameters based on the 2010 California Building Code (CBC)
   - Geologic Hazards (Liquefaction)
   - Pavement Design

5. MACTEC (formerly Harding Lawson Associates, HLA) to review historic and

current project documents and assess whether the landslides and corrective buttress fills discussed in the 1977 HLA soil report could have any bearing on the cause of the culvert collapse and/or on the repairs to be considered.

6. Subsequent to our proposal and completion of geotechnical field studies the City also requested to extend the paving of El Portal Drive beyond Via Verdi to the pavement change just west of San Pablo Dam Road. To assess the pavement section and conditions and develop pavement rehabilitation recommendations, NCE performed pavement coring (3 locations) and deflection testing of the pavement within this section of El Portal.

7. Present the results of our geotechnical investigation in a written report, complete with appropriate field and laboratory data.

In addition as part of our forensic investigation to evaluate the collapse of the culvert, NCE also completed forensic test pits during the removal of the collapsed culvert excavation and construction of the shored channel. A geophysics investigation was also performed as part of our forensic work to assess voids and potentially weaker soils along the remaining intact culvert section. The results if these investigations as they pertain to the geotechnical conclusions and recommendations will be summarized in this report.

Temporary shoring is not part of the design documents and will be left to the contractor's means and methods and sole responsibility for design of these structures. Therefore providing geotechnical recommendations for shoring systems is specifically excluded from our scope of work. In addition geotechnical scope of work excluded assessment or evaluation of any environmental aspects of the project, which are addressed by separate environmental permitting documents.

2.0 METHODS OF INVESTIGATION

2.1 Review of Previous Data

A variety of published and unpublished sources were reviewed to evaluate geotechnical data and geologic hazards relevant to the site. Appropriate maps that were reviewed included topographic maps, geologic maps, and fault maps by the United States Geological Survey and the California Division of Mines and Geology. A review was also completed of the as-builts provided by the City for the culvert and the nearby Sobrante Glen Subdivision consisting of two plan sets by KCA Engineers, Inc. titled *Subdivision 4593 "Sobrante Glen" Improvement Plans Via Verdi,* dated December 17, 1977 and *Grading Plan Subdivision 4593 "Sobrante Glen" "As built"* dated December 6, 1977 (1977 As-built). The geotechnical investigation that was completed as part of the Sobrante Glen Subdivision improvements by Harding- Lawson Associates was also reviewed and is titled *Geotechnical Investigation, Sobrante Glen Subdivision, Richmond, California,* dated October 11, 1977 (HLA 1977). Finally, as provided by the City, we also reviewed the geotechnical consulting report by Raney Geotechnical for the Creek View Condominiums titled *Geotechnical Consulting Slope Stability and Earth Retaining, Creekview Apartments, El Portal and Via Verdi Drives, Richmond, California*, dated November 28, 1989 (Raney 1989).

2.2 Site Reconnaissance

A reconnaissance of the site was performed by our field engineer before exploratory drilling to observe surficial conditions including site access, utility locations, topography, and any obvious geotechnical concerns. In addition to contacting Underground Service Alert (USA), NCE obtained the services of a private utility locator to identify utilities in the vicinity of our borings using non-invasive geophysical techniques.

2.3 Subsurface Exploration

The field investigation included a total of six (6) exploratory borings as shown on Figure 3A. One of the originally planned seven borings (B-5) was not performed due to conflict with ongoing construction and underground utilities at the site. The first two exploratory borings B-1 and B-2 were performed on east and west side at the culvert on the north side of El Portal Drive. Boring B-1 was originally planned to be drilled on the south side of El Portal near the endwall, but could not be completed due to extensive utilities, and in particular concern for the EBMUD 54-inch water transmission main, which is quite deep and runs below the existing culvert with uncertainties as to its location. Boring B-3 was conducted on the Cemetery Property at the top of the fill terrace to the north of the culvert. Borings B-4 and B-7 were advanced with Via Verdi on the north and south sides of the culvert, with B-7 having to be moved further north of the culvert to accommodate emergency stabilization construction measures. Boring B-6 was performed within the parking lot of the Creek View Condominiums located south of the culvert. The completed boring locations were located by our surveyor, Mountain Pacific Surveys (MPS), and are shown on Figure 3A. The locations were surveyed and staked prior to drilling. The locations and elevations should be considered accurate only to the degree implied by the method used. The exploratory boring methods and results are discussed herein and detailed logs can be found in Appendix A.

In addition, subsequent to our proposal and completion of geotechnical field studies the City also requested to extend the paving of El Portal Drive, starting east of Via Verdi to the pavement change just west of San Pablo Dam Road. To assess the pavement section and conditions and develop pavement rehabilitation recommendations, NCE performed pavement cores at three (3) locations, as shown on Figure

3B, and deflection testing of the pavement within this section of El Portal Drive.

NCE also completed three (3) forensic test pits at the base of the culvert during the removal of the collapsed culvert excavation and construction of the shored channel. The purpose of these test pits was to observe soil materials around the culvert and the culvert itself to look for evidence or indicators of factors that could have contributed and/or lead to the collapse of the culvert. This included but was not limited to scour or erosion of soils around the culvert, soft or low strength foundation soils, corrosive soils, ground movement, and or liquefiable soils, etc.

Additionally, a geophysics investigation was conducted including Ground Penetration Radar (GPR), seismic refraction, and seismic surface wave studies were employed to assess voids and potentially weaker soils along the remaining intact culvert section. The methods of investigation and detailed results are in the Geophysics Investigation report in Appendix B and the results are discussed herein.

2.3.1 Exploratory Borings

Borings B-1, B-2, B-6 and B-7 were drilled to depths of approximately 61 to 61.5 feet from June 21 through June 24, 2010. Borings B-3 and B-4 had to be drilled at a later date due to access on to the Cemetery Property for boring B-3 and closure of Via Verdi to complete boring B-4. Borings B-3 and B-4 were drilled to depths of approximately 90.5 and 61 feet, respectively, on November 22 and 15, 2010, respectively. All borings were drilled by our subcontractor, Gregg Drilling. Exploratory borings, except B-3, were advanced using a truck mounted Fraste Multi Drill XL rubber tired drill rig. Boring B-3 was drilled with a track mounted Fraste Multi Drill XL drill rig to allow access to more difficult and wet ground at the top of the fill terrace within the Cemetery Property. In general, solid flight 6-inch diameter solid flight augers were used until groundwater was encountered to better evaluate soil moisture contents and depth to groundwater, and thereafter drilling methods were switched over to rotary wash with a 5 7/8-inch drag bit.

Our field engineer logged the borings and obtained samples of subsurface materials for visual soil and rock classification and possible laboratory testing. Boring logs are presented on Figures A-4 through A-9 in Appendix A. The samples were classified based on the soil and rock classification charts designated as Figures A-1 through A-3.

Soil and rock samples were obtained using the following methods:

- Driving a Standard Penetration Test (SPT) split-barrel sampler with 2.0-inch outside diameter (OD) and 1.4-inch inside diameter (ID)

- Driving a “California Modified” split-barrel sampler with 3.0-inch OD and 2.43-inch ID

Generally, both SPT and “California Modified” samplers were used both in the soil and rock materials encountered.

The SPT and “California Modified” samplers were driven by 30-inch drops of a 140-pound aboveground automatic trip hammer system. The blow counts recorded from driving the “California Modified” and SPT samplers from the final 12 inches of an 18-inch drive, or to practical refusal, were converted to approximate SPT N-values using a conversion factor of 0.8 and 1.2, respectively. The converted blow count SPT N-values are shown on Figures A-4 through A-9 in Appendix A.

Immediately after drilling, borings were either converted to piezometers or fully grouted with neat-cement tremie grout to the ground surface. An inspector from Contra Costa County Department of Environmental Health was onsite to observe grouting procedures. After grouting was completed, soils from cuttings were either spread neatly at the surface where permitted or collected and placed in 55-gallon drums and left onsite.

2.3.2 Pavement Coring and Deflection Testing

NCE performed Cores C-1 through C-3 within the additional section of El Portal Drive, on October 14, 2011 using NCE's rotary coring rig. NCE collected pavement section core samples (8"diameter) at each location and measured and recorded the thickness and material type of each layer encountered in the pavement structural section, including the presence of any pavement reinforcing fabric. Additionally, at two of the core locations (C-2 and C-3) bulk samples of subgrade materials were obtained for laboratory testing, including moisture content and plasticity index. All cores were then backfilled with the excavated materials and capped with AC cold patch.

Pavement deflection measurements were obtained also obtained within the additional section of El Portal Drive on October 14, 2011 using NCE's Dynatest Model 8000 Falling Weight Deflectometer (FWD) in accordance with California Test Method (CTM) 356. Deflection measurements were taken in the wheel path of all travel lanes in each direction and tested at 50-foot intervals that were staggered at one-half the test interval length in opposite directions. Occasionally, minor adjustments were made to avoid obstacles such as manholes or intersections, storm drain inlets and other utility facilities.

2.3.3 Standpipe Piezometers

Three piezometers were installed in Borings B-2, B-4, and B-7 following drilling to monitor groundwater levels.

The piezometers were installed by placing 2-inch diameter slotted Schedule 40 PVC pipe down to the boring termination depths. Screen length (.02-inch factory slot) varied from 17 to 60 foot in length from the bottom of the hole and was based on observed soil moisture or standing water in the borings. The annulus was then brought up with #3 sand, which extended 2 feet above the top of screen. The sand was capped with a bentonite chip seal and the remaining annulus was grouted to the surface with neat cement (5% Bentonite), where a traffic rated box was embedded in concrete and finished level with the ground surface. The typical piezometer detail is shown on Figure A-10 in Appendix A. Water levels were measured to the nearest 0.01 foot after the piezometer was installed, after groundwater had a chance to stabilize in the piezometer, and on a monthly basis afterward. Results are presented in Section 3.6.

2.3.4 Forensic Test Pits

Forensic Test Pits TP-1 through TP-3 were excavated on October 23, October 28, and November 2, 2010, respectively by Bay Cities, the general contractor for the shored channel, with the onsite excavator. In general, test pits were excavated several feet below the culvert to exposed foundation soils and approximately transverse to the shored channel. It should be noted that test pit locations and time to observe these test pits was very limited due to a very tight construction schedule.

The first test pit (TP-1) was located at the west side of shored channel (the location of the new headwall), and was excavated approximately the entire width of the shored channel below the remaining intact culvert. This test pit allowed observation of soils at the transition between the failed culvert and remaining intact culvert section. The second (TP-2) was excavated within the middle portion of the shored channel, to allow for observation of soils where the culvert had completely collapsed. This test pit could only be excavated a partial width of shored channel due to poor weather and ground conditions that limited access and made excavation difficult. The third test pit (TP-3) was excavated approximately the full width of the shored channel at the east side of the remaining intact headwall. The locations of the test pits are shown on Figure 3A and test pit schematic diagrams and logs are shown in Figures 4 through 6.

In addition, at each test pit, a steel T-probe was advanced by hand perpendicular into the excavated culvert face into the bedding sand to help assess potential voids under the culvert and the condition of the bedding sand.

Measurements of the penetration into the bedding sand behind the culvert face were recorded in inches and are presented on Figures 4 through 6. Pocket penetrometer readings were also measured in clayey soils below the culvert to estimate the strength foundation soils, for which approximate locations and penetrometer readings are also provided on Figures 4 through 6.

NCE also obtained bulk samples of fill and native soils at the test pits at other locations within the shored channel excavation to assess the condition and estimate engineering properties of culvert backfill and foundation soils. The approximate location of these soil sample locations is shown on Figure 7.

2.3.5 Geophysics Investigation

A geophysics investigation was performed on December 7, 23, and 30, 2010 and January 5, 2011 by Advanced Geologic Services (AGS) to look for potential voids and areas of weak and/or disturbed soils along the remaining intact culvert section that might be indicative of potential soil collapse areas. This data in combination with other forensic data was used to help evaluate factors that could have contributed and/or lead to the collapse of the culvert. For example, if scour and erosion of soils materials was taking place outside of the culvert, it would be likely, that if significant, would be represented by a void or weakened zone of soil from collapse of soil into voids.

The investigation includes use of a combination of several geophysical methods to assess the condition of soils around the remaining intact culvert. Ground Penetrating Radar (GPR) was performed that uses a radar technology to scan the subsurface voids and/or disturbed soil. Seismic Refraction and Seismic Surface-Wave methods were also performed by inducing ground motions at shot points (i.e. hammer blow/strike) and then measuring compression or primary wave (P-wave) and surface waves, respectively to look for anomalous low-velocity zones indicative of weakened soils or potential collapsed soil zones along the remaining intact culvert section. In addition surface waves measured can be used to approximate shear wave velocity (S-wave) of rock and soil materials at the site that are used in developing seismic design parameters. Specifically using Seismic Surface-Wave a parameter called Vs30, the s-wave velocity in the upper 30 meters (100 feet) of the site profile, can be estimated and is important in determining the 2010 California Building Code (CBC) soil profile site class, which is discussed further in Section 5.10 of this report.

The methods of investigation and detailed results are in the Geophysics Investigation report in Appendix B

2.4 Laboratory Testing

Samples recovered from the field investigation were visually checked for soil and rock classifications. Selected samples were then submitted for laboratory testing based on soil and rock type, depth, and quality. Laboratory tests were performed by RGH Consultants, Inc. to measure the desired engineering and physical properties.

Samples were tested to measure moisture content, dry density, Atterberg Limits (Plasticity), strength, consolidation, compaction, corrosivity, gradation, and R-values. Test results for boring samples are summarized on the boring logs and presented entirely in Appendix C. In addition test results for bulk samples obtained from forensic test pits and other locations within the shored channel as well as those from pavement coring are also presented in their entirety in Appendix C.

3.0 SITE CONDITIONS

3.1 Regional Geology

The Site is located in the eastern portion of the San Francisco Bay Area, which lies within the Coast Ranges geomorphic province. The San Francisco Bay is generally a northwest trending wide depression that is bounded by similarly trending ridges that comprise the Berkeley Hills to the east and the San Francisco and Marin Peninsulas to the west. This bay trough and ridge structure was formed as a result of a combination of faulting and warping related to the San Andreas Fault system whereby the bay is underlain by a down-dropped or tilted block (CDMG, 1969). The oldest and most widespread rocks in the San Francisco Bay Area are comprised of the Jurassic-Cretaceous age Franciscan Formation. The Franciscan Formation can be fault contacted with other Mesozoic sedimentary rocks and is then in turn overlain by Tertiary and Quaternary age sedimentary and volcanic rock units. Within the San Francisco region many of the valleys have been in-filled with quaternary age sediments (i.e. alluvium and bay deposits) and include marine and non-marine clays, silts, sands, and gravels.

The Site lies at the lower reaches of the Richmond Hills and is underlain by deposits of alluvium associated with San Pablo Creek with underlying rock of the Orinda Formation (Miocene Age) consisting of poorly consolidated sedimentary rock including conglomerate, sandstone, siltstone, and claystone (USGS Preliminary Geologic Map Emphasizing Bedrock Formations in Contra Costa County, California, 1994 and USGS Preliminary Geologic Map of the Richmond Quadrangle, Alameda and Contra Costa Counties, California, 1980).

3.2 Seismicity and Faulting

The Site is within a seismically active region, and historically numerous moderate to strong earthquakes related to the San Andreas system of faults have occurred in this region. Active faults are considered to be those that have moved during the past 11,000 years, and generally only active faults are considered in evaluating seismic risk for building construction. The nearest active fault is the Hayward fault, approximately 3,000 feet to the southwest of the site (California Division of Mines and Geology [CDMG] Earthquake Fault Zones, 1994), as shown on Figure 2. Other major faults which could cause significant shaking at the project site are the, Concord, Green Valley, Calaveras, San Andreas, Greenville, West Napa, San Gregorio, and Rodgers Creek faults. The seismicity parameters for each of the pertinent active faults are shown in the following table:

Fault	Moment Magnitude (1)	Slip Rate (mm/yr) (1)	Approximate Distance to Site (km) (2)
Hayward	6.4	9	<1.0 (3000 ft)
Concord	6.2	4	22
Green Valley	6.2	5	23
Calaveras	6.8	6	34
San Andreas	7.4	24	30
Greenville	6.6	2	46
West Napa	6.5	1	23
San Gregorio	7.2	7	52
Rodgers Creek	7.0	9	23

(1) Based on CGS, Revised 2002 California Probabilistic Seismic Hazards Maps
(2) Based on Jennings (CDMG), 1994 and CDMG Earthquake Fault Zones, 1994

3.3 Surface Conditions

The Site is located within an urban area (adjacent to I-80) at lower reaches of the Richmond hills that transition down into the more heavily urbanized Richmond flatlands bordering the San Francisco Bay. The area is mostly comprised of a mixture residential and commercial properties with undeveloped watershed areas generally associated with San Pablo Creek and its tributary drainages. Moderately steep grass covered hillsides to the north of the site slope down to the south into the creek drainage. Much of the surface along the top of the culverted section of San Pablo Creek, is relatively flat. The surface is paved with asphalt concrete within Via Verdi (roadway grades of Elev. 91 to Elev. 100, Datum: NAVD 88) and El Portal Drive (roadway grades of Elev. 91 to Elev. 92) roadways. The culvert also extends underneath southeast corner the Cemetery Property fill terrace, an undeveloped grass covered parcel of land. This fill terrace slopes up from El Portal Drive to the north, approximately 2:1 (horizontal: vertical) slopes, about 30 feet above the street grade. Creek banks at the existing upstream head wall and downstream end wall of the culvert are heavily vegetated with groundcovers, shrubs, and large trees and are quite steep at certain locations. Average slopes near the head wall and end wall are approximately 2:1 and 1.5, respectively, with bottom of the creek at approximately Elev. 65 feet.

3.4 Subsurface Conditions

Subsurface materials encountered during field exploratory borings generally consisted of a fill soils over native soils (predominantly clay soils) underlain by Orinda Formation bedrock as shown on boring logs in Appendix A.

Fill soils were observed in all borings and are the result of historical grading at the site to establish reasonably level building pads and roadways and backfilling of San Pablo Creek channel for placement of the current existing culvert. The fill materials are particularly thick in the fill terrace area within the Cemetery Property, where grades were raised substantially to establish a level building area in preparation for commercial use as indicated on HLA 1977 report site plan. Fill soil thicknesses in our borings ranged from 8 to 46 feet, including asphalt and aggregate base materials for those borings conducted on paved surfaces. The fill thicknesses appear to be fairly consistent comparing existing surface elevations with old surface elevations shown on the 1977 KCA Engineers Grading Plan for the Sobrante Glen Subdivision. Fill soils were predominantly comprised of stiff to very stiff (occasionally medium stiff) clays with occasional medium dense to dense sand zones (found in borings B-2 and B-3).

In addition, during the removal of the collapsed section of culvert and conducting forensic test pits, we observed that the culvert backfill (lateral extent not known) consisted of aggregate base type materials with a layer of bedding sand underneath the culvert, as shown on the schematic test pit diagrams in Figures 4 through 6. These backfill materials appeared to be very competent and dense in nature with no apparent voids or loss of material. Bedding sand below the culvert based on T-probe penetration and visual observation, also appeared to be intact, well compacted, and no apparent voids were observed. T-probe penetration into the bedding sand, shown on Figures 4 through 6, was greater in some locations below the culvert due to wash out of bedding sand from seeping water after test pits were excavated and lack of sand confinement.

In addition, it was the conclusion of the geophysics investigation that no voids or disturbed soil areas were indicated in the GPR study (note that maximum depth of penetration was approximately 10 feet below ground surface) and that Seismic Refraction and Seismic Surface-Wave methods did no indicate any anomalies that would indicate zones of loosed soil or potential collapse areas. However, a low velocity layer was found within the Cemetery Property fill terrace that was concluded to be associated with variations in the fill material properties (level of compaction) and was interpreted to not represent a collapse area.

Beneath the upper fill soils are native clay soils predominantly comprised of alluvium associated with San Pablo Creek, with exception to B-3, where no native soils were encountered. The native soils are typically stiff to very stiff (occasionally medium stiff) clays. Loose to medium dense sands were also observed in Borings B-1 and B-4. Forensic test pits also were consistent with exploratory borings and Foundation were comprised mostly of native soils (possible fill materials for leveling of subgrade for placement of original culvert) and were generally stiff to very stiff clay soils with occasional dense sands. Foundation soils appeared to be very competent with no evidence of weak soils, voids, or collapsed soils.

The underlying Orinda Formation bedrock rock is comprised of deeply weathered mudstone, siltstone, and sandstone sedimentary rocks to the maximum depth explored. The bedrock surface is variable in depth likely due from erosion by San Pablo Creek prior to deposition of alluvium, and ranges in depth where explored from 24 to 55 feet (Elev. 67 to Elev. 41 feet). Rock materials at the site generally had physical properties of soft to low hardness, plastic to friable, and deep weathering and in many cases properties similar to that of a hard clay.

To better understand the engineering properties of the extensive fill soils at the site, relative compaction[1] of fill material was estimated for each boring comparing relatively “undisturbed” driven soil sample densities to compaction curve tests of fill material within the same depth ranges . The table below summarizes the in-situ relative compaction at the specified depths in each boring.

Boring	Depth to Ground Surface (feet)	Elevation (feet)*	In-Situ Relative Compaction (%)
B-1	10	81	91
B-1	20	71	86
B-2	5	86.5	89
B-3	6.5	113	87
B-3	20	100	81
B-3	25	95	79
B-3	30	90	96
B-4	10	83.5	90
B-4	15	78.5	87
B-4	25	68.5	82
B-6	5	91.5	87
B-7	3.5	100	82
B-7	10	94	90
B-7	15	89	91

*Datum: NAVD 88

As shown in the table above, the in-situ relative compaction was less than 90 percent at many of the depth intervals, with particularly lower compaction at B-3, which corresponds to fill materials within the Cemetery Property fill terrace and possibly the low velocity layer detected in the geophysics investigation.

3.5 Pavement Section Conditions

Based on borings advanced within El Portal Drive and Via Verdi and pavement cores performed within the additional section of El Portal Drive (east of Via Verdi to the pavement change before San Pablo Dam Road), asphalt concrete thickness (AC) and aggregate base thicknesses are summarized in the following table below:

Boring/ Core	Applicable Street	AC Thickness (inches)	AB Thickness (inches)
B-1	El Portal Drive	4	20
B-2	El Portal Drive	5	19
B-4	Via Verdi	2.5	12
B-7	Via Verdi	3.5	14.5
C-1	El Portal Drive	3	NA*
C-2	El Portal Drive	6.5	7.5
C-3	El Portal Drive	7.625**	10

* Bulk sample was not obtained
** Pavement fabric was observed at a depth of 2.625 inches

Pavement subgrade consists of stiff lean to fat clay soil materials of moderate to high plasticity with moisture contents ranging from 18.5% to 26.4%, indicating subgrade is well in excess of optimum moisture for compaction.

3.6 Groundwater

Groundwater was encountered during drilling at all six borings at depths ranging from 20 to 46 feet below ground surface (Elev. 74 to Elev. 66 feet) Water levels encountered were generally measured during or shortly after the time of exploration and may have not had time to achieve equilibrium. Fluctuations in the groundwater level may occur due to variations in rainfall, subsurface soil layer characteristics, temperature and other factors not evident at the time the measurements were made.

Therefore, to better estimate water levels fluctuations through out the year, piezometers were installed in at Borings B-2, B-4, and B-7 in accordance with the typical piezometer detail

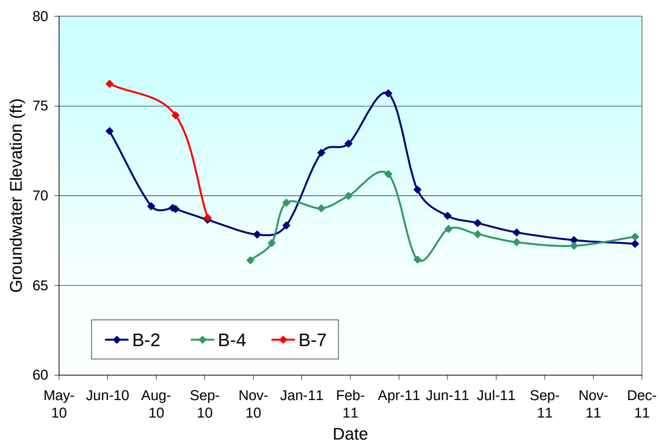
[1] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil determined by ASTM D1557 laboratory test procedure. Optimum Moisture Content is the water content that corresponds to the maximum dry density as determined by the same procedure.

shown on Figure A-10 in Appendix A and are summarized in the following table:

Piezometer	Date	Depth to Groundwater (feet)	Groundwater Elevation (feet) *
B-2	6/23/10	17.8	73.6
B-2	8/5/10	22.0	69.4
B-2	8/27/10	22.1	69.3
B-2	8/30/10	22.2	69.3
B-2	10/2/10	22.8	68.7
B-2	11/22/10	23.6	67.8
B-2	12/22/10	23.1	68.3
B-2	1/27/11	19.0	72.4
B-2	2/24/11	18.5	72.9
B-2	4/6/11	15.7	75.7
B-2	5/6/11	21.1	70.3
B-2	6/6/11	22.5	68.9
B-2	7/7/11	22.9	68.5
B-2	8/16/11	23.5	68.0
B-2	10/14/11	23.9	67.5
B-2	12/16/11	24.1	67.3
B-4	12/7/10	26.1	67.4
B-4	12/22/10	23.9	69.6
B-4	1/27/11	24.2	69.3
B-4	2/24/11	23.5	70.0
B-4	4/6/11	22.3	71.2
B-4	5/6/11	27.1	66.4
B-4	6/7/11	23.4	68.2
B-4	7/7/11	25.7	67.9
B-4	8/16/11	26.1	67.4
B-4	10/14/11	26.3	67.2
B-4	12/16/11	25.8	67.7
B-7	6/23/10	27.5	76.2
B-7	8/30/10	29.2	74.5
B-7	10/2/10	34.9	68.8

*Datum: NAVD 88

The plot below illustrates the water level readings summarized in the above table.



It is critical to observe that the peak groundwater level, which is very near the top of the culvert, is achieved in the April time frame, which is consistent with the collapse of the culvert on April 15, 2010.

It should be noted that boring B-7 was covered by a stockpile from the construction of the temporary shored channel since November 2010. Therefore, no piezometer readings are available since this date. In addition Boring B-4 readings start in December 2010 reflecting drilling and installation of the piezometer in B-4 at a later date than the initial phase of borings completed in June 2010.

4.0 DISCUSSION AND CONCLUSIONS

We conclude that the project is feasible from a geotechnical standpoint. However, all of the conclusions and recommendations presented in this report should be incorporated in the design and construction of the project to reduce the possibility of soil and foundation problems.

The main geotechnical issue will be large excavation depths for the open cut required for replacement of the remaining intact culvert section with high ground water surrounded by a highly urbanized and constrained area. Excavation depths within the remaining intact culvert section will approach 40 feet below street grades at the deepest locations and almost 60 feet below top of the Cemetery Property fill terrace. Temporary shoring will also be required at various locations where site constraints from private properties and the shored channel do not allow for sloping back of the excavation. Excavation concerns include dewatering, excavation stability related proper dewatering, potential ground movement adjacent to temporary excavation slopes and shoring, and protection of the 54-inch water transmission main that will remain below the excavation, which will discussed in greater detail later in this section.

The culvert, headwall, and endwall footing will be founded well below street grade and groundwater and will be supported on spread and strip footings in stiff engineered fill material and native clay soils. Proper footing bearing surfaces will need to consider possible removal of isolated unsuitable soft/weak clay or loose sand soil materials below the footings and protection of the soil bearing surface from water as will be discussed later in the recommendations section of this report. At the endwall, due to higher wall height and corresponding higher overturning moments from seismic loads, foundations will be supported on drilled piers. Based on experience with drilled piers at the shored channel for the soldier beams, piers will encounter groundwater and will likely encounter soils that may be susceptible to squeezing or caving, requiring casing and/or the use of drilling fluid additives to stabilize the drilled pier hole.

The main geologic hazards and other geotechnical concerns are discussed in the following paragraphs:

4.1 Geologic Hazards

4.1.1 Seismic Shaking

The primary geologic hazard at the site is the potential for moderate to strong ground shaking associated with nearby faults discussed in the prior section on seismicity and faulting. Factors determining the characteristics of earthquake ground motion at the site will depend upon the magnitude of the earthquake, distance from the zone of energy release, travel path, topographic effects, subsurface materials, and rupture/source mechanism.

Site structures should be designed to accommodate anticipated ground motions in accordance with the 2010 California Building Code (CBC) seismic design criteria presented in section 5.10 of this report.

4.1.2 Fault Rupture

The Site is not within an Alquist-Priolo Earthquake Fault Zone that designates a zone on either side of known active fault (fault that is defined to be active if it has ruptured or shows evidence of displacement in the Holocene or the last 11,000 years) that is susceptible to fault rupture as defined by the California Geologic Survey (formerly the California Division of Mines and Geology). Therefore the potential for fault rupture at the site is considered to be low.

4.1.3 Liquefaction

Liquefaction is a phenomenon in which wet or saturated cohesionless soils temporarily lose strength due to the buildup of excess pore water pressure during cyclic loading, such as that resulting from earthquakes. Soil most susceptible to liquefaction is loose, clean, saturated, uniformly graded sand. Based on the 2000 *USGS Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine County San Francisco Bay Region*, the site overall is identified to have moderate susceptibility to liquefaction within the alluvial soils from San Pablo Creek. Based on soils borings the majority of the soils are clays and/or of sufficient density to have a high resistance to liquefaction. In addition, the majority of site soils will be removed for the open cut excavation of the culvert. However, a medium dense sand layer was encountered at B-1 at a depth of 29 to 38 feet and B-4 at 28.5 to 38 feet, is susceptible to liquefaction and a portion of this layer will remain below the planned culvert excavation. Due to presence of the medium dense sandy layer, isolated zones settlement due to liquefaction may be approximated to be up to ½ to 1 ½ inches. Recommendations later in this report will call for removal and replacement of any isolated zones of loose sandy soils below the new culvert and wall footings.

4.1.4 Landslides

Based on our recent site reconnaissance, we did not observe evidence of landslides or large slope movements within the culvert area. The only evidence of ground movement beyond that, associated with the collapse area itself, was a dish shaped settlement profile along El Portal Drive directly above the remaining intact culvert section as it crosses El Portal Drive and slope creep settlement (very typical of steepened creek bank slopes) within the pavements at the top of the creek bank at the Church Property downstream of the headwall. Based on the pavement distresses exhibited in the El Portal Drive directly above the remaining intact culvert section, this settlement appears to be old and is likely the surface manifestation of the culvert roof flattening as the downward deflection of the culvert translates up to the surface.

A shallow landslide repair was completed further north of the culvert as part of the construction of the Sobrante Glen Subdivision and included a toe fill buttress that a portion of Via Verdi road is constructed upon, around the time of the construction of the culvert, as detailed in the HLA 1977 report. NCE requested the review of this geotechnical report and other available geotechnical information by AMEC (formerly known as MACTEC and HLA) pertaining to the landslide and repair to evaluate whether it could be related to the culvert failure. AMEC's review concluded that because of the distance between the landslide repair and the failed culvert section and the absence of any evidence of movement in the toe fill buttress, the landslide repair was not likely to not have any connection to the culvert failure. AMEC's review letter can found enclosed in Appendix D.

Based on the California Division of Mines and Geology 1973 *Geologic and Geophysical Investigations For Tri-Cities Seismic Safety And Environmental Resources Study* (CDMG 1973), the culvert area is identified as low relief and upland slope areas north of the culvert are assigned a zone area identified as being underlain by incompetent formations (Orinda Formation) which have few or no slides. However, the only nearby landslide that pertains to the site is mapped by CDMG 1973 as a shallow to intermediate slide plane and appears to be the same landslide indentified in the HLA 1977 report. Further based on review of the Raney 1989 report for the nearby Creek View condominiums it was the judgment that the "westerly trending portion" of the creek, that is to say the creek banks directly upstream of the existing culvert headwall, were judged to be stable, remedial stabilization unnecessary, and the only expected instability would be movement related to slope creep.

In light of the above information, the relatively low relief, the general stiffness and density soils underlain by rock would suggest the potential for landslides or deep seated ground movement is low and the only expected minor ground movements would be related to slope creep at the creek banks north and south of the culvert.

However, steepening of natural slopes by temporary cuts during construction may affect stability and should be sloped back and shored as described in later sections. Seismic slope stability was not considered nor part of our scope of work, given the culvert will be located below grade, and will be designed appropriately for seismic loading as discussed in later sections.

4.2 Excavation Considerations

4.2.1 Soil and Rock Excavatability

Based on our field reconnaissance and field exploration, the majority of site fill soils and alluvium are clayey in nature and will be readily excavated. Occasional cobbles were observed within the clay alluvium during the excavation of the shored channel, but should not impede excavation or drilling activities. Highly weathered mudstone, siltstone, and sandstone sedimentary rocks (Elev. 67 to Elev. 41 feet) were encountered in all borings and may be encountered in excavation below the planned new culvert. Rock materials are deeply weathered and in many cases had properties similar to that of a hard clay and therefore should be rippable by a D9R/D9T or equivalent and excavated with conventional excavation equipment.

Based the drilled holes of the soldier beams with the shored channel and high groundwater, drilling for drilled piers will likely encounter caving and squeezing zones in looser and softer soil zones below groundwater and weak rock. It is important that caving be minimized during drilling to maintain the integrity of foundation elements both laterally and axially. During rotary wash rotary wash test borings we did not encounter caving our squeezing conditions. The drilled holes may need to be stabilized with drilling fluid additives and/or the use of casing to maintain the integrity of the hole. Borehole stability may be improved by the addition of foam, polymer additives, and combinations thereof. The intent of the additives is to increase borehole stability by providing an apparent cohesion to the sidewalls, ease removal of drilling cuttings, and enhance drilling fluid circulation by reducing fluid losses. Whatever method is selected by the contractor, he should be solely responsible for maintaining a stable borehole for placement of grout and other foundation elements.

The excavation will extend through predominantly wet and stiff clayey fill and native soils. However, isolated zones of looser sandy soils as encountered in several borings and/or softer clay soils may be encountered during excavation. These conditions will be compounded by the excavation being completed within an old creek channel with high groundwater, particularly high during the spring months after winter rains. Therefore it will be paramount to dewater the excavation to maintain overall excavation stability as will be described further in the following section. Even with proper dewatering, isolated seepage zones may destabilize soils locally and may need to be further stabilized with shoring, reduced slope cut angles, and/or the placing additional sump pit locations at active seepage zones. This should be anticipated and planned for by the contractor for excavation, temporary shoring, and dewatering activities. In addition as will be discussed further in earthwork and site preparation and foundation recommendations soft and/or loose unsuitable foundation materials will need to be removed and replaced.

4.2.2 Temporary Excavation Dewatering

During excavation and construction, the contractor will be solely responsible for diversion of surface creek waters in accordance with project plans and specifications. In addition, the excavation will be within an old creek channel with high groundwater, particularly in the spring months when water levels appear to be the highest from winter rains. The groundwater flow regime is characterized predominantly of flow through overburden soils and likely by fracture flow through bedrock at depth. The seepage or flow rates into the excavation will be governed by many factors such as groundwater levels and permeability of overburden soils, and may vary across the site.

Therefore we anticipate that significant dewatering will be required. The contractor is solely responsible for design, means and methods of temporary dewatering systems to keep water out of the excavation at all times. A properly designed, installed, and operated dewatering system should:

- Lower the water levels at least 5 feet below the bottom of the excavation and intercept seepage points
- Improve the stability of the excavation and prevent disturbance to the bottom of the excavation
- Provide for collection and removal of surface water and rainfall

Experience indicates that seepage can often be handled with exterior dewatering wells and/or combination within the excavation of a system of trenches, piping, sumps, and pumps. This type of dewatering is desirable because of its flexibility; more sumps can be installed where seepage is greater than expected, and fewer sumps would be needed in dryer portions of the excavation.

Because of the uncertainty in seepage rates and groundwater conditions, and the large impact they may have on the design, it is important that groundwater conditions be carefully observed and recorded by the contractor during excavation operations. Based on construction observations by the contractor the contractor will be solely responsible to make appropriate modifications to the dewatering systems in response to groundwater flow rates actually encountered.

Areas outside the excavation such as roads, utilities, and structures will be monitored by periodic surveys to check for drawdown-induced settlement. Anticipated settlements are small because the soils and rock above groundwater levels are relatively stiff, dense and incompressible. If surveys indicate that settlements may be excessive, groundwater remediation measures will be the sole responsibility of the contractor and may include modification of the dewatering system and/or underpinning would be installed to reduce settlements to acceptable amounts.

4.2.3 Protection of Existing Structures and Utilities

Due to need for deep open cut excavations with lay back slopes and temporary shoring at various locations, the contractor will need to maintain stable excavation with proper dewatering and design temporary shoring so as not to damage or cause lateral or vertical (settlement) movement to adjacent structures and utilities. This will be particularly important for the private residence east of the endwall and the Creek View Condominiums, where the structure foundations and outside flatwork are very close to planned excavations and shoring.

For conventional retaining wall and shoring systems within stiff clay soils, similar to the soils at the site, average maximum lateral wall movements and settlements of the retained soil (at the wall face) average about 0.2% to 0.3% of the wall height (H). Tolerable lateral and vertical movements for structures and utilities are set forth in project plans and specifications. If unacceptable movements are measured, it will be the sole responsibility and cost to the contractor to mitigate movement which may include but not be limited to making adjustments to the shoring system, stabilizing cut slopes, modifying dewatering, and or installation of underpinning. For the EBMUD 54-inch water transmission main the contractor shall also maintain the proper offsets, stay off the alignment, maintain adequate soil cover, and minimize vibrations in accordance with EBMUD requirement and project plans and specifications.

It will be important to perform periodic surveys during construction to evaluate the performance of all shoring and underpinning systems as will be discussed further in the recommendations section of this report.

5.0 RECOMMENDATIONS

5.1 Earthwork and Site Preparation

5.1.1 Subgrade Preparation

Areas to receive slabs, pavements, or fills should be stripped of any debris, vegetation, and organic topsoil (where present). Within the shored channel this will include removal of creek sediment that has been deposited on underlying rip rap rock materials as well as the removal of the rip rock material itself to expose firm and dense foundation soils (compaction of foundation subgrade soils will not be practical and will not be required). Native or fill soils exposed by stripping should be suitable to receive fill and subgrades that will support exterior flatwork/slabs, but should be scarified to a minimum depth of 6 inches for exterior flatwork/slabs, moisture conditioned to above Optimum Moisture Content and recompacted in place to at least 90 percent Relative Compaction[2]. Pavement subgrades should be compacted to at least 95 percent Relative Compaction within the upper 1 foot. Depressions or voids created by the removal of existing pavements, slabs, rip rap, or utilities should be excavated to expose firm soil and backfilled as described later in this section. The subgrade in asphalt-paved or exterior flatwork/slab areas should be smooth and non-yielding. Based on shallow subgrade soils tested below roadway pavements, subgrade soils have high moisture content and moderate to high plasticity, and therefore may be difficult to compact and may yield or "pump" under construction traffic. If soft, unstable, or saturated soils are encountered asphalt-paved or exterior flatwork/slab areas, they should be addressed with mitigation measures that may include but are not limited to the following:

- Scarifying, discing, or tilling the soil to aerate and dry the soil
- Use of larger compaction equipment to deliver more compaction energy
- Over-excavation and replacement with aggregate base
- Stabilization with geogrids

Mitigation measures will be dependent upon severity subgrade issues, construction schedule, and available means of the contractor. Typically for roadway projects where time is limited isolated areas of problematic subgrade are excavated on the order of 6 to 12 inches, geogrid is placed, and then replaced with aggregate base.

5.1.2 Footing Excavations

Footing excavations should be excavated into stiff and dense fill and native soils and footing surfaces should be excavated flat, where on sloping ground may require benching. Footings should be cleared of any loose soil or debris and kept moist before concrete placement. Water should not be allowed to accumulate in footing excavations. A qualified geotechnical field engineer or representative should verify that the exposed surfaces within footing excavations are firm and dense and unyielding and suitable to bear structural loads prior to any placement of reinforcing steel or concrete. Loose (particularly loose sands that may be susceptible to liquefaction), weak, soft unsuitable to bear structural loads should be over-excavated and backfilled with lean concrete flowable fill also called controlled low strength material (CLSM), with an ultimate strength of 150 pounds per square inch (psi).

To provide a working surface and uniform bearing area for the culvert, soils will be excavated an additional 2.5 feet below the bottom of the culvert (including sediment and rip rap in the shored channel section), a filter

[2] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil determined by ASTM D1557 laboratory test procedure. Optimum Moisture Content is the water content that corresponds to the maximum dry density as determined by the same procedure.

fabric will be placed, and then backfilled with a minimum of 1 1/2 –inch crushed clean rock, with no appreciable fines. The rock must be clean and free of fines, as soil conditions will likely be wet and will not be receptive to compaction.

Because footing excavations will be made within the creek channel, soils conditions will be wet and need to be properly dewatered to prevent softening and degradation of footing soils once excavated. The contractor should keep water out of the footing bottoms at all times, minimize foot and vehicle disturbance to footing bottoms, and may need to protect the footing bottoms with a concrete “rat” slab.

5.1.3 Fills and Backfills

Fills and backfills will be primarily related to two main activities, restoration of the Cemetery Property fill terrace and backfill of the proposed new box culvert.

For the cemetery property, restoration will be a relatively balanced earthwork operation and require very little to no import fills and will utilize stockpiled soils from the Cemetery Property only. Fill from the Cemetery Property and culvert excavation shall be segregated and not be mixed. Onsite Cemetery Property soils are expected to be suitable for placement as general engineered fill, however large cobbles or concrete debris should be removed. Moisture conditioning may be necessary to achieve compaction requirements depending on the season when earthwork is performed.

For the culvert excavation, soil material excavated from the culvert can be used as general engineered backfill for the culvert, but will require import due to off-haul of soil materials from the shored channel. Import fill should be non-expansive and consist of soil that has a Liquid Limit of less than 40 and a Plasticity Index of less than 15 (as determined by ASTM D 4318-98), is free of organic material, and contains no rocks or clods larger than 4 inches in greatest dimension. Onsite fill and native soils excavated for the culvert are expected to be suitable for use as general engineered fill, however significant moisture condition will be required and larger cobbles and concrete debris will need to be removed. Soils excavated for the culvert are expected to be wet, particularly in the lower reaches of the culvert excavation below groundwater. Dryer shallow soils excavated for the culvert should be segregated from wetter deeper soils. The contractor should expect effort to disc and till soils at stockpile areas to dry out soils to achieve desired compaction and workability. This should be done well in advance of placement and compaction to give greater time for drying and moisture conditioning. Moisture conditioning may be necessary to achieve compaction requirements depending on the season when earthwork is performed.

A qualified geotechnical field engineer or representative should verify suitability of site soils or import material prior to their use as fill or backfill by checking that they satisfy the above criteria.

Import fill or on-site fill should be moisture conditioned to near Optimum Moisture Content and on-site native soils being used as fill should be moisture conditioned to above Optimum Moisture Content. Fill for the Cemetery Property should be placed in uniform horizontal layers not exceeding 8 inches in loose thickness, and compacted to at least 90 percent Relative Compaction. This level of compaction will restore the cemetery property to its approximate prior condition to the best of our knowledge based on limited compaction results within the Cemetery Property fill terrace. Grindings for removal of the AC bypass road may not be used as fill for the Cemetery Property. At this time we do not know the intended future use, and fill condition should be assessed by a geotechnical engineer during design of any future structures or development.

Backfill for the culvert should be placed in uniform horizontal layers not exceeding 8 inches in loose thickness, and compacted to at least 95 percent Relative Compaction. In areas where fill or backfill will underlie pavements or exterior flatwork/slabs, the upper 6 inches of fill should be kept moist until exterior flatwork/slabs are placed. A qualified geotechnical field engineer or representative should monitor all placement and compaction of fill.

Any filling operations on slopes steeper than 6:1 (horizontal to vertical), as will be the case for backfilling the temporary bypass road in the Cemetery Property, should be benched and keyed into competent material prior to placing fill as will be described in greater detail in the next section.

At the existing shored channel the soldier beams, lagging, and tie-backs can be left in-place. However, the shoring system will need to have at least 5 feet of engineered fill cover that may be achieved by placement of fill and/or the cutting of soldier beams and removal of lagging, in accordance with project plans and specifications. There are also visible voids behind the top of the existing lagging that will need to be excavated and backfilled with engineered fill, compacted to 95% relative compaction. It should also be noted that there will be approximately 5 feet or less between the shored channel lagging and the box culvert (approximately less than 2 feet at tie-back walers), and therefore limited access compaction equipment should be anticipated by the contractor to achieve 95% relative compaction of engineered fill.

5.1.4 Permanent and Temporary Slopes

Significant cuts and fills are planned at the site, and that will require permanent and temporary cut or fill slopes. Temporary cut slopes will be required for removal and replacement of the remaining intact culvert section by open cut methods, requiring both cut slopes within El Portal and Via Verdi and cut slopes extending up into the Cemetery Property fill terrace. Permanent fill slopes will be required for restoration of the Cemetery Property after culvert repairs have been completed. We recommend that permanent fill slopes at the site have a maximum inclination of 2:1 (Horizontal: Vertical) and temporary cut slopes have a maximum inclination of 1.5:1. However, permanent slopes for creek restoration areas may be steeper than 2:1 (but generally not steeper than 1.5:1), due to the use of bioengineered slope protection methods specified in project plans and specifications. At localized areas where softer, loose, wet (seepage areas) are encountered, temporary slope angles may need to be decreased and/or shored depending on the severity of the soil condition, with the final means and methods to be determined by the contractor. Permanent fill slopes should be benched and keyed into competent materials prior to placing fill. Benches should be a minimum of 2 feet high, sloped back into the cut slope, and should be wide enough to accommodate standard earthwork equipment. The key at the bottom of the slope should be at least 8 feet wide and extend at least 4 feet below competent material and should be sloped back into the slope. A 4-inch diameter perforated pipe bedded in 3/4-inch clean, open-graded rock should be placed at the back of the key. The entire rock/pipe unit should be wrapped in filter fabric to prevent migration of fines into the drainage rock. The pipe should be appropriately sloped to provide adequate drainage of the pipe into nearby storm water facilities. In addition, permanent slopes greater than 25 feet in height must contain one drainage bench mid-slope (sloped back into the slope).

Steeper temporary slopes may be considered and evaluated by the contractor if soil materials are sufficiently stiff and dense and do not appear to be excessively wet. The contractor is solely responsible for the safety and performance of temporary cut slopes compliance for the safety of its personnel and should comply with OSHA standards for excavation shoring and safety

At permanent fill slopes, particularly within the Cemetery Property, the long term performance of these slopes will be primarily dependent on erosion from drainage and runoff. Slopes should be graded to direct water away from slopes faces, and erosion control protection measures such as the use of vegetation, hydro seeding, erosion control fabrics/blankets, geosynthetics, shotcrete, and/or rip rap should be considered. Otherwise cut and fill slopes will be subjected to erosion and/or sloughing, thus requiring periodic maintenance of the slopes. Erosion control and re-vegetation measures should be in accordance with project plans and specifications.

5.1.5 Utility Trenches

All utility trenches should be excavated in accordance with current OSHA excavation and trench safety standards. The contractor should be solely responsible for the design and construction of all excavation and trench safety.

We recommend that utility line bedding material consist of sand with less than 10 percent fines. The bedding should extend from the bottom of the trench to 1 foot above the top of the pipe. Sand bedding should be placed in a trench free of standing water and mechanically compacted to a dense condition (as verified by a qualified geotechnical field engineer).

Trench backfill above the pipe bedding should meet the criteria for fill as described above. A qualified geotechnical field engineer or representative should evaluate any proposed imported soil sample prior to its use as trench backfill. Trench backfill should be placed in uniform layers not exceeding 6 inches in loose thickness, moisture-conditioned to near-optimum moisture content, and compacted. Backfill should be compacted to at least 95 percent relative compaction. Jetting should not be permitted for any backfill compaction.

Any groundwater infiltrating into utility trenches should be pumped out prior to backfilling.

Trenches near footings should not extend down below a 2:1 plane extending down and away from the bottom edge of any footing.

5.2 Shallow Foundation Support

The proposed project structures be supported on conventional continuous and isolated spread footings bearing on stiff and dense engineered fill soils and undisturbed native soils. However, endwall footings will also gain support in skin friction on drilled piers, with recommendations in the following section.

All footings should be founded at least 24 inches below the lowest adjacent finished grade. Footings located near other footings or utility trenches should have their bearing surfaces situated below an imaginary 1.5 horizontal to 1 vertical plane projected upward from the bottom of the nearby footing or utility trench. To provide a working surface and a uniform bearing area for the culvert, soils will be excavated an additional 2.5 feet below the bottom of the culvert, a filter fabric will be placed, and then backfilled with a minimum of 1 1/2 –inch crushed clean rock, with no appreciable fines. The rock must be clean and free of fines, as soil conditions will likely be wet and will not be receptive to compaction.

For the culvert, which will essentially behave as a large strip footing, with a least 22 feet of embedment (14 feet for height of culvert, thickness of culvert neglected, and 8 feet minimum cover depth), the recommended net allowable bearing capacity is 3,000 psf due to a dead load and 4,500 psf for all loads including wind and seismic. These values include a factor of safety of 3 and 2, respectively. For auxiliary footings at the headwall and endwall located outside of the culvert excavation, embedment should be neglected and the recommended net allowable bearing capacity is 2,100 psf due to a dead load and 3,200 psf for all loads including wind and seismic. These values include a factor of safety of 3 and 2, respectively. These allowable bearing pressures are net values; therefore, the weight of the footing can be neglected for design purposes. Footings should not, however, have a width of less than 24 inches.

All continuous footings should be designed with adequate top and bottom reinforcement to provide structural continuity and to permit spanning of local irregularities. Any visible cracks in the bottoms of the footing excavations should be closed by wetting prior to construction of the foundations. To assure that footings are founded on appropriate material, a qualified geotechnical field engineer or representative should observe the footing excavations prior to placing steel or concrete.

Because the final culvert will experience a similar stress regime as the existing culvert, settlements are anticipated to be small. Therefore based on the provided allowable bearing pressures capacity the total settlement will be less than 1 inch. Differential settlements between adjacent footings should not exceed one-half of the total settlement. If the planned loads exceed the current loads, we should be contacted to re-evaluate foundation settlements. Due to presence of the isolated medium dense sand materials, isolated zones of settlement due to liquefaction may be approximated to be up to ½ to 1 ½ inches.

For shallow foundations founded predominantly on stiff clay soils, we recommend an allowable modulus of subgrade reaction (Kv1) of 70 kips per cubic foot (kcf) for a l-foot-square bearing plate. This value does not include a safety factor and for short term loads, for which a safety factor of 1.5 would be appropriate. For a loaded area width of B feet, we recommend the modulus of subgrade reaction be calculated using the following equation:

$$k_s = \frac{k_{v1}}{B}\left(\frac{m+0.5}{1.5m}\right)$$

Where

B = Width of loaded area
mB = Length of loaded area
kv1 = Coefficient of Subgrade Reaction for a 1-foot square plate

5.3 Lateral Load Resistance

Lateral load resistance for the culvert and the headwall and endwall may be developed in friction between the foundation bottom and the supporting subgrade. A friction coefficient of 0.35 is considered applicable. In addition, a passive resistance equal to an equivalent fluid weighing 375 pounds per cubic foot acting against the foundations may be used. The above values for friction and passive resistance do not contain a safety factor. We typically recommend geotechnical safety factors of at least 2 for long-term and 1.5 for short term loads. Passive and friction resistance can be assumed to act together at the same time. The upper 12 inches of embedment can be ignored for passive resistance calculations except where the ground is paved or covered by a slab. Where sloping ground is present, to develop full passive resistance the ground should be graded approximately level 10 feet from the bottom of the footing.

5.4 Retaining Walls

Retaining walls must be designed to resist lateral earth pressures and any additional lateral loads caused by seismic loading and/or surcharge loads on the adjoining ground surface. The wall pressures that are subsequently given below were developed for walls retaining undisturbed native soils or compacted onsite soils. If other backfill is to be used or consideration of backfill types to reduce earth pressures is needed (such as angular gravel or crushed rock) additional earth pressures can be provided.

The recorded water levels indicate that high groundwater should be anticipated. Therefore we recommend a design groundwater elevation at approximately the top of the culvert, or approximately Elev. 80 feet. For retaining walls fixed against rotation and translation should be designed to resist at-rest lateral earth pressures corresponding to an equivalent fluid density of 70 pounds per cubic foot (pcf) above the design groundwater elevation and 100 pcf below the design groundwater elevation. It should be noted that for the culvert, these earth pressures should be applied starting at the ground surface. Cantilevered retaining walls free to displace or rotate should be designed to resist active lateral earth pressures corresponding to an equivalent fluid density of 45 pcf above the design groundwater elevation and 90 pcf below the design groundwater elevation. The above pressures are for un-drained walls with level backfill and therefore include hydrostatic pressure below the design groundwater elevation. If walls with level backfill were to be designed to be free draining the earth pressures above the design groundwater elevation may be utilized. The above at-rest and active lateral earth pressures do not include a factor of safety.

For smaller angled flange walls at both headwall and endwall of limited length (approximately 10 to 15 feet), which based on design plans specify to be drained, there a varying degrees of sloping ground behind the wall. For design of these flange walls for lateral earth pressures, assuming a drained condition, the following at-rest earth pressure values should be used corresponding to the slope angle behind the wall. At-rest earth pressures for slope angles between the values presented below may be estimated by linear interpolation.

Retained Earth Slope Angle - β (degrees)	**At-Rest Earth Pressure (pcf)**
5	74
15	91
25	117
35	158
45	230

Retaining walls also should be designed to resist additional seismic loads from earthquake shaking per the 2010 California Building Code (CBC). For the retaining walls at the headwall and endwall the additional seismic load can be represented for both fixed and free walls, assuming level ground and drained wall conditions, as an inverted triangular distribution, where the additional seismic load increment is an equivalent fluid pressure of 42 pcf. This seismic load should be added to the active earth pressure and not the at-rest static earth pressure.

Wherever walls will be subjected to uniform surcharge loads, they should be designed for an additional uniform lateral pressure equal to one-third or one-half the anticipated surcharge load depending on whether the wall is unrestrained or restrained.

We understand from the project structural engineer, that seismic design of the culvert (including flange walls) will be completed with deformation based racking analysis for culverts and buried structures. For the purposes of this seismic evaluation and design the project structural engineer has requested geotechnical design parameters including poisson’s ratio, shear wave velocity, soil strength, and total unit weight of the soils appropriate for the soil material at and around the proposed new culvert. Based on in-situ s-wave and p-wave velocities measured at the site during the geophysics investigation, the recommended poisson’s ratio ranges from 0.2 to 0.5 based on variations in measured seismic wave velocities. The range is shear wave velocities in the fill and native soil materials measured at the site ranged from 300 to 800 feet per second (ft/s) and is judged to be appropriate for the purposes of seismic design and evaluation. The recommended undrained shear strength for the fill and native soils materials around the culvert is 1,100 psf, corresponding to a stiff soil. The total unit weight for the soil materials at and around the culvert is 125 pcf for soil load capacity and 135 pcf for soil load demand.

The above pressures are based on the assumption that sufficient drainage will be provided behind the walls to prevent the build-up of hydrostatic pressures from surface and subsurface water infiltration. Adequate wall drainage may be provided by a sub-drain system consisting of a 4-inch diameter perforated pipe bedded in 3/4-inch clean, open-graded rock. The entire rock/pipe unit should be wrapped in filter fabric to prevent migration of fines into the drainage rock. The rock and fabric placed behind the wall should be at least 1 foot in width and should extend to within 1 foot of finished grade. The upper 1 foot of backfill should consist of compacted low permeability soil to reduce surface water infiltration. Alternatively, prefabricated drainage panels of low compressibility may be used instead of drain rock, with the drainage panels connected to a 4-inch-diameter perforated pipe at the base of the wall. For consideration and additional guidelines, Figure 15 in Appendix E presents sketches of typical drainage and waterproofing systems from the Navy design manual DM 7.02. In either case, the sub-drain pipe should be sloped to drain by gravity and be connected to a system of closed pipes that lead to suitable discharge stormwater discharge facilities. In addition, the "high" end and all 90 degree bends of the sub-drain pipe should be connected to a riser which extends to the surface and acts as a cleanout.

5.5 Drilled Piers

The project structural engineer has determined that drilled piers will be required at the endwall to accommodate higher overturning moments from higher wall sections and applied seismic loads. The piers should generally extend to a depth to provide adequate axial capacity and overturning resistance. We recommend allowable pier capacity skin friction values of 300 pounds per square foot (psf) for dead loads and 400 psf for all loads, including wind and seismic. These values can be used starting at a depth of 5 feet.

Lateral loads on the piers may be resisted by passive pressures acting against the sides of the piers. We recommend a passive pressure equal to a uniform pressure of 1100 psf for long term loads and 1500 psf for short term loads. The passive pressure can be assumed to be acting against 2 times the diameter of the individual pier shafts starting at 5 feet below the ground surface.

To achieve axial and lateral pier capacities the drilled pier shaft will need to be free of loose debris have clean and straight sidewalls. Any accumulated water in the pier excavations should be removed prior to placing reinforcing steel and concrete or the concrete should be tremied to from the bottom of the pier shaft. As aforementioned, based on experience of drilled holes for soldier beams at the shored channel, high groundwater, and the presence of zones of loose to medium dense sands the contractor should also anticipate the potential for squeezing/caving of soil materials into the hole. The drilled holes may need to be stabilized with drilling fluid additives and/or the use of casing to maintain the integrity of the hole. We recommend that the drilled pier excavations be performed under observation of a qualified geotechnical field engineer or representative check that they are constructed in accordance with the recommendations presented herein.

5.6 Construction Monitoring

In conjunction with construction of excavated slopes and/or temporary shoring and a monitoring program should be set up and executed by the contractor to monitor the effects of the excavation, dewatering, and shoring on surrounding structure, streets, and utilities. Pre-existing condition surveys should be performed. Reference points should be set on existing features and read prior to the start of construction and dewatering activities, and points should be set on the shoring as soon as initial installations are made. Both lateral and vertical movements should be measured during construction. If excessive lateral or vertical movements are recorded by the surveys, modifications to the retaining systems and/or underpinning may be required and shall be the sole responsibility of the contractor.

Caution should be exercised to minimize deflection of the shoring system and settlements of the ground surface surrounding the excavation as a result of construction activities such as excavation, dewatering, and shoring installation. The allowable deflections and settlements should be with project plans and specifications. If measurements exceed the predetermined limits, the design team consulted regarding alternative construction techniques that may be proposed by the contractor.

5.7 Pavement Design

Due to the poor condition of the pavement on El Portal Drive and Via Verdi, we have provided pavement reconstruction recommendations for portions of these streets adjacent to the Site.

It is recommended that the first section, El Portal Drive from the pavement change just east of the I-80 off-ramp to the east side of Via Verdi intersection as shown approximately on Figure 3A, be fully reconstructed because of the future culvert repair construction activities. Based on the on subgrade soil collected from boring B-2 and experience with Richmond subgrade soils we used an R-value of 5, and a design traffic index (TI) of 9.0, provided by the City. Therefore, the recommended pavement section is either 14 inches of full depth hot mix asphalt (HMA) or 7 inches of HMA over 18 inches of aggregate base (AB). The City has also elected to resurface El Portal Drive starting at the east side of Via Verdi to the pavement change before San Pablo Dam Road, as shown on Figure 3B. Based on pavement analysis and coring performed, this section is recommended to receive an 8-inch surface reconstruction by removing 8 inches of AC/AB and replacing with 8 inches of HMA.

The second section, Via Verdi from the north side of the El Portal Drive intersection (as shown on Figure 3A) to the north side of the current bypass road contains the collapsed culvert area and due to past and expected future construction is recommended for reconstruction. This section is assumed to have an R-value 5 (similar to El Portal Drive) and a TI of 5.0, provided by the City. Therefore, the recommended pavement section is either 7.5 inches of full depth HMA or 4 inches HMA over 8 inches AB.

The last section, Via Verdi from the north side of the bypass road to the west side of Mozart Drive as shown on Figure 3A, is recommended to receive a surface reconstruction treatment based on this pavement section being in poor condition and having been and likely in the future being used as a construction lay down area. The recommended rehabilitation is to remove the top 4 inches of AC and AB and replace with 4 inches of HMA.

The subgrade in asphalt-paved areas should be smooth and non-yielding. The upper 1-foot should be moisture conditioned (if necessary) to above optimum moisture content and compacted to at least 95 percent relative compaction. The subgrade should not be allowed to dry out prior to pavement construction. If soft, unstable, or saturated soils are encountered, they should be mitigated in accordance with subgrade preparation recommendations presented earlier in this report.

For HMA it is recommended that Type A asphalt concrete mix be utilized with a 3/4 inch maximum size aggregate (as per Caltrans Standard Specification Section 39) for lower AC lifts and a ½ inch maximum size aggregate for the final wearing course. Note that Type "A" mixes use 90% crushed aggregate. The asphalt binder grade should be PG 64-10 (as per Caltrans Highway Design Manual). Asphalt concrete shall be spread and compacted in the number of layers of the maximum thickness indicated in Section 39 of the Caltrans Standard Specifications.

5.8 Site Drainage

Finished grades should be planned to prevent ponding of water and to direct surface water away from foundations, pavements, and slab edges. Roof downspouts should also be directed to discharge collected water away from foundations and pavements.

5.9 Erosion Control

Erosion control measures should be in conformance with project specific erosion control requirements for the City, Contra Costa County and consistent with all applicable agency requirements.

Slopes should be graded to direct water away from slopes faces, and erosion control protection measures such as the use of vegetation, hydro seeding, erosion control fabrics/blankets, geosynthetics, shotcrete, and/or rip rap should be considered. Otherwise cut and fill slopes will be subjected to erosion and/or sloughing, thus requiring periodic maintenance of the slopes. Erosion control shall be in accordance with project plans and specifications.

5.10 Seismic Design Criteria

For seismic design in accordance with the 2010 California Building Code (CBC), we recommend a soil profile type S_D, which corresponds to a stiff soil profile with estimated average undrained shear strengths between 1,000 and 2,000 pounds per square foot (psf) in the upper 100 feet. Due to the Hayward Fault, the mapped spectral accelerations for the short periods (0.2 seconds) S_S is 2.0, and the mapped spectral accelerations for a 1-second period S_1 is

0.78. In addition, seismic surface wave measurements at the Site by AGS indicate an average site shear velocity in the upper 100 feet (30 meters), commonly referred to as Vs30, of 820 feet per second (ft/s). This Vs30 value corresponds to a soil profile type S_D.

Based on the 2010 CBC, the corresponding site modified maximum considered spectral response acceleration for soil profile type S_D and the site modified design spectral response acceleration for soil profile S_D for the Peak Ground Acceleration (PGA, Period of 0 seconds) are approximately 0.8g and .53g, respectively. Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002, revised April 2003 the PGA for 10% probability of exceedance in 50 years for an alluvium site (Site Category D) is approximately 0.7g.

5.11 Soil Corrosion Potential

5.11.1 Soil Resistivity and pH

Soil resistivity is a measure of the ability of a soil to conduct electrical current. Resistivity is usually related to the amount of soluble salts in the soil. Low resistivities generally indicate more corrosive conditions. Seawater has a resistivity of about 70 ohm-cm.

A commonly used soil classification for interpretation of corrosive environments on metals is presented below.

Soil Resistivity (ohm-cm)	Degree of Corrosivity
0 – 1000	Very corrosive
1,000 - 2,000	Corrosive
2,000 - 5,000	Fairly corrosive
5,000 – 10,000	Mildly corrosive
10,000 and above	Negligible

Another factor influencing corrosion potential is pH. Values below pH 7 indicate acidic conditions, and hence, a corrosive environment for metals and concrete.

Resistivity and pH measurements were performed on soil samples from three borings and on samples obtained from conducting forensic test pits during general excavation and removal of the collapsed culvert for the excavation of the current shored channel. The test results are summarized below:

Test No.	Depth (feet)	pH	Resistivity (ohm-cm)	Material
Borings				
B-1	11	7.52	847	Fill Soil
B-1	21	7.36	1050	Fill Soil
B-1	25	7.14	1110	Native
B-2	6	7.74	833	Fill Soil
B-2	16	7.70	1110	Native
B-2	31	8.19	833	Rock
B-3	40	7.61	690	Fill Soil
B-3	45.5	7.77	877	Fill Soil
B-4	11	7.44	781	Fill Soil
B-4	16	7.17	769	Fill Soil
B-4	21.5	7.52	833	Fill Soil
B-7	11	7.87	800	Fill Soil
Forensic Test Locations				
TP1-1	NA	7.43	4650	Bedding Sand
TP1-2	NA	6.77	1180	Native
TP3	NA	7.25	877	Bedding Sand
TP2-1	NA	7.41	3570	Bedding Sand
TP2-2	NA	7.46	1250	Native
TP3-1	NA	7.86	1925	AB
TP3-2	NA	7.60	6670	Bedding Sand
TP3-2B	NA	7.64	7140	Bedding Sand
TP3-3	NA	6.90	1540	Native
TP3-4	NA	7.42	826	Native
TP3-5B	NA	7.48	5745	Bedding Sand
TP3-6B	NA	7.96	1250	AB
V V1	NA	7.12	826	AB
V V2	NA	7.29	1010	AB
V V3	NA	7.83	840	Fill Soil
V V4	NA	7.39	833	AB
V V5	NA	7.39	893	AB
V V6	NA	7.45	800	Fill Soil
V V7A	NA	7.59	1890	AB

AB = Aggregate Base Type Material

These test results indicate that the soil and rock materials obtained from the exploratory borings and culvert forensic investigation soil samples are corrosive to very corrosive and slightly acidic to basic pH. The only exception was the bedding sand material found directly below the collapsed culvert section during the culvert forensic investigation, the test results indicate that the bedding sand is basic to neutral pH and are generally mildly corrosive to very corrosive.

5.11.2 Sulfates and Chlorides

The concentrations of sulfate and chloride in soils can also have a corrosive effect on buried utilities and foundation elements. General correlations between sulfate and chloride concentrations and corrosivity are presented below:

Chloride Concentration (mg/kg)	Degree of Corrosivity
Over 1,500	Severe
300 – 1,500	Positive
0 – 300	Negligible

Sulfate Concentration (mg/kg)	Degree of Corrosivity
Over 5,000	Severe
2,000 - 5,000	Considerable
1,000 - 2,000	Positive
0 – 1,000	Negligible

Sulfates are increasingly corrosive to ferrous metals at concentrations above 1,000 mg/kg and to concrete above 2,000 mg/kg. In addition to a corrosive attack that is chemical, sulfates can exhibit a physical attack on concrete at higher concentrations. Chloride does not demonstrate a physical attack on concrete. Sulfate and chloride test results are summarized below:

Test No.	Depth (feet)	Chloride Concen. (mg/kg)	Sulfate Concen. (mg/kg)	Material
Borings				
B-1	11	33	45	Fill Soil
B-1	21	45	90	Fill Soil
B-1	25	30	114	Native
B-2	6	54	33	Fill Soil
B-2	16	9	36	Native
B-2	31	30	105	Rock
B-3	40	78	30	Fill Soil
B-3	45.5	155	170	Fill Soil
B-4	11	144	45	Fill Soil
B-4	16	17	93	Fill Soil
B-4	21.5	87	99	Fill Soil
B-7	11	63	12	Fill Soil
Forensic Test Locations				
TP1-1	NA	36	54	Bedding Sand
TP1-2	NA	33	12	Native
TP3	NA	54	54	Bedding Sand
TP2-1	NA	33	120	Bedding Sand
TP2-2	NA	51	72	Native
TP3-1	NA	33	51	AB
TP3-2	NA	21	15	Bedding Sand
TP3-2B	NA	39	24	Bedding Sand
TP3-3	NA	54	30	Native
TP3-4	NA	33	102	Native
TP3-5B	NA	48	39	Bedding Sand
TP3-6B	NA	36	144	AB
V V1	NA	18	780	AB
V V2	NA	24	96	AB
V V3	NA	33	147	Fill Soil
V V4	NA	72	90	AB
V V5	NA	30	108	AB
V V6	NA	60	174	Fill Soil
V V7A	NA	30	102	AB

The above sulfate and chloride concentrations indicate that the analyzed soil and rock materials obtained from the exploratory borings and culvert forensic investigation soil samples have a negligible degree of corrosivity to ferrous metals and concrete based solely on corrosive salt concentrations for sulfates and chlorides.

However, based on the entire results of resistivity, pH, sulfate and chloride measurements on near-surface soils at the site, it appears that the conditions in site soils are "very corrosive" to buried reinforced concrete elements and utilities. Therefore, we recommend that appropriate protection be given to steel elements and concrete. The corrosion potential for any imported fill and backfill should also be checked.

6.0 ADDITIONAL GEOTECHNICAL SERVICES DURING CONSTRUCTION

If changes are made in the project, the conclusions and recommendations presented in this report may not be applicable; therefore, we should review any changes to verify that our conclusions and recommendations are valid and modify them if required. During construction a qualified geotechnical field engineer or representative should perform frequent site visits to check geotechnical aspects of the work and perform quality control testing of the following work items:

- Foundation excavations
- Drilled piers
- Dewatering
- Excavation cuts and slopes
- Preparation of areas to receive fill
- Retaining wall drainage
- Placement and compaction of all fill and backfill, including backfill
- Subgrade preparation for all slabs-on-grade and pavements, and aggregate base courses
- Asphalt Paving

7.0 REFERENCES

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Appendix J

WEB SOIL SURVEY RESOURCE REPORT

United States
Department of
Agriculture

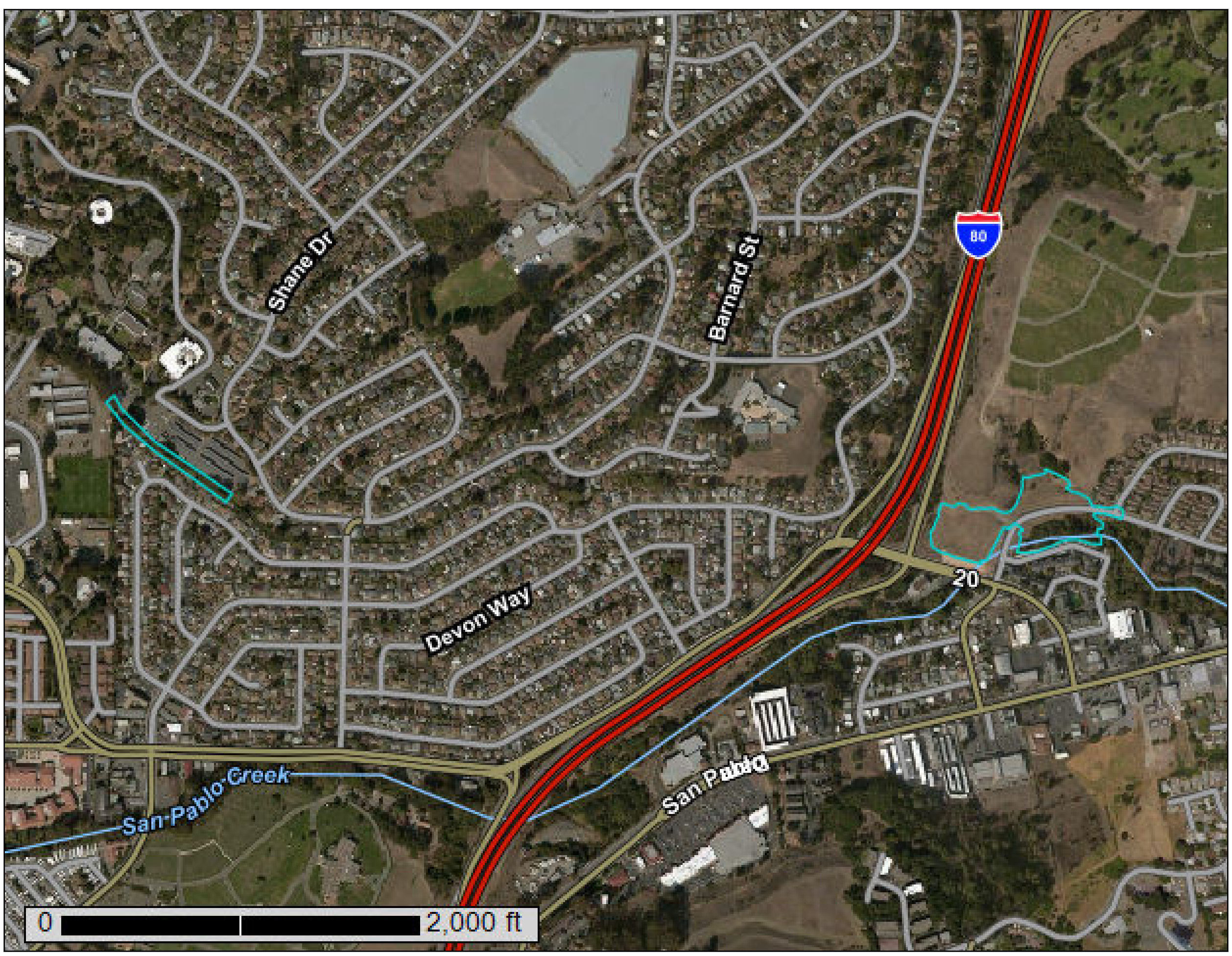
NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for

Contra Costa County, California



May 21, 2019

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 (https://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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Soil Map


122° 20' 21" W
122° 18' 55" W
37° 58' 24" N
37° 57' 40" N
558100
558300
558500
558700
558900
559100
559300
559500
559700
559900
560100
4203000
4202800
4202600
4202400
4202200
4202000
4201800
TaC
Cc
LhE
CnE
CeA
Shane Dr
Gonzaga Ave
Barnard St
Devon Way
El Portal
Barranca
San Pablo Dam
San Pablo Creek
80
20
Soil Map may not be valid at this scale.
Map Scale: 1:9,540 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 100 200 400 600
Feet
0 450 900 1800 2700
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Contra Costa County, California
Survey Area Data: Version 15, Sep 14, 2018

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

Date(s) aerial images were photographed: Oct 8, 2013—Oct 25, 2013

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Cc	Clear Lake clay, 0 to 15 percent slopes, MLRA 15	0.6	8.5%
CeA	Conejo clay loam, 0 to 2 percent slopes, MLRA 14	2.8	39.4%
CnE	Cut and fill land-Los Osos complex, 9 to 30 percent slopes	0.3	4.1%
LhE	Los Osos clay loam, 15 to 30 percent slopes, MLRA 15	3.1	42.4%
TaC	Tierra loam, 2 to 9 percent slopes, MLRA 14	0.4	5.6%
Totals for Area of Interest		**7.2**	**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.

Contra Costa County, California

Cc—Clear Lake clay, 0 to 15 percent slopes, MLRA 15

Map Unit Setting

National map unit symbol: 2vbsq
Elevation: 0 to 1,060 feet
Mean annual precipitation: 13 to 32 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 260 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Clear lake and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clear Lake

Setting

Landform: Basin-floor remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Clayey alluvium derived from metamorphic and sedimentary rock

Typical profile

Ap - 0 to 5 inches: clay
Ass - 5 to 20 inches: clay
Bss - 20 to 30 inches: clay
Bkss1 - 30 to 46 inches: clay
Bkss2 - 46 to 60 inches: clay

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 4 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.5 to 3.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 7.0
Available water storage in profile: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Pescadero

Percent of map unit: 4 percent
Landform: Depressions
Hydric soil rating: Yes

Cropley

Percent of map unit: 4 percent
Hydric soil rating: No

Conejo

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Landform: Strand plains
Hydric soil rating: Yes

CeA—Conejo clay loam, 0 to 2 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2xc94
Elevation: 40 to 730 feet
Mean annual precipitation: 19 to 27 inches
Mean annual air temperature: 59 to 61 degrees F
Frost-free period: 341 to 361 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Conejo and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Conejo

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 6 inches: clay loam
A - 6 to 27 inches: clay loam
Bw1 - 27 to 41 inches: clay loam
Bw2 - 41 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline (0.2 to 0.5 mmhos/cm)
Available water storage in profile: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Botella

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Clear lake

Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: Yes

Garretson

Percent of map unit: 2 percent
Hydric soil rating: No

CnE—Cut and fill land-Los Osos complex, 9 to 30 percent slopes

Map Unit Setting

National map unit symbol: h98p
Elevation: 100 to 2,500 feet
Mean annual precipitation: 14 to 25 inches
Mean annual air temperature: 59 degrees F
Frost-free period: 260 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Cut and fill land (fill part): 70 percent
Los osos and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cut And Fill Land (fill Part)

Typical profile

- 0 to 60 inches: clay

Description of Los Osos

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and shale

Typical profile

H1 - 0 to 8 inches: clay loam
H2 - 8 to 27 inches: clay
H3 - 27 to 31 inches: weathered bedrock

Properties and qualities

Slope: 9 to 30 percent
Depth to restrictive feature: 24 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Alo

Percent of map unit: 10 percent
Hydric soil rating: No

Sehorn

Percent of map unit: 5 percent
Hydric soil rating: No

LhE—Los Osos clay loam, 15 to 30 percent slopes, MLRA 15

Map Unit Setting

National map unit symbol: 2tb85
Elevation: 20 to 1,810 feet
Mean annual precipitation: 15 to 30 inches
Mean annual air temperature: 55 to 61 degrees F
Frost-free period: 200 to 330 days
Farmland classification: Not prime farmland

Map Unit Composition

Los osos and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Los Osos

Setting

Landform: Hillslopes, mountain slopes
Down-slope shape: Convex, concave
Across-slope shape: Convex, concave
Parent material: Residuum weathered from sandstone and shale

Typical profile

A - 0 to 10 inches: clay loam
Bt1 - 10 to 20 inches: clay
Bt2 - 20 to 32 inches: clay

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 24 to 39 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: FINE LOAMY (R015XD024CA), CLAYEY (R015XD001CA)
Hydric soil rating: No

Minor Components

Alo

Percent of map unit: 5 percent
Hydric soil rating: No

Lodo

Percent of map unit: 5 percent
Hydric soil rating: No

Millsholm

Percent of map unit: 5 percent
Hydric soil rating: No

Diablo

Percent of map unit: 5 percent
Hydric soil rating: No

TaC—Tierra loam, 2 to 9 percent slopes, MLRA 14

Map Unit Setting

National map unit symbol: 2tz0r
Elevation: 0 to 1,210 feet
Mean annual precipitation: 15 to 24 inches
Mean annual air temperature: 56 to 60 degrees F
Frost-free period: 240 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tierra and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tierra

Setting

Landform: Fluvial terraces, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 7 inches: loam
A - 7 to 25 inches: loam
Bt - 25 to 59 inches: clay
C - 59 to 79 inches: clay loam

Properties and qualities

Slope: 2 to 9 percent

Depth to restrictive feature: 10 to 26 inches to abrupt textural change
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: CLAYPAN (R015XD115CA)
Hydric soil rating: No

Minor Components

Positas

Percent of map unit: 5 percent
Landform: Terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Los osos

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Botella

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

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Appendix K

CULTURAL RESOURCE INVENTORY REPORT

SECTION 106 CONCURRENCE LETTER AND TRIBAL CORRESPONDENCE

State of California • Natural Resources Agency
Gavin Newsom, *Governor*

DEPARTMENT OF PARKS AND RECREATION
OFFICE OF HISTORIC PRESERVATION
Lisa Ann L. Mangat, *Director*

Julianne Polanco, State Historic Preservation Officer
1725 23rd Street, Suite 100, Sacramento, CA 95816-7100
Telephone: (916) 445-7000 FAX: (916) 445-7053
calshpo.ohp@parks.ca.gov www.ohp.parks.ca.gov

August 7, 2019 In reply refer to: COE_2019_0718_002

VIA ELECTRONIC MAIL

Ms. Naomi Schowalter,
Sr. Regulatory Project Manager
Army Corps of Engineers, San Francisco District
455 Golden Gate Ave
San Francisco CA 94102

RE: Section 106 consultation for the Via Verdi Slope Stabilization Project, Richmond, Contra Costa County (COE File Number 2010-00171S)

Dear Ms. Schowalter:

The U.S. Army Corps of Engineers (COE) is initiating consultation with the State Historic Preservation Officer (SHPO) to comply with Section 106 of the National Historic Preservation Act of 1966 (as amended) and its implementing regulation at 36 CFR Part 800. By letter received on July 18, 2019, the COE is seeking comments on their finding of effect for the above-referenced undertaking. The COE submitted the following document to support their finding of effect:

- *Cultural Resource Inventory Report Via Verdi Slope Stabilization Project, Contra Costa County, California* (NCE May 2019).

Efforts to identify historic properties that may be affected by the undertaking included a records search, pedestrian survey, and Native American consultation. A records search conducted in May 2018 indicated the project area had not been previously surveyed, but prehistoric archaeological sites have been recorded nearby. The current pedestrian survey determined there are no cultural resources present in the 6.2-acre APE.

Native American consultation included contacting the Native American Heritage Commission (NAHC) and requesting a record search of their sacred land file which was positive for a sacred site in the area. The COE sent letters and emails to the tribal entities identified by the NAHC as having ancestral ties to the project area. The COE states that the only response was from Andrew Galvan who requested a copy of the report that the COE provided.

The COE has concluded that there is a low probability of encountering any previously undiscovered cultural resources in the APE, and therefore have determined the project would have no effect on historic properties. The COE has requested review and comment on their finding of effect for the proposed undertaking. After reviewing the COE's letter and supporting documentation, I do not object to a finding of *no historic properties affected* for this undertaking pursuant to 36 CFR 800.4(d)(1).

Be advised that under certain circumstances, such as unanticipated discovery or a change in project description, the COE may have additional future responsibilities for this undertaking under 36 CFR Part 800. If you require further information, please contact Anmarie Medin of my staff at (916) 445-7023 or Anmarie.Medin@parks.ca.gov.

Sincerely,

Julianne Polanco
State Historic Preservation Officer

Collaboration. Commitment. Confidence.℠

Cultural Resource Inventory Report

Via Verdi Slope Stabilization Project
Contra Costa County, California

Prepared on Behalf of:
City of Richmond
Engineering and Capital Improvements
450 Civic Center Plaza
Richmond, CA 94804

Prepared For:
U.S. Army Corps of Engineers,
Sacramento District,
1324 J Street, Room 1350
Sacramento, CA 95814

Prepared By:
NCE
501 Canal Boulevard, Suite I
Richmond, CA 94804

Date:
May 2019

NCE Project Number:
568.41.55

Molly Laitinen
Project Archaeologist

Molly Laitinen

Jeremy Hall
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Senior Cultural Resources Technical Advisor

Charles D. Zeier

With contributions from:
Ed Yarbrough
Senior Architectural Historian
Yarbrough Architectural Resources
2150 Silverado Trail North, Saint Helena, CA 94574

ADMINISTRATIVE SUMMARY

The City of Richmond (City) proposes to conduct the Via Verdi Slope Stabilization Project (project) in order to reconstruct a segment of Via Verdi roadway that was damaged by a landslide in 2017. Reconstruction of the roadway requires installation of a culvert, backfilled with engineered fill, within San Pablo Creek to buttress the landslide and provide a stabilized footing for the roadway embankment. The project proposes to mitigate for impacts to San Pablo Creek by restoring an urban stream approximately 0.75 miles from the project area.

The project must comply with Public Resource Code Section 21083.2 of the California Environmental Quality Act and, due to federal involvement by the United States Army Corps of Engineers, Section 106 of the National Historic Preservation Act.

An investigation was conducted to locate, describe, and evaluate cultural resources present within the project area and within the mitigation site. An Area of Potential Effect (APE) was defined that encompasses the approximately 6.2-acre project area (including a portion of Via Verdi, a section of San Pablo Creek, a soil stockpile staging area, an existing temporary emergency access road, and a landslide slope area north of Via Verdi) and the approximately 1.0-acre proposed mitigation site at Rheem Creek. Much of the project area has experienced some level of previous disturbance (e.g., landslide events, cut and fill activities, and urban development).

A records search was conducted at the Northwest Information Center. The search results indicated that no sites have been previously recorded within the APE. Pedestrian surveys of the APE were conducted on November 5, 2018, and April 17, 2019. Supplementary photographs were taken on November 13, 2018, and December 6, 2018. Fieldwork was performed in accordance with federal and State of California standards. Most of the APE was surveyed utilizing 15-meter transect spacing. Clearly disturbed areas were walked, but without much transect control. Emphasis was placed on the examination of the undisturbed or relatively undisturbed ground.

No cultural resources were identified within or adjacent to the APE. In the absence of such resources, there was no need to assess resource eligibility for listing in the California Register of Historical Resources or the National Register of Historic Places. It is recommended that a finding of "*no historic properties will be affected*," as that phrase is viewed within the context of compliance with the Advisory Council on Historic Preservation regulations (36 Code of Federal Regulations part 800).

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1.0 INTRODUCTION

1.1 BACKGROUND AND PROJECT DESCRIPTION

During the week of February 20, 2017, a landslide moved over 200 feet of the Via Verdi roadway down the embankment towards San Pablo Creek, affecting access to 85 single-family homes and 100 apartment units in the Sobrante Glen neighborhood. The City of Richmond (City) proclaimed the landslide to be a local emergency with potential impacts to street infrastructure, access to nearby communities through Via Verdi, local utilities (sanitary sewer, water supply, gas, electricity, and telecom), San Pablo Creek, the San Pablo Reservoir (located upstream), and the nearby apartment structures. The City retained NCE to provide emergency engineering and design services. The initial step included a geotechnical investigation, which found landslide movement 38 to 53 feet below existing grade and smaller sinkholes developing in Via Verdi's pavement. The affected portion of Via Verdi was closed, and residents are currently using a 650-foot-long by 32-foot-wide emergency access road designed by NCE to bypass the landslide area.

The City secured Federal Emergency Management Agency (FEMA) funding for permanent repairs. The funding is administered by the California Governor's Office of Emergency Services (Cal OES) under Presidential Major Disaster Declaration FEMA-4308-DR-CA for winter storm events occurring in February/March 2017.

The City proposes the Via Verdi Slope Stabilization Project (project) in order to reconstruct a 0.6-acre section of Via Verdi and the associated utilities that pass under the roadway. In order to stabilize the landslide, a section of San Pablo Creek south of the roadway reconstruction area would be culverted; engineered fill would be installed above the culvert on an approximately 1.4-acre area to stabilize the landslide. Once the reconstruction of Via Verdi is complete, the temporary emergency access road would be demolished and all work areas, including the staging area, would be revegetated. The total area of disturbance within the project area, including revegetation areas, would be approximately 6.2 acres.

The Area of Potential Effect (APE) encompasses the approximately 6.2-acre project area (including a portion of Via Verdi, a section of San Pablo Creek, a soil stockpile staging area, an existing temporary emergency access road, and a landslide slope area north of Via Verdi) and the approximately 1.0-acre proposed mitigation site at Rheem Creek. The locations of the project area and the mitigation site are shown in **Appendix A, Figures 1 and 2**. The project contains City rights-of-way and portions of adjacent private parcels including the following assessor's parcel numbers (APNs): 414-340-002, 414-340-001, 414-202-128, 420-021-038, 414-132-001, 414-132-002, 416-140-050, 416-140-033, 416-140-021, and 414-360-041. Details of the APE are further defined in **Section 1.3**.

This document describes cultural resource compliance work completed for the project.

1.2 DEFINITION OF UNDERTAKING

It is anticipated that the project will require a Mitigated Negative Declaration (MND) under the California Environmental Quality Act (CEQA) and an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA) in the form of a United States Army Corps of Engineers (USACE) Permit Evaluation and Decision Format. The archaeological inventory for the proposed project was conducted to comply with PRC Section 21083.2 of CEQA and Section 106 of National Historic Preservation Act (NHPA). The City will be the lead agency for CEQA documentation, and it is anticipated the USACE will be the lead federal agency for NEPA during the implementation of the proposed project.

The project requires a Section 404 permit from the USACE, a Section 401 Water Quality Certification from the Regional Water Quality Control Board, and a Notification of Lake or Streambed Alteration Agreement from the California Department of Fish and Wildlife. It is anticipated that completion of a final Mitigation and Monitoring Plan (MMP) will be required prior to the issuance of permits by these agencies. To support the permit applications, NCE and the City conducted preliminary field evaluations and identified a potential mitigation site within the City's creeks and watersheds. The proposed Rheem Creek mitigation site was inventoried as part of the APE and is included in this report.

This report describes an archaeological inventory of approximately 7.2 acres conducted by NCE as an initial step in the state and federal compliance process. All work was designed to comply with current state, federal (USACE), and professional standards. Those standards state that the goals of an intensive archaeological inventory (maximum 15-meter transect interval) are to:

- Establish an APE,
- Identify prehistoric and historic period archaeological resources in the APE,
- Evaluate identified resources as to their eligibility for listing in the California Register of Historical Resources (California Register) and the National Register of Historic Places (National Register), and
- Provide management recommendations for those properties considered eligible for the California Register and/or the National Register.

1.3 AREA OF POTENTIAL EFFECT

The 7.2-acre APE includes the immediate project area and one proposed mitigation site located along Rheem Creek. The project area includes approximately 6.2 acres, including a portion of Via Verdi, a section of San Pablo Creek, a soil stockpile staging area, an existing temporary emergency access road, and a landslide slope area north of Via Verdi.

The Rheem Creek mitigation area is located southwest of Mills Avenue and Shane Drive, immediately adjacent to the Contra Costa College parking lot and college facilities. The site includes approximately 800 feet of Rheem Creek and its associated, heavily vegetated area.

<u>Area of Direct Impact (ADI)</u>: Construction is anticipated to begin in April 2020 and end in October 2020. Proposed project construction includes the following:

- **Concrete Box Culvert**
  The proposed project places San Pablo Creek into an approximately 350-linear-foot concrete culvert, approximately 17.5 feet high by 24 feet wide. To construct the culvert, the creek channel would be excavated to provide space for the culvert and foundation section, a compacted building pad of crushed rock approximately 2.5 feet thick. Once the concrete structure is constructed approximately 18,000-20,000 cubic yards of engineered fill (rock/soil) would be placed around and over the culvert to buttress the landslide and achieve an acceptable factor of safety for the slope. With a stabilized buttressed slope, the Via Verdi roadway can then be regraded and reconstructed with new asphalt pavement and sidewalk and curb and gutter. Erosion control measures and slope protection including bioengineered slope protection and riprap with pole plantings would be placed at the headwall of the new culvert.

- **Temporary Dewatering**
  Construction would occur during the creek's low-flow summer months; however, dewatering would be necessary to complete the project. Prior to dewatering a bypass system consisting of temporary coffer dams, wire mesh screens, pumps, piping, and sedimentation and siltation control. The temporary coffer dams would serve as barriers to fish and frogs up and downstream of the construction site. Water would be pumped around the construction area and discharged downstream. Downstream flows would be maintained throughout construction.

- **Emergency Road Restoration**
  The portion of the Cemetery Trust Property affected by the construction of the Via Verdi emergency access road would be restored, similar to previous conditions, but the grading would be modified to improve drainage. The restoration would require demolition of the Via Verdi emergency access road. Soil material that was excavated and stockpiled on the Cemetery Trust Property would be removed and used as fill for grading. An approximately 1.5-acre area where the road was installed would be revegetated.

- **Repair of Via Verdi**
  Approximately 0.6 acre of the Via Verdi roadway, sidewalk, and curb and gutter would be reconstructed along the existing alignment. No major earthwork to the slide mass itself is planned; however, minor grading would be required to re-establish street grades and drainage.

  Existing materials such as existing asphalt concrete pavement, concrete sidewalk, and curb and gutter would be rubblized to make aggregate base. Full-depth reclamation would be used to mix the rubblized aggregate base, subgrade material, and asphalt grindings to construct the subgrade for the new pavement. Subsequent to the placement of the subgrade, Via Verdi would be paved with a 4-inch-thick layer of hot-mix asphalt. Temporary utilities constructed as part of the Via Verdi emergency access road would be removed. All utilities (i.e., gas, electrical, water, sewer) would be restored underground within the Via Verdi right-of-way. An existing chain link fence to the north of the Via Verdi emergency access road, between the fire lane access to the Cemetery Trust Property and the first residence on Mozart Drive, would be replaced next to the curb and gutter along the north side of Via Verdi.

- **Site Drainage**
  A new rock-lined swale would be constructed to convey runoff from the Cemetery Trust Property and Via Verdi into San Pablo Creek, just upstream of the new culvert headwall. The rock-lined swale would extend to an existing storm drainpipe underneath Via Verdi to capture runoff discharging from the ephemeral drainage culvert. The swale would accommodate for site drainage and protect integrity of the new culvert.

- **Mitigation – Urban Stream Restoration**
  To mitigate for permanent impacts associated with placement of a concrete culvert within San Pablo Creek, the project proposes to restore and enhance approximately 1.0-acre of urban stream habitat at Rheem Creek.

The Rheem Creek mitigation site is located southwest of Mills Avenue and Shane Drive, immediately adjacent to the Contra Costa College parking lot and college facilities (**Figure 3**). The site includes approximately 800 feet of Rheem Creek and its associated, heavily vegetated area dominated by non-native and invasive plant species. The project proposes to restore Rheem Creek by implementing a restoration planting plan that would include removal of non-native species (including several non-native trees) and revegetation with native species. Removal of non-native trees would include removal of the associated root ball. Several non-native trees (e.g., Eucalyptus) may require limb trimming to allow better light into the creek channel to promote vegetation growth. The native species (including trees) within the mitigation site would be preserved and protected during planting restoration activities.

- **Construction Access and Staging**
  At the project area, staging is planned to occur within a combination of the currently closed section of Via Verdi, the approximately 1.5 acre graded and compacted terrace at the adjacent Cemetery Trust Property, and the portion of land between Via Verdi and the existing culvert headwall. Access to the project area would occur via the existing Via Verdi roadway where it meets the project area.

  At the Rheem Creek mitigation area, it is anticipated staging and access would occur in a portion of the adjacent Contra Costa College parking lot.

- **Equipment and Labor Force**
  Various types of equipment would be needed for the construction of the various project elements at the project area. Medium sized dozers would be used to clear the work area of vegetation and to move soil. Scrapers and excavators would be used to excavate the creek channel to make room for the culvert construction. The foundation section for the culvert would require excavators and dozers to place aggregate rock materials and then compacted with roller compactors. The reinforced concrete culvert would be constructed of cast-in-place concrete placed in reusable formwork. Concrete trucks and a concrete pump would transfer the concrete to the forms where reinforcing rebar had been placed prior to placing concrete. Temporary drilled, vibratory, and/or driven vertical shoring members may be required at the headwall areas as well as where the existing culvert ties in within the new proposed culvert section. Dewatering and creek water diversion would require the use of medium to large size pumps depending on water flows at the time of construction.

  Construction of the roadway would require a pavement milling machine, a concrete crusher to crush concrete into usable aggregate base, a reclaimer to mix the subgrade materials, a compactor, a grader, asphalt pavers, and rollers to compact the asphalt pavement. Various smaller equipment would be needed like a skip loader, back-hoe, water truck, and lifting equipment to complete the numerous tasks of this project.

  At the Rheem Creek mitigation site hand crews using a variety of mechanized tools would be utilized for restoration planting activities. Small to medium sized excavators, dozers, and backhoes may be utilized for removal of root balls.

  To construct this project a skilled labor force will be required that includes equipment operators, steel workers, carpenters, concrete finishers, asphalt paving crews, truck drivers, laborers, and landscape contractors.

Area of Indirect Impact (AII): The proposed undertaking has the potential to cause indirect visual, audible, and atmospheric impacts. During operations at the site, there will be a temporary increase in construction traffic levels, dust, equipment noise, and vibrations. At the completion of project activities, all project-related disturbance will be restored and re-contoured to the surrounding topography. The proposed undertaking does not call for the development of vertical elements within the APE and indirect effects are not expected to be measurable outside of the ADI. As a result, the AII is defined as the same area contained in the ADI.

2.0 ENVIRONMENTAL SETTING

This section provides the environmental context for the immediate project-related APE and a slightly more expansive region surrounding the project area. The geologic and geographic setting, soils, and flora and fauna summaries reiterated here were primarily sourced from Sloan (2006). Other sources for this context include Casterman and Rios (2018), NCE (2011), Shafer and Crow (2012), Hultgren – Tillis Engineers (2018), Soil Survey Staff (2018), United States Department of Agriculture (USDA) (1997, 2001, 2006, 2016, and 2018), and Welch (1977).

2.1 CURRENT PHYSICAL SETTING

The APE is located within an urban area (adjacent to I-80) at lower reaches of the Richmond hills that transition down into the more heavily urbanized Richmond flatlands bordering the San Francisco Bay (Shafer and Crow 2012). The area is mostly comprised of a mixture residential and commercial properties with undeveloped watershed areas generally associated with San Pablo Creek and its tributary drainages. Creeks in the East Bay, including San Pablo Creek, have often been culverted beneath urban environments (Sloan 2006:218-251). Most creeks west of the East Bay Hills flow directly into the San Pablo and San Francisco Bays; however, San Pablo Creek flows north along the east side of the hills before connecting with San Pablo Bay. Moderately steep grass covered hillsides to the north of the APE slope down to the south into the creek drainage (Shafer and Crow 2012). Much of the surface along the top of the culverted section of San Pablo Creek, is relatively flat. The surface is paved with asphalt concrete within Via Verdi (roadway grades of Elev. 91 to Elev. 100, Datum: NAVD 88) and El Portal Drive (roadway grades of Elev. 91 to Elev. 92) roadways. The culvert also extends underneath southeast corner the Cemetery Property fill terrace, an undeveloped grass covered parcel of land. This fill terrace slopes up from El Portal Drive to the north, approximately 2:1 (horizontal: vertical) slopes, about 30 feet above the street grade. Creek banks at the existing upstream head wall and downstream end wall of the culvert are heavily vegetated with groundcovers, shrubs, and large trees and are quite steep at certain locations. Average slopes near the head wall and end wall are approximately 2:1 and 1.5, respectively, with bottom of the creek at approximately Elev. 65 feet.

2.1.1 Previous Via Verdi Road Repair

Via Verdi has been previously disturbed by construction efforts due to culvert failures within San Pablo Creek. In April 2010, a section of a large elliptical corrugated metal pipe (CMP) culvert on San Pablo Creek collapsed, creating a sinkhole in Via Verdi near El Portal Drive. The sinkhole blocked access to the Sobrante Glen subdivision and the City subsequently closed the road. The collapsed area was approximately 130 feet long, 30 to 50 feet in width, and 30 feet in depth. The upstream headwall adjacent to the collapsed portion of culvert remained in place. In addition to the sinkhole, the culvert collapse damaged utilities. The City conducted emergency repairs and constructed a temporary emergency access road through the Cemetery Trust Property to the Sobrante Glen neighborhood.

In 2012, the City conducted the Via Verdi Repair Project, constructing a new, reinforced concrete box culvert. The project also rehabilitated pavement and reconstructed Via Verdi and El Portal Drive, reconstructed damaged utilities, demolished the temporary bypass road, restored areas of the creek adjacent to the culvert headwall and endwall, daylighted the creek to the extent feasible, and restored the adjacent damaged Cemetery Trust Property.

2.1.2 Existing Conditions

In late February 2017, the landslide was observable as undulations/settlement with some cracking in the asphalt pavement and concrete sidewalk with a vertical offset at the developing scarp. In addition, there was damage to utilities including water, stormwater, and sewer requiring temporary repairs. By late March, the landslide scarp had become more pronounced and the pavement had settled up to several feet. The pavement required frequent patching by the City to maintain the roadway driving surface.

The existing Via Verdi roadway is approximately 40 feet wide with a sidewalk along its southern edge. The roadway has been closed to traffic due to the ongoing landslide movement; residents are currently accessing the Sobrante Glen neighborhood via an approximately 650-foot-long emergency access road that was constructed just north of the existing roadway. Temporary utilities were constructed through a vacant land parcel to maintain safe access for Sobrante Glen residents (Johnson Marigold Consulting, LLC and NCE 2018).

The landslide is within the Via Verdi roadway fill embankment, with the top of the head scarp above (or north) of Via Verdi, extending down through Via Verdi and into the San Pablo Creek bank. The landslide currently affects approximately 250 feet of the Via Verdi roadway. The landslide scarp has been mostly obscured by earthwork and grading to construct the emergency access road and appropriate erosional control measures, but is still evident within Via Verdi with several feet of settlement.

2.2 Geologic and Geographic Setting

The APE is located in the eastern portion of the San Francisco Bay Area, which lies within the Coast Ranges geomorphic province (Shafer and Crow 2012). The San Francisco Bay is generally a northwest trending wide depression that is bounded by similarly trending ridges that comprise the Berkeley Hills to the east and the San Francisco and Marin Peninsulas to the west. This bay trough and ridge structure was formed as a result of a combination of faulting and warping related to the San Andreas Fault system whereby the bay is underlain by a down-dropped or tilted block (California Division of Mines and Geology [CDMG] 1969). The oldest and most widespread rocks in the San Francisco Bay Area are comprised of the Jurassic-Cretaceous age Franciscan Formation. The Franciscan Formation can be fault contacted with other Mesozoic sedimentary rocks and is then in turn overlain by Tertiary and Quaternary age sedimentary and volcanic rock units. Within the San Francisco region many of the valleys have been in-filled with quaternary age sediments (i.e. alluvium and bay deposits) and include marine and non-marine clays, silts, sands, and gravels.

The APE lies at the lower reaches of the Richmond Hills and is underlain by deposits of alluvium associated with San Pablo Creek with underlying rock of the Orinda Formation (Miocene Age) consisting of poorly consolidated sedimentary rock including conglomerate, sandstone, siltstone, and claystone (Graymer, Jones, and Brabb 1994; Dibblee 1980).

The APE is within a seismically active region, and historically numerous moderate to strong earthquakes related to the San Andreas system of faults have occurred in this region (Shafer and Crow 2012). Active faults are considered to be those that have moved during the past 11,000 years, and generally only active faults are considered in evaluating seismic risk for building construction. The nearest active fault is the Hayward fault, approximately 3,000 feet to the southwest of the APE (CDMG 1982). Other major faults which could cause significant shaking at the APE are the, Concord, Green Valley, Calaveras, San Andreas, Greenville, West Napa, San Gregorio, and Rodgers Creek faults.

2.2.1 Soils

Via Verdi Project Area Soils

The project area consists of natural soils that have been overlain or mixed with 8 to 35 feet of fill soil (Shafer and Crow 2012; Hultgren – Tillis Engineers 2018). As defined by the Natural Resources Conservations Service, natural soils of the project area fall within three categories, including Conejo clay loam, Los Osos series, and Cut and fill land – Los Osos (Soil Survey Staff 2018).

The southern half of the project area, approximately 46 percent, consists of Conejo clay loam soils. The Conejo series contains very deep, well-drained soils formed on alluvial fans and stream terraces derived from basic igneous or sedimentary rocks (USDA 2006). Typical natural vegetation includes annual grasses and forbs interspersed with oak trees. Land with this soil series has been used for irrigated row crops, grain, pasture hay, and orchards.

The northern half of the project area, approximately 49 percent, consists of Los Osos series. This soil is a moderately deep, well-drained residuum derived from weathered sandstone and shale (USDA 2001). Los Osos series occurs on upland areas with shallow to steep slopes that that are used primarily for rangeland. Typical vegetation includes annual grasses and forbs, perennial grasses, live oak, and coastal sagebrush.

The third defined soil category is Cut and fill land – Los Osos, which is depicted within the Soil Survey Staff (2018) database as comprising the western-most edge of the project area. The USDA Soil Survey of Contra Costa County describes this soil complex as the result of mechanical manipulation of upland areas for urban use, and approximately 70 percent cut and fill, 15 percent Los Osos clay loam, 10 percent Alo clay, and 5 percent Sehorn clay (Welch 1977). This complex consists of 20 percent angular fragments of shale and sandstone by volume. It is well drained to somewhat excessively drained and is highly erosive. There is no typical vegetation type for cut and fill land.

The Soil Survey Staff (2018) database represents more generalized mapped soils based on scattered field reconnaissance. Such information can be improved on and determined in greater detail from local studies. As such, findings from NCE's (2012) and Hultgren – Tillis Engineers (2018) geotechnical investigations indicate fill soil within much of APE. The full reports can be found in **Appendix B**.

Table 1 outlines additional details for each of these soil types.

Table 1. Project Area Soils.

Soil Name	Slope Range	Landform	Drainage Class	Parent Material	% Coverage
Conejo clay loam	0-2%	Stream terraces	Well-drained	Alluvium derived from sedimentary rock	46%
Cut and fill land-Los Osos	9-30%	Hills	Well-drained	Residuum weathered from sandstone and shale	5%
Los Osos clay loam	15-30%	Mountain slopes, hill slopes	Well-drained	Residuum weathered from sandstone and shale	49%

Proposed Mitigation Area Soils

As defined by the Natural Resources Conservations Service, the Rheem Creek mitigation site falls within two soil categories (Soil Survey Staff 2018): Clear Lake Clay and Tierra Loam.

Clear Lake Clay, found in the southeast section, consists of very deep, poorly drained soils found in floodplains, flood basins, and drainageway swales (USDA 2018). It is described as fine-textured alluvium derived from sedimentary, igneous, and metamorphic rocks. Typical native vegetation in this soil complex includes grasses and forbs. Clear Lake Clay has also been extensively used for growing row crops (e.g., sugar beets, beans, and tomatoes), dry farmed pasture, or as rangeland.

Tierra Loam, found in the northwestern section of the mitigation site, is a moderately well-drained soil located on dissected terraces and low hills with shallow slopes (USDA 1997). The soil series formed in weakly consolidated, slightly stratified old alluvium deposits derived from sedimentary rocks that were interspersed with beds of sandstone. Annual grasses and forbs make up the typical vegetation found on Tierra Loam. **Table 2** outlines additional details for each of these soil types.

Table 2. Proposed Mitigation Area Soils.

Soil Name	Slope Range	Landform	Drainage Class	Parent Material	% Coverage
Clear Lake Clay	0-5%	Basin floors	Poorly drained	Alluvium derived from mixed-rock sources	60%
Tierra Loam	2-9%	Fluvial terraces	Moderately well-drained	Alluvium derived from sedimentary rock	40%

2.3 FLORA AND FAUNA

The APE encompasses four distinct habitat types: ruderal/developed, riparian woodland, annual grassland, and coast live oak woodland (Casterman and Rios 2018). Ruderal and developed habitats are located within disturbed urban environments typical of underdeveloped cut and fill areas. Plants within this habitat are mostly non-native invasive species. The riparian woodland, found near creeks, includes red willow (*Salix laevigata*), California buckeye (*Aesculus californica*), boxelder (*Acer negundo*), and poison oak (*Toxicodendron diversilobum*). Annual grasslands consist primarily of non-native grasses, annual forbs, and perennial forbs. Coyote brush (*Baccharis pilularis*) scrub can also be found in grassland habitats as an invasive species (USDA 2016). Oak woodland is typically dominated by coast live oak (*Quercus agrifolia*) with an underlying shrub layer of elderberry (*Sambucus* spp.), Himalayan blackberry (*Rubus armeniacus*), wild cucumber (*Marah fabacea*), greater periwinkle (*Vinca major*), and posion oak (Casterman and Rios 2018).

These habitats support a varied assemblage of wildlife. Riparian woodlands provide habitat for California red-legged frog (*Rana draytonii*), Central California Coast steelhead (*Oncorhynchus mykiss*), the Bridges' Coast Range shoulderband snail (*Helminthoglypta nickliniana bridgesi*), and the common garter snake (*Thamnophis sirtalis*). Vegetation upland of the creeks provides habitat for eastern gray squirrel (*Sciurus niger*), coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), North American racoon (*Procyon lotor*), and near the residential homes, domestic cats (*Felis catus*). A large number of resident and migratory birds are found in the APE. A few species include the American robin (*Turdus migratorious*), Anna's hummingbird (*Calypte anna*), barn swallow (*Hirundo rustica*), house finch (*Carpodacus mexicanus*), turkey vulture (*Cathartes aura*), great blue heron (*Ardea herodias*) red-shouldered hawk (*Buteo lineatus*), Northern harrier (*Circus cyaneus*), great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), white-tailed kite (*Elanus leucurus*), and American kestrel (*Falco sparverius*) (NCE 2011).

3.0 CULTURAL SETTING

Analytical Environmental Services (AES) conducted an extensive archaeological study in 2009 of Point Molate, located in the City of Richmond approximately 5 miles to the west of the project area. Due to the scale of that proposed undertaking, a thorough context was drafted. Given the high level of relevancy between the 2009 study area and the present APE, the following cultural setting overview is paraphrased from the Taggart and Haydu (2009) report with supplemental prehistoric Bay Area information acquired from Milliken et al. (2007) and additional historic information derived from Johnson (1993), Cole (2014), and LSA (2011).

3.1 PREHISTORIC OVERVIEW

The Bay Area has been inhabited by prehistoric peoples since the terminal Pleistocene (Moratto 1984). By the time of Spanish settlement in 1776, seven native languages were spoken within the region including Southern Pomo, Wapo, Patwin, Coast Miwok, Bay Miwok, Karkin Costanoan, and San Francisco Costanoan (Milliken et al. 2007).

Early archaeological excavations focused primarily on shell mounds, a fairly ubiquitous prehistoric feature throughout the region. More than 100 shell mounds were recorded in Alameda and Contra Costa County during the early years of the twentieth century by University of California, Berkeley archaeologists. These features have provided archaeologists with a wealth of information pertaining to Bay Area prehistoric human land use patterns and subsistence practices (Banks and Orlins 1981). The Bay Area is recognized as a discrete archaeological entity derived from an economy primarily focused on the intensive use of shellfish, which has resulted in the accumulation of large shell middens (Moratto 1984).

Culture chronology within the region is a subject of significant debate between researchers (e.g., Beardsley 1948, 1954; Bennyhoff and Hughes 1987; Bennyhoff 1972; Heizer 1949, Heizer and Fenenga 1939, Lillard et al. 1939; and Lillard and Purves 1936). In the last 50 to 60 years, the archaeological recognition of sub-regional cultural variation, beyond the classic Central California Taxonomic System (CCTS) has led to more refined cultural chronologies based on specific artifact types and/or assemblages (e.g., Bennyhoff and Fredrickson 1994; La Jeunesse and Pryor 1990; Milliken et al. 2007; Moratto 1972; Olsen and Payen 1968; Ragir 1972; Sundahl 1982; and White 2002).For purposes of this report, the Bay Area cultural sequence provided by Milliken et al. (2007) is used.

3.1.1 Paleoindian Period (13,000 to 10,000 B.P.)

The climate during the Paleoindian Period was cool and moist, supporting extensive pine forests. Archaeological evidence, although sparse, indicates that people lived in small groups, collecting shellfish and harvesting wild seeds. The artifact assemblage includes basketry, seagrass cordage, incipient milling stones (e.g., metates and manos), beads, chert tools, and fish-like effigies (Santa Barbara Museum of Natural History 2002).

3.1.2 Early Holocene/Lower Archaic (10,000 – 5,500 B.P.)

Within the Bay Area, this period is characterized by a generalized mobile forager subsistence pattern, typified by the more widespread use of milling stones and handstones compared with the Paleoindian Period and by a variety of large, wide-stemmed and leaf-shaped projectile points made from local Franciscan chert toolstone (Hylkema 2002). Burials have been dated to this period; however, there is an overall lack of associated artifacts.

3.1.3 Early Period/Middle Archaic (5,500 – 2,500 B.P.)

Pine forests were extensive during the Early Period, reflecting a cool and wet climate that continued from the earlier Paleoindian Period. Considerably more evidence exists for occupation during this period, commonly referred to as the Millingstone Culture due to the abundance of milling stones. The first mortar and pestle groundstone implements are documented in the Bay Area during this period. In fact, during the latter stages of the Early Period, the mortar and pestle wholly replaced milling slabs and handstones (Milliken et al. 2007). As such, seed and plant processing formed a major part of the diet. Shellfish-gathering and fishing appear more important than hunting during this time. A typical Early Period marker is the net sinker (i.e., stone weights to help sink a net).

In addition to the abundance of milling stones, the Early Period is also typified by a strong association of artifacts with buried human remains. The artifact assemblage includes projectile points and blades, charmstones, rectangular *Olivella* and *Haliotis* beads (cut and/or perforated), bone and antler implements, quartz crystals, and red ochre. Many of these artifacts served as funerary objects that were coupled with highly-specific mortuary practices (e.g., interment westerly orientation). Other artifacts associated with the Early Period, but somewhat less consistently, include baked clay objects, human bone, trident harpoon tips, and pipes (Taggart and Haydu 2009; Milliken et al. 2007).

3.1.4 Lower Middle Period/Initial Upper Archaic (2,500 – 1,520 B.P.)

This period is marked by the disappearance of the rectangular shell bead, used for 3,000 years prior, within the Bay Area, Central Valley, and Southern California. The new decorative and presumed religious objects that appeared included tiny saucer-shaped, split-beveled, and spire-lopped *Olivella* beads and circular *Haliotis* ornaments (Elsasser 1978; Luby 2004). New tool types made from bone appeared, such as barbless fish spears, elk femur spatulae, whistles, and basketry awls. Mortars and pestles continued to be the primary groundstone implements. Net sinkers, a typical marker of the Early Period, disappeared during the Lower Middle Period (Milliken et al. 2007).

Although shellfish and seed/nut processing remained important, one major shift in subsistence during this period was a focus on big game such as elk, deer, and sea mammals. This is evidenced not only by faunal remains but by the occurrence of large projectile points hafted to dart shafts that were thrown with an atlatl (i.e., throwing board or stick).

3.1.5 Upper Middle Period/Late Upper Archaic (1,520 – 900 B.P.)

Fishing and sea mammal hunting became more important during the Upper Middle Period. New inventions, including shell hooks and single-barbed bone fish spears, enabled coastal peoples to catch a wider variety of fish. Intensified fishing led to population increase and large, permanent coastal settlements. New or distinct artifact types include intricate ceremonial blades, fishtail charmstones, new *Haliotis* ornament forms, mica ornaments, *Olivella* wall beads, ear spools, and large mortars (Elsasser 1978; Tamez 1978).

Other markers of the Upper Middle Period include the sudden collapse of the *Olivella* saucer bead trade, the appearance of *Olivella* saddle beads, and the arrival of the Meganos extended burial mortuary pattern (i.e., dorsal extended interments) (Bennyhoff and Fredrickson 1994).

Within the Bay Area during this period, the *Olivella* saddle bead type was replaced with a variety of wide and tall bisymmetrical forms and the appearance of unperforated rectangular and horizontally-perforated half oval *Haliotis* ornaments (Milliken et al. 2007). Although grave accompaniments continue during this period, the quantity and variety of mortuary artifacts are reduced compared to earlier periods.

3.1.6 Initial Late Period/Lower Emergent (900 – Contact)

The Initial Late Period is typified by a resurgence of mortuary artifacts. Typical artifacts include *Haliotis* beads, ornaments and whole shells, *Olivella* beads, charmstones, *Saxidomus nuttalli* (clam) beads, magnesite and steatite beads, ear spools and tubes, mammal bone tubes, incised bird bone whistles, barbed harpoon tips, antler arrow shaft straighteners, baked clay objects, wooden fishhooks, netting and basketry, and mortars and pestles (Heizer 1939).

This period is also referred to as the Emergent Period due to increased levels of sedentism, status ascription, and ceremonial integration evidenced in the archaeological record within Central California (Milliken et al. 2007).

Within the Central Valley, the bow and arrow replaced the atlatl and dart about 1,500 B.P., reflecting a shift in targeted faunal subsistence resources. However, arrow-sized projectile points (Stockton Serrated series) did not appear in the Bay Area until after 1,250 A.D. (Justice 2002). Napa Valley obsidian is a common toolstone from which these projectile points were manufactured, whereas other tools continued to be made from local Franciscan chert (Bieling 1997; Hylkema 2002).

Milling stones and handstones were still present. Marine fishing remained a major part of the diet for coastal peoples. Sardines taken with nets were particularly important. Hunting land animals and gathering wild plants, with an emphasis on acorns, helped supplement the marine diet.

3.2 ETHNOGRAPHIC OVERVIEW

3.2.1 Ohlone Territory & Origins

Ethnographic literature indicates that the region surrounding the current project area was near the northwestern extent of the Ohlone or Costanoan people's pre-contact territory (Levy 1978). Their territory ranged from the San Francisco Peninsula in the north to Big Sur in the south and from the Pacific Ocean in the west to the Diablo Range in the east. Their vast region included the San Francisco Peninsula, Santa Clara Valley, Santa Cruz Mountains, Monterey Bay area, as well as present-day Alameda County, Contra Costa County, and the Salinas Valley.

The Ohlone language belongs to the Costanoan sub-family, a group of eight languages that were spoken by approximately 50 autonomous groups that occupied lands from the Carquinez Straight in Contra Costa County south into Monterey County. Villages comprised 50 to 500 members each, with an average of 200; members interacted freely in matters of marriages, trade, religious and other cultural practices (Levy 1978). The vicinity of the current project area is within the area attributed to the Huchiun Costanoan (Milliken 1995).

Linguistic evidence suggests Ohlone people migrated from the San Joaquin-Sacramento River system and arrived in the San Francisco and Monterey Bay Areas around 2400 B.P. (Levy 1978). This migration is thought to have displaced or assimilated earlier Hokan-speaking populations. In the vicinity of the project area, ancient shell mounds dated from Newark and Emeryville areas suggest villages were established in those areas as early as 5900 B.P. (Stanger 1968).

3.2.2 Ohlone Settlement and Subsistence

The Ohlone inhabited sedentary villages with targeted seasonal resource procurement. They are in many ways thought of as hunter-gatherers but can also be considered harvesters because of the common practice to set annual fires to generate new and higher density seed crops (Brown 1973; Levy 1978). Their staple diet consisted of processed acorns, nuts, grass seeds, and berries, supplemented by game including grizzly bear, elk, pronghorn, and deer. Their diet also included various fish, mussels, and abalone, and riverine resources such as salmon, perch, and stickleback (Levy 1978). Waterfowl, captured with nets and decoys, and other birds were also found within the ethnographic Ohlone diet, including ducks, geese, quail, great horned owls, red-shafted flickers, downy woodpeckers, goldfinches, and yellow-billed magpies (Levy 1978; Teixeira 1997).

Ohlone houses consisted of dome-shaped structures ranging from 6 to 20 feet in diameter and built from woven or bundled mats of tules. At inland settlements located closer to redwood stands, houses were conical shaped and built from redwood bark attached to a wooden frame (Teixeira 1997).

3.2.3 Spanish Mission Era (1769-1833)

The arrival of missionaries and Spanish explorers had a profound impact on the relatively stable Ohlone culture and population. Goals of the Spanish missionaries were to establish a series of missions in strategic and defensible locations, convert Native Americans to Christianity, and expand the Spanish territory. In December of 1602, Spanish explorer Sebastian Vizcaíno may have been the first to make contact with the Ohlone people, known as the Rumsien, at Monterey (Levy 1978). For more than 160 years, nothing is documented in the historical record.

The next Spanish incursion did not take place until 1769, where Gaspar de Portolà, accompanied by Franciscan missionaries, landed in Monterey. Led by Father Junípero Serra, the missionaries introduced Spanish religion and culture to the Ohlone people. The Spanish erected a total of seven missions inside Ohlone territory between 1770 and 1823 (Teixeira 1997). Ohlone were brought into these missions to live and work, disrupting and undermining the traditional Ohlone social structure and way of life. Large numbers of Bay Area Native Americans were moved into three of the missions including Mission Santa Clara, Mission San Jose, and Mission San Francisco between 1794 and 1805. In the spring of 1795, food shortages and an epidemic struck the missions, resulting in thousands of deaths and widespread panic. Escaping Ohlone spread the disease to outside villages (Milliken 1995). A total of 60,000 deaths were recorded (Bean 1994).

The first recorded contact of the Huchiun (the Ohlone people occupying lands near the current project area) occurred in 1772 at the Richmond Wildcat Creek village during a Spanish expedition led by Lt. Pedro Fages and Father Juan Crespi. The goal of the expedition was to find a land route to the Point Reyes area from the South Bay region. The Huchiun were moved to Mission San Francisco between 1788 and 1803, where they intermarried with other Costanoan peoples, as well as non-Costanoan peoples from the Bay Area. By mid-1801, the coastal Huchiun villages were all abandoned in favor of mission life (Milliken 1995).

It is estimated that the Native American population in the Bay Area was reduced by as much as 80 percent of during the Spanish Mission Era (Pritzker 2000).

Between 1813 and 1817, an outpost to Mission San Francisco named *San Ysidro de Los Juchiunes* was established in the Richmond-San Pablo area (Milliken 1995). Francisco Maria Castro, a father at Mission San Francisco, held title to the outpost. He filed a petition to the Mexican authorities in San Jose for the land in 1817 and his application was granted. The land grant was called *El Rancho de Los Cuchinyunes* and was later renamed Rancho San Pablo (otherwise known as the Castro Land Grant). It covered an area that included what is now Richmond, El Sobrante, Pinole, as well as the San Francisco and San Pablo Bays. This proposed project area is located within the boundaries of the rancho. Castro used the land to raise cattle and planted the area's first fruit trees and grapes (Hoover et al. 1990). After Castro's death in 1831, Rancho San Pablo was divided between his wife and 10 children; the land was still used for grazing cattle.

3.2.4 Ohlone Today

The Ohlone people today belong to one of several geographically distinct groups. The Muwekma Ohlone Tribe has members from around the Bay Area and is composed of descendants of the Ohlones from the San Jose, Santa Clara, and San Francisco missions. The Ohlone Costanoan Esselen Nation, consisting of descendants of intermarried Rumsen Costanoan and Esselen speakers of Mission San Carlos Borromeo, are centered within the Greater Monterey Bay Area. The Amah-Mutsun Tribe, located inland from Monterey Bay, are descendants of Mutsun Costanoan speakers of Mission San Juan Bautista. The Costanoan Rumsien Carmel Tribe of Pomona/Chino are descendants from Mission San Carlos and now reside in southern California.

3.3 Historic Overview

3.3.1 Mexican/Colonial Period (1821 – 1845)

Following the Spanish Mission Era (see **Section 3.2.3**), Mexico declared its independence from Spain, first as an empire in 1821, then as a republic in 1824. Spanish missions within what was known as Alta California were left to fend for themselves. In 1833, the Mexican government passed the Secularization Act, which stripped the missions of their previously established land holdings. These holdings were issued to Mexican colonists as ranchos. Indians, whose lives had become entrenched with the missions, were also considered secularized. However, a simple return to aboriginal life was not possible. Disease was responsible for the further decline of native populations. Those that remained lived in small pueblos established in secluded pockets of Alta California or became enlisted essentially as indentured servants to the burgeoning cattle ranch industry within the Central Valley (Cole 2014).

Between the 1830s and late 1840s, word had started to spread of the Bay Area's fertile and underpopulated land. Yerba Buena was the original name of the Mexican settlement that would later become San Francisco. Located near the northeastern end of the San Francisco Peninsula, it was originally intended as a trading post for ships visiting San Francisco Bay. The first homes in the settlement were built by William Richardson (a whaling captain) and Jacob Lesse (a merchant) in the mid-1830s. By 1845, Yerba Buena was inhabited by a few hundred people including Americans, Indians, Spanish, Dutch, and a few Hawaiians (Cole 2014).

3.3.2 Industrial Boom (1848 –1930s)

When gold was discovered at Coloma in 1848, the Bay Area and the City of San Francisco especially, underwent significant and rapid transformation. Prior to the gold discovery, San Francisco was home to less than 1,000 people, but by the end of 1848, the population grew to nearly 25,000 (Wollenberg 2002). In 1850, the year California was admitted to the United States, the population of San Francisco exploded to more than 149,000 (Gilman et al. 1904).

The East Bay experienced similar rapid development in response to the gold rush (Johnson 1993:13-19). Oakland served as a main departure point to the Sierra gold fields by stagecoach. However, due to the rapid increase of California's population, transportation became a challenge and the need for railroads became apparent. Travel by stagecoach was expensive, slow, and outdated. Roads were often impassable in the winter months due to mud or snow. Travel by rail, in stark contrast, offered comfort, and shorter travel times at a much lower cost (Robertson 1998). Oakland was selected as the terminus for the nation's first transcontinental railroad and became a transportation hub for the East Bay. With the arrival of the Central Pacific Railroad in 1869, nearly all freight passed through it. This enabled similar booms to occur in nearby cities, including Richmond's growth around the turn of the century (Johnson 1993:13-19).

The principal industry in Contra Costa County from the 1870s to the 1890s was grain agriculture. However, by the turn of the twentieth century, farms were being subdivided into city blocks (LSA 2011). This development was partially due to the Atchison Topeka & Santa Fe Railroad, which established its western terminus on what is now Point Richmond. This further attracted businesses and by 1902, the Standard Oil Company established the largest petroleum refinery on the west coast (Banks and Orlins 1981), with the Pullman Company, Western Pipe and Steel, and numerous smaller industries following close behind (Johnson 1993:22). A. E. McDonald, in particular, wanted to develop a city east of Point Richmond and purchased Barrett ranch farmland (LSA 2011). The land was immediately subdivided into business, residential, and commercial lots (Banks and Orlins 1981). The growth of the new town of Richmond continued to advance with the addition of railroad spurs and trolleys.

In 1903, the Oakland Branch, linking Point Richmond to El Cerrito (LSA 2011), and the Richmond Belt Line Railroad (Belt Line), located on Richmond's western waterfront and around Point San Pablo, were established (AES 2009). The Oakland Branch enabled access to the California and Nevada Railroad Pier in Emeryville and Oakland (Robertson 1998). The Belt Line tied together a multitude of industries along the waterfront. By 1904, the East Shore and Suburban Railway was built, extending from the Southern Pacific depot (now the Richmond Amtrak station) to the Santa Fe Depot in Point Richmond (LSA 2011). This facilitated major residential development in Richmond and the City of Richmond was incorporated in 1905 (Johnson 1993:14).

Efforts were immediately directed at developing the commercial potential of Richmond's waterfront (LSA 2011). The northern portion of the western waterfront was home to many commercial enterprises, including the Standard Oil Long Wharf, a whale oil processing plant, an oil can factory (owned by Standard Oil) at Point Orient, a brick factory (Central Brick, just beyond Point San Pablo), two rock quarries (Blake Bros. and Healey & Tibbetts), and a large winery complete with worker housing, a hotel, and a school (Winehaven) (AES 2009). A shipping terminal at Point San Pablo was built to handle all the cargo being produced at these enterprises (Bastin 2016). In 1915, Charles Van Damme founded the Richmond – San Rafael Ferry and Transportation Company, which established a ferry terminal at Point San Quentin and ran to Point Castro (Harland and Fisher 1951). By 1931, Richmond's inner harbor was completed through dredging and filling activities (LSA 2011). More businesses took advantage of establishing waterfront positions, including the Felice and Perrelli Canning Company and Ford Motor Company (Banks and Orlins 1981).

By the end of the 1920s, the Belt Line ran the length of the coast with spur lines connecting local industry with transcontinental railroad lines (Haydu and Rodman 2009). However, use of the Belt Line slowed during this time due to Prohibition, which overturned the previously booming business stemming from Winehaven. The Healey & Tibbetts quarry and the Central Brick Company also closed their doors during this time. Business picked up during the 1940s when the Navy acquired Winehaven and set up a fuel depot, using the old winery housing for naval families. The Belt Line ran until the late 1980s for avocational use and was discontinued in 1995 when the Navy abandoned the property at Point Molate (Bastin 2016).

3.3.3 World War II Years (1939 – 1960s)

During World War II, the Bay Area experienced a population explosion as workers flocked to jobs in factories, shipyards, and the Naval Supply Center (just north of Castro Point) (Richmond California League of Women Voters 1966:3). The groundwork for the wartime construction boom was established by the Merchant Marine Act of 1936 to expand merchant fleets (Johnson 1993:32). In 1941, the United States Maritime Commission coordinated the emergency construction program to build ships. Between 1941 and 1942, four shipyards were added to the harbor; Liberty and Victory ships launched in support of the war effort (National Park Service [NPS] 2000). Richmond's population quadrupled from 23,234 in 1940 to over 100,000 in 1943. By this time, 80 percent of the Bay Area's population was employed at shipyards (Johnson 1993:32). Large scale public housing projects had to be undertaken to accommodate the increased population, and thousands of temporary barracks-style, two-story houses were built in Richmond (NPS 2000).

A new ferry slip and apron were constructed in 1946 to accommodate the increase in vehicular traffic (Richmond California League of Women Voters 1966). The project included a 1,000-foot causeway on creosoted piles (which is evident in the partially collapsed causeway), hoisting equipment, and two frame buildings to house terminal equipment (Oakland Tribune 1946). In 1947, a fourth ferry, the Sierra Nevada, was added to the Richmond-San Rafael fleet. By 1952, a short wood pier and a causeway were constructed south of the original pier. The timber-pile wharf extended 920 feet and supported two lanes of concrete roadway with curbs, railings, streetlights, and two additional boat slips, which were constructed to meet the increasing transportation demands. A series of ferry strikes in the late 1940s and early 1950s had a severe impact on transportation and commerce in the north bay. The strikes provided the impetus for the City of Richmond, Marin County, and the State of California to unite in efforts to construct a bridge crossing. In 1956, the Richmond-San Rafael Bridge carrying Interstate Highway 580 was completed, which effectively replaced the service provided by the Richmond-San Rafael Ferry Company. The last day of ferry service was August 31, 1956 (Whiting n.d.).

During the 1930s through 1960, the Eastshore Highway (Highway 40), was being transformed by State engineers into Interstate 80 (I-80), which would be the East Bay's first freeway. The final section of I-80 to be improved went through Richmond between the Distribution Structure at the east end of San Francisco-Oakland Bay Bridge and Vallejo (California Highways and Public Works [CHPW] 1960:57). San Pablo Avenue, which is still in use today, was part of the original Highway 40 alignment located west of the APE. This section of I-80 was moved eastward and improved from a four-lane highway to a six-lane concrete roadway with frontage roads, street connections, structure ramps, and extensive sewer and storm drainage systems (CHPW 1960:60). Observations from topographic quadrangle maps and aerial images indicate that the APE was primarily open space prior to the construction of I-80, built by 1958, and Via Verdi roadway, built by 1987 (Nationwide Environmental Title Research [NETR] 2019).

Rheem Creek bisected ranch land to the north and farmland to the south in 1939 (Google Earth 2019). By 1946, the entire southern area of farmland was residential homes (NETR 2019). By 1958, Rheem Creek was channelized as more homes were built immediately north of the creek. The creek was fully locked in place by 1980 after the Contra Costa College parking lot and college facilities were built.

After the war, Richmond was considered the nation's prime site for redevelopment (Johnson 1993:216-228). The ensuing demolition program of the 1950s razed hundreds of acres of war housing. In doing so, tens of thousands of minority and low-income residents were displaced highlighting the racial issues that motivated redevelopment. Few structures still remain in use (Banks and Orlins 1981).

3.3.4 Post War Richmond

The end of the war saw a decline in population with closing shipyards (LSA 2011). The Richmond Redevelopment Agency was formed in 1949 to rebuild Richmond's economy. Various projects included warehousing, distribution, and chemical and research facilities. Main contributors to Richmond's economy today are the Safeway food chain, Richmond Kaiser Permanente Medical Center, the Chevron Refinery, and the port with its associated warehousing facilities.

Today, Richmond is one of many culturally diverse Bay Area suburbs transitioning its economy from industrial foundations to technological enterprises (CivicPlus 2019).

4.0 LITERATURE REVIEW

4.1 ARCHIVAL RESEARCH

Prior to performing the field survey, archival data were reviewed to determine the location and nature of prehistoric and historic resources recorded previously within and adjacent to the APE. Archaeological project and site records maintained by the Northwest Information Center (NWIC) were requested using a quarter-mile (0.25) search buffer around the APE. Emphasis was placed on determining which portions of the archival study area have been inventoried previously and the location of previously recorded archaeological sites within or adjacent to the project area. Historic aerial, USGS topographic, and General Land Office survey plat maps were examined for the presence of cultural features near the project area.

The records search indicated 24 inventories and 10 sites that were recorded within 0.25 miles of the project area. Additionally, 16 inventories and 0 sites were recorded within 0.25 miles of the Rheem Creek mitigation site. None of the recorded sites near the project area extend into the APE. Search results are discussed in the following sections. **Appendix C** contains records search results received from NWIC.

4.2 PREVIOUS INVENTORIES

4.2.1 Project Area

As listed in **Table 3**, numerous archaeological inventories have been previously conducted in the project area's archival study area, with the majority dating between 10 and 20 years ago.

Table 3. Previous Inventories within 0.25 Miles of the Project Area.

Report Number	Title	Author(s)	Year
S-001475	County File #3065-78, cultural resource field reconnaissance conducted on a 0.79 acre parcel at 3741 San Pablo Dam Road in El Sobrante, Contra Costa County (letter report)	Milliken, Randy	1979
S-001581	An Archaeological Reconnaissance of Two Acres in El Sobrante, Contra Costa County, California	Amaroli, Paul E.	1979
S-004950	Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from Bay Bridge to Carquinez Bridge, 04-ALA/CC-80 2.0/8.0, 0.0/14.1, 04209-400211	Buss, Margaret	1982
S-004950	First Addendum Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge in Alameda and Contra Costa Counties 04-Ala/CC 80 2.0/8.0; 0.0/14.1, 04209-400211	Melandry, Mara	1982
S-006214	An Archaeological Survey of the Triplett Property, 3640 San Pablo Dam Road, El Sobrante, Contra Costa County, California	Elling, C. Michael	1983
S-006592	An Archaeological Reconnaissance of the Appian Way Widening Project, El Sobrante, Contra Costa County, California	Banks, Peter M.	1984
S-007131	An Archaeological Reconnaissance of the Appian Way Widening Project: Phase II, El Sobrante, Contra Costa County, California	Banks, Peter M.	1985

Table 3. Previous Inventories within 0.25 Miles of the Project Area.

Report Number	Title	Author(s)	Year
S-007573	An Archaeological Reconnaissance of the Rancho Plaza Project, Richmond, Contra Costa County, California	Banks, Peter M.	1985
S-007894	Archeological Investigations of Assessor's Parcel Nos. 420-150-13, 22 and 23 in Contra Costa County (letter report)	Steiner, Maureen	1986
S-007988	A Cultural Resource Investigation for the San Pablo Dam Road Widening Project, El Sobrante, Contra Costa County, California	Orlins, Robert I.	1986
S-008100	Archaeological Reconnaissance of the Tyson Property, Parcel #425-170-025, El Sobrante, Contra Costa County	Baker, Suzanne	1986
S-008186	Subsurface Archaeological Investigations for the Appian Way Widening Project, El Sobrante, Contra Costa County, California	Banks, Peter M.	1986
S-010228	The Archaeological Monitoring of Excavations for Three Electrical Vaults on Appian Way, El Sobrante, Contra Costa County, California	Wood, Alice F.	1988
S-011534	Archaeological survey of property located at 4247 Appian Way, El Sobrante, Contra Costa County (letter report)	Flynn, Katherine	1988
S-012297	Archaeological evaluation of 4201 Garden Lane, El Sobrante, Contra Costa Co., Project No. MS 192-90 (letter report)	Flynn, Katherine	1991
S-013803	Archaeological Field Inspection of the Property at 3995 Garden Road, El Sobrante, Contra Costa County, California (letter report)	Holman, Miley Paul	1991
S-014541	Archaeological Test Excavations at CA-CCO-156, El Sobrante, California	Baker, Suzanne, Eric Wohlgemuth, and Cindy Desgrandchamp	1992
S-022273	A Cultural Resources Study of 4439 Appian Way (APN# 425-110-021), El Sobrante, Contra Costa County, California	Schneyder, Stacey	1999
S-027935	Archaeological Survey and Record Search Results for 4150 Appian Way, El Sobrante (APN 425-170-030) (letter report)	Holson, John	2004
S-038237	Cultural Resources Study for the Via Verde Sinkhole Repair Project, Richmond, Contra Costa County, California	Blind, Heather	2011
S-038251	Buried Archaeological Site Assessment and Extended Phase I Subsurface Explorations for the I-80 Integrated Corridor Mobility Project, Caltrans District 04, Alameda and Contra Costa Counties, California, 04-ALA-CC-80, P.M. ALA 1.99/P.M. ALA 8.04, P.M. CC 0.0/P.M. CC 13.49, EA 3A7761 / EA 3A7771	Meyer, Jack	2011
S-043527	Archaeological Survey Report Interstate 80/San Pablo Dam Road Interchange Project, Contra Costa County, California, 4-CC-80 PM 3.8/5.3 EA 0A0800	Martorana, Dean	2008
S-043527	Historical Resources Evaluation Report Interstate 80/San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0800 4-CC-80 PM 3.8/5.3	Wee, Stephen	2008

Table 3. Previous Inventories within 0.25 Miles of the Project Area.

Report Number	Title	Author(s)	Year
S-043527	Supplemental Historic Property Survey Report Interstate 80/ San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0811; EFIS 0413000365 4-CC-80, PM 3.8/5.3	Kubal, Kathleen	2014

4.2.2 Proposed Mitigation Site

Similar to the project area, the majority of previous inventories conducted in the archival study area around the mitigation site date between 10 and 20 years ago. A bulk of the reports completed near Rheem Creek were conducted under one contract in 2007 for U.S. Army Reserve facilities. **Table 4** provides a full list of the previous inventories that have been conducted within 0.25 miles of the mitigation site.

Table 4. Previous Inventories within 0.25 Miles of the Proposed Mitigation site.

Report Number	Title	Author(s)	Year
S-001610	An Archaeological Investigation of a Parcel on El Portal Drive, San Pablo, Contra Costa County, California	Banks, Peter M.	1979
S-033596	Cultural Resource Inventory and Evaluation of United States Army Reserve 63D Regional Readiness Command Facilities; Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve Heroic War Dead USAR Center/Area Maintenance Support Activity 85 (G), Oakland, California; P-01-[010831], 63D Regional Readiness Command Facility CA036, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve Oakland USAR Center #2, Oakland, California; P-01-01830, 63D Regional Readiness Command Facility CA-125, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve PFC Baccigliери Armed Forces Reserve Center, Concord, California; P-07-002752, 63 D Regional Readiness Command Facility CA007, Contract No. W912C8-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve Col. Hunter Hall USAR Center, San Pablo, California; P-07-002753, 63D Regional Readiness Command Facility CA 070, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve Fort Ord USAR Center, Marina, California; 63D Regional Readiness Command Facility CA012, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve Moss Landing Local Training Area, Moss Landing, California; 63D Regional Readiness Command Facility CA189, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007

Table 4. Previous Inventories within 0.25 Miles of the Proposed Mitigation site.

Report Number	Title	Author(s)	Year
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve Jones Hall USAR Center, Mountain View, California; P-43-001836, 63D Regional Readiness Command Facility CA031, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve Richey Hall USAR Center, San Jose, California; P-43-000728, 63D Regional Readiness Command Facility CA069, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve Moffett USAR Center, Mountain View, California; P-43-001837, 63D Regional Readiness Command Facility CA120, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	Cultural Resources Inventory and Evaluation of the United States Army Reserve PFC Young USAR Center, Vallejo, California; P-[48-000752], 63D Regional Readiness Command Facility CA-090, Contract No. W912C8-05-P-0052	Maniery, Mary L. and Cindy L. Baker	2007
S-033596	USA070613A; Inventory and Evaluation of Historic Resources at 63D Regional Readiness Command, US Army Reserve Center in California	Donaldson, Milford Wayne and James O. Anderson	2007
S-035664	A Cultural and Paleontological Resources Study for the Contra Costa College Facilities Master Plan Project, San Pablo, Contra Costa County, California	Jones, E. Timothy and Michael Hibma	2008
S-049682	Colonel Hunter Hall, United States Army Reserve Center, Facility ID No. CA070	Polanco, Julianne, Laura M. Caballero, and Susan K. Stratton	2017
S-049682	USA_2017_0206_002, Real Property Exchange of Hunter Hall Army Reserve Center, 2600 Castro Road, San Pablo, California	Polanco, Julianne, Laura M. Caballero, and Susan K. Stratton	2017

4.3 Previously Recorded Resources

4.3.1 Project Area

Resources near the project area include both prehistoric and historic sites (**Table 5**). Prehistoric resources include two habitation sites with evidence of shell and stone tool debris. The closest prehistoric site is approximately 0.2 miles away from the project area. The historic resource closest to the project area is a neighborhood containing residential homes built in 1950. However, the homes are located outside of the project's viewshed to the west of I-80.

Table 5. Previously Recorded Resources within 0.25 Miles of the Project Area.

Site Number	Age	Description	Last Recorded	NRHP Status	Proximity to Project Area
P-07-000097	Prehistoric	El Sobrante Library Site; habitation debris	1985	Unevaluated	Outside
P-07-000098	Prehistoric	Garden Road Cul-de-Sac Site; burials and habitation debris	1988	Unevaluated	Outside
P-07-000839	Historic	Lu Farm Complex	1999	Unevaluated	Outside

Table 5. Previously Recorded Resources within 0.25 Miles of the Project Area.

Site Number	Age	Description	Last Recorded	NRHP Status	Proximity to Project Area
P-07-004605	Historic	Map Reference #7; single family residence	2007	Unevaluated	Outside
P-07-004606	Historic	Map Reference #6; single family residence	2007	Unevaluated	Outside
P-07-004607	Historic	Map Reference #5; single family residence	2008	Unevaluated	Outside
P-07-004608	Historic	Map Reference #4; single family residence	2008	Unevaluated	Outside
P-07-004609	Historic	Map Reference #3; single family residence	2007	Unevaluated	Outside
P-07-004610	Historic	Map Reference #2; single family residence	2007	Unevaluated	Outside
P-07-004611	Historic	Map Reference #1; single family residence	2007	Unevaluated	Outside

4.3.2 Proposed Mitigation site

No sites have been previously recorded within 0.25-miles of the Rheem Creek mitigation site.

4.4 Historic Maps and Aerial Images Consulted

Historic maps and aerial images reviewed as part of the present study included the following:

- A GLO survey plat map (dated 1883) on file at the Bureau of Land Management's GLO Records for Township 2 North, Range 4 West.
- A GLO survey plat map (dated 1887) on file at the Bureau of Land Management's GLO Records for Township 2 North, Range 4 West.
- An 1895 USGS 15-minute San Francisco quadrangle map on file at the USGS Historical Topographic Map Explorer.
- An 1899 USGS 15-minute San Francisco quadrangle map on file at the USGS Historical Topographic Map Explorer.
- A 1915 USGS 15-minute San Francisco quadrangle map on file at the USGS Historical Topographic Map Explorer.
- A 1947 USGS 7.5-minute Richmond quadrangle map on file at the USGS Historical Topographic Map Explorer.
- A 1949 USGS 7.5-minute Richmond quadrangle map on file at the USGS Historical Topographic Map Explorer.
- A 1959 USGS 7.5-minute Richmond quadrangle map on file at the USGS Historical Topographic Map Explorer.
- A 1939 aerial image covering Richmond, CA on file on Google Earth.
- A 1946 aerial image covering Richmond, CA on file at NETRonline Historic Aerials.
- A 1948 aerial image covering Richmond, CA on file at NETRonline Historic Aerials.
- A 1958 aerial image covering Richmond, CA on file at NETRonline Historic Aerials.

The APE is not mapped on the Public Land Survey System (PLSS). General Land Office (GLO) survey plat maps confirm the area encompassing and surrounding the APE as Rancho San Pablo.

As mentioned in section 3.3.3, observations from topographic quadrangle maps and aerial images indicate that the project area was primarily open space prior to the construction of I-80, built by 1958, and Via Verdi roadway, built by 1987 (NETR 2019). The area surrounding the project area contained rolling grassland hills with scattered oak trees near San Pablo Creek and various tributaries.

Rheem Creek changed dramatically from ranch land to the north and farmland to the south in 1939 to a channelized creek surrounded by residential homes and the Contra Costa College by 1980 (Google Earth 2019; NETR 2019).

5.0 FIELD METHODOLOGY

5.1 EXPECTATIONS

Archival research suggests that the archaeological record of the APE is quite sparse and that significant sites have not been recorded in the APE to date. According to previous geotechnical studies (Shafer and Crow 2012; Hultgren – Tillis Engineers 2018), areas of the APE outside of the creek's natural alluvium are highly disturbed with fill soils blanketing much of the developed portions of the site area. If archaeological sites were located in the area, cut and fill activities and landslide events have potentially displaced or destroyed them. Further, sites within the creek channel area may have been disturbed, displaced or destroyed by urban channelization, active creek erosion, and transport of sediment. Given the proximity of prehistoric midden sites in the vicinity and the area's association with Rancho San Pablo, anticipated cultural material would include isolated artifacts or small artifact scatters visible on the surface.

The Rheem Creek mitigation site is surrounded by a highly developed residential area to the south and the Contra Costa College parking lot and college facilities to the north. Much of the area is comparatively flat and channelized, so most parcels in the subdivision have seen some level of development that may have disturbed or destroyed cultural resources in the area. It is most likely that isolated historic artifacts or features from ranching or farming activities would be encountered within this mitigation site.

5.2 INVENTORIED AREAS AND FIELD METHODS

The objective of the investigation was to locate, describe, and evaluate cultural resources within or adjacent to the APE. Fieldwork within the project area was performed in accordance with state (14 CCR § 15064.5) and federal (Advisory Council on Historic Preservation 2009) standards. As such, the pedestrian survey was conducted using 15-meter transect spacing. Due to the nature of the mitigation site, standard transect spacing was not applied. Rheem Creek is perennial and was surveyed along its north and south banks next to the channel.

Much of the APE has experienced some level of previous disturbance. The most predominant types in the project area include disturbance associated with cut and fill activities from previous construction efforts, as well as landslide events. Areas closest to San Pablo Creek contained inaccessible steep slopes and highly dense vegetated slopes. Rheem Creek was densely vegetated with invasive plant species (e.g. ivy). Emphasis was placed on the examination of the undisturbed or relatively undisturbed ground along shallow slopes. In areas along steep slopes, exposed soil strata were observed for cultural resource identification. Surface visibility varied considerably across the project area. Vegetation and leaf litter were present and restricted ground visibility somewhat; however, sufficient ground visibility was present to ensure survey adequacy.

If cultural resources were encountered, field personnel more thoroughly examined the immediate area to determine the type and extent of cultural material. Archaeological components including diagnostic artifacts, artifact concentrations, and features were described in field notebooks, photographed using a high-quality camera, and plotted using the ESRI Collector mobile application. If sites were identified, at least two overview photographs were taken per site to capture the general surroundings with attention paid to capturing the horizon (if possible) to aid in potential future relocation. If applicable, photos of artifacts contain a scale. Upon completion of the inventory, field data GIS shapefiles were created and projected to California State Plane Zone 3 (NAD 83). If necessary, a California Department of Parks and

Recreation (DPR) site form was prepared for each site identified during the inventory, its location plotted on a USGS 7.5-minute map, and photographs of site overviews and diagnostic artifacts included. Isolates were mapped and photographed (if diagnostic) as well. No artifacts were collected during the field survey. A detailed photo log for the project is located in **Appendix D**.

5.3 PROFESSIONAL QUALIFICATIONS

The archaeological survey was conducted on November 5, 2018, and April 17, 2019, by Molly Laitinen, NCE Cultural Resources Specialist. Ms. Laitinen assisted in compiling the project's technical report and meets the Secretary of Interior's Standards for Archaeology and Historic Preservation (36 CFR Part 61). She has 3 years of experience in historic preservation, archaeological investigation, and cultural resource evaluation as part of state, federal, and professional standards in compliance with Section 106 of the NHPA and PRC Section 21083.2 of the CEQA.

Edward Yarbrough, of Yarbrough Architectural Resources, contributed the sections related to historic contexts in this report. Mr. Yarbrough is a qualified architectural historian who has over 25 years of experience in historical and architectural evaluation. Additionally, Mr. Yarbrough meets the Secretary of Interior Standards for Architectural History (36 CFR Part 61).

Charles Zeier, NCE Senior Scientist, assisted with report preparation. Mr. Zeier has over 40 years of experience in historic preservation, archaeological and architectural surveys and evaluations, cultural resource management, Section 106 of the NHPA, and NEPA. Mr. Zeier meets the Secretary of Interior's Standards for Archaeology and Historic Preservation and is a Registered Professional Archaeologist.

Jeremy Hall, NCE Cultural Resources Specialist, served as the task lead for the project. Mr. Hall meets the Secretary of Interior's Standards for Archaeology and Historic Preservation (36 CFR Part 61) and is a Registered Professional Archaeologist. He has 15 years of experience in historic preservation, archaeological investigation, and cultural resource evaluation as part of state, federal, and professional standards in compliance with Section 106 of the NHPA and PRC Section 21083.2 of the CEQA.

6.0 CONSULTATION COMMUNICATIONS

6.1 NATIVE AMERICAN COORDINATION

Under 33 CFR Part 325 and the USACE Tribal Consultation Policy, it is stated that tribal consultation will be directed by USACE at the district or division level under the guidance of a Tribal Liaison (USACE 2012, 2013). It is, therefore, the assumed responsibility of the USACE to conduct Native American consultation for the Via Verdi Slope Stabilization Project.

6.2 OTHER INTERESTED PARTY COORDINATION

The project proponent has kept key stakeholders, including the Sobrante Glen Subdivision HOA, Solace Apartment Homes, and the Cemetery Trust Property, informed of progress at various points in the project. The opportunity for public participation will be presented during a comment period of the CEQA and NEPA environmental documents.

7.0 INVENTORY RESULTS

7.1 PROJECT AREA OBSERVATIONS

Approximately 7.2 acres were surveyed during the inventory. The undisturbed or relatively undisturbed ground along shallow slopes of the APE was examined. This examination resulted in a determination that various forms of disturbance occupy most of the APE. Very little undisturbed ground is present due to cut and fill processes in the project area and types of channelization within Rheem Creek.

Aspects of the project area and Rheem Creek were difficult to survey due to steep slopes near the San Pablo Creek and heavy vegetation consisting of English and poison ivies, and dense tree growth through both areas.

Modern debris was present throughout the inventoried APE. Items noted included aluminum cans, bottles and bottle glass, hard and soft plastics, styrofoam containers and wrappings, cigarette packs and butts, paper, and a vacuum. All such items were “recent” (less than 50 years in age) and none were recorded.

7.2 IDENTIFIED ARCHAEOLOGICAL RESOURCES

As a result of the present effort, no previously recorded prehistoric or historic resources were revisited, and no newly recorded prehistoric or historic resources were identified within the APE. Proposed road reconstruction and slope improvements will be located in previously disturbed cut and fill areas. Proposed mitigation efforts along Rheem Creek will be within a previously disturbed channelized creek.

8.0 ELIGIBILITY RECOMMENDATIONS

An important component of an intensive inventory is the development of recommendations as to whether or not identified cultural resources are eligible for listing on various registers of historic places. Eligibility is based on a consideration of two site characteristics – significance and integrity. The significance of a cultural resource is evaluated in accordance with standards set by federal, state, and local entities. Federal standards are defined in the National Register, specifically in 36 CFR 60.4. California standards are prescribed as part of the CEQA under PRC 5024.1. Essentially the same significance criteria apply under both programs.

8.1 National Register Criteria Overview

The National Register Criteria for Eligibility state that properties must be at least 50 years old, remained fairly unaltered and meets one or more of the following National Register significance criteria.

- **A) Event:** Property is associated with events that have made a significant contribution to the broad patterns of our history.
- **B) Person:** Property is associated with the lives of persons significant in our past.
- **C) Design/Construction:** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- **D) Information Potential:** Property has yielded, or is likely to yield, information important in prehistory or history.

To be considered eligible under Criterion A, a property must be associated with events that are important within a defined context. Several distinct cultural periods are described in the cultural overview above. A prehistoric site that exemplifies an adaptive trend associated with a distinctive cultural period might be considered eligible under Criterion A. An ethnographic period site that is an outstanding example of changing lifeways and Native adaptation might also be considered as significant. Likewise, a historic period site that is considered eligible should represent an important contribution to an event within the associated context.

Criterion B applies to properties associated with individuals whose specific contributions to history can be identified and documented. As such, Criterion B usually applies to ethnohistoric and historic period sites because prehistoric sites generally lack associations with known individuals.

Criterion C applies to properties that embody distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic value; or represent a significant and distinguishable entity within a larger “district”. Prehistoric site types that meet Criterion C are generally distinctive site types that reflect elements of community design or contribute to larger districts as key elements within a regional land use context.

Criterion D pertains to the information potential a property may contribute toward our understanding of prehistory or history. Research topics or themes presented in a historic context are the mechanisms by which properties are evaluated against this Criterion D.

8.1.1 Integrity

For a resource to be listed in the National Register, it must not only demonstrate its significance based on one or more National Register criteria, but it must also have the integrity to convey such significance. Site integrity, or the extent to which potential information is preserved in contexts that are sufficiently intact, represents another consideration for National Register eligibility. The evaluation of integrity must always be grounded in an understanding of a resource's physical features and how they relate to its significance. To retain integrity, a resource will possess at least several aspects of integrity including location, design, setting, materials, workmanship, feeling, and association.

1) **Location:** The place where the historic property was constructed or the place where the historic event occurred.
2) **Design:** The combination of elements that create the form, plan, space, structure, and style of a property.
3) **Setting:** The physical environment of a historic property.
4) **Materials:** The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property.
5) **Workmanship:** The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
6) **Feeling:** A property's expression of the aesthetic or historic sense of a particular period of time.
7) **Association:** The direct link between an important historic event or person and a historic property.

8.1.2 Linear Resources

Many historic period resources represent fragments of larger linear resources such as roads and utility lines. There are two issues here. The first is whether the site as a whole is significant under any federal or state criteria. The second issue only relates to sites that are either evaluated as significant or are managed as if they are significant. This issue is whether or not segments recorded within the study area contribute to the eligibility of the larger site. Guidelines have been devised specifically to the evaluation of individual segments of linear features. Citing Mikesell (1990), Owen (1991), and Supernowicz (1991), Lindström and Hall (1994) combined historic context with property type requirements to create a framework for the comparative evaluation of "discrete segments of a linear feature." This same framework was subsequently included in a contextual history and evaluation methodology established by the USFS for roads and trails in the Lake Tahoe Basin (USFS 1999). Those evaluation guidelines rely on the review of four specific criteria. Each criterion is described below.

- **Length:** Linear features were intended to connect distant points. The ability to understand the connective role of an individual segment is reflected, in part, by that segment's length. The segment should be of sufficient length to convey the functionality of the linear feature at large, and the segment's relationship to that larger feature. The more the segment conveys that sense of function and relation, the more likely it is to contribute to the overall feature's integrity of association with events or patterns important in history.
- **Distinctive Engineering Features and Associated Properties:** Examples of engineering features include bridges, rock retaining walls, and drainage structures. The presence of such features increases the richness of the resource and contributes to the overall feature's significance as a type or method of construction. Examples of associated properties include way stations, fences, and construction-related features or sites. The

presence of associated properties also enriches the resource and contributes to their integrity of feeling.
- **Structural Integrity:** The ability to understand the original character and purpose of the segment is reflected, in part, by the feature's integrity of design, material, and workmanship. This criterion assesses the extent to which the segment retains those types of integrity. Subsequent natural and man-induced factors such as erosion and abandonment may conspire to diminish these types of structural integrity.
- **Setting:** The final criterion attempts to measure the integrity of the immediate context in which the segment exists. The segment should retain sufficient integrity of setting to convey a sense of place specific to the time when the segment and linear feature at large were in use. The integrity of setting is reduced by the presence of non-related sites or linear features or alterations in the general landscape.

These criteria were used to assign segments of linear features into one of four integrity levels:

I. Primary feature (grade, flume, ditch, earthwork, etc.) is ***substantially intact***, as are the contour and bed; no major impacts, recent alterations, or significant erosion/deterioration.

II. ***Lightly impacted*** but morphology is intact, with less than 25% altered or significantly eroded; at least half of structural elements, earthworks, or other elements are present.

III. ***Morphology is compromised***, but route/contour still discernable; 25-50% altered, impacted, or significantly eroded; structural or other elements are missing or rare.

IV. ***Route/segment difficult to discern***; over 50% altered, impacted, or significantly eroded; no remaining structural elements, earthworks, or other elements. The grade may be unrecognizable as a historic feature, but convincing archival or contextual evidence exists.

In general, levels I or II have sufficient integrity to warrant considering the segment contributing to the significance of a linear site. Levels III and IV are generally judged to be lacking in such integrity and are not judged as contributing. Exceptions to this general rule are possible due to the possible presence of rare and significant elements within segments that have generally poor preservation. Even if a segment is not part of a significant site, characterization using these integrity levels provides a comparative framework for descriptive purposes.

8.2 ELIGIBILITY RECOMMENDATIONS

8.2.1 Archaeological Resources

No previously identified, NRHP-eligible cultural resources were identified within the APE. Further, neither prehistoric nor historic period archaeological resources were identified within the APE as a result of the current inventory effort. In the absence of such resources, there is no need to assess National eligibility.

Debris observed in the field that is less than 50 years in age was noted at various locations throughout the APE. None of those items are of an exceptional nature and, therefore, a consideration of their National Register eligibility is not required at this time.

9.0 MANAGEMENT SUMMARY

9.1 SUMMARY

The City proposes to conduct the Via Verdi Slope Stabilization Project in order to reconstruct a segment of Via Verdi roadway that was damaged by a landslide in 2017. Reconstruction of the roadway requires installation of a culvert, backfilled with engineered fill, within San Pablo Creek to buttress the landslide and provide a stabilized footing for the roadway embankment. The project proposes to mitigate for impacts to San Pablo Creek by restoring an urban stream approximately 0.75 miles from the project area.

An investigation was conducted to locate, describe, and evaluate cultural resources present within the APE utilizing 15-meter transect spacing where applicable. The APE encompasses the approximately 6.2-acre project area (including a portion of Via Verdi, a section of San Pablo Creek, a soil stockpile staging area, an existing temporary emergency access road, and a landslide slope area north of Via Verdi) and the approximately 1.0-acre proposed mitigation site at Rheem Creek. The project contains City rights-of-way and portions of adjacent private parcels including the following APNs: 414-340-002, 414-340-001, 414-202-128, 420-021-038, 414-132-001, 414-132-002, 416-140-050, 416-140-033, 416-140-021, and 414-360-041. Much of the APE has experienced some level of previous disturbance (e.g., landslide events, cut and fill activities, and urban development). Emphasis was placed on the examination of the undisturbed or relatively undisturbed ground.

No newly recorded prehistoric or historic archaeological resources were identified as a result of the intensive survey and National eligibility was not required.

9.2 DETERMINATION OF EFFECT

Significant cultural resources are not present within the APE defined in association with the project. Given the absence of historic properties, it is recommended that the project as proposed by the City will not impact properties listed on or eligible to the National Register, nor will it impact historic resources that meet criteria outlined in Section 5024.1 of the California PRC. It is recommended that "*no historic properties will be affected*," as that phrase is viewed within the context of compliance with the Advisory Council on Historic Preservation regulations (36 CFR part 800).

9.3 OTHER CONSIDERATIONS

Although improbable, it is possible that prehistoric burials might be found in the APE (none were apparent based on an examination of the ground surface). In the event human remains are discovered, the County Coroner and local law enforcement shall be notified within 24 hours of the discovery in accordance with PRC Section 5097.98 and Section 7050.5 of California Health and Safety Code to conduct proper evaluation and treatment of remains. The coroner and law enforcement agency with jurisdiction will evaluate the find to determine whether it is a crime scene or a burial. If human remains are determined to be associated with an archaeological site (burial), the California Office of Historic Preservation (OHP) will be notified. The OHP will work with appropriate tribes to determine measures to take. That office will contact the appropriate tribal representatives and consult on the disposition of the remains and any associated artifacts.

NCE prepared this report for use by the City as the intended beneficiary of this work. Interpretations, conclusions, and recommendations contained within the report are based in part on information presented in other reports that are cited in the text and listed in the references. This report is subject to limitations and qualifications inherent to the referenced documents.

Techniques and methods used during this investigation were such that existing resources of a prescribed size (15-meters across, and a sample of smaller resources) in the APE visible to surface examination have been identified. Every reasonable effort was made to identify cultural resources in the APE. If, however, prehistoric or historic period resources are subsequently discovered that could be adversely affected by project-related activities, all such activities should cease immediately. The OHP representatives should be contacted immediately.

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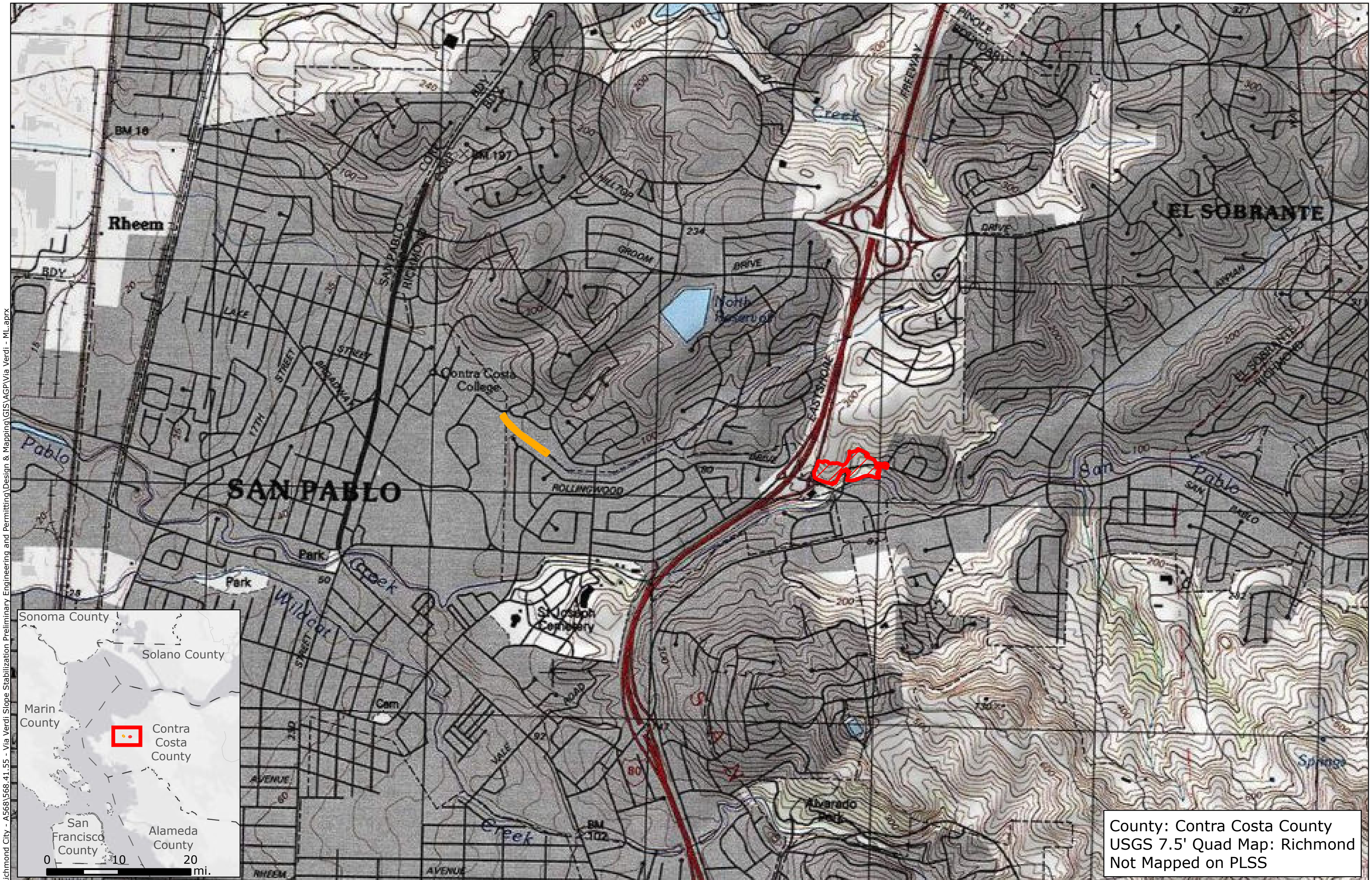
Appendix A

FIGURES



APE

- Project Area
- Proposed Mitigation Area

NCE

City of Richmond

Via Verdi Slope Stabilization Project

APE Vicinity Map

N

1 : 24,000

0 1,000 2,000 ft.

FIGURE

1

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
ESRI USA Topo Maps	568.41.55	mlaitinen	4/8/2019	4/24/2019	jhall

APE

Project Area

Proposed Mitigation Area

NCE

Richmond

Via Verdi Slope Stabilization Project

Project Area Overview Map

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE

2

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
Bing Aerial Map Hybrid	568.41.55	mlaitinen	11/8/2018	4/24/2019	jhall

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APE

- Project Area
- Proposed Mitigation Area

NCE

Richmond

Via Verdi Slope Stabilization Project

Proposed Rheem Creek Mitigation Area Overview Map

N

1 in. = 200 ft.

0 100 200 ft.

FIGURE

3

SOURCE	JOB NUMBER	DRAWN	DATE	REVISED	APPROVED
Bing Aerial Map Hybrid	568.41.55	mlaitinen	11/8/2018	4/8/2019	jhall

Document Path: P:\Active Projects\Richmond City - A568\568.41.55 - Via Verdi Slope Stabilization Preliminary Engineering and Permitting\Design & Mapping\GIS\AGP\Via Verdi - ML.aprx

Collaboration. Commitment. Confidence.SM

Appendix B

GEOTECHNICAL INVESTIGATIONS FOR VIA VERDI, 2012 & 2018

100% Final Geotechnical Investigation Via Verdi Repair Project

San Pablo Creek Culvert Replacement

Richmond, California

Nichols Consulting Engineers, Chtd.
501 Canal Blvd Ste I Richmond CA 94804 / (510) 215-3620

NICHOLS CONSULTING ENGINEERS, Chtd.
Engineering and Environmental Services

501 Canal Blvd., Suite I • Point Richmond, CA 94804 • 510.215.3620 • FAX 510.215.2898

100% Final Geotechnical Investigation
Via Verdi Repair Project
San Pablo Creek Culvert Replacement
Richmond, California

Prepared for

City of Richmond
Engineering Services Department
450 Civic Center Plaza
Richmond, California 94804-1630

NCE Project No. A568.12.20

J. Ryan Shafer, PE, GE
Geotechnical Engineer

Jennifer Crow
Project Engineer

January 30, 2012

100% Final Geotechnical Investigation
Via Verdi Repair Project
San Pablo Creek Culvert Replacement
Richmond, California

NCE Project No. A568.12.20

This 100% final document was prepared by Nichols Consulting Engineers, Chtd. (NCE), for the sole use of the City of Richmond and their design consultant team the only intended beneficiaries of this work. No other party should rely on the information contained herein without the prior written consent of the City of Richmond. This report and the interpretations, conclusions, and recommendations contained within are based in part on information presented in other documents that are cited in the text and/or listed in the references. Therefore, this report is subject to the limitations and qualifications presented in the referenced documents. This report has been prepared for specific application to the proposed project in accordance with accepted geotechnical engineering practices. No other warranty, expressed or implied, is made. In the event that any changes in or additions to the nature, design, or location of the project are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

CONTENTS

FIGURES

APPENDICES

DISTRIBUTION

1.0 INTRODUCTION

NCE is pleased to present the results of our geotechnical investigation for the repair of the culvert at Via Verdi near El Portal Drive in Richmond, California (Site) as shown on the vicinity map and site plan shown on Figures 1 and 3A.

1.1 Project Background

1.1.1 Collapse ("Sinkhole")

On April 15, 2010 the City responded to an emergency "sinkhole" that collapsed unexpectedly at Via Verdi near El Portal Drive. Via Verdi was closed due to the collapse of a portion of Via Verdi into the "sinkhole" shown in the photograph below, which is the only street

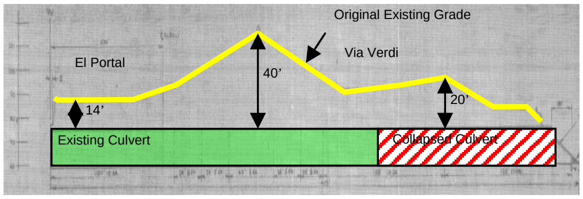
access for a community of single family homes and several apartment buildings (known as the Sobrante Glen Subdivision) and serves as a point of access for an apartment complex located at Via Verdi and El Portal Drive. This event was proclaimed by the City as a local state of emergency with implications to street infrastructure and access to nearby communities through Via Verdi, local utilities (sanitary sewer, gas, electricity, telecom, and water supply), San Pablo Creek, the upstream San Pablo Reservoir, and the nearby apartment structures.

The approximate collapsed area shown in the photograph in the next column was approximately 130 feet long, 30 to 50 feet in width, and approximately 30 feet in depth. It became evident that the collapse occurred within a portion of a culvert for San Pablo Creek with the upstream headwall adjacent to the collapsed portion of culvert still in place.

During NCE's site visit on April 16, 2010, NCE was provided by the City with as-builts of the culvert and the nearby Sobrante Glen Subdivision with two plan sets by KCA Engineers, Inc. titled *Subdivision 4593 "Sobrante Glen" Improvement Plans Via Verdi*, dated December 17, 1977 and *Grading Plan Subdivision 4593 "Sobrante Glen" "As built"* dated December 6, 1977 (1977 As-built). Based on as-built plans of the culvert, this 34-year old culvert was constructed of large oval shape corrugated metal pipe, approximately 22 feet 6-inches in width and 15 feet 8-inches in height. The grading plans for the subdivision also included placement of a large engineered fill terrace adjacent to El Portal Drive, with approximately 2:1 (horizontal: vertical) slopes as high as 30-feet. At the time of the culvert collapse, this fill terrace was undeveloped grassland and is the property of the Rolling Hills Memorial Park Cemetery (Cemetery Property). Since the collapse, a temporary bypass road was constructed by the City on this property in order to serve the residents in the Sobrante Glen Subdivision.

The culvert alignment runs in a southwesterly direction adjacent to the Creek View

Condominiums, underneath Via Verdi, under the south-eastern corner of the engineered fill terrace, and then turns south (perpendicular to El Portal Drive) under El Portal Drive to the downstream endwall at the southern edge of El Portal Drive, also shown on Figure 3A. The bottom of culvert is on the order of 30 to 36 feet below El Portal Drive and Via Verdi respectively, and as much as 56 feet below the engineered fill terrace, as shown below in the schematic profile view below.



1.1.2 Emergency Response

Subsequent to the collapse, the City retained NCE for the initial emergency response and preliminary design professional services. These services generally included:

- assistance in securing the site,
- developing access for residents,
- designing a temporary bypass road through the adjacent Cemetery Property,
- initial site investigation work, and
- design and permitting for the construction of a temporary shored channel to restore San Pablo creek flow at the collapsed culvert section.

The temporary bypass road (as shown in photograph below) was constructed and opened

to the public in the summer of 2010. The temporary shored channel, consisting of drilled soldier piles and lagging with tie-backs, was constructed and completed by the fall of 2010, and is shown in the following photograph with water flowing through from San Pablo Creek.

East Bay Municipal Utility District (EBMUD) also constructed an emergency temporary bypass of their water line that crossed the collapse area that services the Sobrante Glen community with a crossing further upstream.

It is important to note that none of the emergency response actions are permanent solutions, but strictly are temporary interim measures to maintain access and services to the community until the Via Verdi Repair project is completed. These temporary measures were completed with the understanding that a final repair plan would be implemented beginning in March 2012.

1.1.3 Culvert Failure Analysis

Over the pasts 18 months, NCE completed intensive forensic work and gathered field data to evaluate the possible environmental factors that may have contributed to the failure of the culvert. The failure of the culvert could have been influenced by a combination of factors, but in our judgment the likely cause of the failure was flattening of the culvert roof from overburden soils over time, in combination with a groundwater triggering event(s).

The triggering could have been progressive with multiple cycles of high groundwater levels or one event, but eventually the culvert flattened to a point in combination with high groundwater levels and reached a point of failure. The groundwater could be directly from groundwater flow into the creek drainage, creek surface, and/or may have been significantly influenced by groundwater moving through more permeable zones of utility trench backfill materials. It should also be noted that groundwater and creek levels can be significantly influenced by water releases into San Pablo Creek from the EBMUD San Pablo Dam Reservoir located upstream of the site.

As part of our forensic work, other factors that may have played a role in the collapse were investigated and summarized in greater detail in our forensic documents. We concluded that additional environmental factors that could negatively impact the culvert, but played a lesser role in the collapse were as follows:

- Corrosion
- CMP material properties
- Erosion/scouring
- Hydraulic capacity
- Liquefaction
- Seismicity
- Landslides and ground movement
- Utilities

After evaluating the potential causes of failure, the project structural engineer, Certus Consulting, next structurally evaluated the remaining original culvert section underneath the Cemetery Property and El Portal Drive. It was concluded that this remaining section of culvert is only in marginally better condition than the collapsed section was just prior to failure. In addition, the remaining culvert is likely subject to those same factors outlined above that contributed to the culvert collapse. The potential exists that these factors, including high groundwater or seismic activity could result in a similar failure of the remaining original culvert.

Given the marginal capacity to demand ratio (CDR), significant roof deflection, age of the remaining original culvert section, and need to have a culvert meeting current design standards including seismicity, the remaining intact culvert section will need to be replaced.

1.2 Project Description

The repair project will include the replacement of the section of culvert that collapsed and remaining intact culvert with a modern reinforced concrete box culvert. The design of the repair will include a reinforced concrete headwall at the upstream end of the new culvert and the endwall at the downstream end of the new culvert. The headwall is anticipated to be supported on spread footings while the endwall will be supported on a combination of spread footings and drilled piers to accommodate higher overturning moments from higher wall sections and applied seismic loads. In addition to the reconstruction of the culvert itself, the proposed project will include:

- Design related to utilities (temporary bypasses for sanitary sewer and water service, utility reconstruction)
- Restoration of creek areas adjacent to the headwall and endwall
- Re-vegetation of areas disturbed by construction
- Pavement rehabilitation and road reconstruction for Via Verdi and El Portal Drive
- Daylighting as much of the creek as feasible at the original headwall area (approximately 30 linear feet)
- Utility re-construction in Via Verdi
- Demolition of the temporary bypass road, appropriately benching and keying the bypass road cut to receive fill, and

restoration of the adjacent impacted Cemetery Property to its general former condition including necessary erosion control to establish re-vegetation

- Backfilling of shored channel with remaining solder beams, lagging, and tie-backs remaining in-place in accordance with project plans and specifications

Given the limited construction window within the summer months during lower creek flows, the limited time frame for closing El Portal Drive, and to provide adequate construction space and laydown areas, the replacement of the remaining original culvert will be completed with open cut methods to minimize shoring and facilitate ease of construction. This work will require pavement removal, excavation, vegetation removal, and the relocation of underground utilities. It is also anticipated that during construction, temporary shoring will be required at various locations where site constraints from private properties and the shored channel do not allow for sloping back of the excavation. Temporary shoring is not part of the design documents and will be left to the contractor’s means and methods and sole responsibility for design of these structures.

As previously mentioned, utility service providers (i.e., EBMUD, AT&T, PG&E, and Comcast) will conduct construction of temporary bypasses and relocation of their facilities as related to the culvert repair work prior to the start of culvert repair construction. The bypasses/relocation required for the sanitary sewers owned by the West County Sanitary District will be carried out by the contractor for the project. Underground utilities that failed during the catastrophic collapse, including water supply and sanitary sewer, will be reconstructed more or less in their original alignment in Via Verdi.

1.3 Purpose and Scope

The purpose of our geotechnical services was to provide subsurface conditions and develop geotechnical conclusions and recommendations in support of the culvert repair project. As detailed in our initial draft proposal dated June 16, 2010 and final proposal dated April 19, 2011 to accomplish this stated purpose, our scope of work included the following:

1. We reviewed other readily available geotechnical reports and geologic/seismic references.

2. Explore the subsurface conditions by drilling seven (7) exploratory borings with a typical depth of 60 feet (with exception to B-3 drilled to a deeper depth of 80 to 90 feet to penetrate through the Cemetery Property fill terrace) located the approximate perimeter of the culvert, and installation of three (3) piezometers to monitor seasonal groundwater level fluctuations.

3. Laboratory testing of selected samples for moisture content, dry density, compaction (to assess compaction within fill soils), gradation, Atterberg Limits (plasticity), strength, consolidation, corrosion, and R-value, as deemed appropriate.

4. Analyze field and laboratory data to develop geotechnical conclusions and recommendations for the following:

    - Subsurface and groundwater conditions
    - Earthwork and site preparation
    - Permanent and temporary cut slopes
    - Foundation design criteria including differential and total settlements
    - Lateral earth pressures and resistance to lateral loads
    - Seismic design parameters based on the 2010 California Building Code (CBC)
    - Geologic Hazards (Liquefaction)
    - Pavement Design

5. MACTEC (formerly Harding Lawson Associates, HLA) to review historic and

current project documents and assess whether the landslides and corrective buttress fills discussed in the 1977 HLA soil report could have any bearing on the cause of the culvert collapse and/or on the repairs to be considered.

6. Subsequent to our proposal and completion of geotechnical field studies the City also requested to extend the paving of El Portal Drive beyond Via Verdi to the pavement change just west of San Pablo Dam Road. To assess the pavement section and conditions and develop pavement rehabilitation recommendations, NCE performed pavement coring (3 locations) and deflection testing of the pavement within this section of El Portal.

7. Present the results of our geotechnical investigation in a written report, complete with appropriate field and laboratory data.

In addition as part of our forensic investigation to evaluate the collapse of the culvert, NCE also completed forensic test pits during the removal of the collapsed culvert excavation and construction of the shored channel. A geophysics investigation was also performed as part of our forensic work to assess voids and potentially weaker soils along the remaining intact culvert section. The results if these investigations as they pertain to the geotechnical conclusions and recommendations will be summarized in this report.

Temporary shoring is not part of the design documents and will be left to the contractor's means and methods and sole responsibility for design of these structures. Therefore providing geotechnical recommendations for shoring systems is specifically excluded from our scope of work. In addition geotechnical scope of work excluded assessment or evaluation of any environmental aspects of the project, which are addressed by separate environmental permitting documents.

2.0 METHODS OF INVESTIGATION

2.1 Review of Previous Data

A variety of published and unpublished sources were reviewed to evaluate geotechnical data and geologic hazards relevant to the site. Appropriate maps that were reviewed included topographic maps, geologic maps, and fault maps by the United States Geological Survey and the California Division of Mines and Geology. A review was also completed of the as-builts provided by the City for the culvert and the nearby Sobrante Glen Subdivision consisting of two plan sets by KCA Engineers, Inc. titled *Subdivision 4593 "Sobrante Glen" Improvement Plans Via Verdi,* dated December 17, 1977 and *Grading Plan Subdivision 4593 "Sobrante Glen" "As built"* dated December 6, 1977 (1977 As-built). The geotechnical investigation that was completed as part of the Sobrante Glen Subdivision improvements by Harding- Lawson Associates was also reviewed and is titled *Geotechnical Investigation, Sobrante Glen Subdivision, Richmond, California,* dated October 11, 1977 (HLA 1977). Finally, as provided by the City, we also reviewed the geotechnical consulting report by Raney Geotechnical for the Creek View Condominiums titled *Geotechnical Consulting Slope Stability and Earth Retaining, Creekview Apartments, El Portal and Via Verdi Drives, Richmond, California*, dated November 28, 1989 (Raney 1989).

2.2 Site Reconnaissance

A reconnaissance of the site was performed by our field engineer before exploratory drilling to observe surficial conditions including site access, utility locations, topography, and any obvious geotechnical concerns. In addition to contacting Underground Service Alert (USA), NCE obtained the services of a private utility locator to identify utilities in the vicinity of our borings using non-invasive geophysical techniques.

2.3 Subsurface Exploration

The field investigation included a total of six (6) exploratory borings as shown on Figure 3A. One of the originally planned seven borings (B-5) was not performed due to conflict with ongoing construction and underground utilities at the site. The first two exploratory borings B-1 and B-2 were performed on east and west side at the culvert on the north side of El Portal Drive. Boring B-1 was originally planned to be drilled on the south side of El Portal near the endwall, but could not be completed due to extensive utilities, and in particular concern for the EBMUD 54-inch water transmission main, which is quite deep and runs below the existing culvert with uncertainties as to its location. Boring B-3 was conducted on the Cemetery Property at the top of the fill terrace to the north of the culvert. Borings B-4 and B-7 were advanced with Via Verdi on the north and south sides of the culvert, with B-7 having to be moved further north of the culvert to accommodate emergency stabilization construction measures. Boring B-6 was performed within the parking lot of the Creek View Condominiums located south of the culvert. The completed boring locations were located by our surveyor, Mountain Pacific Surveys (MPS), and are shown on Figure 3A. The locations were surveyed and staked prior to drilling. The locations and elevations should be considered accurate only to the degree implied by the method used. The exploratory boring methods and results are discussed herein and detailed logs can be found in Appendix A.

In addition, subsequent to our proposal and completion of geotechnical field studies the City also requested to extend the paving of El Portal Drive, starting east of Via Verdi to the pavement change just west of San Pablo Dam Road. To assess the pavement section and conditions and develop pavement rehabilitation recommendations, NCE performed pavement cores at three (3) locations, as shown on Figure

3B, and deflection testing of the pavement within this section of El Portal Drive.

NCE also completed three (3) forensic test pits at the base of the culvert during the removal of the collapsed culvert excavation and construction of the shored channel. The purpose of these test pits was to observe soil materials around the culvert and the culvert itself to look for evidence or indicators of factors that could have contributed and/or lead to the collapse of the culvert. This included but was not limited to scour or erosion of soils around the culvert, soft or low strength foundation soils, corrosive soils, ground movement, and or liquefiable soils, etc.

Additionally, a geophysics investigation was conducted including Ground Penetration Radar (GPR), seismic refraction, and seismic surface wave studies were employed to assess voids and potentially weaker soils along the remaining intact culvert section. The methods of investigation and detailed results are in the Geophysics Investigation report in Appendix B and the results are discussed herein.

2.3.1 Exploratory Borings

Borings B-1, B-2, B-6 and B-7 were drilled to depths of approximately 61 to 61.5 feet from June 21 through June 24, 2010. Borings B-3 and B-4 had to be drilled at a later date due to access on to the Cemetery Property for boring B-3 and closure of Via Verdi to complete boring B-4. Borings B-3 and B-4 were drilled to depths of approximately 90.5 and 61 feet, respectively, on November 22 and 15, 2010, respectively. All borings were drilled by our subcontractor, Gregg Drilling. Exploratory borings, except B-3, were advanced using a truck mounted Fraste Multi Drill XL rubber tired drill rig. Boring B-3 was drilled with a track mounted Fraste Multi Drill XL drill rig to allow access to more difficult and wet ground at the top of the fill terrace within the Cemetery Property. In general, solid flight 6-inch diameter solid flight augers were used until groundwater was encountered to better evaluate soil moisture contents and depth to groundwater, and thereafter drilling methods were switched over to rotary wash with a 5 7/8-inch drag bit.

Our field engineer logged the borings and obtained samples of subsurface materials for visual soil and rock classification and possible laboratory testing. Boring logs are presented on Figures A-4 through A-9 in Appendix A. The samples were classified based on the soil and rock classification charts designated as Figures A-1 through A-3.

Soil and rock samples were obtained using the following methods:

- Driving a Standard Penetration Test (SPT) split-barrel sampler with 2.0-inch outside diameter (OD) and 1.4-inch inside diameter (ID)

- Driving a “California Modified” split-barrel sampler with 3.0-inch OD and 2.43-inch ID

Generally, both SPT and “California Modified” samplers were used both in the soil and rock materials encountered.

The SPT and “California Modified” samplers were driven by 30-inch drops of a 140-pound aboveground automatic trip hammer system. The blow counts recorded from driving the “California Modified” and SPT samplers from the final 12 inches of an 18-inch drive, or to practical refusal, were converted to approximate SPT N-values using a conversion factor of 0.8 and 1.2, respectively. The converted blow count SPT N-values are shown on Figures A-4 through A-9 in Appendix A.

Immediately after drilling, borings were either converted to piezometers or fully grouted with neat-cement tremie grout to the ground surface. An inspector from Contra Costa County Department of Environmental Health was onsite to observe grouting procedures. After grouting was completed, soils from cuttings were either spread neatly at the surface where permitted or collected and placed in 55-gallon drums and left onsite.

2.3.2 Pavement Coring and Deflection Testing

NCE performed Cores C-1 through C-3 within the additional section of El Portal Drive, on October 14, 2011 using NCE's rotary coring rig. NCE collected pavement section core samples (8"diameter) at each location and measured and recorded the thickness and material type of each layer encountered in the pavement structural section, including the presence of any pavement reinforcing fabric. Additionally, at two of the core locations (C-2 and C-3) bulk samples of subgrade materials were obtained for laboratory testing, including moisture content and plasticity index. All cores were then backfilled with the excavated materials and capped with AC cold patch.

Pavement deflection measurements were obtained also obtained within the additional section of El Portal Drive on October 14, 2011 using NCE's Dynatest Model 8000 Falling Weight Deflectometer (FWD) in accordance with California Test Method (CTM) 356. Deflection measurements were taken in the wheel path of all travel lanes in each direction and tested at 50-foot intervals that were staggered at one-half the test interval length in opposite directions. Occasionally, minor adjustments were made to avoid obstacles such as manholes or intersections, storm drain inlets and other utility facilities.

2.3.3 Standpipe Piezometers

Three piezometers were installed in Borings B-2, B-4, and B-7 following drilling to monitor groundwater levels.

The piezometers were installed by placing 2-inch diameter slotted Schedule 40 PVC pipe down to the boring termination depths. Screen length (.02-inch factory slot) varied from 17 to 60 foot in length from the bottom of the hole and was based on observed soil moisture or standing water in the borings. The annulus was then brought up with #3 sand, which extended 2 feet above the top of screen. The sand was capped with a bentonite chip seal and the remaining annulus was grouted to the surface with neat cement (5% Bentonite), where a traffic rated box was embedded in concrete and finished level with the ground surface. The typical piezometer detail is shown on Figure A-10 in Appendix A. Water levels were measured to the nearest 0.01 foot after the piezometer was installed, after groundwater had a chance to stabilize in the piezometer, and on a monthly basis afterward. Results are presented in Section 3.6.

2.3.4 Forensic Test Pits

Forensic Test Pits TP-1 through TP-3 were excavated on October 23, October 28, and November 2, 2010, respectively by Bay Cities, the general contractor for the shored channel, with the onsite excavator. In general, test pits were excavated several feet below the culvert to exposed foundation soils and approximately transverse to the shored channel. It should be noted that test pit locations and time to observe these test pits was very limited due to a very tight construction schedule.

The first test pit (TP-1) was located at the west side of shored channel (the location of the new headwall), and was excavated approximately the entire width of the shored channel below the remaining intact culvert. This test pit allowed observation of soils at the transition between the failed culvert and remaining intact culvert section. The second (TP-2) was excavated within the middle portion of the shored channel, to allow for observation of soils where the culvert had completely collapsed. This test pit could only be excavated a partial width of shored channel due to poor weather and ground conditions that limited access and made excavation difficult. The third test pit (TP-3) was excavated approximately the full width of the shored channel at the east side of the remaining intact headwall. The locations of the test pits are shown on Figure 3A and test pit schematic diagrams and logs are shown in Figures 4 through 6.

In addition, at each test pit, a steel T-probe was advanced by hand perpendicular into the excavated culvert face into the bedding sand to help assess potential voids under the culvert and the condition of the bedding sand.

Measurements of the penetration into the bedding sand behind the culvert face were recorded in inches and are presented on Figures 4 through 6. Pocket penetrometer readings were also measured in clayey soils below the culvert to estimate the strength foundation soils, for which approximate locations and penetrometer readings are also provided on Figures 4 through 6.

NCE also obtained bulk samples of fill and native soils at the test pits at other locations within the shored channel excavation to assess the condition and estimate engineering properties of culvert backfill and foundation soils. The approximate location of these soil sample locations is shown on Figure 7.

2.3.5 Geophysics Investigation

A geophysics investigation was performed on December 7, 23, and 30, 2010 and January 5, 2011 by Advanced Geologic Services (AGS) to look for potential voids and areas of weak and/or disturbed soils along the remaining intact culvert section that might be indicative of potential soil collapse areas. This data in combination with other forensic data was used to help evaluate factors that could have contributed and/or lead to the collapse of the culvert. For example, if scour and erosion of soils materials was taking place outside of the culvert, it would be likely, that if significant, would be represented by a void or weakened zone of soil from collapse of soil into voids.

The investigation includes use of a combination of several geophysical methods to assess the condition of soils around the remaining intact culvert. Ground Penetrating Radar (GPR) was performed that uses a radar technology to scan the subsurface voids and/or disturbed soil. Seismic Refraction and Seismic Surface-Wave methods were also performed by inducing ground motions at shot points (i.e. hammer blow/strike) and then measuring compression or primary wave (P-wave) and surface waves, respectively to look for anomalous low-velocity zones indicative of weakened soils or potential collapsed soil zones along the remaining intact culvert section. In addition surface waves measured can be used to approximate shear wave velocity (S-wave) of rock and soil materials at the site that are used in developing seismic design parameters. Specifically using Seismic Surface-Wave a parameter called Vs30, the s-wave velocity in the upper 30 meters (100 feet) of the site profile, can be estimated and is important in determining the 2010 California Building Code (CBC) soil profile site class, which is discussed further in Section 5.10 of this report.

The methods of investigation and detailed results are in the Geophysics Investigation report in Appendix B

2.4 Laboratory Testing

Samples recovered from the field investigation were visually checked for soil and rock classifications. Selected samples were then submitted for laboratory testing based on soil and rock type, depth, and quality. Laboratory tests were performed by RGH Consultants, Inc. to measure the desired engineering and physical properties.

Samples were tested to measure moisture content, dry density, Atterberg Limits (Plasticity), strength, consolidation, compaction, corrosivity, gradation, and R-values. Test results for boring samples are summarized on the boring logs and presented entirely in Appendix C. In addition test results for bulk samples obtained from forensic test pits and other locations within the shored channel as well as those from pavement coring are also presented in their entirety in Appendix C.

3.0 SITE CONDITIONS

3.1 Regional Geology

The Site is located in the eastern portion of the San Francisco Bay Area, which lies within the Coast Ranges geomorphic province. The San Francisco Bay is generally a northwest trending wide depression that is bounded by similarly trending ridges that comprise the Berkeley Hills to the east and the San Francisco and Marin Peninsulas to the west. This bay trough and ridge structure was formed as a result of a combination of faulting and warping related to the San Andreas Fault system whereby the bay is underlain by a down-dropped or tilted block (CDMG, 1969). The oldest and most widespread rocks in the San Francisco Bay Area are comprised of the Jurassic-Cretaceous age Franciscan Formation. The Franciscan Formation can be fault contacted with other Mesozoic sedimentary rocks and is then in turn overlain by Tertiary and Quaternary age sedimentary and volcanic rock units. Within the San Francisco region many of the valleys have been in-filled with quaternary age sediments (i.e. alluvium and bay deposits) and include marine and non-marine clays, silts, sands, and gravels.

The Site lies at the lower reaches of the Richmond Hills and is underlain by deposits of alluvium associated with San Pablo Creek with underlying rock of the Orinda Formation (Miocene Age) consisting of poorly consolidated sedimentary rock including conglomerate, sandstone, siltstone, and claystone (USGS Preliminary Geologic Map Emphasizing Bedrock Formations in Contra Costa County, California, 1994 and USGS Preliminary Geologic Map of the Richmond Quadrangle, Alameda and Contra Costa Counties, California, 1980).

3.2 Seismicity and Faulting

The Site is within a seismically active region, and historically numerous moderate to strong earthquakes related to the San Andreas system of faults have occurred in this region. Active faults are considered to be those that have moved during the past 11,000 years, and generally only active faults are considered in evaluating seismic risk for building construction. The nearest active fault is the Hayward fault, approximately 3,000 feet to the southwest of the site (California Division of Mines and Geology [CDMG] Earthquake Fault Zones, 1994), as shown on Figure 2. Other major faults which could cause significant shaking at the project site are the, Concord, Green Valley, Calaveras, San Andreas, Greenville, West Napa, San Gregorio, and Rodgers Creek faults. The seismicity parameters for each of the pertinent active faults are shown in the following table:

Fault	Moment Magnitude (1)	Slip Rate (mm/yr) (1)	Approximate Distance to Site (km) (2)
Hayward	6.4	9	<1.0 (3000 ft)
Concord	6.2	4	22
Green Valley	6.2	5	23
Calaveras	6.8	6	34
San Andreas	7.4	24	30
Greenville	6.6	2	46
West Napa	6.5	1	23
San Gregorio	7.2	7	52
Rodgers Creek	7.0	9	23

(1) Based on CGS, Revised 2002 California Probabilistic Seismic Hazards Maps
(2) Based on Jennings (CDMG), 1994 and CDMG Earthquake Fault Zones, 1994

3.3 Surface Conditions

The Site is located within an urban area (adjacent to I-80) at lower reaches of the Richmond hills that transition down into the more heavily urbanized Richmond flatlands bordering the San Francisco Bay. The area is mostly comprised of a mixture residential and commercial properties with undeveloped watershed areas generally associated with San Pablo Creek and its tributary drainages. Moderately steep grass covered hillsides to the north of the site slope down to the south into the creek drainage. Much of the surface along the top of the culverted section of San Pablo Creek, is relatively flat. The surface is paved with asphalt concrete within Via Verdi (roadway grades of Elev. 91 to Elev. 100, Datum: NAVD 88) and El Portal Drive (roadway grades of Elev. 91 to Elev. 92) roadways. The culvert also extends underneath southeast corner the Cemetery Property fill terrace, an undeveloped grass covered parcel of land. This fill terrace slopes up from El Portal Drive to the north, approximately 2:1 (horizontal: vertical) slopes, about 30 feet above the street grade. Creek banks at the existing upstream head wall and downstream end wall of the culvert are heavily vegetated with groundcovers, shrubs, and large trees and are quite steep at certain locations. Average slopes near the head wall and end wall are approximately 2:1 and 1.5, respectively, with bottom of the creek at approximately Elev. 65 feet.

3.4 Subsurface Conditions

Subsurface materials encountered during field exploratory borings generally consisted of a fill soils over native soils (predominantly clay soils) underlain by Orinda Formation bedrock as shown on boring logs in Appendix A.

Fill soils were observed in all borings and are the result of historical grading at the site to establish reasonably level building pads and roadways and backfilling of San Pablo Creek channel for placement of the current existing culvert. The fill materials are particularly thick in the fill terrace area within the Cemetery Property, where grades were raised substantially to establish a level building area in preparation for commercial use as indicated on HLA 1977 report site plan. Fill soil thicknesses in our borings ranged from 8 to 46 feet, including asphalt and aggregate base materials for those borings conducted on paved surfaces. The fill thicknesses appear to be fairly consistent comparing existing surface elevations with old surface elevations shown on the 1977 KCA Engineers Grading Plan for the Sobrante Glen Subdivision. Fill soils were predominantly comprised of stiff to very stiff (occasionally medium stiff) clays with occasional medium dense to dense sand zones (found in borings B-2 and B-3).

In addition, during the removal of the collapsed section of culvert and conducting forensic test pits, we observed that the culvert backfill (lateral extent not known) consisted of aggregate base type materials with a layer of bedding sand underneath the culvert, as shown on the schematic test pit diagrams in Figures 4 through 6. These backfill materials appeared to be very competent and dense in nature with no apparent voids or loss of material. Bedding sand below the culvert based on T-probe penetration and visual observation, also appeared to be intact, well compacted, and no apparent voids were observed. T-probe penetration into the bedding sand, shown on Figures 4 through 6, was greater in some locations below the culvert due to wash out of bedding sand from seeping water after test pits were excavated and lack of sand confinement.

In addition, it was the conclusion of the geophysics investigation that no voids or disturbed soil areas were indicated in the GPR study (note that maximum depth of penetration was approximately 10 feet below ground surface) and that Seismic Refraction and Seismic Surface-Wave methods did no indicate any anomalies that would indicate zones of loosed soil or potential collapse areas. However, a low velocity layer was found within the Cemetery Property fill terrace that was concluded to be associated with variations in the fill material properties (level of compaction) and was interpreted to not represent a collapse area.

Beneath the upper fill soils are native clay soils predominantly comprised of alluvium associated with San Pablo Creek, with exception to B-3, where no native soils were encountered. The native soils are typically stiff to very stiff (occasionally medium stiff) clays. Loose to medium dense sands were also observed in Borings B-1 and B-4. Forensic test pits also were consistent with exploratory borings and Foundation were comprised mostly of native soils (possible fill materials for leveling of subgrade for placement of original culvert) and were generally stiff to very stiff clay soils with occasional dense sands. Foundation soils appeared to be very competent with no evidence of weak soils, voids, or collapsed soils.

The underlying Orinda Formation bedrock rock is comprised of deeply weathered mudstone, siltstone, and sandstone sedimentary rocks to the maximum depth explored. The bedrock surface is variable in depth likely due from erosion by San Pablo Creek prior to deposition of alluvium, and ranges in depth where explored from 24 to 55 feet (Elev. 67 to Elev. 41 feet). Rock materials at the site generally had physical properties of soft to low hardness, plastic to friable, and deep weathering and in many cases properties similar to that of a hard clay.

To better understand the engineering properties of the extensive fill soils at the site, relative compaction[1] of fill material was estimated for each boring comparing relatively "undisturbed" driven soil sample densities to compaction curve tests of fill material within the same depth ranges . The table below summarizes the in-situ relative compaction at the specified depths in each boring.

Boring	Depth to Ground Surface (feet)	Elevation (feet)*	In-Situ Relative Compaction (%)
B-1	10	81	91
B-1	20	71	86
B-2	5	86.5	89
B-3	6.5	113	87
B-3	20	100	81
B-3	25	95	79
B-3	30	90	96
B-4	10	83.5	90
B-4	15	78.5	87
B-4	25	68.5	82
B-6	5	91.5	87
B-7	3.5	100	82
B-7	10	94	90
B-7	15	89	91

*Datum: NAVD 88

As shown in the table above, the in-situ relative compaction was less than 90 percent at many of the depth intervals, with particularly lower compaction at B-3, which corresponds to fill materials within the Cemetery Property fill terrace and possibly the low velocity layer detected in the geophysics investigation.

3.5 Pavement Section Conditions

Based on borings advanced within El Portal Drive and Via Verdi and pavement cores performed within the additional section of El Portal Drive (east of Via Verdi to the pavement change before San Pablo Dam Road), asphalt concrete thickness (AC) and aggregate base thicknesses are summarized in the following table below:

Boring/ Core	Applicable Street	AC Thickness (inches)	AB Thickness (inches)
B-1	El Portal Drive	4	20
B-2	El Portal Drive	5	19
B-4	Via Verdi	2.5	12
B-7	Via Verdi	3.5	14.5
C-1	El Portal Drive	3	NA*
C-2	El Portal Drive	6.5	7.5
C-3	El Portal Drive	7.625**	10

* Bulk sample was not obtained
** Pavement fabric was observed at a depth of 2.625 inches

Pavement subgrade consists of stiff lean to fat clay soil materials of moderate to high plasticity with moisture contents ranging from 18.5% to 26.4%, indicating subgrade is well in excess of optimum moisture for compaction.

3.6 Groundwater

Groundwater was encountered during drilling at all six borings at depths ranging from 20 to 46 feet below ground surface (Elev. 74 to Elev. 66 feet) Water levels encountered were generally measured during or shortly after the time of exploration and may have not had time to achieve equilibrium. Fluctuations in the groundwater level may occur due to variations in rainfall, subsurface soil layer characteristics, temperature and other factors not evident at the time the measurements were made.

Therefore, to better estimate water levels fluctuations through out the year, piezometers were installed in at Borings B-2, B-4, and B-7 in accordance with the typical piezometer detail

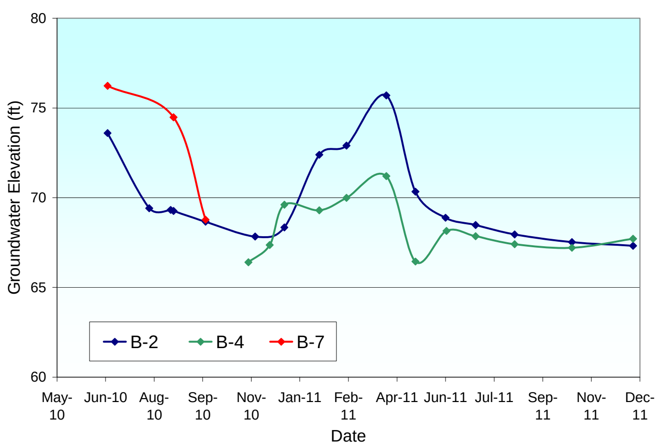
[1] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil determined by ASTM D1557 laboratory test procedure. Optimum Moisture Content is the water content that corresponds to the maximum dry density as determined by the same procedure.

shown on Figure A-10 in Appendix A and are summarized in the following table:

Piezometer	Date	Depth to Groundwater (feet)	Groundwater Elevation (feet) *
B-2	6/23/10	17.8	73.6
B-2	8/5/10	22.0	69.4
B-2	8/27/10	22.1	69.3
B-2	8/30/10	22.2	69.3
B-2	10/2/10	22.8	68.7
B-2	11/22/10	23.6	67.8
B-2	12/22/10	23.1	68.3
B-2	1/27/11	19.0	72.4
B-2	2/24/11	18.5	72.9
B-2	4/6/11	15.7	75.7
B-2	5/6/11	21.1	70.3
B-2	6/6/11	22.5	68.9
B-2	7/7/11	22.9	68.5
B-2	8/16/11	23.5	68.0
B-2	10/14/11	23.9	67.5
B-2	12/16/11	24.1	67.3
B-4	12/7/10	26.1	67.4
B-4	12/22/10	23.9	69.6
B-4	1/27/11	24.2	69.3
B-4	2/24/11	23.5	70.0
B-4	4/6/11	22.3	71.2
B-4	5/6/11	27.1	66.4
B-4	6/7/11	23.4	68.2
B-4	7/7/11	25.7	67.9
B-4	8/16/11	26.1	67.4
B-4	10/14/11	26.3	67.2
B-4	12/16/11	25.8	67.7
B-7	6/23/10	27.5	76.2
B-7	8/30/10	29.2	74.5
B-7	10/2/10	34.9	68.8

*Datum: NAVD 88

The plot below illustrates the water level readings summarized in the above table.



It is critical to observe that the peak groundwater level, which is very near the top of the culvert, is achieved in the April time frame, which is consistent with the collapse of the culvert on April 15, 2010.

It should be noted that boring B-7 was covered by a stockpile from the construction of the temporary shored channel since November 2010. Therefore, no piezometer readings are available since this date. In addition Boring B-4 readings start in December 2010 reflecting drilling and installation of the piezometer in B-4 at a later date than the initial phase of borings completed in June 2010.

4.0 DISCUSSION AND CONCLUSIONS

We conclude that the project is feasible from a geotechnical standpoint. However, all of the conclusions and recommendations presented in this report should be incorporated in the design and construction of the project to reduce the possibility of soil and foundation problems.

The main geotechnical issue will be large excavation depths for the open cut required for replacement of the remaining intact culvert section with high ground water surrounded by a highly urbanized and constrained area. Excavation depths within the remaining intact culvert section will approach 40 feet below street grades at the deepest locations and almost 60 feet below top of the Cemetery Property fill terrace. Temporary shoring will also be required at various locations where site constraints from private properties and the shored channel do not allow for sloping back of the excavation. Excavation concerns include dewatering, excavation stability related proper dewatering, potential ground movement adjacent to temporary excavation slopes and shoring, and protection of the 54-inch water transmission main that will remain below the excavation, which will discussed in greater detail later in this section.

The culvert, headwall, and endwall footing will be founded well below street grade and groundwater and will be supported on spread and strip footings in stiff engineered fill material and native clay soils. Proper footing bearing surfaces will need to consider possible removal of isolated unsuitable soft/weak clay or loose sand soil materials below the footings and protection of the soil bearing surface from water as will be discussed later in the recommendations section of this report. At the endwall, due to higher wall height and corresponding higher overturning moments from seismic loads, foundations will be supported on drilled piers. Based on experience with drilled piers at the shored channel for the soldier beams, piers will encounter groundwater and will likely encounter soils that may be susceptible to squeezing or caving, requiring casing and/or the use of drilling fluid additives to stabilize the drilled pier hole.

The main geologic hazards and other geotechnical concerns are discussed in the following paragraphs:

4.1 Geologic Hazards

4.1.1 Seismic Shaking

The primary geologic hazard at the site is the potential for moderate to strong ground shaking associated with nearby faults discussed in the prior section on seismicity and faulting. Factors determining the characteristics of earthquake ground motion at the site will depend upon the magnitude of the earthquake, distance from the zone of energy release, travel path, topographic effects, subsurface materials, and rupture/source mechanism.

Site structures should be designed to accommodate anticipated ground motions in accordance with the 2010 California Building Code (CBC) seismic design criteria presented in section 5.10 of this report.

4.1.2 Fault Rupture

The Site is not within an Alquist-Priolo Earthquake Fault Zone that designates a zone on either side of known active fault (fault that is defined to be active if it has ruptured or shows evidence of displacement in the Holocene or the last 11,000 years) that is susceptible to fault rupture as defined by the California Geologic Survey (formerly the California Division of Mines and Geology). Therefore the potential for fault rupture at the site is considered to be low.

4.1.3 Liquefaction

Liquefaction is a phenomenon in which wet or saturated cohesionless soils temporarily lose strength due to the buildup of excess pore water pressure during cyclic loading, such as that resulting from earthquakes. Soil most susceptible to liquefaction is loose, clean, saturated, uniformly graded sand. Based on the 2000 *USGS Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine County San Francisco Bay Region*, the site overall is identified to have moderate susceptibility to liquefaction within the alluvial soils from San Pablo Creek. Based on soils borings the majority of the soils are clays and/or of sufficient density to have a high resistance to liquefaction. In addition, the majority of site soils will be removed for the open cut excavation of the culvert. However, a medium dense sand layer was encountered at B-1 at a depth of 29 to 38 feet and B-4 at 28.5 to 38 feet, is susceptible to liquefaction and a portion of this layer will remain below the planned culvert excavation. Due to presence of the medium dense sandy layer, isolated zones settlement due to liquefaction may be approximated to be up to ½ to 1 ½ inches. Recommendations later in this report will call for removal and replacement of any isolated zones of loose sandy soils below the new culvert and wall footings.

4.1.4 Landslides

Based on our recent site reconnaissance, we did not observe evidence of landslides or large slope movements within the culvert area. The only evidence of ground movement beyond that, associated with the collapse area itself, was a dish shaped settlement profile along El Portal Drive directly above the remaining intact culvert section as it crosses El Portal Drive and slope creep settlement (very typical of steepened creek bank slopes) within the pavements at the top of the creek bank at the Church Property downstream of the headwall. Based on the pavement distresses exhibited in the El Portal Drive directly above the remaining intact culvert section, this settlement appears to be old and is likely the surface manifestation of the culvert roof flattening as the downward deflection of the culvert translates up to the surface.

A shallow landslide repair was completed further north of the culvert as part of the construction of the Sobrante Glen Subdivision and included a toe fill buttress that a portion of Via Verdi road is constructed upon, around the time of the construction of the culvert, as detailed in the HLA 1977 report. NCE requested the review of this geotechnical report and other available geotechnical information by AMEC (formerly known as MACTEC and HLA) pertaining to the landslide and repair to evaluate whether it could be related to the culvert failure. AMEC's review concluded that because of the distance between the landslide repair and the failed culvert section and the absence of any evidence of movement in the toe fill buttress, the landslide repair was not likely to not have any connection to the culvert failure. AMEC's review letter can found enclosed in Appendix D.

Based on the California Division of Mines and Geology 1973 *Geologic and Geophysical Investigations For Tri-Cities Seismic Safety And Environmental Resources Study* (CDMG 1973), the culvert area is identified as low relief and upland slope areas north of the culvert are assigned a zone area identified as being underlain by incompetent formations (Orinda Formation) which have few or no slides. However, the only nearby landslide that pertains to the site is mapped by CDMG 1973 as a shallow to intermediate slide plane and appears to be the same landslide indentified in the HLA 1977 report. Further based on review of the Raney 1989 report for the nearby Creek View condominiums it was the judgment that the "westerly trending portion" of the creek, that is to say the creek banks directly upstream of the existing culvert headwall, were judged to be stable, remedial stabilization unnecessary, and the only expected instability would be movement related to slope creep.

In light of the above information, the relatively low relief, the general stiffness and density soils underlain by rock would suggest the potential for landslides or deep seated ground movement is low and the only expected minor ground movements would be related to slope creep at the creek banks north and south of the culvert.

However, steepening of natural slopes by temporary cuts during construction may affect stability and should be sloped back and shored as described in later sections. Seismic slope stability was not considered nor part of our scope of work, given the culvert will be located below grade, and will be designed appropriately for seismic loading as discussed in later sections.

4.2 Excavation Considerations

4.2.1 Soil and Rock Excavatability

Based on our field reconnaissance and field exploration, the majority of site fill soils and alluvium are clayey in nature and will be readily excavated. Occasional cobbles were observed within the clay alluvium during the excavation of the shored channel, but should not impede excavation or drilling activities. Highly weathered mudstone, siltstone, and sandstone sedimentary rocks (Elev. 67 to Elev. 41 feet) were encountered in all borings and may be encountered in excavation below the planned new culvert. Rock materials are deeply weathered and in many cases had properties similar to that of a hard clay and therefore should be rippable by a D9R/D9T or equivalent and excavated with conventional excavation equipment.

Based the drilled holes of the soldier beams with the shored channel and high groundwater, drilling for drilled piers will likely encounter caving and squeezing zones in looser and softer soil zones below groundwater and weak rock. It is important that caving be minimized during drilling to maintain the integrity of foundation elements both laterally and axially. During rotary wash rotary wash test borings we did not encounter caving our squeezing conditions. The drilled holes may need to be stabilized with drilling fluid additives and/or the use of casing to maintain the integrity of the hole. Borehole stability may be improved by the addition of foam, polymer additives, and combinations thereof. The intent of the additives is to increase borehole stability by providing an apparent cohesion to the sidewalls, ease removal of drilling cuttings, and enhance drilling fluid circulation by reducing fluid losses. Whatever method is selected by the contractor, he should be solely responsible for maintaining a stable borehole for placement of grout and other foundation elements.

The excavation will extend through predominantly wet and stiff clayey fill and native soils. However, isolated zones of looser sandy soils as encountered in several borings and/or softer clay soils may be encountered during excavation. These conditions will be compounded by the excavation being completed within an old creek channel with high groundwater, particularly high during the spring months after winter rains. Therefore it will be paramount to dewater the excavation to maintain overall excavation stability as will be described further in the following section. Even with proper dewatering, isolated seepage zones may destabilize soils locally and may need to be further stabilized with shoring, reduced slope cut angles, and/or the placing additional sump pit locations at active seepage zones. This should be anticipated and planned for by the contractor for excavation, temporary shoring, and dewatering activities. In addition as will be discussed further in earthwork and site preparation and foundation recommendations soft and/or loose unsuitable foundation materials will need to be removed and replaced.

4.2.2 Temporary Excavation Dewatering

During excavation and construction, the contractor will be solely responsible for diversion of surface creek waters in accordance with project plans and specifications. In addition, the excavation will be within an old creek channel with high groundwater, particularly in the spring months when water levels appear to be the highest from winter rains. The groundwater flow regime is characterized predominantly of flow through overburden soils and likely by fracture flow through bedrock at depth. The seepage or flow rates into the excavation will be governed by many factors such as groundwater levels and permeability of overburden soils, and may vary across the site.

Therefore we anticipate that significant dewatering will be required. The contractor is solely responsible for design, means and methods of temporary dewatering systems to keep water out of the excavation at all times. A properly designed, installed, and operated dewatering system should:

- Lower the water levels at least 5 feet below the bottom of the excavation and intercept seepage points
- Improve the stability of the excavation and prevent disturbance to the bottom of the excavation
- Provide for collection and removal of surface water and rainfall

Experience indicates that seepage can often be handled with exterior dewatering wells and/or combination within the excavation of a system of trenches, piping, sumps, and pumps. This type of dewatering is desirable because of its flexibility; more sumps can be installed where seepage is greater than expected, and fewer sumps would be needed in dryer portions of the excavation.

Because of the uncertainty in seepage rates and groundwater conditions, and the large impact they may have on the design, it is important that groundwater conditions be carefully observed and recorded by the contractor during excavation operations. Based on construction observations by the contractor the contractor will be solely responsible to make appropriate modifications to the dewatering systems in response to groundwater flow rates actually encountered.

Areas outside the excavation such as roads, utilities, and structures will be monitored by periodic surveys to check for drawdown-induced settlement. Anticipated settlements are small because the soils and rock above groundwater levels are relatively stiff, dense and incompressible. If surveys indicate that settlements may be excessive, groundwater remediation measures will be the sole responsibility of the contractor and may include modification of the dewatering system and/or underpinning would be installed to reduce settlements to acceptable amounts.

4.2.3 Protection of Existing Structures and Utilities

Due to need for deep open cut excavations with lay back slopes and temporary shoring at various locations, the contractor will need to maintain stable excavation with proper dewatering and design temporary shoring so as not to damage or cause lateral or vertical (settlement) movement to adjacent structures and utilities. This will be particularly important for the private residence east of the endwall and the Creek View Condominiums, where the structure foundations and outside flatwork are very close to planned excavations and shoring.

For conventional retaining wall and shoring systems within stiff clay soils, similar to the soils at the site, average maximum lateral wall movements and settlements of the retained soil (at the wall face) average about 0.2% to 0.3% of the wall height (H). Tolerable lateral and vertical movements for structures and utilities are set forth in project plans and specifications. If unacceptable movements are measured, it will be the sole responsibility and cost to the contractor to mitigate movement which may include but not be limited to making adjustments to the shoring system, stabilizing cut slopes, modifying dewatering, and or installation of underpinning. For the EBMUD 54-inch water transmission main the contractor shall also maintain the proper offsets, stay off the alignment, maintain adequate soil cover, and minimize vibrations in accordance with EBMUD requirement and project plans and specifications.

It will be important to perform periodic surveys during construction to evaluate the performance of all shoring and underpinning systems as will be discussed further in the recommendations section of this report.

5.0 RECOMMENDATIONS

5.1 Earthwork and Site Preparation

5.1.1 Subgrade Preparation

Areas to receive slabs, pavements, or fills should be stripped of any debris, vegetation, and organic topsoil (where present). Within the shored channel this will include removal of creek sediment that has been deposited on underlying rip rap rock materials as well as the removal of the rip rock material itself to expose firm and dense foundation soils (compaction of foundation subgrade soils will not be practical and will not be required). Native or fill soils exposed by stripping should be suitable to receive fill and subgrades that will support exterior flatwork/slabs, but should be scarified to a minimum depth of 6 inches for exterior flatwork/slabs, moisture conditioned to above Optimum Moisture Content and recompacted in place to at least 90 percent Relative Compaction[2]. Pavement subgrades should be compacted to at least 95 percent Relative Compaction within the upper 1 foot. Depressions or voids created by the removal of existing pavements, slabs, rip rap, or utilities should be excavated to expose firm soil and backfilled as described later in this section. The subgrade in asphalt-paved or exterior flatwork/slab areas should be smooth and non-yielding. Based on shallow subgrade soils tested below roadway pavements, subgrade soils have high moisture content and moderate to high plasticity, and therefore may be difficult to compact and may yield or "pump" under construction traffic. If soft, unstable, or saturated soils are encountered asphalt-paved or exterior flatwork/slab areas, they should be addressed with mitigation measures that may include but are not limited to the following:

- Scarifying, discing, or tilling the soil to aerate and dry the soil
- Use of larger compaction equipment to deliver more compaction energy
- Over-excavation and replacement with aggregate base
- Stabilization with geogrids

Mitigation measures will be dependent upon severity subgrade issues, construction schedule, and available means of the contractor. Typically for roadway projects where time is limited isolated areas of problematic subgrade are excavated on the order of 6 to 12 inches, geogrid is placed, and then replaced with aggregate base.

5.1.2 Footing Excavations

Footing excavations should be excavated into stiff and dense fill and native soils and footing surfaces should be excavated flat, where on sloping ground may require benching. Footings should be cleared of any loose soil or debris and kept moist before concrete placement. Water should not be allowed to accumulate in footing excavations. A qualified geotechnical field engineer or representative should verify that the exposed surfaces within footing excavations are firm and dense and unyielding and suitable to bear structural loads prior to any placement of reinforcing steel or concrete. Loose (particularly loose sands that may be susceptible to liquefaction), weak, soft unsuitable to bear structural loads should be over-excavated and backfilled with lean concrete flowable fill also called controlled low strength material (CLSM), with an ultimate strength of 150 pounds per square inch (psi).

To provide a working surface and uniform bearing area for the culvert, soils will be excavated an additional 2.5 feet below the bottom of the culvert (including sediment and rip rap in the shored channel section), a filter

[2] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil determined by ASTM D1557 laboratory test procedure. Optimum Moisture Content is the water content that corresponds to the maximum dry density as determined by the same procedure.

fabric will be placed, and then backfilled with a minimum of 1 1/2 –inch crushed clean rock, with no appreciable fines. The rock must be clean and free of fines, as soil conditions will likely be wet and will not be receptive to compaction.

Because footing excavations will be made within the creek channel, soils conditions will be wet and need to be properly dewatered to prevent softening and degradation of footing soils once excavated. The contractor should keep water out of the footing bottoms at all times, minimize foot and vehicle disturbance to footing bottoms, and may need to protect the footing bottoms with a concrete "rat" slab.

5.1.3 Fills and Backfills

Fills and backfills will be primarily related to two main activities, restoration of the Cemetery Property fill terrace and backfill of the proposed new box culvert.

For the cemetery property, restoration will be a relatively balanced earthwork operation and require very little to no import fills and will utilize stockpiled soils from the Cemetery Property only. Fill from the Cemetery Property and culvert excavation shall be segregated and not be mixed. Onsite Cemetery Property soils are expected to be suitable for placement as general engineered fill, however large cobbles or concrete debris should be removed. Moisture conditioning may be necessary to achieve compaction requirements depending on the season when earthwork is performed.

For the culvert excavation, soil material excavated from the culvert can be used as general engineered backfill for the culvert, but will require import due to off-haul of soil materials from the shored channel. Import fill should be non-expansive and consist of soil that has a Liquid Limit of less than 40 and a Plasticity Index of less than 15 (as determined by ASTM D 4318-98), is free of organic material, and contains no rocks or clods larger than 4 inches in greatest dimension. Onsite fill and native soils excavated for the culvert are expected to be suitable for use as general engineered fill, however significant moisture condition will be required and larger cobbles and concrete debris will need to be removed. Soils excavated for the culvert are expected to be wet, particularly in the lower reaches of the culvert excavation below groundwater. Dryer shallow soils excavated for the culvert should be segregated from wetter deeper soils. The contractor should expect effort to disc and till soils at stockpile areas to dry out soils to achieve desired compaction and workability. This should be done well in advance of placement and compaction to give greater time for drying and moisture conditioning. Moisture conditioning may be necessary to achieve compaction requirements depending on the season when earthwork is performed.

A qualified geotechnical field engineer or representative should verify suitability of site soils or import material prior to their use as fill or backfill by checking that they satisfy the above criteria.

Import fill or on-site fill should be moisture conditioned to near Optimum Moisture Content and on-site native soils being used as fill should be moisture conditioned to above Optimum Moisture Content. Fill for the Cemetery Property should be placed in uniform horizontal layers not exceeding 8 inches in loose thickness, and compacted to at least 90 percent Relative Compaction. This level of compaction will restore the cemetery property to its approximate prior condition to the best of our knowledge based on limited compaction results within the Cemetery Property fill terrace. Grindings for removal of the AC bypass road may not be used as fill for the Cemetery Property. At this time we do not know the intended future use, and fill condition should be assessed by a geotechnical engineer during design of any future structures or development.

Backfill for the culvert should be placed in uniform horizontal layers not exceeding 8 inches in loose thickness, and compacted to at least 95 percent Relative Compaction. In areas where fill or backfill will underlie pavements or exterior flatwork/slabs, the upper 6 inches of fill should be kept moist until exterior flatwork/slabs are placed. A qualified geotechnical field engineer or representative should monitor all placement and compaction of fill.

Any filling operations on slopes steeper than 6:1 (horizontal to vertical), as will be the case for backfilling the temporary bypass road in the Cemetery Property, should be benched and keyed into competent material prior to placing fill as will be described in greater detail in the next section.

At the existing shored channel the soldier beams, lagging, and tie-backs can be left in-place. However, the shoring system will need to have at least 5 feet of engineered fill cover that may be achieved by placement of fill and/or the cutting of soldier beams and removal of lagging, in accordance with project plans and specifications. There are also visible voids behind the top of the existing lagging that will need to be excavated and backfilled with engineered fill, compacted to 95% relative compaction. It should also be noted that there will be approximately 5 feet or less between the shored channel lagging and the box culvert (approximately less than 2 feet at tie-back walers), and therefore limited access compaction equipment should be anticipated by the contractor to achieve 95% relative compaction of engineered fill.

5.1.4 Permanent and Temporary Slopes

Significant cuts and fills are planned at the site, and that will require permanent and temporary cut or fill slopes. Temporary cut slopes will be required for removal and replacement of the remaining intact culvert section by open cut methods, requiring both cut slopes within El Portal and Via Verdi and cut slopes extending up into the Cemetery Property fill terrace. Permanent fill slopes will be required for restoration of the Cemetery Property after culvert repairs have been completed. We recommend that permanent fill slopes at the site have a maximum inclination of 2:1 (Horizontal: Vertical) and temporary cut slopes have a maximum inclination of 1.5:1. However, permanent slopes for creek restoration areas may be steeper than 2:1 (but generally not steeper than 1.5:1), due to the use of bioengineered slope protection methods specified in project plans and specifications. At localized areas where softer, loose, wet (seepage areas) are encountered, temporary slope angles may need to be decreased and/or shored depending on the severity of the soil condition, with the final means and methods to be determined by the contractor. Permanent fill slopes should be benched and keyed into competent materials prior to placing fill. Benches should be a minimum of 2 feet high, sloped back into the cut slope, and should be wide enough to accommodate standard earthwork equipment. The key at the bottom of the slope should be at least 8 feet wide and extend at least 4 feet below competent material and should be sloped back into the slope. A 4-inch diameter perforated pipe bedded in 3/4-inch clean, open-graded rock should be placed at the back of the key. The entire rock/pipe unit should be wrapped in filter fabric to prevent migration of fines into the drainage rock. The pipe should be appropriately sloped to provide adequate drainage of the pipe into nearby storm water facilities. In addition, permanent slopes greater than 25 feet in height must contain one drainage bench mid-slope (sloped back into the slope).

Steeper temporary slopes may be considered and evaluated by the contractor if soil materials are sufficiently stiff and dense and do not appear to be excessively wet. The contractor is solely responsible for the safety and performance of temporary cut slopes compliance for the safety of its personnel and should comply with OSHA standards for excavation shoring and safety

At permanent fill slopes, particularly within the Cemetery Property, the long term performance of these slopes will be primarily dependent on erosion from drainage and runoff. Slopes should be graded to direct water away from slopes faces, and erosion control protection measures such as the use of vegetation, hydro seeding, erosion control fabrics/blankets, geosynthetics, shotcrete, and/or rip rap should be considered. Otherwise cut and fill slopes will be subjected to erosion and/or sloughing, thus requiring periodic maintenance of the slopes. Erosion control and re-vegetation measures should be in accordance with project plans and specifications.

5.1.5 Utility Trenches

All utility trenches should be excavated in accordance with current OSHA excavation and trench safety standards. The contractor should be solely responsible for the design and construction of all excavation and trench safety.

We recommend that utility line bedding material consist of sand with less than 10 percent fines. The bedding should extend from the bottom of the trench to 1 foot above the top of the pipe. Sand bedding should be placed in a trench free of standing water and mechanically compacted to a dense condition (as verified by a qualified geotechnical field engineer).

Trench backfill above the pipe bedding should meet the criteria for fill as described above. A qualified geotechnical field engineer or representative should evaluate any proposed imported soil sample prior to its use as trench backfill. Trench backfill should be placed in uniform layers not exceeding 6 inches in loose thickness, moisture-conditioned to near-optimum moisture content, and compacted. Backfill should be compacted to at least 95 percent relative compaction. Jetting should not be permitted for any backfill compaction.

Any groundwater infiltrating into utility trenches should be pumped out prior to backfilling.

Trenches near footings should not extend down below a 2:1 plane extending down and away from the bottom edge of any footing.

5.2 Shallow Foundation Support

The proposed project structures be supported on conventional continuous and isolated spread footings bearing on stiff and dense engineered fill soils and undisturbed native soils. However, endwall footings will also gain support in skin friction on drilled piers, with recommendations in the following section.

All footings should be founded at least 24 inches below the lowest adjacent finished grade. Footings located near other footings or utility trenches should have their bearing surfaces situated below an imaginary 1.5 horizontal to 1 vertical plane projected upward from the bottom of the nearby footing or utility trench. To provide a working surface and a uniform bearing area for the culvert, soils will be excavated an additional 2.5 feet below the bottom of the culvert, a filter fabric will be placed, and then backfilled with a minimum of 1 1/2 –inch crushed clean rock, with no appreciable fines. The rock must be clean and free of fines, as soil conditions will likely be wet and will not be receptive to compaction.

For the culvert, which will essentially behave as a large strip footing, with a least 22 feet of embedment (14 feet for height of culvert, thickness of culvert neglected, and 8 feet minimum cover depth), the recommended net allowable bearing capacity is 3,000 psf due to a dead load and 4,500 psf for all loads including wind and seismic. These values include a factor of safety of 3 and 2, respectively. For auxiliary footings at the headwall and endwall located outside of the culvert excavation, embedment should be neglected and the recommended net allowable bearing capacity is 2,100 psf due to a dead load and 3,200 psf for all loads including wind and seismic. These values include a factor of safety of 3 and 2, respectively. These allowable bearing pressures are net values; therefore, the weight of the footing can be neglected for design purposes. Footings should not, however, have a width of less than 24 inches.

All continuous footings should be designed with adequate top and bottom reinforcement to provide structural continuity and to permit spanning of local irregularities. Any visible cracks in the bottoms of the footing excavations should be closed by wetting prior to construction of the foundations. To assure that footings are founded on appropriate material, a qualified geotechnical field engineer or representative should observe the footing excavations prior to placing steel or concrete.

Because the final culvert will experience a similar stress regime as the existing culvert, settlements are anticipated to be small. Therefore based on the provided allowable bearing pressures capacity the total settlement will be less than 1 inch. Differential settlements between adjacent footings should not exceed one-half of the total settlement. If the planned loads exceed the current loads, we should be contacted to re-evaluate foundation settlements. Due to presence of the isolated medium dense sand materials, isolated zones of settlement due to liquefaction may be approximated to be up to ½ to 1 ½ inches.

For shallow foundations founded predominantly on stiff clay soils, we recommend an allowable modulus of subgrade reaction (Kv1) of 70 kips per cubic foot (kcf) for a l-foot-square bearing plate. This value does not include a safety factor and for short term loads, for which a safety factor of 1.5 would be appropriate. For a loaded area width of B feet, we recommend the modulus of subgrade reaction be calculated using the following equation:

$$k_s = \frac{k_{v1}}{B}\left(\frac{m+0.5}{1.5m}\right)$$

Where

B = Width of loaded area
mB = Length of loaded area
kv1 = Coefficient of Subgrade Reaction for a 1-foot square plate

5.3 Lateral Load Resistance

Lateral load resistance for the culvert and the headwall and endwall may be developed in friction between the foundation bottom and the supporting subgrade. A friction coefficient of 0.35 is considered applicable. In addition, a passive resistance equal to an equivalent fluid weighing 375 pounds per cubic foot acting against the foundations may be used. The above values for friction and passive resistance do not contain a safety factor. We typically recommend geotechnical safety factors of at least 2 for long-term and 1.5 for short term loads. Passive and friction resistance can be assumed to act together at the same time. The upper 12 inches of embedment can be ignored for passive resistance calculations except where the ground is paved or covered by a slab. Where sloping ground is present, to develop full passive resistance the ground should be graded approximately level 10 feet from the bottom of the footing.

5.4 Retaining Walls

Retaining walls must be designed to resist lateral earth pressures and any additional lateral loads caused by seismic loading and/or surcharge loads on the adjoining ground surface. The wall pressures that are subsequently given below were developed for walls retaining undisturbed native soils or compacted onsite soils. If other backfill is to be used or consideration of backfill types to reduce earth pressures is needed (such as angular gravel or crushed rock) additional earth pressures can be provided.

The recorded water levels indicate that high groundwater should be anticipated. Therefore we recommend a design groundwater elevation at approximately the top of the culvert, or approximately Elev. 80 feet. For retaining walls fixed against rotation and translation should be designed to resist at-rest lateral earth pressures corresponding to an equivalent fluid density of 70 pounds per cubic foot (pcf) above the design groundwater elevation and 100 pcf below the design groundwater elevation. It should be noted that for the culvert, these earth pressures should be applied starting at the ground surface. Cantilevered retaining walls free to displace or rotate should be designed to resist active lateral earth pressures corresponding to an equivalent fluid density of 45 pcf above the design groundwater elevation and 90 pcf below the design groundwater elevation. The above pressures are for un-drained walls with level backfill and therefore include hydrostatic pressure below the design groundwater elevation. If walls with level backfill were to be designed to be free draining the earth pressures above the design groundwater elevation may be utilized. The above at-rest and active lateral earth pressures do not include a factor of safety.

For smaller angled flange walls at both headwall and endwall of limited length (approximately 10 to 15 feet), which based on design plans specify to be drained, there a varying degrees of sloping ground behind the wall. For design of these flange walls for lateral earth pressures, assuming a drained condition, the following at-rest earth pressure values should be used corresponding to the slope angle behind the wall. At-rest earth pressures for slope angles between the values presented below may be estimated by linear interpolation.

Retained Earth Slope Angle - β (degrees)	At-Rest Earth Pressure (pcf)
5	74
15	91
25	117
35	158
45	230

Retaining walls also should be designed to resist additional seismic loads from earthquake shaking per the 2010 California Building Code (CBC). For the retaining walls at the headwall and endwall the additional seismic load can be represented for both fixed and free walls, assuming level ground and drained wall conditions, as an inverted triangular distribution, where the additional seismic load increment is an equivalent fluid pressure of 42 pcf. This seismic load should be added to the active earth pressure and not the at-rest static earth pressure.

Wherever walls will be subjected to uniform surcharge loads, they should be designed for an additional uniform lateral pressure equal to one-third or one-half the anticipated surcharge load depending on whether the wall is unrestrained or restrained.

We understand from the project structural engineer, that seismic design of the culvert (including flange walls) will be completed with deformation based racking analysis for culverts and buried structures. For the purposes of this seismic evaluation and design the project structural engineer has requested geotechnical design parameters including poisson’s ratio, shear wave velocity, soil strength, and total unit weight of the soils appropriate for the soil material at and around the proposed new culvert. Based on in-situ s-wave and p-wave velocities measured at the site during the geophysics investigation, the recommended poisson’s ratio ranges from 0.2 to 0.5 based on variations in measured seismic wave velocities. The range is shear wave velocities in the fill and native soil materials measured at the site ranged from 300 to 800 feet per second (ft/s) and is judged to be appropriate for the purposes of seismic design and evaluation. The recommended undrained shear strength for the fill and native soils materials around the culvert is 1,100 psf, corresponding to a stiff soil. The total unit weight for the soil materials at and around the culvert is 125 pcf for soil load capacity and 135 pcf for soil load demand.

The above pressures are based on the assumption that sufficient drainage will be provided behind the walls to prevent the build-up of hydrostatic pressures from surface and subsurface water infiltration. Adequate wall drainage may be provided by a sub-drain system consisting of a 4-inch diameter perforated pipe bedded in 3/4-inch clean, open-graded rock. The entire rock/pipe unit should be wrapped in filter fabric to prevent migration of fines into the drainage rock. The rock and fabric placed behind the wall should be at least 1 foot in width and should extend to within 1 foot of finished grade. The upper 1 foot of backfill should consist of compacted low permeability soil to reduce surface water infiltration. Alternatively, prefabricated drainage panels of low compressibility may be used instead of drain rock, with the drainage panels connected to a 4-inch-diameter perforated pipe at the base of the wall. For consideration and additional guidelines, Figure 15 in Appendix E presents sketches of typical drainage and waterproofing systems from the Navy design manual DM 7.02. In either case, the sub-drain pipe should be sloped to drain by gravity and be connected to a system of closed pipes that lead to suitable discharge stormwater discharge facilities. In addition, the "high" end and all 90 degree bends of the sub-drain pipe should be connected to a riser which extends to the surface and acts as a cleanout.

5.5 Drilled Piers

The project structural engineer has determined that drilled piers will be required at the endwall to accommodate higher overturning moments from higher wall sections and applied seismic loads. The piers should generally extend to a depth to provide adequate axial capacity and overturning resistance. We recommend allowable pier capacity skin friction values of 300 pounds per square foot (psf) for dead loads and 400 psf for all loads, including wind and seismic. These values can be used starting at a depth of 5 feet.

Lateral loads on the piers may be resisted by passive pressures acting against the sides of the piers. We recommend a passive pressure equal to a uniform pressure of 1100 psf for long term loads and 1500 psf for short term loads. The passive pressure can be assumed to be acting against 2 times the diameter of the individual pier shafts starting at 5 feet below the ground surface.

To achieve axial and lateral pier capacities the drilled pier shaft will need to be free of loose debris have clean and straight sidewalls. Any accumulated water in the pier excavations should be removed prior to placing reinforcing steel and concrete or the concrete should be tremied to from the bottom of the pier shaft. As aforementioned, based on experience of drilled holes for soldier beams at the shored channel, high groundwater, and the presence of zones of loose to medium dense sands the contractor should also anticipate the potential for squeezing/caving of soil materials into the hole. The drilled holes may need to be stabilized with drilling fluid additives and/or the use of casing to maintain the integrity of the hole. We recommend that the drilled pier excavations be performed under observation of a qualified geotechnical field engineer or representative check that they are constructed in accordance with the recommendations presented herein.

5.6 Construction Monitoring

In conjunction with construction of excavated slopes and/or temporary shoring and a monitoring program should be set up and executed by the contractor to monitor the effects of the excavation, dewatering, and shoring on surrounding structure, streets, and utilities. Pre-existing condition surveys should be performed. Reference points should be set on existing features and read prior to the start of construction and dewatering activities, and points should be set on the shoring as soon as initial installations are made. Both lateral and vertical movements should be measured during construction. If excessive lateral or vertical movements are recorded by the surveys, modifications to the retaining systems and/or underpinning may be required and shall be the sole responsibility of the contractor.

Caution should be exercised to minimize deflection of the shoring system and settlements of the ground surface surrounding the excavation as a result of construction activities such as excavation, dewatering, and shoring installation. The allowable deflections and settlements should be with project plans and specifications. If measurements exceed the predetermined limits, the design team consulted regarding alternative construction techniques that may be proposed by the contractor.

5.7 Pavement Design

Due to the poor condition of the pavement on El Portal Drive and Via Verdi, we have provided pavement reconstruction recommendations for portions of these streets adjacent to the Site.

It is recommended that the first section, El Portal Drive from the pavement change just east of the I-80 off-ramp to the east side of Via Verdi intersection as shown approximately on Figure 3A, be fully reconstructed because of the future culvert repair construction activities. Based on the on subgrade soil collected from boring B-2 and experience with Richmond subgrade soils we used an R-value of 5, and a design traffic index (TI) of 9.0, provided by the City. Therefore, the recommended pavement section is either 14 inches of full depth hot mix asphalt (HMA) or 7 inches of HMA over 18 inches of aggregate base (AB). The City has also elected to resurface El Portal Drive starting at the east side of Via Verdi to the pavement change before San Pablo Dam Road, as shown on Figure 3B. Based on pavement analysis and coring performed, this section is recommended to receive an 8-inch surface reconstruction by removing 8 inches of AC/AB and replacing with 8 inches of HMA.

The second section, Via Verdi from the north side of the El Portal Drive intersection (as shown on Figure 3A) to the north side of the current bypass road contains the collapsed culvert area and due to past and expected future construction is recommended for reconstruction. This section is assumed to have an R-value 5 (similar to El Portal Drive) and a TI of 5.0, provided by the City. Therefore, the recommended pavement section is either 7.5 inches of full depth HMA or 4 inches HMA over 8 inches AB.

The last section, Via Verdi from the north side of the bypass road to the west side of Mozart Drive as shown on Figure 3A, is recommended to receive a surface reconstruction treatment based on this pavement section being in poor condition and having been and likely in the future being used as a construction lay down area. The recommended rehabilitation is to remove the top 4 inches of AC and AB and replace with 4 inches of HMA.

The subgrade in asphalt-paved areas should be smooth and non-yielding. The upper 1-foot should be moisture conditioned (if necessary) to above optimum moisture content and compacted to at least 95 percent relative compaction. The subgrade should not be allowed to dry out prior to pavement construction. If soft, unstable, or saturated soils are encountered, they should be mitigated in accordance with subgrade preparation recommendations presented earlier in this report.

For HMA it is recommended that Type A asphalt concrete mix be utilized with a 3/4 inch maximum size aggregate (as per Caltrans Standard Specification Section 39) for lower AC lifts and a ½ inch maximum size aggregate for the final wearing course. Note that Type "A" mixes use 90% crushed aggregate. The asphalt binder grade should be PG 64-10 (as per Caltrans Highway Design Manual). Asphalt concrete shall be spread and compacted in the number of layers of the maximum thickness indicated in Section 39 of the Caltrans Standard Specifications.

5.8 Site Drainage

Finished grades should be planned to prevent ponding of water and to direct surface water away from foundations, pavements, and slab edges. Roof downspouts should also be directed to discharge collected water away from foundations and pavements.

5.9 Erosion Control

Erosion control measures should be in conformance with project specific erosion control requirements for the City, Contra Costa County and consistent with all applicable agency requirements.

Slopes should be graded to direct water away from slopes faces, and erosion control protection measures such as the use of vegetation, hydro seeding, erosion control fabrics/blankets, geosynthetics, shotcrete, and/or rip rap should be considered. Otherwise cut and fill slopes will be subjected to erosion and/or sloughing, thus requiring periodic maintenance of the slopes. Erosion control shall be in accordance with project plans and specifications.

5.10 Seismic Design Criteria

For seismic design in accordance with the 2010 California Building Code (CBC), we recommend a soil profile type S_D, which corresponds to a stiff soil profile with estimated average undrained shear strengths between 1,000 and 2,000 pounds per square foot (psf) in the upper 100 feet. Due to the Hayward Fault, the mapped spectral accelerations for the short periods (0.2 seconds) S_S is 2.0, and the mapped spectral accelerations for a 1-second period S_1 is

0.78. In addition, seismic surface wave measurements at the Site by AGS indicate an average site shear velocity in the upper 100 feet (30 meters), commonly referred to as Vs30, of 820 feet per second (ft/s). This Vs30 value corresponds to a soil profile type S_D.

Based on the 2010 CBC, the corresponding site modified maximum considered spectral response acceleration for soil profile type S_D and the site modified design spectral response acceleration for soil profile S_D for the Peak Ground Acceleration (PGA, Period of 0 seconds) are approximately 0.8g and .53g, respectively. Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002, revised April 2003 the PGA for 10% probability of exceedance in 50 years for an alluvium site (Site Category D) is approximately 0.7g.

5.11 Soil Corrosion Potential

5.11.1 Soil Resistivity and pH

Soil resistivity is a measure of the ability of a soil to conduct electrical current. Resistivity is usually related to the amount of soluble salts in the soil. Low resistivities generally indicate more corrosive conditions. Seawater has a resistivity of about 70 ohm-cm.

A commonly used soil classification for interpretation of corrosive environments on metals is presented below.

Soil Resistivity (ohm-cm)	Degree of Corrosivity
0 – 1000	Very corrosive
1,000 - 2,000	Corrosive
2,000 - 5,000	Fairly corrosive
5,000 – 10,000	Mildly corrosive
10,000 and above	Negligible

Another factor influencing corrosion potential is pH. Values below pH 7 indicate acidic conditions, and hence, a corrosive environment for metals and concrete.

Resistivity and pH measurements were performed on soil samples from three borings and on samples obtained from conducting forensic test pits during general excavation and removal of the collapsed culvert for the excavation of the current shored channel. The test results are summarized below:

Test No.	Depth (feet)	pH	Resistivity (ohm-cm)	Material
Borings				
B-1	11	7.52	847	Fill Soil
B-1	21	7.36	1050	Fill Soil
B-1	25	7.14	1110	Native
B-2	6	7.74	833	Fill Soil
B-2	16	7.70	1110	Native
B-2	31	8.19	833	Rock
B-3	40	7.61	690	Fill Soil
B-3	45.5	7.77	877	Fill Soil
B-4	11	7.44	781	Fill Soil
B-4	16	7.17	769	Fill Soil
B-4	21.5	7.52	833	Fill Soil
B-7	11	7.87	800	Fill Soil
Forensic Test Locations				
TP1-1	NA	7.43	4650	Bedding Sand
TP1-2	NA	6.77	1180	Native
TP3	NA	7.25	877	Bedding Sand
TP2-1	NA	7.41	3570	Bedding Sand
TP2-2	NA	7.46	1250	Native
TP3-1	NA	7.86	1925	AB
TP3-2	NA	7.60	6670	Bedding Sand
TP3-2B	NA	7.64	7140	Bedding Sand
TP3-3	NA	6.90	1540	Native
TP3-4	NA	7.42	826	Native
TP3-5B	NA	7.48	5745	Bedding Sand
TP3-6B	NA	7.96	1250	AB
V V1	NA	7.12	826	AB
V V2	NA	7.29	1010	AB
V V3	NA	7.83	840	Fill Soil
V V4	NA	7.39	833	AB
V V5	NA	7.39	893	AB
V V6	NA	7.45	800	Fill Soil
V V7A	NA	7.59	1890	AB

AB = Aggregate Base Type Material

These test results indicate that the soil and rock materials obtained from the exploratory borings and culvert forensic investigation soil samples are corrosive to very corrosive and slightly acidic to basic pH. The only exception was the bedding sand material found directly below the collapsed culvert section during the culvert forensic investigation, the test results indicate that the bedding sand is basic to neutral pH and are generally mildly corrosive to very corrosive.

5.11.2 Sulfates and Chlorides

The concentrations of sulfate and chloride in soils can also have a corrosive effect on buried utilities and foundation elements. General correlations between sulfate and chloride concentrations and corrosivity are presented below:

Chloride Concentration (mg/kg)	Degree of Corrosivity
Over 1,500	Severe
300 – 1,500	Positive
0 – 300	Negligible

Sulfate Concentration (mg/kg)	Degree of Corrosivity
Over 5,000	Severe
2,000 - 5,000	Considerable
1,000 - 2,000	Positive
0 – 1,000	Negligible

Sulfates are increasingly corrosive to ferrous metals at concentrations above 1,000 mg/kg and to concrete above 2,000 mg/kg. In addition to a corrosive attack that is chemical, sulfates can exhibit a physical attack on concrete at higher concentrations. Chloride does not demonstrate a physical attack on concrete. Sulfate and chloride test results are summarized below:

Test No.	Depth (feet)	Chloride Concen. (mg/kg)	Sulfate Concen. (mg/kg)	Material
Borings				
B-1	11	33	45	Fill Soil
B-1	21	45	90	Fill Soil
B-1	25	30	114	Native
B-2	6	54	33	Fill Soil
B-2	16	9	36	Native
B-2	31	30	105	Rock
B-3	40	78	30	Fill Soil
B-3	45.5	155	170	Fill Soil
B-4	11	144	45	Fill Soil
B-4	16	17	93	Fill Soil
B-4	21.5	87	99	Fill Soil
B-7	11	63	12	Fill Soil
Forensic Test Locations				
TP1-1	NA	36	54	Bedding Sand
TP1-2	NA	33	12	Native
TP3	NA	54	54	Bedding Sand
TP2-1	NA	33	120	Bedding Sand
TP2-2	NA	51	72	Native
TP3-1	NA	33	51	AB
TP3-2	NA	21	15	Bedding Sand
TP3-2B	NA	39	24	Bedding Sand
TP3-3	NA	54	30	Native
TP3-4	NA	33	102	Native
TP3-5B	NA	48	39	Bedding Sand
TP3-6B	NA	36	144	AB
V V1	NA	18	780	AB
V V2	NA	24	96	AB
V V3	NA	33	147	Fill Soil
V V4	NA	72	90	AB
V V5	NA	30	108	AB
V V6	NA	60	174	Fill Soil
V V7A	NA	30	102	AB

The above sulfate and chloride concentrations indicate that the analyzed soil and rock materials obtained from the exploratory borings and culvert forensic investigation soil samples have a negligible degree of corrosivity to ferrous metals and concrete based solely on corrosive salt concentrations for sulfates and chlorides.

However, based on the entire results of resistivity, pH, sulfate and chloride measurements on near-surface soils at the site, it appears that the conditions in site soils are "very corrosive" to buried reinforced concrete elements and utilities. Therefore, we recommend that appropriate protection be given to steel elements and concrete. The corrosion potential for any imported fill and backfill should also be checked.

6.0 ADDITIONAL GEOTECHNICAL SERVICES DURING CONSTRUCTION

If changes are made in the project, the conclusions and recommendations presented in this report may not be applicable; therefore, we should review any changes to verify that our conclusions and recommendations are valid and modify them if required. During construction a qualified geotechnical field engineer or representative should perform frequent site visits to check geotechnical aspects of the work and perform quality control testing of the following work items:

- Foundation excavations
- Drilled piers
- Dewatering
- Excavation cuts and slopes
- Preparation of areas to receive fill
- Retaining wall drainage
- Placement and compaction of all fill and backfill, including backfill
- Subgrade preparation for all slabs-on-grade and pavements, and aggregate base courses
- Asphalt Paving

7.0 REFERENCES

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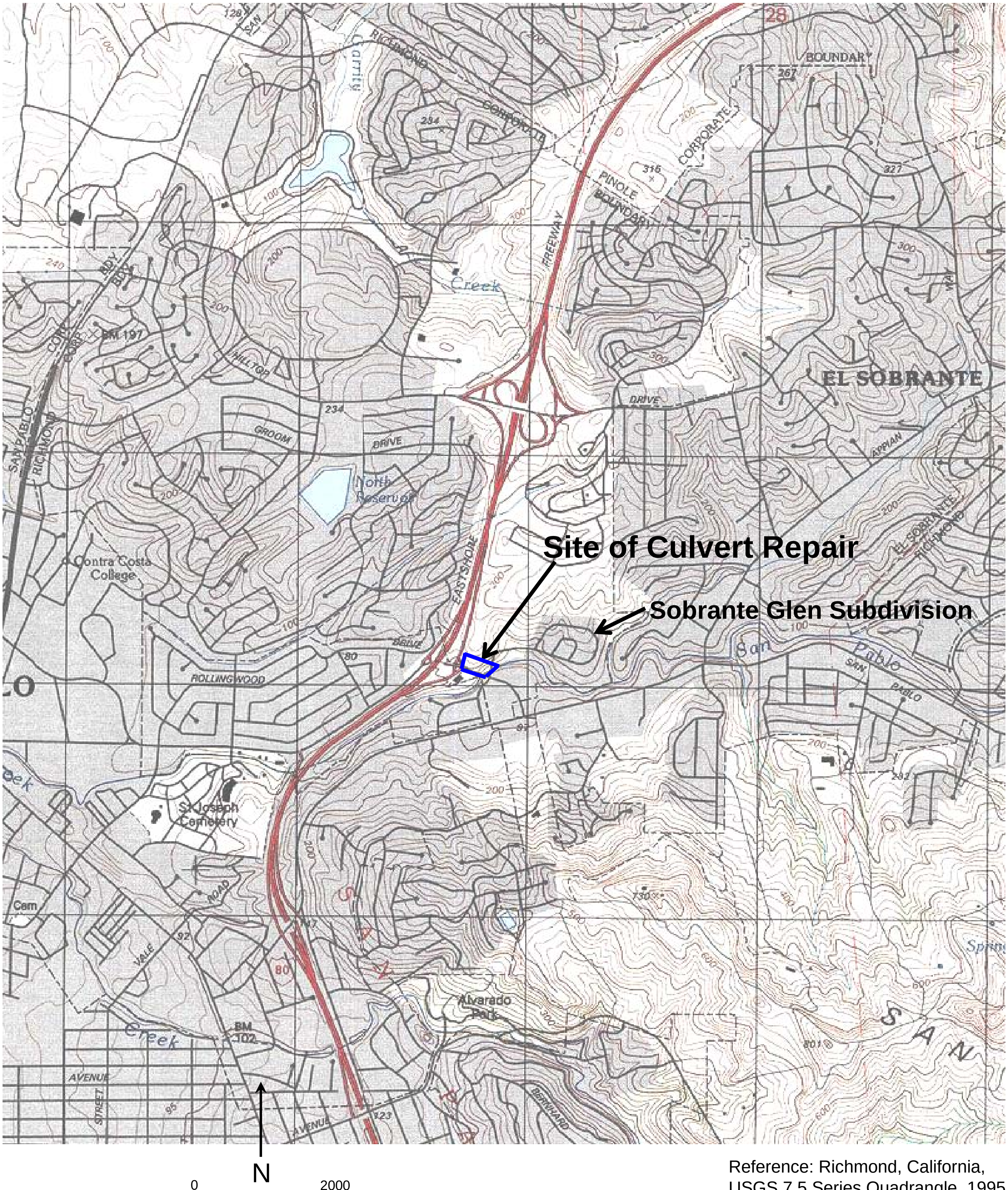
FIGURES



Reference: Richmond, California, USGS 7.5 Series Quadrangle, 1995

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Vicinity Map
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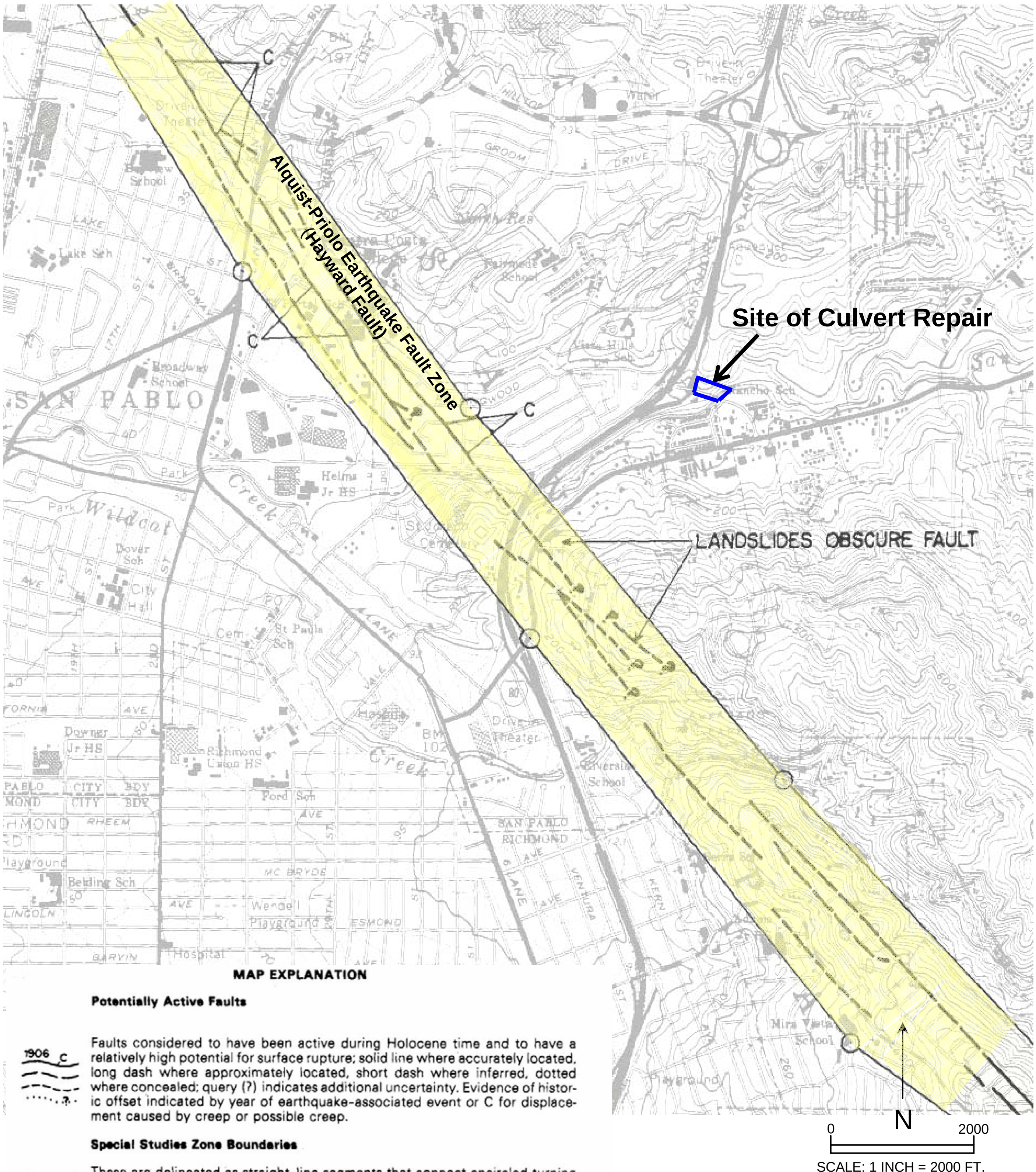
FIGURE 1

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
YVG	A568.12.20	JRS	6/11	



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Fault Zone Map
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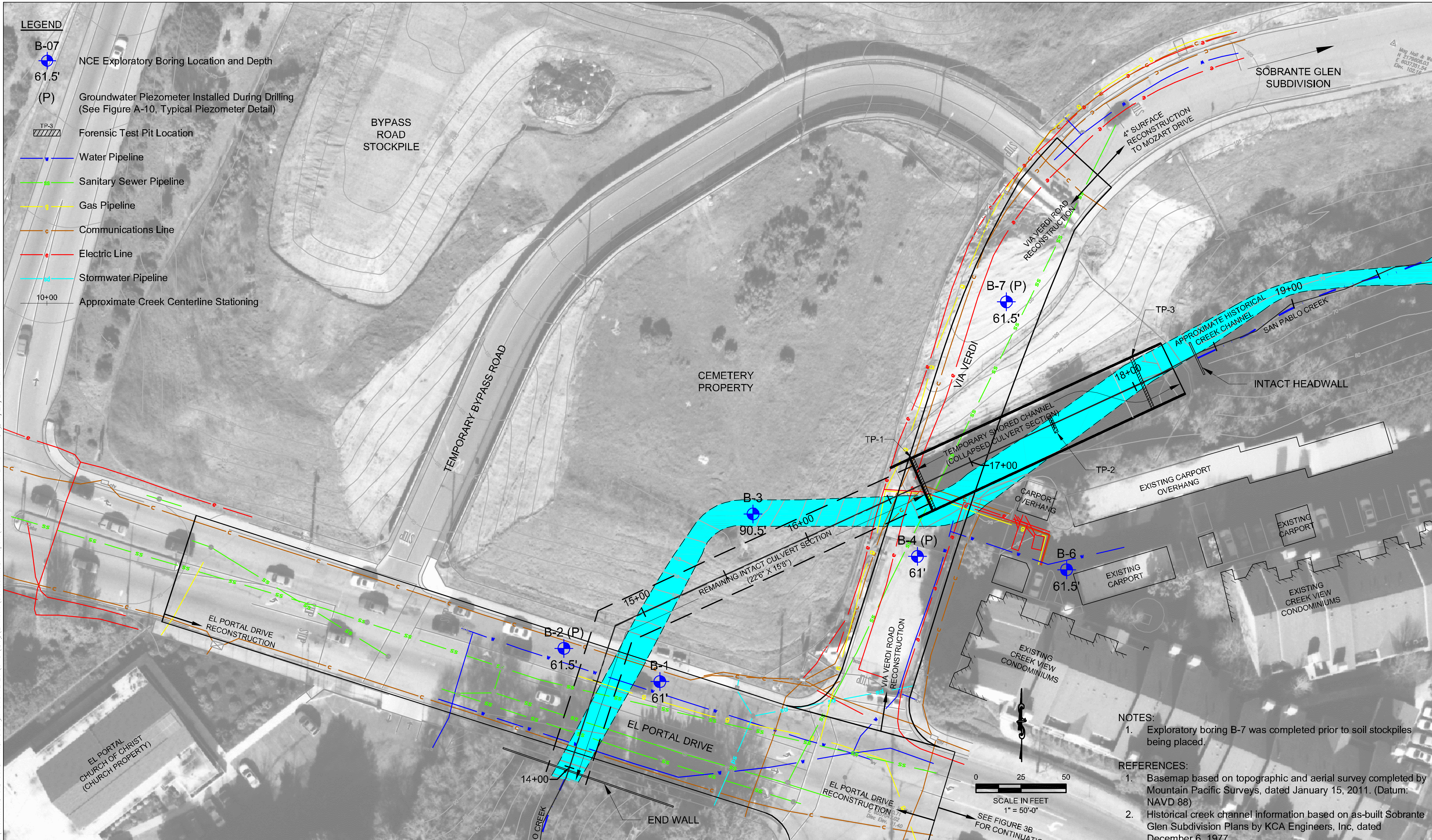
FIGURE
2

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
YVG	A568.12.20	JRS	6/11	



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Site Plan A
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FIGURE 3A

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
CKN	A568.12.20	JRS	1/19/12	JAC	8/5/11

LEGEND

C-3 NCE Exploratory Coring Location

10+00 Approximate Street Centerline Stationing

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Site Plan B
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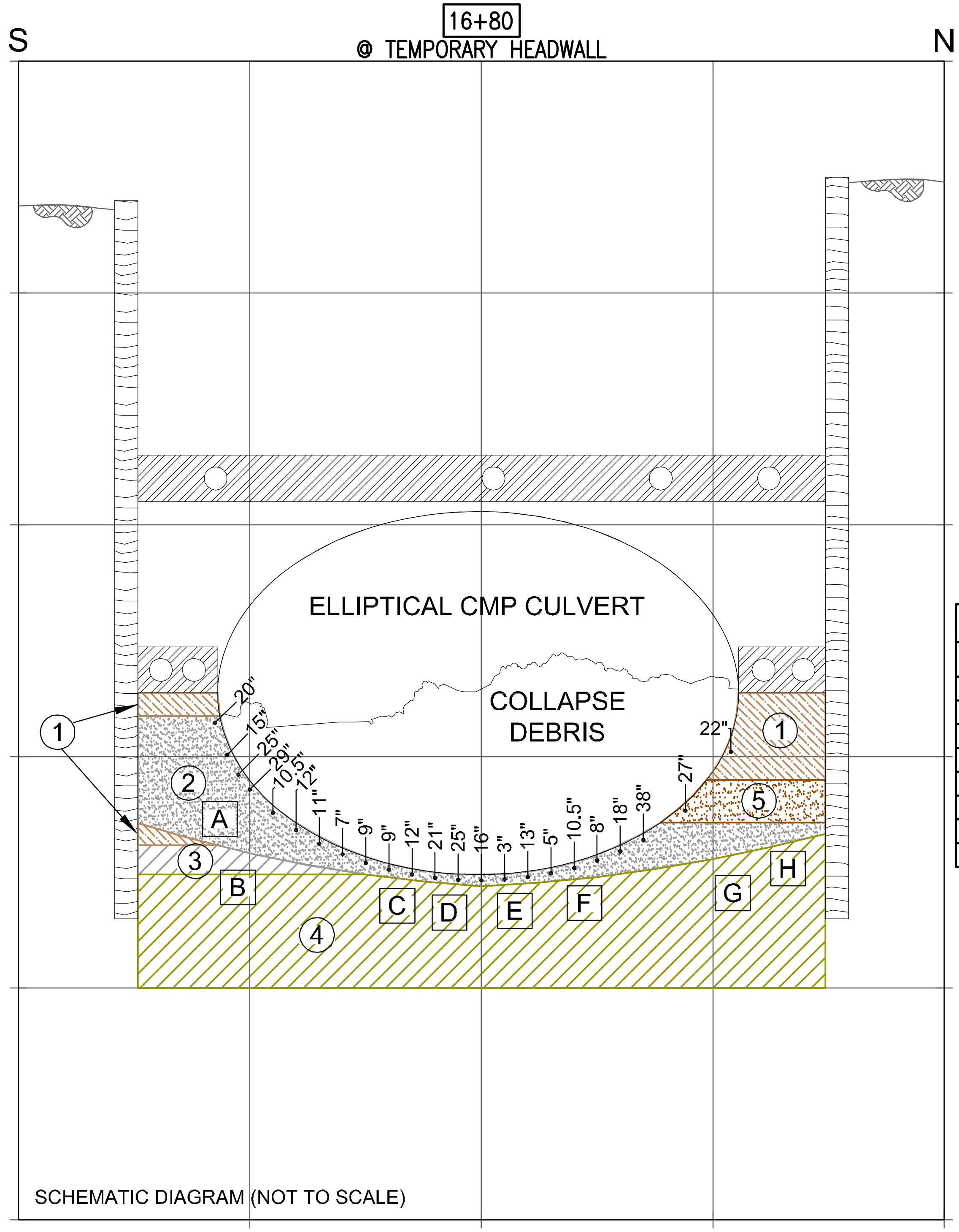
FIGURE 3B

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
CKN	A568.12.20	JRS	1/19/12	JAC	8/5/11



NOTE: TEST PIT COMPLETED OCTOBER 23, 2010

SOIL LAYER LEGEND

1. AGGREGATE BASE TYPE MATERIAL [FILL] WELL COMPACTED, WET
2. GRAY POORLY GRADED BEDDING SAND (SP) [FILL], WELL COMPACTED, WET
3. GRAY SILTY FAT CLAY (CH) [NATIVE/FILL?] STIFF, WET OCCASIONALLY ROUNDED / SUBROUNDED GRAVEL UP TO 1"
4. BROWN MOTTLED WITH YELLOWISH BROWN CLAYEY SAND WITH GRAVEL (SC) AND BROWN MOTTLED WITH YELLOWISH BROWN SANDY LEAN CLAY (CL) WITH GRAVEL [NATIVE/FILL?], STIFF TO VERY STIFF, WET SUBROUNDED GRAVEL AND COBBLES UP TO 3.25"
5. BROWN POORLY GRADED BEDDING SAND (SP) [FILL], WELL COMPACTED, WET

POCKET PENETROMETER READINGS

LOCATION	READING (TSF)
A	1.50
B	2.25
C	1.50
D	2.50
E	>4.5
F	3.75
G	2.25
H	3.00

LEGEND

- SOLDIER PILE WALL
- STEEL WALER
- TIE BACK
- 29" DEPTH OF T-PROBE PENETRATION INTO BEDDING SAND BEHIND CULVERT FACE

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Test Pit 1 Schematic Diagram
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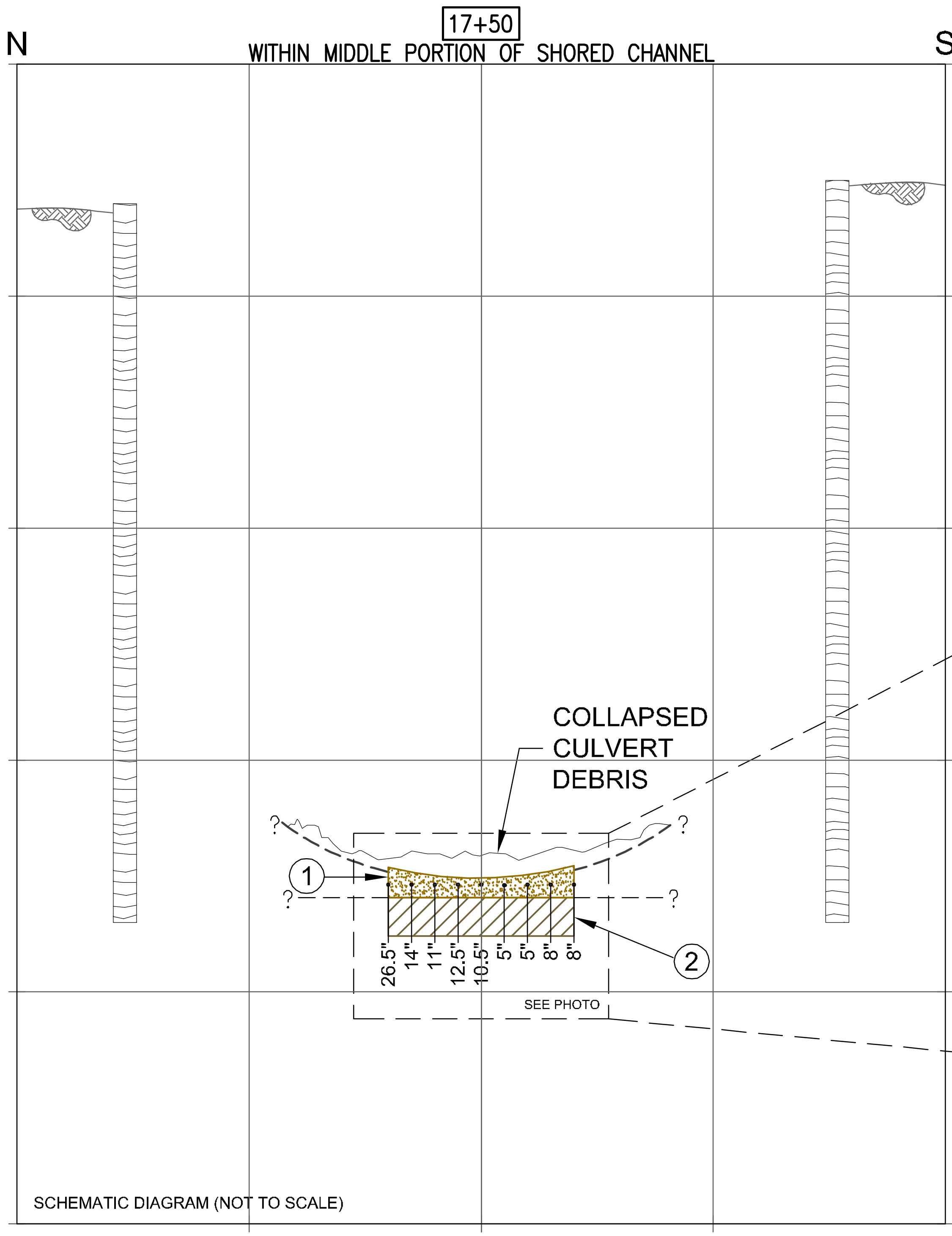
FIGURE 4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
CKN	A568.12.20	JRS	1/19/12	JAC	8/5/11



SOIL LAYER LEGEND

(1) GRAY BEDDING SAND WITH CLAY (SP-SC) [FILL], INTACT, WELL COMPACTED NO SIGNS OF VOIDS, WET

(2) BROWN MOTTLED WITH GRAY CLAYEY SAND WITH GRAVEL (SC) AND BROWN MOTTLED WITH GRAY SANDY LEAN CLAY WITH GRAVEL (CL) [NATIVE/FILL?] STIFF TO VERY STIFF, WET

NOTE: DUE TO CONSTRUCTION TIMING, POCKET PENETROMETER READINGS COULD NOT BE COMPLETED.
TEST PIT COMPLETED OCTOBER 28, 2010

LEGEND

- SOLDIER PILE WALL
- STEEL WALER
- TIE BACK
- 26.5" DEPTH OF T-PROBE PENETRATION INTO BEDDING SAND BEHIND CULVERT FACE

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Test Pit 2 Schematic Diagram
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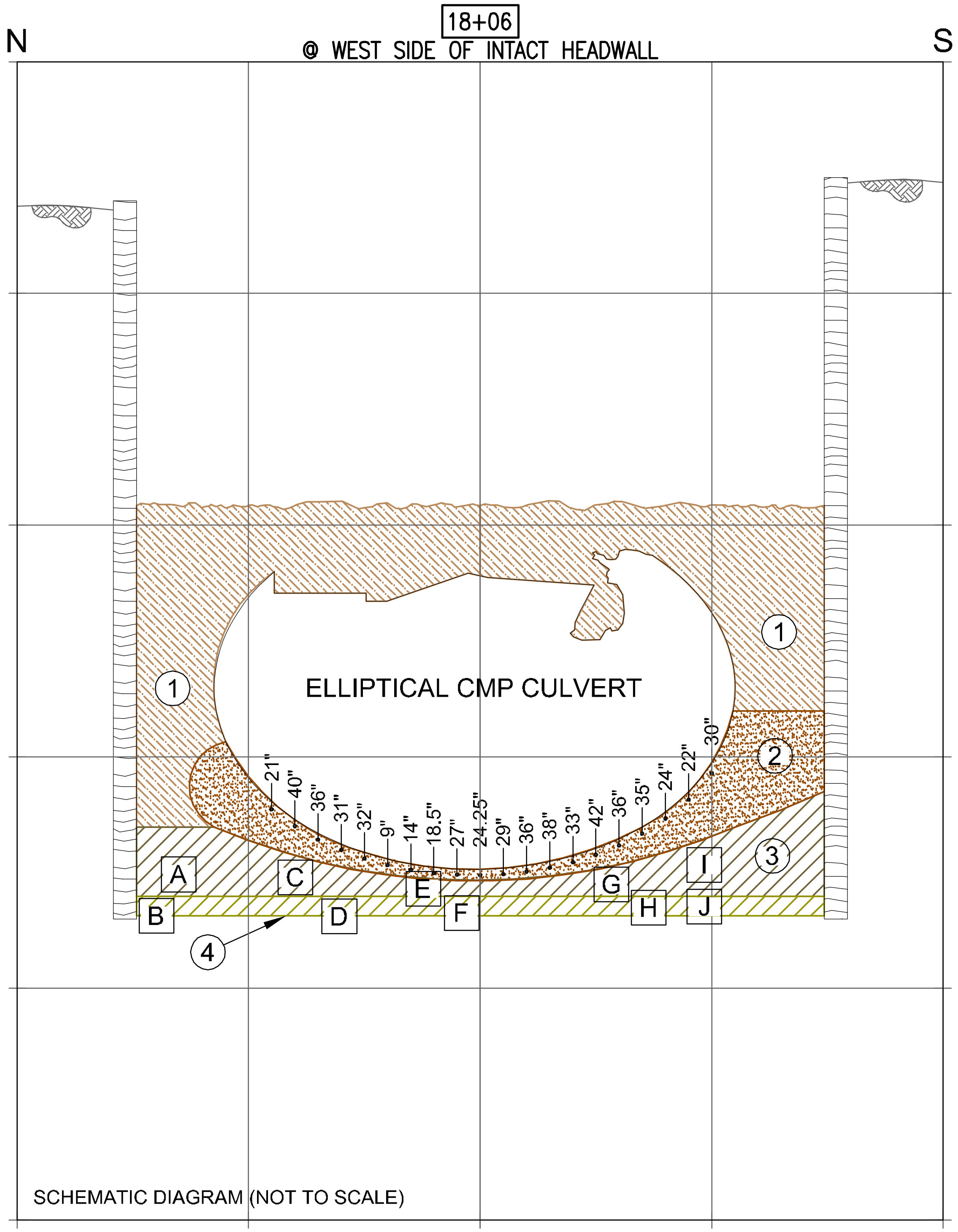
FIGURE 5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
CKN	A568.12.20	JRS	1/19/12	JAC	8/5/11



NOTE: TEST PIT COMPLETED NOVEMBER 2, 2010

LEGEND

- SOLDIER PILE WALL
- STEEL WALER
- TIE BACK
- 42" DEPTH OF T-PROBE PENETRATION INTO BEDDING SAND BEHIND CULVERT FACE

SOIL LAYER LEGEND

1. AGGREGATE BASE TYPE MATERIAL [FILL] WELL COMPACTED, MOIST TO WET
2. BROWN BEDDING SAND WITH CLAY (SP-SC) [FILL] WELL COMPACTED, MOIST TO WET
3. BROWN MOTTLED WITH YELLOWISH BROWN AND GRAY, CLAYEY SAND W/ GRAVEL (SC) AND BROWN MOTTLED WITH YELLOWISH BROWN AND GRAY SANDY LEAN CLAY WITH GRAVEL (CL) [NATIVE/FILL?] STIFF TO VERY STIFF, MOIST TO WET SUBROUNDED GRAVEL UP TO 2"
4. GRAY MOTTLED WITH LIGHT GRAY SANDY LEAN CLAY (CL) [NATIVE/FILL?] STIFF TO VERY STIFF, WET EVIDENCE OF ROOT TRACKS AND MANGANESE STAINING

POCKET PENETROMETER READINGS

LOCATION	READING (TSF)
A	2.50
B	4.00
C	3.00
D	3.25
E	2.75
F	2.00
G	1.75
H	3.25
I	2.25
J	2.50

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Test Pit 3 Schematic Diagram
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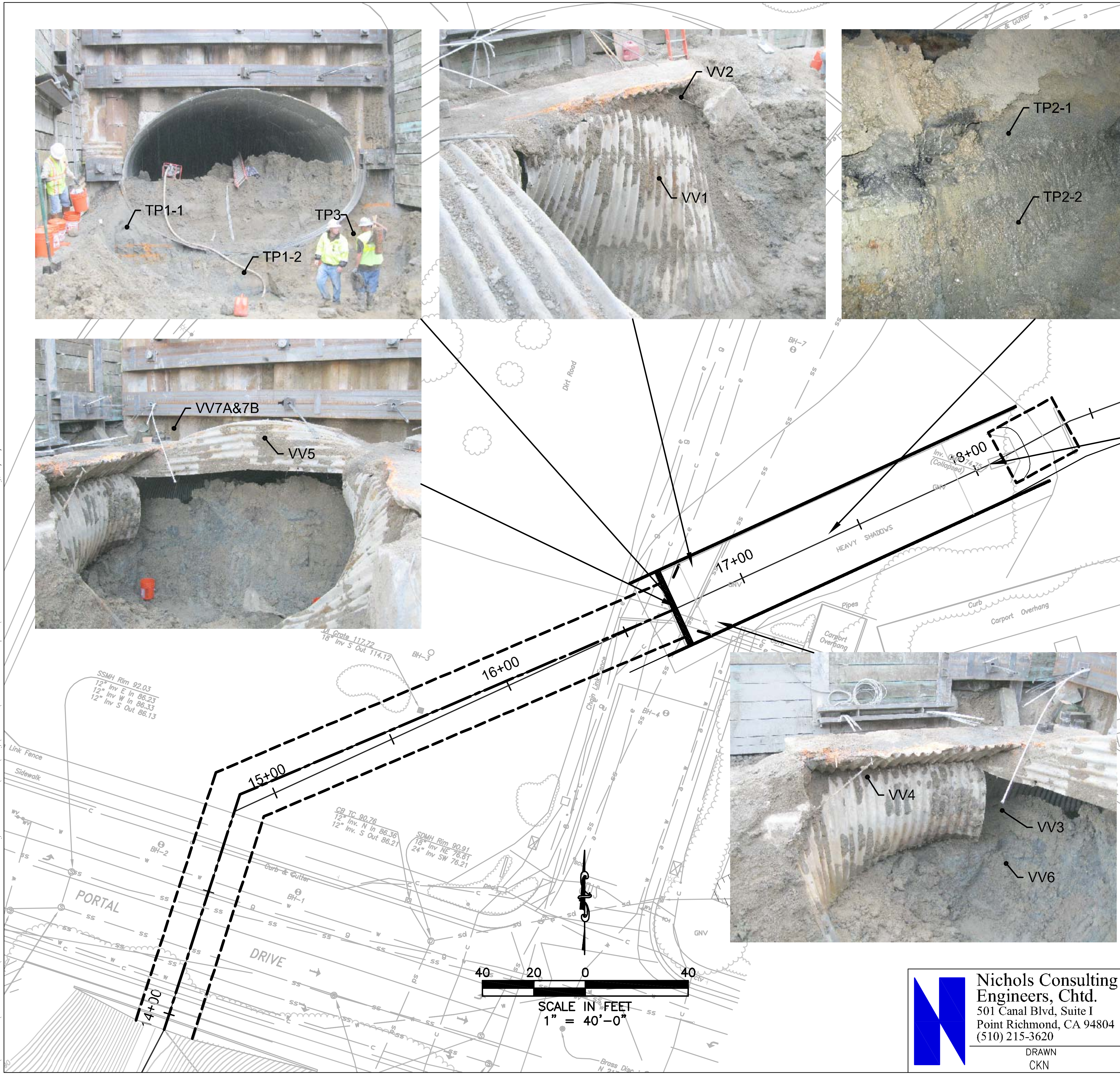
FIGURE 6

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
CKN	A568.12.20	JRS	1/19/12	JAC	8/5/11



GEOTECHNICAL SOIL SAMPLE SUMMARY			
SAMPLE ID	MATERIAL DESCRIPTION	TEST(S)	USCS
V V1	FILL (AGGREGATE BASE TYPE MATERIAL)	CORROSION	
V V2	FILL (AGGREGATE BASE TYPE MATERIAL)	PARTICLE SIZE ANALYSIS, CORROSION	GC
V V3	FILL SOIL	CORROSION	
V V4	FILL (AGGREGATE BASE TYPE MATERIAL)	PARTICLE SIZE ANALYSIS, CORROSION	SC
V V5	FILL (AGGREGATE BASE TYPE MATERIAL)	PARTICLE SIZE ANALYSIS, CORROSION	SC
V V6	FILL SOIL	PARTICLE SIZE ANALYSIS, CORROSION	MH
V V7A & 7B	FILL (AGGREGATE BASE TYPE MATERIAL)	PARTICLE SIZE ANALYSIS, CORROSION, MOISTURE, COMPACTION CURVE	SC
TP1-1	FILL (BEDDING SAND)	PARTICLE SIZE ANALYSIS, CORROSION	SP
TP1-2	FILL / NATIVE SOIL	PARTICLE SIZE ANALYSIS, CORROSION	SC
TP3	FILL (BEDDING SAND)	PARTICLE SIZE ANALYSIS, CORROSION	SP
TP2-1	FILL (BEDDING SAND)	PARTICLE SIZE ANALYSIS, CORROSION	SP-SC
TP2-2	FILL / NATIVE SOIL	PARTICLE SIZE ANALYSIS, CORROSION	SC
TP3-1	FILL (AGGREGATE BASE TYPE MATERIAL)	PARTICLE SIZE ANALYSIS, CORROSION, COMPACTION CURVE	GC
TP3-2 & 3-2B	FILL (BEDDING SAND)	PARTICLE SIZE ANALYSIS, CORROSION	SP-SC
TP3-3	FILL / NATIVE SOIL	PARTICLE SIZE ANALYSIS, CORROSION	SC
TP3-4	FILL / NATIVE SOIL	PARTICLE SIZE ANALYSIS, CORROSION	CL
TP3-5B	FILL (BEDDING SAND)	CORROSION	
TP3-6B	FILL (AGGREGATE BASE TYPE MATERIAL)	PARTICLE SIZE ANALYSIS, CORROSION	SC

NOTE: SEE LABORATORY TEST RESULTS FOR MORE DETAILED INFORMATION.

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Soil Sample Location Map
Via Verdi Repair Project
Forensic Summary Letter
Richmond, California

FIGURE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
CKN	A568.12.20	JRS	1/19/12	JAC	8/5/11

APPENDIX A

EXPLORATORY BORING LOGS

RELATIVE DENSITY OF COARSE –GRAINED SOILS

Relative Density	Standard Penetration Test Blow Count (blows per foot)
very loose	<4
loose	4-10
medium dense	10-30
dense	30-50
very dense	>50

CONSISTENCY OF FINE–GRAINED SOILS

Consistency	Approximate Blows/foot (SPT)	Undrained Shear Strength (psf)
very soft	<2	0-250
soft	2-4	250-500
medium stiff	4-8	500-1,000
stiff	8-15	1,000-2,000
very stiff	15-30	2,000-4,000
hard	>30	>4,000

NATURAL MOISTURE CONTENT

Dry	–	Requires additional moisture to obtain optimum moisture content for compaction
Moist	–	Near the optimum moisture content for compaction
Wet	–	Requires drying to obtain optimum moisture content for compaction

Note: Where laboratory data are not available, the field classifications given above provide a general indication of material properties; the classifications may require modification based on judgment or laboratory testing.

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Material Properties for Soil Classification
Via Verdi Repair Project
Richmond, California

FIGURE A-1

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
YG	568.12.20	JRS	6/11	

MAJOR DIVISIONS			SYMBOLS	TYPICAL NAMES
COARSE–GRAINED SOILS OVER 50%>No. 200 SIEVE SIZE	GRAVELS MORE THAN 1/2 OF COARSE FRACTION> No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW	Well–graded gravels or gravel–sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel–sand mixtures, little or no fines
		GRAVELS WITH OVER 15% FINES	GM	Silty gravels, gravel–sand–silt mixtures
			GC	Clayey gravels, gravel–sand–clay mixtures
	SANDS MORE THAN 1/2 OF COARSE FRACTION< No. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW	Well–graded sands or gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH OVER 15% FINES	SM	Silty sands, sand–silt mixtures
			SC	Clayey sands, sand–clay mixtures
FINE–GRAINED SOILS OVER 50%<No. 200 SIEVE SIZE	SILTS & CLAYS LIQUID LIMIT 50% OR LESS		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 silts and organic silty clays of low plasticity
	SILTS & 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
				Caliche

TEST KEY

	HQ Core Sampler
	SPT Sampler
	Modified California Sampler
	Shelby or Osterberg Sampler
	Pitcher Barrel
	Grab or Bulk Sample
	First-encountered groundwater level
	Static groundwater level
(10YR4/4)	Munsell soil color / 1990 edition
Perm	Permeability
Consol	Consolidation
LL	Liquid Limit (%)
PI	Plasticity Index (%)
EI	Expansion Index (%)
Gs	Specific Gravity
MA	Particle Size Analysis
-200=55%	Percent Passing No. 200 Sieve
Corrosion	Corrosion Testing

Shear Strength (psf) — Cell Pressure

TxUU 3000 (1500) (FM) OR (S)	- Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
TxUU 3000 (1500) (P)	- Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
TxCD 3000 (1500)	- Consolidated Drained Triaxial Shear
SSCU 3000 (1500) (P)	- Simple Shear Consolidated Undrained (with or without pore pressure measurement)
SSCD 3000 (1500)	- Simple Shear Consolidated Drained
DSCD 3000 (1500)	- Consolidated Drained Direct Shear
UC 500	- Consolidated Compression
LVS 1000	- Laboratory Vane Shear

SOURCE: ASTM D2488–93 and Unified Soil Classification System (D2487–93)

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Soil Classification Chart and Test Key
Via Verdi Repair Project
Richmond, California

FIGURE A-2

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
YG	568.12.20	JRS	6/11	

I CONSOLIDATION OF SEDIMENTARY ROCKS; usually determined from unweathered samples. Largely dependent on cementation.

U = unconsolidated
P = poorly consolidated
M = moderately consolidated
W = well consolidated

II BEDDING OF SEDIMENTARY ROCKS

Splitting Property	Thickness	Stratification
Massive	Greater than 4.0 ft.	Very thick bedded
Blocky	2.0 to 4.0 ft.	Thick-bedded
Slabby	0.2 to 2.0 ft.	Thin-bedded
Flaggy	0.05 to 0.2 ft.	Very thin-bedded
Shaly or platy	0.01 to 0.05 ft.	Laminated
Papery	Less than 0.01 ft.	Thinly laminated

III FRACTURING

Intensity	Size of Pieces in Feet
Very little fractured	Greater than 4.0
Occasionally fractured	1.0 to 4.0
Moderately fractured	0.5 to 1.0
Closely fractured	0.1 to 0.5
Intensely fractured	0.05 to 0.1
Crushed	Less than 0.05

IV HARDNESS

1. Soft - Reserved for plastic material alone
2. Low hardness - can be gouged deeply or carved easily with a knife blade
3. Moderately hard - can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away.
4. Hard - can be scratched with difficulty; scratch produces little powder and is often faintly visible.
5. Very hard - cannot be scratched with knife blade, leaves a metallic streak.

V STRENGTH

1. Plastic or very low strength
2. Friable - crumbles easily by rubbing with fingers
3. Weak - An unfractured specimen of such material will crumble under light hammer blows.
4. Moderately strong - Specimen will withstand a few heavy hammer blows before breaking
5. Strong - Specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.
6. Very Strong - Specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

VI WEATHERING - The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, and freezing and thawing.

D. Deep - Moderate to complete mineral decomposition; extensive disintegration: deep and thorough discoloration, many fractures, all extensively coated or filled with oxides,carbonates and/or clay or silt.
M. Moderate - Slight change or partial decomposition of minerals, little disintegration: cementation little to unaffected. Moderate to occasionally intense discoloration. Moderately coated fractures.
L. Little - No megascopic decomposition of minerals; little to no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains on fracture surfaces.
F. Fresh - Unaffected by weathering agents. No disintegration or discoloration. Fractures usually less numerous than joints.

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Physical Properties Criteria for Rock Descriptions
Via Verdi Repair Project
Richmond, California

FIGURE A-3

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
YG	568.12.20	JRS	6/11	

Project: Via Verdi Repair Project Project Location: Richmond, California Project Number: A568.12.20	**Log of Boring B-1** Sheet 1 of 2

Date(s) Drilled	**6/23/10**	Logged By	**Jenny Crow**	Checked By	**Ryan Shafer**
Drilling Method	**Solid Flight Auger (2 ft.- 26.5 ft)** **Rotary Wash (26.5 ft - 61 ft)**	Drill Bit Size/Type	**Solid Flight Auger: 6-inch Rotary Wash Drag Bit: 5 7/8-inch**	Total Depth of Borehole	**61 feet**
Drill Rig Type	**Fraste Multi Drill XL**	Drilling Contractor	**Pitcher Drilling**	Approximate Surface Elevation	**90.86 feet (NAVD 88)**
Groundwater Level and Date Measured	**25 feet ATD**	Sampling Method(s)	**Cal Mod, SPT**	Hammer Data	**140lb Auto Trip, 30-inch Drop**
Borehole Backfill	**Neat Cement Tremie Grout**	Location	**(See Site Plan)**		

Depth, feet	Sample Type	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	Graphic Log	LITHOLOGIC DESCRIPTION
0										4 inch Asphalt Concrete
										20 inch Aggregate Base
								CH		BLUE-GRAY MOTTLED WITH DARK GRAY AND BROWN CLAY WITH SAND (CH) very stiff, moist, up to 3/4-inch gravel and some coarse sand [FILL]
5		LL = 54, PI = 37	19 *	18.5	109	4.5				
								CL-CH		OLIVE-GRAY MOTTLED WITH DARK GRAY LEAN TO FAT CLAY (CL-CH), stiff, moist, with up to 3/4 inch sub-rounded gravel with pockets of sand [FILL]
10		Corrosion TxUU = 1740 (700) LL = 50, PI = 34	10 *	19.3	106	2.0				
								CL		YELLOWISH-BROWN SANDY LEAN CLAY WITH GRAVEL (CL) stiff, moist [FILL]
15		LL = 41, PI = 22	14 *	21.7	105	1.5				
20		Corrosion TxUU = 1340 (1200)	15 *	23.4	102	1.5		SM		@20.25-20.75 ft.: POCKETS OF GRAY SILTY SAND (SM) [FILL] @20.75 ft.: mottled dark gray and blue-gray, up to 1/2-inch sub-rounded gravel
								CL		BROWNISH-GRAY SANDY LEAN CLAY (CL) medium stiff, wet, with root tracks and organic material Groundwater encountered at 25 feet during drilling (ATD)
25		Corrosion -200 = 59.4	7				59.4			
		-200 = 58.4	5				58.4			@26.5 ft.: gray, sandy
		MA	9 *				16.5	SC		DARK GRAY CLAYEY SAND (SC) loose to medium dense, wet
30										

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Figure A-4

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-1

Depth, feet	Sample Type	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	Graphic Log	LITHOLOGIC DESCRIPTION
30		MA	14				11.4	SP-SC		DARK GRAY POORLY GRADED SAND WITH CLAY AND GRAVEL (SP-SC) medium dense, wet
								SC		GRAY CLAYEY SAND WITH GRAVEL (SC) medium dense, wet, up to 3/4 inch sub-angular to sub-rounded gravel
35		MA	19				16.5			@35.5 ft.: with up to 3/4-inch sub-angular to sub-rounded gravel
								CL		LIGHT BROWN LEAN CLAY WITH SAND (CL) hard, wet, up to 1.25-inch sub-rounded gravel
40		Consol	40/6" *	15.0	120	>4.5				
										LIGHT BROWN MOTTLED WITH GRAY MUDSTONE (WEATHERED ROCK), soft to low hardness, friable, deep weathering
45		TxUU = 6770 (1800)	48/6" *	13.5	124	>4.5				
50			43							@50 ft.: with caliche veinlets
55										
60			60							
		* Blow counts with and without an * have been converted to approximate SPT N-values using conversion factors of 0.8 and 1.2 respectively ** Approximate unconfined compressive strength								Terminated Boring at 61 feet and backfilled with neat cement tremie grout.
65										

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Figure A-4

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-2

Date(s) Drilled **6/22/10**	Logged By **Jenny Crow**	Checked By **Ryan Shafer**
Drilling Method **Solid Flight Auger (2 ft.- 31.5 ft) Rotary Wash (31.5 ft - 61.5 ft)**	Drill Bit Size/Type **Solid Flight Auger: 6-inch Rotary Wash Drag Bit: 5 7/8-inch**	Total Depth of Borehole **61.5 feet**
Drill Rig Type **Fraste Multi Drill XL**	Drilling Contractor **Pitcher Drilling**	Approximate Surface Elevation **91.42 feet (NAVD 88)**
Groundwater Level and Date Measured **20 feet ATD, 17.82 feet on 6/23/10**	Sampling Method(s) **Cal Mod, SPT**	Hammer Data **140lb Auto Trip, 30-inch Drop**
Borehole Backfill **Piezometer Installed**	Location **(See Site Plan)**	

Depth, feet	Sample Type	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	LITHOLOGIC DESCRIPTION
0									5 inch Asphalt Concrete
									19 inch Aggregate Base
								CL	MOTTLED BROWN AND LIGHT GRAY LEAN CLAY WITH SAND (CL) very stiff, dry to moist [FILL]
5		Corrosion TxUU = 2900 (400)	21 *	20.6	105	3.5			
10			66 *			>4.0		SC	BROWN CLAYEY SAND WITH GRAVEL (SC) dense, dry, with up to 1.5-inch sub-angular gravel, with concrete debris [FILL]
								CL	LIGHT BROWN SANDY LEAN CLAY WITH GRAVEL (CL) very stiff, moist
15		Corrosion TxUU = 2120 (1000)	19 *	20.7	106	2.5			
									Groundwater measured at 17.82 feet (on 6/23/10)
20			15 *			2.0			Groundwater encountered at 20 feet during drilling (ATD) @20 ft.: light gray mottled with dark gray, sandy with gravel, stiff to very stiff, wet
								SP	2-inch pocket of SP
		LL = 55, PI = 39	13					CH	DARK GRAY FAT CLAY (CH) stiff, wet
								---	DARK GRAY MUDSTONE (WEATHERED ROCK) soft to low hardness, plastic to friable, deep weathering, caliche veinlets
25									
		TxUU = 5370 (1400)	68 *	16.7	115	>4.5			
30									

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Figure A-5

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-2

Depth, feet	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	LITHOLOGIC DESCRIPTION
30	Corrosion	60 *	16.9	117	>4.5			
35	TxUU = 10,300 (1700)	88 *	12.2	126	>4.5			@35 ft.: pockets of weathered sand and up to 2.5-inch rounded gravel
40	TxUU = 4200 (1800)	38 *	16.1	117	>4.5			
45		46 *	16.3	118	>4.5			
50		47 *	18.1	116	3.5			@50 ft.: pockets of weathered sand, and up to 1-inch sub-rounded gravel
55								
60		73 *	18.4	111	>4.5			MEDIUM GRAY SANDSTONE (WEATHERED ROCK) soft to low hardness, friable, deep weathering
65	* Blow counts with and without an * have been converted to approximate SPT N-values using conversion factors of 0.8 and 1.2 respectively ** Approximate unconfined compressive strength							Terminated Boring at 61.5 feet and installed piezometer (see Figure A-10, Typical Piezometer Detail).

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Figure A-5

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Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-3

Date(s) Drilled	**11/22/10**	Logged By	**Jenny Crow**	Checked By	**Ryan Shafer**
Drilling Method	**Solid Flight Auger (0 ft- 36.5 ft) Rotary Wash (36.5 ft - 90.5 ft)**	Drill Bit Size/Type	**Solid Flight Auger: 6-inch Rotary Wash Drag Bit: 5 7/8-inch**	Total Depth of Borehole	**90.5 feet**
Drill Rig Type	**Fraste Multi Drill XL (Track Mounted)**	Drilling Contractor	**Pitcher Drilling**	Approximate Surface Elevation	**119.59 feet (NAVD 88)**
Groundwater Level and Date Measured	**46 feet ATD**	Sampling Method(s)	**Cal Mod, SPT**	Hammer Data	**140lb Auto Trip, 30-inch Drop**
Borehole Backfill	**Neat Cement Tremie Grout**	Location	**(See Site Plan)**		

Depth, feet	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	LITHOLOGIC DESCRIPTION
0							CL-CH	LIGHT BROWN MOTTLED WITH DARK BROWN LEAN TO FAT CLAY WITH SAND (CL-CH), very stiff, moist, up to 1/2-inch sub-angular to angular gravel [FILL]
5	LL = 50, PI = 33	20 *	17.8					
		17 *	18.2	104	3.75			@6.5 ft.: with sand, up to 1.5-inch sub-rounded gravel, with some manganese staining
8							CL	LIGHT OLIVE-BROWN MOTTLED WITH YELLOWISH-BROWN LEAN CLAY WITH SAND (CL) stiff, moist, with up to 3/4-inch sub-angular to sub-rounded gravel, with some iron oxide staining [FILL]
10		14 *	21.0		2.75			
15		27 *	18.2					@15 ft.: dark olive-brown mottled with yellowish-brown, very stiff, with up to 1-inch sub-angular to sub-rounded gravel, with some coarse sand
	LL = 37, PI = 19	31						@16.5 ft.: yellowish-brown mottled with gray and very dark gray, very stiff to hard
20	TxUU = 1510 (1300)	27 *	23.8	96.7	3.75			@20 ft.: stiff, with up to 1.5-inch sub-rounded gravel, with dark gray clay fill inclusions
25		22 *	24.4	96	2.75			@25 ft.: light brown mottled with light gray, with sand, with up to 1.75-inch sub-rounded gravel, with fragments of weathered mudstone rock
30								

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Figure A-6

Depth, feet	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	LITHOLOGIC DESCRIPTION
30	TxUU = 900 (1800) MA	20 *	10.6	111	2.0	66.7	CL	@30 ft.: light grayish-brown mottled with yellowish-brown, medium stiff to stiff, sandy and with up to 1.75-inch sub-rounded gravel, with pockets of silty clay
35		24 *			2.25			@35 ft.: light olive-brown mottled with gray, very stiff, with up to 1.25-inch angular gravel, with pockets of silty clay
40	Corrosion LL = 41, PI = 20	30 *	25.8	102	>4.5			@39 ft.: olive mottled with yellowish-brown, sandy, very stiff to hard
45	TxUU = 2730 (2300)	27 *	19.4	110	3.25	58.4		@44 ft.: dark brown and reddish-dark gray, sandy, very stiff, with up to 3/4-inch sub-angular to sub-rounded gravel
								Groundwater encountered at 46 feet during drilling (ATD)
	Corrosion LL = 44, PI = 29 -200 = 36.4	24	17.4			36.4	SC	LIGHT BROWN CLAYEY SAND (SC), medium dense, wet [FILL]
50	Consol MA	54 *	25.6	99.2	3.75	35.3		@49.5 ft.: dark gray mottled with blueish-gray, dense, with root fibers with up to 1-inch sub-rounded gravel
55								DARK GRAY MUDSTONE, soft to low hardness, friable, deep weathering (behaves like a hard clay)
60		120						
65								

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-3

Depth, feet	Sample Type	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	Graphic Log	LITHOLOGIC DESCRIPTION
65										
70			113							
75										
80										
85										
90			116							@89 ft.: mottled gray with light brown
		* Blow counts with and without an * have been converted to approximate SPT N-values using conversion factors of 0.8 and 1.2 respectively ** Approximate unconfined compressive strength								Terminated Boring at 90.5 feet and backfilled with neat cement tremie grout.
95										
100										

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Figure A-6

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Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-4

Date(s) Drilled **11/15/10**	Logged By **Jenny Crow**	Checked By **Ryan Shafer**
Drilling Method **Solid Flight Auger (14.5 in - 31.5 ft) Rotary Wash (31.5 ft - 61 ft)**	Drill Bit Size/Type **Solid Flight Auger: 6-inch Rotary Wash Drag Bit: 5 7/8-inch**	Total Depth of Borehole **61 feet**
Drill Rig Type **Fraste Multi Drill XL**	Drilling Contractor **Pitcher Drilling**	Approximate Surface Elevation **93.5 feet (NAVD 88)**
Groundwater Level and Date Measured **28 feet ATD, 27.1 feet on 11-15-2010**	Sampling Method(s) **Cal Mod, SPT**	Hammer Data **140lb Auto Trip, 30-inch Drop**
Borehole Backfill **Piezometer Installed**	Location **(See Site Plan)**	

Depth, feet	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	LITHOLOGIC DESCRIPTION
0								2.5 inch Asphalt Concrete
								12 inch Aggregate Base
							CL	GRAY MOTTLED WITH YELLOWISH-BROWN AND DARK-BROWN LEAN CLAY WITH SAND (CL) stiff, moist, up to 1-inch sub-angular gravel [FILL]
		13 *			2.25			
5		15 *	21.1		3.0			@5.5 ft: blue-gray mottled with dark gray and dark brown, with sand and up to 3/4-inch sub-angular gravel, stiff to very stiff
10	Corrosion LL = 46, PI = 28 TxUU = 1760 (700) MA	22 *	20.2	104	3.25	58.3		@10 ft.: olive mottled with yellowish-brown, sandy with up to 2.5-inch sub-rounded gravel, stiff
15	Corrosion TxUU = 940 (1000)	19 *	21.1	102	3.0			@15 ft.: very dark brown mottled with gray, medium stiff to stiff, sandy
20		19 *			3.25			@20 ft.: yellowish-brown, sandy, with up to 1/4-inch sub-angular gravel, very stiff, moist
	LL = 40, PI = 23 Corrosion MA	20	22.1			65.6		@21.5 ft.: dark olive-gray mottled with blueish-gray
							CL	VERY DARK BROWN LEAN CLAY WITH SAND (CL) stiff, moist, up to 1/2-inch sub-angular gravel
25	TxUU = 1200 (600)	14 *	24.4	98.1	0.75			
								Groundwater measured at 27.1 feet (on 11-15-2010)
								Groundwater encountered at 28 feet during drilling (ATD)
							SC	
30								

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Figure A-7

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-4

Depth, feet	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	LITHOLOGIC DESCRIPTION
30	-200 = 33.4	6				33.4	SC	BROWN CLAYEY SAND WITH GRAVEL (SC) loose, wet
35	Consol -200 = 40.8	18 *	21.6	110		40.8		@35 ft.: olive-brown, with some root fibers and some manganese staining, medium dense
							CL	YELLOWISH-BROWN MOTTLED WITH LIGHT GRAY SANDY LEAN CLAY (CL) hard, wet, with iron oxide staining
40	Consol LL = 34, PI = 16	34 *	18.6	112	4.5			
								LIGHT GRAY MOTTLED WITH OLIVE MUDSTONE, soft to low hardness, friable, deep weathering
45		62						
50		88						
55								
60		106						
	* Blow counts with and without an * have been converted to approximate SPT N-values using conversion factors of 0.8 and 1.2 respectively ** Approximate unconfined compressive strength							Terminated Boring at 61 feet and installed piezometer (see Figure A-10, Typical Piezometer Detail)
65								

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Figure A-7

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-6

Date(s) Drilled	**6/24/10**	Logged By	**Jenny Crow**	Checked By	**Ryan Shafer**
Drilling Method	**Solid Flight Auger (11in-31.5 ft) Rotary Wash (31.5 ft - 61.5 ft)**	Drill Bit Size/Type	**Solid Flight Auger: 6-inch Rotary Wash Drag Bit: 5 7/8-inch**	Total Depth of Borehole	**61.5 feet**
Drill Rig Type	**Fraste Multi Drill XL**	Drilling Contractor	**Pitcher Drilling**	Approximate Surface Elevation	**96.41 feet (NAVD 88)**
Groundwater Level and Date Measured	**25 feet ATD**	Sampling Method(s)	**Cal Mod, SPT**	Hammer Data	**140lb Auto Trip, 30-inch Drop**
Borehole Backfill	**Neat Cement Tremie Grout**	Location	**(See Site Plan)**		

Depth, feet	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	LITHOLOGIC DESCRIPTION
0								2.5 inch Asphalt Concrete
								8.5 inch Aggregate Base
							CL	YELLOWSH-BROWN SANDY LEAN CLAY (CL) medium stiff to stiff, moist, with up to 1/2-inch sub-angular gravel [FILL]
		8*			2.5			
5								@5 ft.: brown mottled with yellowish-brown, stiff, with up to 1/2-inch sub-angular gravel
	TxUU = 1170 (400)	6*	18.2	106	2.0			
							CL	DARK BROWN MOTTLED WITH OLIVE-GRAY AND YELLOWISH-BROWN LEAN CLAY WITH SAND (CL) stiff to very stiff, moist, up to 1/2-inch sub-angular gravel
10		15*	20.8	104	2.0			
15	TxUU = 1230 (1000)	10*	20.7	107	1.25			@15 ft.: dark gray mottled with blue-gray with sand, with up to 1/2-inch sub-rounded gravel, stiff
20		10*	21.6	105	2.5			@20 ft.: mottled blue-gray and dark gray
25								Groundwater encountered at 25 feet during drilling (ATD)
	TxUU = 1120 (1600)	10*	27.5	96.2	1.5			@25ft.: dark bluish-gray, wet
30								

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Figure A-8

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-6

Depth, feet	Sample Type	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	Graphic Log	LITHOLOGIC DESCRIPTION
30		TxUU = 210 (1800)	20*	26.8	96.1	0.5		CL		@30 ft.: mottled light brown and brown, very soft pocket (may have been disturbed by drilling), sandy
			10							@31.5 ft.: light brown mottled with gray, with gravel, stiff, with manganese staining and root fibers
35			10*	30.1	93.0	0.75				@35 ft.: light brown, sandy
40			10*	30.6	92.0	1.0				@40 ft.: dark gray, with manganese staining
45			12*	24.0	102	1.5				@45 ft.: gray, with manganese staining
50			17*	25.9	98.0	2.0				@50 ft.: sandy, very stiff
55										LIGHT GRAY SILTSTONE (WEATHERED ROCK) soft to low hardness, friable, deep weathering
60			72*	17.6	112	>4.5				
		* Blow counts with and without an * have been converted to approximate SPT N-values using conversion factors of 0.8 and 1.2 respectively ** Approximate unconfined compressive strength								Terminated Boring at 61.5 feet and backfilled with tremie grout.
65										

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Figure A-8

P:\A568 - City of Richmond Public Works\A568.12.20 - Via Verdi Final Design\BorinGS\Via Verdi repair project.bgs [Boring-NCE-Richmond-fines.tpl]

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-7

Date(s) Drilled **6/21/10**	Logged By **Jenny Crow**	Checked By **Ryan Shafer**
Drilling Method **Solid Flight Auger (1.5 ft.- 21.5 ft) Rotary Wash (21.5 ft - 61.5 ft)**	Drill Bit Size/Type **Solid Flight Auger: 6-inch Rotary Wash Drag Bit: 5 7/8-inch**	Total Depth of Borehole **61.5 feet**
Drill Rig Type **Fraste Multi Drill XL**	Drilling Contractor **Pitcher Drilling**	Approximate Surface Elevation **103.68 feet (NAVD 88)**
Groundwater Level and Date Measured **30 feet ATD, 27.45 feet on 6/23/10**	Sampling Method(s) **Cal Mod, SPT**	Hammer Data **140lb Auto Trip, 30-inch Drop**
Borehole Backfill **Installed Piezometer**	Location **(See Site Plan)**	

Depth, feet	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	LITHOLOGIC DESCRIPTION
0								3.5 inch Asphalt Concrete
								14.5 inch Aggregate Base
							CL	OLIVE MOTTLED WITH BROWN AND GRAY LEAN CLAY (CL) stiff, moist, with pockets of gravel and sand [FILL]
		11*			1.5			
	TxUU = 1750 (300)	16*	22.5	98.5	3.5			
5								
10	Corrosion	14*	20.3	106	1.5			@10 ft.: dark gray mottled with blue-gray
15	TxUU = 2130 (1000)	17*	21.0	107	2.5			@15 ft.: mottled blue-gray and dark gray with some sand, very stiff
20		29 *	21.3	108	2.75			@20 ft.: light brown mottled with gray, with sand
							CL	OLIVE-BROWN MOTTLED WITH DARK BROWN LEAN CLAY WITH SAND (CL), very stiff to hard, moist, manganese staining and caliche veinlets
25		31*	17.0	114	2.0			
								Driller noted drilling resistance @27 feet (likely a gravelly zone).
								Groundwater measured at 27.45 feet (on 6/23/10) ▼
								Groundwater encountered at 30 feet during drilling (ATD) ▽
30								

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Figure A-9

Project: Via Verdi Repair Project
Project Location: Richmond, California
Project Number: A568.12.20

Log of Boring B-7

Sheet 2 of 2

Depth, feet	Sample Type	Other Tests / Notes	Blows / foot	Moisture Content (%)	Dry Density (pcf)	Pocket Pen (Tsf) **	% Fines	USCS Symbol	Graphic Log	LITHOLOGIC DESCRIPTION
30			22					CL		(ATD) ▽ @30 ft.: very dark gray to black mottled with blue-gray, with sand and sub-rounded to rounded gravel, wet
35		TxUU = 230 (2000) -200 = 71.1	6*	29.8	92.8	<0.5	71.1			@35 ft.: mottled brown and gray, sandy, medium stiff, with very soft pockets, with root fibers
		-200 = 54.3	7				54.3			@36.5 ft.: sandy with pockets of clayey sand, with up to 1.5-inch sub-rounded gravel
40										
			22*	22.9	104	3.0		ML		BLUE-GRAY SILT WITH SAND (ML) very stiff, wet, with occasional up to 1.5-inch sub-rounded gravel, with root fibers and iron oxide staining, and manganese staining
45										
										LIGHT GRAY SANDSTONE (WEATHERED ROCK), soft to low hardness, friable, deep weathering
50			50							
55										
60			70							
		* Blow counts with and without an * have been converted to approximate SPT N-values using conversion factors of 0.8 and 1.2 respectively ** Approximate unconfined compressive strength								Terminated Boring at 61.5 feet and installed piezometer (see Figure A-10, Typical Piezometer Detail).
65										

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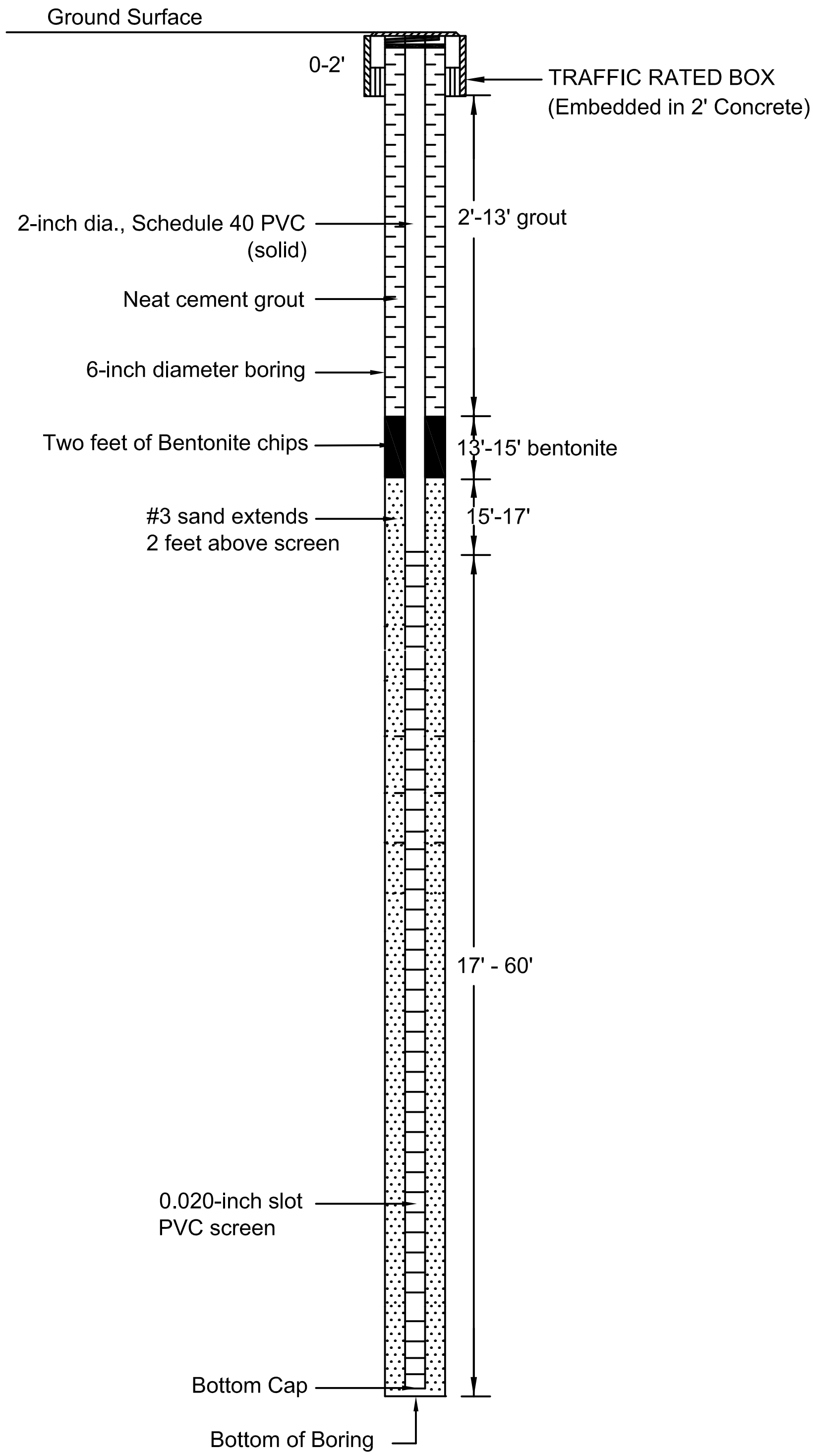
Figure A-9



NOT TO SCALE

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Typical Piezometer Detail
Via Verdi Repair Project
Richmond, California

FIGURE
A-10

DRAWN	FILE NAME	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
YVG		568.12.20	JRS	6/11	

APPENDIX B

GEOPHYSICAL INVESTIGATION, FINAL REPORT
by ADVANCED GEOLOGICAL SERVICES

1605 School Street, #4
Moraga CA 94556
925 (808-8965)

July 14, 2011

Ryan Shafer, PE, GE
Nichols Consulting Engineers
501 Canal Boulevard, Suite I
Richmond, California 94804

Subject: Geophysical Investigation, Final Report
Via Verdi Restoration Project
Richmond, California

Dear Mr. Shafer:

1.0 INTRODUCTION

Figure 1 - Via Verdi Project Location

This letter presents the results of Advanced Geological Services, Inc. (AGS) geophysical investigation in support of Nichols Consulting Engineers' (NCE) Via Verdi Restoration Project in Richmond, California. Briefly, on April 15, 2010 a 130- by 50-foot "sinkhole" suddenly appeared on Via Verdi Avenue (Figure 1). NCE investigations indicated that the sinkhole was caused by the collapse of a portion of the culvert for San Pablo Creek. In addition to investigating the mechanism of the collapse, NCE is also assessing the condition of the remaining section of the intact culvert. As part of that assessment, NCE has retained AGS to perform a geophysical investigation to look for potential voids and areas of weak or disturbed soil along the intact portion of culvert. In addition, Nichols has requested a Vs30 assessment of the shear-wave velocity of the soil to determine the seismic site classification.

The investigation was performed on December 7, 23, and 30, 2010 and on January 5, 2011 by AGS senior geophysicist Roark W. Smith and his assistant. The investigation consisted of a Ground Penetrating Radar (GPR) survey to scan the subsurface for voids and disturbed soil indicative of potential collapse areas, and Seismic Surface-Wave and high-resolution Seismic Refraction Tomography surveys to assess Vs30 and look for anomalous low-velocity zones indicative of loosened soil and potential collapse areas.

2.0 SUMMARY OF FINDINGS

- No voids or disturbed soil areas were indicated by the GPR survey. GPR achieved a maximum penetration depth of approximately 10 feet bgs.

- Seismic refraction and seismic surface wave surveys achieved investigation depths of approximately 40 and 60 feet, respectively. No seismic anomalies that would indicate zones of loosened soil or potential collapse areas were observed.

- Surface-Wave survey results indicate that the Fill Terrace may contain a 5- to 10-foot thick low-velocity layer at depths between 15 and 40 feet bgs. Although the layer is most pronounced at the bend in the culvert, it is widespread throughout the Fill Terrace and is also observed in background measurements obtained in the northern portion of the Fill Terrace, 70 feet away from the culvert. These results lead AGS to conclude that the low-velocity layer is associated with variations in the fill material properties and does not represent a potential collapse area. Nonetheless, further investigation of culvert bend area may be warranted. It is worth noting that this low-velocity layer approximate1y corresponds to a zone of lower blow-counts observed during the advancement of NCE boring B-1.

- Vs30 at the Via Verdi site is 820 feet per second (fps), which equates to a seismic site classification of "D".

- Observed fill and alluvium overburden velocity ranges were as follows:

	S-wave Velocity (fps)	**P-wave Velocity (fps)**
Fill and Alluvium Overburden	300 to 800	1250 to 1850 fps*
Rock	800 to 1400	NA**
* at Fill Terrace area; P-wave velocity at El Portal Drive may be as high as 3,000 fps		
** Shallow-focus refraction survey performed at Fill Terrace only and was not designed to assess velocity at bedrock depths		

3.0 SITE DESCRIPTION

The investigation area encompassed the approximately 25-foot wide footprint of the culvert where it crosses beneath El Portal Drive and then angles to the northeast as it passes beneath the corner of an undeveloped fill terrace (Figure 8). Accordingly, the site is divided into two distinct areas— El Portal Drive and the Fill Terrace. The El Portal Drive area is approximately 75 feet long and 30 feet wide and includes the paved street and sidewalks above the culvert. The Fill Terrace area begins approximately 10 feet north of El Portal Drive, at the toe of the fill terrace, where the culvert bends approximately 50^{o} to the east beneath the fill terrace and continues 160 feet to Via Verdi Drive, for a total length of 235 feet. The Fill Terrace area comprises steep slopes (approximately 2:1) and rises to a height of approximately 30 feet above El Portal Drive before it descends back to street level at Via Verdi Avenue. The oval-shaped culvert is approximately 23 feet wide and 16 feet tall at its center; the center (top) of the culvert is approximately 11 feet below ground surface (bgs) beneath El Portal Drive and up to 30 feet bgs in the Fill Terrace area.

4.0 GEOPHYSICAL METHODS

4.1 Ground Penetrating Radar (GPR)

GPR uses radar technology to produce a graphical profile of the subsurface that shows soil layering and images of buried objects. GPR systems typically use a single transceiving antenna (one that both transmits and receives the radar signal) that is dragged along the ground surface. The antenna emits a radar pulse into the ground; some of the radar energy reflects off of interfaces between materials with different electrical properties (e.g., soil and an air pocket) and returns to the surface where it is detected by the antenna and sent via the cable to a separate control unit where it is amplified and displayed on a computer screen as a vertical "wiggle trace," which is a plot of the strength (amplitude) of the received GPR signal (i.e., the reflection) over time. Although the vertical scale of a GPR profile is usually considered as depth, it actually measures the travel time of the radar pulse from the surface to a reflecting interface and back to the surface.

A subsurface profile is built as the antenna is pulled along the survey line and successive wiggle traces are recorded. GPR data are usually displayed as an array of closely-spaced traces; this procedure produces an image of the subsurface as the reflections (wiggles) on adjacent traces merge into coherent patterns. Undisturbed soil layers appear as laterally continuous horizontal bands across a GPR profile; the horizontal banding becomes distorted where the soil has been disturbed by subsidence, while backfilled excavations and buried refuse often appear as zones of chaotic reflection patterns. Buried objects appear as localized, high-amplitude (dark) reflection patterns. Buried pipes and USTs often exhibit a characteristic "upside down V" hyperbolic pattern, which allows them to be readily identified on a GPR record. Burial depths are determined by using calibrating GPR profiles with images objects buried at known depths. Culverts and storm drain pipelines observed in drop inlets are often used for this purpose.

4.2 Seismic Refraction

The seismic refraction method uses compressional (P-) wave energy to delineate seismic velocity layers within the subsurface. Interpretation entails correlating the velocity layers to geologic features such as soil and various types of bedrock. To perform a refraction survey, an elastic wave (compressional, or P-wave) is generated at certain locations (shotpoints) along a survey line. The P-wave energy is usually produced with a small explosion or by striking the ground with a sledgehammer. As the P-wave propagates through the ground it is refracted along boundaries between geologic layers with different seismic velocities.

Part of the refracted P-wave energy returns to the ground surface where it is detected by vibration-sensitive devices called geophones, which are placed in a co-linear array along the seismic survey line. The geophone data are fed to a seismograph, where they are recorded, and then to a computer, where they are analyzed to determine the depth and velocities of subsurface seismic layers. Key data for refraction analysis are the positions of the geophones and shotpoints along a seismic line, and the amount of time it takes for the refracted wave to travel from the shotpoint to each geophone location. Because the P-wave is the fastest traveling of all types of seismic waves, it can be readily identified as the first deflection ("first break") on a seismic trace.

Additional discussion of the refraction method, its limitations, and the relationship between seismic velocity and geologic materials is presented in Appendix A.

4.3 Seismic Surface Wave

Briefly, a seismic Surface-Wave survey entails measuring the velocity of Rayleigh, or surface waves using an array of motion detectors (geophones) placed on the ground surface. Because Surface-Wave velocity closely follows shear-wave velocity (90 to 95% of V_S), surface-wave velocity data can be used to estimate shear wave velocity (V_S). Surface-waves are seismic waves that travel along or near the surface of the earth; they are generated by both natural (e.g., wind, ocean waves) and man-made (e.g., hammer blow, traffic noise, factory vibration) sources. Surface-Waves travel in assemblages of frequencies, with each frequency having a corresponding wavelength. Because surface-waves are influenced by subsurface material to a depth approximately equal to the surface-wave's wavelength, a velocity vs. depth profile can be generated by measuring the velocity of surface-waves of varying wavelengths. Short wavelengths (higher frequencies) respond to the material properties (e.g., stiffness) of shallower materials while longer wavelengths (lower frequency) respond to deeper materials.

For the Via Verdi investigation, AGS looked for low-velocity zones indicative of reduced soil stiffness. In addition, AGS used the surface wave technique to assess average S-wave velocity of the upper 30 meters (Vs30) of soil to determine its seismic site classification.

5.0 FIELD PROCEDURES

5.1 Establish Investigation Area

The field work was performed in four days spread over a month's time due to inclement weather. In general, the field work was divided into two phases: the El Portal Drive phase and the Fill Terrace phase. The El Portal Drive work was performed on pavement and required the use of a traffic control subcontractor (E.D. Safety Services of Lodi, California), who prepared a Traffic Control Plan for approval by the City of Richmond, and who controlled the vehicle traffic along El Portal Drive during the field work. The Fill Terrace work performed largely on the terrace slopes and was hampered by the steep slopes that were made slippery by grass and mud from recent rainfalls.

AGS began the work on December 7, 2010 at the Fill Terrace portion of the site. Before beginning the geophysical data acquisition, AGS first marked the investigation area boundaries, which were based on the culvert location. AGS established the culvert location across the El Portal Drive by climbing down into the San Pablo Creek ravine to place backsight marks along the culvert centerline. AGS then pulled a fiberglass tape measure through the culvert beneath El Portal Drive to measure the distance to the culvert "kink point," where the culvert bends; AGS then went topside to measure and mark the kink point on the ground surface. AGS then marked the culvert centerline and edges on the ground surface with spray paint.

Working next from the northeast end of the site, AGS then established the culvert boundaries over the fill terrace by backsighting along the culvert edges, which were exposed by the open ditch where the sinkhole had been repaired. The culvert location was marked with red pin flags on the grassy soil slopes of the fill terrace. As a check, AGS compared its field marks to the culvert location as shown on drawings provided by NCE.

5.2 GPR Survey

AGS then obtained GPR data in the Fill Terrace portion of the site by hand-pulling the GPR antenna alongside a fiberglass tape measure placed on the ground surface to mark each survey line. GPR lines were positioned along the culvert centerline and just beyond the culvert edges. AGS scanned the lines with two different GPR antennas— a higher resolution 400-MegaHertz (MHz) antenna to look for voids and areas of disturbed soil, and a lower-resolution 120-MHz antenna to maximize investigation depth, albeit at the expense of resolution. GPR line locations were marked on AGS' field map using site features and topography for reference. Distance marks were placed on the GPR profiles at 5-foot intervals so that any notable GPR images could be readily referenced to an onsite location.

The El Portal Drive phase of work was performed on December 23, 2010 and entailed both GPR and seismic survey work. First, AGS performed the GPR survey by hand-pulling the GPR antennas across El Portal Drive while vehicle traffic was halted briefly by E.D. Safety Services. As with the Fill-Terrace work, GPR data were obtained along survey lines positioned along the culvert centerline and just beyond the culvert edges. GPR data were obtained with both the 400- and 120-MHz antennas, and a tape measure was used for horizontal control.

5.3 Seismic Surface Wave Survey

Next, AGS performed the seismic survey work. Seismic surface-wave data were obtained in a grid pattern across El Portal Drive using a series of geophone arrays oriented parallel to the roadway and positioned within traffic lanes blocked by the traffic control subcontractor. This procedure allowed traffic to be routed around the seismic work area, in compliance with the Traffic Control Plan. AGS obtained surface-wave data using the "active-source" Multi-channel Analysis of Surface Waves (MASW) technique. After briefly halting traffic, AGS generated surface waves by striking the pavement with a 16-lb sledgehammer at "shotpoints" positioned in-line with the geophone array and 15 feet from the first geophone. Seismic energy was detected by an array of 24 Geospace 4.5-Hz geophones spaced 3 feet apart, for a total spread length of 84 feet. The detected seismic signals were digitized by a DAQLink II data acquisition system and recorded on a laptop computer using a 1-second record length and a 0.25-millisecond sample interval. After the data were recorded, the geophone array was then moved to the next survey location and the process was repeated. The survey grid at El Portal Drive was arranged so that geophone arrays were centered over the culvert and at points approximately 8 feet beyond the culvert edges. AGS returned to the site on December 30 to complete the seismic surface-wave survey work onto the Fill Terrace, where the same grid-based surface wave survey approach and the same data recording parameters were used. Overall, a total of 46 surface-wave data sets were obtained.

5.4 Vs30 and Seismic Refraction and Surveys

AGS performed the Vs30 and seismic refraction tomography surveys On January 5, 2011. The Vs30 work was performed on the top of the fill terrace using combined "active" and "passive" seismic sources. Active-source data were obtained the same manner as the previously-described MASW technique; the passive-source data were obtained using an "L" shaped geophone array with 11 geophones spaced 15 feet apart. For the passive-source portion of the work, twenty 30-second records using a 2-millisecond sample interval were obtained. Passive seismic sources comprise ambient noise vibrations generated by ocean waves, traffic, and other machinery and generally include lower-frequency signals that sample deeper into the subsurface. Combining the shallow information generated from higher-frequency active-source data with deeper information from lower-frequency passive-source data yields a more accurate assessment of Vs30 than if either source alone is used.

The seismic refraction work was performed using a 24-channel geophone array with geophones spaced 5 and 10 feet apart for a total spread length of 160 feet. Shot points were located 5 feet beyond each end of the array and every 20 feet within the array of a total of 9 shotpoints overall. AGS produced P-waves through multiple impacts with a 16-lb sledge hammer against a metal plate placed on the ground surface at each shotpoint location. Owing to the noise from the vehicle traffic along El Portal Drive, AGS used the technique of "stacking" to enhance data quality. Stacking, entails using multiple hammer blows at each shotpoint location to improve the signal-to-noise ratio. The additive affect of stacking of multiple hammer blows at the same location enhances or increases the amplitude of the signal (i.e., the refracted wave arrival) while amplitude of the background noise, which, being random in nature, tends to cancel itself on successive hammer blows and remains largely unchanged. AGS stacked data from up to 7 hammer blows for each shotpoint. The P-waves produced by the hammer impacts were detected using Sensor SM-15 10-Hz high output geophones. The detected seismic signals were digitized by a DAQLink II data acquisition system and recorded on a laptop computer using a 1-second record length and a 0.125-millisecond sample interval.

After the seismic data were obtained, AGS performed a hand-level survey to measure the relative elevation of each geophone and shotpoint so that the ground surface topography could be incorporated into the data analysis. Seismic refraction work was performed only on the Fill Terrace area; refraction data could not be obtained in the El Portal Drive area because it would have required laying cables across the road and stopping traffic for at least 2 hours.

6.0 DATA PROCESSING AND ANALYSIS

6.1 GPR Survey

GPR data were examined in real-time on the instrument's view screen as the survey progressed. The AGS geophysicist inspected the GPR profiles for distorted layering indicative of subsidence, and also looked for high-amplitude reflections indicative of void spaces. Upon returning to the office, the GPR data were downloaded to a desktop computer where they were examined again for notable but more subtle reflections that may have gone unnoticed in the field.

6.2 Seismic Surface Wave Survey, including Vs30 Survey

In general, surface wave data processing entails first producing a velocity spectrum image, which shows the phase velocity for the various frequencies of surface waves detected (Figure 2). This image is used as the basis for interpreting ("picking") a dispersion curve, which is a graph that depicts how surface-wave velocity varies with frequency (hence, depth). The dispersion curve is then used to prepare an initial 1D model of surface-wave velocity versus depth using a one-third wavelength approximation (i.e., a given phase velocity is assigned to a depth that is one-third of the wavelength of the corresponding surface-wave). The initial velocity layer model is then adjusted using an inversion process until the corresponding synthetic dispersion curve achieves a "best-fit" match to the original dispersion curve that was interpreted from the observed data (i.e., the velocity spectrum image). The degree or closeness of the fit between the interpreted and synthetic curves provides an indication of how well the model represents actual subsurface conditions.

The seismic surface wave data were processed using the *SeisImager/SW* software package by Geometrics, Inc. *SeisImager/SW* comprises the software models *Pickwin*, and *WaveEq*. *Pickwin* displays the raw field data and the corresponding velocity spectrum image, and it enables the geophysical analyst to pick a dispersion curve. *Pickwin* automatically creates a dispersion curve by picking the mathematical maximum amplitude for each frequency; however, this curve was usually edited by the geophysical analyst to adjust spurious picks resulting from noisy data. *WaveEq* is then used to prepare the initial velocity layer model from the interpreted dispersion curve and perform the subsequent inversion that refines the initial model into the final "best fit" model. Inputs to *WaveEq* included the number of layers and the number of iterations to be performed by the inversion process. AGS specified 15 layers and 20 inversions; however, a "best fit" was usually achieved by the 10^{th} inversion.

For the Vs30 survey, AGS first processed the active- and passive-source data sets independently, using *Pickwin* to prepare separate dispersion curves for each source type. The two dispersion curves were then combined using *WaveEq* to prepare the velocity layer model. As previously stated, combining the shallow information generated from higher-frequency active-source data with deeper information from lower-frequency passive-source data results in a deeper investigation depth and a more accurate assessment of Vs30 than if either source alone is used.

Separate, independent processing was performed for each of the 46 surface-wave data-sets obtained for this investigation. The processing output for each data-set was a 1-dimensional (1D) velocity layer model depicting S-wave velocity variations with depth at a single point (which is assumed to be at the center of the geophone array). The velocity models were output in two formats— a graphical format (.pdf) showing the velocity layering with depth, and in digital format as a tabulated text file containing depth and velocity information. The text files were used to perform a 3-Dimensional analysis of S-wave velocity variations across the site.

The 3D analysis was performed using the GEOSOFT Oasis montaj earth science software system. To position the velocity information in "3-D space", AGS first assigned location coordinates to each of the 46 1D S-wave velocity models. The velocity models were then imported into a GEOSOFT database and a three-dimensional "voxel" gridding operation was performed. The voxel gridding produced a three-dimensional "block" model showing how S-wave velocity varies both laterally and with depth across the site. The velocity variations are color-coded so that lower-velocity material is indicated by "cool" colors (blue and geen) and higher-velocity material is indicated by "hot" colors (red and pink). AGS then used GEOSOFT's clipping and dynamic rotation capabilities to slice into the velocity block model and view it from different angles (Figures 4 - 7).

6.3 Seismic Refraction Survey

Seismic refraction data were processed using the *SeisImager/2D* software package by Geometrics, Inc. Briefly, *SeisImager/2D* is a computer inversion program that generates an initial velocity layer model, produces synthetic data from the model, and then adjusts the model so that the synthetic data better matches the observed field data. The agreement between the synthetic and observed data provides an indication of how well the model represents the true subsurface conditions.

First, AGS used the *SeisImager/2D* module *PickWin* to interpret ("pick") the P-wave arrivals ("first breaks") for each of the nine shotpoint data sets ("shot gathers") obtained along the seismic line. *PickWin* was also used to check (against the geophysicst's field log) that the proper locations were assigned to the geophones and shotpoints. Next, the first break files were fed to the SeisImager module *PlotRefra*, which was used display a time-distance (TD) plot for the seismic line, which facilitates an assessment of the investigation depth, number of geologic layers detected, and their seismic velocity. *PlotRefra* is also used to assign a specific seismic layer to each arrival time. For the initial refraction analysis, each P-wave arrival is considered to have refracted from a distinct seismic layer. The number of layers resolved by the seismic survey, and their thickness and average velocity, are revealed by straight line segments on the TD plot; because these straight-line segments represent a constant velocity condition within the subsurface, they often represent a distinct geologic layer. The topographic elevation files were incorporated into the analysis at this point. Next, a time-term inversion was performed to produce preliminary layered velocity models.

The layered velocity models were then used as starting models for the tomographic inversion process that produced the velocity model presented on Figure 12. Briefly, tomographic inversion is a grid-based modeling process wherein the subsurface is divided into rectangular cells based on the geophone spacing. The tomography software assigns a velocity to each cell, produces a synthetic arrival time data set based on seismic raypaths projected through the velocity grid, and then compares the synthetic data to the real data recorded in the field. The cell velocities are then adjusted and re-adjusted until the synthetic data achieve a "best fit" with the observed field data.

Tomographic modeling is often used to complement layered modeling at sites where gradual velocity transitions, such as those often seen within thick soil and fill layers, are expected. In addition, tomographic modeling, especially when used in conjunction with data from a large number of closely-spaced shotpoints, can depict localized lateral velocity variations within the subsurface more accurately than a layered modeling approach. To analyze the refraction survey results AGS looked for localized low-velocity zones, which could be indicative of a disturbed subsurface condition and loosened fill material.

7.0 RESULTS

In general, no voids or disturbed soil areas were indicated by the GPR survey. GPR achieved a maximum penetration depth of approximately 10 feet below ground surface (bgs). Seismic refraction and seismic surface wave surveys achieved investigation depths of approximately 40 and 60 feet, respectively. No seismic anomalies that would indicate large zones of loosened soil or potential collapse areas were observed.

Surface-Wave survey results indicate that the Fill Terrace may contain a 5- to 10-foot thick low-velocity layer at depths between 15 and 40 feet bgs. Although the low-velocity layer is most pronounced at the bend in the culvert, it is widespread throughout the Fill Terrace and is also observed in background measurements obtained in the northern portion of the Fill Terrace, approximately 70 feet away from the culvert. These results lead AGS to conclude that the low-velocity layer is associated with variations in the fill material properties, such as type of fill or amount of compaction, and does not represent a potential collapse area. Nonetheless, further investigation of the culvert bend area may be warranted. Results for each geophysical method are discussed in more detail below.

7.1 GPR Survey

The GPR profiles are presented on Figures 9 and 10. Figure 9 shows the GPR profiles crossing

El Portal Drive and Figure 10 shows the GPR profiles from the Fill Terrace. The most notable features on the GPR profiles are the localized, high-amplitude reflections associated with buried utilities on the north side of El Portal Drive (Figure 9), and similar reflections from top of the Fill Terrace where a storm drain inlet was observed (Figure 10). In addition, profiles from El Portal drive show laterally-continuous horizontal reflections associated with the road fill layering; profiles from the Fill Terrace show the characteristic reverberations (“ringing”) often associated with electrically conductive material (i.e., the muddy soil and wet grass).

7.2 Seismic Refraction Survey

The seismic refraction profile is presented on Figure 12. It indicates homogeneous subsurface conditions at depth and is largely unremarkable except for a shallow zone of slightly lower compressional (P-) wave velocity on the northeast slope of the Fill Terrace. This lower-velocity zone may indicate the presence of looser, less compacted fill material at the surface. The refraction survey achieved an investigation depth of approximately 40 feet below ground surface (bgs) and provided P-wave velocity information for the fill material surrounding the culvert. P-wave velocities of the fill material at the Fill Terrace ranged from 1250 to 1850 feet per second (fps).

7.3 Seismic Surface-Wave Survey

The Surface-Wave survey results are presented on Figures 2 through 7 and Figure 11. Figures 2 and 3 show a typical velocity spectrum image/ dispersion curve and the associated 1-D S-wave model, respectively. Figures 4 through 7 show selected views of the 3-D S-wave velocity “block” prepared from the 46 1-D velocity models. Figure 11 provides an overview of the Surface-Wave survey results by presenting the 46 1-D velocity models according to their relative locations within the investigation area.

The Surface-Wave survey achieved an investigation depth of approximately 60 feet bgs. The resulting velocity models exhibited different characteristics for the El Portal Drive area as compared to the Fill Terrace area. In general, the El Portal models indicate a moderate and relatively uniform overall increase in S-wave velocity with depth from approximately 450 feet per second (fps) at the surface to 800 to 1200 fps at a depth of approximately 60 feet below ground surface (bgs). In contrast, most of the Fill Terrace profiles are characterized by a low-velocity “notch” that indicates the presence of a 5- to 10-foot thick layer of lower-velocity fill material at depths ranging from 15 to 40 feet below ground surface (bgs). S-wave velocities within this notch layer are 300 to 400 fps. It is worth noting that this low-velocity notch approximately corresponds to a zone of lower blow counts observed during the advancement of NCE boring B-1. NCE’s log of boring B-1 shows blow counts dropping from 15 blows per foot at 20 feet bgs to 5 blows per foot at 27 feet bgs, before rising to 14 blows per foot at 30 ft bgs.

The Surface Wave survey also indicates that the near-surface material on the Fill Terrace exhibits somewhat lower S-wave velocity than the near-surface material at El Portal Drive. The lower near-surface velocity at the Fill Terrace is attributed to unconfined nature of the fill material on the terrace and to loosening of surface material as it creeps down the steep terrace slopes. The higher near-surface velocity in the El Portal Drive area is attributed to the more compacted road fill, which is confined by the overlying pavement and continuously compacted by vehicle traffic.

Overall S-wave velocity trends across the site are shown below on Figures 4 through 7, which present selected views of the S-wave velocity block model. Figures 4 and 5 are views from the south and north, respectively, to show how the lower-velocity surface material (400 to 600 fps) drapes on the Fill Terrace slopes; they also show that the flat area at the top of the Fill Terrace exhibits slightly higher S-wave velocity (700 fps). Figures 4 and 5 figures also show the overall increase in S-wave velocity with depth (from 400 fps up to 1,300 fps and greater), as indicated by progressively hotter colors towards the bottom of the block.

Figures 6 and 7 are "slice views" of the block model with the shallower information stripped away to better show the S-wave velocity signature at the top of the culvert and at the culvert invert, respectively. Figure 6 is a slice view of the top-of-culvert elevation (approximately 80 ft MSL); it shows pockets of dark blue-colored lower-velocity material, which represent the low-velocity "notches" on the 1D models. At this elevation, the low-velocity zone is most pronounced at the bend in the culvert, which could indicate looser material in that area. Such an interpretation is reasonable if one considers that the force of San Pablo Creek as it flows through the culvert would be greatest in the area of the culvert bend. However, as stated previously, the fact that the low-velocity zone is widespread throughout the Fill Terrace area leads AGS to conclude that the low-velocity response is associated with a variation of material properties within the Fill Terrace such as the type of fill material or the amount of compaction.

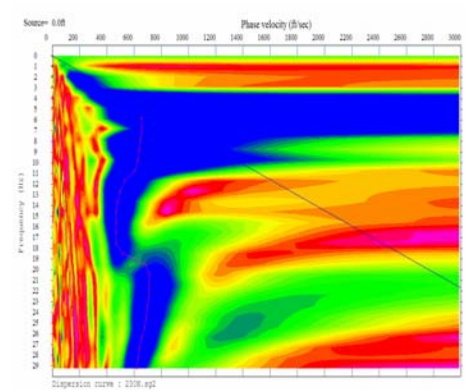


Figure 2 - ***Velocity spectrum image and dispersion curve (red dots) from Fill Terrace area***

Figure 7 is a slice view through the base-of-culvert elevation (approximately 64 ft MSL). The extent and intensity of the blue-colored lower-velocity material is greatly reduced; however, lower-velocity material at the culvert bend is still indicated.

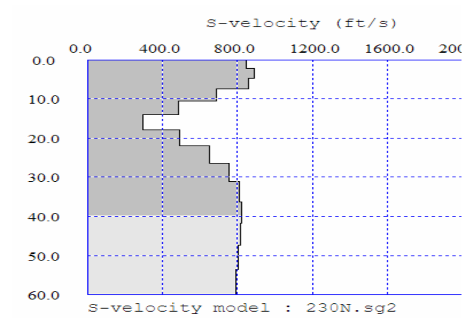


Figure 3 – ***1D S-wave model generated from Figure 2 dispersion curve showing low-velocity "notch"***

A brief discussion of the velocity spectrum images and the associated dispersion curves is also warranted. Usually, the velocity of geologic material increases with depth so that the corresponding velocity spectrum image and associated dispersion curve show a regular trend of increasing phase velocity with decreasing surface wave frequency (i.e., increasing investigation depth increases). Most of the velocity spectrum images obtained in the Fill Terrace area, however, show a pronounced offset or "kink" in the peak amplitude trend such that the phase velocity abruptly decreases before resuming the general trend of increasing velocity with decreasing frequency. Such kinks usually indicate a velocity inversion, wherein a layer of lower-velocity material underlies higher velocity material and, accordingly, many of the 1D S-wave models show a velocity inversion, which is indicated by the previously mentioned low-velocity "notch" on the associated 1D models. A typical velocity spectrum image exhibiting such a kink, along with the resulting 1D S-wave model with the corresponding low-velocity "notch" are presented on

Figures 2 and 3.

Velocity inversions are usually associated with adjacent layers of strongly contrasting geologic materials, such as clay and gravel. Given the presumably homogeneous nature of the Fill Terrace fill material, such a pronounced velocity inversion is unexpected. The log of NCE boring B-1, located near the south toe of the Fill Terrace, where a velocity inversion was observed, shows that the subsurface in that area is composed largely of sandy clay; however it is worth noting that the low-velocity notch corresponds to pockets of sandy fill and organic material and to the zone of lower blow counts previously mentioned.

S-wave velocities obtained from the surface wave survey were as follows: Fill and alluvium overburden: 300 to 800 fps; rock: 800 to 1400 fps.

7.4 Vs30 Wave Survey

Vs30 at the Via Verdi site is 820 feet per second (fps), which equates to a seismic site classification of "D". The Vs30 survey was performed at the top of the Fill Terrace in a clear, topographically flat area conducive to obtaining good-quality surface-wave data; it achieved an investigation depth of approximately 100 feet bgs.

8.0 CLOSING

All geophysical data and field notes collected as a part of this investigation will be archived at the AGS office. The data collection and interpretation methods used in this investigation are consistent with standard practices applied to similar geophysical investigations. The correlation of geophysical responses with probable subsurface features is based on the past results of similar surveys although it is possible that some variation could exist at this site. Due to the nature of geophysical data, no guarantees can be made or implied regarding the targets identified or the presence or absence of additional objects or targets.

Sincerely,

Roark W. Smith
Senior Geophysicist
Advanced Geological Services, Inc.

Figures:	Figure 1	Site Location (imbedded in Report text)
	Figures 2 - 3	Example Velocity Spectrum Image and Velocity Model (imbedded in Report text)
	Figures 4 - 7	Selected Slice Views of 3D S-Wave Velocity Block Model
	Figure 8	Site Map Showing Geophysical Data Locations

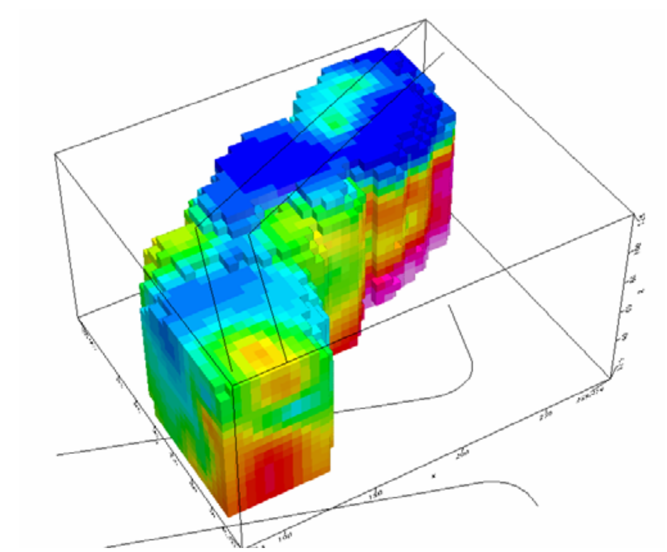


Figure 4 - *Velocity "block" prepared from 1D S-wave velocity models, viewed from the south. Depth range shown is from the ground surface to the base of the culvert. Blue area indicates lower S-wave velocity associated with the shallow subsurface at the fill terrace. Culvert location is shown for reference.*

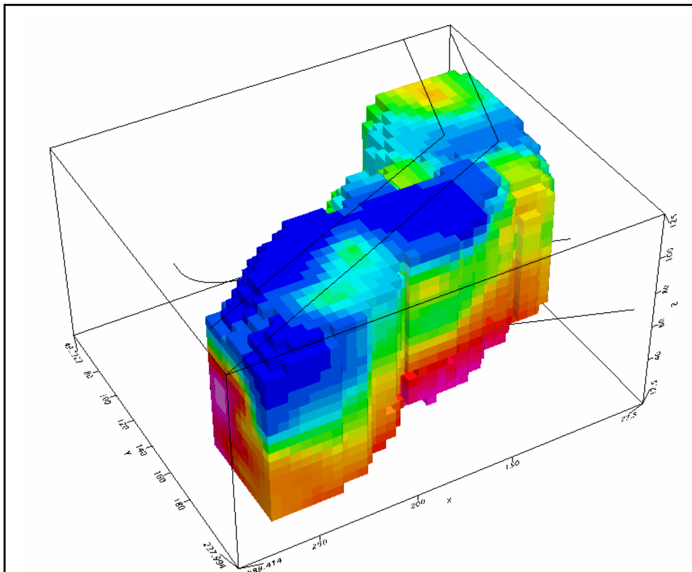
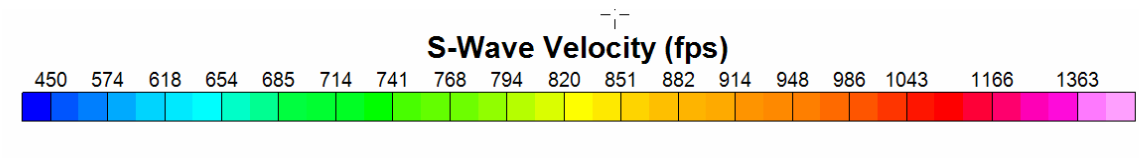


Figure 5- View is reverse of Figure 4 to better show the near-surface low-velocity layer draped on the fill terrace slopes, and the overall trend of increasing S-wave velocity with depth.



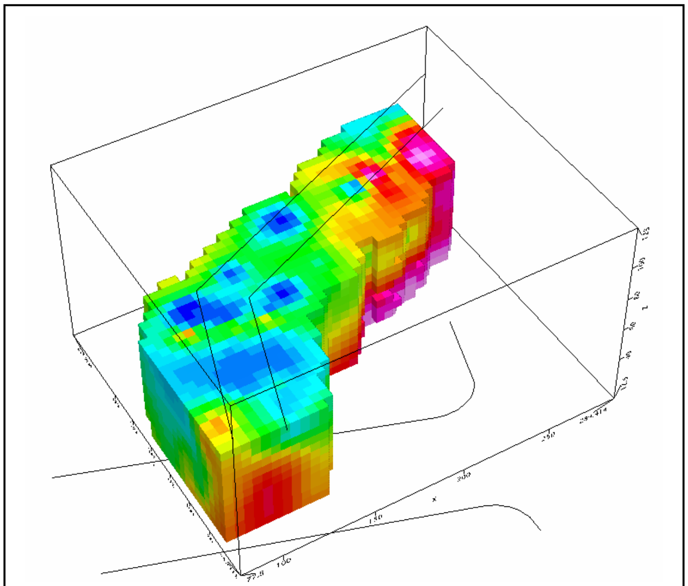


Figure 6 - *Velocity block model viewed from same angle as in Figure 4 but with upper portion stripped away to show the S-wave velocity configuration at the top-of-culvert elevation. This view shows the deeper low-velocity layer is most pronounced at the bend in the culvert.*

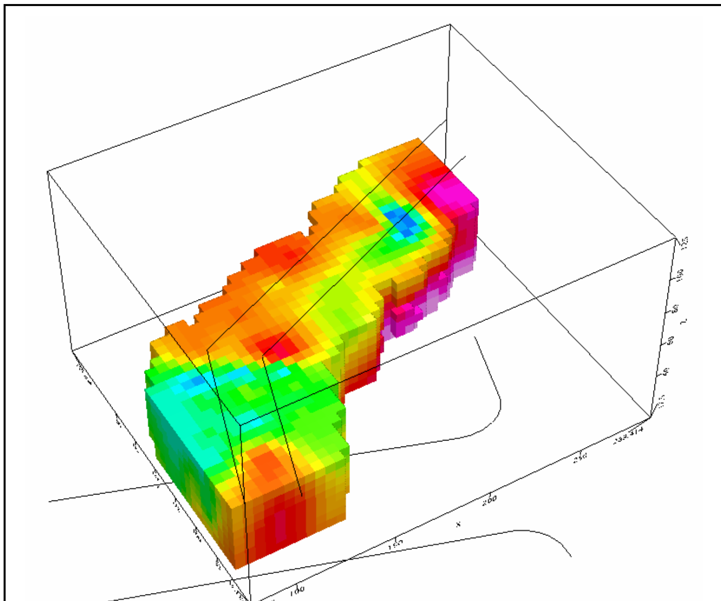
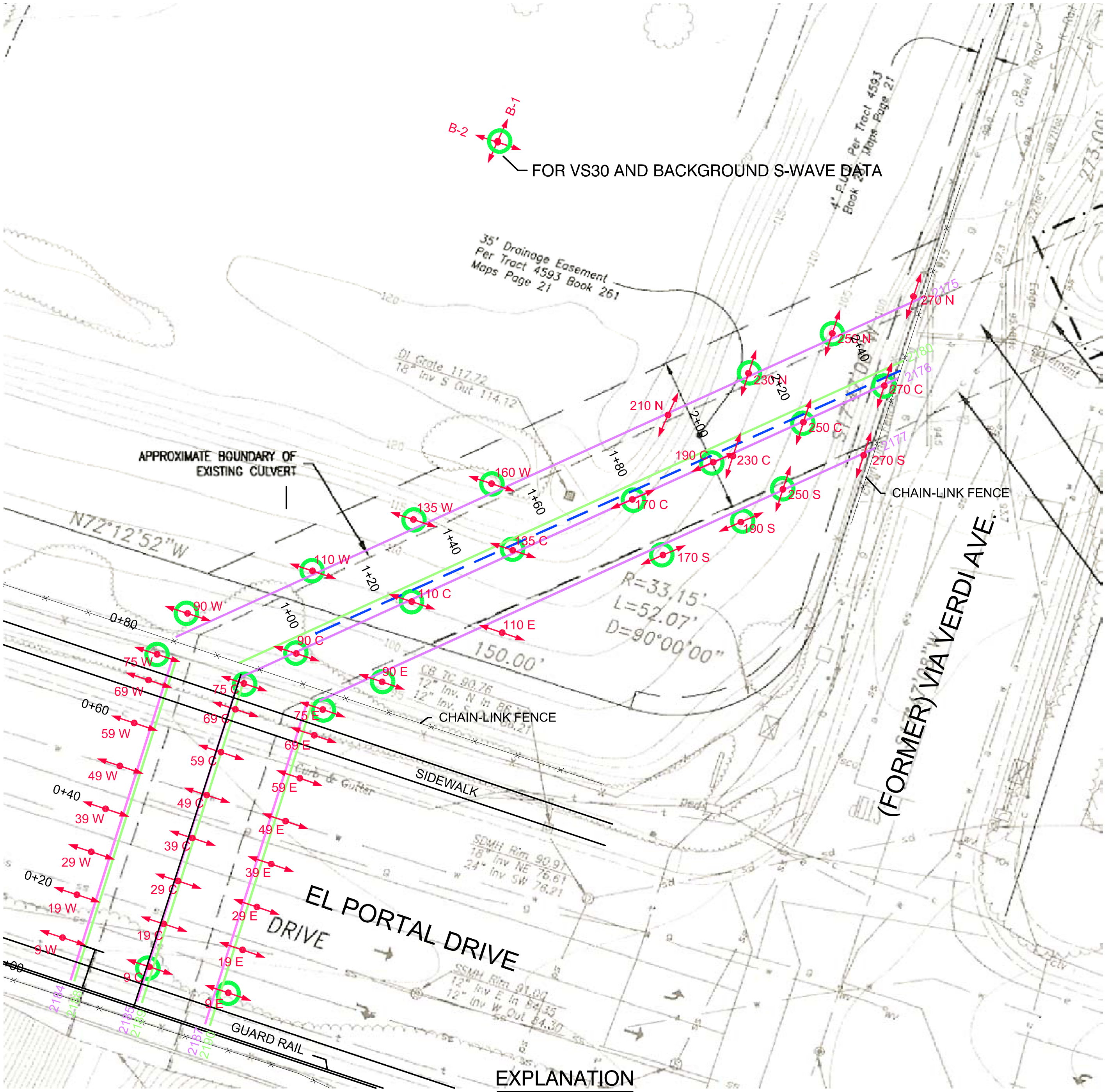


Figure 7 - *Velocity block model viewed from same angle as in Figure 4 with more of the upper portion removed to show velocity configuration at the base-of-culvert (invert) elevation. Low-velocity layer is much less evident*



EXPLANATION

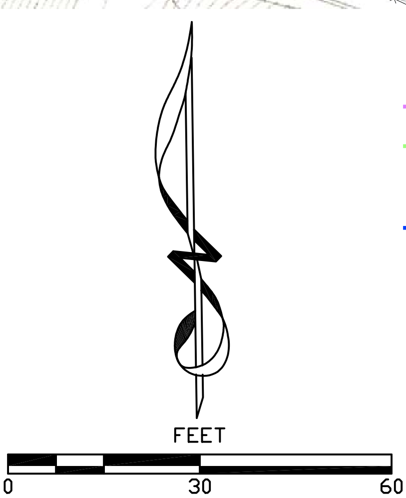
S-WAVE VELOCITY MODELS EXHIBITING VELOCITY INVERSION "NOTCH"

GROUND PENETRATING RADAR (GPR) LINE, 400-MHz Antenna

GROUND PENETRATING RADAR (GPR) LINE, 120-MHz Antenna

SEISMIC SURFACE WAVE ARRAY SHOWING GEOPHONE ARRAY ORIENTATION

SEISMIC REFRACTION TOMOGRAPHY LINE

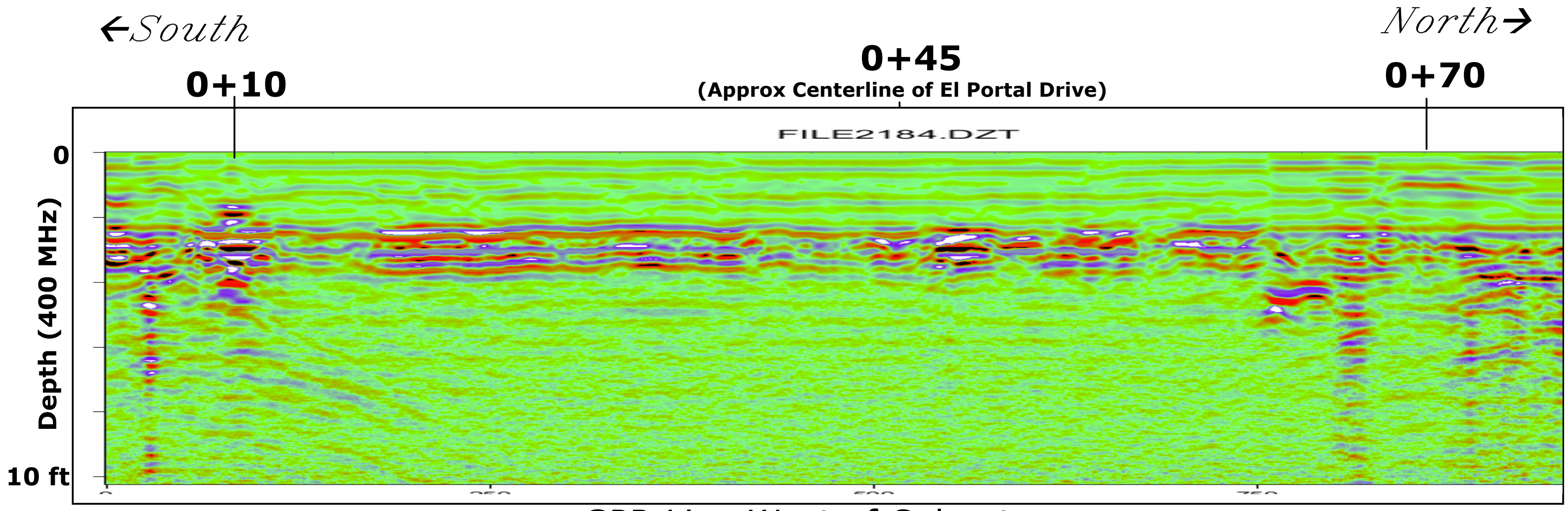


ADVANCED GEOLOGICAL SERVICES

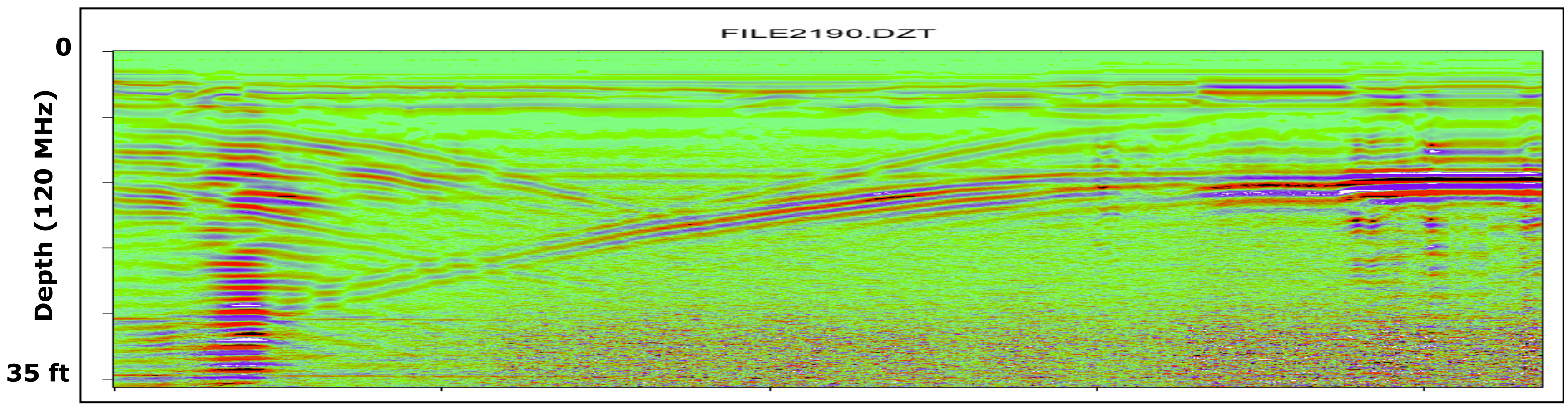
1605 School Street
Suite 4
Moraga, CA 94556
(925) 631-1989

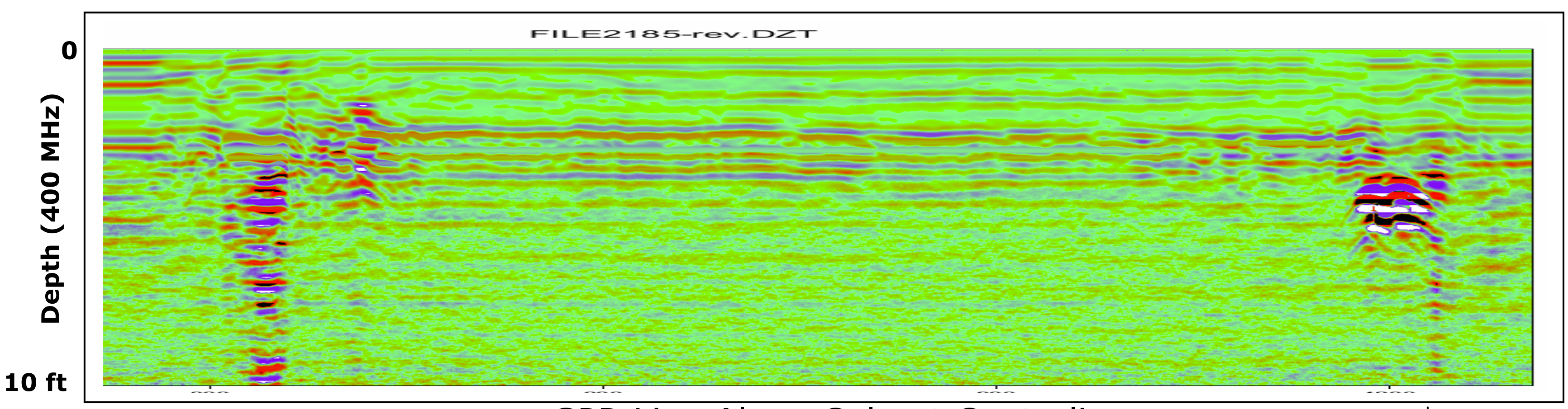
Geophysical Data Locations
Via Verdi Forensic Investigation

LOCATION: Richmond, California	
CLIENT: Nichols Consulting Engineers, Chtd.	FIGURE 8
PROJECT #: 10-039-1CA	
DATE: Jan 18, 2011	DRAWN BY: R. SMITH

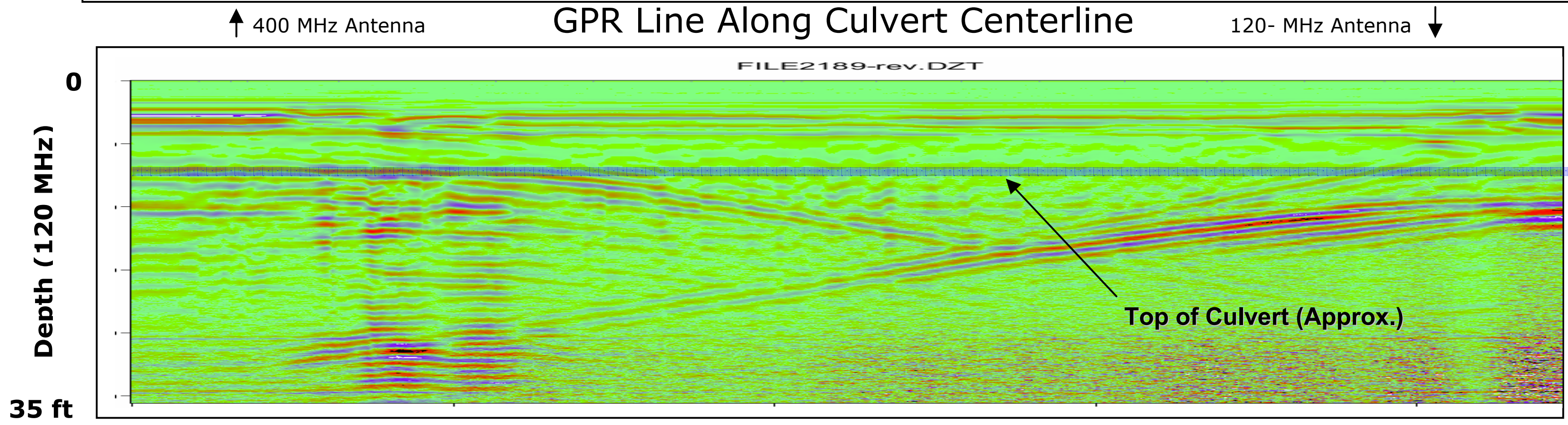


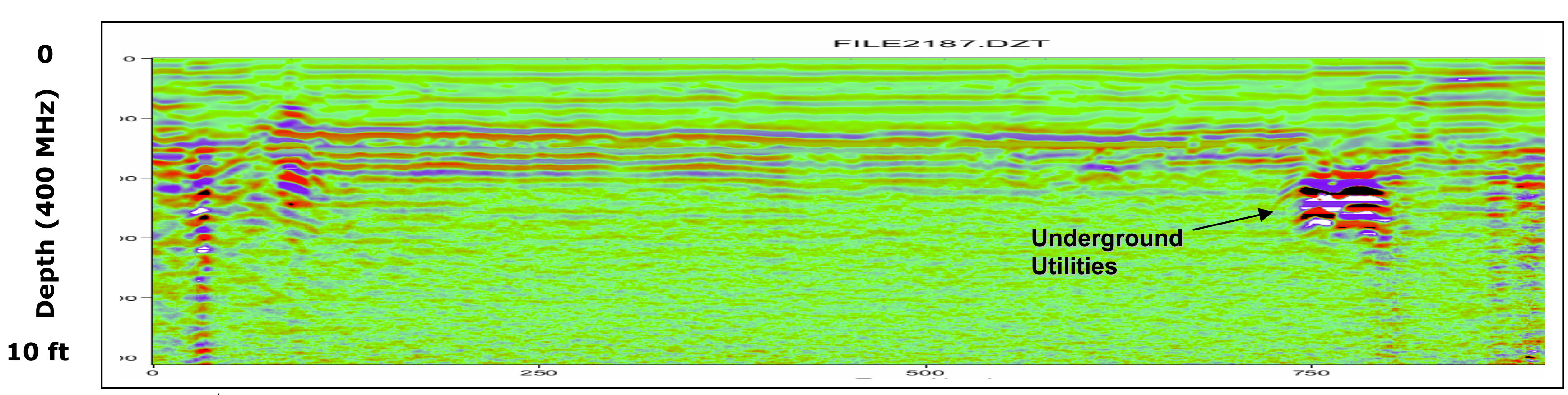
↑400 MHz Antenna — GPR Line West of Culvert — 120- MHz Antenna ↓



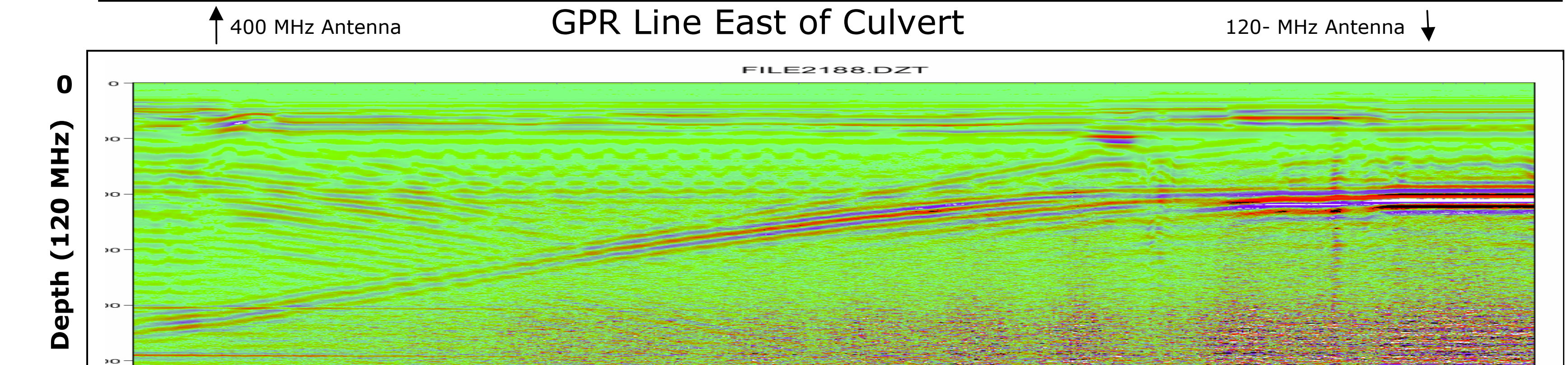


↑ 400 MHz Antenna — GPR Line Along Culvert Centerline — 120- MHz Antenna ↓

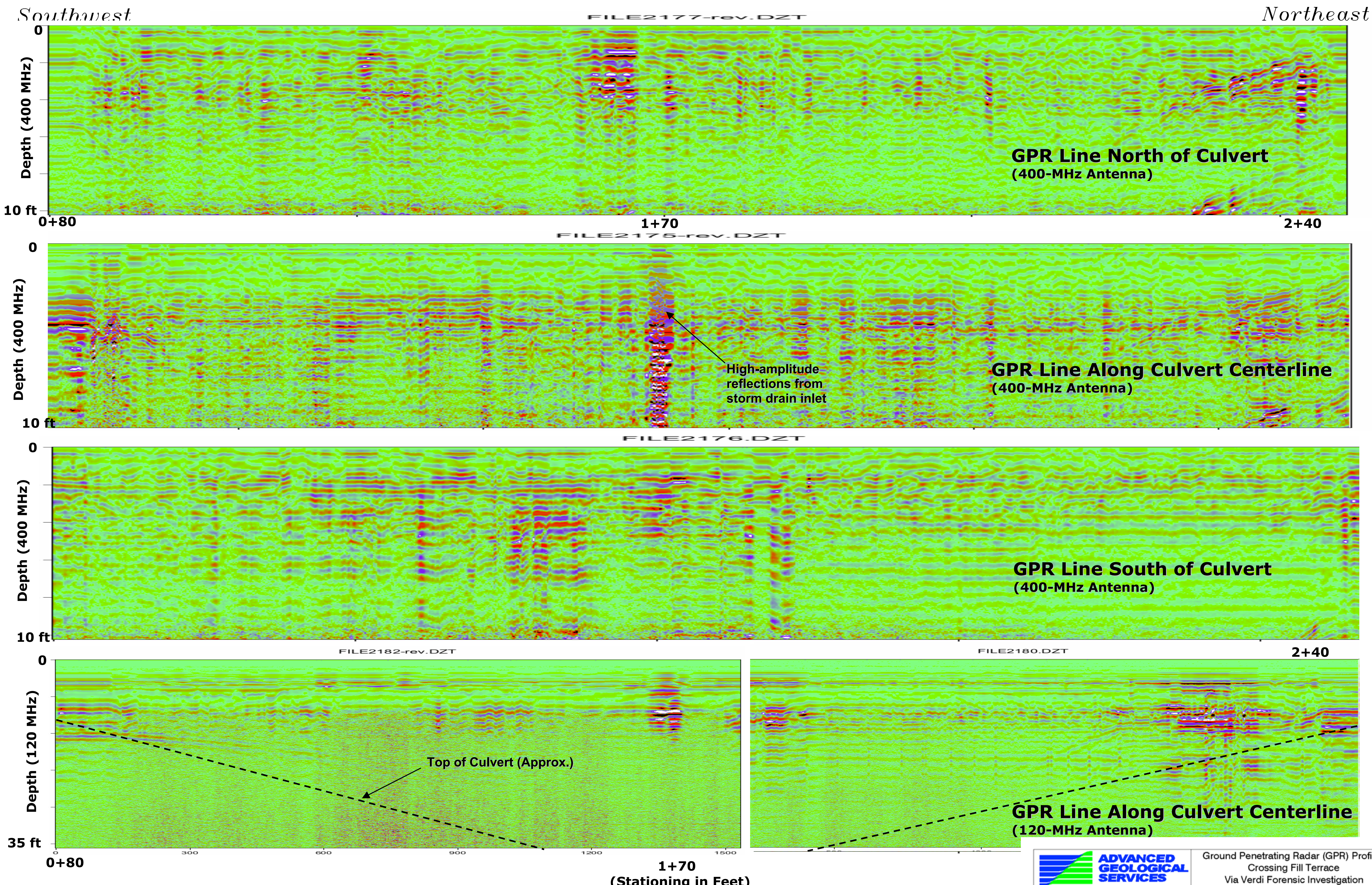




↑ 400 MHz Antenna — GPR Line East of Culvert — 120- MHz Antenna ↓



ADVANCED GEOLOGICAL SERVICES	Ground Penetrating Radar (GPR) Profiles Crossing El Portal Drive Via Verdi Forensic Investigation
1605 School Street Suite 4 Moraga, CA 94556 (925) 631-1989	LOCATION: Richmond, California
	CLIENT: Nichols Consulting Engineers, Chtd.
	PROJECT #: 10-039-1CA
	DATE: Mar 10, 2011 — DRAWN BY: R. SMITH
	FIGURE 9



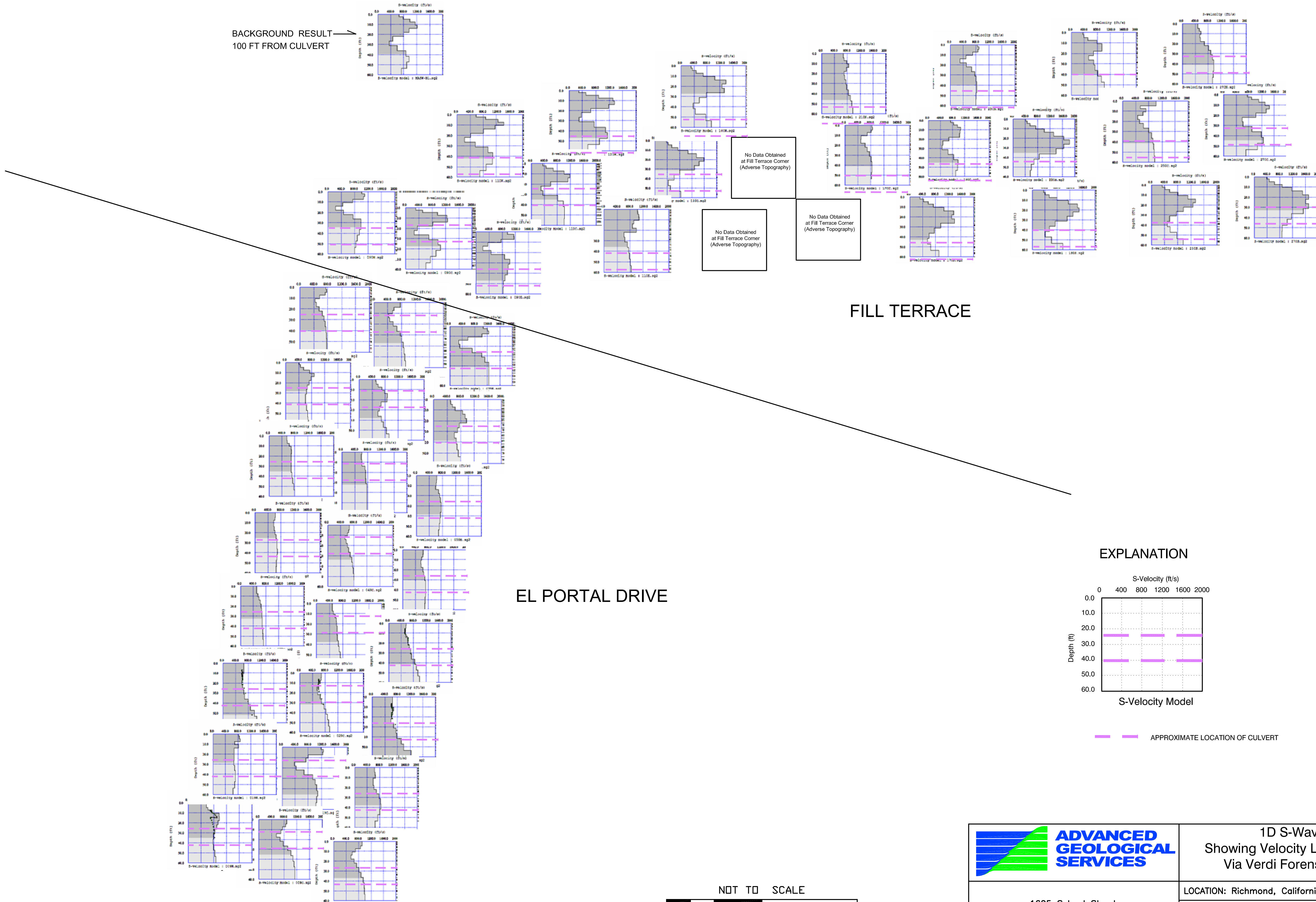
ADVANCED GEOLOGICAL SERVICES

1605 School Street
Suite 4
Moraga, CA 94556
(925) 631-1989

Ground Penetrating Radar (GPR) Profiles
Crossing Fill Terrace
Via Verdi Forensic Investigation

LOCATION: Richmond, California
CLIENT: Nichols Consulting Engineers, Chtd.
PROJECT #: 10-039-1CA
DATE: Mar 10, 2011 DRAWN BY: R. SMITH

FIGURE
10



NOT TO SCALE

SCHEMATIC DISPLAY TO SHOW
APPROXIMATE DATA LOCATIONS

ADVANCED GEOLOGICAL SERVICES

1605 School Street
Suite 4
Moraga, CA 94556
(925) 631-1989

1D S-Wave Models
Showing Velocity Layering with Depth
Via Verdi Forensic Investigation

LOCATION: Richmond, California

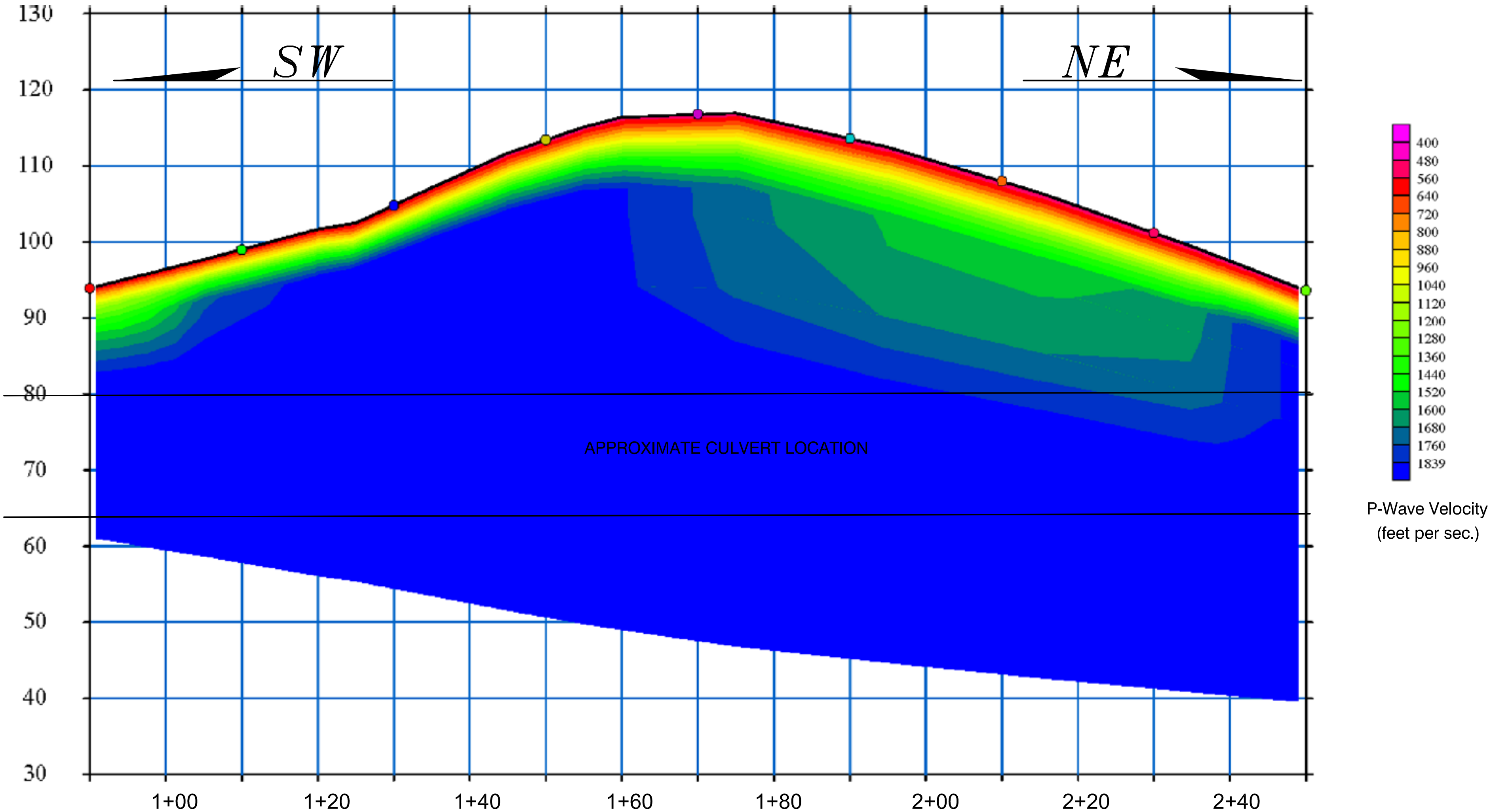
CLIENT: Nichols Consulting Engineers, Chtd.

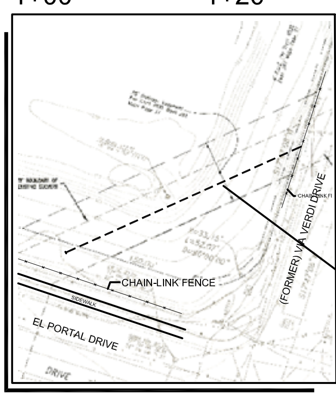
PROJECT #: 10-039-1CA

DATE: Jul 12, 2011

DRAWN BY: R. SMITH

FIGURE 11





SEISMIC REFRACTION
LINE LOCATION

ADVANCED GEOLOGICAL SERVICES

1605 School Street
Suite 4
Moraga, CA 94556
(925) 631-1989

Seismic Refraction Profile
Via Verdi Forensic Investigation

LOCATION: Richmond, California	
CLIENT: Nichols Consulting Engineers, Chtd.	FIGURE 12
PROJECT #: 10-039-1CA	
DATE: Feb 18, 2011	DRAWN BY: R. SMITH

APPENDIX A

SEISMIC VELOCITY AND LIMITATIONS OF THE REFRACTION METHOD

The physical properties of earth materials (fill, sediment, rock) such as compaction, density, hardness, and induration dictate the corresponding seismic velocity of the material. Additionally, other factors such as bedding, fracturing, weathering, and saturation can also affect seismic velocity. In general, low velocities indicate loose soil, poorly compacted fill material, poorly to semi-consolidated sediments, deeply weathered, and highly fractured rock. Conversely, high velocities are indicative of competent rock or dense and highly compacted sediments and fill. The highest velocities are measured in unweathered and little fractured rock.

There are certain limitations associated with the seismic refraction method as applied for this investigation. These limitations are primarily based on assumptions that are made by the data analysis routine. The data analysis routine assumes that the velocities along the length of each spread are uniform. If there are localized zones within each layer where the velocities are higher or lower than indicated, the analysis routine will interpret these zones as changes in the surface topography of the underlying layer. A zone of higher velocity material would be interpreted as a low in the surface of the underlying layer. Zones of lower velocity material would be interpreted as a high in the underlying layer. The data analysis routine also assumes that the velocity of subsurface materials increase with depth. Therefore, if a layer exhibits velocities that are slower than those of the material above it, the slower layer will not be resolved. Also, a velocity layer may simply be too thin to be detected.

The quality of the field data is critical to the construction of an accurate depth and velocity profile. Strong, clear “first-break” information from refracted interfaces will make the data processing, analysis, and interpretation much more accurate and meaningful. Vibrational noise or poor subsurface conditions can decrease the ability to accurately locate and pick seismic waves from the interfaces.

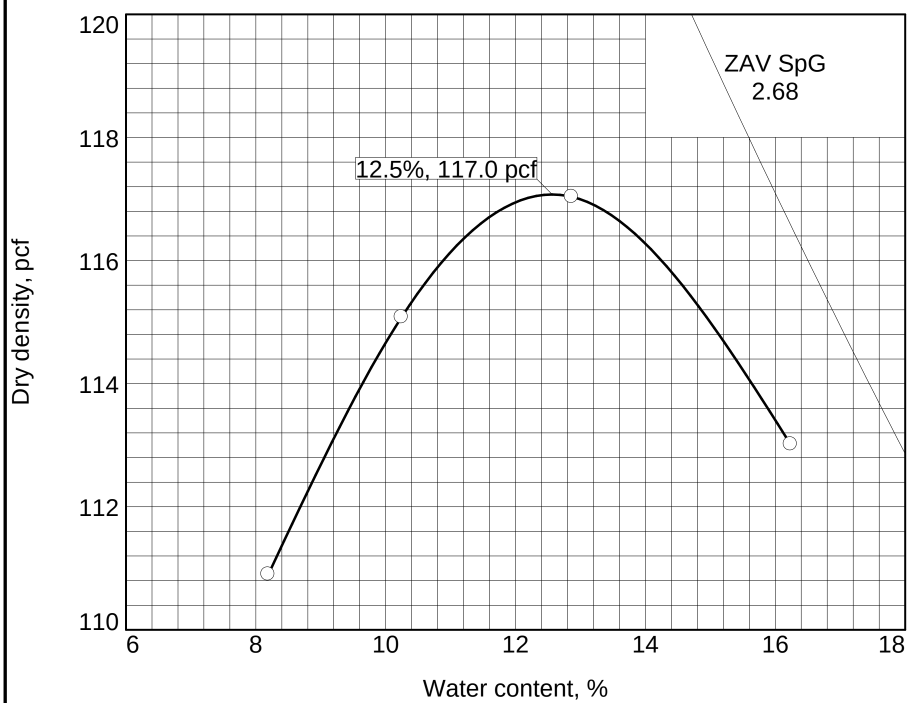
Due to these and other limitations inherent to the seismic refraction method, resultant velocity cross-sections should be considered only as approximations of the subsurface conditions. The actual conditions may vary locally.

APPENDIX C

GEOTECHNICAL LABORATORY TEST RESULTS

EXPLORATORY BORINGS

PROCTOR TEST REPORT



Curve No.
B-1 @ 10'-14'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM ____ **LL** ____ **PI** ____
Sp.G. (ASTM D 854) ____
%>3/8 in. ____ **%<No.200** ____
USCS CL **AASHTO** ____
Date Sampled ____
Date Tested 7-21-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3835.0	3939.0	4018.0	4007.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	760.8	718.4	805.7	742.8		
WD + T #1	710.0	659.4	723.4	654.4		
TARE #1	89.9	83.4	83.6	109.9		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.2	10.2	12.9	16.2		
DRY DENSITY	110.9	115.1	117.0	113.0		

TEST RESULTS

Maximum dry density = 117.0 pcf

Optimum moisture = 12.5 %

Material Description

Light Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

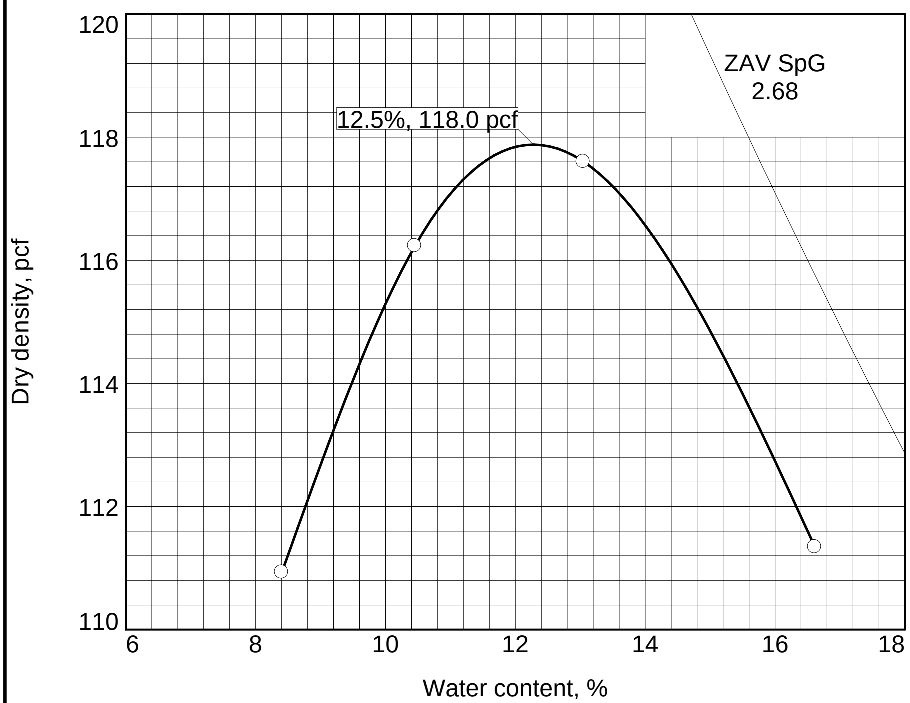
○ **Source of Sample:** B-1 **Depth:** 10.0-14.0'

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-1 @ 20-24'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM ____ **LL** ____ **PI** ____
Sp.G. (ASTM D 854) ____
%>3/8 in. ____ **%<No.200** ____
USCS CH **AASHTO** ____
Date Sampled ____
Date Tested 7-14-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3839.0	3962.0	4031.0	3984.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	815.6	871.6	825.1	756.3		
WD + T #1	760.8	799.5	739.6	664.2		
TARE #1	108.7	109.9	84.5	109.9		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.4	10.5	13.1	16.6		
DRY DENSITY	110.9	116.2	117.6	111.3		

TEST RESULTS

Maximum dry density = 118.0 pcf

Optimum moisture = 12.5 %

Material Description

Brown Sandy Fat Clay (CH)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

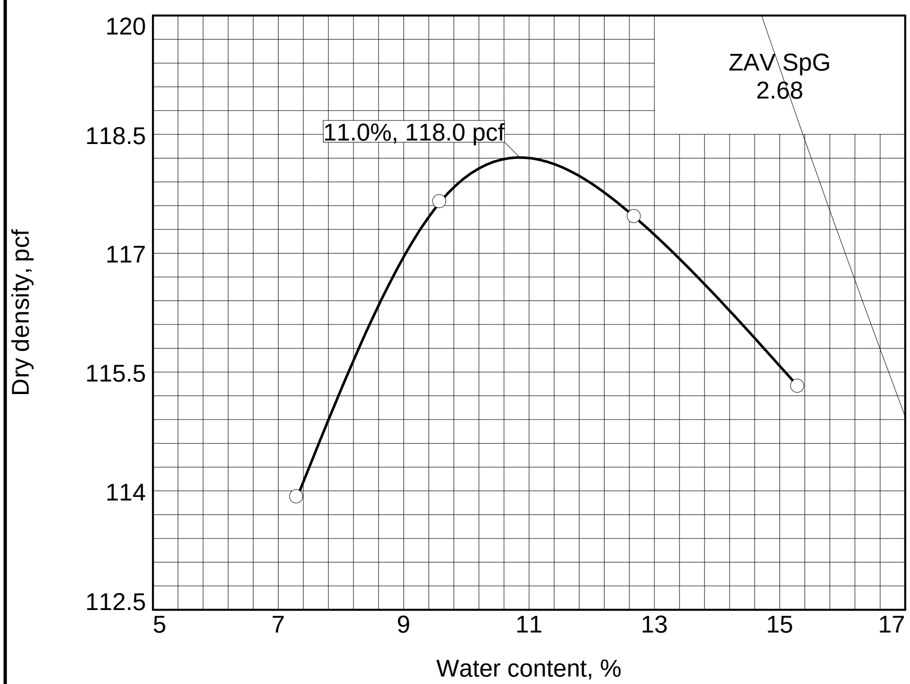
Source of Sample: B-1 **Depth:** 20.0-24.0'

Checked by: TMc
Title: Senior Advisor

RGH CONSULTANTS, INC.

Plate

PROCTOR TEST REPORT



Curve No.
B-2 @ 5-9'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM ____ **LL** ____ **PI** ____
Sp.G. (ASTM D 854) ____
%>3/8 in. ____ **%<No.200** ____
USCS CH **AASHTO** ____
Date Sampled ____
Date Tested 7-14-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3869.0	3970.0	4022.0	4031.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	714.5	779.7	683.8	572.0		
WD + T #1	672.0	718.8	619.2	507.4		
TARE #1	89.9	83.2	110.0	85.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	7.3	9.6	12.7	15.3		
DRY DENSITY	113.9	117.6	117.5	115.3		

TEST RESULTS

Maximum dry density = 118.0 pcf

Optimum moisture = 11.0 %

Material Description

Brown Sandy Fat Clay (CH)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

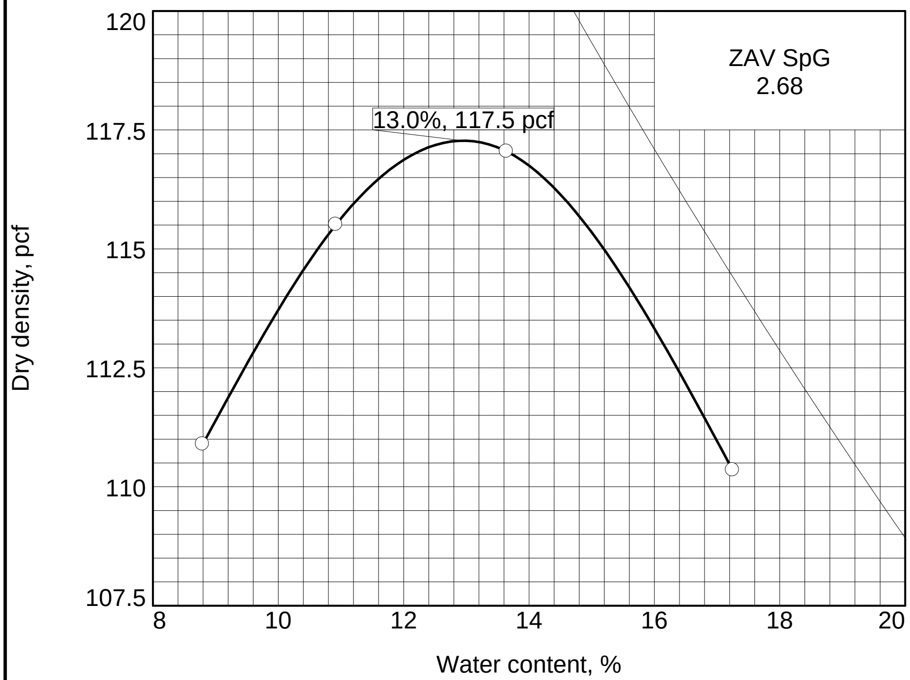
Source of Sample: B-2 **Depth:** 5.0-9.0'

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-2 @ 15-18.5'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CL **AASHTO**
Date Sampled
Date Tested 7-21-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3845.0	3958.0	4032.0	3977.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	723.2	845.7	719.6	713.9		
WD + T #1	672.0	770.9	646.4	621.1		
TARE #1	89.9	85.9	109.9	83.1		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.8	10.9	13.6	17.2		
DRY DENSITY	110.9	115.5	117.0	110.3		

TEST RESULTS

Maximum dry density = 117.5 pcf

Optimum moisture = 13.0 %

Material Description

Light Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

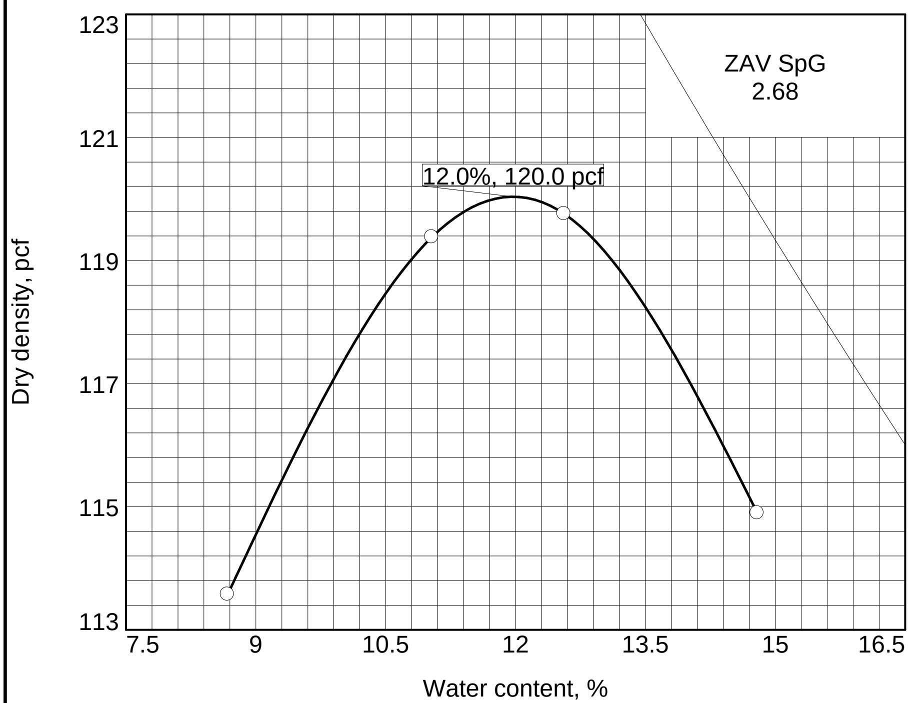
○ **Source of Sample:** B-2 **Depth:** 15.0-18.5'

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-3 @ 5-10'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CL **AASHTO**
Date Sampled
Date Tested 12-6-10
Tested By GEF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3881.0	4019.0	4053.0	4009.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	639.4	647.5	590.6	576.1		
WD + T #1	596.2	593.3	535.8	515.4		
TARE #1	98.2	102.1	99.6	105.1		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.7	11.0	12.6	14.8		
DRY DENSITY	113.6	119.4	119.8	114.9		

TEST RESULTS

Maximum dry density = 120.0 pcf

Optimum moisture = 12.0 %

Material Description

Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

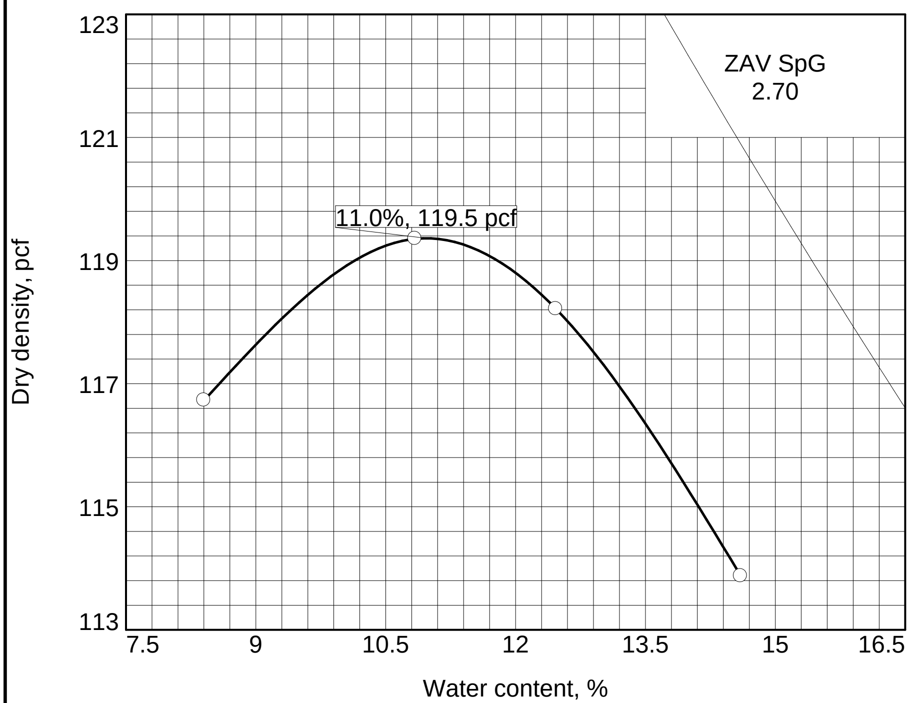
○ **Source of Sample:** B-3 **Depth:** 5.0-10.0' **Sample Number:** Bulk

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-3 @ 20-25'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CL **AASHTO**
Date Sampled
Date Tested 12-7-10
Tested By GEF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3928.0	4015.0	4025.0	3988.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	584.2	595.0	587.8	662.3		
WD + T #1	546.7	546.7	533.8	591.9		
TARE #1	100.4	101.1	100.7	109.8		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.4	10.8	12.5	14.6		
DRY DENSITY	116.7	119.4	118.2	113.9		

TEST RESULTS

Maximum dry density = 119.5 pcf

Optimum moisture = 11.0 %

Material Description

Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

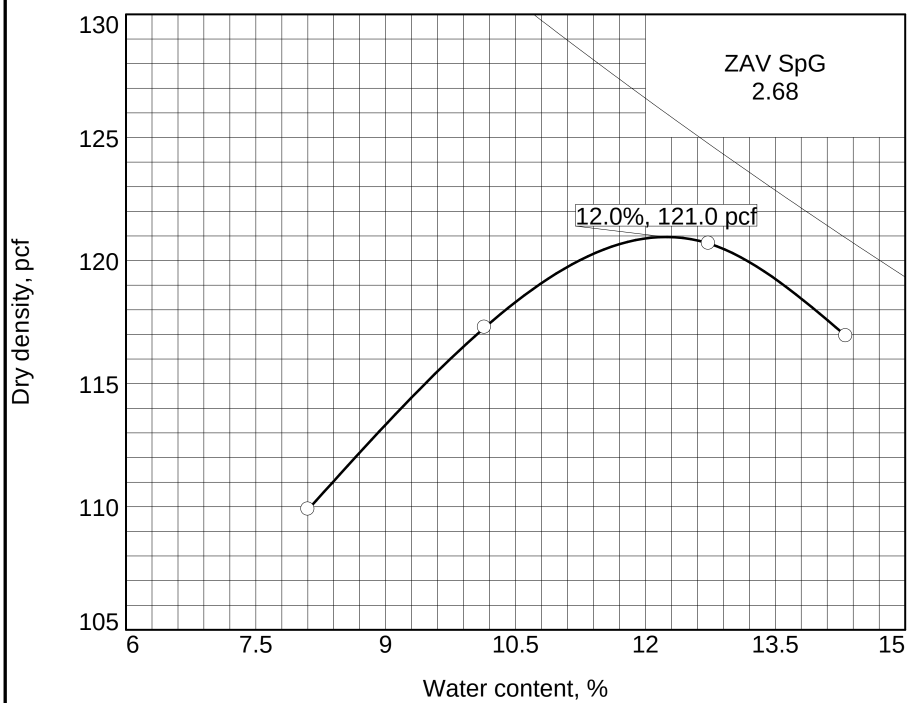
○ **Source of Sample:** B-3 **Depth:** 20.0-25.0' **Sample Number:** Bulk

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-3 @ 25-28'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.

Test Performed on Material Passing 3/8 in. **Sieve**

NM ____ **LL** ____ **PI** ____
Sp.G. (ASTM D 854) ____
%>3/8 in. ____ **%<No.200** ____
USCS CL **AASHTO** ____
Date Sampled ____
Date Tested 12-6-10
Tested By GEF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3811.0	3968.0	4072.0	4036.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	706.5	719.6	551.9	570.5		
WD + T #1	661.1	662.8	501.1	511.6		
TARE #1	100.9	102.9	102.1	100.2		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.1	10.1	12.7	14.3		
DRY DENSITY	109.9	117.3	120.7	116.9		

TEST RESULTS

Maximum dry density = 121.0 pcf

Optimum moisture = 12.0 %

Material Description

Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

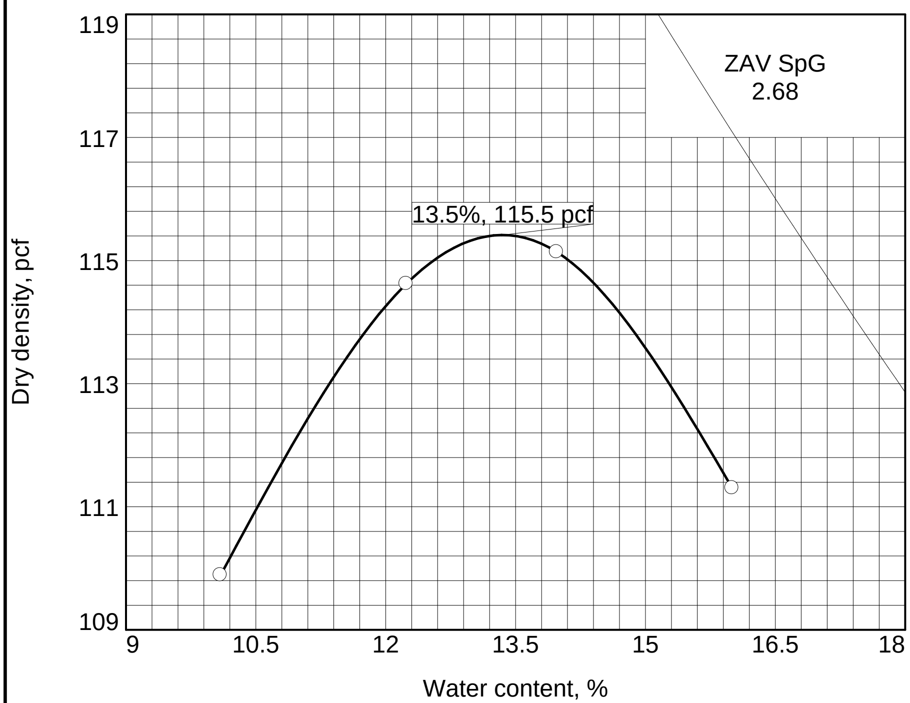
○ **Source of Sample:** B-3 **Depth:** 25.0-28.0' **Sample Number:** Bulk

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-3 @ 30-35'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CL **AASHTO**
Date Sampled
Date Tested 12-7-10
Tested By GEF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3844.0	3960.0	3999.0	3967.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	552.2	593.5	608.5	594.9		
WD + T #1	510.8	540.1	546.4	526.9		
TARE #1	100.6	103.8	102.1	102.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	10.1	12.2	14.0	16.0		
DRY DENSITY	109.9	114.6	115.1	111.3		

TEST RESULTS

Maximum dry density = 115.5 pcf

Optimum moisture = 13.5 %

Material Description

Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

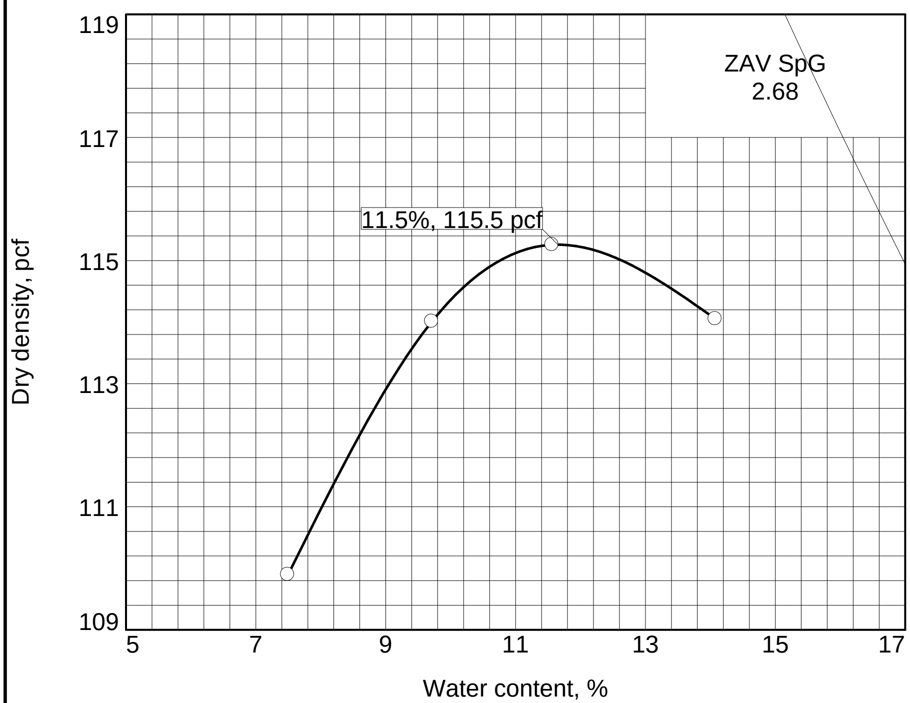
Source of Sample: B-3 **Depth:** 30.0-35.0' **Sample Number:** Bulk

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-4 @ 6.5-10'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CL **AASHTO**
Date Sampled
Date Tested 12-7-10
Tested By GEF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3801.0	3906.0	3959.0	3982.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	557.2	566.3	553.5	583.1		
WD + T #1	526.0	525.3	506.8	523.5		
TARE #1	109.8	103.1	103.0	100.2		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	7.5	9.7	11.6	14.1		
DRY DENSITY	109.9	114.0	115.3	114.0		

TEST RESULTS

Maximum dry density = 115.5 pcf

Optimum moisture = 11.5 %

Material Description

Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

○ **Source of Sample:** B-4 **Depth:** 6.5-10.0' **Sample Number:** Bulk

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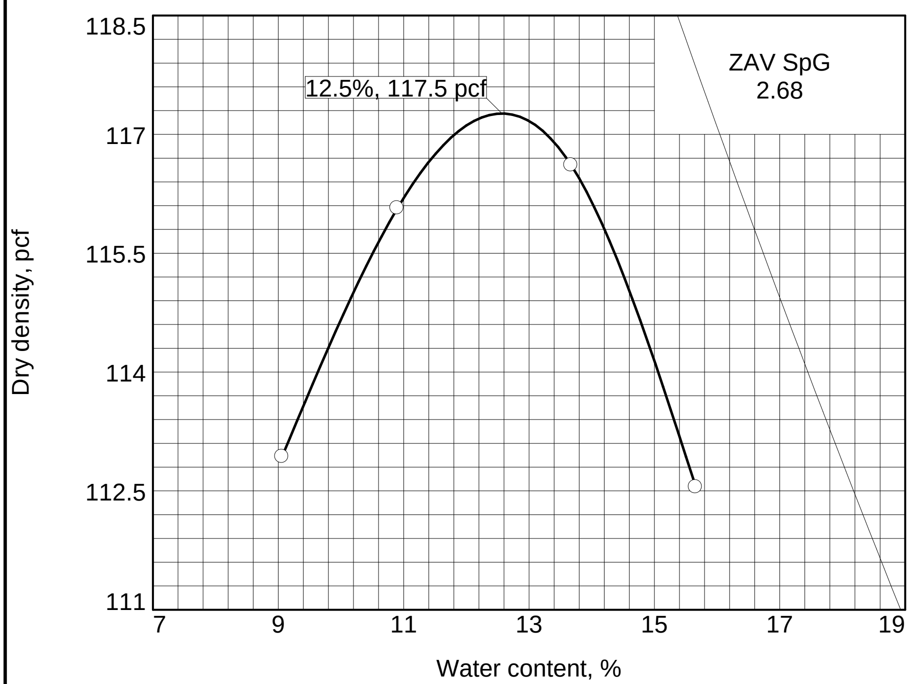
Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-4 @ 15-20'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.

Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CL **AASHTO**
Date Sampled
Date Tested 12-7-10
Tested By GEF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3877.0	3961.0	4019.0	3983.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	742.3	635.9	593.3	604.0		
WD + T #1	689.2	583.1	534.0	536.0		
TARE #1	103.1	98.7	100.3	101.8		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	9.1	10.9	13.7	15.7		
DRY DENSITY	112.9	116.1	116.6	112.5		

TEST RESULTS

Maximum dry density = 117.5 pcf

Optimum moisture = 12.5 %

Material Description

Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

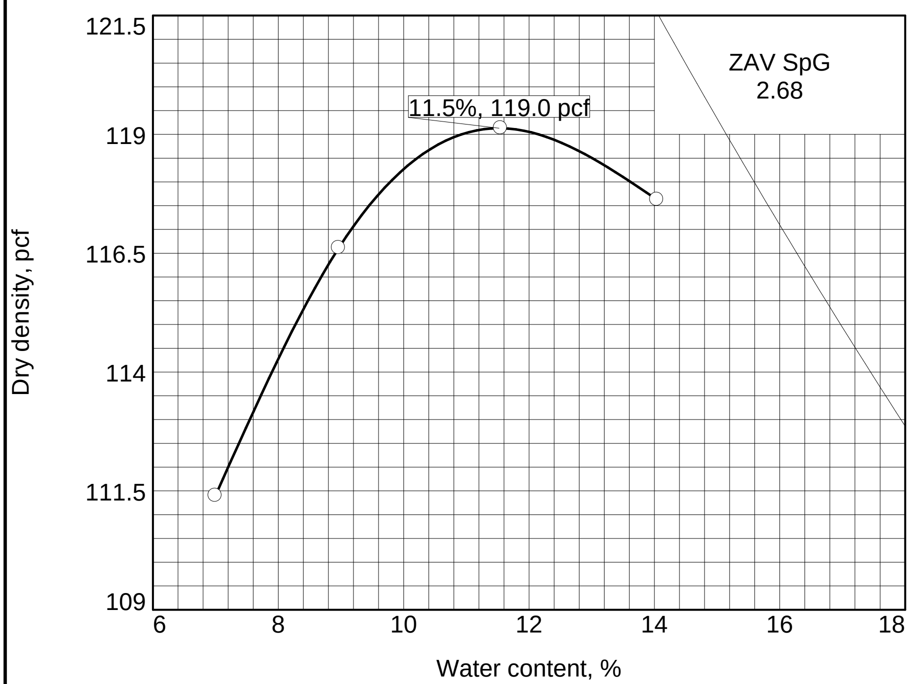
Source of Sample: B-4 **Depth:** 15.0-20.0' **Sample Number:** Bulk

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-4 @ 26.5-30'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CL **AASHTO**
Date Sampled
Date Tested 12-6-10
Tested By GEF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3936.0	4024.0	4043.0	3817.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	603.3	523.4	624.6	539.1		
WD + T #1	561.9	479.6	560.4	510.4		
TARE #1	100.1	100.3	103.2	100.2		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	9.0	11.5	14.0	7.0		
DRY DENSITY	116.6	119.1	117.6	111.4		

TEST RESULTS

Maximum dry density = 119.0 pcf

Optimum moisture = 11.5 %

Material Description

Brown Sandy Lean Clay (CL)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

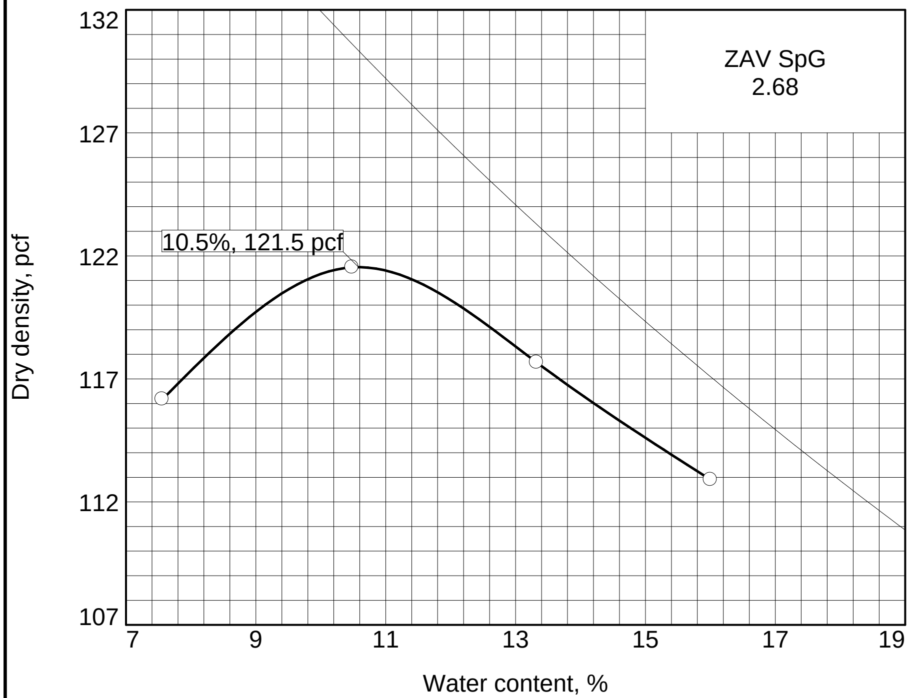
Source of Sample: B-4 **Depth:** 26.5-30.0' **Sample Number:** Bulk

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-6 @ 5-9'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM ____ **LL** ____ **PI** ____
Sp.G. (ASTM D 854) ____
%>3/8 in. ____ **%<No.200** ____
USCS GP-GM **AASHTO** ____
Date Sampled ____
Date Tested 7-9-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3910.0	4051.0	4037.0	4001.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	736.1	838.7	727.9	695.8		
WD + T #1	690.2	767.2	652.3	612.2		
TARE #1	83.0	85.2	85.0	89.9		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	7.6	10.5	13.3	16.0		
DRY DENSITY	116.2	121.5	117.7	112.9		

TEST RESULTS

Maximum dry density = 121.5 pcf

Optimum moisture = 10.5 %

Material Description

Light Brown Gravel W/Silt And Sand (GP-GM)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

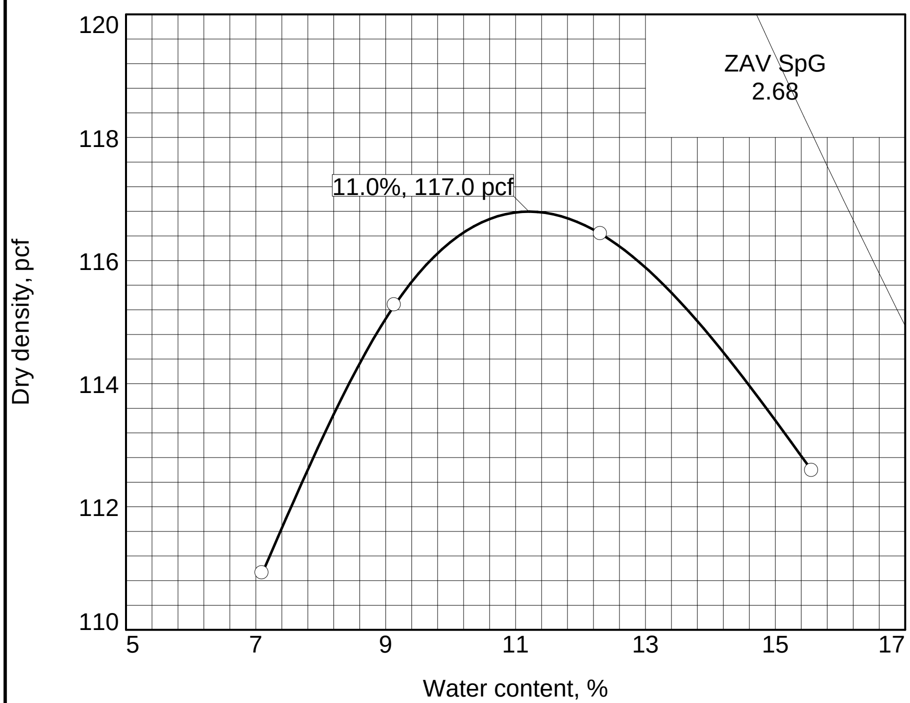
○ **Source of Sample:** B-6 **Depth:** 5.0-9.0'

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-6 @ 15-19'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.

Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS GP-GM **AASHTO**
Date Sampled
Date Tested 7-9-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3817.0	3923.0	3998.0	3988.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	752.2	906.2	769.8	601.0		
WD + T #1	708.3	837.3	694.4	534.9		
TARE #1	89.9	83.2	82.0	110.2		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	7.1	9.1	12.3	15.6		
DRY DENSITY	110.9	115.3	116.4	112.6		

TEST RESULTS

Maximum dry density = 117.0 pcf

Optimum moisture = 11.0 %

Material Description

Light Brown Gravel W/Clay And Sand (GP-GM)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

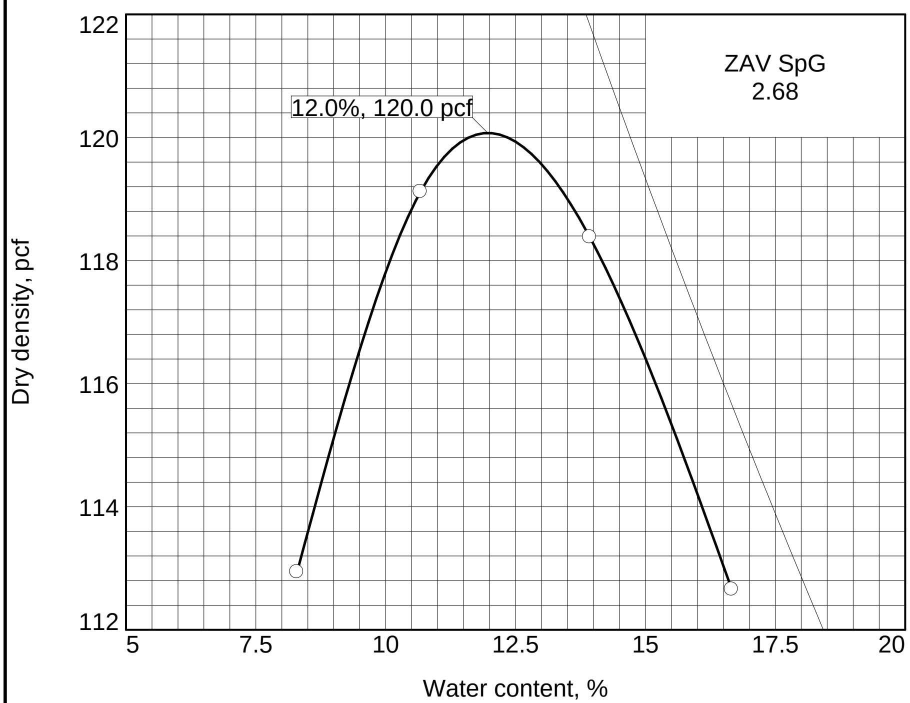
Source of Sample: B-6 **Depth:** 15.0-19.0'

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-7 @ 2-5'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.

Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS GP-GM **AASHTO**
Date Sampled
Date Tested 7-9-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3870.0	4014.0	4060.0	4008.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	770.6	823.3	725.5	736.5		
WD + T #1	720.0	754.5	647.3	647.0		
TARE #1	109.8	109.7	85.9	109.9		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.3	10.7	13.9	16.7		
DRY DENSITY	112.9	119.1	118.4	112.7		

TEST RESULTS

Maximum dry density = 120.0 pcf

Optimum moisture = 12.0 %

Material Description

Light Brown Gravel W/Silt And Sand (GP-GM)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

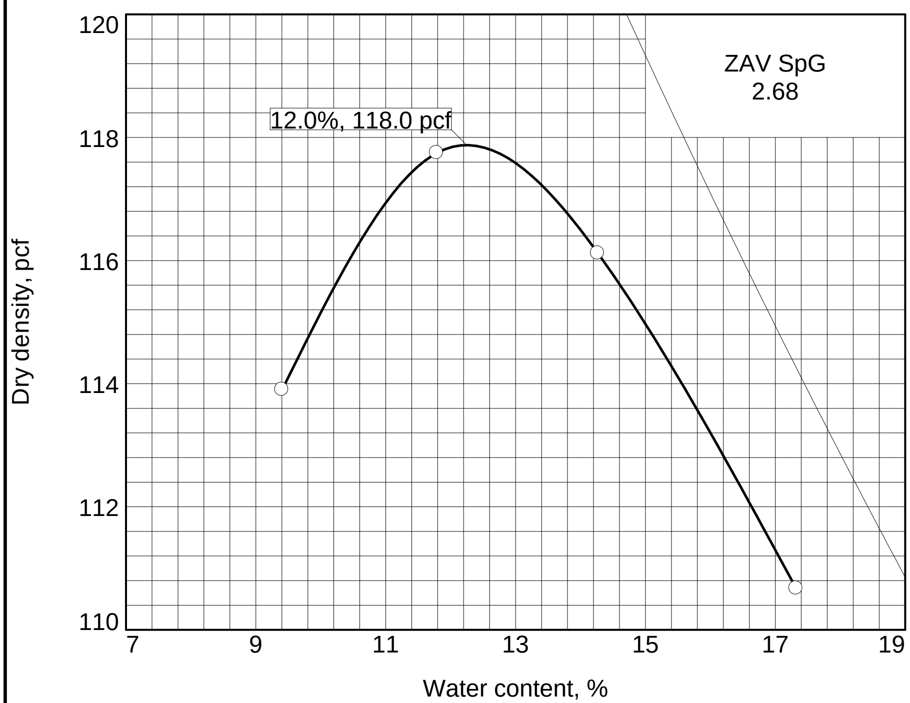
Source of Sample: B-7 **Depth:** 2.0-5.0'

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-7 @ 10-12.5'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.

Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CH **AASHTO**
Date Sampled
Date Tested 7-14-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3905.0	4011.0	4027.0	3984.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	866.1	924.4	893.1	673.5		
WD + T #1	801.0	838.5	795.3	590.2		
TARE #1	108.9	109.8	109.9	109.3		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	9.4	11.8	14.3	17.3		
DRY DENSITY	113.9	117.7	116.1	110.7		

TEST RESULTS

Maximum dry density = 118.0 pcf

Optimum moisture = 12.0 %

Material Description

Brown Sandy Fat Clay (CH)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

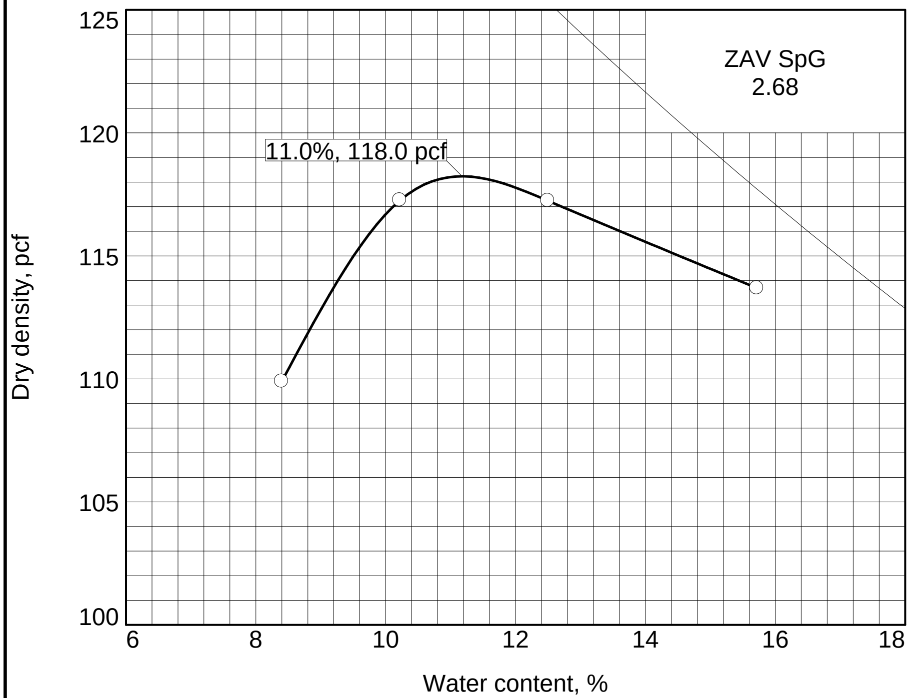
Source of Sample: B-7 **Depth:** 10.0-12.5'

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
B-7 @ 17-19'

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.

Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS CH **AASHTO**
Date Sampled
Date Tested 7-14-10
Tested By SF

TESTING DATA

	1	2	3	4	5	6
WM + WS	3822.0	3975.0	4015.0	4010.0		
WM	2021.0	2021.0	2021.0	2021.0		
WW + T #1	712.0	823.8	725.9	584.2		
WD + T #1	663.1	755.0	654.5	519.8		
TARE #1	80.9	81.9	83.3	110.1		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	8.4	10.2	12.5	15.7		
DRY DENSITY	109.9	117.3	117.2	113.7		

TEST RESULTS

Maximum dry density = 118.0 pcf

Optimum moisture = 11.0 %

Material Description

Brown Sandy Fat Clay (CH)

Remarks:

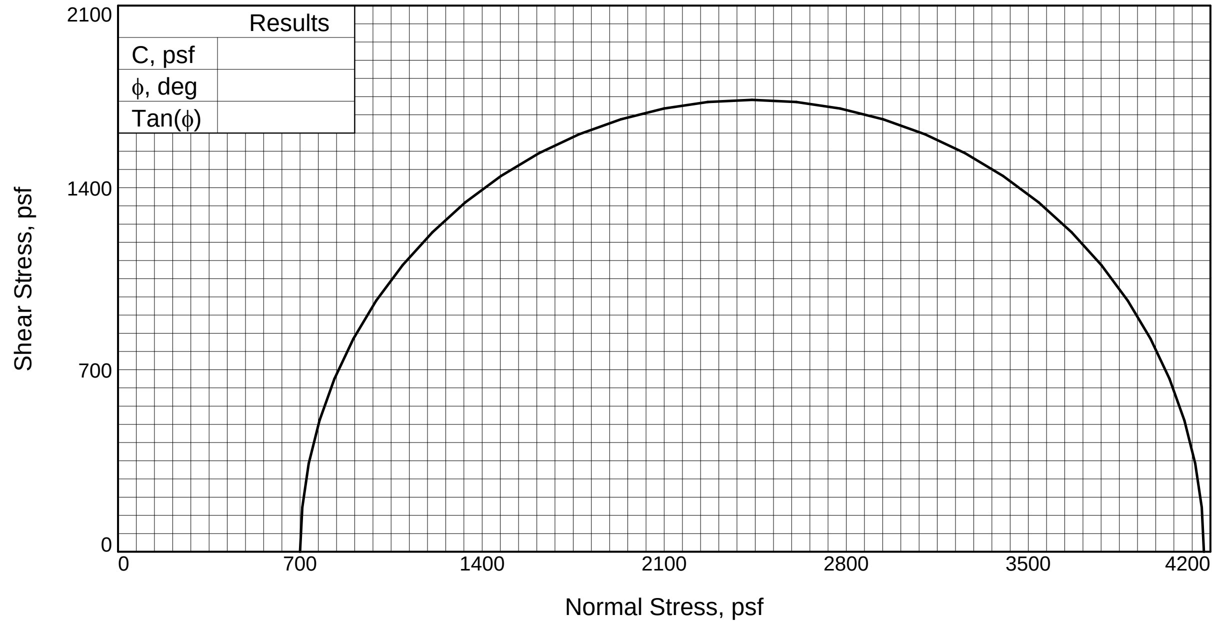
Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

○ **Source of Sample:** B-7 **Depth:** 17.0-19.0'

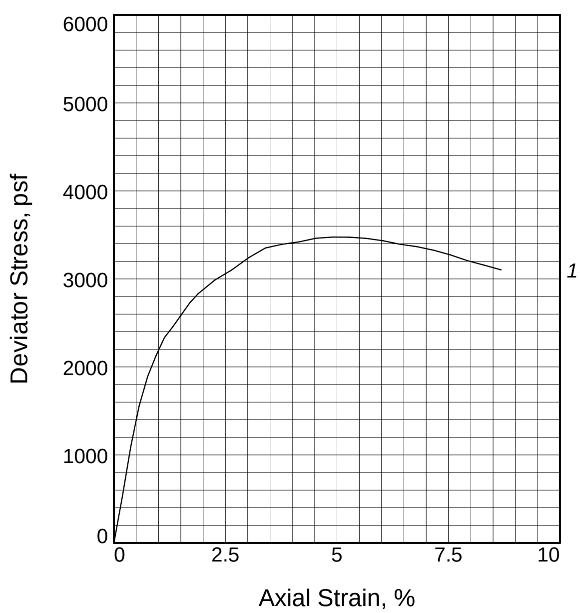
R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate



	Results
C, psf	
ϕ, deg	
Tan(ϕ)	



Sample No.		1
Initial	Water Content, %	19.3
	Dry Density, pcf	105.6
	Saturation, %	87.5
	Void Ratio	0.5964
	Diameter, in.	2.430
	Height, in.	5.300
At Test	Water Content, %	19.3
	Dry Density, pcf	105.6
	Saturation, %	87.5
	Void Ratio	0.5964
	Diameter, in.	2.430
	Height, in.	5.300
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		699.8
Fail. Stress, psf		3475.5
Strain, %		4.9
Ult. Stress, psf		3475.5
Strain, %		4.9
σ_1 Failure, psf		4175.3
σ_3 Failure, psf		699.8

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Brown Sandy Lean Clay W/Gravel (CL)

LL= 50 **PL=** 16 **PI=** 34
Assumed Specific Gravity= 2.70
Remarks:

Plate ________

Client: Nichols Consulting Engineers

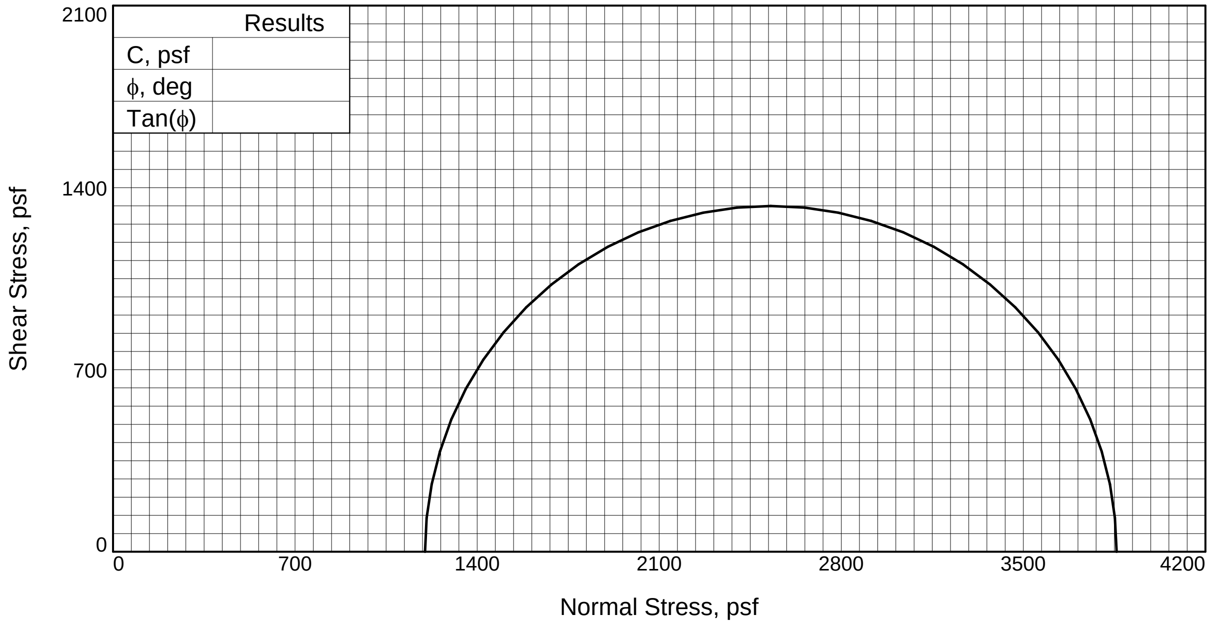
Project: Richmond-Via Verdi Geotechnical Investigation

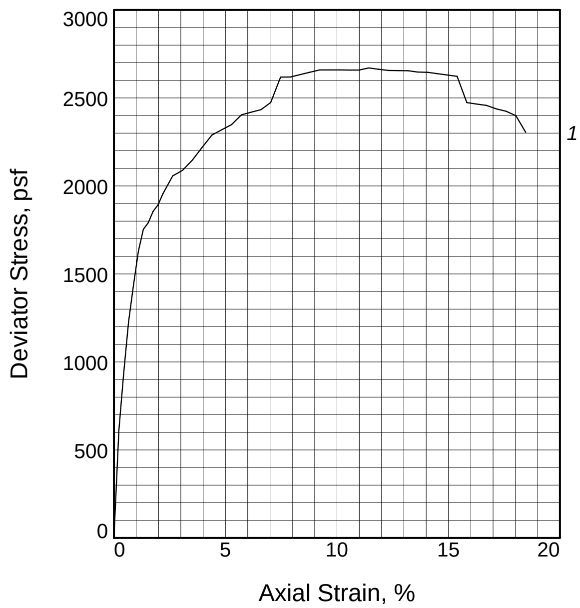
Source of Sample: B-1 **Depth:** 11.0-11.5'

Proj. No.: 568.08.20 **Date Sampled:**

RGH CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





Sample No.	1
Initial	
Water Content, %	23.4
Dry Density, pcf	102.1
Saturation, %	97.3
Void Ratio	0.6502
Diameter, in.	2.430
Height, in.	4.550
At Test	
Water Content, %	23.4
Dry Density, pcf	102.1
Saturation, %	97.3
Void Ratio	0.6502
Diameter, in.	2.430
Height, in.	4.550
Strain rate, in./min.	0.060
Back Pressure, psf	0.0
Cell Pressure, psf	1199.5
Fail. Stress, psf	2659.1
Strain, %	9.2
Ult. Stress, psf	2670.3
Strain, %	11.4
σ_1 Failure, psf	3858.6
σ_3 Failure, psf	1199.5

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Dark Brown Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

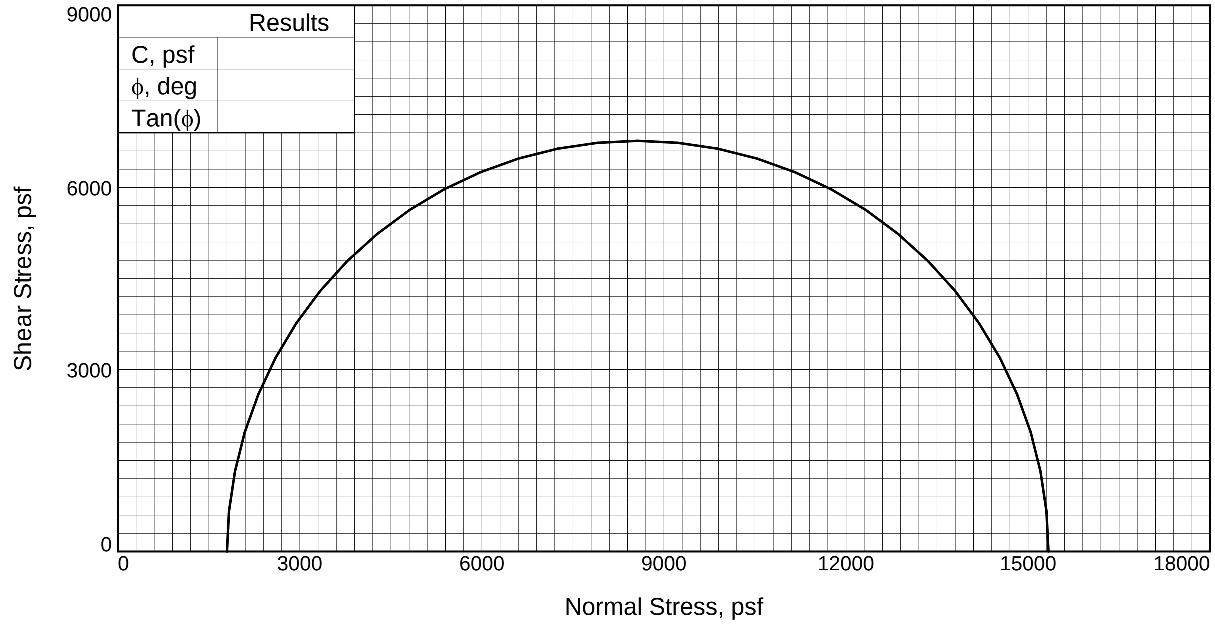
Project: Richmond-Via Verdi Geotechnical Investigation

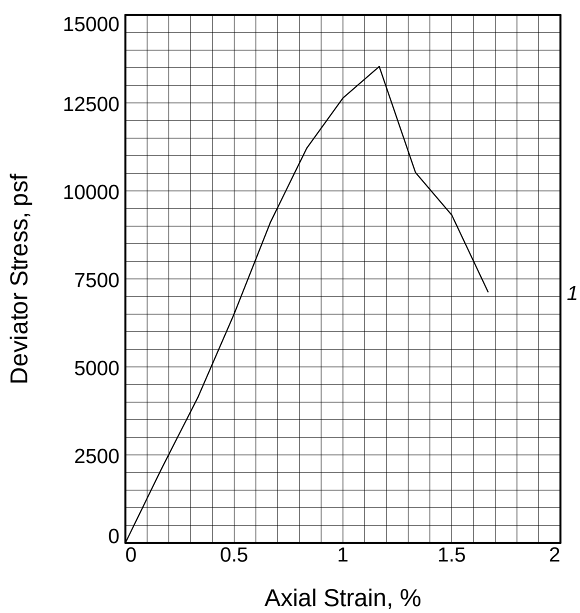
Source of Sample: B-1 **Depth:** 21.0-21.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	13.5
	Dry Density, pcf	123.5
	Saturation, %	99.9
	Void Ratio	0.3649
	Diameter, in.	2.430
	Height, in.	6.000
At Test	Water Content, %	13.5
	Dry Density, pcf	123.5
	Saturation, %	99.9
	Void Ratio	0.3649
	Diameter, in.	2.430
	Height, in.	6.000
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		1800.0
Fail. Stress, psf		13534.9
Strain, %		1.2
Ult. Stress, psf		13534.9
Strain, %		1.2
σ_1 Failure, psf		15334.9
σ_3 Failure, psf		1800.0

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Brown Fat Clay (CH)

Assumed Specific Gravity= 2.70
Remarks:

Client: Nichols Consulting Engineers

Project: Richmond-Via Verdi Geotechnical Investigation

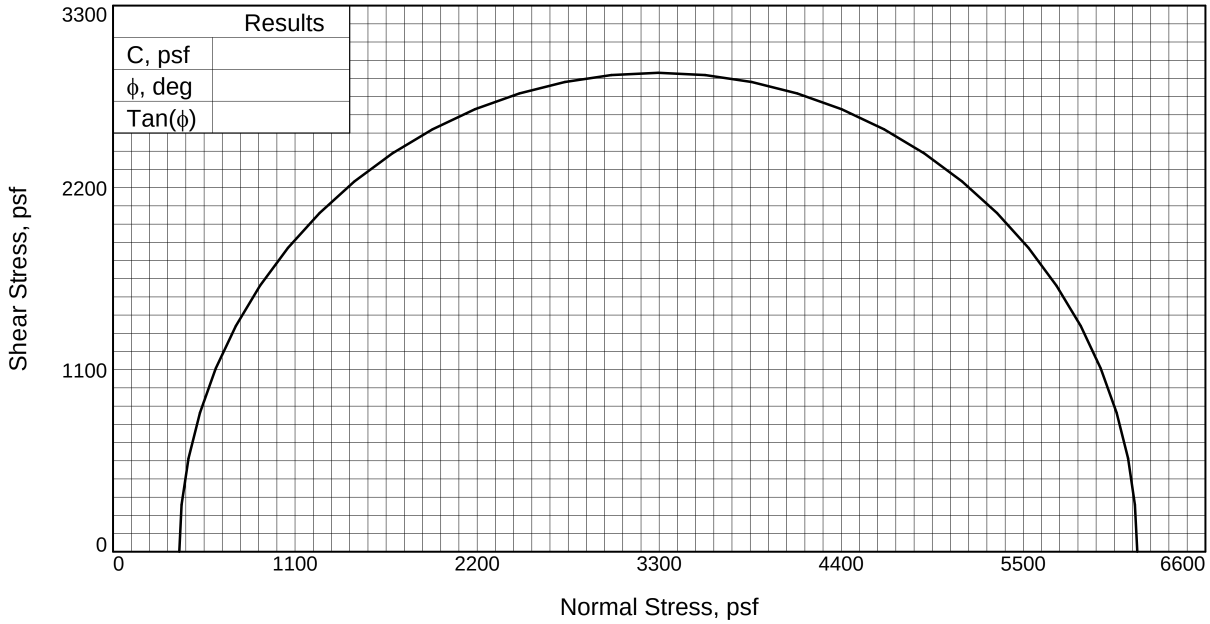
Source of Sample: B-1 **Depth:** 45.5-46.0'

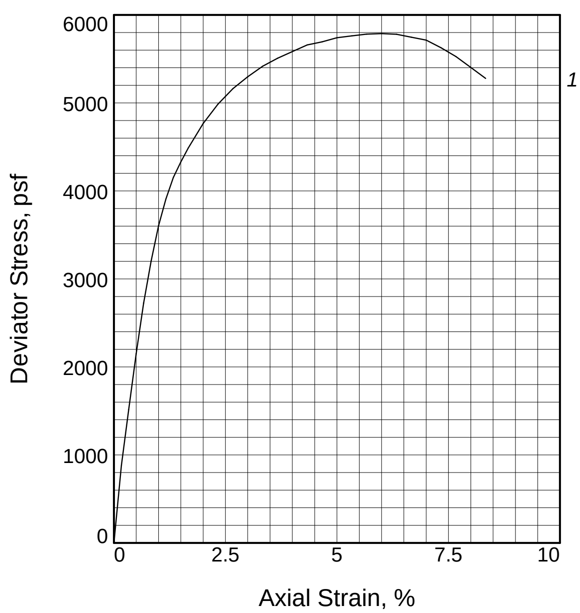
Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Plate ________

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	20.6
	Dry Density, pcf	105.4
	Saturation, %	92.9
	Void Ratio	0.5987
	Diameter, in.	2.430
	Height, in.	6.000
At Test	Water Content, %	20.6
	Dry Density, pcf	105.4
	Saturation, %	92.9
	Void Ratio	0.5987
	Diameter, in.	2.430
	Height, in.	6.000
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		400.3
Fail. Stress, psf		5788.2
Strain, %		6.0
Ult. Stress, psf		5788.2
Strain, %		6.0
σ_1 Failure, psf		6188.5
σ_3 Failure, psf		400.3

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown Sandy Fat Clay (CH)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

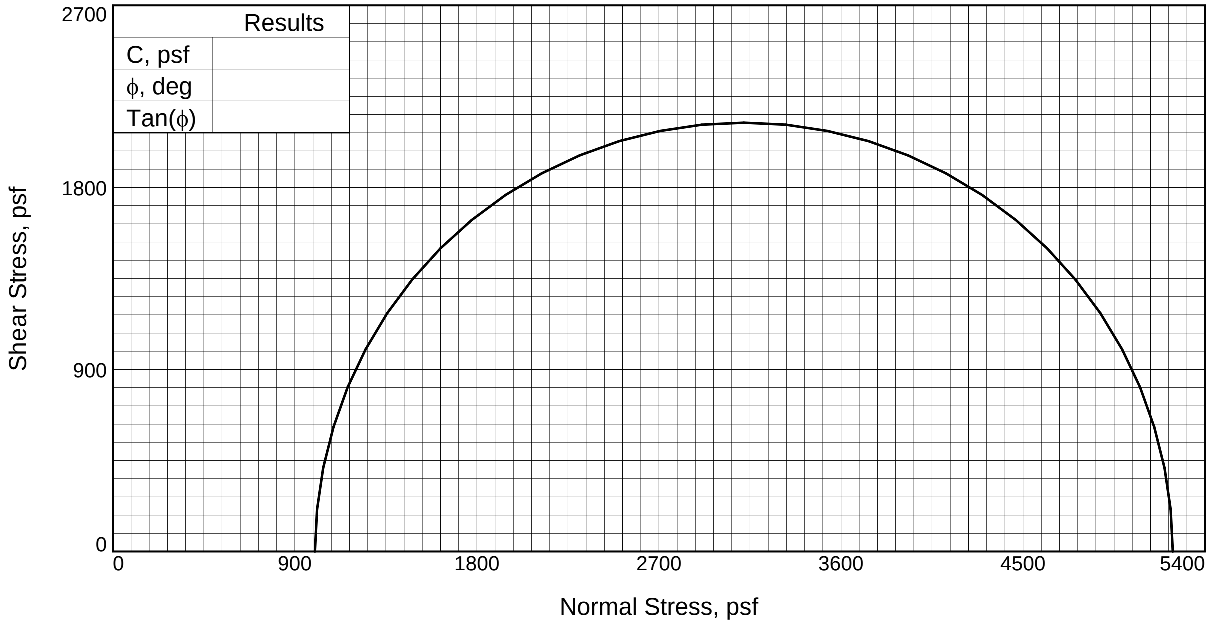
Project: Richmond-Via Verdi Geotechnical Investigation

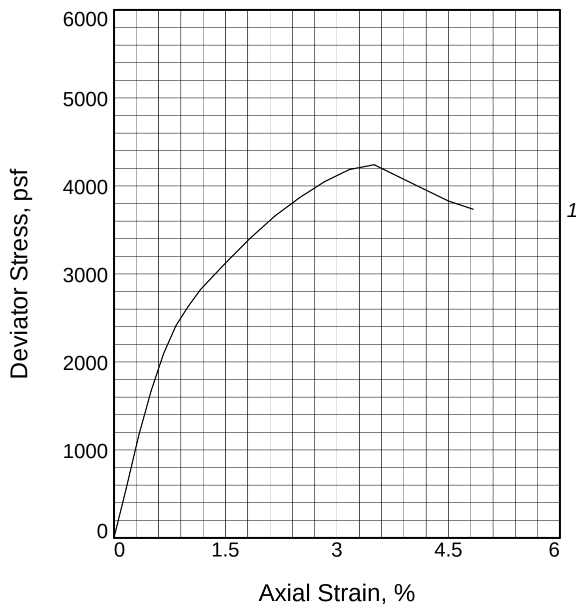
Source of Sample: B-2 **Depth:** 6.0-6.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	20.7
	Dry Density, pcf	106.3
	Saturation, %	95.2
	Void Ratio	0.5858
	Diameter, in.	2.430
	Height, in.	6.000
At Test	Water Content, %	20.7
	Dry Density, pcf	106.3
	Saturation, %	95.2
	Void Ratio	0.5858
	Diameter, in.	2.430
	Height, in.	6.000
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		999.4
Fail. Stress, psf		4240.4
Strain, %		3.5
Ult. Stress, psf		4240.4
Strain, %		3.5
σ_1 Failure, psf		5239.8
σ_3 Failure, psf		999.4

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

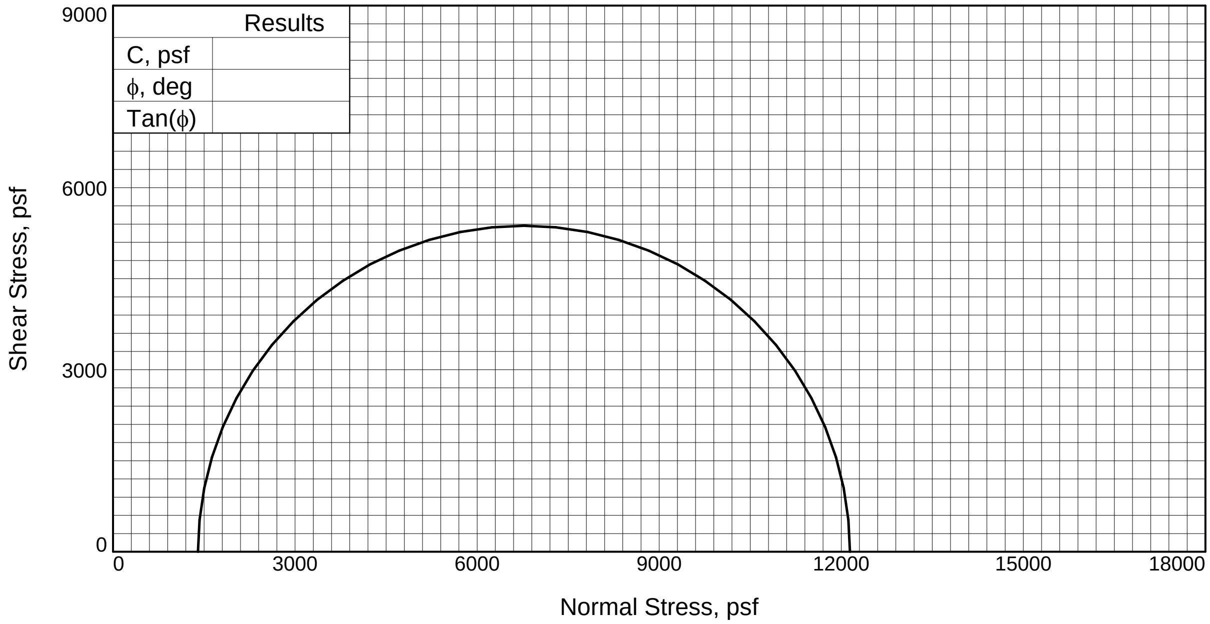
Project: Richmond-Via Verdi Geotechnical Investigation

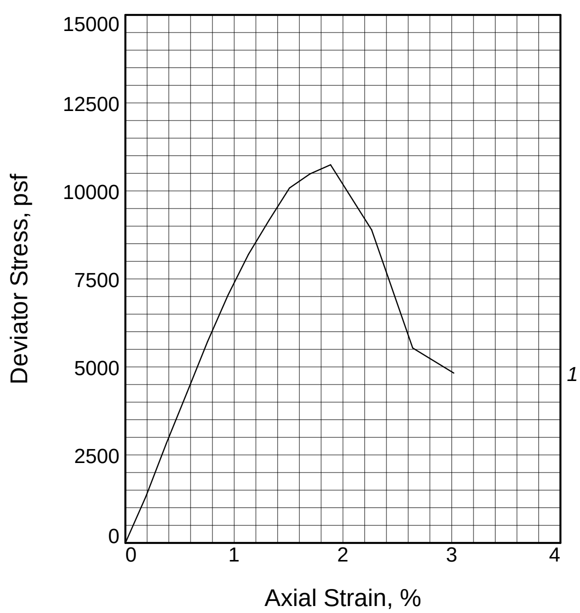
Source of Sample: B-2 **Depth:** 16.0-16.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	16.7
	Dry Density, pcf	115.1
	Saturation, %	97.1
	Void Ratio	0.4649
	Diameter, in.	2.430
	Height, in.	5.300
At Test	Water Content, %	16.7
	Dry Density, pcf	115.1
	Saturation, %	97.1
	Void Ratio	0.4649
	Diameter, in.	2.430
	Height, in.	5.300
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		1399.7
Fail. Stress, psf		10743.4
Strain, %		1.9
Ult. Stress, psf		10743.4
Strain, %		1.9
σ_1 Failure, psf		12143.1
σ_3 Failure, psf		1399.7

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Brown Fat Clay W/Sand (CH)

Assumed Specific Gravity= 2.70
Remarks:

Client: Nichols Consulting Engineers

Project: Richmond-Via Verdi Geotechnical Investigation

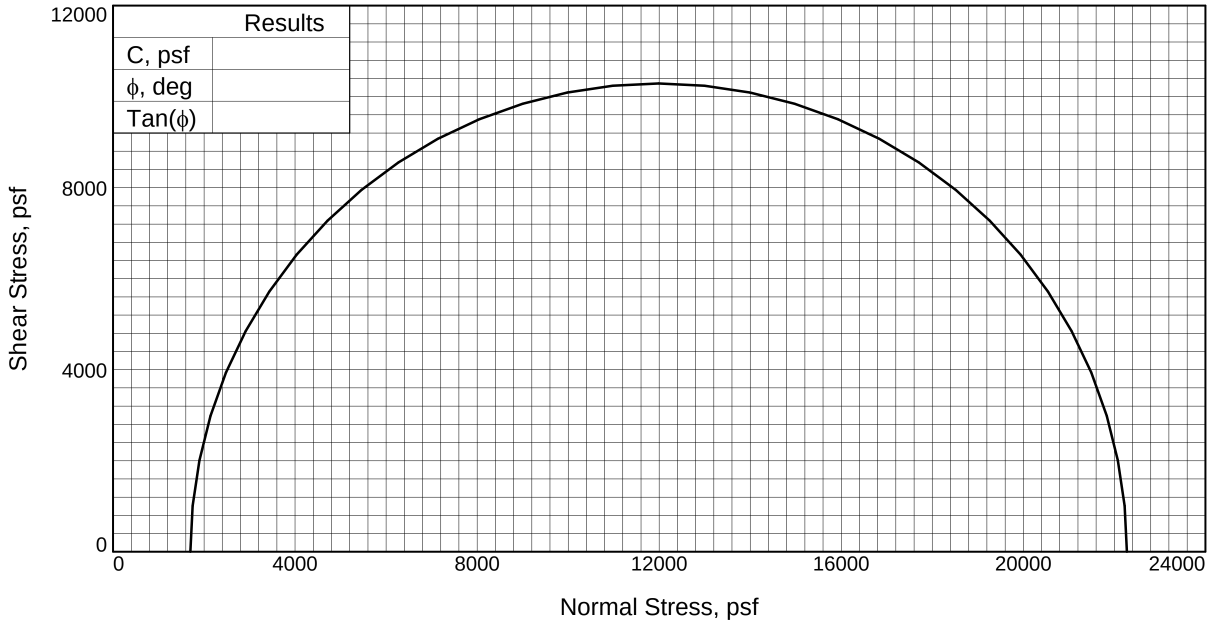
Source of Sample: B-2 **Depth:** 27.0-27.5'

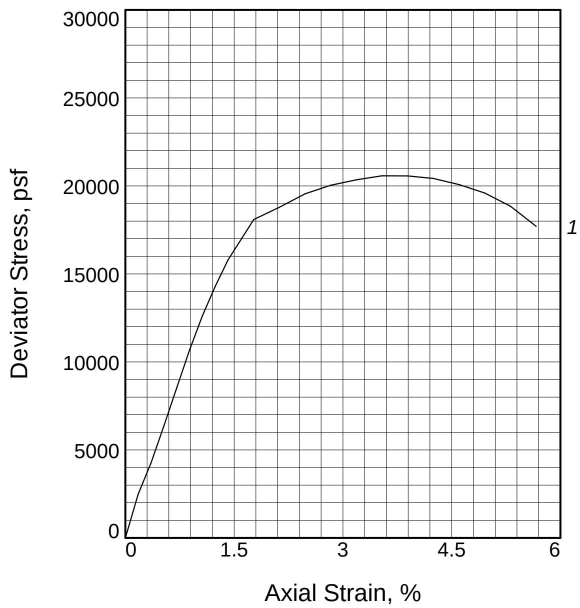
Proj. No.: 568.08.20 **Date Sampled:**

RGH CONSULTANTS, INC.

Plate ________

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	12.2
	Dry Density, pcf	125.9
	Saturation, %	97.3
	Void Ratio	0.3384
	Diameter, in.	2.430
	Height, in.	5.650
At Test	Water Content, %	12.2
	Dry Density, pcf	125.9
	Saturation, %	97.3
	Void Ratio	0.3384
	Diameter, in.	2.430
	Height, in.	5.650
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		1699.2
Fail. Stress, psf		20576.2
Strain, %		3.5
Ult. Stress, psf		20576.2
Strain, %		3.5
σ_1 Failure, psf		22275.4
σ_3 Failure, psf		1699.2

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Olive Green Fat Clay (CH)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

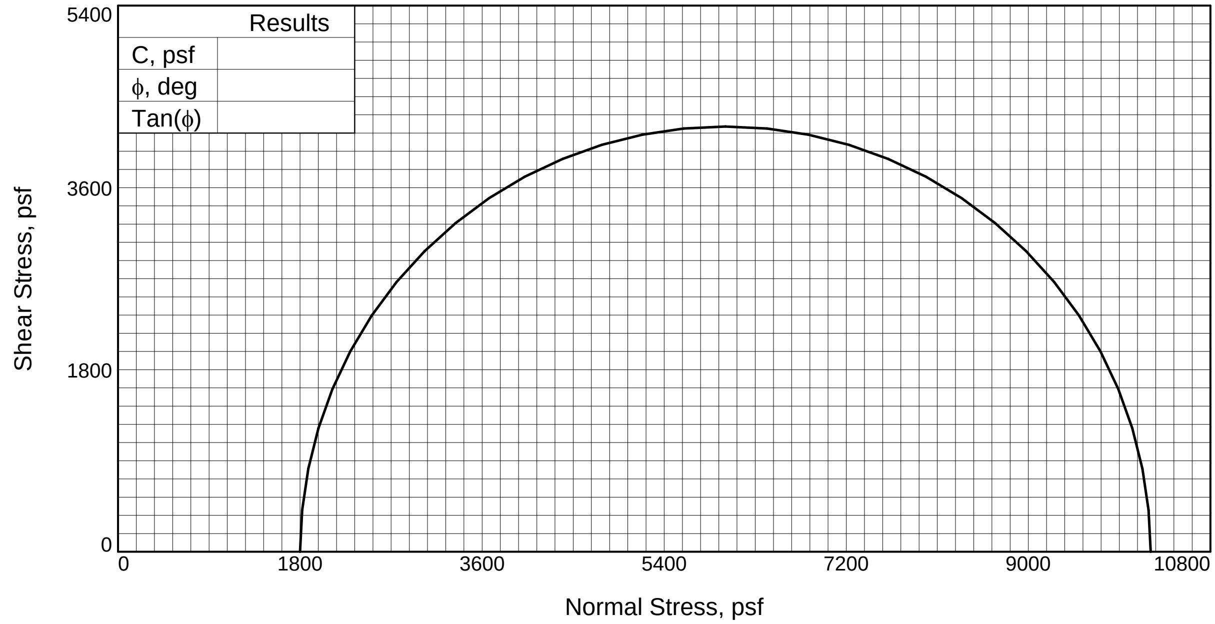
Project: Richmond-Via Verdi Geotechnical Investigation

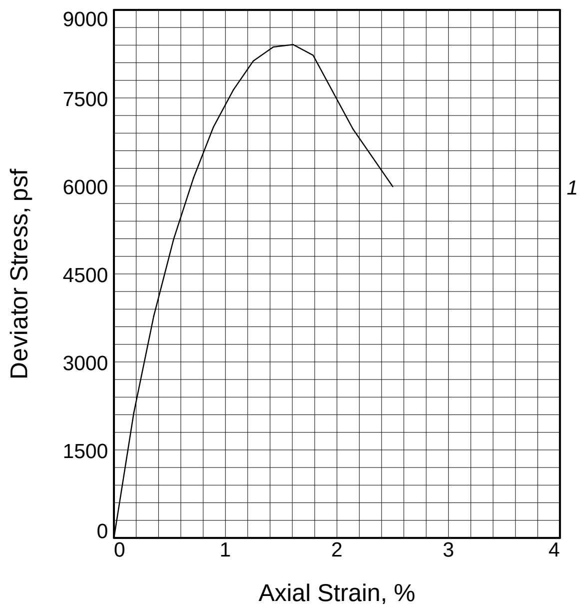
Source of Sample: B-2 **Depth:** 36.0-36.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	16.1
	Dry Density, pcf	117.0
	Saturation, %	98.2
	Void Ratio	0.4413
	Diameter, in.	2.430
	Height, in.	5.600
At Test	Water Content, %	16.1
	Dry Density, pcf	117.0
	Saturation, %	98.2
	Void Ratio	0.4413
	Diameter, in.	2.430
	Height, in.	5.600
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		1800.0
Fail. Stress, psf		8409.4
Strain, %		1.6
Ult. Stress, psf		8409.4
Strain, %		1.6
σ_1 Failure, psf		10209.4
σ_3 Failure, psf		1800.0

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Blue Grey Fat Clay (CH)

Assumed Specific Gravity= 2.70
Remarks:

Plate ________

Client: Nichols Consulting Engineers

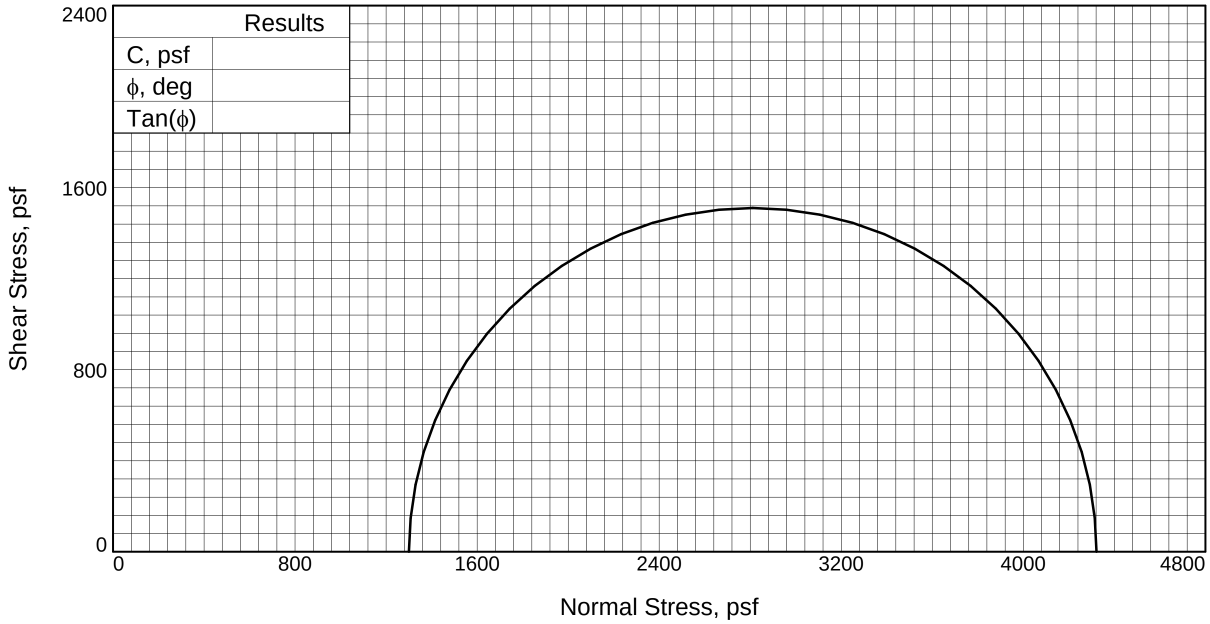
Project: Richmond-Via Verdi Geotechnical Investigation

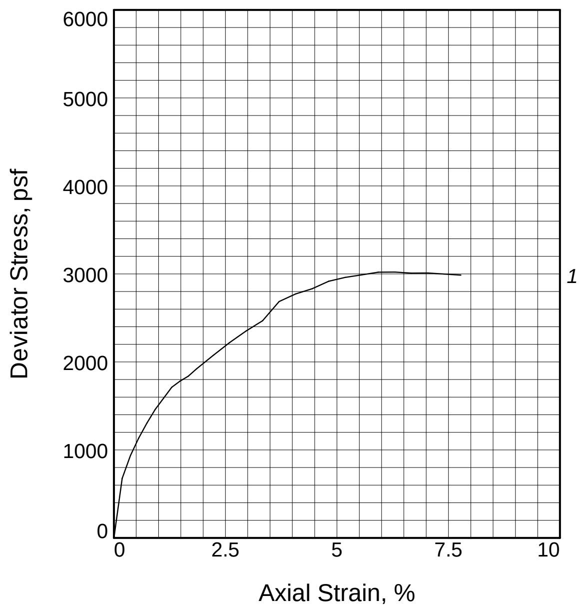
Source of Sample: B-2 **Depth:** 41.0-41.5'

Proj. No.: 568.08.20 **Date Sampled:**

RGH CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





	Sample No.	1
Initial	Water Content, %	23.8
	Dry Density, pcf	96.7
	Saturation, %	86.3
	Void Ratio	0.7440
	Diameter, in.	2.410
	Height, in.	5.400
At Test	Water Content, %	23.8
	Dry Density, pcf	96.7
	Saturation, %	86.3
	Void Ratio	0.7440
	Diameter, in.	2.410
	Height, in.	5.400
	Strain rate, in./min.	0.060
	Back Pressure, psf	0.0
	Cell Pressure, psf	1300.3
	Fail. Stress, psf	3021.1
	Strain, %	6.3
	Ult. Stress, psf	3021.1
	Strain, %	6.3
	σ_1 Failure, psf	4321.4
	σ_3 Failure, psf	1300.3

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Light Brown Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70
Remarks:

Plate ________

Client: Nichols Consulting Engineers

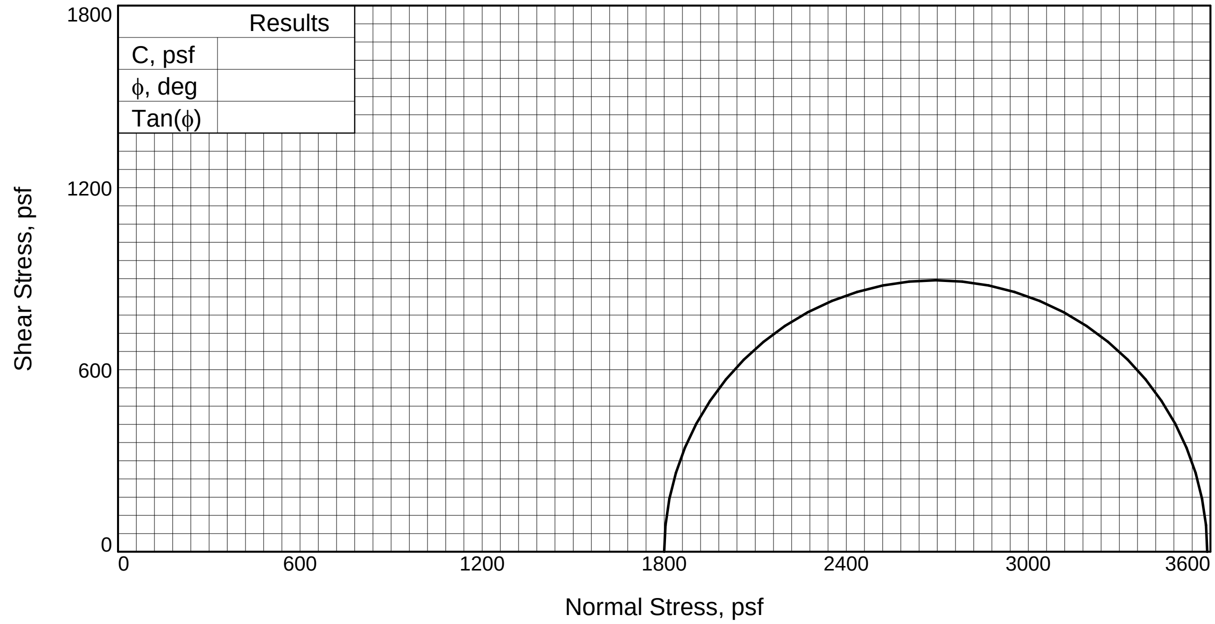
Project: Richmond Via Verdi Geotechnical Investigation

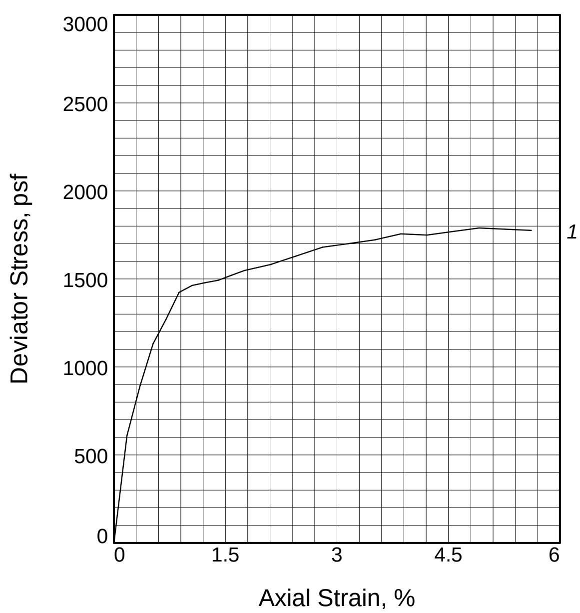
Source of Sample: B-3 **Depth:** 21.0-21.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: CMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	10.6
	Dry Density, pcf	111.0
	Saturation, %	55.0
	Void Ratio	0.5184
	Diameter, in.	2.430
	Height, in.	5.700
At Test	Water Content, %	10.6
	Dry Density, pcf	111.0
	Saturation, %	55.0
	Void Ratio	0.5184
	Diameter, in.	2.430
	Height, in.	5.700
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		1800.0
Fail. Stress, psf		1789.8
Strain, %		4.9
Ult. Stress, psf		1789.8
Strain, %		4.9
σ_1 Failure, psf		3589.8
σ_3 Failure, psf		1800.0

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Light Brown Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

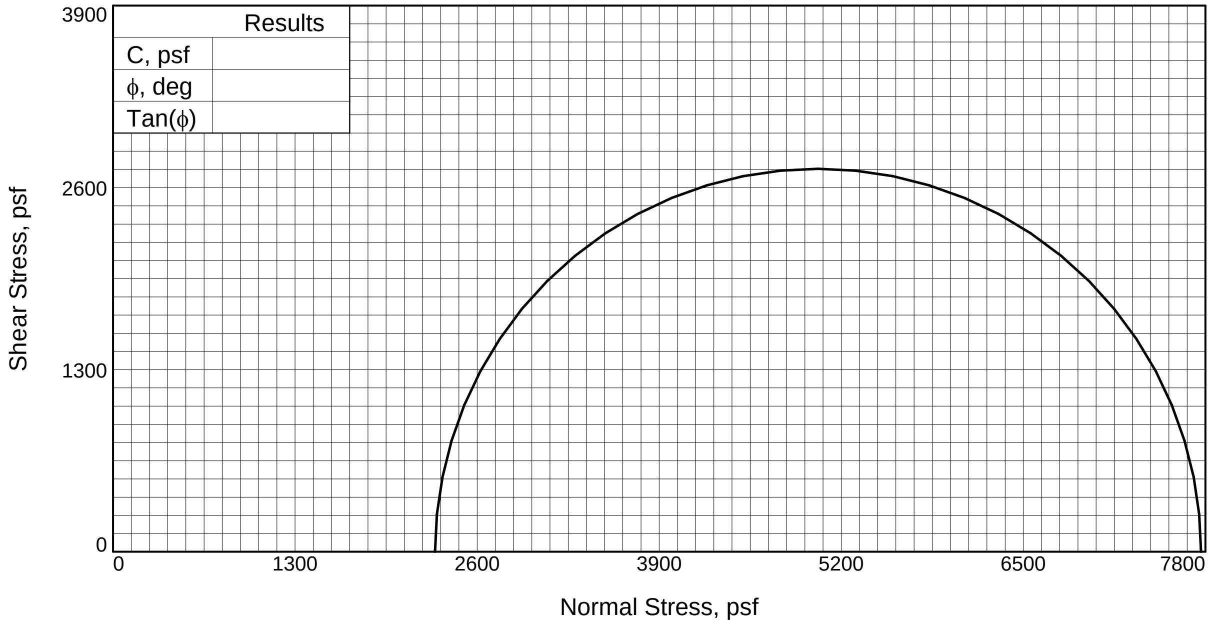
Project: Richmond Via Verdi Geotechnical Investigation

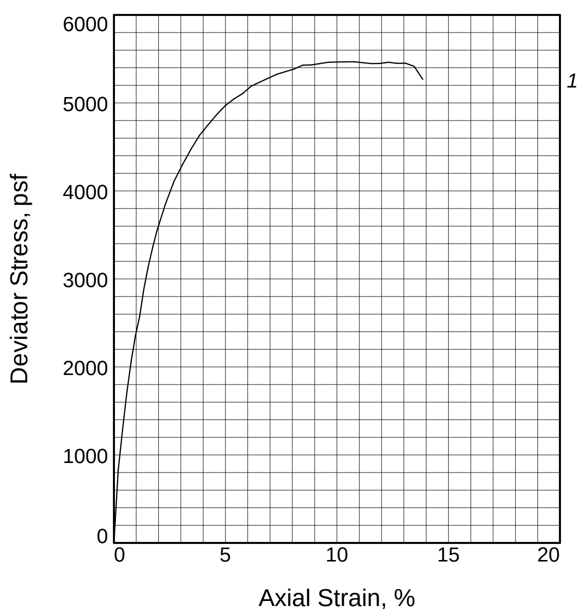
Source of Sample: B-3 **Depth:** 31.0-31.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: CMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	19.4
	Dry Density, pcf	110.0
	Saturation, %	98.6
	Void Ratio	0.5322
	Diameter, in.	2.430
	Height, in.	5.200
At Test	Water Content, %	19.4
	Dry Density, pcf	110.0
	Saturation, %	98.6
	Void Ratio	0.5322
	Diameter, in.	2.430
	Height, in.	5.200
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		2299.7
Fail. Stress, psf		5469.1
Strain, %		10.8
Ult. Stress, psf		5469.1
Strain, %		10.8
σ_1 Failure, psf		7768.8
σ_3 Failure, psf		2299.7

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Black Sandy Fat Clay (CH)

Assumed Specific Gravity= 2.70
Remarks:

Plate ________

Client: Nichols Consulting Engineers

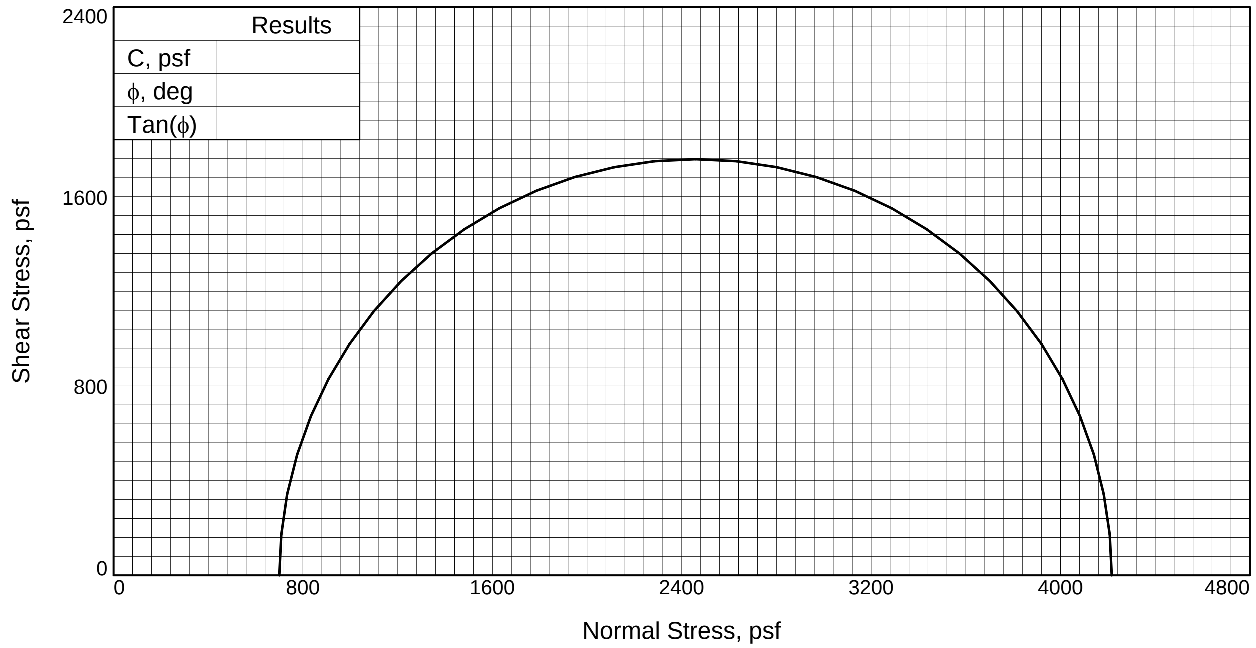
Project: Richmond Via Verdi Geotechnical Investigation

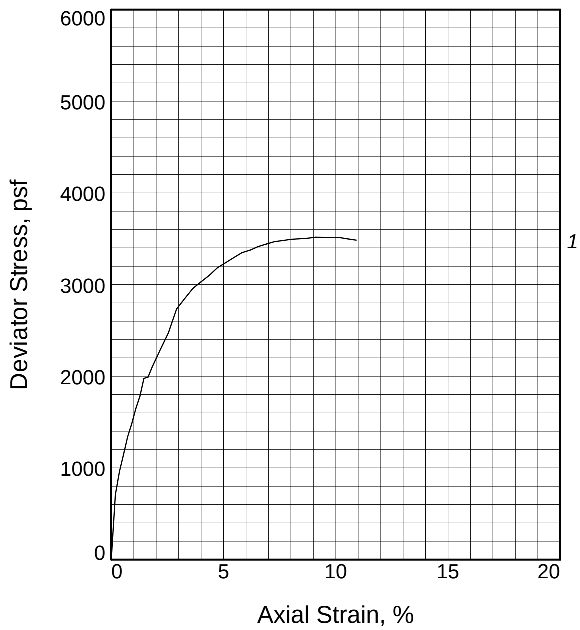
Source of Sample: B-3 **Depth:** 45.0-45.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: CMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	20.2
	Dry Density, pcf	103.7
	Saturation, %	87.5
	Void Ratio	0.6251
	Diameter, in.	2.430
	Height, in.	5.500
At Test	Water Content, %	20.2
	Dry Density, pcf	103.7
	Saturation, %	87.5
	Void Ratio	0.6251
	Diameter, in.	2.430
	Height, in.	5.500
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		699.8
Fail. Stress, psf		3516.4
Strain, %		9.1
Ult. Stress, psf		3516.4
Strain, %		9.1
σ_1 Failure, psf		4216.3
σ_3 Failure, psf		699.8

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown Sandy Lean Clay (CL)

LL= 46 **PL=** 18 **PI=** 28

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

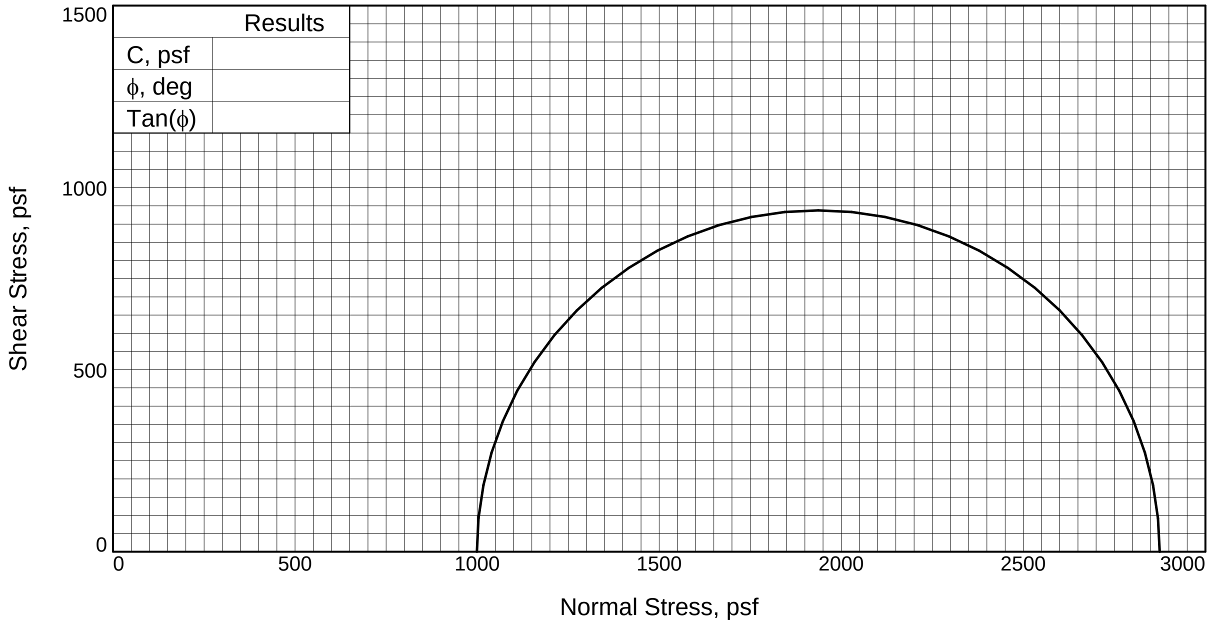
Client: Nichols Consulting Engineers

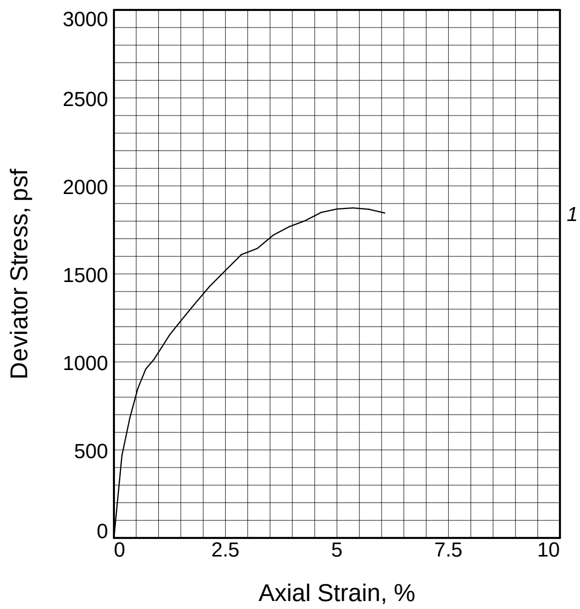
Project: Richmond Via Verdi Geotechnical Investigation

Source of Sample: B-4 **Depth:** 11.0-11.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.





Sample No.		1
Initial	Water Content, %	21.1
	Dry Density, pcf	102.2
	Saturation, %	87.8
	Void Ratio	0.6491
	Diameter, in.	2.430
	Height, in.	5.600
At Test	Water Content, %	22.3
	Dry Density, pcf	102.2
	Saturation, %	93.0
	Void Ratio	0.6491
	Diameter, in.	2.430
	Height, in.	5.600
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		999.4
Fail. Stress, psf		1875.1
Strain, %		5.4
Ult. Stress, psf		1875.1
Strain, %		5.4
σ_1 Failure, psf		2874.4
σ_3 Failure, psf		999.4

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Black Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70
Remarks:

Plate ________

Client: Nichols Consulting Engineers

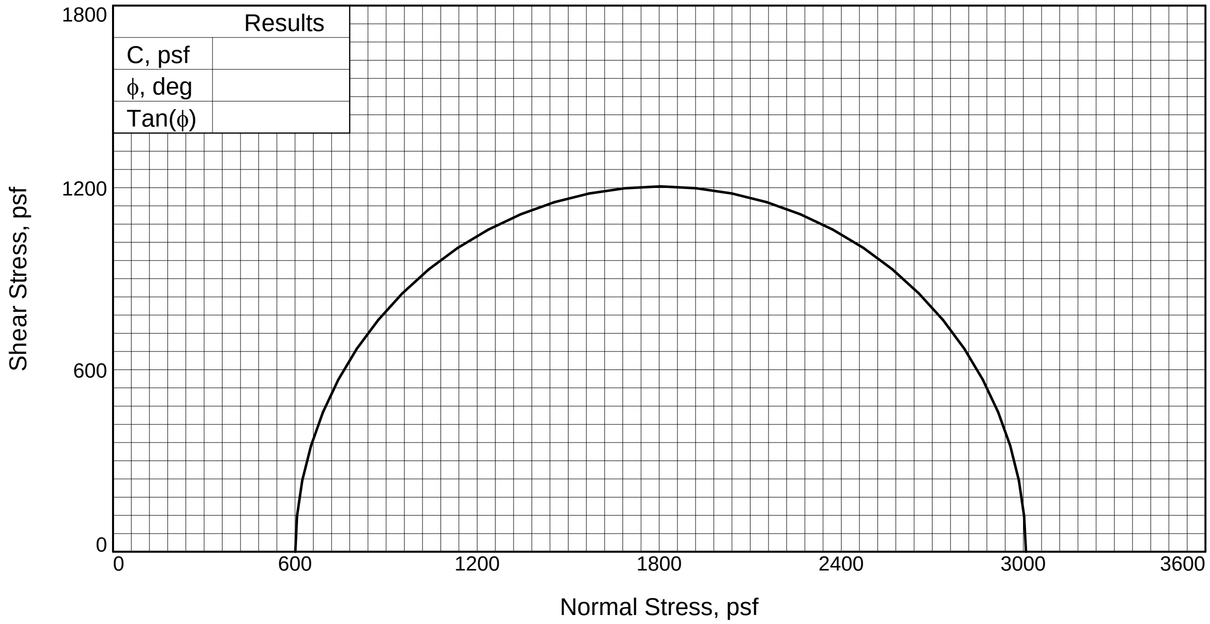
Project: Richmond Via Verdi Geotechnical Investigation

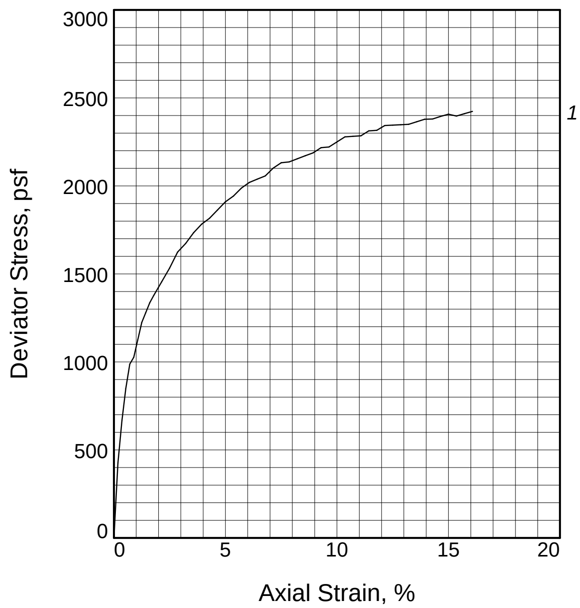
Source of Sample: B-4 **Depth:** 16.0-16.5'

Proj. No.: 568.08.20 **Date Sampled:**

RGH CONSULTANTS, INC.

Tested By: CMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	24.4
	Dry Density, pcf	98.1
	Saturation, %	91.6
	Void Ratio	0.7179
	Diameter, in.	2.430
	Height, in.	5.600
At Test	Water Content, %	24.4
	Dry Density, pcf	98.1
	Saturation, %	91.6
	Void Ratio	0.7179
	Diameter, in.	2.430
	Height, in.	5.600
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		600.5
Fail. Stress, psf		2408.1
Strain, %		15.0
Ult. Stress, psf		2423.8
Strain, %		16.1
σ_1 Failure, psf		3008.6
σ_3 Failure, psf		600.5

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Black Lean Clay W/Sand (CL)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

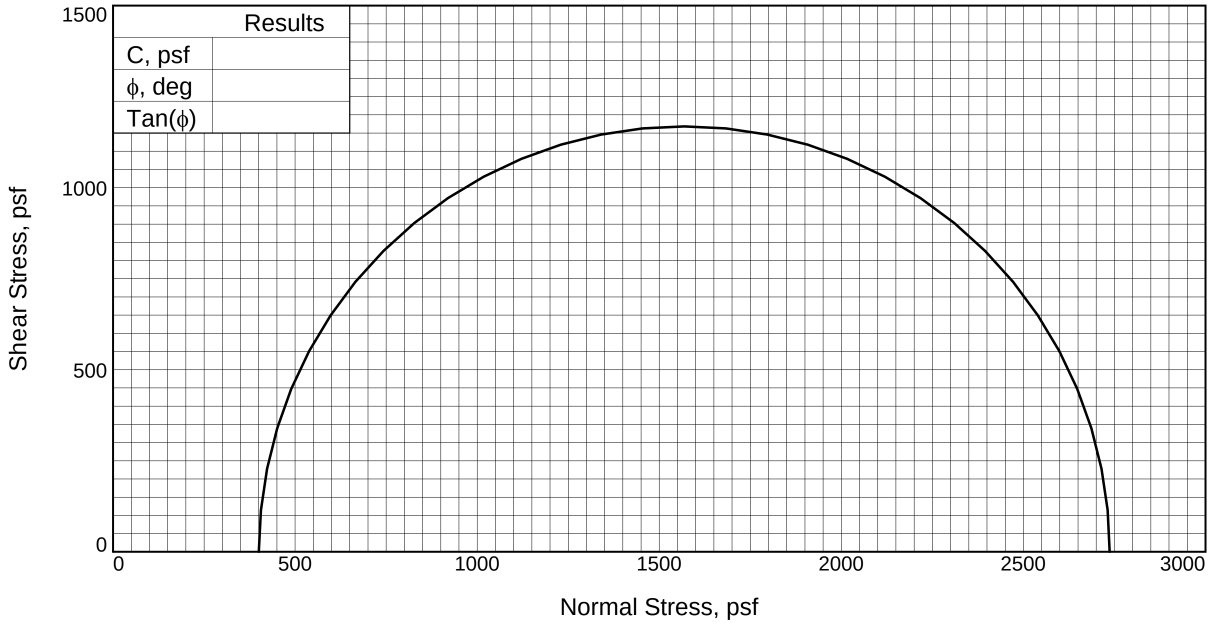
Project: Richmond Via Verdi Geotechnical Investigation

Source of Sample: B-4 **Depth:** 26.0-26.5'

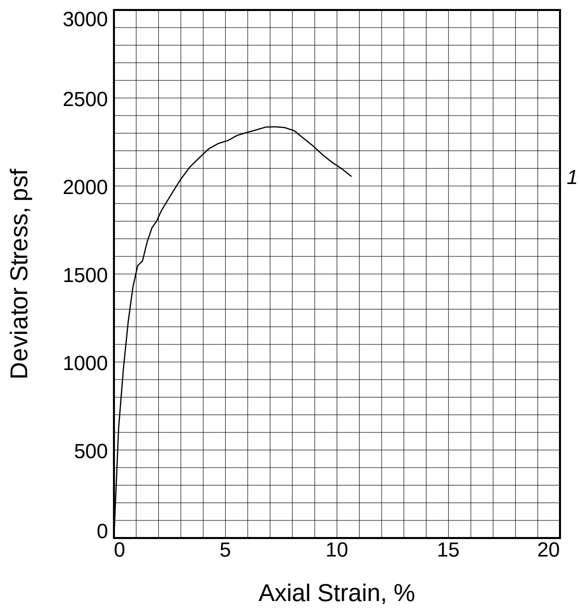
Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: CMc **Checked By:** TMc



Results	
C, psf	
ϕ, deg	
Tan(ϕ)	



	Sample No.	1
Initial	Water Content, %	18.2
	Dry Density, pcf	105.9
	Saturation, %	82.9
	Void Ratio	0.5910
	Diameter, in.	2.430
	Height, in.	4.700
At Test	Water Content, %	18.2
	Dry Density, pcf	105.9
	Saturation, %	82.9
	Void Ratio	0.5910
	Diameter, in.	2.430
	Height, in.	4.700
	Strain rate, in./min.	0.060
	Back Pressure, psf	0.0
	Cell Pressure, psf	400.3
	Fail. Stress, psf	2336.6
	Strain, %	7.2
	Ult. Stress, psf	2336.6
	Strain, %	7.2
	σ_1 Failure, psf	2736.9
	σ_3 Failure, psf	400.3

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown Sandy Lean Clay W/Gravel (CL)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

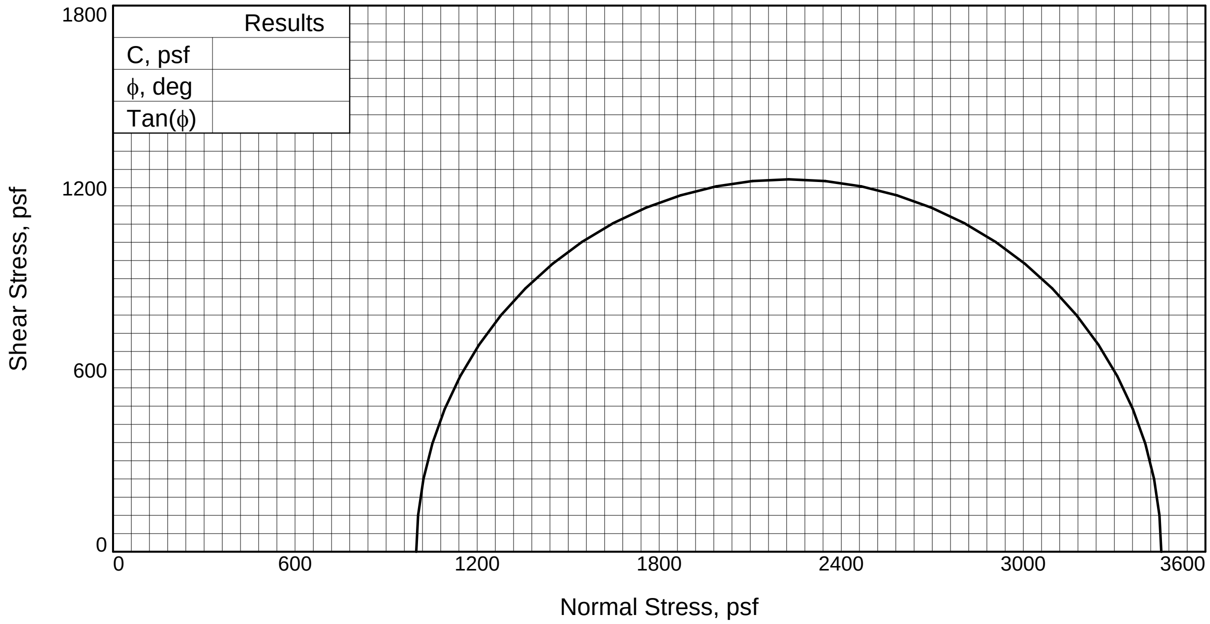
Project: Richmond-Via Verdi Geotechnical Investigation

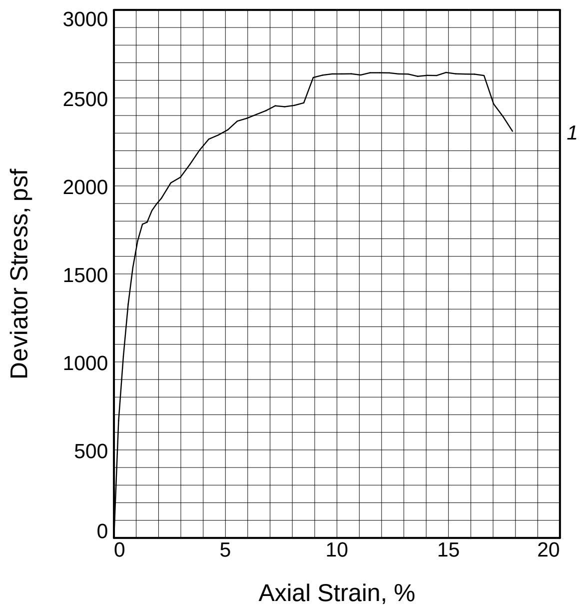
Source of Sample: B-6 **Depth:** 6.0-6.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





	Sample No.	1
Initial	Water Content, %	20.7
	Dry Density, pcf	107.0
	Saturation, %	97.4
	Void Ratio	0.5749
	Diameter, in.	2.430
	Height, in.	4.700
At Test	Water Content, %	20.7
	Dry Density, pcf	107.0
	Saturation, %	97.4
	Void Ratio	0.5749
	Diameter, in.	2.430
	Height, in.	4.700
	Strain rate, in./min.	0.060
	Back Pressure, psf	0.0
	Cell Pressure, psf	999.4
	Fail. Stress, psf	2455.3
	Strain, %	7.2
	Ult. Stress, psf	2644.5
	Strain, %	14.9
	σ_1 Failure, psf	3454.7
	σ_3 Failure, psf	999.4

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Dark Grey Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70
Remarks:

Plate ________

Client: Nichols Consulting Engineers

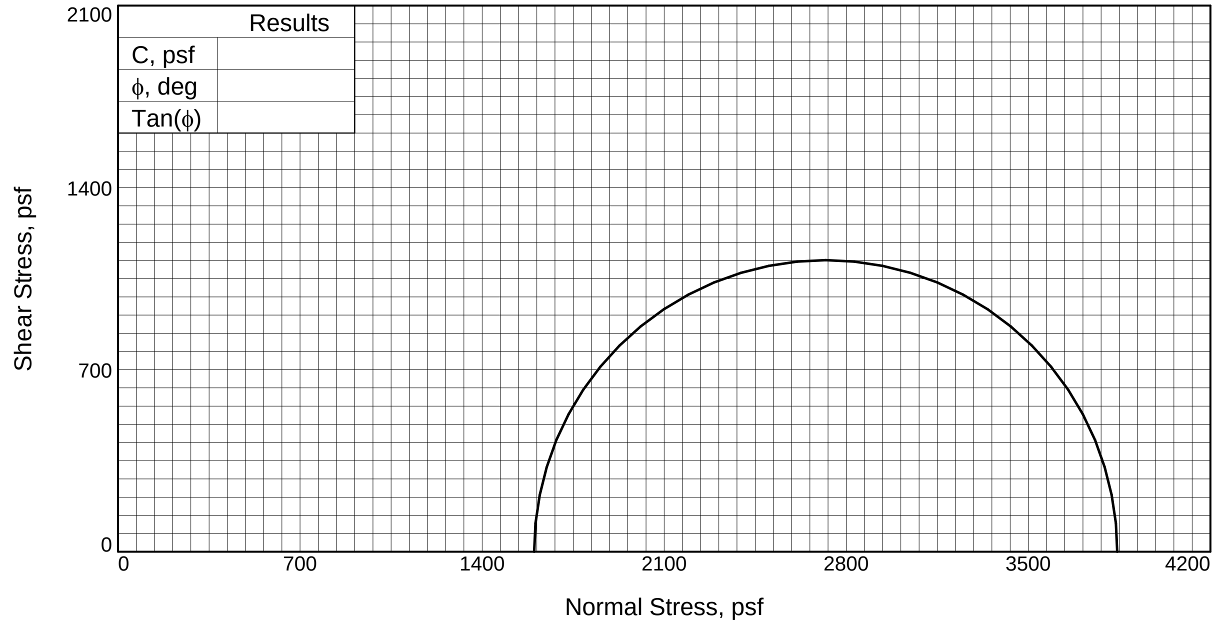
Project: Richmond-Via Verdi Geotechnical Investigation

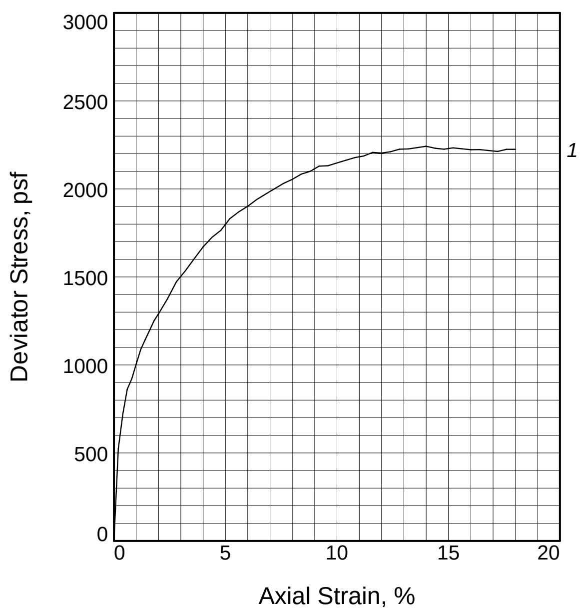
Source of Sample: B-6 **Depth:** 16.0-16.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	27.5
	Dry Density, pcf	96.2
	Saturation, %	98.5
	Void Ratio	0.7528
	Diameter, in.	2.430
	Height, in.	5.000
At Test	Water Content, %	27.5
	Dry Density, pcf	96.2
	Saturation, %	98.5
	Void Ratio	0.7528
	Diameter, in.	2.430
	Height, in.	5.000
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		1599.8
Fail. Stress, psf		2242.3
Strain, %		14.0
Ult. Stress, psf		2242.3
Strain, %		14.0
σ_1 Failure, psf		3842.1
σ_3 Failure, psf		1599.8

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Mottled Brown And Black Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70
Remarks:

Plate ________

Client: Nichols Consulting Engineers

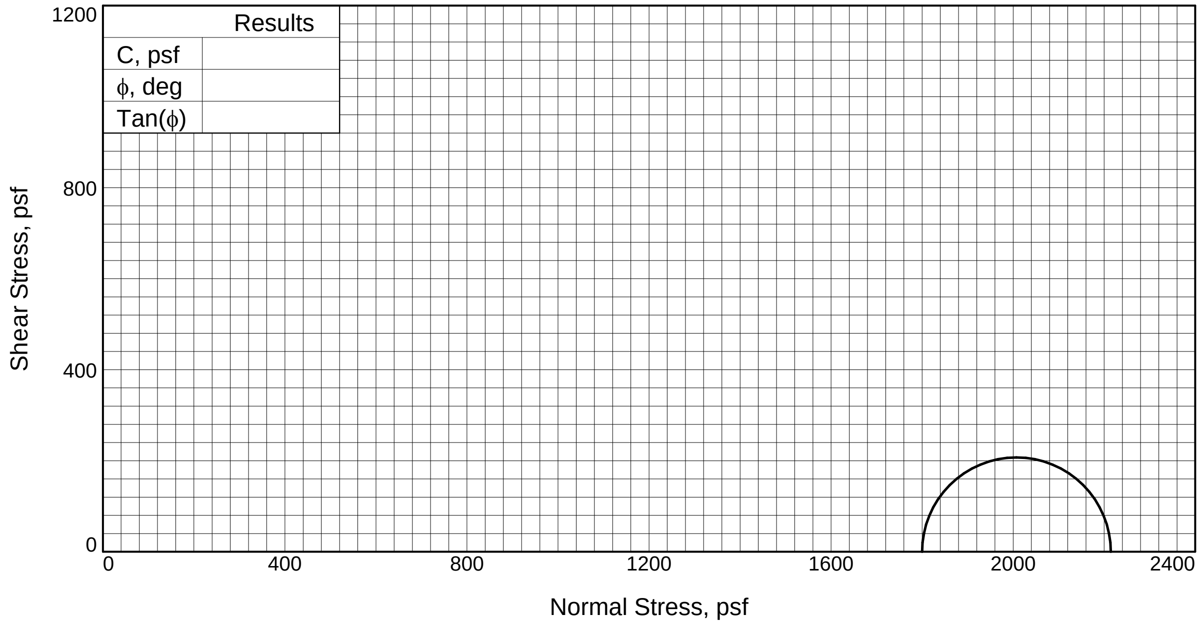
Project: Richmond-Via Verdi Geotechnical Investigation

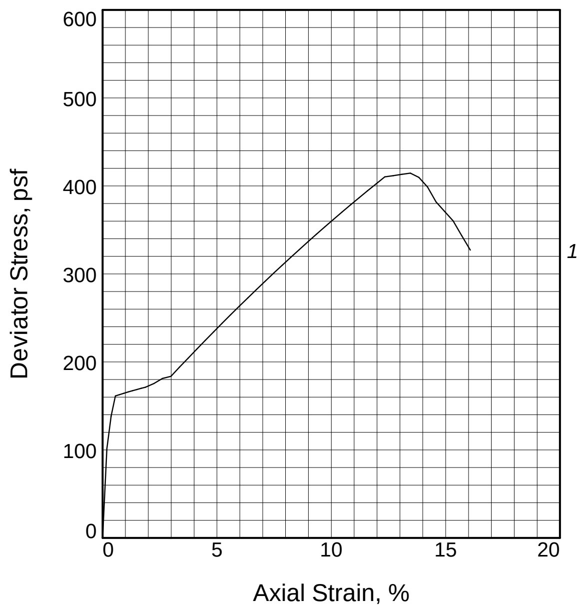
Source of Sample: B-6 **Depth:** 26.0-26.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	26.8
	Dry Density, pcf	96.1
	Saturation, %	95.9
	Void Ratio	0.7538
	Diameter, in.	2.430
	Height, in.	5.350
At Test	Water Content, %	26.8
	Dry Density, pcf	96.1
	Saturation, %	95.9
	Void Ratio	0.7538
	Diameter, in.	2.430
	Height, in.	5.350
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		1800.0
Fail. Stress, psf		414.5
Strain, %		13.5
Ult. Stress, psf		414.5
Strain, %		13.5
σ_1 Failure, psf		2214.5
σ_3 Failure, psf		1800.0

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Grey Brown Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70
Remarks:

Plate ________

Client: Nichols Consulting Engineers

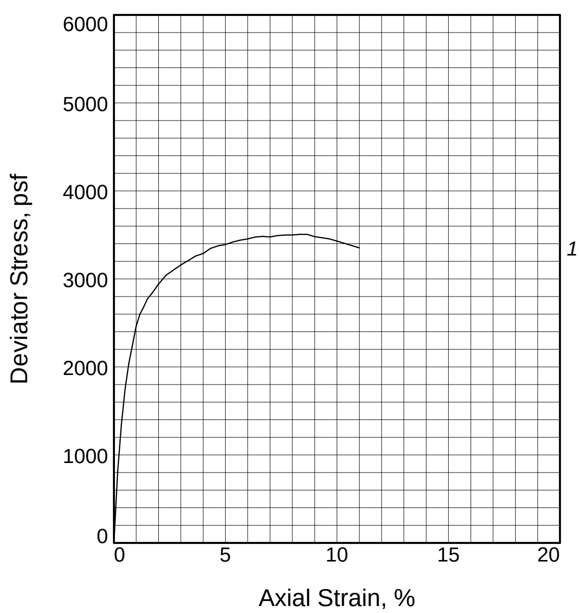
Project: Richmond-Via Verdi Geotechnical Investigation

Source of Sample: B-6 **Depth:** 31.0-31.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc



Sample No.		1
Initial	Water Content, %	22.5
	Dry Density, pcf	98.5
	Saturation, %	85.4
	Void Ratio	0.7110
	Diameter, in.	2.430
	Height, in.	6.000
At Test	Water Content, %	22.5
	Dry Density, pcf	98.5
	Saturation, %	85.4
	Void Ratio	0.7110
	Diameter, in.	2.430
	Height, in.	6.000
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		299.5
Fail. Stress, psf		3506.9
Strain, %		8.7
Ult. Stress, psf		3506.9
Strain, %		8.7
σ_1 Failure, psf		3806.4
σ_3 Failure, psf		299.5

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Brown Sandy Lean Clay (CL)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

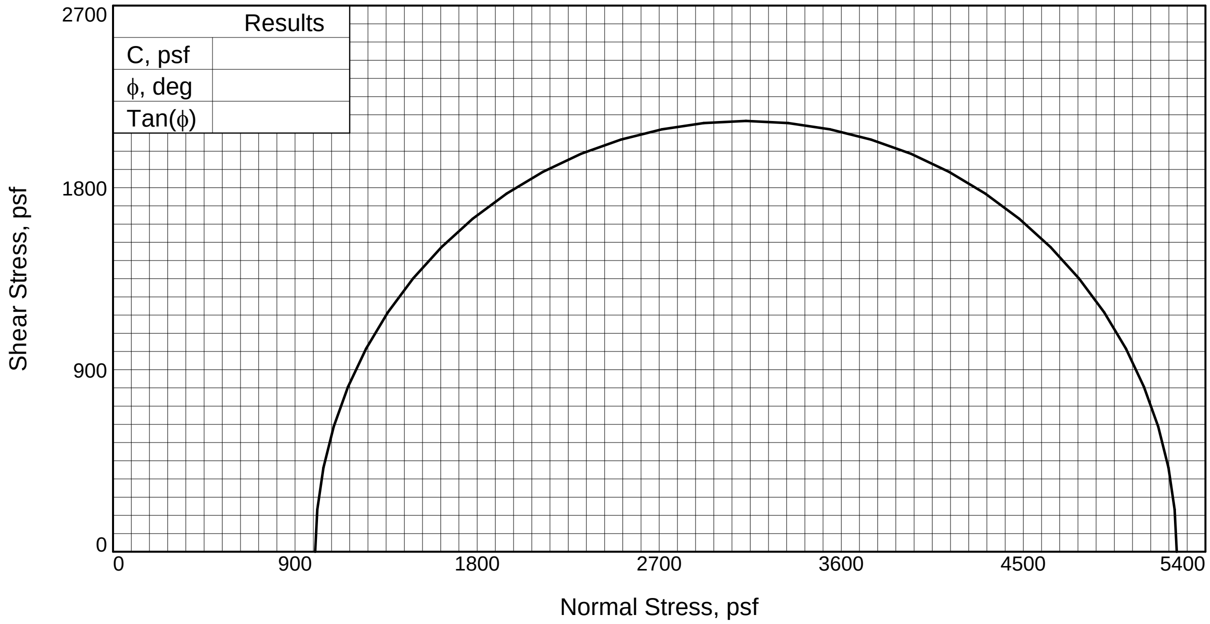
Project: Richmond-Via Verdi Geotechnical Investigation

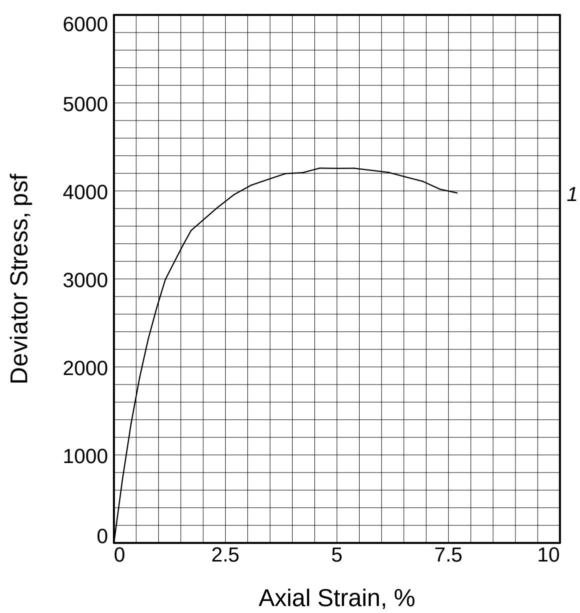
Source of Sample: B-7 **Depth:** 4.5-5.0'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc





Sample No.		1
Initial	Water Content, %	21.0
	Dry Density, pcf	107.0
	Saturation, %	98.8
	Void Ratio	0.5752
	Diameter, in.	2.430
	Height, in.	5.200
At Test	Water Content, %	21.0
	Dry Density, pcf	107.0
	Saturation, %	98.8
	Void Ratio	0.5752
	Diameter, in.	2.430
	Height, in.	5.200
Strain rate, in./min.		0.060
Back Pressure, psf		0.0
Cell Pressure, psf		999.4
Fail. Stress, psf		4259.3
Strain, %		4.6
Ult. Stress, psf		4259.3
Strain, %		4.6
σ_1 Failure, psf		5258.6
σ_3 Failure, psf		999.4

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Mottled Brown, Black And Blue Sandy Fat Clay W/Gravel (CH)

Assumed Specific Gravity= 2.70

Remarks:

Plate ________

Client: Nichols Consulting Engineers

Project: Richmond-Via Verdi Geotechnical Investigation

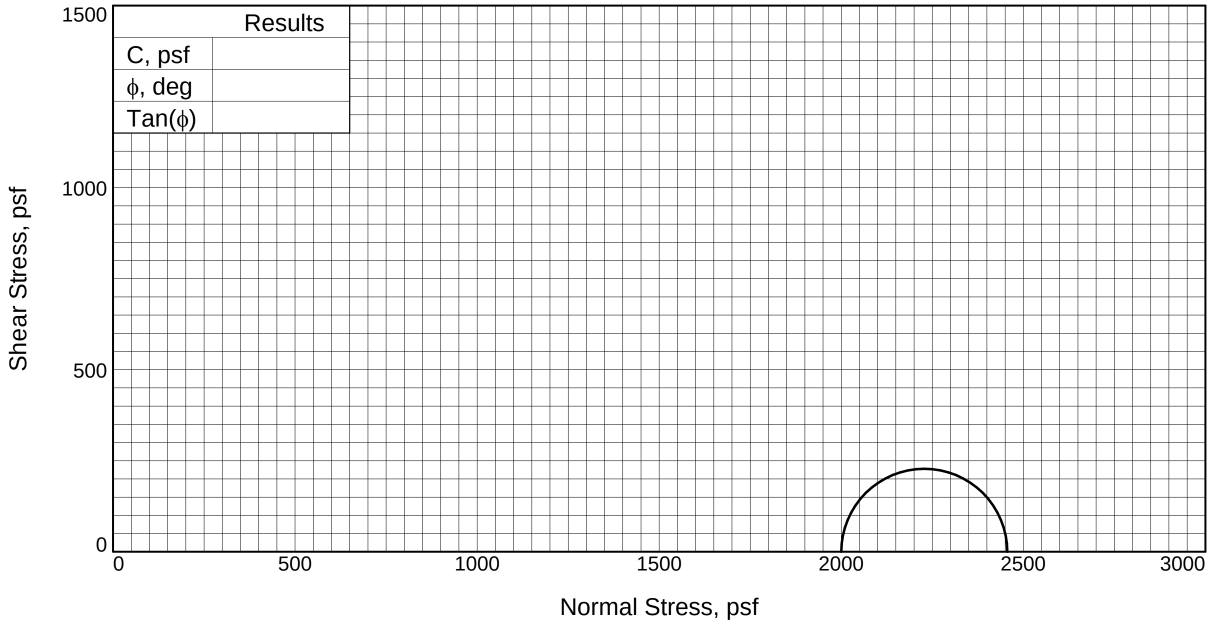
Source of Sample: B-7 **Depth:** 16.0-16.5'

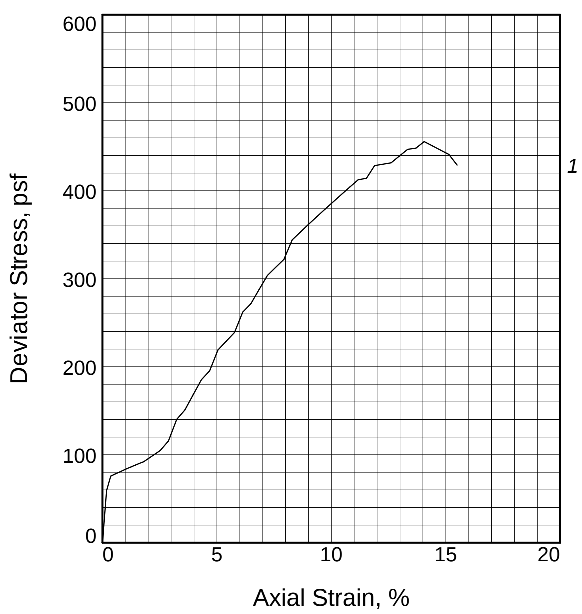
Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Tested By: TMc **Checked By:** TMc

Results	
C, psf	
ϕ, deg	
Tan(ϕ)	





	Sample No.	1
Initial	Water Content, %	29.8
	Dry Density, pcf	92.8
	Saturation, %	98.7
	Void Ratio	0.8158
	Diameter, in.	2.430
	Height, in.	5.550
At Test	Water Content, %	29.8
	Dry Density, pcf	92.8
	Saturation, %	98.7
	Void Ratio	0.8158
	Diameter, in.	2.430
	Height, in.	5.550
	Strain rate, in./min.	0.060
	Back Pressure, psf	0.0
	Cell Pressure, psf	2000.2
	Fail. Stress, psf	455.8
	Strain, %	14.1
	Ult. Stress, psf	455.8
	Strain, %	14.1
	σ_1 Failure, psf	2455.9
	σ_3 Failure, psf	2000.2

Type of Test:
Unconsolidated Undrained
Sample Type: Undisturbed
Description: Grey Lean Clay W/Sand (CL)

Assumed Specific Gravity= 2.70
Remarks:

Client: Nichols Consulting Engineers

Project: Richmond-Via Verdi Geotechnical Investigation

Source of Sample: B-7 **Depth:** 36.0-36.5'

Proj. No.: 568.08.20 **Date Sampled:**

R G H CONSULTANTS, INC.

Plate ________

Tested By: TMc **Checked By:** TMc

ETS

Environmental Technical Services

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Petaluma, CA 94954

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COMPANY:	RGH Geotech, 1305 N. Dutton Avenue, Santa Rosa, CA 95401			ANALYST(S)	SUPERVISOR
ATTN:	Terry McCue		DATE of	D. Salinas	D. Jacobson
JOB SITE:	Via Verde, east bay (Nichol's Engineering)	DATE RECEIVED	COMPLETION	S. Santos	LAB DIRECTOR
JOB #:	568.08.20	7/15/2010	7/23/2010		G.S. Conrad PhD

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SOIL pH -log[H+]	MINIMUM RESISTIVITY ohm-cm	ELECTRICAL CONDUCTIVITY μmhos/cm	SULFATE SO4 ppm	CHLORIDE Cl ppm
04048-1	VV1/EB	B-1 @ 11'	**7.52**	**847**	**[1180]**	**45**	**33**
04048-2	VV2/EB	B-1 @ 21'	**7.36**	**1,050**	**[950]**	**90**	**45**
04048-3	VV3/EB	B-1 @ 25-26.5'	**7.14**	**1,110**	**[900]**	**114**	**30**
04048-4	VV4/EB	B-2 @ 6'	**7.74**	**833**	**[1200]**	**33**	**54**
04048-5	VV6/EB	B-2 @ 16'	**7.70**	**1,110**	**[900]**	**36**	**9**
04048-6	VV6/EB	B-2 @ 31'	**8.19**	**833**	**[1200]**	**105**	**30**
04048-7	VV7/EB	B-7 @ 11'	**7.87**	**800**	**[1250]**	**12**	**63**
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 %
04048-1	VV1/EB	B-1 @ 11'				**+243.6**	
04048-2	VV2/EB	B-1 @ 21'				**+242.1**	
04048-3	VV3/EB	B-1 @ 25-26.5'				**-91.9**	
04048-4	VV4/EB	B-2 @ 6'				**+222.1**	
04048-5	VV6/EB	B-2 @ 16'				**+235.4**	
04048-6	VV6/EB	B-2 @ 31'				**+203.6**	
04048-7	VV7/EB	B-7 @ 11'				**+137.6**	
Method	Detection	Limits --->	---	0.1	0.1	1	0.1

** COMMENTS **

Resistivities vary from just 800 to ≈1,100 ohm-cm, i.e., poor to very low, although soil reactions (i.e., pHs) are mildly alkaline; sulfates and chlorides are fairly low; redoxes are mostly mild, except one which is strong. The CalTrans times to perforation for galvanized steel are as follows: for VV1 & 18 ga steel the time is ≈23 yrs, and for 12 ga it goes up to >51 yrs; for VV2 the respective times are at 25.5 yrs, and ≈56 yrs; for VV3 they are <21 yrs, and >45 yrs; for VV4 they are >23, and almost 51 yrs; for VV5 they are ≈26, and >57 yrs; for VV6 times are ≈23 yrs, and <51 yrs; and for VV7 the times are >22 yrs, and >50 yrs. Steel pitting times are follows: VV1 w/ rate @ ≈0.155 mm/yr, and 2 mm time @ ≈13 yrs; VV2 @ ≈0.12 mm/yr @ ≈16.7 yrs; VV3 @ 0.16 mm/yr @ ≈12.5 yrs; VV4 @ ≈0.16 mm/yr @ 12.5 yrs; VV5 @ 0.115 mm/yr @ ≈17.4 yrs; VV6 @ 0.15 mm/yr @ ≈13.3 yrs; and VV7 @ 0.155 mm/hr @ ≈13 yrs. All chlorides are low enough that there should be no adverse impact to steel reinforcement; and sulfates are low enough that there should be no adverse impact on concrete, cement, mortar or grout. Most soil redoxes are only mildly reduced (@ >200 mV) to low-moderate (@ +100-+200 mV), thus they are acceptable; however, one of the deepest soils at nearly -100 mV would strongly attack construction materials. Alkaline treatment is either not advantageous (most samples), or not practical (VV3). To increase steel longevity in these soils, especially VV3, would require materials upgrading (i.e., increased gauge and/or more resistant steel type); and/or other actions can be taken. For example, cathodic protection of coated or wrapped pipe would require fairly typical anodes and typical currents, in most cases, to heavy/numerous anodes and a strong impressed current to protect pipe in one (VV3). Other options could include using alternatives where appropriate, i.e., plastic, fiberglass or concrete pipe, etc. Last, standard cement mixes should be fine in most of these soils based on these results with the exception of VV3 which would require upgrading (to ASTM V cement or equivalent).

\\\\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).

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COMPANY: RGH Geotech, 1305 N. Dutton Avenue, Santa Rosa, CA 95401			ANALYST(S)	SUPERVISOR
ATTN: George Fotou		DATE of	D. Salinas	D. Jacobson
JOB SITE: Via Verde, east bay (Nichol's Engineering)	DATE RECEIVED	COMPLETION	S. Santos	LAB DIRECTOR
JOB #: S 68.0220	12/2/2010	12/10/2010		G.S. Conrad PhD

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SOIL pH -log[H+]	MINIMUM RESISTIVITY ohm-cm	ELECTRICAL CONDUCTIVITY µmhos/cm	SULFATE SO4 ppm	CHLORIDE Cl ppm
04225-1	VV11/EB	B-3 @ 40.0'	**7.61**	**690**	**[1450]**	**30**	**78**
04225-2	VV12/EB	B-3 @ 45.5-47.0'	**7.77**	**877**	**[1440]**	**170**	**155**
04225-3	VV13/EB	B-4 @ 11.0'	**7.44**	**781**	**[1280]**	**45**	**144**
04225-4	VV14/EB	B-4 @ 16.0'	**7.17**	**769**	**[1300]**	**93**	**17**
04225-5	VV15/EB	B-4 @ 21.5-23.0'	**7.52**	**833**	**[1200]**	**99**	**87**
Method	Detection	Limits --->	---	1	0.1	1	1

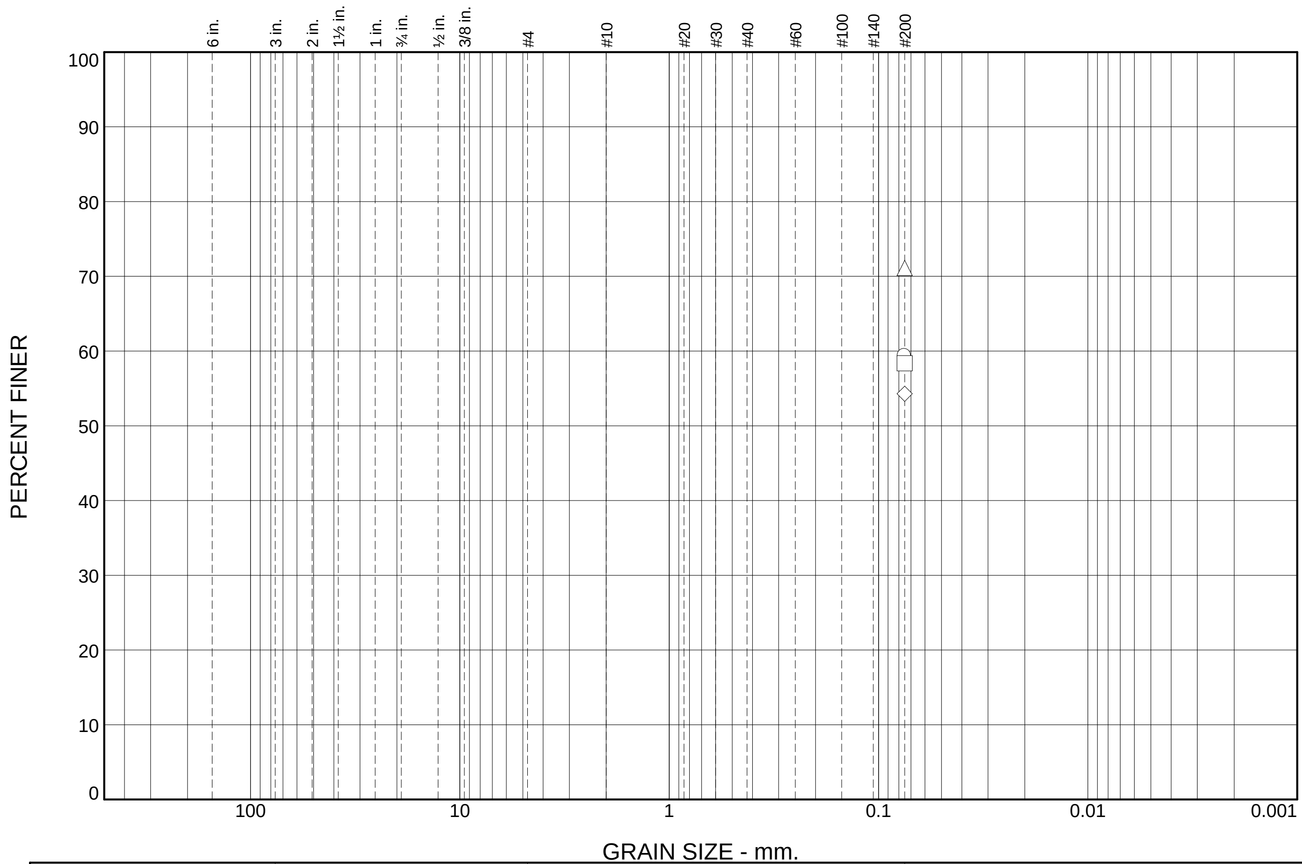
LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SALINITY ECe mmhos/cm	SOLUBLE SULFIDES (S=) ppm	SOLUBLE CYANIDES (CN=) ppm	REDOX mV	PERCENT MOISTURE %
04225-1	VV11/EB	B-3 @ 40.0'				**+257.6**	
04225-2	VV12/EB	B-3 @ 45.5-47.0'				**+246.3**	
04225-3	VV13/EB	B-4 @ 11.0'				**+248.2**	
04225-4	VV14/EB	B-4 @ 16.0'				**+101.6**	
04225-5	VV15/EB	B-4 @ 21.5-23.0'				**+187.8**	
Method	Detection	Limits --->	---	0.1	0.1	1	0.1

** COMMENTS **

Resistivities are all <1,000 ohm-cm range, i.e., poor, although soil reactions (i.e., pHs) are all mildly alkaline; both sulfates and chlorides are low enough; redoxes vary from +100-+260 mV, but all are mild enough. The CalTrans times to perforation for galvanized steel are as follows: for VV11 & 18 ga steel the time is >21 yrs, and for 12 ga it goes up to ≈47 yrs; for VV12 the respective times are at >23 yrs, and ≈52 yrs; for VV13 & VV14 they are >22 yrs, and >49 yrs; and or VV15 they are ≈23 yrs, and <51 yrs. For gray/ductile metals the calculated average pitting rates and times are as follows: VV1 w/ rate @ ≈0.19 mm/yr, the two mm time is @ ≈10.5 yrs; VV2 rate @ ≈0.14 mm/yr, 2 mm time @ ≈14.3 yrs; VV3 rate @ ≈0.175 mm/yr, 2 mm time @ ≈11.4 yrs; VV4 rate @ ≈0.195 mm/yr, 2 mm time @ 10.3 yrs; VV5 rate @ 0.15 mm/yr, 2 mm time @ ≈13.3 yrs. All chlorides are low, thus there should be no adverse impact to steel reinforcement; and sulfates are low enough that there should be no adverse impact on concrete, cement, mortar or grout. All soil redoxes are only mildly reduced, i.e., all are >+100 mV, thus technically all are acceptable. However, it probably would not be unreasonable to assign a point to VV15 and perhaps a couple of points to VV14 considering low resistivities. Alkaline treatment would not provide any significant advantage. To increase steel longevities in these soils would require materials upgrading (i.e., increased gauge and/or more resistant steel type); and/or other actions can be taken. For example, cathodic protection of coated or wrapped pipe would require very typical anode weights & currents. Other options could include using alternatives where appropriate, i.e., plastic, fiberglass or concrete pipe, etc. Last, standard cement mixes should be fine in all of these soils based on these results.

\\\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).

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							59.4	
□							58.4	
△							71.1	
◇							54.3	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-1		25.0-26.5'	Grey Sandy Lean Clay (CL)	CL
□	B-1		26.5-28.0'	Grey Brown Sandy Lean Clay (CL)	CL
△	B-7		36.0-36.5'	Grey Lean Clay W/Sand (CL)	CL
◇	B-7		36.5-38.0'	Brown Sandy Lean Clay (CL)	CL

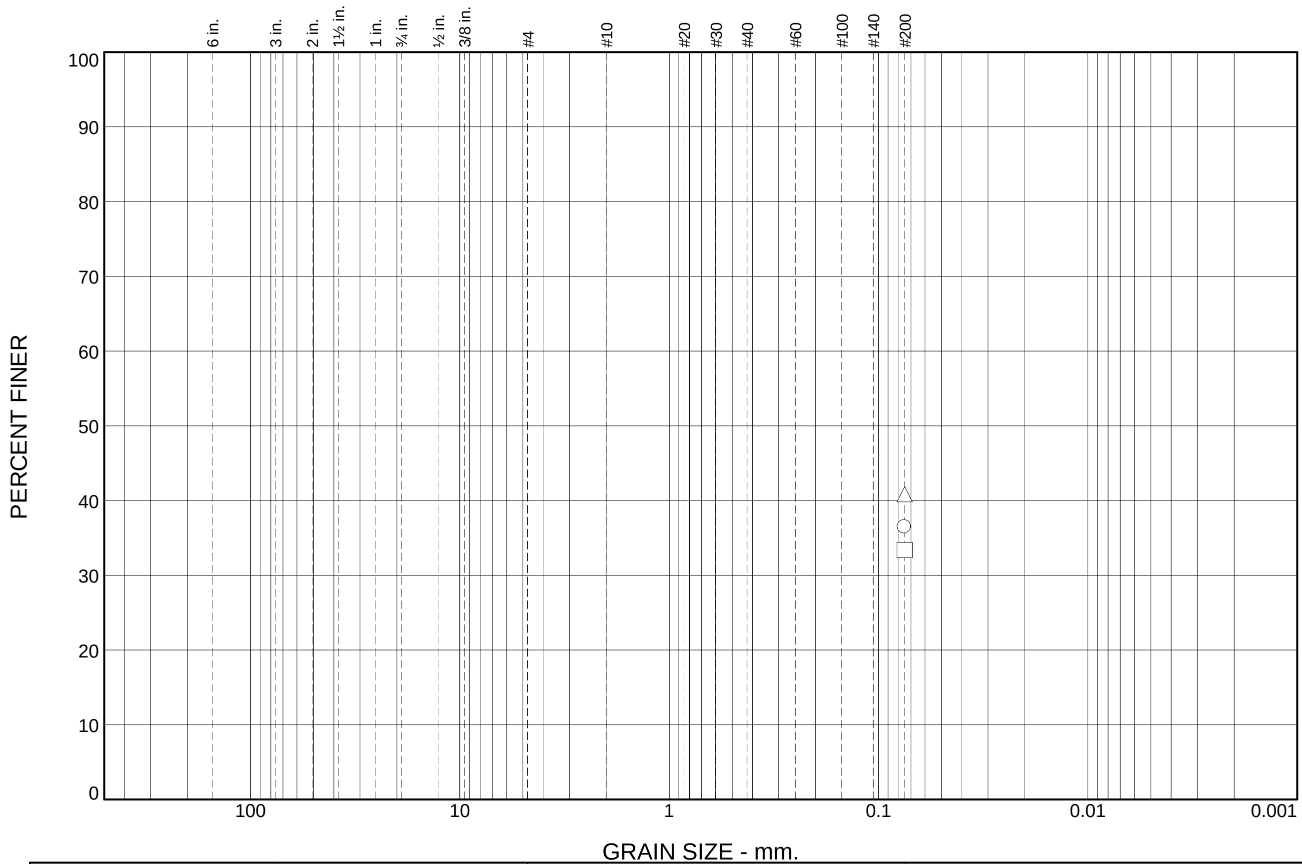
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

Project No.: 568.08.20 **Plate**

Tested By: TMc **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							36.4	
□							33.4	
△							40.8	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-3		46.0-47.5'	Brown Clayey Sand (SC)	SC
□	B-4		30.0-31.5'	Brown Clayey Sand W/Gravel (SC)	SC
△	B-4		36.0-36.5'	Brown Clayey Sand (SC)	SC

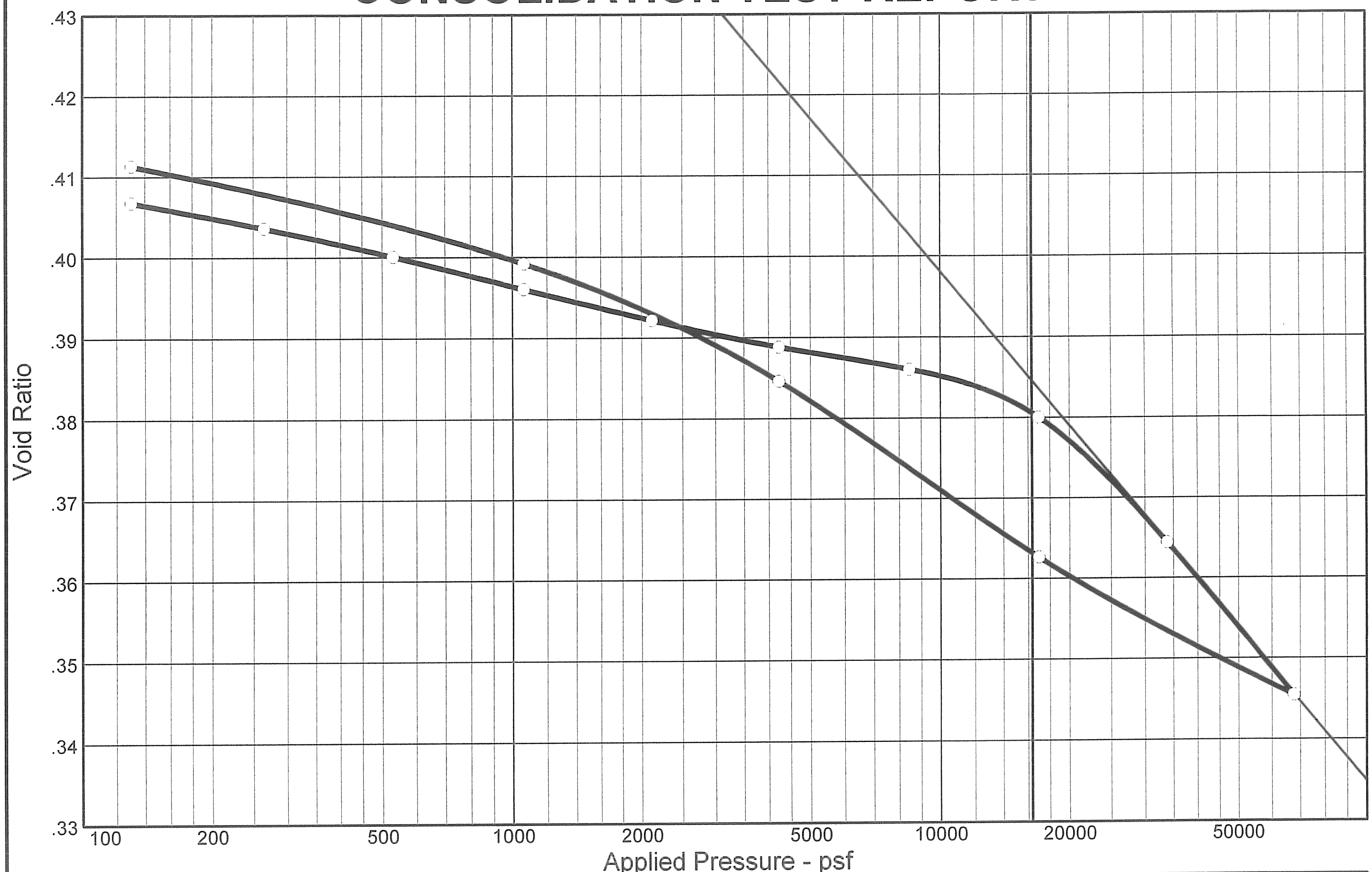
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (psf)	C_v (ft.^{2}/day)	C_α	No.	Load (psf)	C_v (ft.^{2}/day)	C_α	No.	Load (psf)	C_v (ft.^{2}/day)	C_α
8	16940	0.21	0.001								
9	33870	0.14	0.001								

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Swell Press. (psf)	Heave %	e_o
Sat.	Moist.											
99.9 %	15.0 %	119.9			2.70		19901	0.06	0.03			0.406

MATERIAL DESCRIPTION	USCS	AASHTO
Grey Fat Clay (CH)	CH	

Project No. 568.08.20 **Client:** Nichols Consulting Engineers

Project: Richmond-Via Verdi Geotechnical Investigation

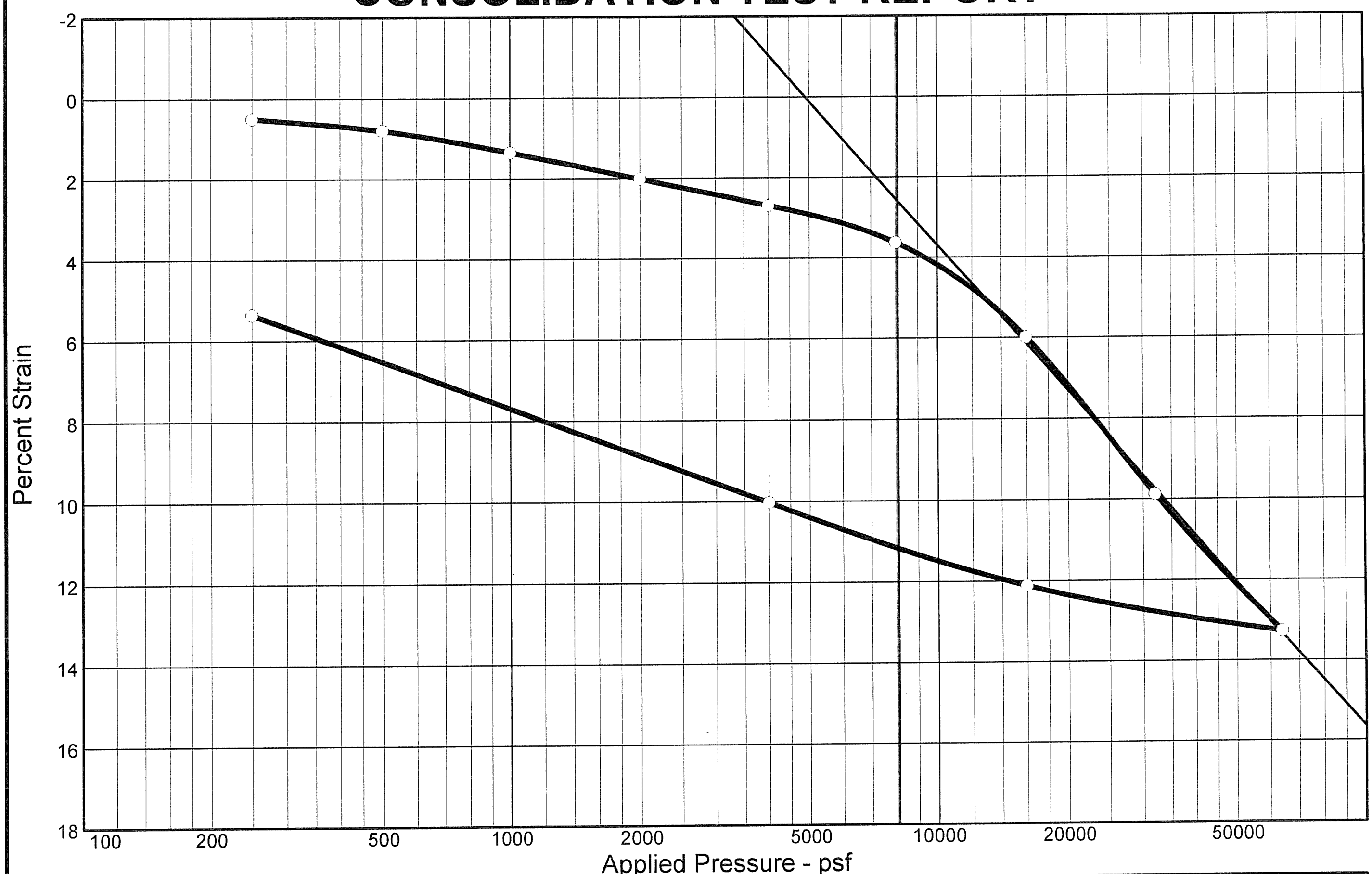
Source: B-1 **Elev./Depth:** 40.5-41.0'

RGH CONSULTANTS, INC.

Remarks:

Plate

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (psf)	C_v (ft.^{2}/day)	C_α	No.	Load (psf)	C_v (ft.^{2}/day)	C_α	No.	Load (psf)	C_v (ft.^{2}/day)	C_α
5	4000	0.04	0.001								
6	8000	0.06	0.002								

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Swell Press. (psf)	Heave %	e_o
Sat.	Moist.											
98.7 %	25.6 %	99.2					10439	0.20	0.05			0.699

MATERIAL DESCRIPTION	USCS	AASHTO
Dark Grey Clayey Sand W/Gravel (SC)	SC	

Project No. 568.08.20 **Client:** Nichols Consulting Engineers

Project: Richmond Via Verdi Geotechnical Investigation

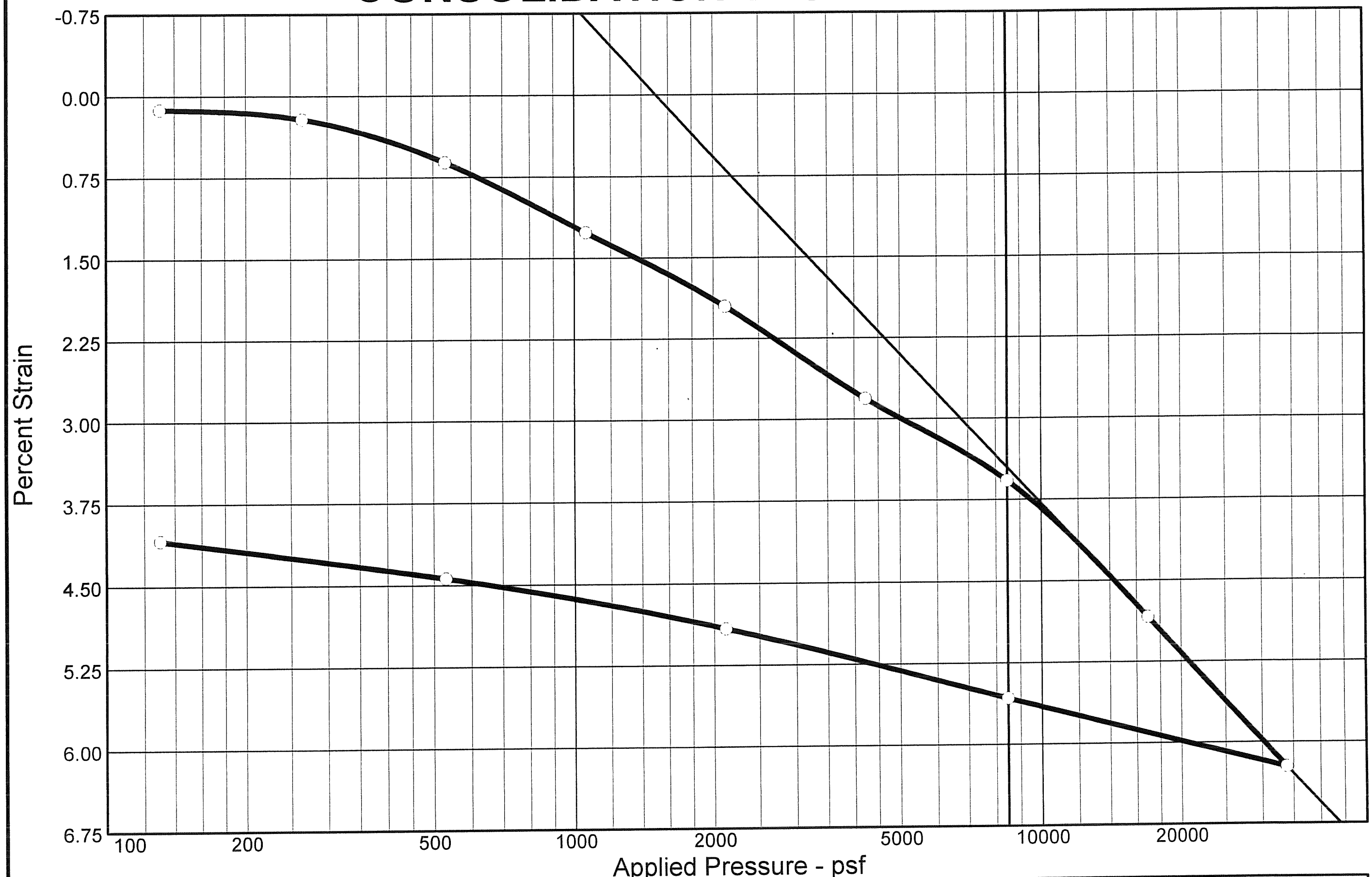
Source: B-3 **Elev./Depth:** 50.0-50.5'

Remarks:

R G H CONSULTANTS, INC.

Plate

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (psf)	C_v (ft.^{2}/day)	C_α	No.	Load (psf)	C_v (ft.^{2}/day)	C_α	No.	Load (psf)	C_v (ft.^{2}/day)	C_α
6	4230	0.10	0.000								
7	8470	0.04	0.001								

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Swell Press. (psf)	Heave %	e_o
Sat.	Moist.											
108.1 %	21.6 %	109.6					9302	0.07	0.01			0.538

MATERIAL DESCRIPTION	USCS	AASHTO
Brown Clayey Sand (SC)	SC	

Project No. 568.08.20 **Client:** Nichols Consulting Engineers

Project: Richmond Via Verdi Geotechnical Investigation

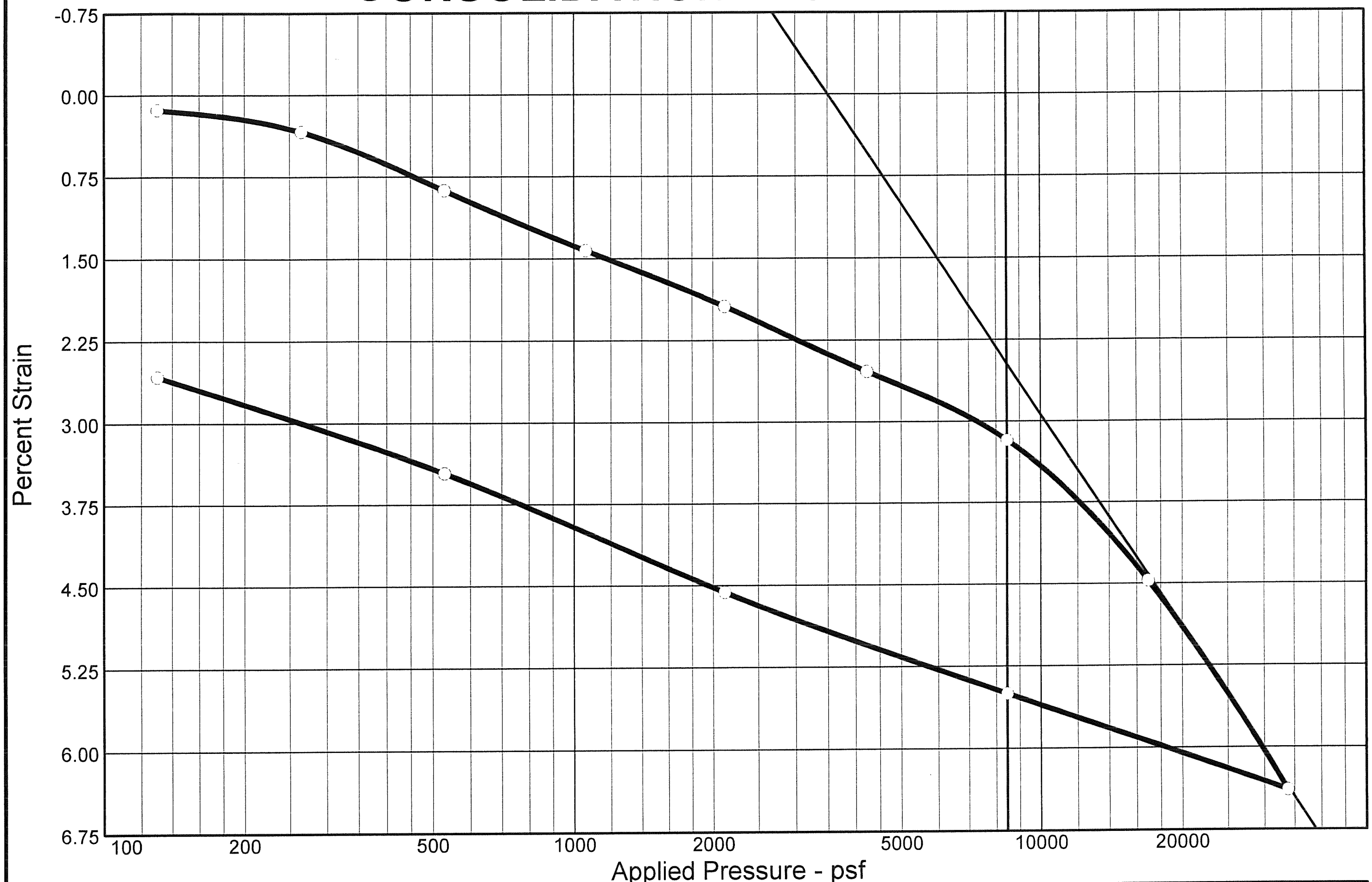
Source: B-4 **Elev./Depth:** 36.0-36.5'

R G H CONSULTANTS, INC.

Remarks:

Plate

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (psf)	C_v (ft.^{2}/day)	C_α	No.	Load (psf)	C_v (ft.^{2}/day)	C_α	No.	Load (psf)	C_v (ft.^{2}/day)	C_α
7	8470	0.07	0.001								

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Swell Press. (psf)	Heave %	e_o
Sat.	Moist.											
100.1 %	18.6 %	112.3	34	16			11718	0.10	0.02			0.501

MATERIAL DESCRIPTION	USCS	AASHTO
Brown Sandy Lean Clay (CL)	CL	

Project No. 568.08.20 **Client:** Nichols Consulting Engineers

Project: Richmond Via Verdi Geotechnical Investigation

Source: B-4 **Elev./Depth:** 41.0-41.5'

Remarks:

R G H CONSULTANTS, INC.

Plate

RGH Consultants, Inc.

MOISTURE DENSITY

Project Name: Richmond-Via Verdi **Project #:** 568.08.20 **Date:** 7/23/2010

Boring	B-1	B-1	B-2	B-2	B-2	B-2	B-6	B-6
Depth	6.0-6.5'	16.0'	31.0'	46.0'	51.0'	61.0'	11.0'	21.0'
Length (in)	5.95	4.85	5.70	6.00	4.85	5.75	6.00	5.95
Diameter (in)	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43
Tube + Wet Soil (g)	1143.2	755.4	945.6	1201.8	805.9	923.0	1128.4	1127.2
Tube (g)	204.0	0.0	0.0	203.3	0.0	0.0	213.7	206.1
Wet Soil (g)	939.2	755.4	945.6	998.5	805.9	923.0	914.7	921.1
Tare + Wet Soil (g)	214.5	196.6	209.8	217.1	250.2	207.7	223.2	228.4
Tare + Dry Soil (g)	188.7	170.4	186.8	193.6	219.4	183.2	193.4	196.7
Tare Weight (g)	49.2	49.6	50.4	49.7	49.2	50.1	49.9	49.9
Moisture Loss (g)	25.8	26.2	23.0	23.5	30.8	24.5	29.8	31.7
Dry Soil (g)	139.5	120.8	136.4	143.9	170.2	133.1	143.5	146.8
Wet Density (pcf)	130	128	136	137	136	132	125	127
Dry Density (pcf)	109	105	117	118	116	111	104	105
Moisture Content (%)	18.5	21.7	16.9	16.3	18.1	18.4	20.8	21.6

Boring	B-6	B-6	B-6	B-6	B-6	B-7	B-7	B-7
Depth	36.0'	41.0'	46.0'	51.0'	61.0'	11.0'	21.0'	26.0'
Length (in)	6.00	6.00	6.00	5.95	4.40	4.10	6.00	5.30
Diameter (in)	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43
Tube + Wet Soil (g)	1093.0	1085.8	1138.4	1100.5	703.5	841.7	1172.4	1122.0
Tube (g)	206.3	208.6	217.9	204.6	0.0	204.2	213.7	259.7
Wet Soil (g)	886.7	877.2	920.5	895.9	703.5	637.5	958.7	862.3
Tare + Wet Soil (g)	266.1	274.8	249.3	276.4	256.6	202.7	230.5	235.8
Tare + Dry Soil (g)	216.2	222.2	210.7	229.8	225.7	176.8	198.7	208.8
Tare Weight (g)	50.3	50.3	49.6	49.8	50.5	49.4	49.7	50.1
Moisture Loss (g)	49.9	52.6	38.6	46.6	30.9	25.9	31.8	27.0
Dry Soil (g)	165.9	171.9	161.1	180.0	175.2	127.4	149.0	158.7
Wet Density (pcf)	121	120	126	124	131	128	131	134
Dry Density (pcf)	93	92	102	98	112	106	108	114
Moisture Content (%)	30.1	30.6	24.0	25.9	17.6	20.3	21.3	17.0

Boring	B-7							
Depth	44.5'							
Length (in)	5.40							
Diameter (in)	2.43							
Tube + Wet Soil (g)	1051.4							
Tube (g)	213.8							
Wet Soil (g)	837.6							
Tare + Wet Soil (g)	245.5							
Tare + Dry Soil (g)	209.0							
Tare Weight (g)	49.9							
Moisture Loss (g)	36.5							
Dry Soil (g)	159.1							
Wet Density (pcf)	127							
Dry Density (pcf)	104							
Moisture Content (%)	22.9							

RGH Consultants, Inc.

MOISTURE DENSITY

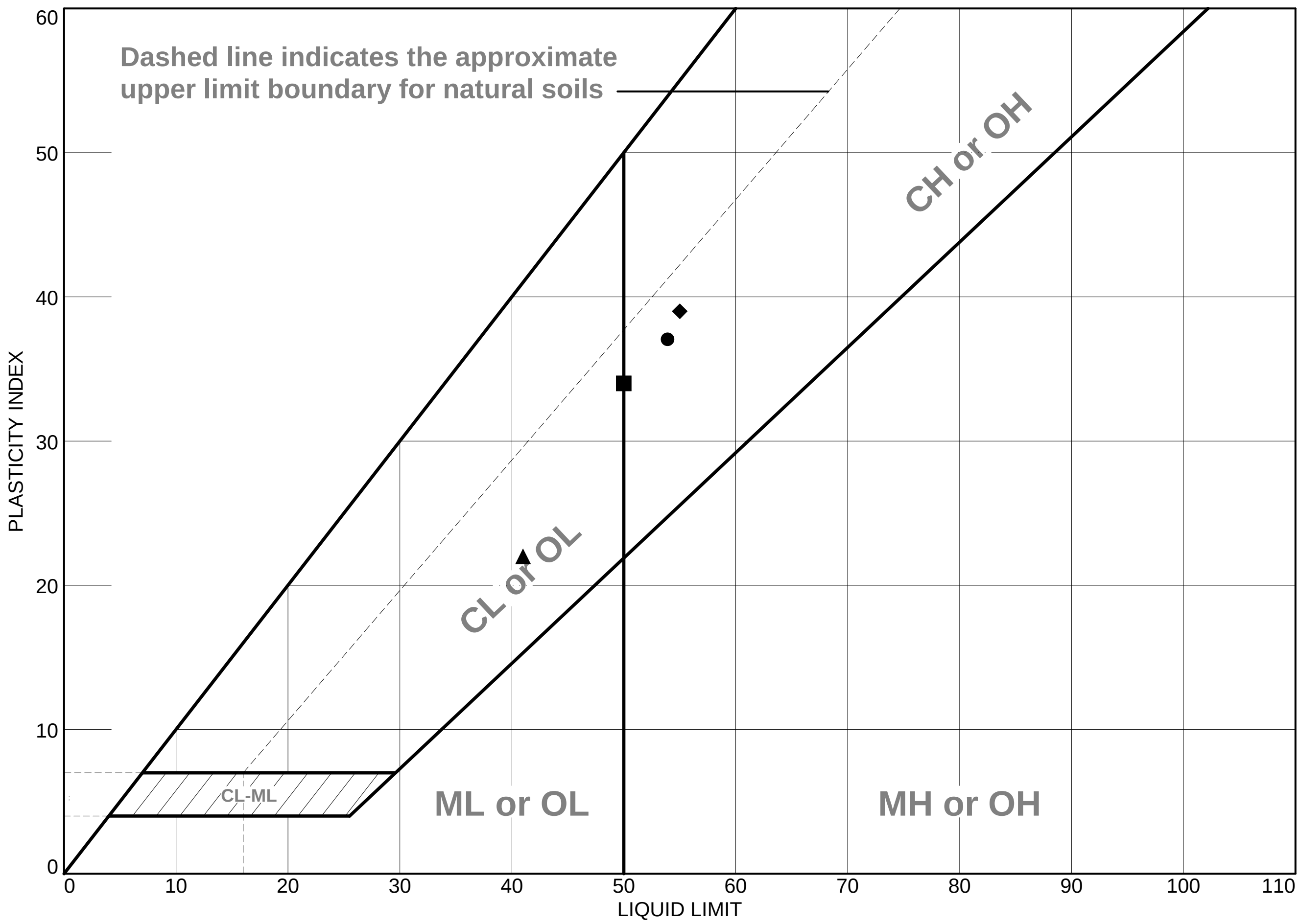
Project Name: Richmond-Via Verdi **Project #:** 568.08.20 **Date:** 12/1/2010

Boring	B-3	B-3	B-3	B-3	B-3	B-3	B-3	
Depth	5.0-6.5'	7.5-8.0'	11.0-11.5'	15.0-16.5'	26.0-26.5'	40.0-40.5'	45.5-47.0'	
Length (in)		5.30			5.10	5.30		
Diameter (in)		2.40			2.41	2.43		
Tube + Wet Soil (g)		776.0			730.0	830.5		
Tube (g)		0.0			0.0	0.0		
Wet Soil (g)		776.0			730.0	830.5		
Tare + Wet Soil (g)	203.3	158.4	196.1	160.5	202.7	115.8	304.9	
Tare + Dry Soil (g)	180.2	141.7	170.6	143.4	172.7	102.3	272.1	
Tare Weight (g)	50.2	50.1	49.2	49.2	49.8	50.0	83.2	
Moisture Loss (g)	23.1	16.7	25.5	17.1	30.0	13.5	32.8	
Dry Soil (g)	130.0	91.6	121.4	94.2	122.9	52.3	188.9	
Wet Density (pcf)		123			120	129		
Dry Density (pcf)		104			96	102		
Moisture Content (%)	17.8	18.2	21.0	18.2	24.4	25.8	17.4	

Boring	B-4	B-4						
Depth	6.0-6.5'	21.5-23.0'						
Length (in)								
Diameter (in)								
Tube + Wet Soil (g)								
Tube (g)								
Wet Soil (g)								
Tare + Wet Soil (g)	223.9	306.4						
Tare + Dry Soil (g)	193.7	270.8						
Tare Weight (g)	50.9	109.6						
Moisture Loss (g)	30.2	35.6						
Dry Soil (g)	142.8	161.2						
Wet Density (pcf)								
Dry Density (pcf)								
Moisture Content (%)	21.1	22.1						

Boring								
Depth								
Length (in)								
Diameter (in)								
Tube + Wet Soil (g)								
Tube (g)								
Wet Soil (g)								
Tare + Wet Soil (g)								
Tare + Dry Soil (g)								
Tare Weight (g)								
Moisture Loss (g)								
Dry Soil (g)								
Wet Density (pcf)								
Dry Density (pcf)								
Moisture Content (%)								

LIQUID AND PLASTIC LIMITS TEST REPORT



	Material Description	Sampled	Tested	Technician	LL	PL	PI	%<#40	USCS
○	Mottled Black And Brown Fat Clay W/Sand (CH)		7-22-10	TMc	54	17	37		CH
□	Brown Sandy Lean Clay W/Gravel (CL)		7-22-10	TMc	50	16	34		CL
△	Light Brown Sandy Lean Clay (CL)		7-22-10	TMc	41	19	22		CL
◇	Grey Fat Clay W/Sand (CH)		7-20-10	TMc	55	16	39		CH

Project No. 568.08.20 **Client:** Nichols Consulting Engineers

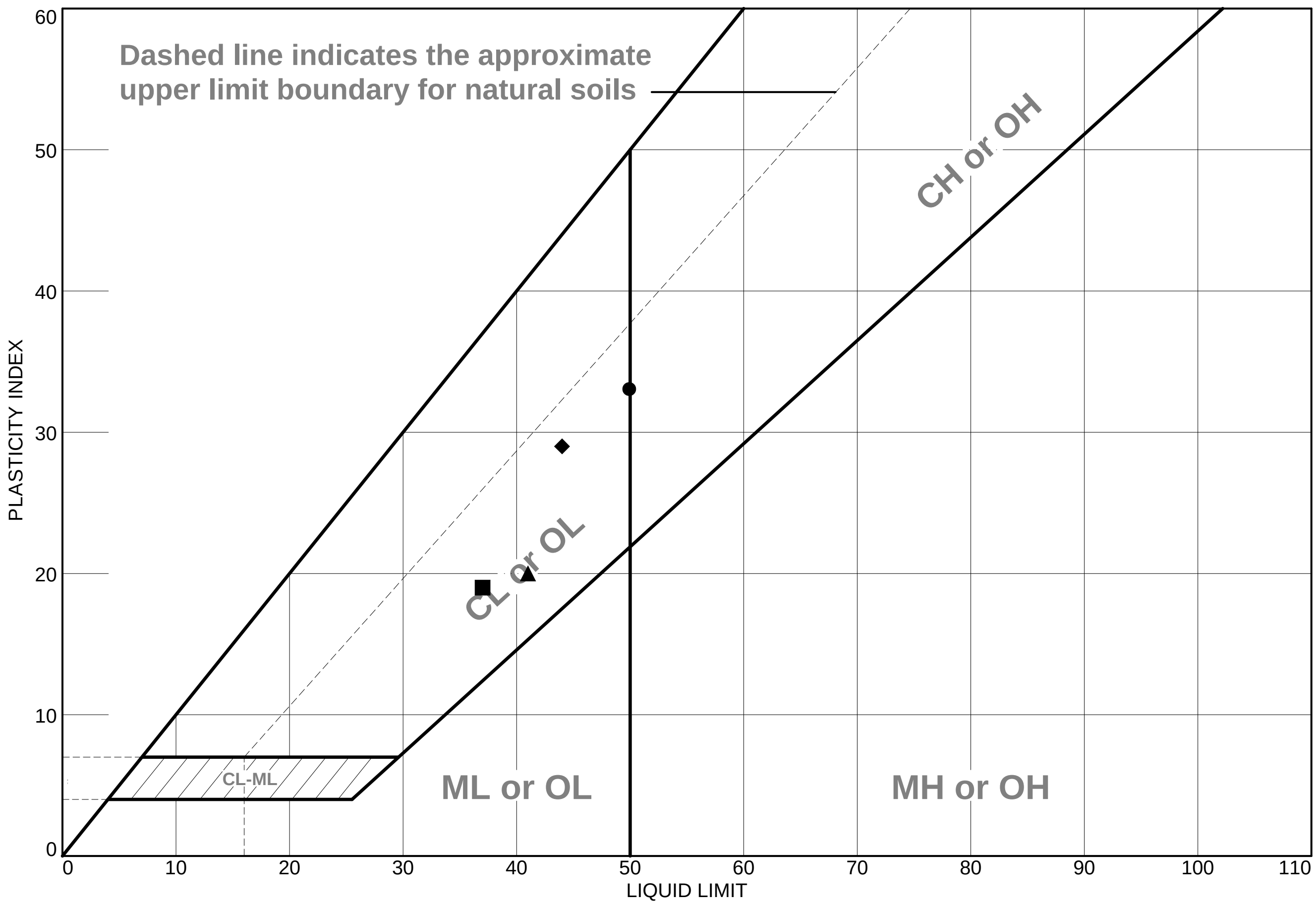
Project: Richmond-Via Verdi Geotechnical Investigation

○ **Source of Sample:** B-1 **Depth:** 6.0-6.5'
□ **Source of Sample:** B-1 **Depth:** 11.0-11.5'
△ **Source of Sample:** B-1 **Depth:** 16.0-16.5'
◇ **Source of Sample:** B-2 **Depth:** 21.5-23.0'

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor
Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



Symbol	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Lean Clay W/Sand (CL)	50	17	33			CL
■	Brown Lean Clay W/Sand (CL)	37	18	19			CL
▲	Light Brown Sandy Lean Clay (CL)	41	21	20			CL
◆	Brown Clayey Sand (SC)	44	15	29		36.4	SC

Project No. 568.08.20 **Client:** Nichols Consulting Engineers

Project: Richmond Via Verdi Geotechnical Investigation

●**Source of Sample:** B-3 **Depth:** 6.0-6.5'
■**Source of Sample:** B-3 **Depth:** 15.0-16.5'
▲**Source of Sample:** B-3 **Depth:** 40.0-40.5'
◆**Source of Sample:** B-3 **Depth:** 45.5-47'

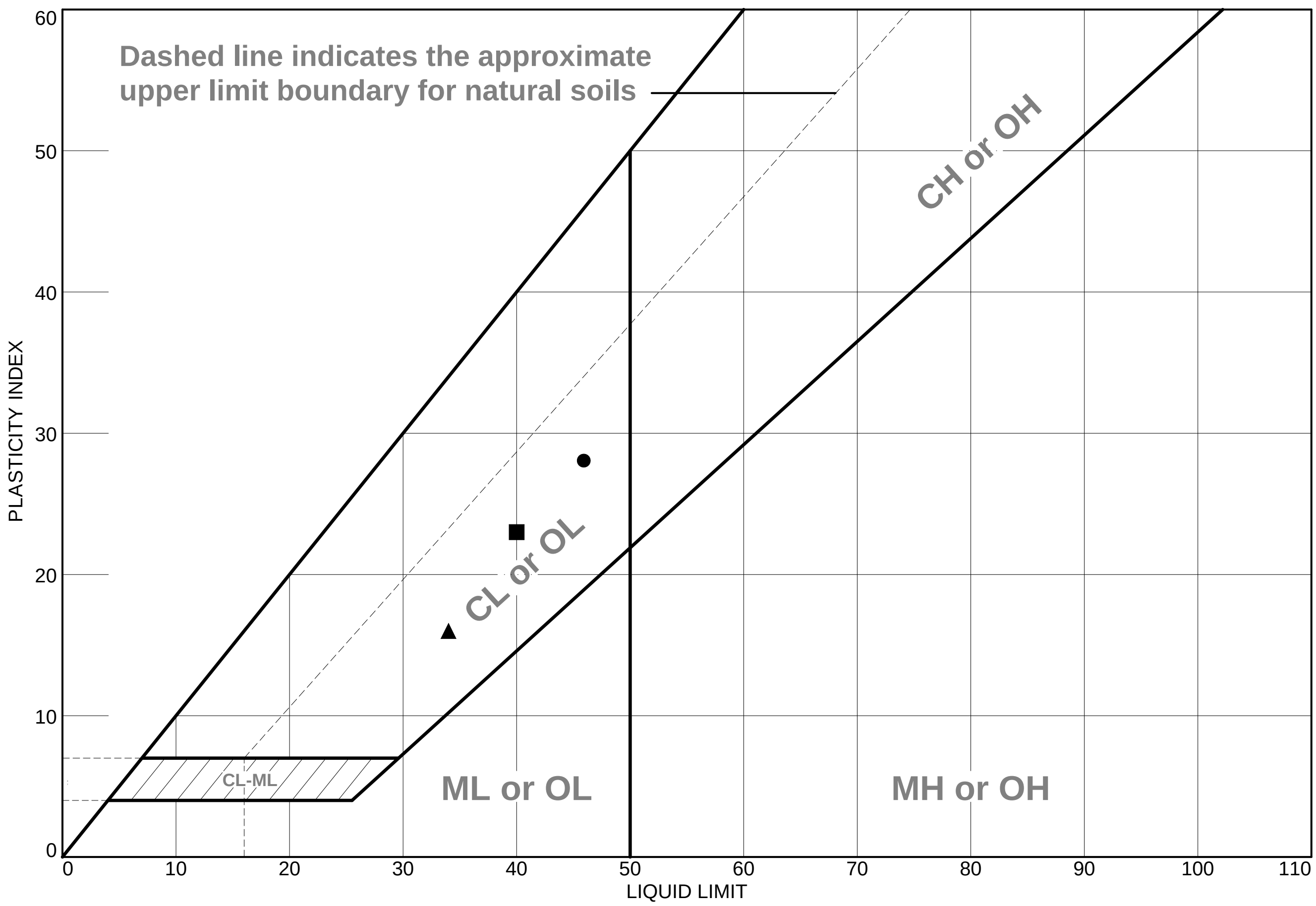
R G H CONSULTANTS, INC.

Remarks:

Plate

Tested By: CMc **Checked By:** TMc

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Sandy Lean Clay (CL)	46	18	28	77.0	58.3	CL
■	Brown Sandy Lean Clay (CL)	40	17	23	90.3	65.6	CL
▲	Brown Sandy Lean Clay (CL)	34	18	16			CL

Project No. 568.08.20 **Client:** Nichols Consulting Engineers

Project: Richmond Via Verdi Geotechnical Investigation

●**Source of Sample:** B-4 **Depth:** 11.0-11.5'
■**Source of Sample:** B-4 **Depth:** 21.5-23.0'
▲**Source of Sample:** B-4 **Depth:** 41.0-41.5'

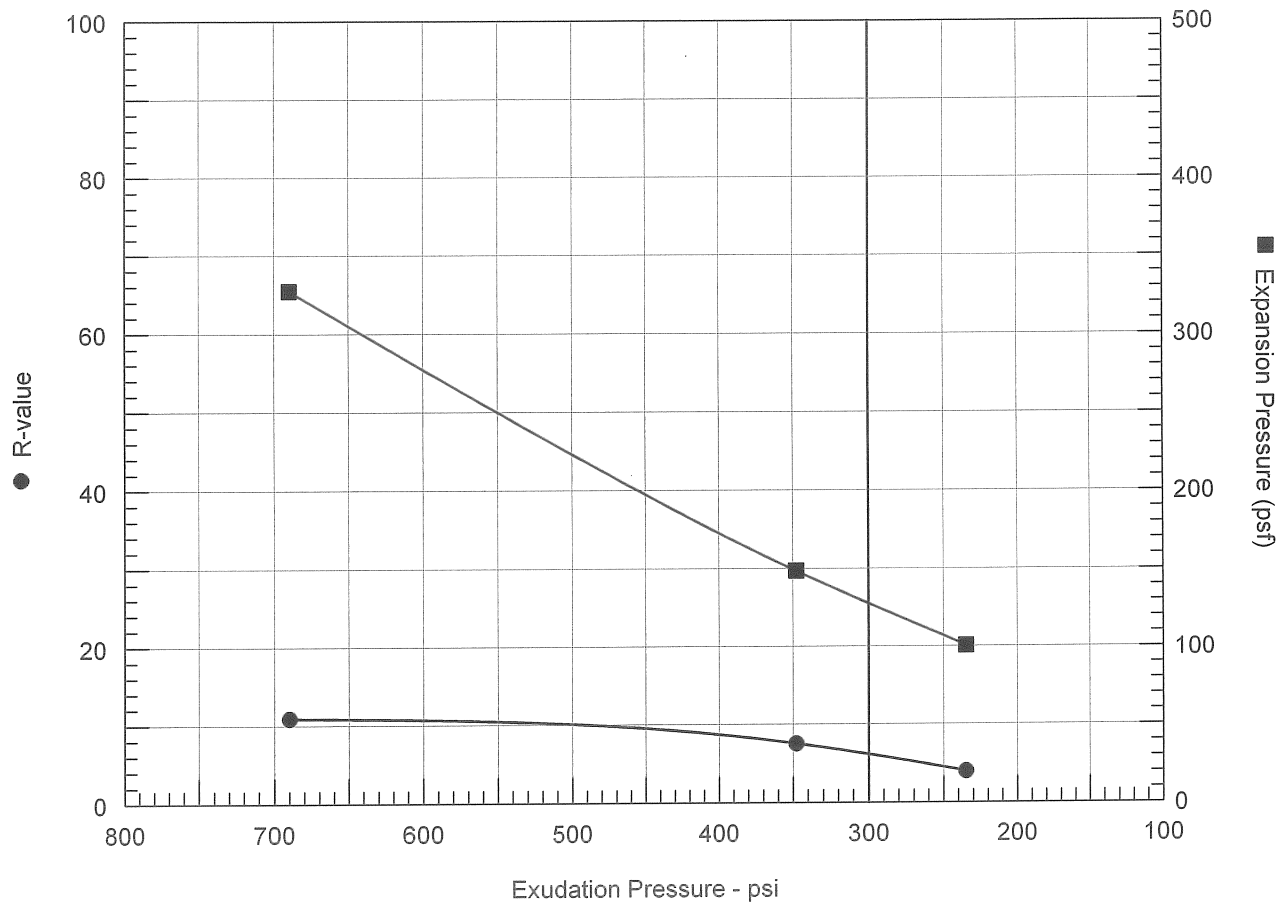
R G H CONSULTANTS, INC.

Remarks:

Plate

Tested By: CMc **Checked By:** TMc

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	90	103.9	22.9	100	150	2.57	235	4	4
2	110	106.5	21.1	148	143	2.54	348	8	8
3	160	112.7	18.3	327	138	2.52	690	11	11

Test Results	Material Description
R-value at 300 psi exudation pressure = 6 **Exp. pressure at 300 psi exudation pressure =** 128 psf	Brown Sandy Fat Clay (CH)

Project No.: 568.08.20

Project: Richmond-Via Verdi Geotechnical Investigation

Source of Sample: B-2 **Depth:** 2.0-5.0'

Date: 7/26/2010

Tested by: GEF

Checked by: TMc

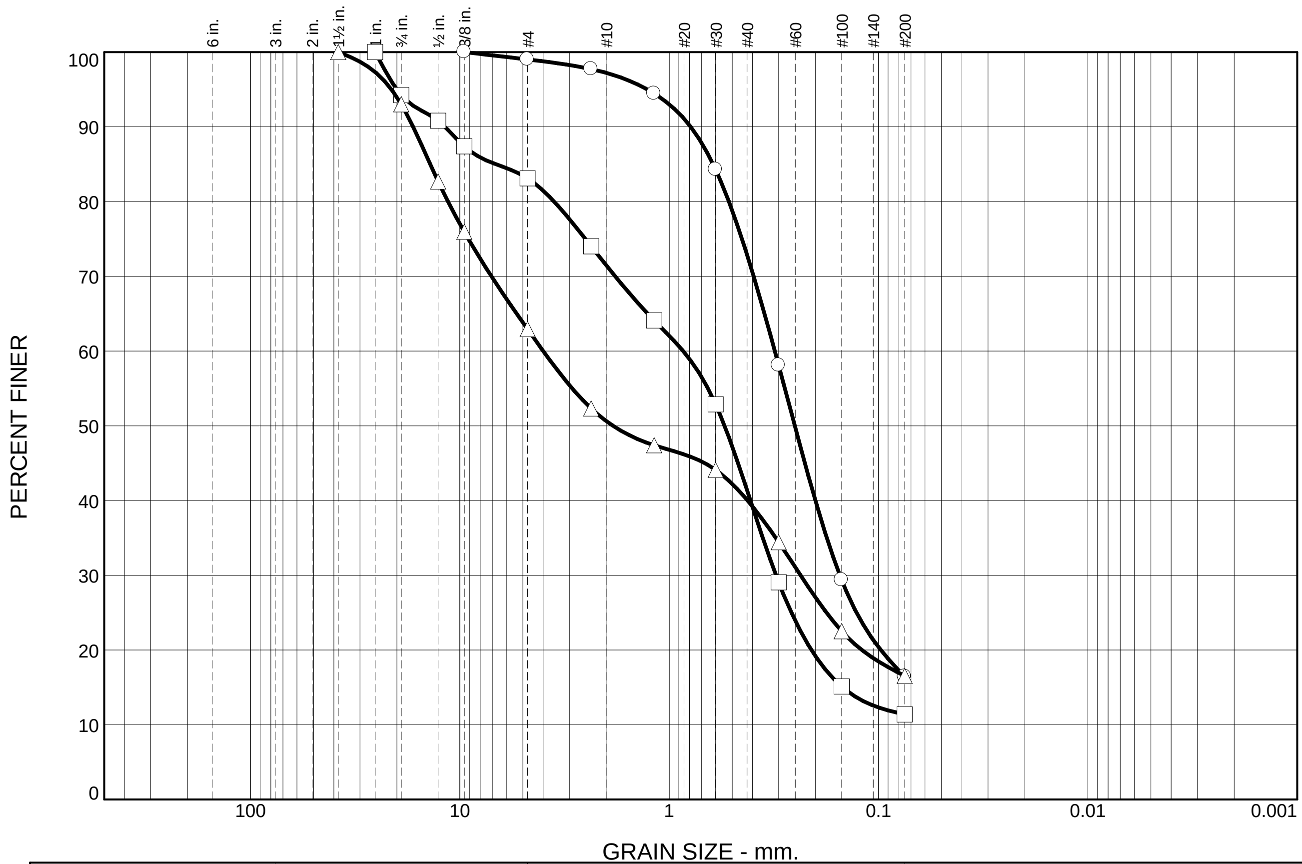
Remarks:

R-VALUE TEST REPORT

RGH CONSULTANTS, INC.

Plate ______

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.0	1.8	24.3	56.4	16.5	
□	0.0	5.8	11.1	11.6	30.1	30.0	11.4	
△	0.0	7.0	30.1	12.3	10.5	23.6	16.5	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-1		29.5-30.0'	Dark Grey Clayey Sand (SC)	SC
□	B-1		30.0-31.5'	Grey Brown Sand W/Clay And Gravel (SC-SP)	SC-SP
△	B-1		35.5-36.5'	Brown Clayey Sand W/Gravel (SC)	SC

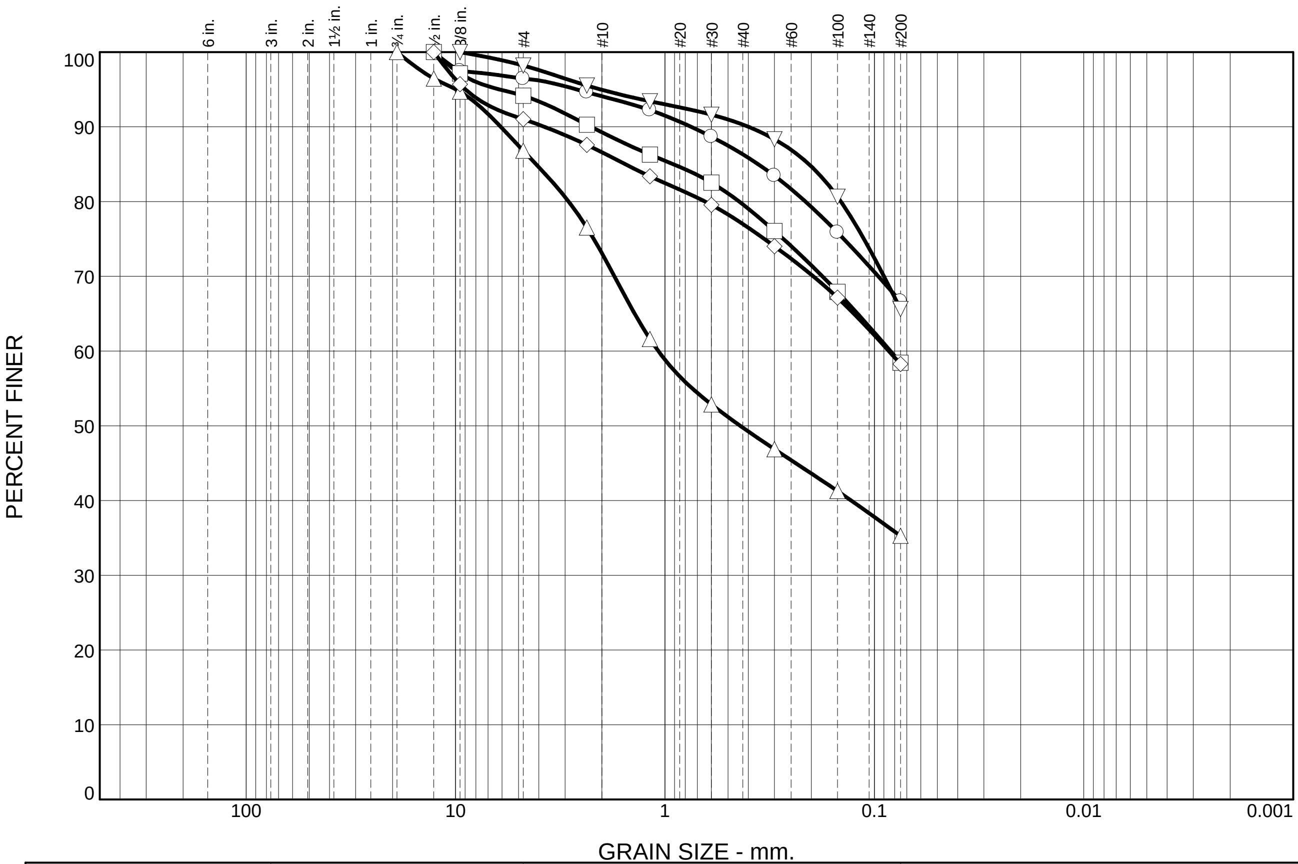
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Richmond-Via Verdi Geotechnical Investigation

Project No.: 568.08.20 **Plate**

Tested By: TMc **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.6	2.3	7.8	19.6	66.7	
□	0.0	0.0	5.8	4.9	9.7	21.2	58.4	
△	0.0	0.0	13.2	13.7	23.3	14.5	35.3	
◇	0.0	0.0	9.0	4.4	9.6	18.7	58.3	
▽	0.0	0.0	1.8	3.2	4.7	24.7	65.6	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-3		31.0-31.5'	Light Brown Sandy Lean Clay (CL)	CL
□	B-3		45.0-45.5'	Black Sandy Fat Clay (CH)	CH
△	B-3		50.0-50.5'	Dark Grey Clayey Sand W/Gravel (SC)	SC
◇	B-4		11.0-11.5'	Brown Sandy Lean Clay (CL)	CL
▽	B-4		21.5-23.0'	Brown Sandy Lean Clay (CL)	CL

R G H CONSULTANTS, INC.

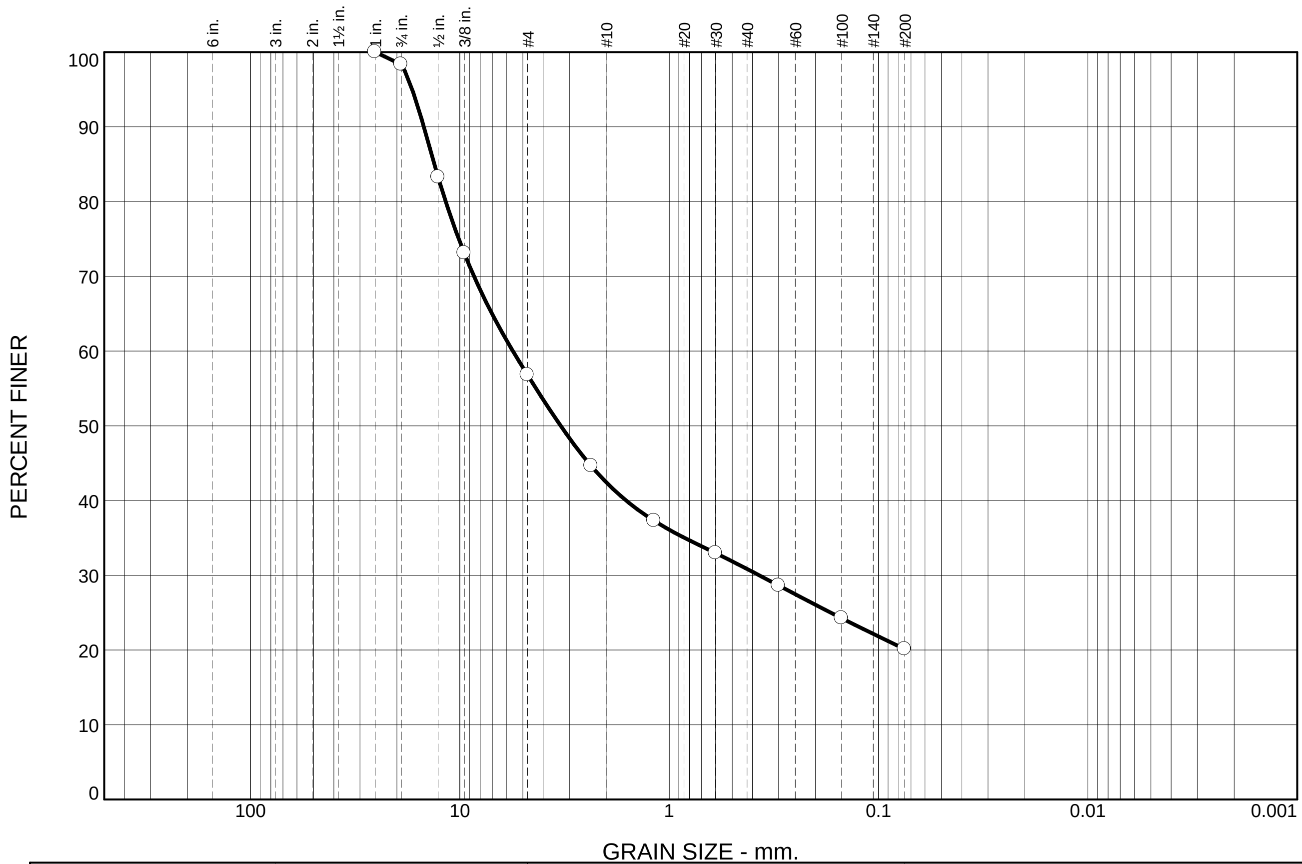
Client: Nichols Consulting Engineers
Project: Richmond Via Verdi Geotechnical Investigation

Project No.: 568.08.20 **Plate**

Tested By: ○ TMc □ CMc △ GEF ◇ CMc ▽ CMc **Checked By:** TMc

FORENSIC BULK SAMPLES

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	2	41	15	11	11	20	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	VV#2			Brown Clayey Gravel W/Sand (GC)	GC

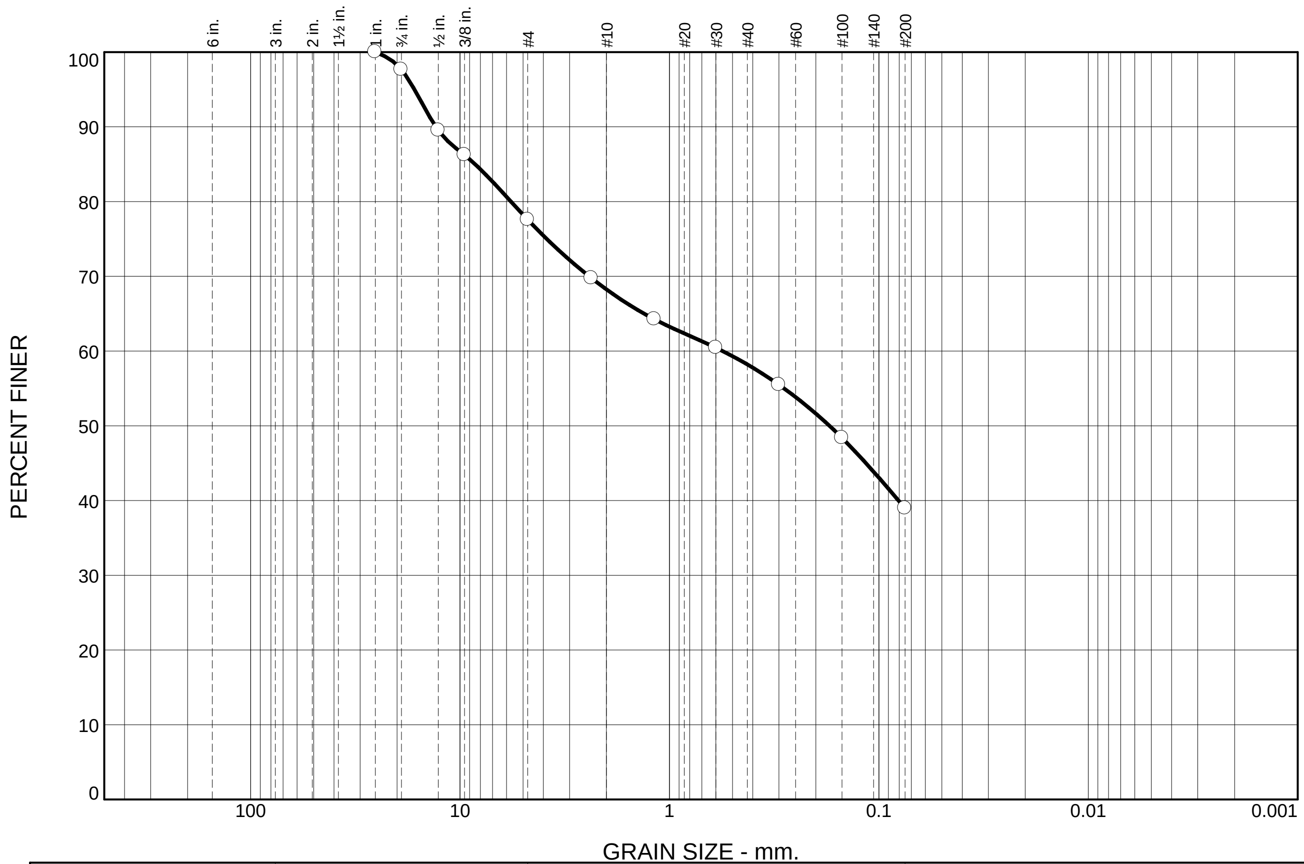
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	2	20	10	10	19	39	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	VV#4			Brown Clayey Sand W/Gravel (SC)	SC

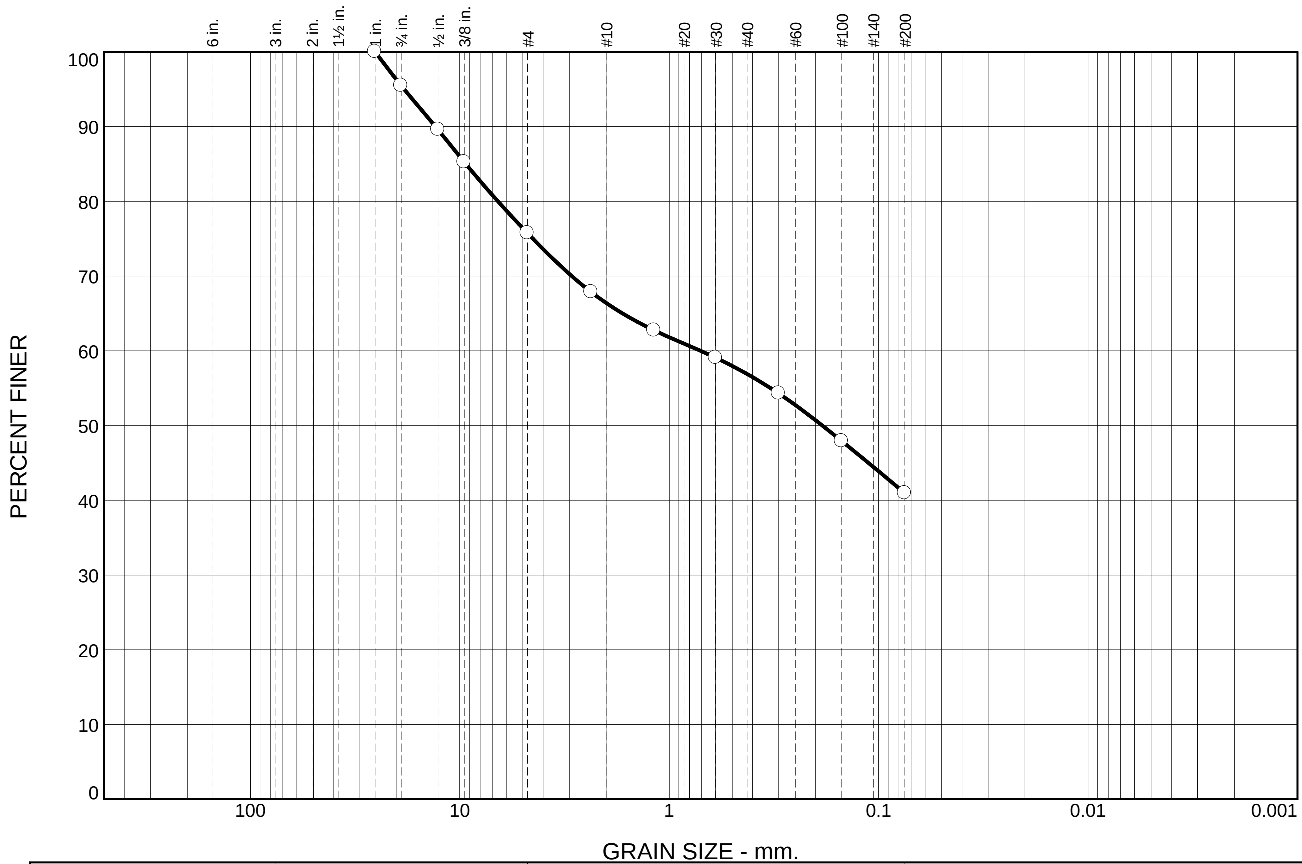
RGH CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	5	19	10	9	16	41	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	VV#5			Brown Clayey Sand W/Gravel (SC)	SC

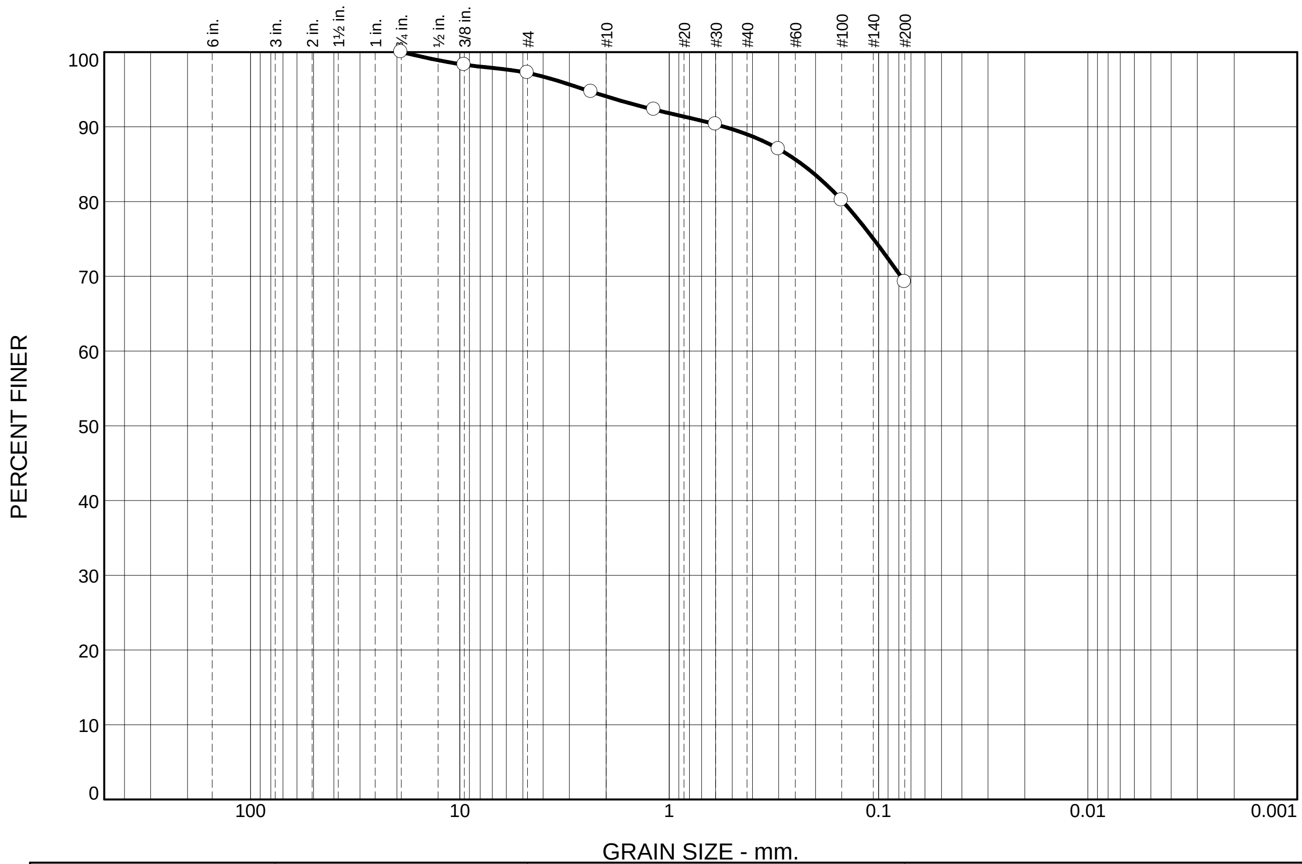
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	3	3	5	20	69	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	VV#6			Dark Brown Sandy Elastic Silt (MH)	MH

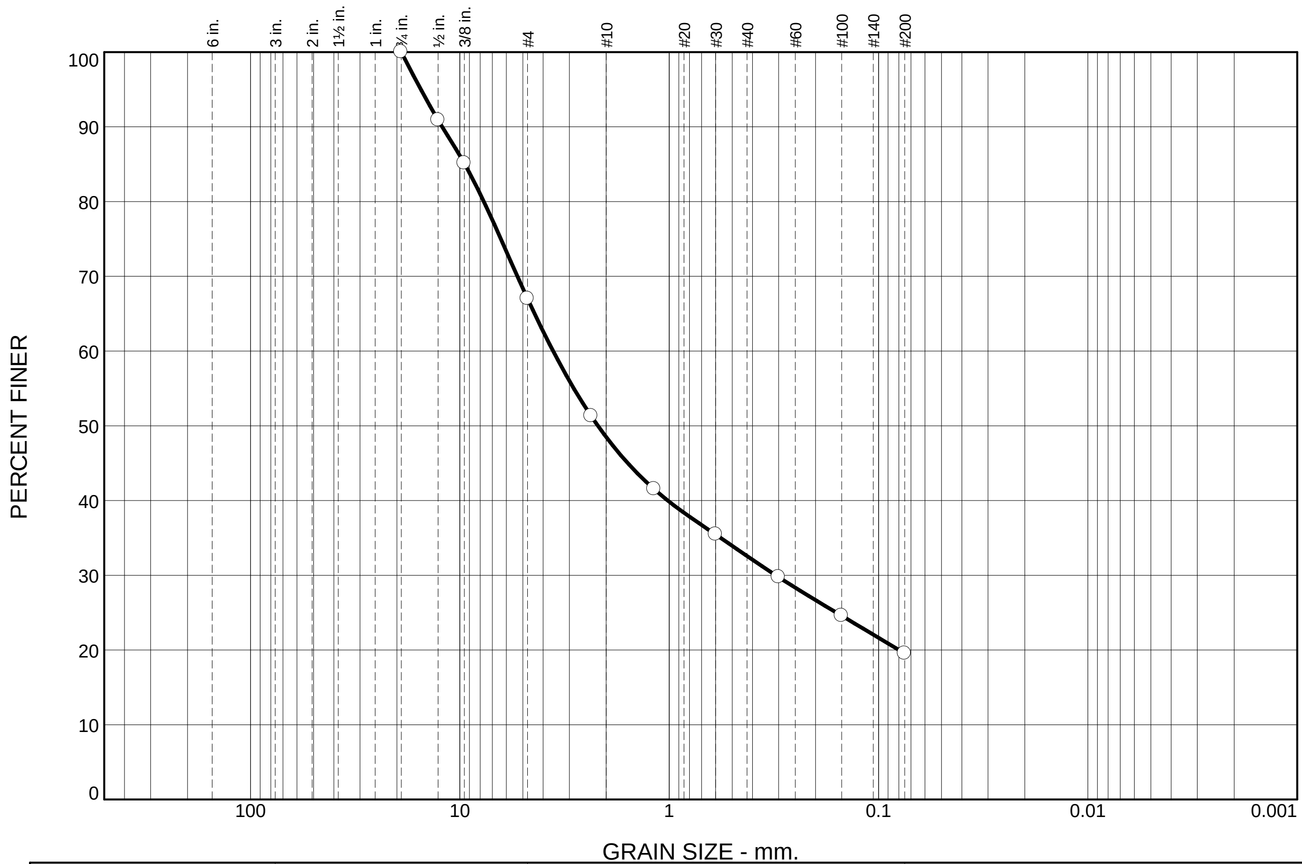
RGH CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	33	19	15	13	20	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	VV#7A			Brown Clayey Sand W/Gravel (SC)	SC

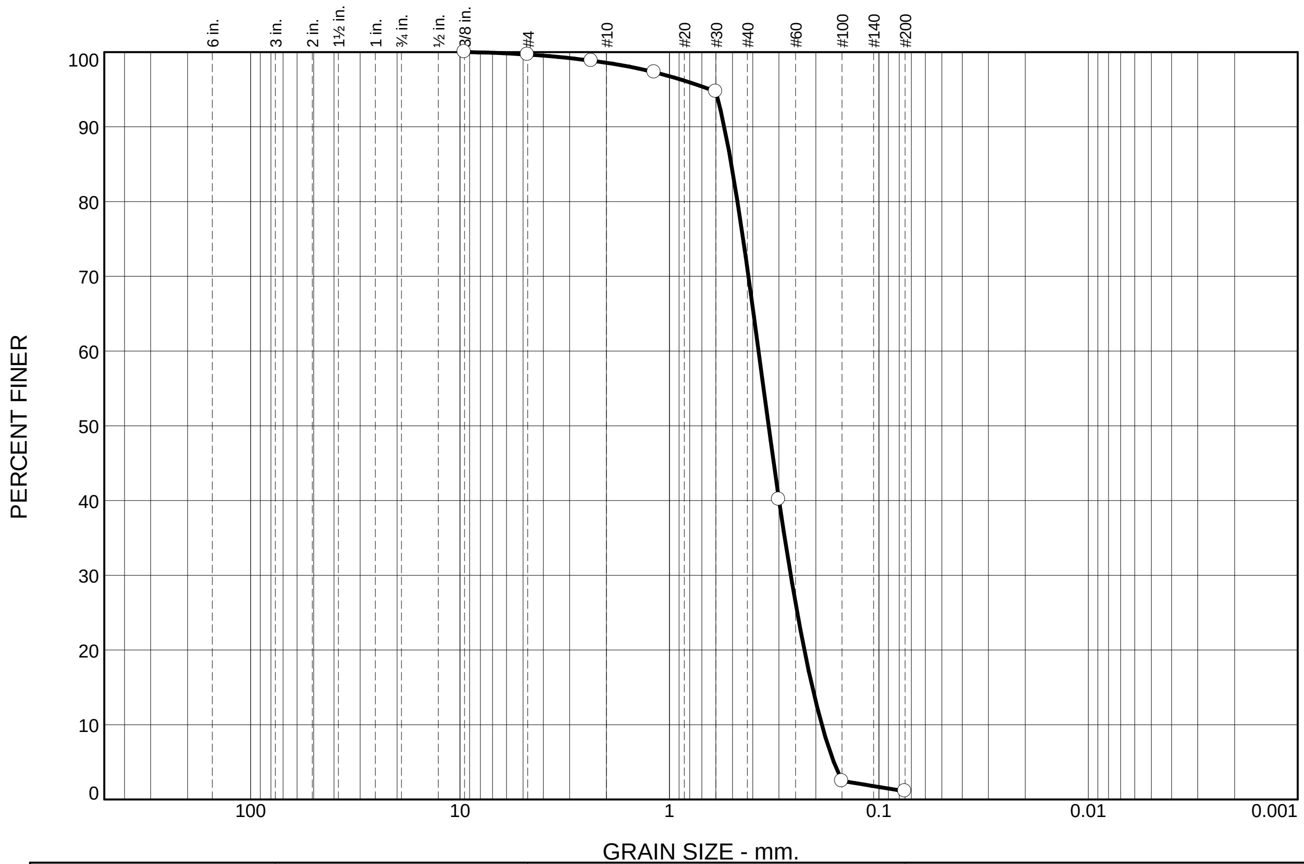
RGH CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.3	1.1	27.5	70.0	1.1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP# 1-1		0.0'	Brown Sand (SP)	SP

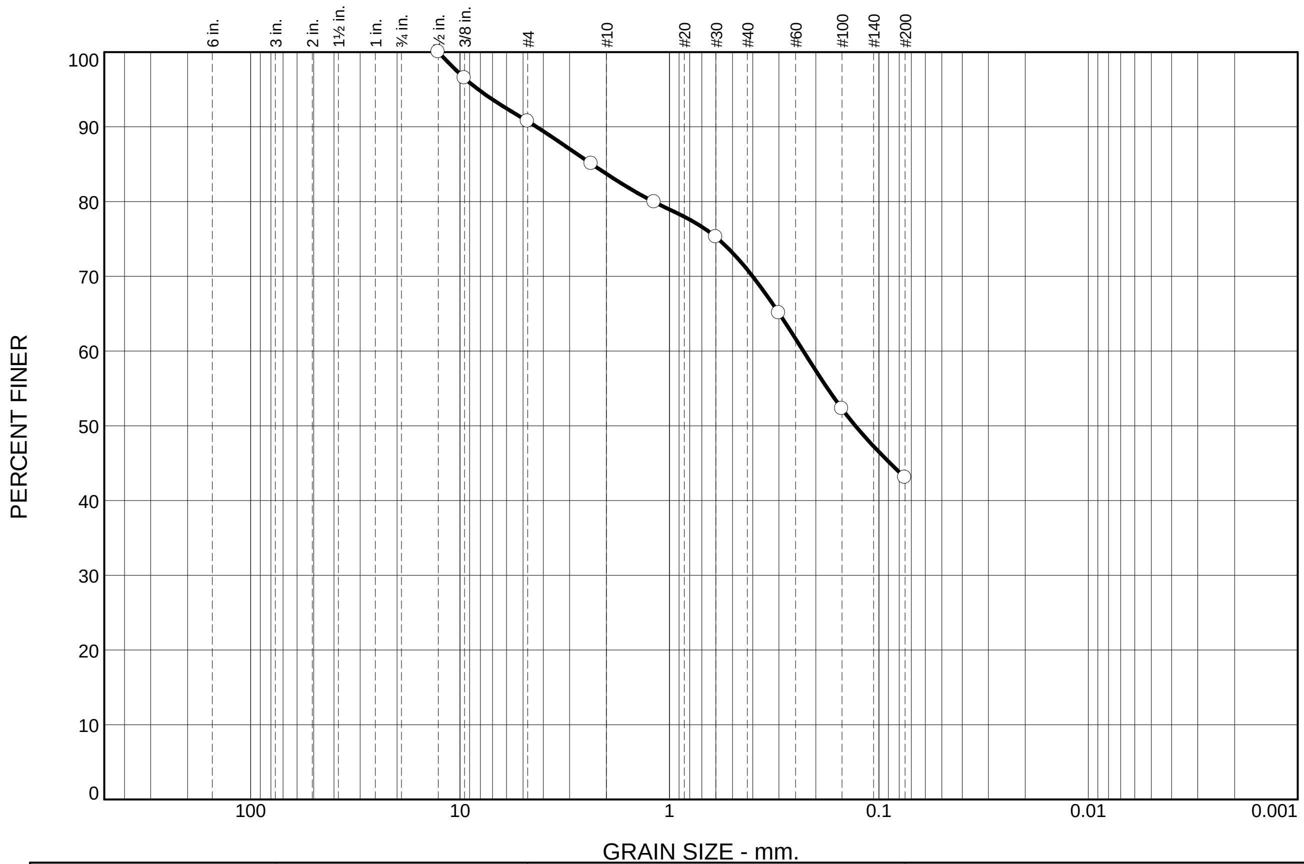
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.3	7.0	12.8	27.8	43.1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP# 1-2		0.0'	Brown Clayey Sand (SC)	SC

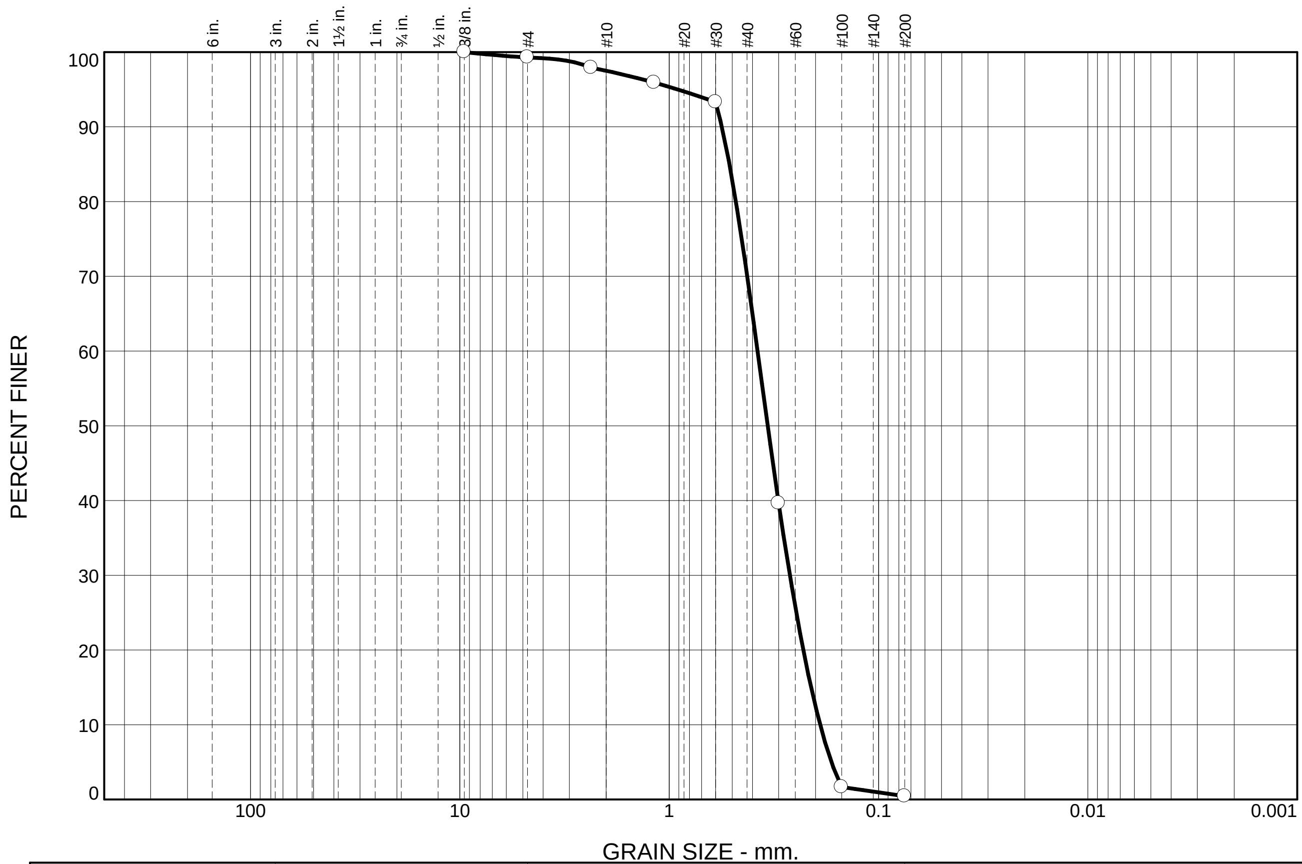
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.7	1.8	27.3	69.8	0.4	

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP# 3		0.0'	Brown Sand (SP)	SP

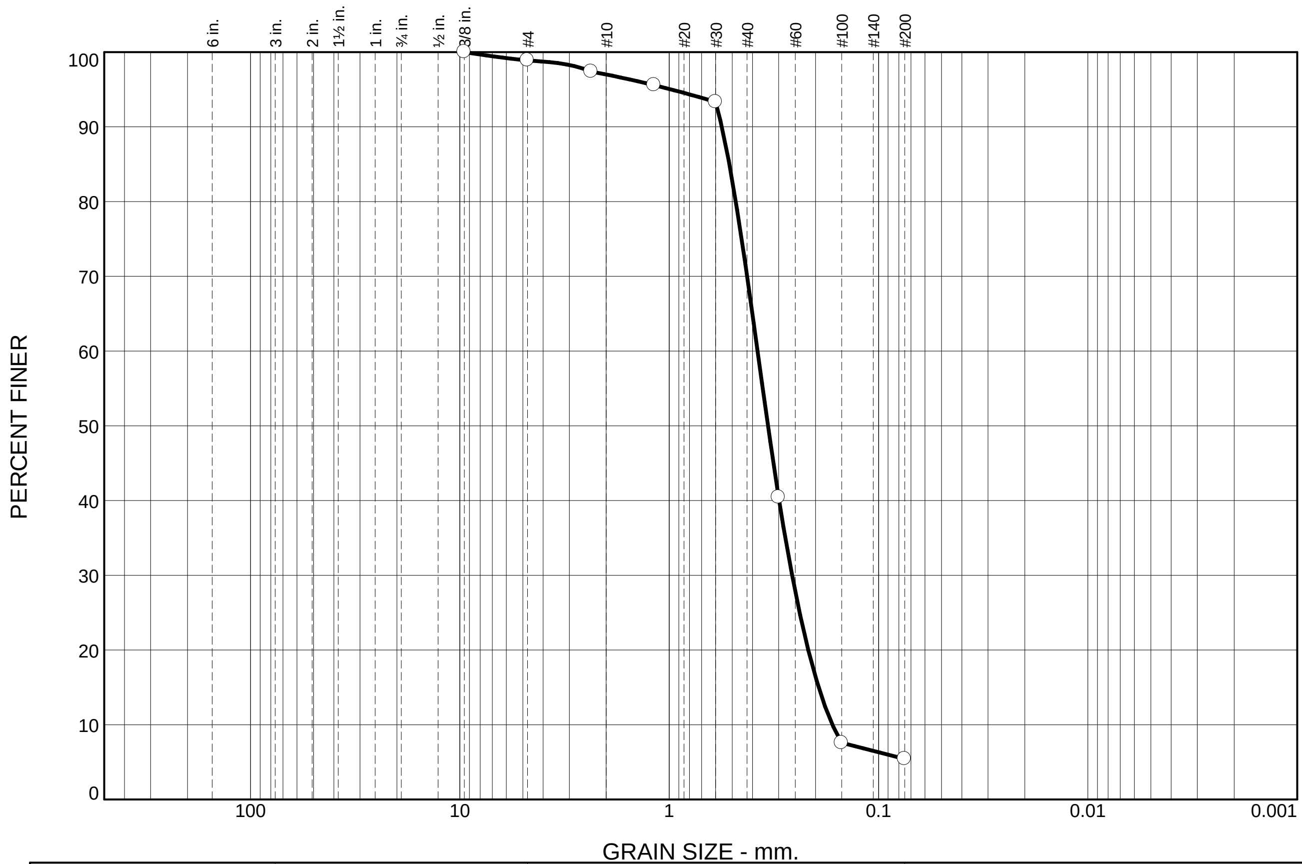
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.1	1.9	26.9	64.7	5.4	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP2-1			Brown Sand W/Clay (SP-SC)	SP-SC

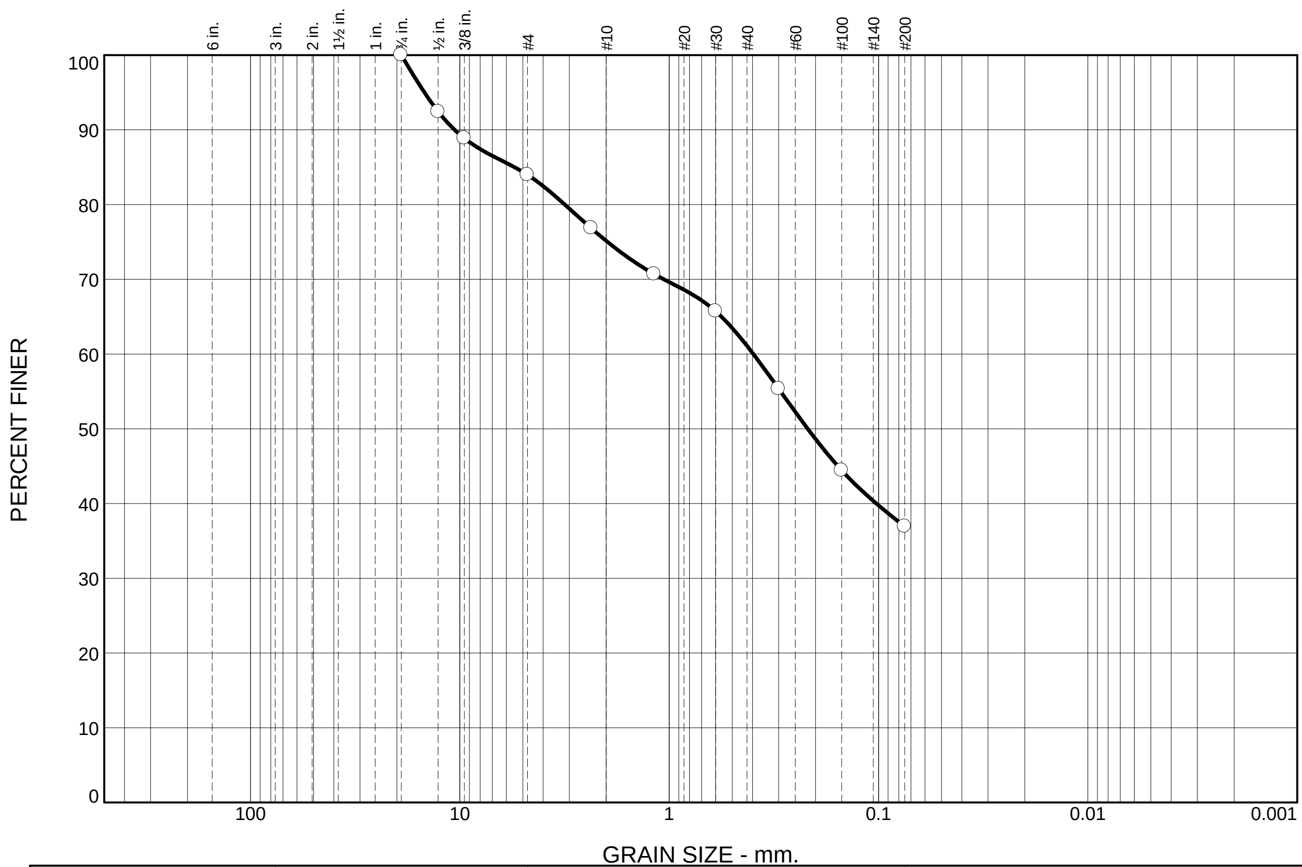
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	16.0	8.9	14.0	24.2	36.9	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP2-2			Brown Clayey Sand W/Gravel (SC)	SC

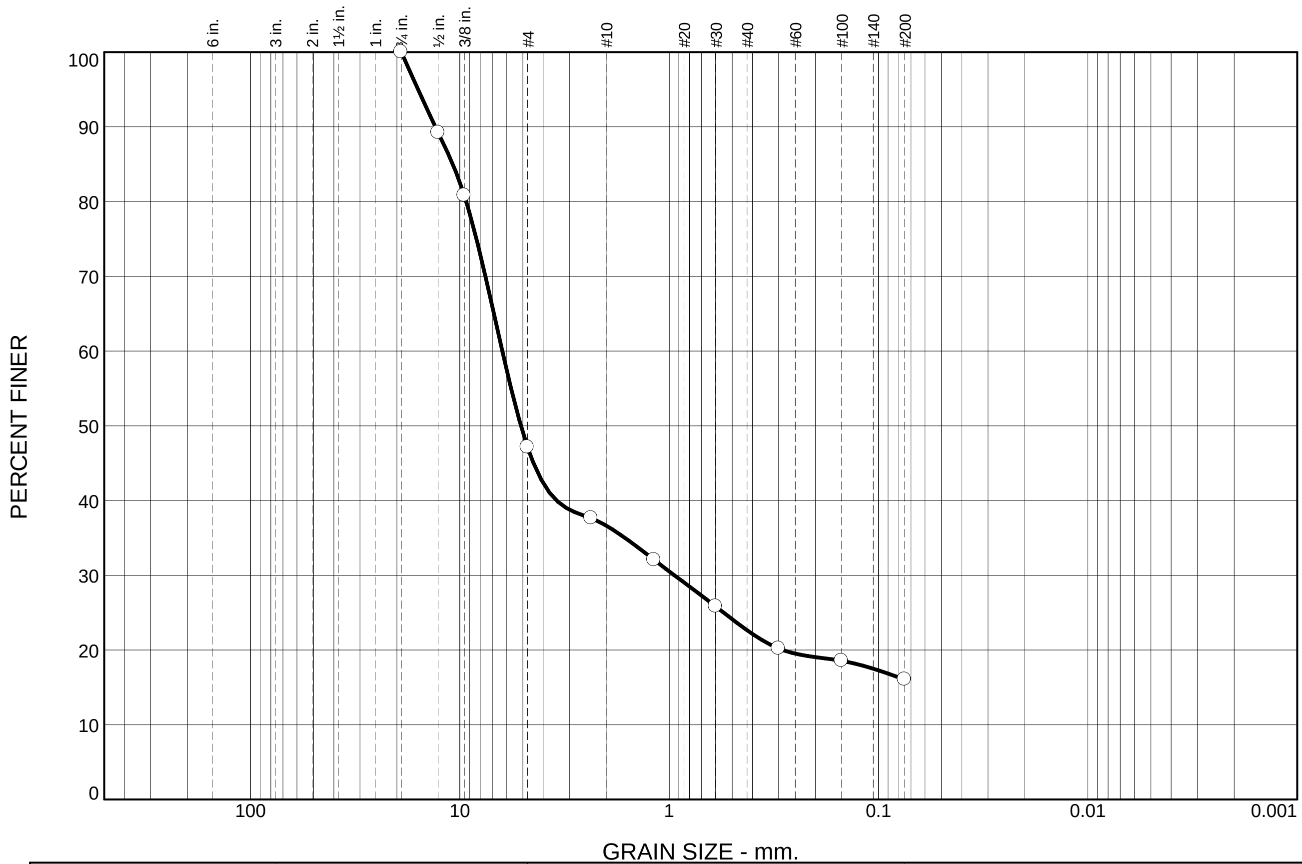
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	52.9	10.5	13.9	6.6	16.1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP3-1			Brown Clayey Gravel W/Sand (GC)	GC

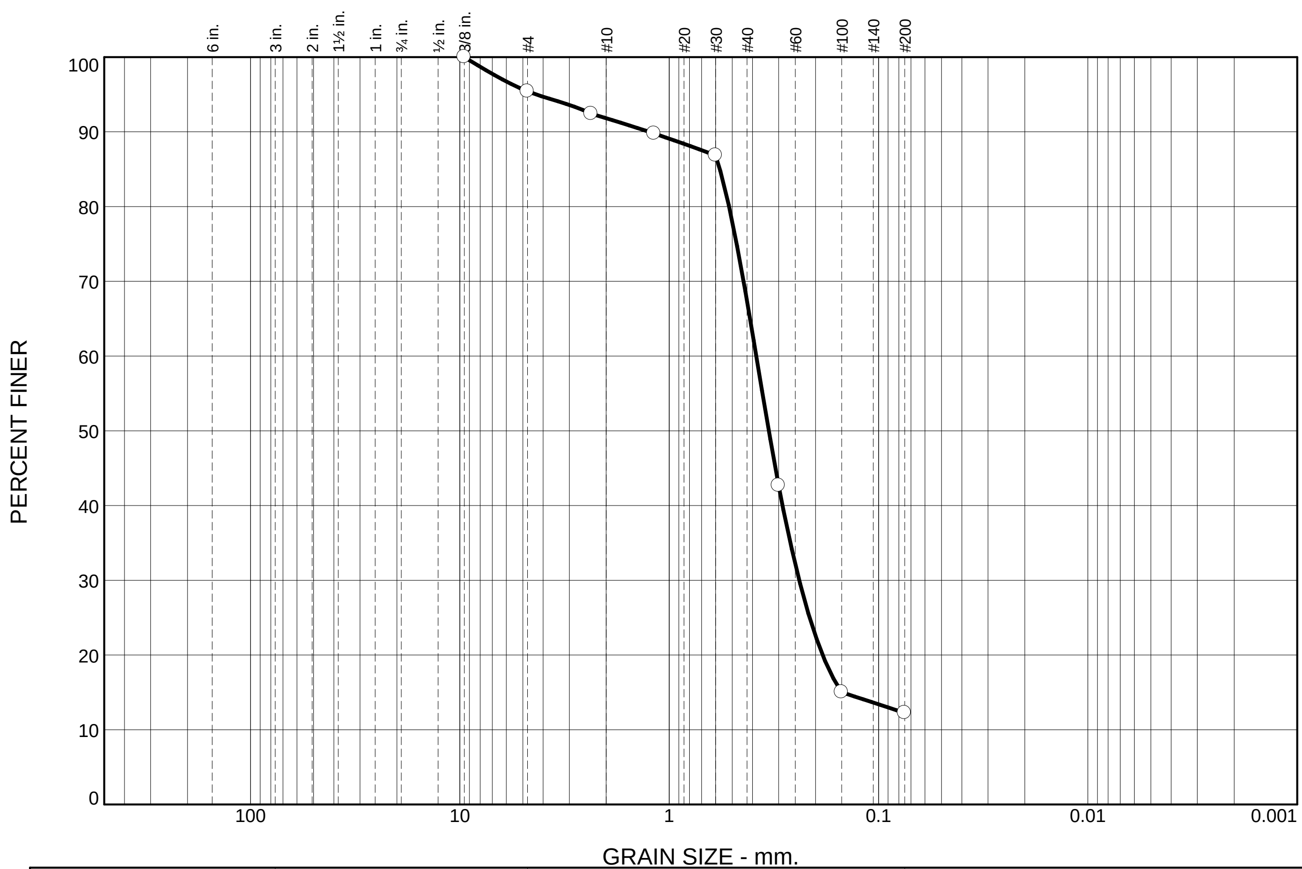
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.6	3.6	24.4	55.1	12.3	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP3-2			Brown Sand W/Clay (SP-SC)	SP-SC

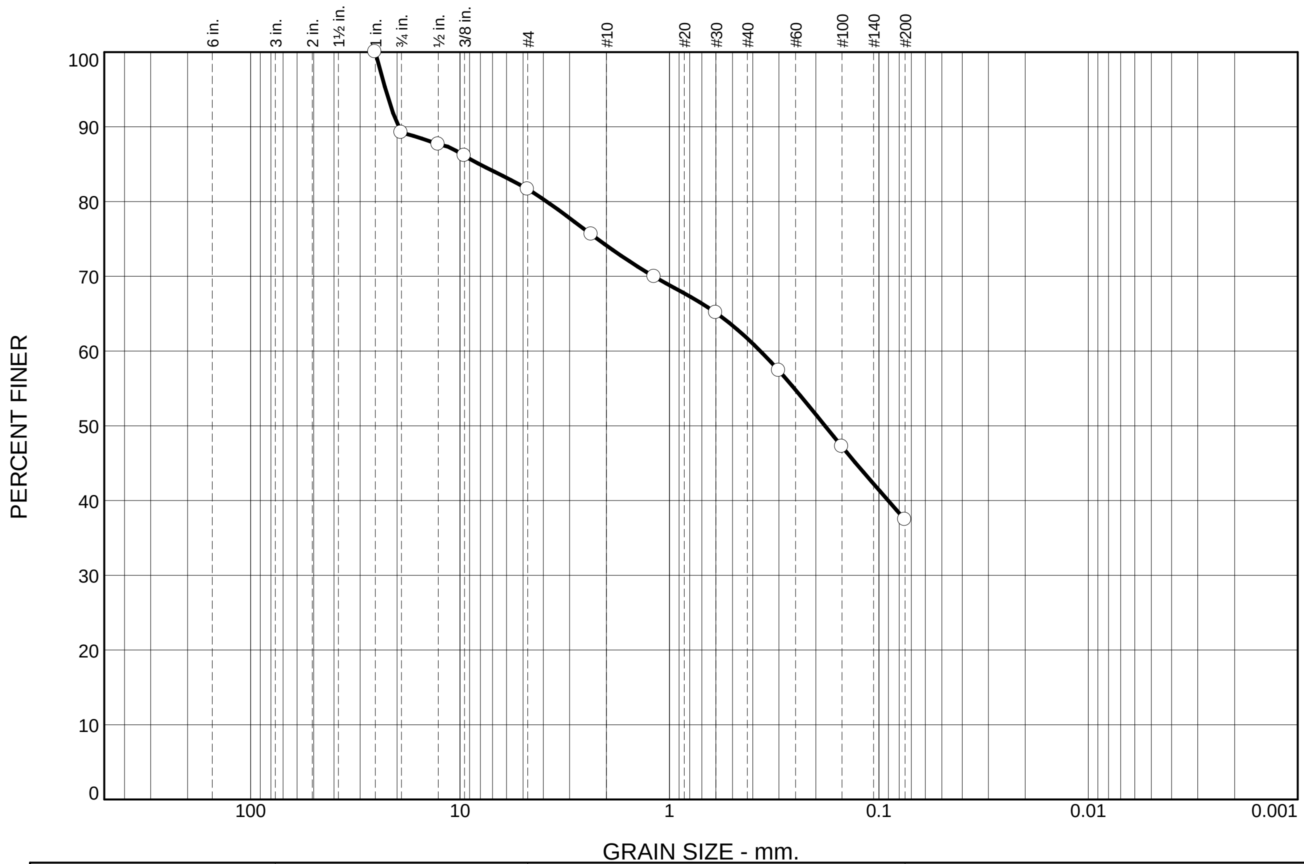
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	10.8	7.6	7.5	12.4	24.3	37.4	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP3-3			Brown Clayey Sand W/Gravel (SC)	SC

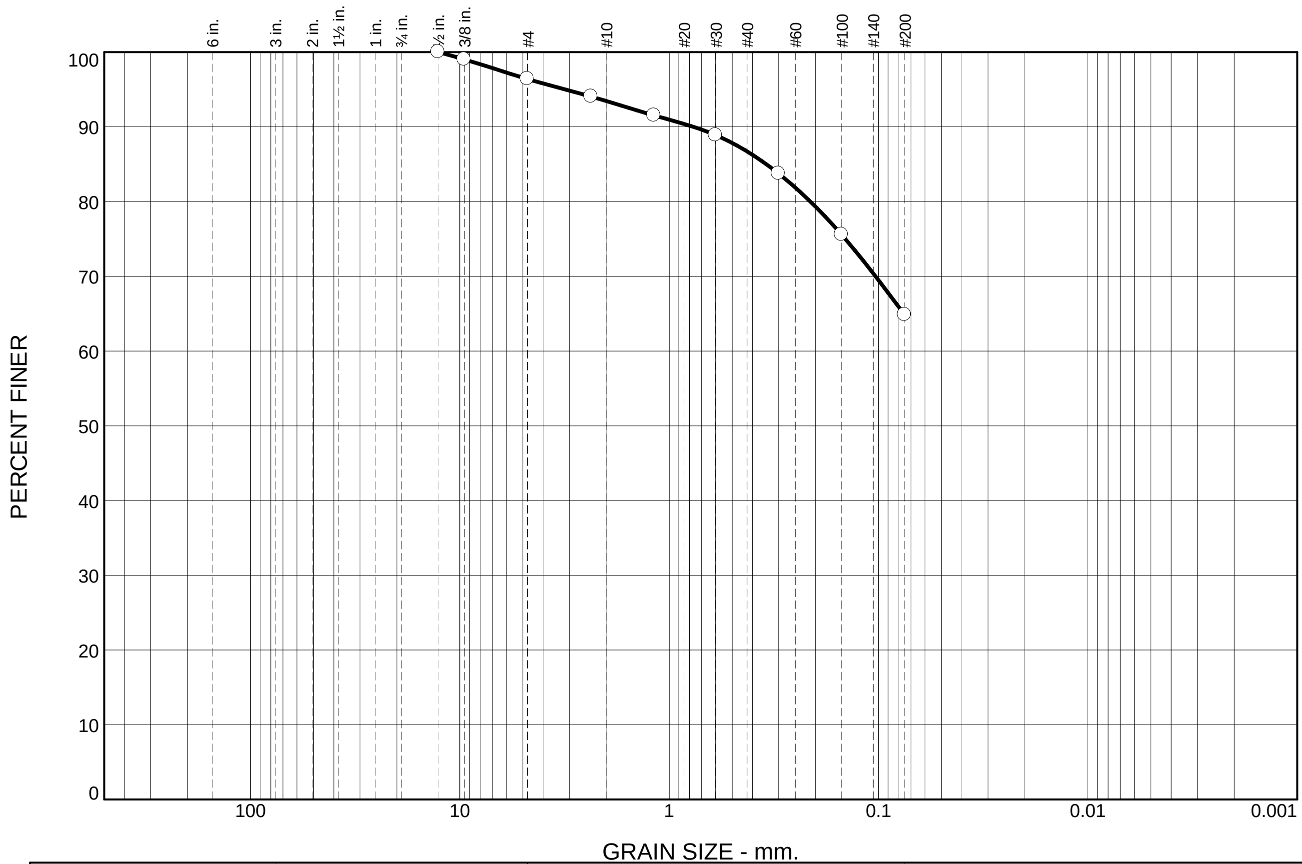
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.6	2.9	6.8	21.8	64.9	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP3-4			Brown Sandy Lean Clay (CL)	CL

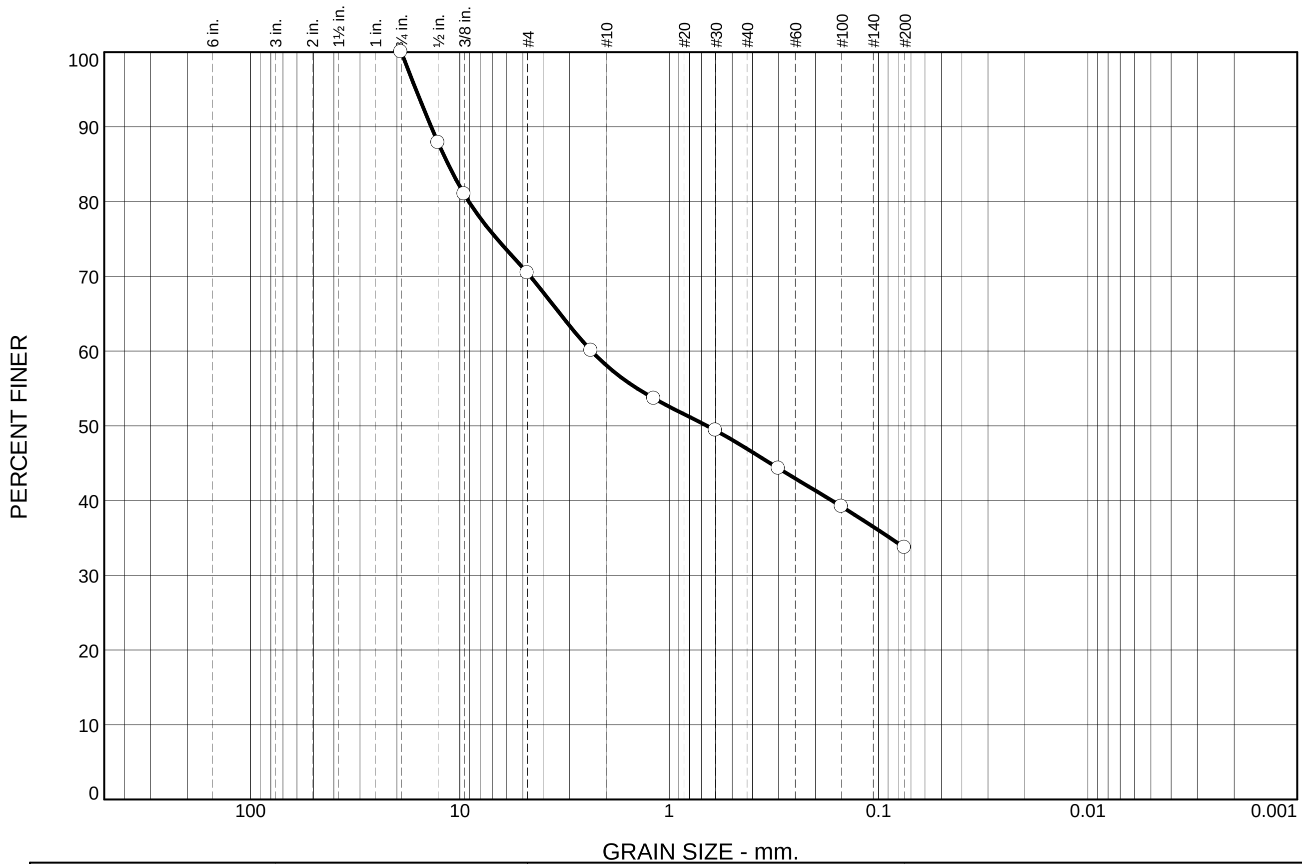
R G H CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	29.6	12.3	11.2	13.2	33.7	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP3-6B			Brown Clayey Sand W/Gravel (SC)	SC

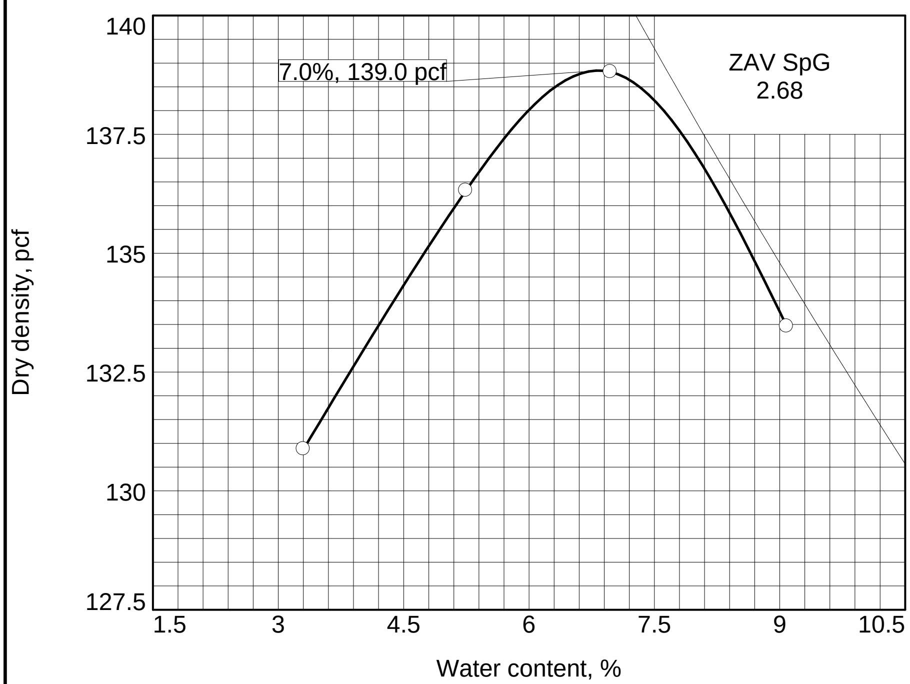
RGH CONSULTANTS, INC.

Client: Nichols Consulting Engineers
Project: Via Verdi Restoration Project

Project No.: 568.08.20 **Plate**

Tested By: GEF **Checked By:** TMc

PROCTOR TEST REPORT



Curve No.
VV#7A

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.
Test Performed on Material Passing 3/8 in. **Sieve**

NM **LL** **PI**
Sp.G. (ASTM D 854)
%>3/8 in. **%<No.200**
USCS SC **AASHTO**
Date Sampled
Date Tested 10-22-10
Tested By GEF

TESTING DATA

	1	2	3	4	5	6
WM + WS	4059.0	4184.0	4260.0	4216.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	635.6	643.0	656.0	660.8		
WD + T #1	618.8	616.4	620.4	612.7		
TARE #1	110.1	109.7	110.0	83.2		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	3.3	5.2	7.0	9.1		
DRY DENSITY	130.9	136.3	138.8	133.5		

TEST RESULTS

Maximum dry density = 139.0 pcf

Optimum moisture = 7.0 %

Material Description

Brown Clayey Sand W/Gravel (SC)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Via Verdi Restoration Project

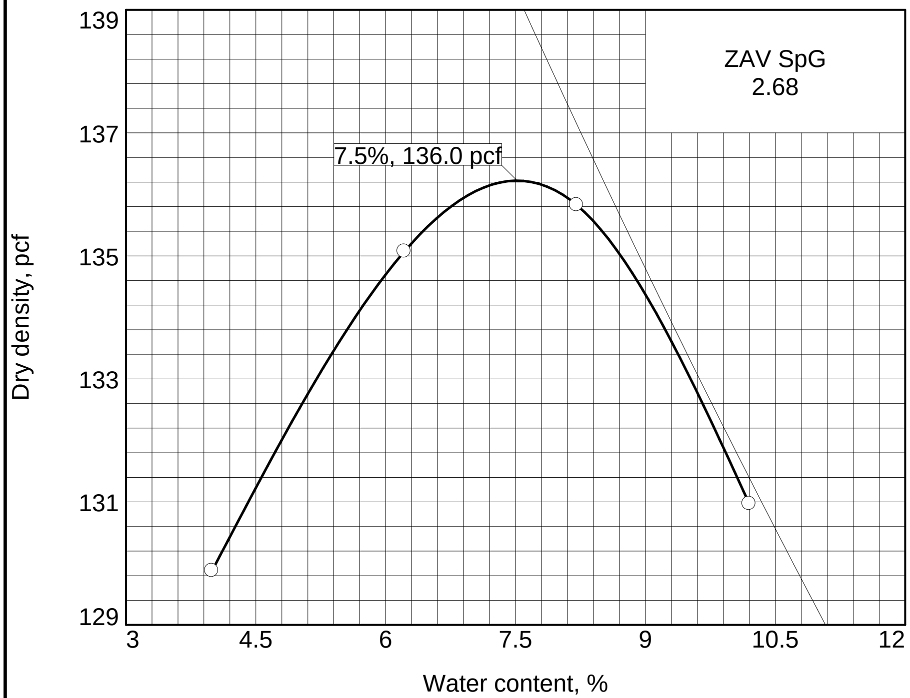
Source of Sample: VV#7A

R G H CONSULTANTS, INC.

Checked by: TMc
Title: Senior Advisor

Plate

PROCTOR TEST REPORT



Curve No.
TP3-1

Test Specification:
ASTM D 1557-07 Method B Modified

Preparation Method Dry Method
Hammer Wt. 10 lb.
Hammer Drop 18 in.
Number of Layers five
Blows per Layer 25
Mold Size 0.03333 cu. ft.

Test Performed on Material Passing 3/8 in. **Sieve**

NM ____ **LL** ____ **PI** ____
Sp.G. (ASTM D 854) ____
%>3/8 in. 19.2 **%<No.200** 16.1
USCS GC **AASHTO** ____
Date Sampled ____
Date Tested ____
Tested By ____

TESTING DATA

	1	2	3	4	5	6
WM + WS	4057.0	4184.0	4237.0	4197.0		
WM	2015.0	2015.0	2015.0	2015.0		
WW + T #1	745.2	747.3	681.8	760.3		
WD + T #1	720.8	708.5	638.4	700.2		
TARE #1	110.0	84.3	109.6	111.0		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	4.0	6.2	8.2	10.2		
DRY DENSITY	129.9	135.1	135.8	131.0		

TEST RESULTS

Maximum dry density = 136.0 pcf

Optimum moisture = 7.5 %

Material Description

Brown Clayey Gravel W/Sand (GC)

Remarks:

Project No. 568.08.20 **Client:** Nichols Consulting Engineers
Project: Via Verdi Restoration Project

○ **Source of Sample:** TP3-1

RGH CONSULTANTS, INC.

Checked by:
Title:

Plate

RGH Consultants, Inc.

MOISTURE DENSITY

Project Name: Via Verdi Restoration Project **Project #:** 568.08.20 **Date:** 11/1/2010

Boring	VV#7B							
Depth								
Length (in)								
Diameter (in)								
Tube + Wet Soil (g)								
Tube (g)								
Wet Soil (g)								
Tare + Wet Soil (g)	1229.5							
Tare + Dry Soil (g)	1140.3							
Tare Weight (g)	101.7							
Moisture Loss (g)	89.2							
Dry Soil (g)	1038.6							
Wet Density (pcf)								
Dry Density (pcf)								
Moisture Content (%)	8.6							

Boring								
Depth								
Length (in)								
Diameter (in)								
Tube + Wet Soil (g)								
Tube (g)								
Wet Soil (g)								
Tare + Wet Soil (g)								
Tare + Dry Soil (g)								
Tare Weight (g)								
Moisture Loss (g)								
Dry Soil (g)								
Wet Density (pcf)								
Dry Density (pcf)								
Moisture Content (%)								

Boring								
Depth								
Length (in)								
Diameter (in)								
Tube + Wet Soil (g)								
Tube (g)								
Wet Soil (g)								
Tare + Wet Soil (g)								
Tare + Dry Soil (g)								
Tare Weight (g)								
Moisture Loss (g)								
Dry Soil (g)								
Wet Density (pcf)								
Dry Density (pcf)								
Moisture Content (%)								

ETS

Environmental Technical Services

975 Transport Way, Suite 2
Petaluma, CA 94954
(707) 778-9605/FAX 778-9612

-Soil, Water & Air Testing & Monitoring
-Analytical Labs
-Technical Support

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COMPANY: RGH Geotech, 1305 N. Dutton Avenue, Santa Rosa, CA 95401 ATTN: Terry McCue JOB SITE: Via Verde, east bay (Nichol's Engineering) JOB #: S 6808.20	DATE RECEIVED 10/21/2010	DATE of COMPLETION 10/29/2010	ANALYST(S) D. Salinas S. Santos	SUPERVISOR D. Jacobson LAB DIRECTOR G.S. Conrad PhD

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SOIL pH -log[H+]	MINIMUM RESISTIVITY ohm-cm	ELECTRICAL CONDUCTIVITY µmhos/cm	SULFATE SO4 ppm	CHLORIDE Cl ppm
04164-1	VV1	grab 1	**7.12**	**826**	**[1210]**	**780**	**18**
04164-2	VV2	grab 2	**7.29**	**1,010**	**[989]**	**96**	**24**
04164-3	VV3	grab 3	**7.83**	**840**	**[1190]**	**147**	**33**
04164-4	VV4	grab 4	**7.39**	**833**	**[1200]**	**90**	**72**
04164-5	VV5	grab 5	**7.39**	**893**	**[1120]**	**108**	**30**
04164-6	VV6	grab 6	**7.45**	**800**	**[1200]**	**174**	**60**
04164-7	VV7A	grab 7	**7.59**	**1,890**	**[1250]**	**102**	**30**
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 %
04164-1	VV1	grab 1				**+235.6**	
04164-2	VV2	grab 2				**+245.9**	
04164-3	VV3	grab 3				**+226.1**	
04164-4	VV4	grab 4				**+226.0**	
04164-5	VV5	grab 5				**+249.9**	
04164-6	VV6	grab 6				**+213.0**	
04164-7	VV7A	grab 7				**+244.3**	
Method	Detection	Limits --->	---	0.1	0.1	1	0.1

** COMMENTS **

Resistivities are mostly in the 800 to ≈1,000 ohm-cm range, i.e., very low to mostly poor with one being mediocre, although soil reactions (i.e., pHs) are all mildly alkaline; most sulfates and all chlorides are low; redoxes are all mild. The CalTrans times to perforation for galvanized steel are as follows: for VV1 & 18 ga steel the time is >18 yrs, and for 12 ga it goes up to ≈41 yrs; for VV2 the respective times are at >26 yrs, and >58 yrs; for VV3 & VV4 they are ≈23 yrs, and ≈51 yrs; for VV5 they are <24 yrs, and >52 yrs; for VV6 times are <23 yrs, and ≈50 yrs; and for VV7 the times are >34 yrs, and >71 yrs. Steel pitting times are as follows: VV1 w/ rate @ ≈0.21 mm/yr, the 2 mm time is @ ≈9.5 yrs; VV2 rate @ ≈0.13 mm/yr, 2 mm time @ >15 yrs; VV3 rate @ ≈0.135 mm/yr, 2 mm time @ <15 yrs; VV4 rate @ ≈0.16 mm/yr, 2 mm time @ 12.5 yrs; VV5 rate @ 0.15 mm/yr, 2 mm time @ >13 yrs; VV6 rate @ 0.17 mm/yr, 2 mm time @ <12 yrs; and VV7 rate @ 0.095 mm/hr, 2 mm time @ ≈21 yrs. All chlorides are low, thus there should be no adverse impact to steel reinforcement; and sulfates are low enough that there should be no adverse impact on concrete, cement, mortar or grout. All soil redoxes are only mildly reduced, thus they are acceptable. Alkaline treatment would not provide any significant advantage. To increase steel longevity in these soils would require materials upgrading (i.e., increased gauge and/or more resistant steel type); and/or other actions can be taken. For example, cathodic protection of coated or wrapped pipe would require high typical anode weights and currents, except in the case of VV7A which would need less anodic weight and current. Other options could include using alternatives where appropriate, i.e., plastic, fiberglass or concrete pipe, etc. Last, standard cement mixes should be fine in these soils based on these results.

\\\\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).

ETS

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Petaluma, CA 94954

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-Analytical Labs

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COMPANY:	RGH Geotech, 1305 N. Dutton Avenue, Santa Rosa, CA 95401			ANALYST(S)	SUPERVISOR
ATTN:	Terry McCue		DATE of	D. Salinas	D. Jacobson
JOB NAME:	Via Verde, east bay (Nichol's Engineering)	DATE RECEIVED	COMPLETION	S. Santos	LAB DIRECTOR
JOB #:	9190.40	10/29/2010	11/8/2010		G.S. Conrad PhD

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SOIL pH -log[H+]	MINIMUM RESISTIVITY ohm-cm	ELECTRICAL CONDUCTIVITY µmhos/cm	SULFATE SO4 ppm	CHLORIDE Cl ppm
04178-1	VV1/BA	TP#1-1	**7.43**	**4,650**	**[215]**	**54**	**36**
04178-2	VV2/BA	TP#1-2	**6.77**	**1,180**	**[850]**	**12**	**33**
04178-3	VV3/BA	TP#3	**7.25**	**877**	**[1140]**	**54**	**54**
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 %
04178-1	VV1/BA	TP#1-1				**+219.4**	
04178-2	VV2/BA	TP#1-2				**+241.9**	
04178-3	VV3/BA	TP#3				**+213.9**	
Method	Detection	Limits --->	---	0.1	0.1	1	0.1

COMMENTS

Resistivities vary from <1,000 to >4,500 ohm-cm which is poor to fair, soil reactions (i.e., pHs) range from mildly acidic to mildly alkaline; sulfates and chlorides are all low; and all soils are mildly reduced. The CalTrans times to perforation for galvanized pipe are as follows: for VV1 and 18 ga steel the time is <47 yrs, and for 12 ga it goes to ≈103 yrs; for VV2 the respective times are at >15 yrs, and >33 yrs; and for VV3 they are >23 yrs, and ≈53 yrs. Gray steel and ductile iron pitting times differ also as follows: VV1 w/ rate @ ≈0.057 mm/yr = 2 mm @ ≈35 yrs, and 4 mm @ ≈70 yrs; for VV2 the rate is ≈0.13 mm/yr putting the 2 mm & 4 mm times @ ≈15 & 30 yrs; and VV3 the rate is ≈0.165 mm/yr with times @ ≈ 12 & 24 yrs. Chlorides are low, thus there should be no significant impact to steel reinforcement; likewise, sulfates are low thus there would be no measureable adverse impact on concrete, cements, mortars and grouts. Soil redox values are all mild, so there should be no additional adverse impact on construction materials from this property. Concerning buried steels, alkaline treatment of VV3 could help somewhat in that increasing its pH to the 7.5-8.5 range would improve its 18 ga time to ≈21 yrs; however, the pitting rate decreases by only about 40% (due to some passivation at modest acidity) to 0.095 mm/yr putting the 2 mm depth time at 21 yrs. One option to increase steel longevity would be to upgrade metal piping (i.e., increased gauge and/or use more resistant steels). Another common approach is to use cathodic protection (employing a pretty typical anode number and mass and impressed current) along with coating or wrapping the pipe. Other options include increased and/or special engineering fill; or using alternatives where appropriate, e.g. plastic, fiberglass or cement pipe, etc. Last based on these results, standard concrete mixes should be fine in these soils.

\\\\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).

ETS

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e-mail: entech@pacbell.net

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COMPANY: RGH Geotech, 1305 N. Dutton Avenue, Santa Rosa, CA 95401
ATTN: Terry McCue
JOB SITE: Via Verde, east bay (Nichol's Engineering)
JOB #: 568.08.20

DATE RECEIVED	DATE of COMPLETION	ANALYST(S)	SUPERVISOR
11/12/2010	11/23/2010	D. Salinas S. Santos	D. Jacobson LAB DIRECTOR G.S. Conrad PhD

LAB SAMPLE NUMBER	SAMPLE ID	DESCRIPTION of SOIL and/or SEDIMENT	SOIL pH -log[H+]	MINIMUM RESISTIVITY ohm-cm	ELECTRICAL CONDUCTIVITY µmhos/cm	SULFATE SO4 ppm	CHLORIDE Cl ppm
04194-1	VV1	TP#2-1	**7.41**	**3,570**	**[280]**	**120**	**33**
04194-2	VV2	TP#2-2	**7.46**	**1,250**	**[800]**	**72**	**51**
04194-3	VV3	TP#3-1	**7.86**	**1,925**	**[520]**	**51**	**33**
04194-4	VV4	TP#3-2	**7.60**	**6,670**	**[150]**	**15**	**21**
04194-5	VV5	TP#3-2B	**7.64**	**7,140**	**[140]**	**24**	**39**
04194-6	VV6	TP#3-3	**6.90**	**1,540**	**[650]**	**30**	**54**
04194-7	VV7	TP#3-4	**7.42**	**826**	**[1210]**	**102**	**33**
04194-8	VV8	TP#3-5B	**7.48**	**5,745**	**[174]**	**39**	**48**
04194-9	VV9	TP#3-6B	**7.96**	**1,250**	**[800]**	**144**	**36**
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 %
04194-1	VV1	TP#2-1				**+253.7**	
04194-2	VV2	TP#2-2				**+175.2**	
04194-3	VV3	TP#3-1				**+244.6**	
04194-4	VV4	TP#3-2				**+266.7**	
04194-5	VV5	TP#3-2B				**+267.8**	
04194-6	VV6	TP#3-3				**+295.2**	
04194-7	VV7	TP#3-4				**+237.2**	
04194-8	VV8	TP#3-5B				**+257.4**	
04194-9	VV9	TP#3-6B				**+216.1**	
Method	Detection	Limits --->	---	0.1	0.1	1	0.1

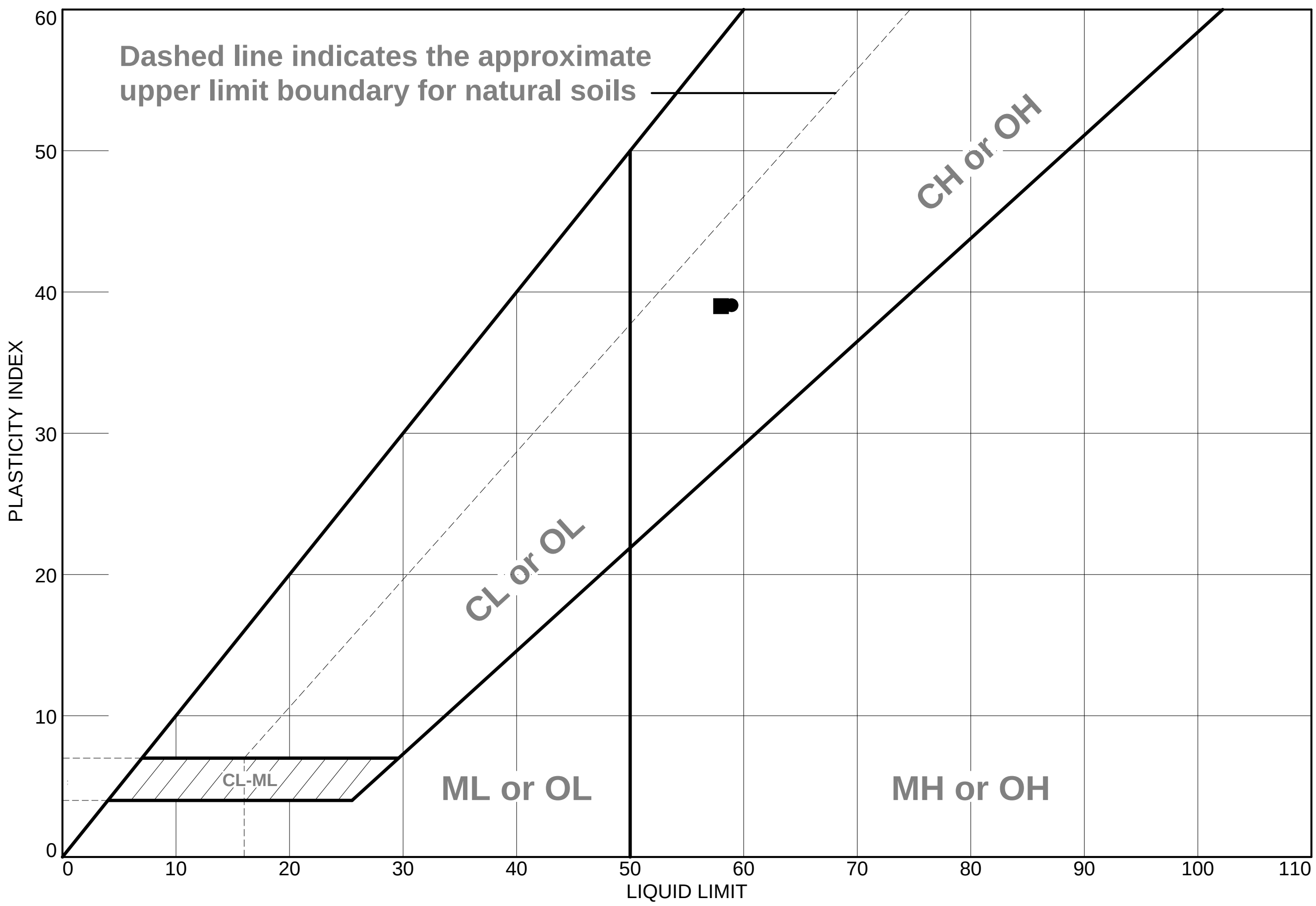
COMMENTS

Resistivities vary from <1,000 on up to >7,000 ohm-cm, i.e., from poor to low to mediocre to fair and then good; soil reactions are mostly mildly alkaline but one is very mildly acidic; all sulfates and chlorides are low enough; and all redoxes are in the mild range. The CalTrans times to perforation for galvanized steel are as follows: for VV1 & 18 ga steel the time is ≈42 yrs, and for 12 ga it goes up to ≈92.5 yrs; for VV2 the respective times are at ≈27 yrs, and ≈60 yrs; for VV3 they are >32 yrs, and >71 yrs; for VV4 they are >54 yrs, and >119 yrs; for VV5 they are >55 yrs, and ≈123 yrs; for VV6 they are >18 yrs, and >40 yrs; for VV7 they are ≈23 yrs, and >50 yrs; for VV8 they are ≈51 yrs, and >112 yrs; and for VV9 they are >27 yrs, and ≈60 yrs. Steel pitting times are as follows: VV1 w/ rate @ ≈0.05 mm/yr, the 2 mm time is @ ≈40 yrs; VV2 rate @ ≈0.11 mm/yr, 2 mm time @ ≈18 yrs; VV3 rate @ ≈0.07 mm/yr, 2 mm time @ ≈28.5 yrs; VV4 rate @ ≈0.04 mm/yr, 2 mm time @ ≈50 yrs; VV5 rate @ >0.04 mm/yr, 2 mm time @ >50 yrs; VV6 rate @ ≈0.105 mm/yr, 2 mm time @ ≈19 yrs; VV7 rate @ ≈0.165 mm/hr, 2 mm time @ ≈12 yrs; VV8 rate @ ≈0.04 mm/hr, 2 mm time @ ≈50 yrs; and VV9 rate @ ≈0.1 mm/hr, 2 mm time @ ≈20 yrs. All chlorides are low, so there would be no adverse impact to steel reinforcement; and sulfates are low enough that there would be no adverse impact on concrete, cement, mortar or grout. All soil redoxes are only mildly reduced, thus they are acceptable. Alkaline treatment could improve corrosion times only for VV6 in that raising its pH to the 7.5-8.5 rage would increase the 18 ga time to >29 yrs; and the 2 mm depth pitting rate would decline to 0.09 mm/yr putting the time to ≈22 yrs. To increase steel longevities any more would require materials upgrading (i.e., increased gauge and/or more resistant steel type); and/or other actions can be taken. For example, cathodic protection of coated or wrapped pipe (requiring low to typical anode weights and currents). Other options include using plastic, fiberglass or concrete pipe, etc. Last, standard cement mixes should be fine in these soils based on these results.

\\\\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).

EL PORTAL DRIVE PAVEMENT CORES

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brn Sandy Clay (CH)	59	20	39			CH
■	Brn Sandy Clay (CH)	58	19	39			CH

Project No. 568.12.20 **Client:** Nichols Consulting Engineers

Project: Via Verde Culvert Repair

●**Source of Sample:** C-2 **Depth:** 14"
■**Source of Sample:** C-3 **Depth:** 17.625"

R G H CONSULTANTS, INC.

Remarks:

Figure

Tested By: SW **Checked By:** GEF

RGH Consultants, Inc.

MOISTURE DENSITY

Project Name: Via Verde Culvert Repair **Project #:** 568.12.20 **Date:** 10/24/2011

Boring	C-2	C-3						
Depth	14"	17.625"						
Length (in)								
Diameter (in)								
Tube + Wet Soil (g)								
Tube (g)								
Wet Soil (g)								
Tare + Wet Soil (g)	193.6	232.4						
Tare + Dry Soil (g)	163.4	194.8						
Tare Weight (g)	49.2	49.9						
Moisture Loss (g)	30.2	37.6						
Dry Soil (g)	114.2	144.9						
Wet Density (pcf)								
Dry Density (pcf)								
Moisture Content (%)	26.4	25.9						

Boring								
Depth								
Length (in)								
Diameter (in)								
Tube + Wet Soil (g)								
Tube (g)								
Wet Soil (g)								
Tare + Wet Soil (g)								
Tare + Dry Soil (g)								
Tare Weight (g)								
Moisture Loss (g)								
Dry Soil (g)								
Wet Density (pcf)								
Dry Density (pcf)								
Moisture Content (%)								

Boring								
Depth								
Length (in)								
Diameter (in)								
Tube + Wet Soil (g)								
Tube (g)								
Wet Soil (g)								
Tare + Wet Soil (g)								
Tare + Dry Soil (g)								
Tare Weight (g)								
Moisture Loss (g)								
Dry Soil (g)								
Wet Density (pcf)								
Dry Density (pcf)								
Moisture Content (%)								

APPENDIX D

AMEC REVIEW LETTER

August 10, 2011

4096107819.01

Mr. Ryan Shafer, PE, GE
Nichols Consulting Engineers
501 Canal Street, Suite I
Richmond, California 94804

Review of Previous Geotechnical Report
Via Verdi Repair Project
San Pablo Creek Culvert Replacement
Richmond, California

Dear Mr. Shafer:

AMEC Environment & Infrastructure, Inc. (AMEC; formerly known as MACTEC Engineering & Consulting, Inc., and Harding-Lawson Associates [HLA]) submits this letter to summarize our review of a 1977 HLA geotechnical report for the Sobrante Glen Subdivision in Richmond, California. The purpose of our review was evaluate whether the recent (April 2010) failure in the San Pablo Creek Culvert, beneath Via Verdi near El Portal Drive, could be related to a landslide repair made during construction of Via Verdi and the Sobrante Glen project approximately 30 years ago.

To address this issue, we reviewed the following documents:

1. *Geotechnical Investigation, Sobrante Glen Subdivision, Richmond, California;* by HLA; Project No. 9237,001.04; dated October 11, 1977.

2. *Improvement Plans, Subdivision 4593, Sobrante Glen*, by KCA Engineers, Inc.; Job No. 1244; dated March 16, 1978.

3. *Grading Plans, Subdivision 4593, Sobrante Glen, As-Built*, by KCA Engineers, Inc.; Job No. 1244; dated December 6, 1983.

4. *Geotechnical Consulting, Slope Stability and Earth Retaining, Creekview Apartments, El Portal and Via Verdi Drive, Richmond, California*; by Raney Geotechnical; Job No. 446-001; dated November 28, 1989.

5. *Via Verdi/El Portal Settlement Monitoring Project, City of Richmond, California*; by Mountain Pacific Surveys; Job No. 510012; dated April 13, 2011.

We have also had several discussions with Nichols Consulting Engineers about the history of the culvert failure, their design of the temporary bypass road that was been built to restore access to Via Verdi, and their preliminary geotechnical data for the culvert replacement project they have designed.

Correspondence:
AMEC Environment & Infrastructure
1330 Broadway Street, Suite 1702
Oakland, CA 94612
USA
Tel 510/451-1001
Fax 510/451-3165

The information we have reviewed indicate that the landslide repair was performed between 1977 and 1983. Its design included the placement of a buttress fill, approximately 30 feet thick and 200 feet wide, located at the toe of an existing shallow landslide that had formed in relatively weak claystone and siltstone of the Orinda formation. The slide extended from the north bank of San Pablo Creek approximately 700 feet up the adjacent hillside to the north. In the area of the buttress fill, slide debris was removed to found the fill on firm soil or rock. Perforated pipe and crushed rock subdrains were used to maintain groundwater levels below the base of the fill.

When completed, the buttress fill formed part of an embankment upon which Via Verdi was constructed over San Pablo Creek and the toe of the landslide. A culvert was built beneath the embankment to carry San Pablo Creek (generally from east to west) under Via Verdi and the existing El Portal Drive. The eastern end of the failed section of culvert, near the still-standing upstream headwall, is approximately 100 feet downstream of the western edge of the buttress fill where it forms the north bank of San Pablo Creek.

The failed section of culvert was constructed of large oval-shaped corrugated metal pipe, approximately 22'-6" in width and 15'-8" in height. It failed as a sudden collapse, creating a "sinkhole" approximately 130 feet long and 30 to 50 feet wide along the culvert. The embankment fill over the culvert at the failure location had been approximately 35 feet high.

Because of (1) the distance between the buttress fill and the failed section of culvert, and (2) the absence of any evidence of movement of the buttress fill since its construction and after the culvert failure, we conclude that the buttress fill is not likely to have had any connection to the culvert failure.

If there are any questions about these recommendations, please contact us.

Yours very truly,

AMEC ENVIRONMENT & INFRASTRUCTURE, INC.

Rambod Hadidi

Rambod Hadidi, PE
Senior Engineer

Donald W. Quigley

Donald W. Quigley, PE, GE
Senior Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
DONALD WALKER QUIGLEY
703
EXP 9-30-11
GEOTECHNICAL
STATE OF CALIFORNIA

DWQ/RH/:dcc/via verdi letter.doc

APPENDIX E

DM 7.02 TYPICAL DRAINAGE AND WATERPROOFING SYSTEMS

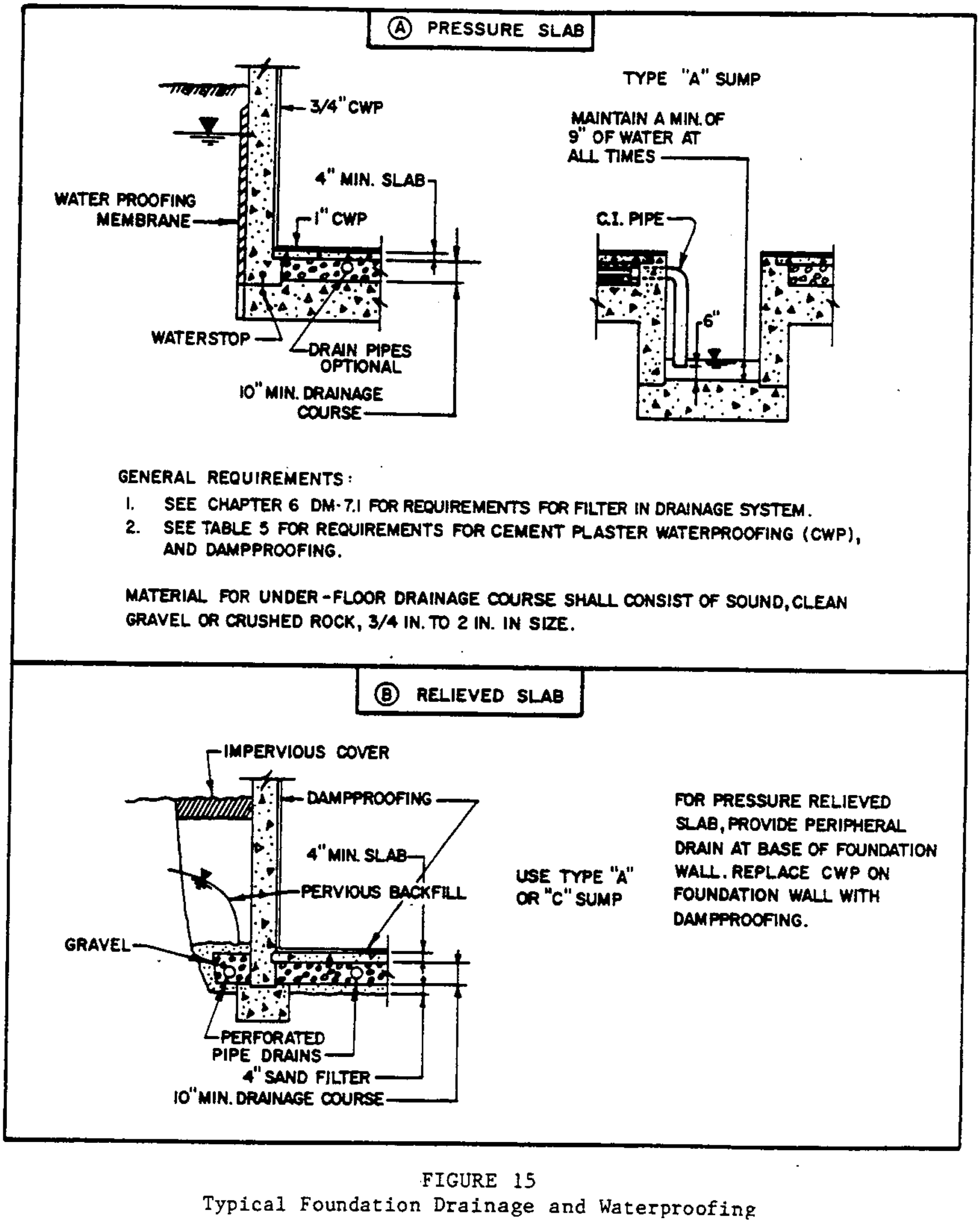


FIGURE 15
Typical Foundation Drainage and Waterproofing

GEOTECHNICAL INVESTIGATION

VIA VERDI LANDSLIDE
RICHMOND, CALIFORNIA

Project No. 867.01
May 1, 2018

Prepared by

Hultgren – Tillis Engineers

A California Corporation
Specializing in Geotechnical Engineering

Hultgren-Tillis Engineers

May 1, 2018
Project No. 867.01

NCE
501 Canal Blvd. Suite I
Richmond, CA 94804

Attention: Mr. Ryan Shafer

Geotechnical Investigation
Via Verdi Landslide
Richmond, California

Dear Mr. Shafer:

We performed a geotechnical investigation for the landslide which developed along Via Verdi in Richmond, California in accordance with the proposals dated March 1 and March 28, 2017, the Master Subconsultant Agreement dated March 2, 2017, and the Work Authorization dated March 3, 2017. The results of the investigation are presented in the attached report.

It was a pleasure working with you on this project. If you have any questions, please call.

Sincerely,

Hultgren – Tillis Engineers

Joseph C. Heavin
Geotechnical Engineer

R. Kevin Tillis
Geotechnical Engineer

JCH:RKT:lm

2 copies submitted

File Name. 86701R01 - Final

4085 Nelson Avenue, Suite A · Concord, California 94520-1257
Phone (925) 685-6300 · www.hultgrentillis.com

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APPENDIX C – INCLINOMETER DATA

APPENDIX D – PIEZOMETER DATA

APPENDIX E – SLOPE STABILITY RESULTS

I. INTRODUCTION

This report presents the results of our geotechnical investigation for the Via Verdi Landslide in Richmond, California. A landslide developed along Via Verdi in late February 2017. The landslide extends upslope of Via Verdi onto Rolling Hills Memorial Park (Cemetery) property. The landslide moved toward San Pablo Creek and displaced the road. A vicinity map showing the approximate location of the site is presented on Plate 1. A map showing the topography at the site is shown on the Site Plan, Plate 2.

Via Verdi is the only access road for the Sobrante Glen Subdivision which consists of single family homes and apartment buildings. The road was constructed in the late 1970's as part of Sobrante Glen development. The Via Verdi right-of-way (ROW) also serves as the alignment for local utilities including water, sanitary sewer, gas, electricity and telecommunications.

An East Bay Municipal Utility District (EBMUD) water main and a sanitary sewer line were damaged from the initial slide movement. Both were replaced with above grade pipes. In late March 2017, the City of Richmond (City) constructed an emergency bypass road above the slide on the Cemetery property. Vehicular traffic was diverted onto the emergency road in early April 2017. Utilities (sanitary sewer, gas and electric) were relocated along the shoulders of the bypass road in mid April.

Our scope of services was outlined in our proposals dated March 1 and March 28, 2017. Our scope of services consisted reviewing geologic maps, drilling borings to collect samples of the underlying materials, installing inclinometers to measure the lateral movement of the landslide, installing piezometers to measure the groundwater conditions, performing laboratory testing to characterize the materials encountered in the borings, and developing repair alternatives based on information from the borings, inclinometers, and piezometers. The results of our geotechnical investigation are presented in this report.

II. FIELD EXPLORATION AND LABORATORY TESTING

The geotechnical field exploration program was divided into two phases. The first phase involved drilling borings and installing inclinometers near and within the Via Verdi roadway and shoulder. The second phase involved drilling borings and installing inclinometers and vibrating wire piezometers above and below the roadway. The approximate locations of the inclinometers and piezometers are shown on the Site Plan, Plate 2. The coordinates are presented in Table 1.

Table 1: Boring and Instrumentation Locations

Name	Latitude	Longitude
Boring 1 – I-1	37.96692	-122.31876
Boring 2 – I-2	37.96683	-122.31910
Boring 3 – I-3	37.96672	-122.31921
Boring 4 – I-4	37.96678	-122.31888
Boring 7 – I-5	37.96690	-122.31919
Boring 8 – I-6	37.96696	-122.31889
Boring 5 – P-1	37.96710	-122.31911
Boring 6 – P-2	37.96693	-122.31904
Boring 9 – P-3	37.96677	-122.31894

We explored subsurface conditions on March 8 through March 10, 2017 by drilling four borings to depths of about 70 feet below existing grade. After the borings were completed, an inclinometer was installed in each of the borings (Inclinometers I-1 through I-4). Our subcontractor drilled the borings with truck-mounted auger drilling equipment and continuous hollow-stem augers. Samples were collected from Inclinometers I-1 and I-2 but not from Inclinometers I-3 and I-4.

We explored subsurface conditions again on March 23, 24, and 27, 2017 by drilling five borings to depths of 63 to 70 feet below existing grade. After Borings 5, 6, and 9 were completed, piezometers were installed in each of the borings (Piezometers P-1 through P-3). After Borings 7 and 8 were completed, an inclinometer was installed in each of the borings (Inclinometers I-5 through I-6). Our subcontractor drilled the borings with track-mounted auger drilling equipment and either continuous hollow-stem augers or continuous solid flight augers. Samples were collected from Piezometers P-1 and P-2 but not from Piezometer P-3 or Inclinometers I-5 and I-6.

We collected samples with a 2.5-inch outside diameter (OD), 1.9-inch inside diameter (ID) split barrel samplers for Borings 1 and 2 (Inclinometers I-1 and I-2) and for Borings 5 and 6 (Piezometers P-1 and P-2). The samplers were driven with 140-pound hammers dropping approximately 30-inches for a penetration depth of up to 18-inches. The hammers utilized automatic trip systems.

Our engineer logged the borings and recorded blow counts from driving the samplers. We recovered samples for further visual classification and for selection of materials for laboratory testing. Our engineer used a pocket penetrometer to evaluate unconfined compressive strength. After the inclinometers and piezometers were installed, the borings were backfilled with bentonite-cement grout.

We converted the field penetration resistance obtained while driving the 2.5-inch sampler to equivalent SPT N-values by multiplying by 0.8 to account for sampler size. Soil descriptions, equivalent SPT N-values and the laboratory test data are shown on the Logs of Boring in Appendix A, Plates A-1 through A-8. The soil descriptions are presented in general accordance with the Soil Classification System presented on Plate A-9 and Physical Properties for Rock Descriptions on Plate A-10. Laboratory test results are presented in the manner described by the Key to Test Data on Plate A-9.

The laboratory testing program consisted of moisture content and dry density measurements, Atterberg limits and sieve analysis. Atterberg limits test results are shown in Appendix B, Plate B-1.

We performed baseline slope inclinometer readings after the casings were installed. Subsequent readings were performed regularly until slope movement exceeded the limits of the inclinometer probe. Four of the six inclinometers have pinched off and additional readings are not possible. The inclinometer readings are presented in Appendix C.

We installed a vibrating wire piezometer at three different elevations at each of the piezometer locations (nine total). We installed a multiple channel data logger at each piezometer location which took readings every 15 minutes. The piezometer readings are presented in Appendix D. The elevations (NAVD88) of the piezometers are presented in the Table 2.

Table 2: Piezometer Elevations

Piezometer Number	Ground Surface Elevation (feet)	Piezometer Elevations (feet)
P-1	112	52, 67, 82
P-2	106.5	39.5, 54.5, 74.5
P-3	102.5	40.5, 65.5, 75.5

III. SITE CONDITIONS

A. Geologic Setting

Via Verdi is located between a hillside slope and San Pablo Creek. The road is located about 50 feet above San Pablo Creek. The slope continues above the road extending up about 100 feet in elevation. The preliminary photointerpretation landslide map prepared by Nilsen (1975) indicates that there is a landslide deposit in the hill to the northwest of the site and there is a colluvial deposit along the hill to the northeast. The landslide deposit is mapped in the southeastern direction. The geology map prepared by Dibblee (2005) indicates the northern portion of the site is underlain by (Tor) described as interbedded terrestrial pebble conglomerate, sandstone and claystone of the Orinda Formation and the southern portion by (Qa) described as alluvial gravel, sand and clay of the valley areas. The geologic map by Nilsen (1975) is presented on Plate 3. The geologic map by Dibble (2005) is presented on Plate 4.

The site was graded to develop the Sobrante Glen subdivision. We reviewed grading plans by KCA Engineers titled “Grading Plan, Subdivision 5493, ‘Sobrante Glen’” and originally dated December 6, 1977 and modified to “As built” on February 26, 1983. Extensive filling occurred to raise the grade for Via Verdi within the limits of the landslide. The plans indicate that fill was placed to construct the Via Verdi roadway. The fill thicknesses range from 20 feet to 33 feet below the landslide according to the as-built plans. The plans called for the removal of some slide debris prior to new fill being placed and construction of subdrains at the base of the fill. The “As built” addition to the grading plans indicates that a desilting basin was constructed above the road and a temporary top soil stockpile was placed upslope of the desilting basin. The desilting basin and temporary soil stockpile remain and apparently were not removed.

B. Surface Conditions

Via Verdi is a two lane roadway that generally runs in the east-west direction and serves as the only access to the Sobrante Glen development to the east. The road is located between San Pablo Creek (to the south) and the Cemetery property (to the north). A graded but undeveloped pad lies to the west of the landslide area.

The road is about 40 feet wide with a sidewalk along its southern edge. Dirt shoulders extend to the ROW to the north and to the south beyond the sidewalk. There is a chain link fence about 10 feet north of the road along the property line. The elevation of the road in the landslide area varies from about 106 feet to 99 feet (NAVD 88).

An approximately 2:1 (horizontal to vertical) slope extends down to San Pablo Creek below. The lower portion of the slope is covered in heavy vegetation and trees. The flow line of San Pablo Creek is around Elevation 65 feet below the landslide. San Pablo Creek flows into a large culvert approximately 200 feet downstream of the centerline of the slide.

A 10 to 12 foot tall slope extends above Via Verdi. There is a 12 foot wide bench mid slope. Above the slope is a slightly lower area around Elevation 110 feet (NAVD 88). The low area, called out as the desilting basin on the 1983 as built plans, is about 300 feet wide and extends up to 100 feet away from the edge of slope. Beyond the desilting basin, the ground surface gradually rises about another 10 feet to the base of the Cemetery hillside, about 150 to 200 feet away. The area behind the desilting basin was called out as a temporary top soil stockpile. The desilting basin is covered in grasses with heavy vegetation and trees around the base of the Cemetery hills.

At the time of our investigation, we observed small amounts of standing water in the desilting basin area.

C. Landslide

We performed an initial site visit on February 28, 2017 to observe the area. An EBMUD water line and a sanitary sewer had been damaged. The pipes were located on the northern side of the road. We observed a scarp in the retention basin area above the road. The scarp was up to 12-inches high. The scarp extended down the slope and is about 200 feet wide at the upslope side of the road. We observed some cracking beyond the southern edge of the sidewalk. The road surface, curb and gutter, and sidewalk contained minor cracks, but appeared to be intact otherwise. NCE performed a survey of the head scarp and the approximate location of the head scarp and landslide limits are shown on Plate 2.

The initial slope movement and the crack above the roadway occurred after weeks of intense rain. After the initial slope movement, the EBMUD and sanitary sewer lines were temporarily relocated above grade along the northern shoulder of Via Verdi. Two sinkholes developed along the road and sidewalk on the eastern side of the landslide on March 23rd. The sinkholes occurred above and below the storm drain manhole on the southern edge of Via Verdi. The City conducted a video inspection of the storm drain pipes entering and exiting the manhole and found that they were broken in multiple locations. The sinkholes were subsequently filled with rock.

We installed a total of six inclinometers in the landslide. Inclinometer I-1 moved laterally about ½-inch per day and then sheared off by March 14th. Inclinometers I-2 through I-4 moved laterally up to ¼-inch per day and then sheared off between March 23rd and March 29th. Inclinometers I-5 and I-6 indicated a slower rate of movement up to ¼-inch per day. The landslide continues to move.

A typical section through the site along with the active slide affecting the roadway is shown on Plate 5. The depth to the bottom of the active slide varies from about 39 feet to 53 feet below Via Verdi. The toe of the landslide is not visible and is inferred to be below or within San Pablo Creek.

D. Subsurface Conditions

In general, the landslide area is underlain by fill. The thickness of the fill varies from 31 feet to 35 feet in our borings along the Via Verdi roadway and shoulder and decreases in thickness toward the Cemetery. The fill generally consists of fine grained material which is predominately lean clay and fat clay. The clayey fill contained varying amounts of course grained material including sand and gravel. The consistency of the fill varied from medium stiff to hard. The moisture content of the fill varied from moist to wet.

We encountered topsoil in Inclinometer I-2 and Piezometer P-1 below the fill. The top soil consists of stiff to very stiff fat clay and is 4 to 6.5 feet thick. The topsoil is underlain by elastic silt in Inclinometer I-2 and older landslide debris in Piezometer P-1. The elastic silt is stiff to hard, moist and about 4 feet thick.

The grading plans by KCA Engineering indicate that there was older slide debris at the site. We observed older slide debris in Piezometer P-1. The older slide debris was encountered below the detention basin fill at a depth of about 28 feet which is coincident with the original grade. The thickness of the older slide debris is unknown and has been estimated on our logs. The older slide debris consisted of lean clay, very stiff to hard, and moist.

We encountered Orinda Formation material below the fill and below the silt and/or older landslide debris. The Orinda Formation consists of interbedded claystone, siltstone and sandstone at our boring locations. The rock is intensely fractured to crushed with low hardness. The rock is generally friable with some of the upper portion being plastic. The rock is moderately to deeply weathered.

Our borings were backfilled shortly after completion and groundwater, where encountered, may not represent stabilized conditions. To estimate groundwater conditions, we installed nested piezometers at two locations within the landslide and one location up slope of the slide. Piezometer P-1 indicates that the groundwater level behind the landslide is within a few feet of the ground surface. Piezometer P-2 (upslope portion of the slide) indicates that groundwater was between Elevation 86 feet and 89 feet or about 17.5 feet to 20.5 feet below existing grade. Piezometer P-3 (south side of Via Verdi) indicates that the groundwater is between Elevation 71 feet and 79 feet or about 23.5 feet to 31.5 feet below existing grade. Piezometer P-3 also indicates that there is an elevated groundwater level in the rock.

The above descriptions of soil and groundwater conditions summarize observations at the time of our investigation. Conditions are expected to vary across the site and with time and depend on several factors including changes in moisture content resulting from seasonal precipitation and land use changes.

E. Inclinometer Data

Inclinometer readings were collected periodically until the slope movement exceeded the limits of the inclinometer probe. The direction of landslide movement at the inclinometer locations are shown on Plate C-1. Inclinometer I-1 pinched off five days after the baseline reading and indicates that the landslide movement is 38 feet below existing grade. Inclinometer I-2 pinched off seventeen days after the baseline reading and indicates that the landslide movement is 46 feet below existing grade. Inclinometer I-3 pinched off eighteen days after the baseline reading and indicates that the landslide movement is 48 feet below existing grade. Inclinometer I-4 pinched off twelve days after the baseline reading and indicates that the landslide movement is 53 feet below existing grade. Inclinometer I-5 indicates that the landslide movement is 38 feet below existing grade. Inclinometer I-6 indicates that the landslide movement is 40 feet below grade. The inclinometer readings are presented in Appendix C.

F. Piezometer Data

Piezometer readings were recorded every 15 minutes by a data logger at each piezometer location. The ground surface elevations and the elevations of the piezometers are presented in Table 2. The piezometer readings are presented in Appendix D.

IV. DISCUSSION AND CONCLUSIONS

A. General

The Via Verdi landslide began in late February 2017 after intense rainfall in January and February. The landslide is approximately 300 feet wide and extends up to 53 feet below the ground surface. The approximate landslide volume is 80,000 cubic yards. The landslide is moving toward San Pablo Creek. The data from the inclinometers and borings indicates that the base of landslide is in the Orinda Formation rock.

The piezometer data indicates that the slide area has high groundwater levels. At the time of the landslide, the groundwater in the area above Via Verdi is only a few feet below the existing grade. During our initial site visits, we observed standing water in the desilting basin area.

B. Landslide Repair Scheme Alternatives

We considered various alternatives to repair the landslide including: (1) an earthwork slope repair, (2) an earthwork slope buttress in San Pablo Creek, (3) subsurface dewatering, and (4) structural retaining. Conceptual sketches of each alternative are shown on Plates 6 through 9. Each alternative is discussed below along with constraints to each alternative.

The site has a number of constraints that make repair of the slide area difficult. The constraints include the depth of the slide and the presence of a sensitive environmental area below the slope in San Pablo Creek with considerable impacts to habitat should it be disturbed. Another constraint is that Via Verdi is the only road to the Sobrante Glen subdivision and repair alternatives will need to maintain access to the neighborhood.

1. Earthwork Slope Repair

This repair option would include removal of the entire landslide to below the existing slide plane and replacement as a compacted fill (Plate 6). The slide plane would be eliminated with this option and the water levels around the slide lowered through placement of extensive subsurface drainage. The soil that is removed from the excavation could be processed and placed as fill. The excavation would be benched into the unexcavated material and drainage placed at the back of each bench. Drainage would need to daylight to the creek or storm drain.

The excavation would likely need to be in excess of 55 feet and would extend below the flow line of San Pablo Creek and disrupt flow within the creek. To work around and below the creek, the creek would need to be bypassed and groundwater levels reduced by dewatering. The existing slope, Via Verdi, and the area above Via Verdi would be removed and replaced.

The slope above the scarp is underlain by old landslide debris and there is an increased risk of slope movement during construction. The removal of the active landslide debris during construction could trigger a much larger landslide above the backcut, increasing the cost and time for construction.

The bypass road and temporary utility alignments may need to be relocated to accommodate the excavation. Given that the temporary alignments are above an old landslide, stability of the bypass road would need to be considered prior to implementation of this alternative.

2. Earthwork Slope Buttress in San Pablo Creek

Another repair option is to buttress the toe of the landslide by filling in San Pablo Creek. A conceptual plan is presented on Plate 7. This alternative includes permanently relocating San Pablo Creek into a culvert, similar to the culvert at El Portal Drive. Backfill would be placed around and over the culvert to raise the ground surface to buttress the landslide. To work around and below the creek, the creek may need to be bypassed and groundwater levels reduced by dewatering.

By constructing an earthen buttress in San Pablo Creek, the bypass road and utilities would not need to be relocated and the repair work could be completely within the City's property. The desilting basin could be excavated for use as fill.

This is a reliable method of reducing the hazard of future landslide movement.

3. Slope Drainage Gallery

We also evaluated a slope drainage gallery. Another option is to lower the groundwater level through installation of a deep drainage gallery. The purpose of the drainage gallery is to intercept groundwater upgradient of the slide to maintain groundwater at a lower level. The drainage gallery could consist of a series of shafts interconnected at or near their bases and drained by a gravity outlet to San Pablo Creek. The large diameter drilled shafts would be filled with a permeable material. A conceptual detail for the drainage gallery is presented on Plate 8. The drainage effects would be similar to the earthwork alternative but the slide plane would not be eliminated.

The drainage gallery would need to be constructed behind the active landslide on Cemetery property. Depending on the location of this alternative, the bypass road and utilities may not need to be relocated.

The effectiveness of the drainage gallery is limited by the flow line of San Pablo Creek. The San Pablo Creek flow line is around Elevation 65 feet in the area of the slide.

4. Structural Repair Alternatives

A fourth option is to resist the landslide movement by constructing buried structural elements within the landslide. Drilled piers, with tie backs, are used to resist landslides. Drilled shafts or piles would be installed through the slide plane. Landslide forces are large and the drilled shafts would need to be heavily reinforced. Drilled shafts installed in a row, could be tied together and anchored behind the slide with tie backs. Multiple rows of drilled shafts may be needed. Smaller pin piles could be installed in array around the landslide as an alternative.

Structural solutions can be configured to remain on City property and to avoid utility lines. Tie backs, if used, would need to extend into the Cemetery property and could impact utilities. Because of the depth of the landslide, the cost of the drilled piers will be very high. To resist movement requires constructing the equivalent of a 50 foot high retaining structure.

C. Analysis

1. Slope Stability Analysis

We performed preliminary slope stability analysis using the computer program SLOPE/W 2016 by Geo-Slope to estimate the active landslide shear strength. We chose a selected cross section for analysis, landslide geometry based on the inclinometer measurements and borings, and groundwater conditions based on the piezometer data.

We assumed the Via Verdi roadway fill material had a friction angle of 20 degrees for design. We then calculated the friction angle within the Orinda Formation which produced a factor of safety of 1.0. The analysis yielded a friction angle of 13 degrees for the failure plane in the Orinda Formation. We used this active landslide model for evaluating the repair alternatives. The results for the existing landslide are presented on Plate E-1.

After establishing the landslide models we evaluated the earthwork slope repairs, the slope buttress within the San Pablo Creek, and drainage gallery alternatives. We modeled the earthwork slide repair by increasing the friction angle of the repaired area and by lowering the groundwater table. The factor of safely was increased to 1.75.

We evaluated the slope buttress by placing fill in San Pablo Creek. To account for the lighter weight of the culvert, we reduced the weight of the soil buttress by about 30 percent. The soil buttress increases the factor of safety to 1.68 for the active landslide model.

We modeled the drainage gallery alternative by lowering the groundwater table behind the landslide. The factor of safety was increased to 1.2 by lowering the groundwater level in the active landslide.

The slope stability results indicate that the earthwork slope repair and the option of filling the creek are feasible. The drainage only solution is not effective in increasing the factor of safety. The slope stability analysis results are presented in Appendix E.

REFERENCES

REFERENCES

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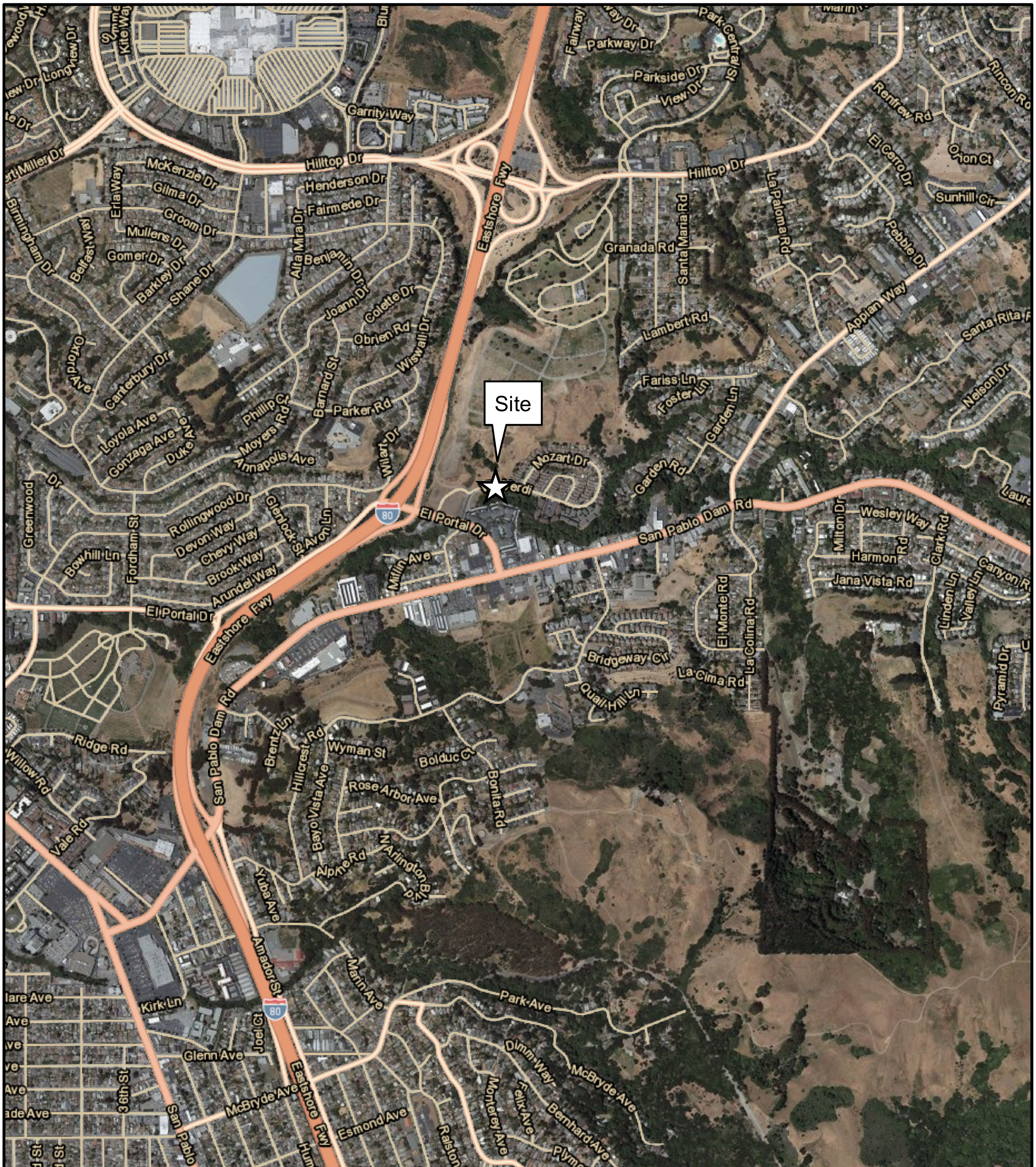
KCA Engineering, 1977 & 1983, Grading Plan, Subdivision 5493, “Sobrante Glen”.

Nilsen, T. H., 1975, Preliminary Photointerpretation Map of Landslide and Other Surficial Deposits of the Richmond 7.5' Quadrangle, Contra Costa County, California: U.S. Geological Survey, Open File Map 75-277-47.

PLATES



N

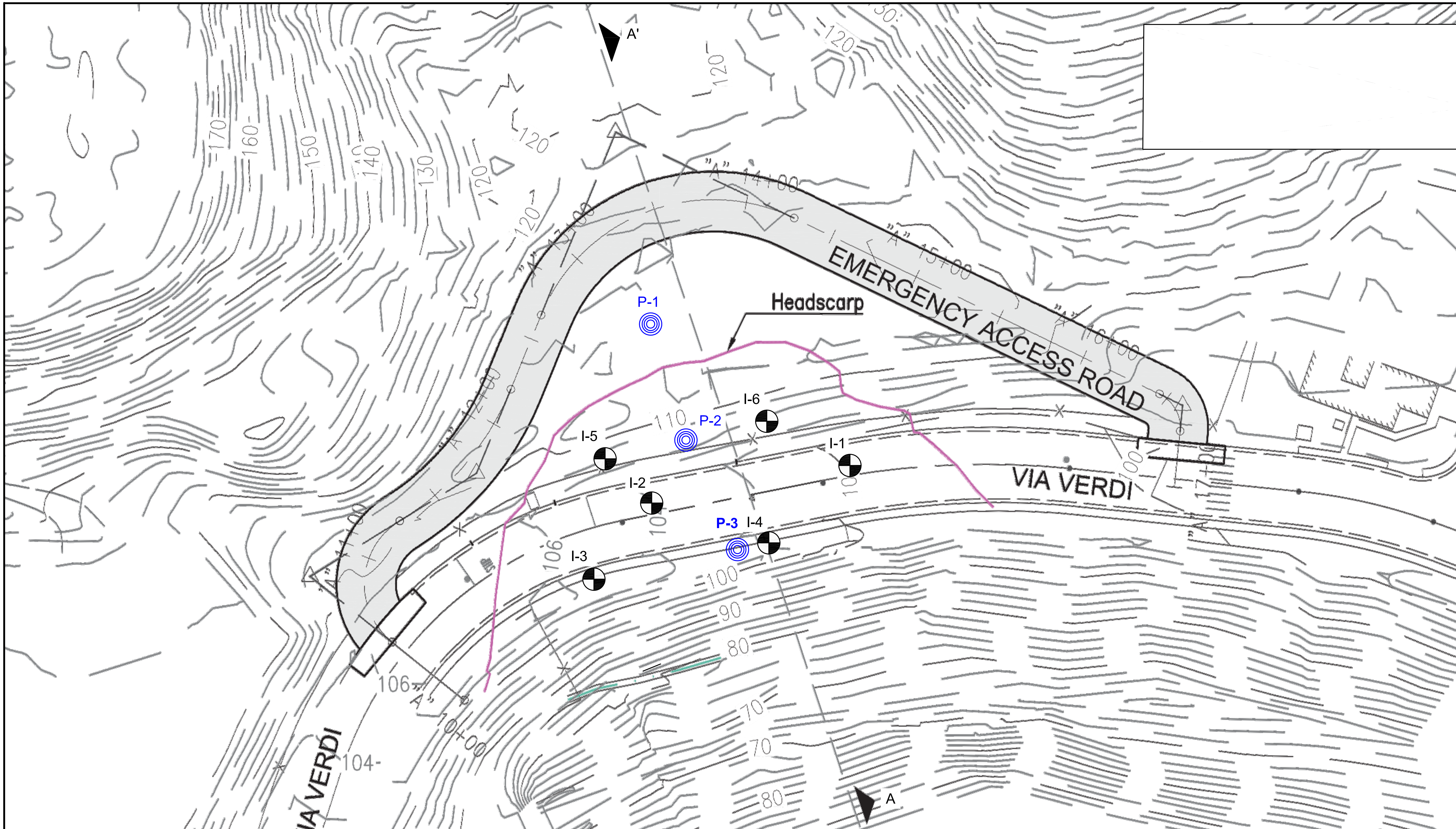
0 2,000 feet

1 inch = 2,000 feet

Via Verdi Landslide
Richmond, California

Vicinity Map

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 1



Approximate Location of Inclinometer

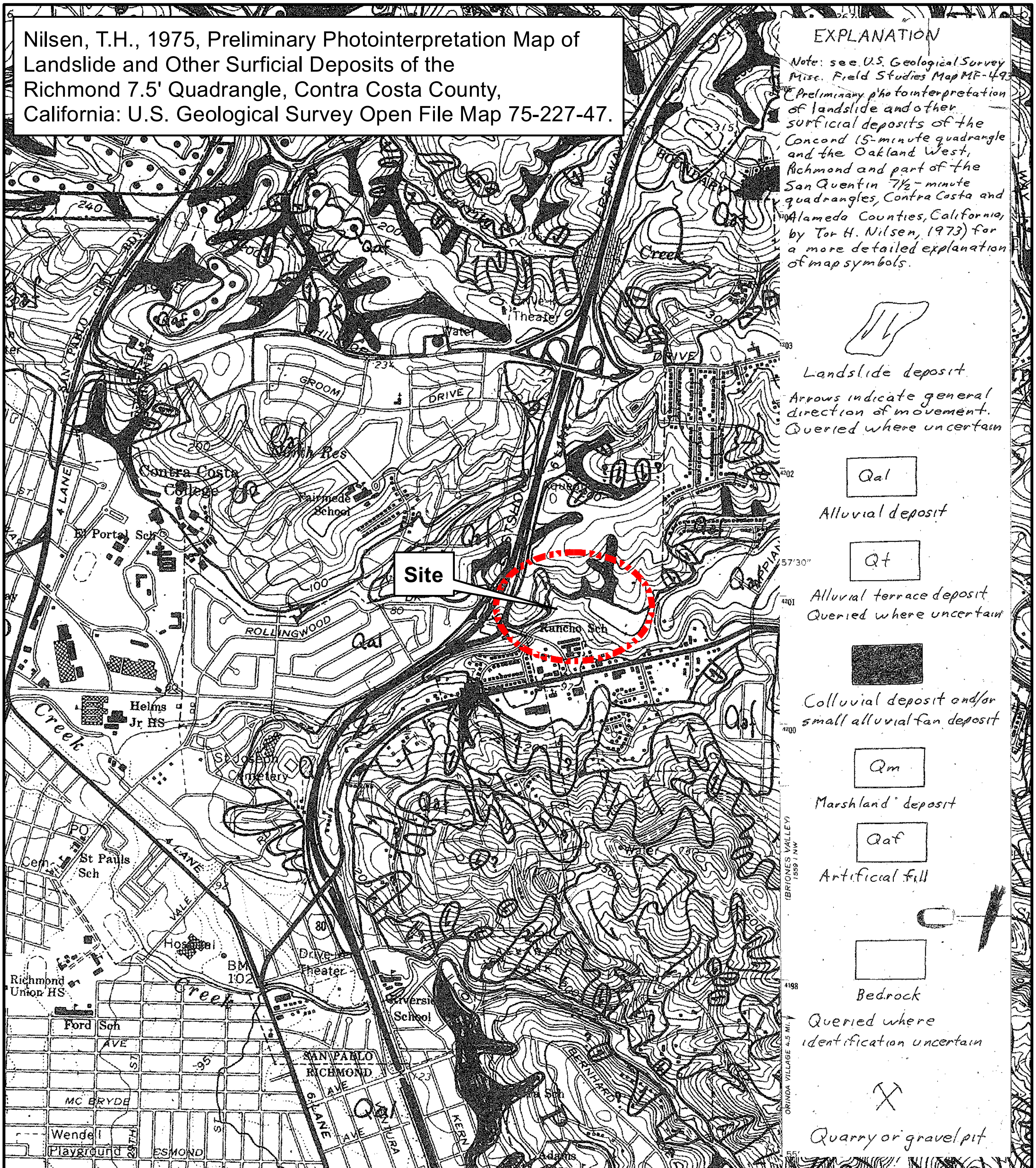
Approximate Location of Piezometer

SCALE
0 50 feet
1 inch = 50 feet

Via Verdi Landslide Richmond, California	**Site Plan**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 2

Nilsen, T.H., 1975, Preliminary Photointerpretation Map of Landslide and Other Surficial Deposits of the Richmond 7.5' Quadrangle, Contra Costa County, California: U.S. Geological Survey Open File Map 75-227-47.



0 2,000 feet

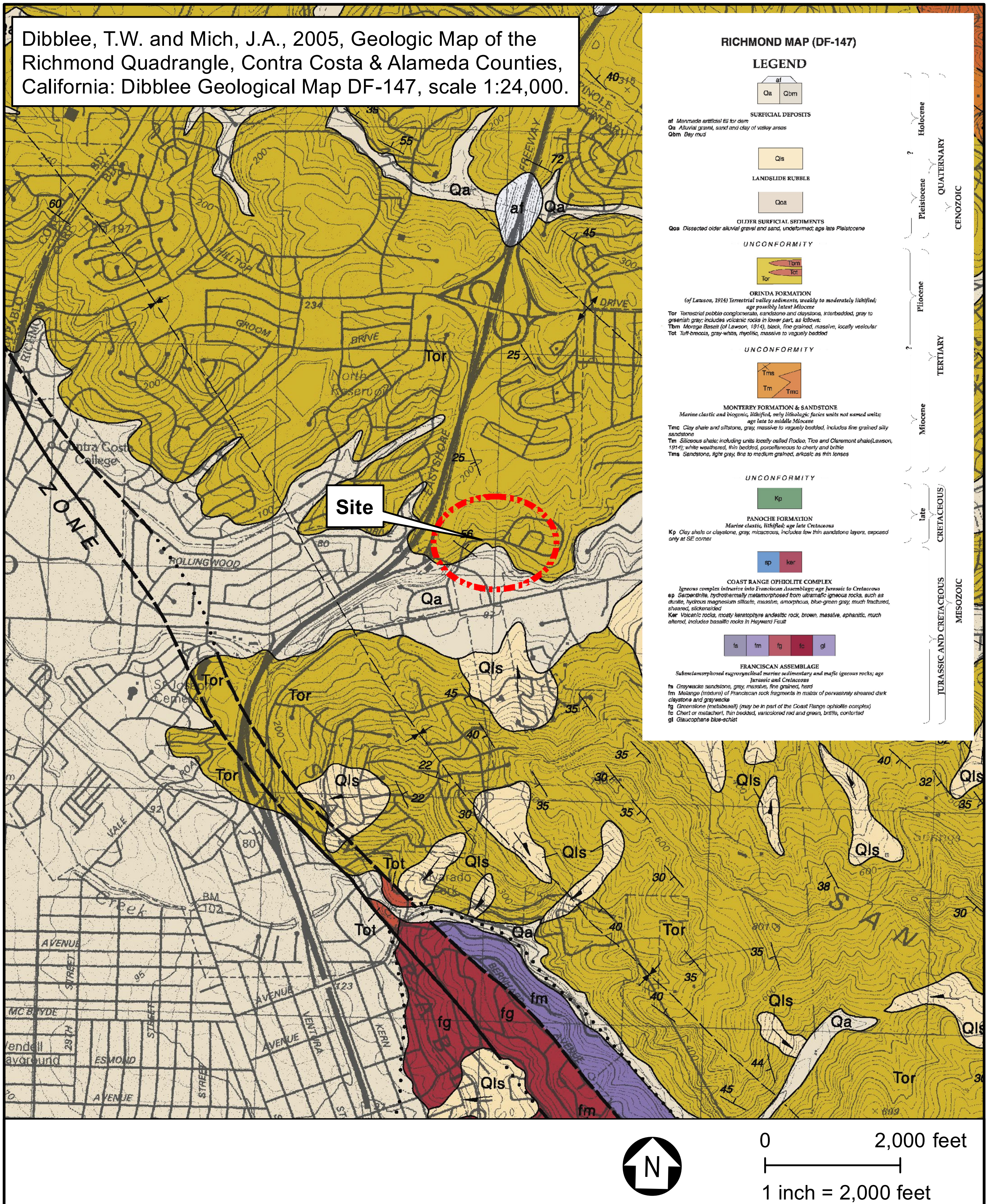
1 inch = 2,000 feet

N

Via Verdi Landslide
Richmond, California

Preliminary Photointerpretation Map

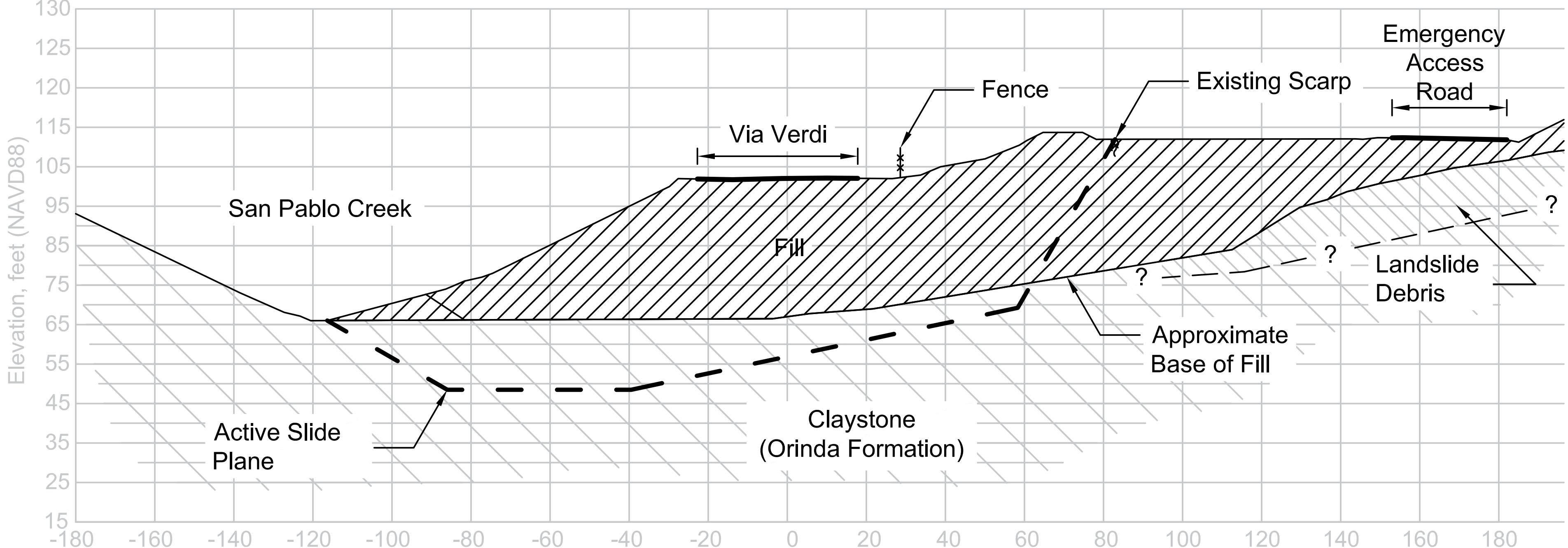
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 3



Via Verdi Landslide
Richmond, California

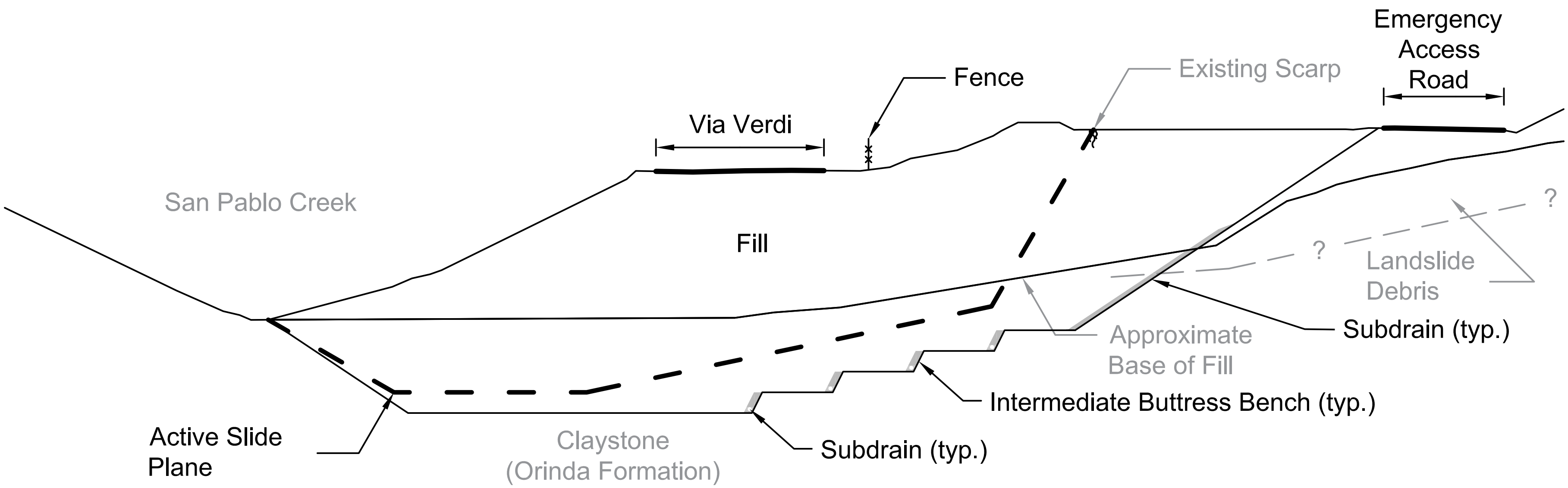
Geologic Map

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 4



SCALE
0 40 feet
1 inch = 40 feet

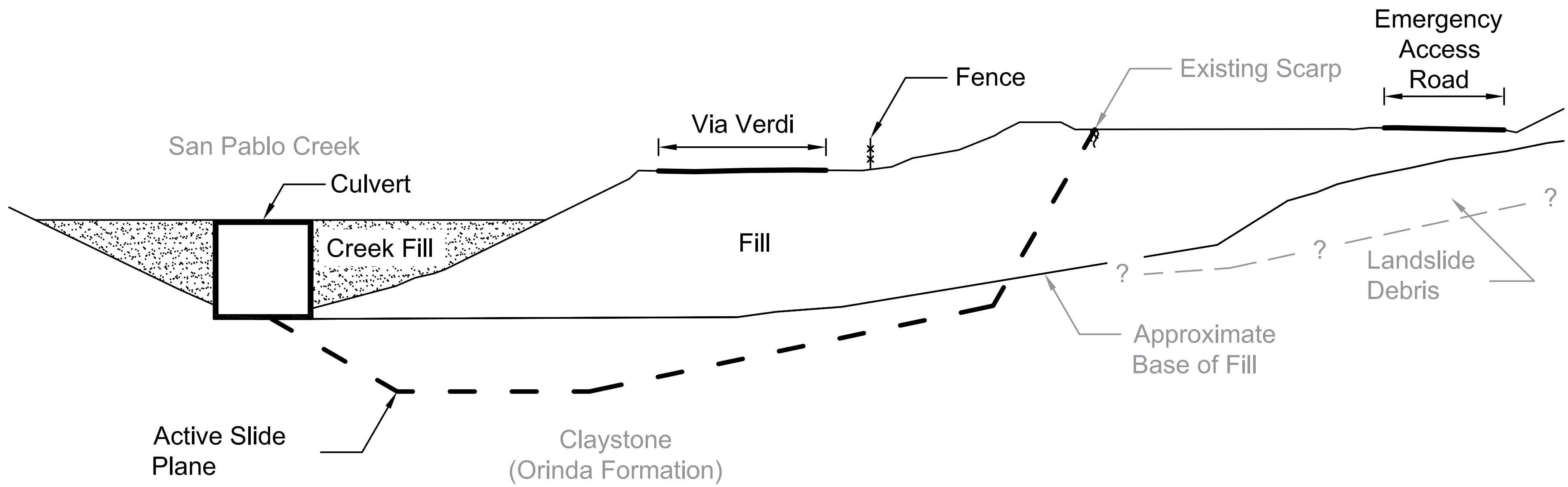
Via Verdi Landslide Richmond, California	**Idealized Subsurface Cross Section**	
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 5



Notes:

1. Earthwork slope buttress repair includes excavating below slide plane.
2. Install subdrains and backfill with excavated material.
3. Risk of backcut failure and expansion of upslope slide during repair.

NOT TO SCALE	Via Verdi Landslide Richmond, California	**Conceptual Earthwork Slope Repair Alternative**	
	Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 6



NOT TO SCALE

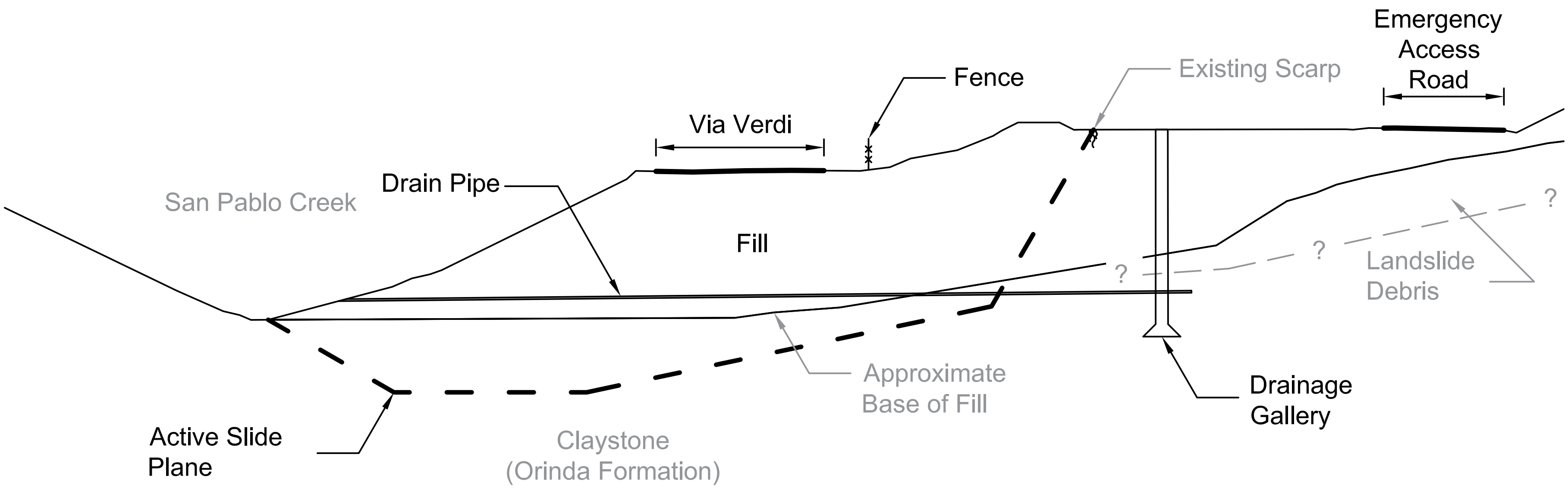
Via Verdi Landslide
Richmond, California

Conceptual Creek Fill Buttress

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 7



NOT TO SCALE

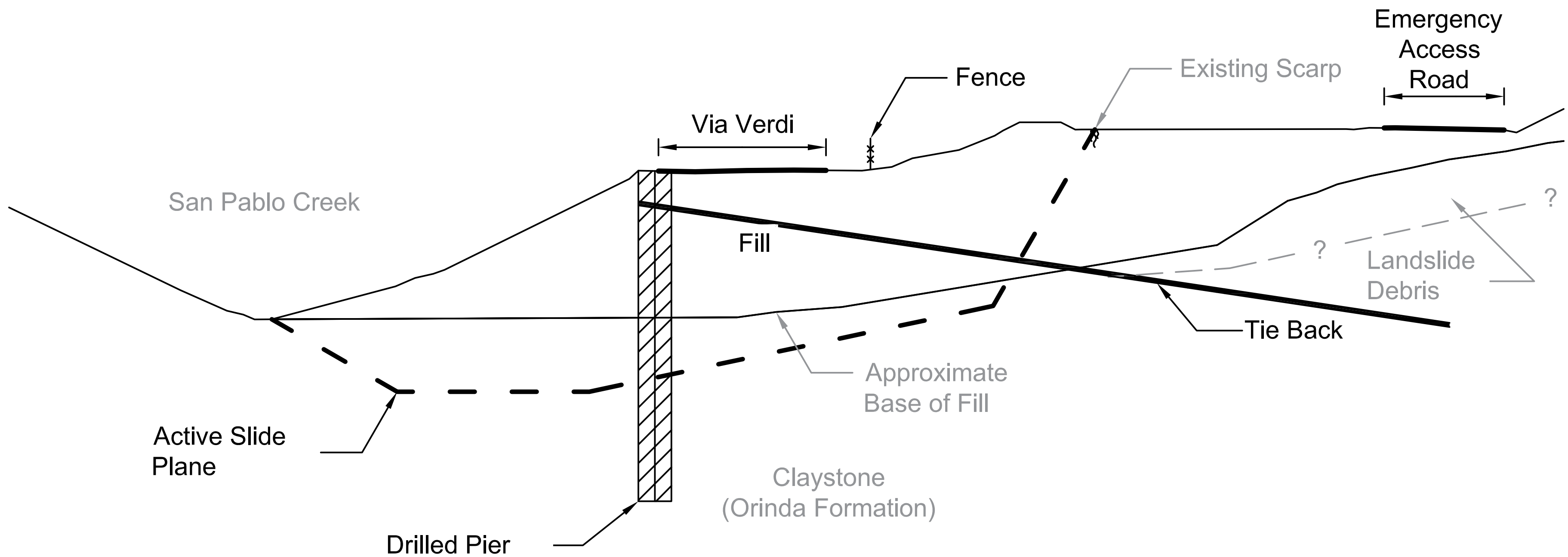
Via Verdi Landslide
Richmond, California

Conceptual Drainage Gallery Alternative

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. 8



NOT TO SCALE	Via Verdi Landslide Richmond, California	**Conceptual Structural Alternative**	
	Hultgren - Tillis Engineers	Project No. 867.01	Plate No. 9

APPENDIX A

Date : 3/8/2017
Drilling Method : Hollow-Stem Auger
Elevation (Feet) : 99.5 (NAVD 88)
Latitude : 37.96692
Longitude : -122.31876

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
						Asphalt concrete (6-inches)					
	B					Lean Clay (CL), gray brown, moist, stiff to very stiff, with some sand and gravel, (fill)					
5	B										
	M	6		CL		Blue gray		2.3 3.0	16	108	LL=42 PI=22
10											
15	M	10						2.3 1.5	20	93	LL=44 PI=26
				CL		Lean Clay (CL), black with gray mottling, moist, stiff, trace sand, (fill)					
20											
	M	14				Lean Clay with Sand (CL), dark gray, moist to wet, stiff, with black inclusions, (fill)		2.3			
25				CL							
	M	15									
30											
	M	14				SANDY CLAYSTONE, gray, crushed, soft to low hardness, plastic to friable, deeply weathered					
35											
	M	10						1.8 2.3			
40											
	M	19				Shear		3.5 4.5+			

Via Verdi Landslide
Richmond, California

Log of Boring 1 (Inclinometer I-1)
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-1

Date : 3/8/2017
Drilling Method : Hollow-Stem Auger
Elevation (Feet) : 99.5 (NAVD 88)
Latitude : 37.96692
Longitude : -122.31876

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	34				Deeply weathered		4.5+	18	109	LL=40 PI=22
50											
	M	34									
55						SILTSTONE, gray, moist, crushed, low hardness, friable, deeply to moderately weathered					
	M	46						4.5+	21	104	
60											
	M	66				CLAYSTONE, dark gray, moist, intensely fractured to crushed, low hardness, friable to weak, deeply to moderately weathered			19	99	
65						3/8/2017					
					▽	CLAYSTONE, brown gray, moist, intensely fractured to crushed, low hardness, plastic to friable, deeply to moderately weathered					
70	M	29							17	111	

Bottom of boring at 70 feet
Groundwater encounted at 67 feet during drilling
Boring converted to Inclinometer I-1

Via Verdi Landslide
Richmond, California

Log of Boring 1 (Inclinometer I-1)
(Page 2 of 2)

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. A-2

Date : 3/9/2017
Drilling Method : Hollow-Stem Auger
Elevation (Feet) : 104 (NAVD 88)
Latitude : 37.96683
Longitude : -122.31910

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
						Asphalt concrete (6-inches)					
	B			CL		Lean Clay (CL), light brown, moist, medium stiff to stiff, occasional sand, (fill)					
5											
	M	9		CL		Gravelly Lean Clay with Sand (CL), reddish brown, moist, stiff, (fill)		4.3 2.8	24	105	LL=55 PI=36
10				CH		Fat Clay (CH), brownish gray, moist, very stiff to hard, (fill)					
15	M	9				Lean Clay (CL), bluish gray, moist, very stiff to hard, with trace gravel, (fill)		4.5+ 2.5	26	91	
20											
	M	13		CL		Becomes dark gray with occasional gravel, (fill)		2.5 3.3	18	111	
25											
	M	14						2.3			
30						Lean Clay with Sand (CL), dark gray, moist, stiff, (fill)					
	M	4		CL				1.3 1.5	28	96	
35						Fat Clay (CH), dark gray, moist, stiff to very stiff, trace organics, (topsoil)					
	M	10		CH				2.3	28	92	LL=64 PI=46
40				MH		Elastic Silt (MH), gray, moist, stiff to very stiff, occasional sand					
	M	6				Becomes brown gray		2.0 1.5			
						CLAYSTONE, greenish gray, moist, crushed, low hardness, friable, deeply to moderately					

Via Verdi Landslide
Richmond, California

Log of Boring 2 (Inclinometer I-2)
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-3

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Date : 3/9/2017 Drilling Method : Hollow-Stem Auger Elevation (Feet) : 104 (NAVD 88) Latitude : 37.96683 Longitude : -122.31910 Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	14				weathered Charcoalized leaf fragments		2.0 1.5			
50	M	44				SANDSTONE, greenish gray, moist to wet, crushed, low hardness, friable, moderately weathered, coarse grained sand to fine gravel, (conglomerate)					
55											
60	M	63				SANDSTONE, greenish gray, moist to wet, crushed, low hardness, friable, moderately weathered Gray, moist			22	104	
65						CLAYSTONE, gray, moist, crushed, low hardness, deeply to moderately weathered, gravel up to 1/2-inch					
70	M	62							22	99	

Bottom of boring at 70 feet
No groundwater encountered
Boring converted to Inclinometer I-2

Via Verdi Landslide
Richmond, California

Log of Boring 2 (Inclinometer I-2)
(Page 2 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-4

Date : 3/23/2017
Drilling Method : Hollow-Stem Auger
Elevation (Feet) : 112
Latitude : 37.96710
Longitude : -122.31911

Depth in Feet	Samples Type/ Recovery	Blow Count	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
			CH		Fat Clay (CH), gray, moist, medium stiff, trace organics, (fill)					
5					Lean Clay (CL), brown, moist, medium stiff to stiff, with occasional coarse sand and occasional 3/4 to 1-inch gravel, (fill)					
	M	9	CL		Becomes orange brown		1.0 2.5			
10										
			CL		Sandy Lean Clay (CL), light blue gray, moist, very stiff, with dark gray mottling, (fill)					
15	M	14					3.3 1.0			
			CH		Fat Clay (CH), dark gray, moist, medium stiff, (fill)					
20										
	M	12					2.0 2.3			
			CH		Fat Clay (CH), dark brown, moist, very stiff, with trace gravel, (topsoil)					
25										
					Lean Clay (CL), olive brown, moist, very stiff to hard, occasional gravel, (landslide debris)					
30	M	28								
			CL							
35										
40					CLAYSTONE, crushed, low hardness, friable, deeply to moderately weathered, mottled light brown gray, moist					

Via Verdi Landslide
Richmond, California

Log of Boring 5 (Piezometer P-1)
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-5

Date : 3/23/2017
Drilling Method : Hollow-Stem Auger
Elevation (Feet) : 112
Latitude : 37.96710
Longitude : -122.31911

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
	M	58				Becomes moderately hard					
50											
55						Intensely fractured to crushed, moderately weathered					
60											
	M	69									

Bottom of boring at 63 feet
No groundwater encountered
Boring converted to Piezometer P-1

Date	: 3/24/2017
Drilling Method	: Hollow-Stem Auger
Elevation (Feet)	: 106.5
Latitude	: 37.96693
Longitude	: -122.31904

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
				CL		Lean Clay (CL), grayish brown, moist, medium stiff, trace sand, trace gravel, (fill)					
5											
	M	12		CH		Fat Clay (CH), brownish gray, moist, medium stiff to stiff, trace sand, (fill)		1.3			
10											
15	M	20		CL		Lean Clay (CL), light gray, moist, stiff to very stiff, with trace gravel and interbedded lense of sand		2.3			
				CH		Fat Clay (CH), dark gray, moist, medium stiff to stiff, (fill)					
20											
	M	16		CL		Lean Clay (CL), dark gray, moist, very stiff, with some light gray mottling, trace sand and gravel, (fill)		2.5			
25											
						CLAYSTONE, olive brown with gray, moist, crushed, plastic, deeply weathered, soft					
	M	13						3.3			
30											
	M	10				Low hardness, friable		2.3			
35											
40											

Via Verdi Landslide
Richmond, California

Log of Boring 6 (Piezometer P-2)
(Page 1 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-7

Depth in Feet	Samples Type/ Recovery	Blow Count	Graphic	USCS	Water Levels	Date : 3/24/2017 Drilling Method : Hollow-Stem Auger Elevation (Feet) : 106.5 Latitude : 37.96693 Longitude : -122.31904 Material Description	Torvane (tsf)	Pocket Pen (tsf)	Moisture Content (%)	Dry Density (pcf)	Other Laboratory Tests
50											
	M	38				CLAYSTONE, crushed, low hardness, friable, moderately weathered, dark gray, dry to moist					
55											
60											
65											
	M	54				Deeply weathered					
70											

Bottom of boring at 70 feet
No groundwater encountered
Boring converted to Piezometer P-2

Via Verdi Landslide
Richmond, California

Log of Boring 6 (Piezometer P-2)
(Page 2 of 2)

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. A-8

MAJOR DIVISIONS				GROUP NAMES
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	**GRAVELS** MORE THAN 50% OF COARSE FRACTION IS RETAINED ON NO. 4 SIEVE	**CLEAN GRAVELS** WITH LESS THAN 5% FINES	GW	WELL GRADED GRAVEL
			GP	POORLY GRADED GRAVEL
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SANDS 50% OR MORE OF COARSE FRACTION PASSES NO. 4 SIEVE	**CLEAN SANDS** WITH LESS THAN 5% FINES	SW	WELL GRADED SAND
			SP	POORLY GRADED SAND
		SANDS WITH OVER 12% FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS 50% OR MORE PASSES NO. 200 SIEVE	**SILTS AND CLAYS** LIQUID LIMIT LESS THAN 50		ML	SILT
			CL	LEAN CLAY
			OL	ORGANIC CLAY, ORGANIC SILT
	SILTS AND CLAYS LIQUID LIMIT 50 OR MORE		MH	ELASTIC SILT
			CH	FAT CLAY
			OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			Pt	PEAT

UNIFIED SOIL CLASSIFICATION SYSTEM- ASTM D 2487

S	- SPT	▽	- Water Level at Time of Drilling	P	- Push
		▼	- Water Level after Drilling (with date measured)	Perm	- Permeability
M	- 2.5 inch	Consol	- Consolidation	Sieve	- Particle Size Analysis
		Gs	- Specific Gravity	VS	- Laboratory Vane Shear (psf)
C	- 3.0 inch	LL	- Liquid Limit (%)	-200	- % Passing No. 200 Sieve
		PI	- Plasticity Index (%)		
T	- Shelby Tube	TxUU	- Shear Strength (psf) - Unconsolidated Undrained Triaxial Shear		
		TxCU	- Shear Strength (psf) - Consolidated Undrained Triaxial Shear		
B	- Bag	UC	- Compressive Strength (psf) - Unconfined Compression		

KEY TO TEST DATA

Via Verdi Landslide
Richmond, California

Soil Classification Chart

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. A-9

I. CONSOLIDATION OF SEDIMENTARY ROCKS; usually determined from unweathered samples. Largely dependent on cementation.

U = unconsolidated
P = poorly consolidated
M = moderately consolidated
W = well consolidated

II. BEDDING OF SEDIMENTARY ROCKS

Splitting Property	Thickness	Stratification
Massive	Greater than 4.0 ft	very thick-bedded
Blocky	2.0 to 4.0 ft	thick-bedded
Slabby	0.2 to 2.0 ft	thin-bedded
Flaggy	0.05 to 0.2 ft	very thin bedded
Shaly or platy	0.01 to 0.05 ft	laminated
Papery	less than 0.01 ft	thinly laminated

III. FRACTURING

Intensity	Size of Pieces in Feet
Very Little Fractured	Greater than 4.0
Occasionally Fractured	1.0 to 4.0
Moderately Fractured	0.5 to 1.0
Closely Fractured	0.1 to 0.5
Intensely Fractured	0.05 to 0.1
Crushed	Less than 0.05

IV. HARDNESS

1. Soft - reserved for plastic material alone
2. Low Hardness - can be gouged deeply or carved easily with a knife blade
3. Moderately Hard - can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away
4. Hard - can be scratched with difficulty; scratch produces little powder and is often faintly visible
5. Very Hard - cannot be scratched with knife blade; leaves a metallic streak

V. STRENGTH

1. Plastic - of very low strength
2. Friable - crumbles easily by rubbing with fingers
3. Weak - an unfractured specimen of such material will crumble under light hammer blows.
4. Moderately Strong - specimen will withstand a few heavy hammer blows before breaking
5. Strong - specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments
6. Very Strong - specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments

VI. WEATHERING The physical and chemical disintegration and decomposition of rock and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, and freezing and thawing.

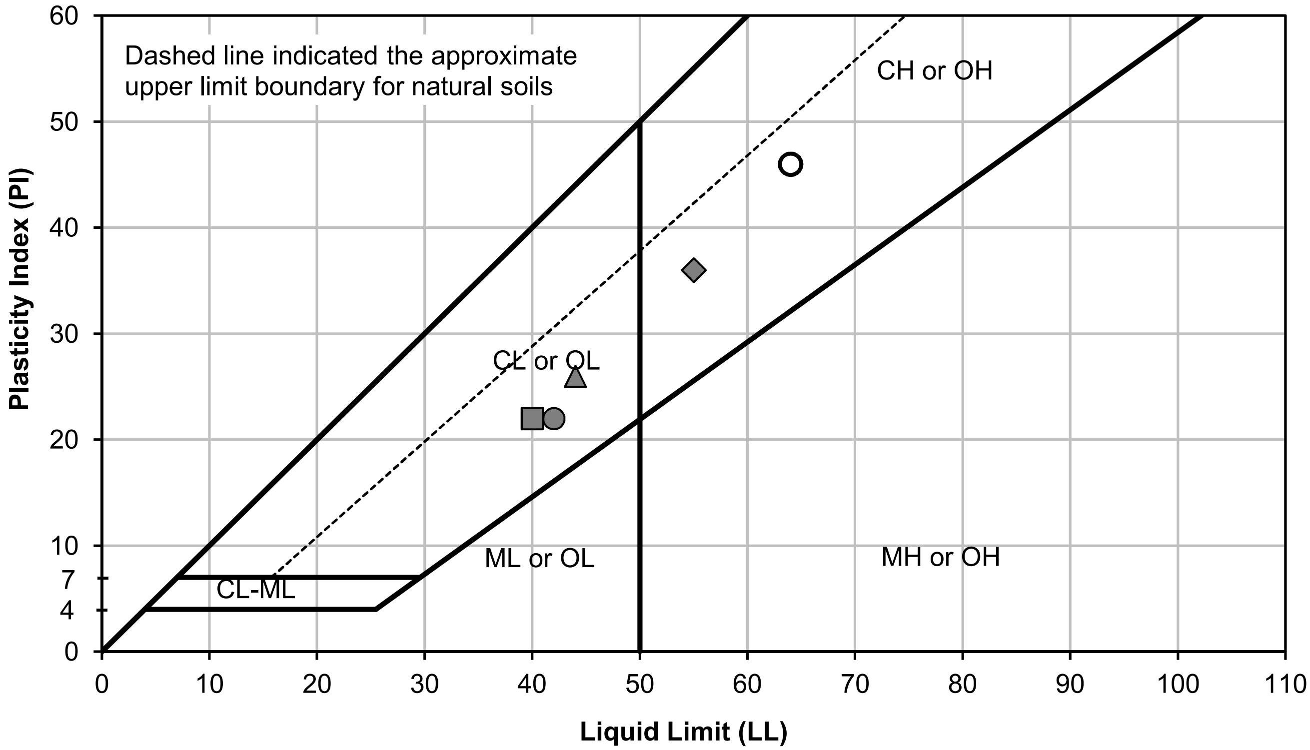
D. Deep - Moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration; - many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.

M. Moderate - Slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected. - Moderate to occasionally intense discoloration. Moderately coated fractures.

L. Little - No megascopic decomposition of minerals; little or no effect on normal cementation. Slight and intermittent, or localized discoloration. Few stains on fracture surface.

F. Fresh - Unaffected by weathering agents. No disintegration or discoloration. Fractures usually less numerous than joints.

APPENDIX B



Symbol	Boring Number	Depth (feet)	Soil Description	LL (%)	PL (%)	PI (%)	Moisture Content (%)
●	1	8 - 8.5	Blue Gray LEAN CLAY	42	20	22	16
▲	1	15 - 15.5	Black with Gray LEAN CLAY	44	18	26	20
■	1	47 - 47.5	Gray Sandy CLAYSTONE	40	18	22	18
◆	2	8 - 8.5	Brownish Gray FAT CLAY	55	19	36	24
○	2	37 - 37.5	Dark Gray FAT CLAY	64	18	46	26

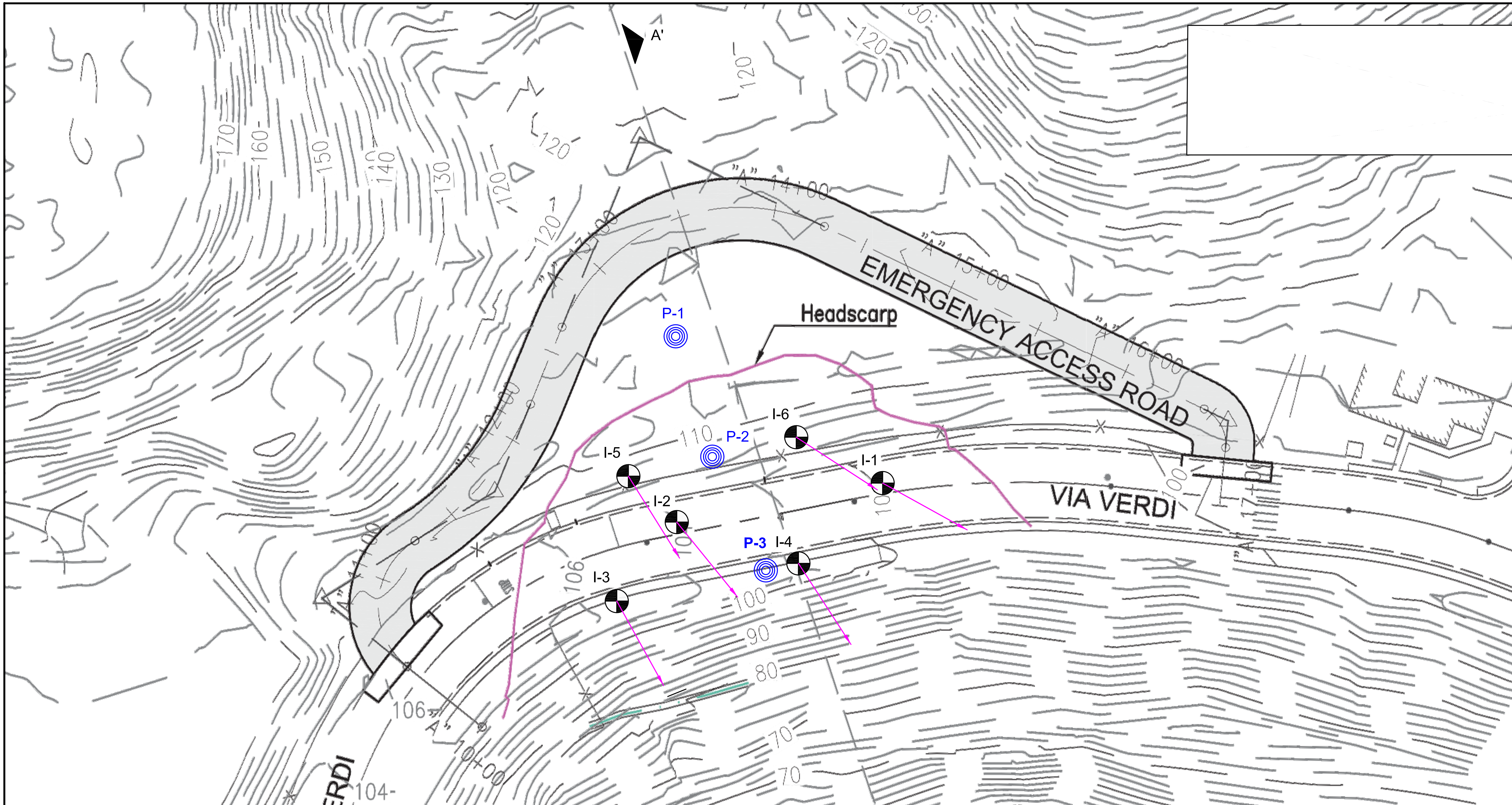
Testing performed by B. Hillebrandt Soils Testing, Inc.

Via Verdi Landslide
Richmond, California

Atterberg Limits

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. B-1

APPENDIX C



Direction of Movement

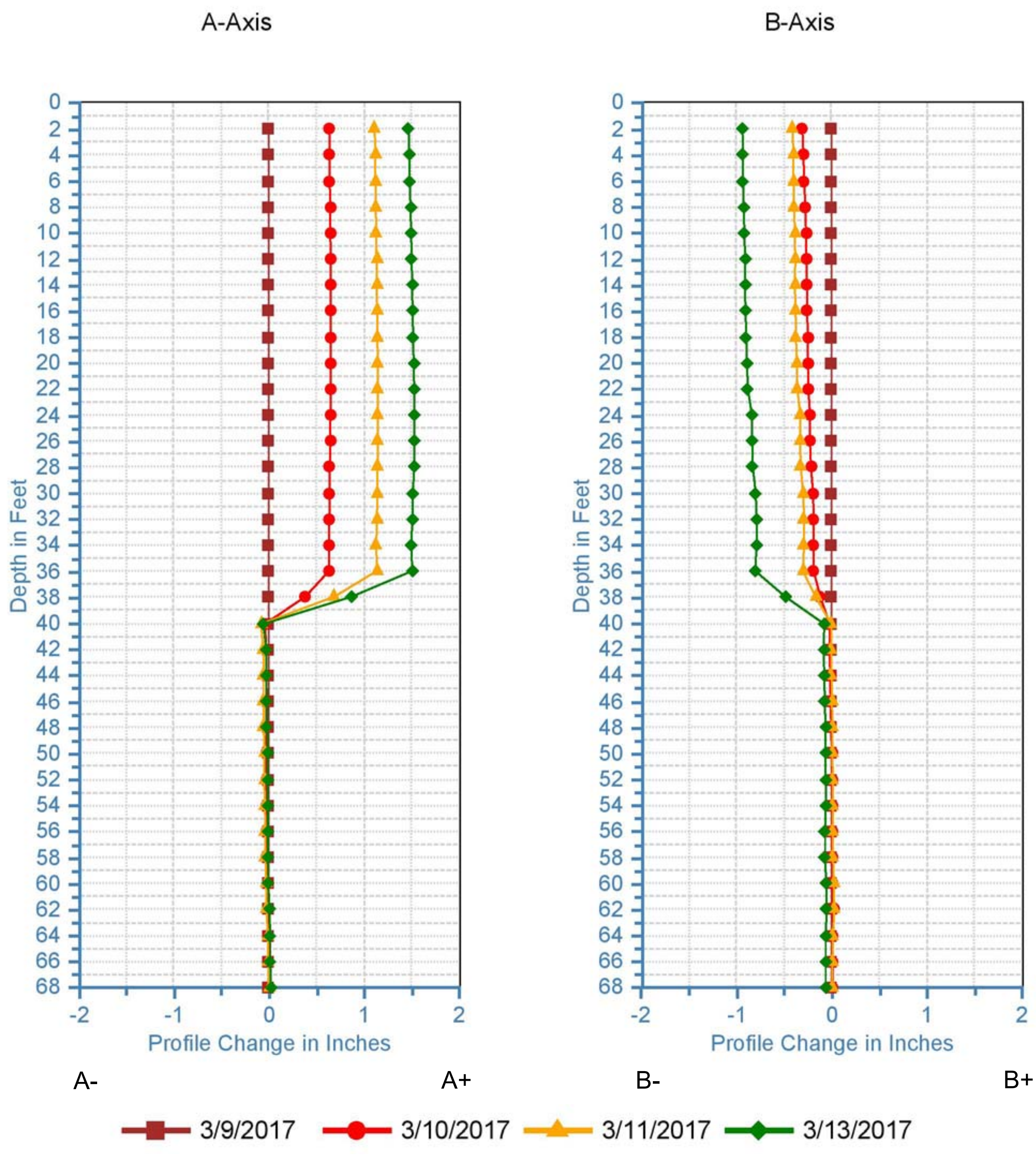
Approximate Location of Inclinometer

Approximate Location of Piezometer

N

SCALE
0 50 feet
1 inch = 50 feet

Via Verdi Landslide Richmond, California		**Slope Inclinometer Bearing Map**
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-1



Notes:

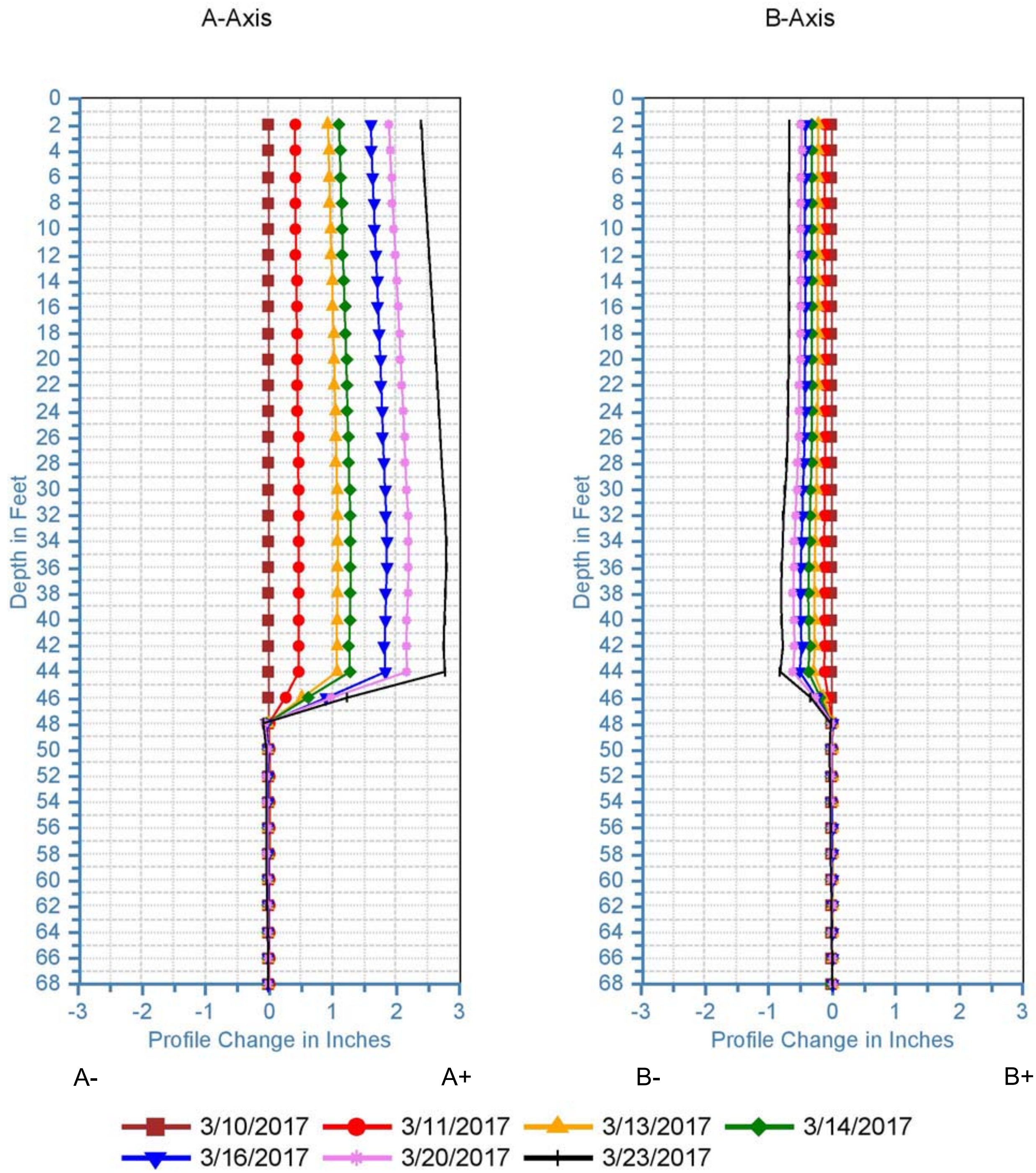
Depth referenced to Elevation 98.9 feet.

Ground surface at Elevation 99.5 feet.

Bearing (A+ Direction): 146 degrees

Via Verdi Landslide Richmond, California	**Inclinometer 1**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-2

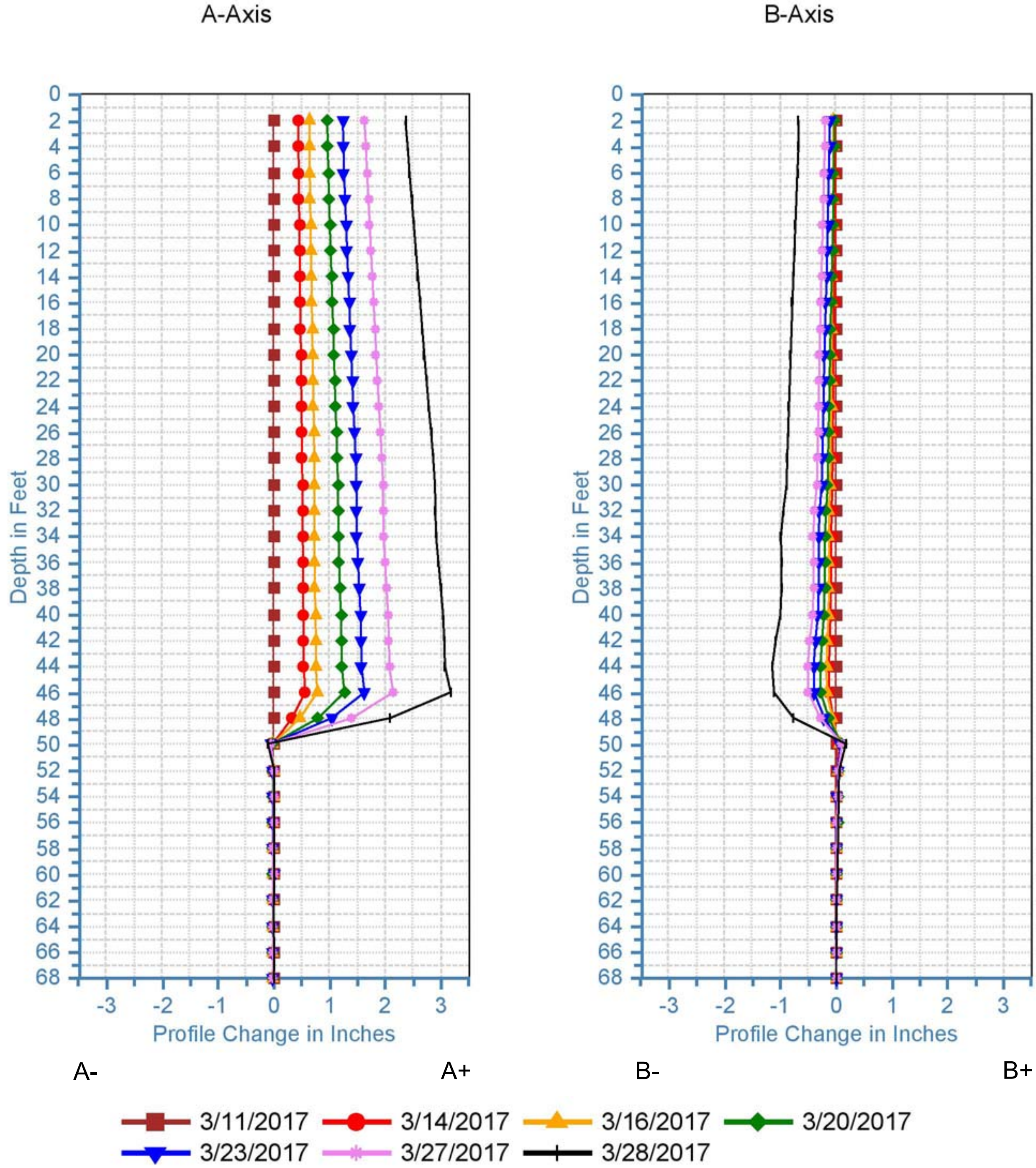


Notes:

Depth referenced to Elevation 103.8 feet.
Ground surface at Elevation 104 feet.
Bearing (A+ Direction): 157degrees

Via Verdi Landslide Richmond, California	**Inclinometer 2**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-3



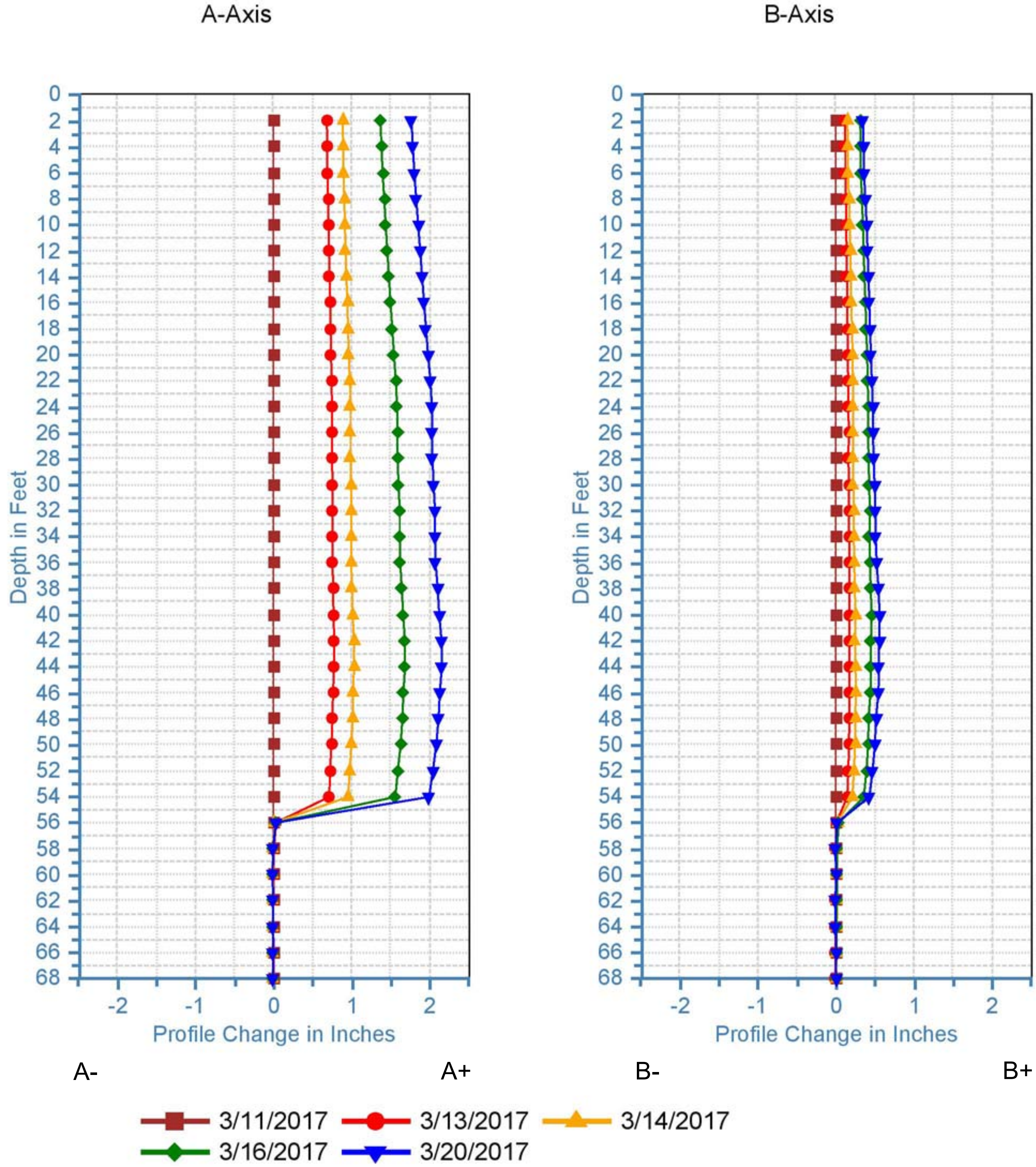
Notes:

Depth referenced to Elevation 105.3 feet.
Ground surface at Elevation 105.5 feet.
Bearing (A+ Direction): 165 degrees

Via Verdi Landslide
Richmond, California

Inclinometer 3

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-4



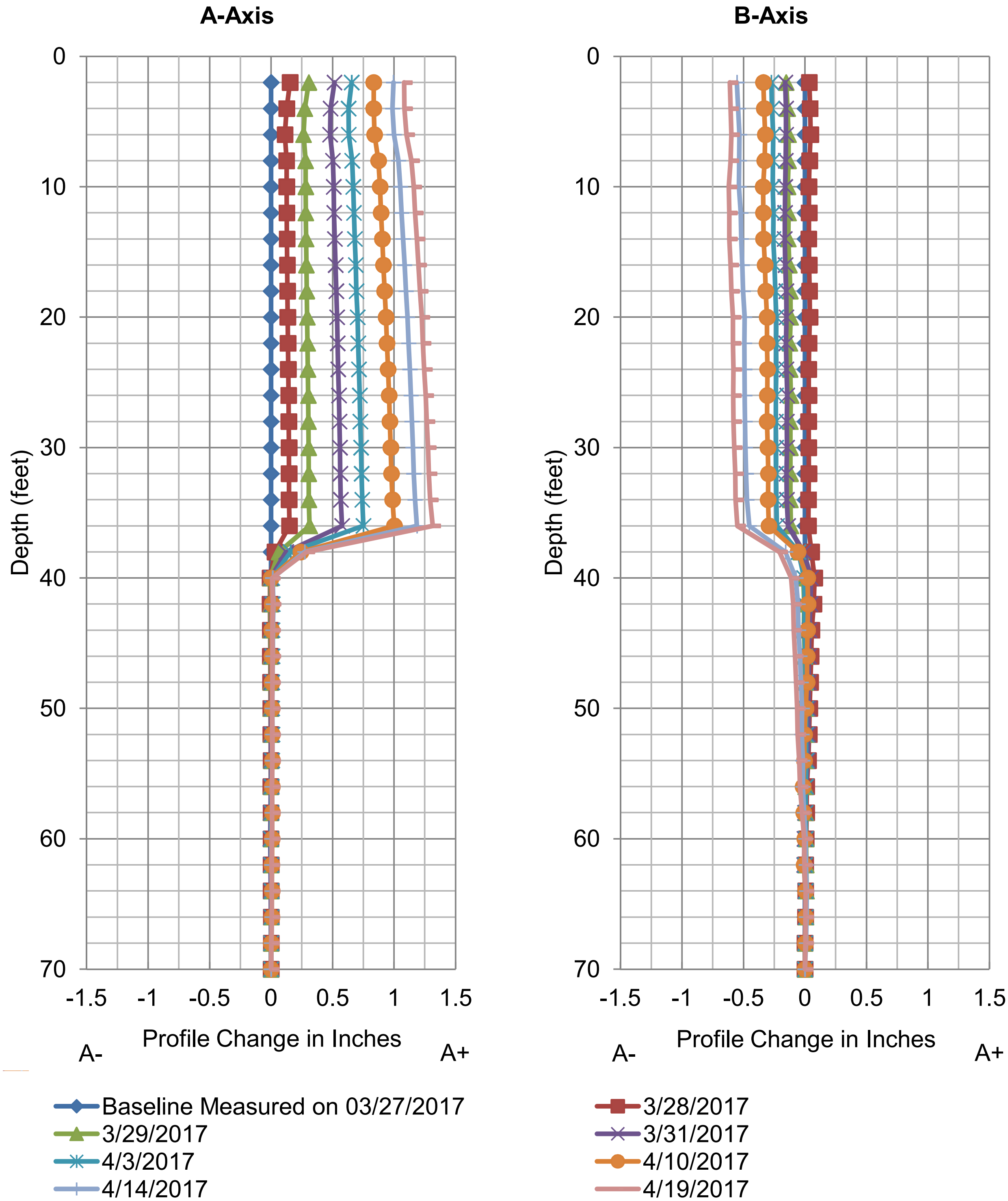
Notes:

Depth referenced to Elevation 101.7 feet.
Ground surface at Elevation 102.2 feet.
Bearing (A+ Direction): 135 degrees

Via Verdi Landslide
Richmond, California

Inclinometer 4

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-5



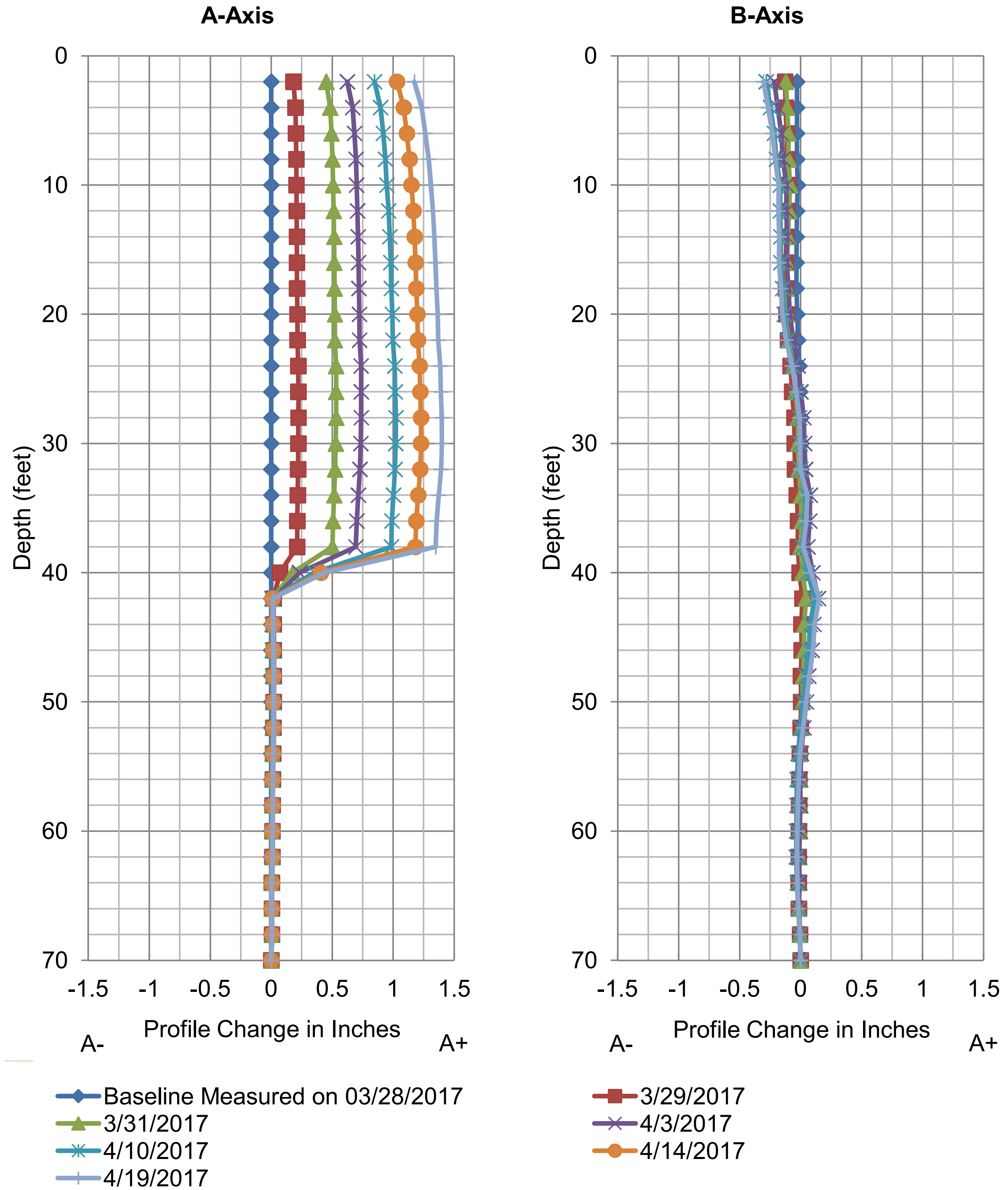
Notes:

Depth referenced to Elevation 107.2 feet.
Ground surface at Elevation 107.5 feet.
Bearing (A+ direction): 163 degrees

Via Verdi Landslide
Richmond, California

Inclinometer 5

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-6



Notes:

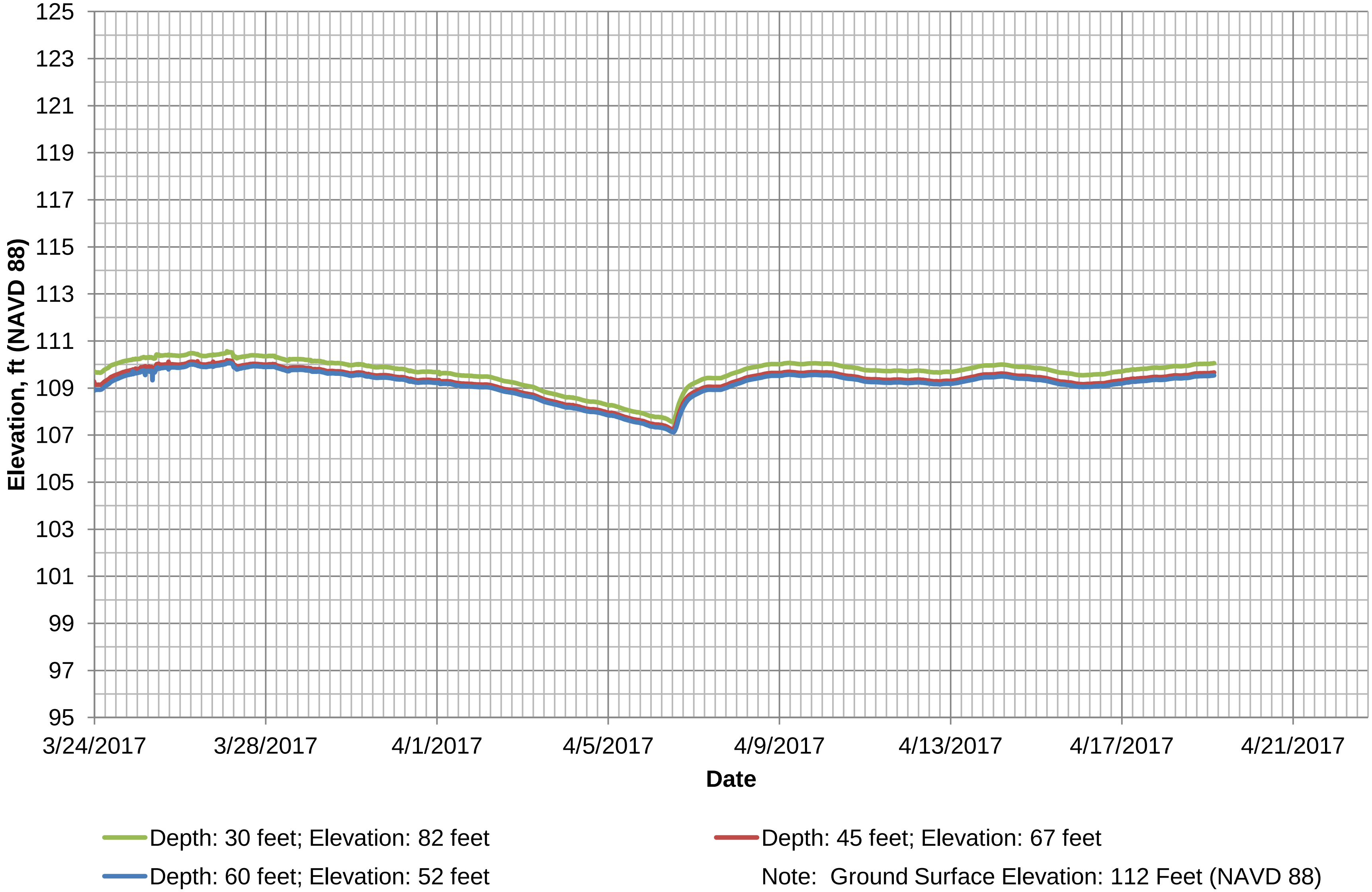
Depth referenced to Elevation 105.2 feet.
Ground surface at Elevation 105.5 feet.
Bearing (A+ direction): 126 degrees

Via Verdi Landslide
Richmond, California

Inclinometer 6

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. C-7

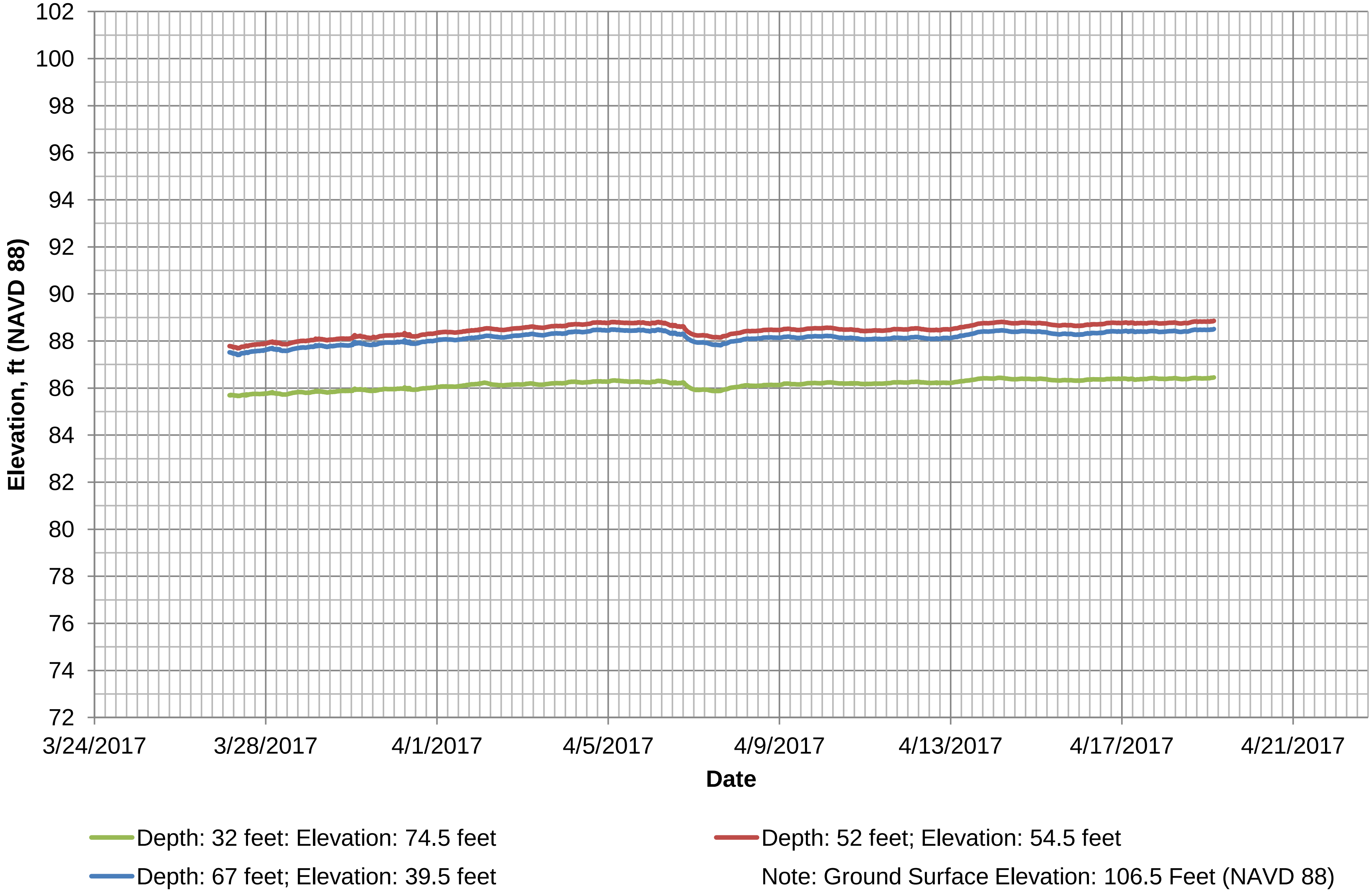
APPENDIX D



Note: Ground Surface Elevation: 112 Feet (NAVD 88)

Via Verdi Landslide Richmond, California	**Piezometer Data** **P-1**

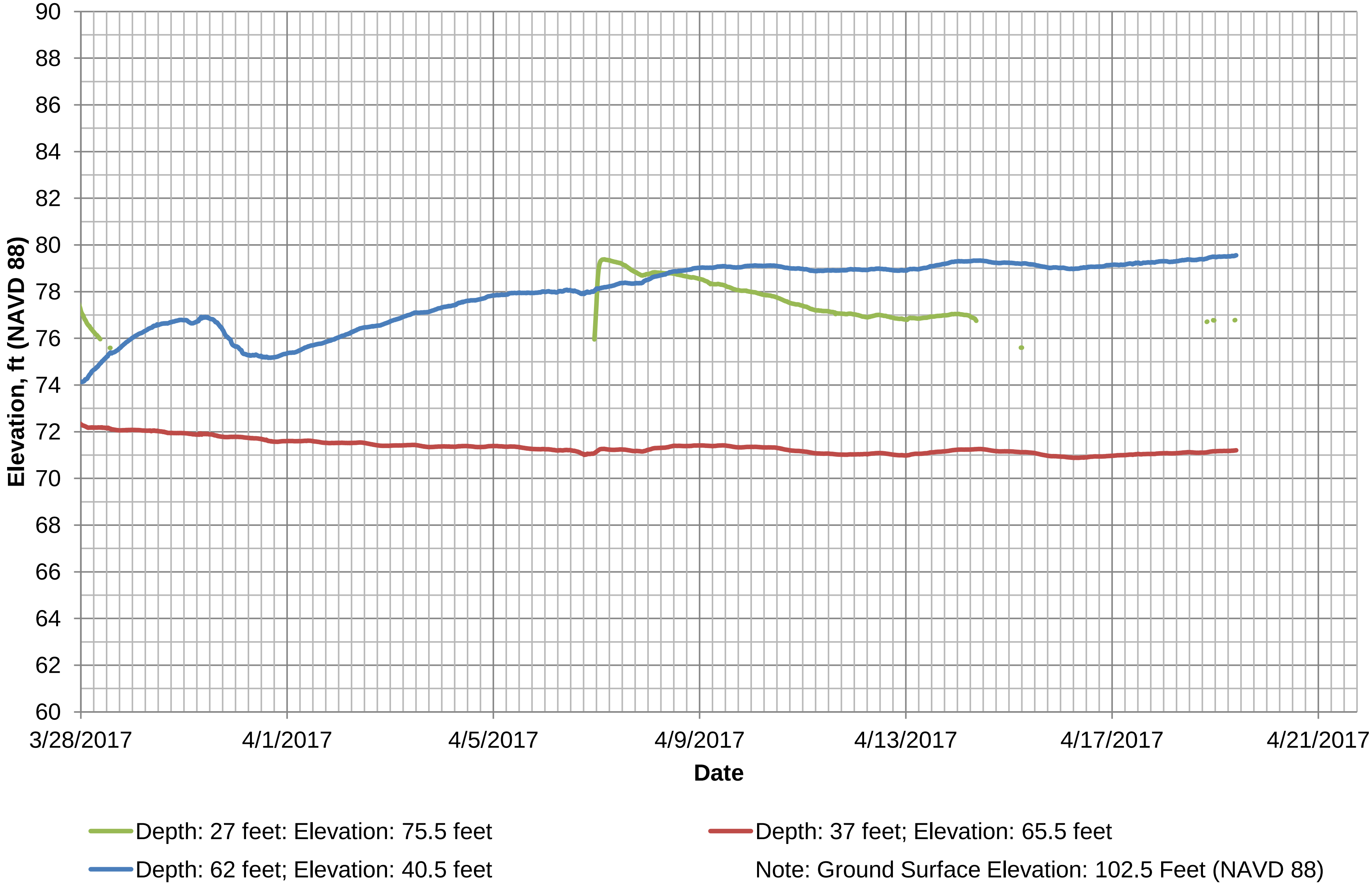
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. D-1



Via Verdi Landslide
Richmond, California

Piezometer Data
P-2

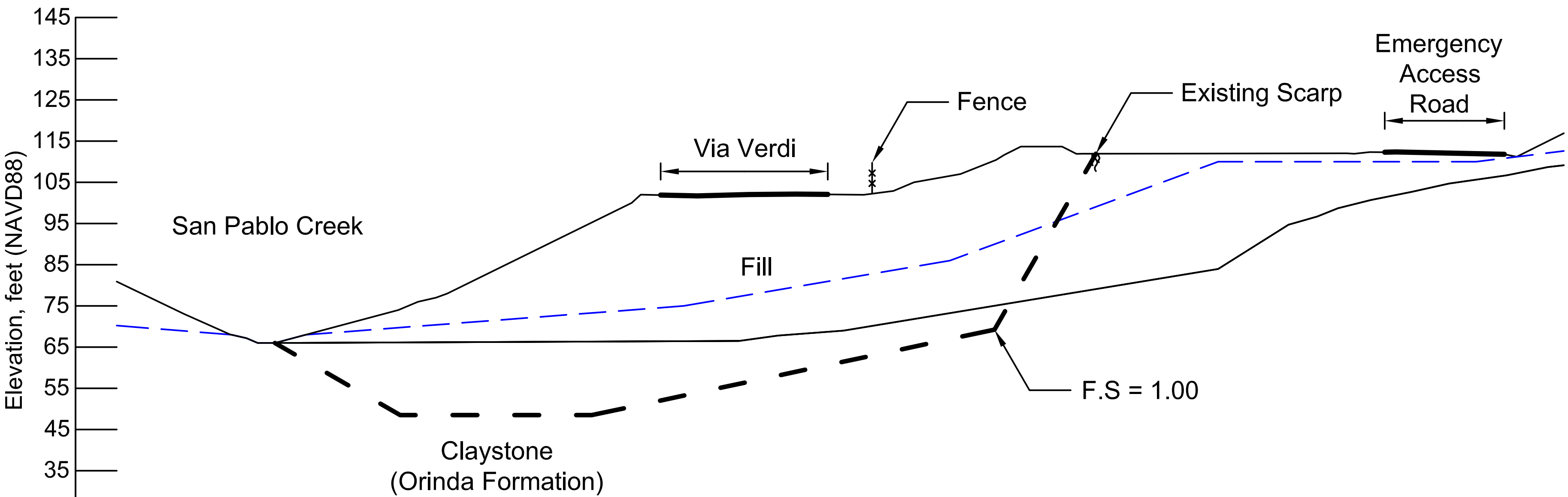
Hultgren - Tillis Engineers	Project No. 867.01	Plate No. D-2



Via Verdi Landslide Richmond, California	**Piezometer Data** **P-3**

Hultgren - Tillis Engineers	Project No. 867.01	Plate No. D-3

APPENDIX E



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE
0 40 feet
1 inch = 40 feet

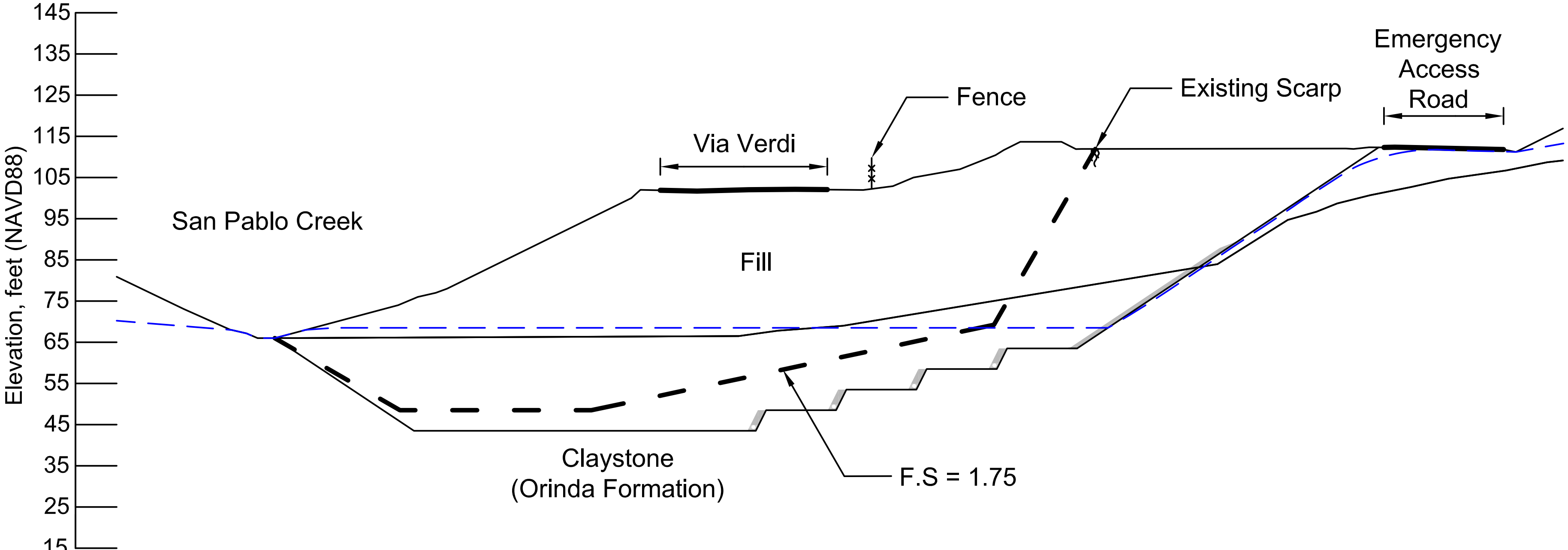
Via Verdi Landslide
Richmond, California

Slope Stability
Existing Condition

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. E-1



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength		Effective Strength	
		Cohesion (psf)	Friction Angle (°)	Cohesion (psf)	Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE
0 40 feet
1 inch = 40 feet

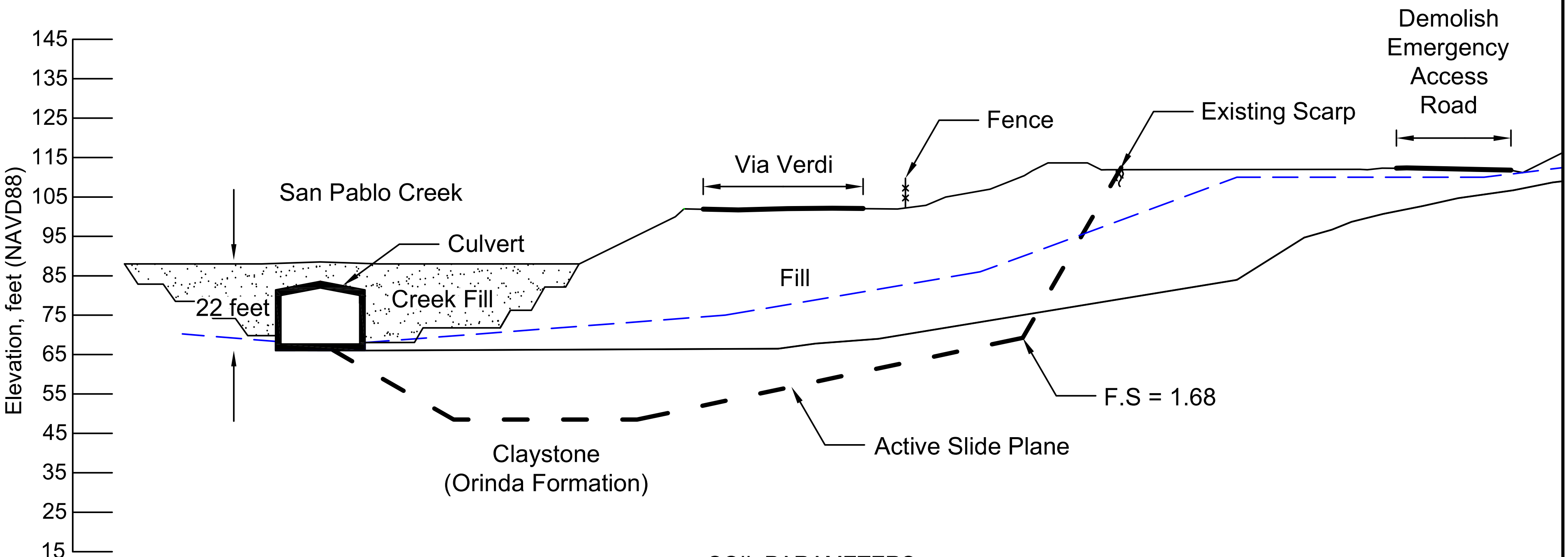
Via Verdi Landslide
Richmond, California

Slope Stability
Earthwork Slope Repair

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. E-2



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-
Creek Fill	80	50	24	-	-

Notes:

1. Unit weight of Creek Fill is weighted to include the empty culvert.

SCALE

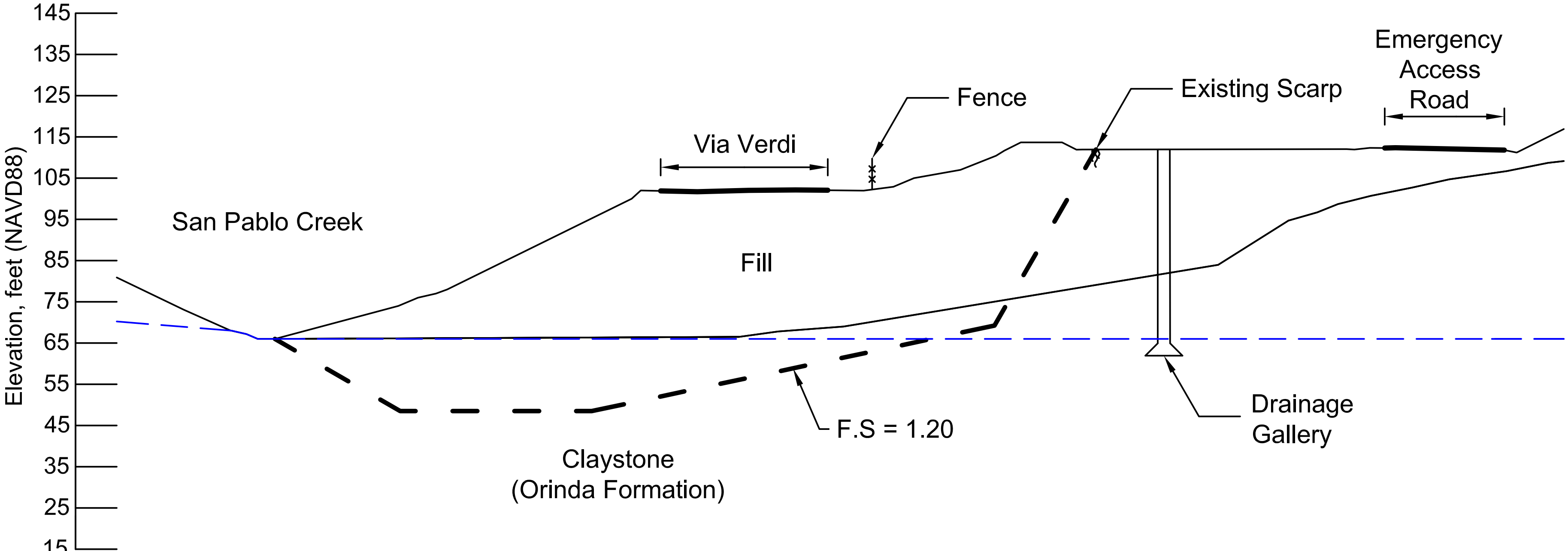
0 40 feet

1 inch = 40 feet

Via Verdi Landslide
Richmond, California

Slope Stability
Slope Buttress

Hultgren - Tillis Engineers | Project No. 867.01 | Plate No. E-3



SOIL PARAMETERS

Soil Type	Unit Weight (pcf)	Undrained Strength Cohesion (psf)	Undrained Strength Friction Angle (°)	Effective Strength Cohesion (psf)	Effective Strength Friction Angle (°)
Fill	125	0	20	-	-
Claystone	125	0	13	-	-

SCALE
0 40 feet
1 inch = 40 feet

Via Verdi Landslide
Richmond, California

Slope Stability
Drainage Gallery

Hultgren - Tillis Engineers

Project No. 867.01

Plate No. E-4

Sensitive Material Redacted

Appendix C

RECORDS SEARCH RESULTS (SENSITIVE MATERIAL REDACTED FOR PUBLIC DISTRIBUTION)

CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

ALAMEDA
COLUSA
CONTRA COSTA
DEL NORTE
HUMBOLDT
LAKE
MARIN
MENDOCINO
MONTEREY
NAPA
SAN BENITO
SAN FRANCISCO
SAN MATEO
SANTA CLATA
SANTA CRUZ
SOLANO
SONOMA
YOLO

Northwest Information Center
Sonoma State University
150 Professional Center Drive, Suite E
Rohnert Park, California 94928-3609
Tel: 707.588.8455
nwic@sonoma.edu
http://www.sonoma.edu/nwic

1/9/2018 NWIC File No.: 17-1628

Jeremy Hall
NCE
P.O. Box 1760
Zephyr Cove, NV 89448

re: Via Verde Road Slope Stabilization Project

The Northwest Information Center received your record search request for the project area referenced above, located on the Richmond USGS 7.5' quad. The following reflects the results of the records search for the project area and a 0.25 mile radius:

Resources within project area:	P-07-98.
Resources within 0.25 mile radius:	P-07-4605, 4606, 4607, 4608, 4609, 4610, 4611, 97, & 839.
Reports within project area:	S-14541, 13803, & 38237.
Reports within 0.25 mile radius:	S-43527, 38251, 4950, 7573, 6214, 1475, 7894, 1581, 8186, 7988, 8100, 10228, 11534, 12297, 22273, 6592, 7131, & 27935.
Other Reports within records search radius:	S-595, 848, 1978, 2458, 9462, 9583, 9795, 15529, 16660, 17835, 18217, 20395, 30204, 32596, 33545, & 33600. These reports are classified as Other Reports; reports with little or no field work or missing maps. The electronic maps do not depict study areas for these reports, however a list of these reports has been provided. In addition, you have not been charged any fees associated with these studies.

Resource Database Printout (list): ☒ enclosed ☐ not requested ☐ nothing listed

Resource Database Printout (details): ☒ enclosed ☐ not requested ☐ nothing listed

Resource Digital Database Records: ☒ enclosed ☐ not requested ☐ nothing listed

Report Database Printout (list): ☒ enclosed ☐ not requested ☐ nothing listed

Report Database Printout (details): ☒ enclosed ☐ not requested ☐ nothing listed

Report Digital Database Records: ☒ enclosed ☐ not requested ☐ nothing listed

Resource Record Copies: ☒ enclosed ☐ not requested ☐ nothing listed

Report Copies: ☐ enclosed ☒ not requested ☐ nothing listed

OHP Historic Properties Directory: ☒ enclosed ☐ not requested ☐ nothing listed

Archaeological Determinations of Eligibility:	☐ enclosed	☐ not requested	☒ nothing listed
CA Inventory of Historic Resources (1976):	☐ enclosed	☐ not requested	☒ nothing listed
Caltrans Bridge Survey:	☐ enclosed	☒ not requested	☐ nothing listed
Ethnographic Information:	☐ enclosed	☒ not requested	☐ nothing listed
Historical Literature:	☐ enclosed	☒ not requested	☐ nothing listed
Historical Maps:	☐ enclosed	☒ not requested	☐ nothing listed
Local Inventories:	☐ enclosed	☒ not requested	☐ nothing listed
GLO and/or Rancho Plat Maps:	☐ enclosed	☒ not requested	☐ nothing listed
Shipwreck Inventory:	☐ enclosed	☒ not requested	☐ nothing listed

*Notes:

** Current versions of these resources are available on-line:

Caltrans Bridge Survey: http://www.dot.ca.gov/hq/structur/strmaint/historic.htm

Soil Survey: http://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=CA

Please forward a copy of any resulting reports from this project to the office as soon as possible. Due to the sensitive nature of archaeological site location data, we ask that you do not include resource location maps and resource location descriptions in your report if the report is for public distribution. If you have any questions regarding the results presented herein, please contact the office at the phone number listed above.

The provision of CHRIS Data via this records search response does not in any way constitute public disclosure of records otherwise exempt from disclosure under the California Public Records Act or any other law, including, but not limited to, records related to archeological site information maintained by or on behalf of, or in the possession of, the State of California, Department of Parks and Recreation, State Historic Preservation Officer, Office of Historic Preservation, or the State Historical Resources Commission.

Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the Office of Historic Preservation are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area. Additionally, Native American tribes have historical resource information not in the CHRIS Inventory, and you should contact the California Native American Heritage Commission for information on local/regional tribal contacts.

Should you require any additional information for the above referenced project, reference the record search number listed above when making inquiries. Requests made after initial invoicing will result in the preparation of a separate invoice.

Thank you for using the California Historical Resources Information System (CHRIS).

Sincerely,
Lisa C. Hagel
Researcher

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS	NAMES	CITY.NAME	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
							HIST.RES.	SPHI-CCO-008	10/04/89	7L	
							ST.PT.INT.	07-0010	10/04/89	7L	
							NAT.REG.	07-0007	10/04/89	7W	
183124		811 SAN RAMON BLVD		DANVILLE	P	1948	PROJ.REVW.	FCC100419C	05/30/10	6Y	
010088	07-000982	SAN RAMON VALLEY BLVD	CHARLES GOOLD HOME, DEARDORFF HOME	DANVILLE	P	1880	HIST.SURV.	4526-0012-0000		5S2	
010092	07-000986	BLACKHAWK RD	BLACKHAWK RANCH QUARRY	DIABLO	P		HIST.SURV.	4528-0004-0000		5S2	
010089	07-000983	SUMMIT RD	MONTE DEL DIABLO / MOUNT DIABLO	DIABLO	S		HIST.SURV.	4528-0001-0000	05/21/91	3S	
							HIST.RES.	SHL-0905-0000	12/07/76	1CL	
010090	07-000984	SUMMIT RD	MOUNT DIABLO OBSERVATION TOWER	DIABLO	S	1941	HIST.SURV.	4528-0002-0000		7N	
010091	07-000985	SUMMIT RD	MOUNTAIN HOUSE SITE	DIABLO	S	1873	HIST.SURV.	4528-0003-0000		5S2	
010093	07-000987	ARLINGTON BLVD	JOAQUIN MURIETA ROCK SITE	EL CERRITO	P		HIST.SURV.	4530-0001-0000		5S2	
010107	07-001001	1101 ARLINGTON BLVD	GEORGE FRIEND ESTATE	EL CERRITO	P		HIST.SURV.	4530-0015-0000		7R	
096096	07-001828	1520 ARLINGTON BLVD	EL CERRITO FIRE STATION #2	EL CERRITO	M	1934	HIST.RES.	DSA-07-SPS-3273	05/17/95	6J	C
150502		5804 AVILA AVE		EL CERRITO		1954	HIST.RES.	DOE-07-04-0018-0000	09/09/04	6Y	
							PROJ.REVW.	HUD040811A	09/09/04	6Y	
010094	07-000988	801 BATES AVE	GILL ESTATE	EL CERRITO	P	1920	HIST.SURV.	4530-0002-0000		7N	
010095	07-000989	5810 CHARLES AVE	DOWNER HOUSE	EL CERRITO	P		HIST.SURV.	4530-0003-0000		7R	
074333	07-001362	5815 CUTTING BLVD	SAVE DEPARTMENT STORE	EL CERRITO	U	1942	HIST.RES.	DOE-07-92-0001-0000	01/22/92	6Y	
							PROJ.REVW.	FHWA911216A	01/22/92	6Y	
185588		6630 CUTTING BLVD		EL CERRITO	P		PROJ.REVW.	HUD100601E	06/25/10	6Y	
163283		7311 DONAL AVE		EL CERRITO	P	1948	PROJ.REVW.	HUD060928A	09/29/06	6Y	
171852		2302 EDITH ST		EL CERRITO			PROJ.REVW.	HUD080527A	06/13/08	6Y	
010096	07-000990	1 EL CERRITO PLAZA	VICTOR CASTRO ADOBE; VICTOR CASTRO	EL CERRITO	P	1839	HIST.SURV.	4530-0004-0000		5S2	
							HIST.RES.	SHL-0356-0000	10/09/39	7L	
132280		1314 EVERETT ST		EL CERRITO	P	1951	HIST.RES.	DOE-07-02-0026-0000	07/18/02	6Y	
							PROJ.REVW.	HUD020717B	07/18/02	6Y	
010097	07-000991	6317 FAIRMONT AVE	LEE HOUSE	EL CERRITO	P	1924	HIST.SURV.	4530-0005-0000		7R	
010098	07-000992	7209 FAIRMONT AVE	CURTIN HOUSE	EL CERRITO	P	1910	HIST.SURV.	4530-0006-0000		3S	
010099	07-000993	ISABEL ST	POINT ISABEL	EL CERRITO	C		HIST.SURV.	4530-0007-0000		5S2	
010108	07-001002	609 KEARNEY ST	ALLINIO HOME	EL CERRITO	P	1908	HIST.SURV.	4530-0016-0000		7R	
136074		825 KEARNEY ST		EL CERRITO	P	1945	HIST.RES.	DOE-07-03-0010-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216L	01/06/03	6Y	
010100	07-000994	1710 LIBERTY ST	BONINNI HOUSE	EL CERRITO	P	1907	HIST.SURV.	4530-0008-0000		7R	
010101	07-000995	1332 NAVELLIER ST	NAVELLIER HOME	EL CERRITO	P	1897	HIST.RES.	SPHI-CCO-011	02/09/96	7L	
							ST.PT.INT.	07-0028		7L	
							HIST.SURV.	4530-0009-0000		7R	
070053	07-001296	557 NORVELL ST		EL CERRITO	U	1930	PROJ.REVW.	HUD910131D	03/07/91	6Y	
135842		754 NORVELL ST		EL CERRITO	P	1940	HIST.RES.	DOE-07-02-0074-0000	12/16/02	6Y	
							PROJ.REVW.	HUD021203C	12/16/02	6Y	
010102	07-000996	10057 SAN PABLO AVE	PASTIME BUILDING	EL CERRITO	P		HIST.SURV.	4530-0010-0000		7R	
010103	07-000997	10086 SAN PABLO AVE	510 034 022, KIEFERT BUILDING	EL CERRITO	P		HIST.SURV.	4530-0011-0000		7R	
010104	07-000998	10102 SAN PABLO AVE	IT CLUB	EL CERRITO	P		HIST.SURV.	4530-0012-0000		7R	
010109	07-001003	10116 SAN PABLO AVE	CONCRETE HOUSE	EL CERRITO	P		HIST.SURV.	4530-0017-0000		7R	
010105	07-000999	11337 SAN PABLO AVE	CISI DRY GOODS STORE	EL CERRITO	P	1926	HIST.SURV.	4530-0013-0000		7R	
010106	07-001000	11440 SAN PABLO AVE	SOLDAVINI HOME	EL CERRITO	P	1912	HIST.SURV.	4530-0014-0000		7R	
074334	07-001363	11915 SAN PABLO AVE	BERRY HOUSE	EL CERRITO	U	1914	HIST.RES.	DOE-07-92-0002-0000	01/22/92	6Y	
							PROJ.REVW.	FHWA911216A	01/22/92	6Y	
070052	07-001295	2617 SONOMA AVE		EL CERRITO	U	1932	PROJ.REVW.	HUD910131C	03/07/91	6Y	
152548		6830 STOCKTON AVE	EL CERRITO UNITED METHODIST CHURCH	EL CERRITO	P	1927	HIST.RES.	DOE-07-05-0001-0000	03/05/05	6Y	
							PROJ.REVW.	FCC041228B	03/05/05	6Y	
132460		854 ALLVIEW AVE		EL SOBRANTE	P	1942	HIST.RES.	DOE-07-02-0002-0000	07/19/02	6Y	
							PROJ.REVW.	HUD020618G	07/19/02	6Y	
131294		994 ALLVIEW AVE		EL SOBRANTE	P	1949	HIST.RES.	DOE-07-02-0013-0000	04/24/02	6Y	

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS	NAMES	CITY.NAME	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
							PROJ.REVW.	HUD020417E	04/24/02	6Y	
147140		4653 CANYON RD		EL SOBRANTE	P	1950	HIST.RES.	DOE-07-04-0007-0000	03/01/04	6Y	
							PROJ.REVW.	HUD040223C	03/01/04	6Y	
165977		5530 CIRCLE DR		EL SOBRANTE	P	1964	PROJ.REVW.	HUD070419D	04/25/07	6Y	
131191		3957 COLINA RD		EL SOBRANTE	P		HIST.RES.	DOE-07-02-0007-0000	04/30/02	6Y	
							PROJ.REVW.	HUD020417H	04/30/02	6Y	
152780		4526 ELMWOOD RD		EL SOBRANTE	P	1949	HIST.RES.	DOE-07-05-0002-0000	02/04/05	6Y	
							PROJ.REVW.	HUD050127A	02/04/05	6Y	
176961		4638 HILLTOP DR		EL SOBRANTE	P	1952	PROJ.REVW.	HUD090928J	10/23/09	6Y	
090697	07-001775	KENNEDY GROVE PARK	CALIFORNIA AND NEVADA RAILROAD	EL SOBRANTE	D		HIST.RES.	SPHI-CCO-004	05/19/71	7L	
132188		3974 LA COLINA RD		EL SOBRANTE	P	1946	HIST.RES.	DOE-07-02-0022-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702J	07/10/02	6Y	
162864		3905 SAN PABLO DAM RD		EL SOBRANTE	P	1955	PROJ.REVW.	HUD060814J	08/16/06	6Y	
144855		4736 SAN PABLO DAM RD		EL SOBRANTE	P	1941	HIST.RES.	DOE-07-03-0038-0000	11/18/03	6Y	
							PROJ.REVW.	HUD031022A	11/18/03	6Y	
153969		4139 SANTA RITA RD		EL SOBRANTE	P	1939	PROJ.REVW.	HUD050429A	05/19/05	6Y	
144857		4056 ST JAMES DR		EL SOBRANTE	P	1955	HIST.RES.	DOE-07-03-0040-0000	11/26/03	6Y	
							PROJ.REVW.	HUD031110A	11/26/03	6Y	
155126		435 VALLEY VIEW DR		EL SOBRANTE	P	1949	PROJ.REVW.	FCC050614B	07/07/05	6Y	
115891	07-002064		WINDMILL	HERCULES	P		HIST.RES.	DOE-07-97-0007-0000	01/17/97	6Y	
							PROJ.REVW.	FHWA961211A	01/17/97	6Y	
091636	07-001785	7 BAY ST	7 BAY ST	HERCULES	P		HIST.SURV.	4547-0001-0009	08/22/80	1D	
010220	07-001005	HERCULES AVE	ELLERHORST HOME	HERCULES	P	1860	HIST.SURV.	4547-0002-0000		3S	
091662	07-001803	54 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0028	08/22/80	1D	
091663	07-001804	56 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0029	08/22/80	1D	
091670	07-001811	135 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0036	08/22/80	1D	
091671	07-001812	160 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0037	08/22/80	1D	
091627	07-001777	8100 KINGS AVE		HERCULES	P		HIST.SURV.	4547-0001-0001	08/22/80	1D	
091628	07-001778	8101 KINGS AVE	LABORATORY	HERCULES	P		HIST.SURV.	4547-0001-0002	08/22/80	1D	
091630	07-001779	8103 KINGS AVE	HERCULES CLUB HOUSE	HERCULES	U		HIST.SURV.	4547-0001-0003	08/22/80	1D	
091631	07-001780	8111 KINGS AVE	GUARD HOUSE	HERCULES	F		HIST.SURV.	4547-0001-0004	08/22/80	1D	
091632	07-001781	8118 KINGS AVE	OFFICE ANNEX	HERCULES	M		HIST.SURV.	4547-0001-0005	08/22/80	1D	
091633	07-001782	9302 LOW LEVEL PLANT RD	STORE / SHED	HERCULES	U		HIST.SURV.	4547-0001-0006	08/22/80	1D	
091634	07-001783	9701 LOW LEVEL PLANT RD	STORE / SHED	HERCULES	U		HIST.SURV.	4547-0001-0007	08/22/80	1D	
091654	07-001798	34 PARK ST	34 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0022	08/22/80	1D	
091657	07-001799	37 PARK ST	37 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0023	08/22/80	1D	
091658	07-001800	38 PARK ST	38 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0024	08/22/80	1D	
091659	07-001801	39 PARK ST	39 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0025	08/22/80	1D	
091660	07-001802	47 PARK ST	47 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0026	08/22/80	1D	
091661	07-002541	48 PARK ST	48 PARK ST	HERCULES	P		HIST.SURV.	4547-0001-0039	08/22/80	1D	
091635	07-001784	4 PINOLE ST	4 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0008	08/22/80	1D	
091638	07-001786	10 PINOLE ST	10 PINOLE ST -	HERCULES	P		HIST.SURV.	4547-0001-0010	08/22/80	1D	
091639	07-001787	12 PINOLE ST	12 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0011	08/22/80	1D	
091644	07-001788	16 PINOLE ST	16 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0012	08/22/80	1D	
091645	07-001789	17 PINOLE ST	17 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0013	08/22/80	1D	
091646	07-001790	18 PINOLE ST	18 PINOLE ST	HERCULES	P		HIST.SURV.	4547-0001-0014	08/22/80	1D	
091665	07-001806	69 RAILROAD AVE	69 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0031	08/22/80	1D	
091666	07-001807	102 RAILROAD AVE	102 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0032	08/22/80	1D	
091667	07-001808	129 RAILROAD AVE	129 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0033	08/22/80	1D	
091668	07-001809	132 RAILROAD AVE	132 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0034	08/22/80	1D	
091669	07-001810	133 RAILROAD AVE	133 RAILROAD AVE	HERCULES	P		HIST.SURV.	4547-0001-0035	08/22/80	1D	
010219	07-001004	SANTA FE AVE	HERCULES VILLAGE	HERCULES	FSP	1890	ST.FND.PRG	619.0-84-HP-07-003	12/31/84	3	
							TAX.CERT.	537.9-07-0004	06/18/84	2S3	
							HIST.RES.	NPS-8000799-9999	08/22/80	1S	A

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS	NAMES	CITY.NAME	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
155420		550 SAN PABLO AVE		RODEO	P	1947	PROJ.REVW.	HUD050822C	09/26/05	6Y	
106577	07-001916	3801 SR 4	BARRY RANCH	RODEO	P	1923	HIST.RES.	DOE-07-97-0003-0000	01/17/97	6Y	
							PROJ.REVW.	FHWA961211A	01/17/97	6Y	
171850		311 VALLEJO AVE		RODEO		1941	PROJ.REVW.	HUD080609H	06/13/08	6Y	
106758	07-001919		RODEO CREEK BRIDGE, BRIDGE #28-003	(VIC) RODEO			HIST.RES.	DOE-07-97-0005-0000	01/17/97	6Y	
							PROJ.REVW.	FHWA961211A	01/17/97	6Y	
010625	07-001132	SR 80	OLEUM	(VIC) RODEO	P	1895	HIST.SURV.	4572-0002-0000		7R	
129337	07-002539	3200 11TH ST		SAN PABLO	P	1949	HIST.RES.	DOE-07-02-0003-0000	01/14/02	6Y	
							PROJ.REVW.	HUD020110N	01/14/02	6Y	
147279		3409 11TH ST		SAN PABLO	P	1954	HIST.RES.	DOE-07-04-0010-0000	01/23/04	6Y	
							PROJ.REVW.	HUD031231D	01/23/04	6Y	
146036		1816 14TH ST		SAN PABLO	P	1924	HIST.RES.	DOE-07-04-0002-0000	02/03/04	6Y	
							PROJ.REVW.	HUD040130C	02/03/04	6Y	
141058		1614 15TH ST		SAN PABLO	P	1935	HIST.RES.	DOE-07-03-0028-0000	07/03/03	6Y	
							PROJ.REVW.	HUD030606A	07/03/03	6Y	
135837		1875 15TH ST		SAN PABLO	P	1952	HIST.RES.	DOE-07-02-0075-0000	12/16/02	6Y	
							PROJ.REVW.	HUD021203B	12/16/02	6Y	
169781		2759 15TH ST		SAN PABLO	P	1951	PROJ.REVW.	HUD071213L	01/08/08	6Y	
129257	07-002534	1740 16TH ST		SAN PABLO	P	1934	HIST.RES.	DOE-107-01-0037-0000	12/31/01	6Y	
							PROJ.REVW.	HUD011226J	12/31/01	6Y	
132825		1881 16TH ST		SAN PABLO	P	1953	HIST.RES.	DOE-07-02-0061-0000	08/05/02	6Y	
							PROJ.REVW.	HUD020729C	08/05/02	6Y	
138782		1958 16TH ST		SAN PABLO	P	1946	HIST.RES.	DOE-07-03-0021-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411A	04/15/03	6Y	
131423		2721 18TH ST		SAN PABLO	P		HIST.RES.	DOE-07-02-0017-0000	06/06/02	6Y	
							PROJ.REVW.	HUD020522K	06/06/02	6Y	
161654		2972 19TH ST		SAN PABLO	P	1953	PROJ.REVW.	HUD060317A	03/21/06	6Y	
136783		2024 20TH ST		SAN PABLO	P	1948	HIST.RES.	DOE-07-03-0014-0000	02/03/03	6Y	
							PROJ.REVW.	HUD030128J	02/03/03	6Y	
166216		2996 20TH ST		SAN PABLO	P	1954	PROJ.REVW.	HUD070529E	06/04/07	6Y	
132819		2331 22ND ST		SAN PABLO	P	1929	HIST.RES.	DOE-07-02-0060-0000	08/05/02	6Y	
							PROJ.REVW.	HUD020729D	08/05/02	6Y	
012818	07-001191	ALVARADO SQUARE	BLUME HOUSE	SAN PABLO	P	1905	HIST.SURV.	4806-0011-0000		7R	
012808	07-001181	ALVARADO SQUARE	TEXIERA HOME	SAN PABLO	M	1890	HIST.SURV.	4806-0001-0000		7R	
171428		1524 AMADOR ST		SAN PABLO	P	1948	PROJ.REVW.	HUD080421D	04/25/08	6Y	
132457		2900 ARUNDEL WY		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0001-0000	07/19/02	6Y	
							PROJ.REVW.	HUD020705Q	07/19/02	6Y	
136070		2445 BANCROFT LANE		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0006-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216M	01/06/03	6Y	
132190		6211 BAYVIEW AVE		SAN PABLO	P	1951	HIST.RES.	DOE-07-02-0024-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702D	07/10/02	6Y	
161955		150 BONNIE DR		SAN PABLO	P	1954	PROJ.REVW.	HUD060428A	05/03/06	6Y	
166244		321 BONNIE DR		SAN PABLO	P	1954	PROJ.REVW.	HUD070702S	07/06/07	6Y	
146035		1300 BROOKSIDE AVE		SAN PABLO	P	1949	HIST.RES.	DOE-07-04-0001-0000	02/03/04	6Y	
							PROJ.REVW.	HUD040120B	02/03/04	6Y	
134262		1811 BUSH AVE		SAN PABLO	P	1940	HIST.RES.	DOE-07-02-0067-0000	10/01/02	6Y	
							PROJ.REVW.	HUD020926I	10/01/02	6Y	
170080		2600 CASTRO RD	ORGANIZATIONAL MANTAINANCE SHOP	SAN PABLO	F	1952	PROJ.REVW.	USA070613A	07/16/07	6Y	
170079		2600 CASTRO RD	COLONIAL HUNTER HALL USAR CENTER	SAN PABLO	F	1952	PROJ.REVW.	USA070613A	07/16/07	6Y	
182102		468 CHRISTINE DR		SAN PABLO	P	1963	PROJ.REVW.	HUD110309F	03/16/11	6Y	
012809	07-001182	1825 CHURCH LANE	ST PAULS CATHOLIC CHURCH & GRAVEYA	SAN PABLO	P	1863	HIST.SURV.	4806-0002-0000		7N	
012819	07-001192	1901 CHURCH LANE	OLD RECTORY	SAN PABLO	P	1875	HIST.RES.	DOE-07-97-0011-0000	07/17/97	2S2	C

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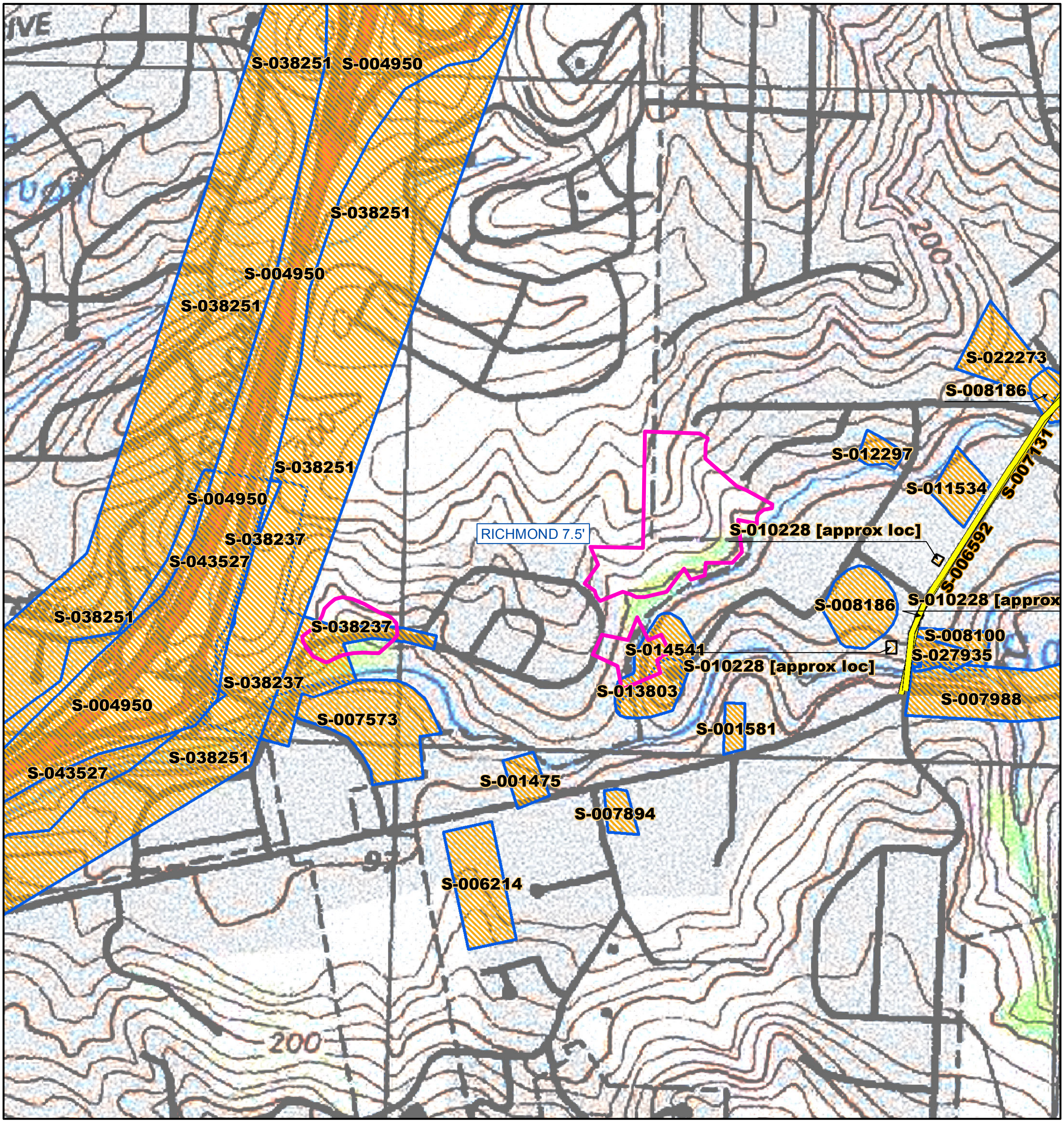
							PROJ.REVW.	HUD950522F	07/17/97	2S2	C
							HIST.SURV.	4806-0014-0000	05/30/80	3S	
							HIST.SURV.	4806-0012-0000		7N	
184209		1845 CHURCH LN	ST PAUL CHURCH	SAN PABLO	P	1931	PROJ.REVW.	FCC091123E	02/25/10	6Y	
131422		1501 COLIN ST		SAN PABLO	P		HIST.RES.	DOE-07-02-0016-0000	06/06/02	6Y	
							PROJ.REVW.	HUD020522E	06/06/02	6Y	
012814	07-001187	930 CR 20	RUMRILL HELMS HOUSE	SAN PABLO	P	1884	HIST.SURV.	4806-0007-0000		3S	
147278		2009 CR 20		SAN PABLO	P	1951	HIST.RES.	DOE-07-04-0009-0000	01/23/04	6Y	
							PROJ.REVW.	HUD031231B	01/23/04	6Y	
012815	07-001188	2022 CR 20	STANLEY ALTER HOME	SAN PABLO	P		HIST.SURV.	4806-0008-0000		7R	
169728		1401 DOVER AVE		SAN PABLO	P	1948	PROJ.REVW.	HUD071213K	01/07/08	6Y	
134260		2418 DOVER AVE		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0066-0000	10/01/02	6Y	
							PROJ.REVW.	HUD020926J	10/01/02	6Y	
129336	07-002538	1514 EMERIC AVE		SAN PABLO	P	1941	HIST.RES.	DOE-07-02-0002-0000	01/14/02	6Y	
							PROJ.REVW.	HUD020110M	01/14/02	6Y	
138783		1807 EMERIC AVE		SAN PABLO	P	1935	HIST.RES.	DOE-07-03-0022-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411B	04/15/03	6Y	
136544		2201 EMERIC AVE		SAN PABLO	P	1930	HIST.RES.	DOE-07-03-0013-0000	01/27/03	6Y	
							PROJ.REVW.	HUD030115A	01/27/03	6Y	
182264		179 JENNIFER DR		SAN PABLO	P	1946	PROJ.REVW.	HUD110419E	04/25/11	6Y	
136071		1108 JOHN AVE		SAN PABLO	P	1942	HIST.RES.	DOE-07-03-0007-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021210B	01/06/03	6Y	
158312		1439 KAREN RD		SAN PABLO	P	1954	PROJ.REVW.	HUD051216M	12/30/05	6Y	
171431		1110 LETTIA RD		SAN PABLO	P	1953	PROJ.REVW.	HUD080410A	04/25/08	6Y	
144729		240 LINDA DR		SAN PABLO	P	1953	HIST.RES.	DOE-07-03-0037-0000	10/20/03	6Y	
							PROJ.REVW.	HUD031003B	10/20/03	6Y	
179036		2664 MACARTHUR AVE		SAN PABLO	P	1943	PROJ.REVW.	HUD100330G	04/23/10	6Y	
137730		1601 MANOR DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-03-0017-0000	03/07/03	6Y	
							PROJ.REVW.	HUD030303E	03/07/03	6Y	
012810	07-001183	2650 MARKET AVE	1906 EARTHQUAKE CAMP SITE	SAN PABLO	P	1906	HIST.SURV.	4806-0003-0000		7N	
138784		1830 MASON ST		SAN PABLO	P	1951	HIST.RES.	DOE-07-03-0023-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411C	04/15/03	6Y	
012811	07-001184	5739 MCBRYDE AVE	BOUQUET CHATEAU	SAN PABLO	P	1911	HIST.SURV.	4806-0004-0000		7R	
178682		2639 MERRITT AVE		SAN PABLO	P	1944	PROJ.REVW.	HUD100203A	02/03/10	6Y	
132191		24 MONTALVIN DR		SAN PABLO	P	1950	HIST.RES.	DOE-07-02-0025-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702I	07/10/02	6Y	
136069		2584 O'HARTE RD		SAN PABLO	P	1952	HIST.RES.	DOE-07-03-0005-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216E	01/06/03	6Y	
137729		2596 O'HARTE RD		SAN PABLO	P	1952	HIST.RES.	DOE-07-03-0016-0000	03/07/03	6Y	
							PROJ.REVW.	HUD030303F	03/07/03	6Y	
161880		2634 OHARE AVE		SAN PABLO	P	1943	PROJ.REVW.	HUD060403C	04/05/06	6Y	
180163		941 PALMER AVE		SAN PABLO	P	1945	PROJ.REVW.	HUD101004H	10/28/10	6Y	
147571		1919 PINE AVE		SAN PABLO	P	1951	HIST.RES.	DOE-07-04-0013-0000	02/23/04	6Y	
							PROJ.REVW.	HUD040213B	02/23/04	6Y	
012812	07-001185	1841 PULLMAN ST	PULLMAN STREET RECTORY	SAN PABLO	P	1875	HIST.SURV.	4806-0005-0000		3S	
012813	07-001186	918 RANDY LANE	ANDRATA HOUSE	SAN PABLO	P	1900	HIST.SURV.	4806-0006-0000		3S	
150832		2009 RD 20		SAN PABLO	P	1950	HIST.RES.	DOE-07-04-0022-0000	07/29/04	6Y	
							PROJ.REVW.	HUD040712B	07/29/04	6Y	
150539		2778 ROLLINGWOOD DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-04-0020-0000	07/12/04	6Y	
							PROJ.REVW.	HUD040301C	07/12/04	6Y	
136068		2797 ROLLINGWOOD DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-03-0004-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216I	01/06/03	6Y	
164754		2807 ROLLINGWOOD DR		SAN PABLO	P	1943	PROJ.REVW.	HUD070126A	01/30/07	6Y	
012816	07-001189	SAN PABLO AVE	ALVARADO ADOBE	SAN PABLO	M	1826	HIST.SURV.	4806-0009-0000		7N	
							HIST.RES.	SHL-0512-0000	11/06/53	7L	

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS	NAMES	CITY.NAME	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
012817	07-001190	14006 SAN PABLO AVE	MELLO RESIDENCE	SAN PABLO	P	1875	HIST.SURV.	4806-0010-0000		7R	
129138	07-002520	1230 SANFORD AVE		SAN PABLO	P	1950	HIST.RES.	DOE-07-01-0023-0000	12/03/01	6Y	
							PROJ.REVW.	HUD011127H	12/03/01	6Y	
160410		1914 SANFORD AVE		SAN PABLO	P	1940	PROJ.REVW.	HUD060201DD	02/02/06	6Y	
183810		SHAMROCK DR	PG&E UTILITY TOWER	SAN PABLO	P	1958	PROJ.REVW.	FCC100505C	05/31/10	6Y	
163418		1748 SUTTER AVE		SAN PABLO	P	1944	PROJ.REVW.	HUD061027B	10/27/06	6Y	
129335	07-002537	1845 TRUMAN ST		SAN PABLO	P	1950	HIST.RES.	DOE-07-02-0001-0000	01/14/02	6Y	
							PROJ.REVW.	HUD020110L	01/14/02	6Y	
171375		2734 VALE RD		SAN PABLO	P	1948	PROJ.REVW.	HUD080523D	06/12/08	6Y	
180742		9885 ALCOSTA BLVD	PGE TOWER 21/84-PITTSBURG-SAN MATE	SAN RAMON	P	1963	PROJ.REVW.	FCC100730G	12/20/10	6Y	
010667	07-001135	CROW CANYON RD	WILLIAM LYNCH HOME	SAN RAMON	P		HIST.SURV.	4583-0003-0000		7R	
010668	07-001136	FINLEY RD	TASSAJARA SCHOOL	SAN RAMON	M	1888	HIST.SURV.	4583-0004-0000		7R	
010669	07-001137	3686 NORRIS CANYON RD	CHRISTIAN WIEDEMANN RANCH	SAN RAMON	P	1860	HIST.SURV.	4583-0005-0000		7R	
010666	07-001134	19251 SAN RAMON BLVD	EL NIDO, THE NES	SAN RAMON	P	1852	HIST.SURV.	4583-0002-0000		3S	
010665	07-001133	19600 SAN RAMON VALLEY BLVD	DAVID GLASS HOME	SAN RAMON	P	1859	HIST.RES.	NPS-02000677-0020	06/28/02	1D	AC
							HIST.SURV.	4583-0001-0000	06/28/02	7R	
132530		19953 SAN RAMON VALLEY BLVD		SAN RAMON	M		HIST.RES.	NPS-02000677-0007	06/28/02	1D	AC
132529		19953 SAN RAMON VALLEY BLVD	BOONE HOUSE	SAN RAMON	M	1900	HIST.RES.	NPS-02000677-0001	06/28/02	1D	AC
132546		19953 SAN RAMON VALLEY BLVD	MACHINE STORAGE SHED	SAN RAMON	M		HIST.RES.	NPS-02000677-0013	06/28/02	1D	AC
132547		19953 SAN RAMON VALLEY BLVD	CISTERN	SAN RAMON	M		HIST.RES.	NPS-02000677-0019	06/28/02	1D	AC
132542		19953 SAN RAMON VALLEY BLVD	BARN	SAN RAMON	M		HIST.RES.	NPS-02000677-0012	06/28/02	1D	AC
132532		19953 SAN RAMON VALLEY BLVD	GROTTO	SAN RAMON	M		HIST.RES.	NPS-02000677-0003	06/28/02	1D	AC
132533		19953 SAN RAMON VALLEY BLVD	GARDENING SHED	SAN RAMON	M		HIST.RES.	NPS-02000677-0004	06/28/02	1D	AC
132548		19953 SAN RAMON VALLEY BLVD	MEN'S OUTHOUSE	SAN RAMON	M		HIST.RES.	NPS-02000677-0017	06/28/02	1D	AC
132541		19953 SAN RAMON VALLEY BLVD	HORSE BARN	SAN RAMON	M		HIST.RES.	NPS-02000677-0008	06/28/02	1D	AC
132540		19953 SAN RAMON VALLEY BLVD	WALNUT PROCESSING SHED #3	SAN RAMON	M		HIST.RES.	NPS-02000677-0016	06/28/02	1D	AC
132531		19953 SAN RAMON VALLEY BLVD	PERGOLA	SAN RAMON	M	1938	HIST.RES.	NPS-02000677-0002	06/28/02	1D	AC
132534		19953 SAN RAMON VALLEY BLVD	MEAT LOCKER	SAN RAMON	M		HIST.RES.	NPS-02000677-0006	06/28/02	1D	AC
132536		19953 SAN RAMON VALLEY BLVD	CARPORT	SAN RAMON	M		HIST.RES.	NPS-02000677-0005	06/28/02	6X	
132545		19953 SAN RAMON VALLEY BLVD	FUEL SHED	SAN RAMON	M		HIST.RES.	NPS-02000677-0011	06/28/02	1D	AC
132538		19953 SAN RAMON VALLEY BLVD	WALNUT PROCESSING SHED #1	SAN RAMON	M		HIST.RES.	NPS-02000677-0014	06/28/02	1D	AC
132544		19953 SAN RAMON VALLEY BLVD	MACHINE SHOP	SAN RAMON	M		HIST.RES.	NPS-02000677-0009	06/28/02	1D	AC
132543		19953 SAN RAMON VALLEY BLVD	GRANARY	SAN RAMON	M		HIST.RES.	NPS-02000677-0010	06/28/02	1D	AC
132535		19953 SAN RAMON VALLEY BLVD	GLASS TANK HOUSE	SAN RAMON	M		HIST.RES.	NPS-02000677-0021	06/28/02	1D	AC
132549		19953 SAN RAMON VALLEY BLVD	WOMEN'S OUTHOUSE	SAN RAMON	M		HIST.RES.	NPS-02000677-0018	06/28/02	1D	AC
128072	07-000340	19953 SAN RAMON VALLEY BLVD	FOREST HOME FARMS	SAN RAMON	M	1850	HIST.RES.	NPS-02000677-9999	06/28/02	1S	AC
							NAT.REG.	07-0041	08/13/01	3S	AC
132539		19953 SAN RAMON VALLEY BLVD	WALNUT PROCESSING SHED #2	SAN RAMON	M		HIST.RES.	NPS-02000677-0015	06/28/02	1D	AC
174089			SAN CARLOS BRIDGE	WALNUT CREEK	M	1960	PROJ.REVW.	BUR081001A	10/16/08	6Y	
065080	07-001218	1500 BANCROFT RD	BANCROFT RANCH PROPERTY	WALNUT CREEK	U		HIST.RES.	DOE-07-87-0001-0000	02/17/87	6Y	
							PROJ.REVW.	FHWA860908A	02/17/87	6Y	
010680	07-001140	1500 BANCROFT RD	BANCROFT RESIDENCE	WALNUT CREEK	P	1922	HIST.SURV.	4596-0003-0000	11/14/88	7N	
							NAT.REG.	07-0001	11/14/88	7J	
010681	07-001141	30 BRUBAKER DR	HERITAGE TREE, BRUBAKER RESIDENCE	WALNUT CREEK	P		HIST.SURV.	4596-0004-0000		5S2	
010682	07-001142	CARMEL DR	WALNUT CREEK WOMEN'S CLUB	WALNUT CREEK	P		HIST.SURV.	4596-0005-0000		7R	
154815		1800 CARMEL DR	WALNUT CREEK ARMORY	WALNUT CREEK	S	1955	PROJ.REVW.	USA030317K	02/26/03	6Y	
010678	07-001138	1035 CASTLEROCK RD	BORGES RANCH/OLD BORGES RANCH	WALNUT CREEK	C	1901	ST.FND.PRG	619.0-HP-88-07-004	12/14/88	3	
							ST.FND.PRG	619.0-84-HP-07-004	12/03/84	3	
							HIST.RES.	NPS-81000147-0000	07/07/81	1S	
							HIST.SURV.	4596-0001-0000	01/01/81	1S	
010699	07-001159	CIVIC PARK DR N	CIVIC PARK BRIDGE	WALNUT CREEK	U		HIST.SURV.	4596-0023-0000	01/01/84	2S2	
							PROJ.REVW.	65000714	06/07/84	2S	

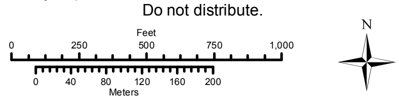
Via Verde Road Slope Stabilization Project
Report Map



Northwest Information Center

File #17-1628, 9 January 2018, L. Hagel

May depict confidential cultural resource locations.
Do not distribute.



Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-001475	Other - County File #3065-78	1979	Randy Milliken	County File #3065-78, cultural resource field reconnaissance conducted on a 0.79 acre parcel at 3741 San Pablo Dam Road in El Sobrante, Contra Costa County (letter report)	Cultural Resources Facility, Sonoma State University	
S-001581		1979	Paul E. Amaroli	An Archaeological Reconnaissance of Two Acres in El Sobrante, Contra Costa County, California.	The Cultural Resources Facility, Sonoma State University	
S-004950	Caltrans - 04209-400211; Voided - S-5750	1982	Margaret Buss	Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from Bay Bridge to Carquinez Bridge, 04-ALA/CC-80 2.0/8.0, 0.0/14.1, 04209-400211	Caltrans, District 4	01-000081, 01-000082, 01-000087, 07-000179, 07-000180, 07-000318, 07-000672
S-004950a		1982	Mara Melandry	First Addendum Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge in Alameda and Contra Costa Counties 04-Ala/CC 80 2.0/8.0; 0.0/14.1, 04209-400211	Caltrans, District 4	
S-006214		1983	C. Michael Elling	An Archaeological Survey of the Triplett Property, 3640 San Pablo Dam Road, El Sobrante, Contra Costa County, California.	Elling and Associates	
S-006592		1984	Peter M. Banks	An Archaeological Reconnaissance of the Appian Way Widening Project, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.	
S-007131		1985	Peter Banks	An Archaeological Reconnaissance of the Appian Way Widening Project: Phase II, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.	07-000097, 07-000276
S-007573		1985	Peter M. Banks	An Archaeological Reconnaissance of the Rancho Plaza Project, Richmond, Contra Costa County, California.	California Archaeological Consultants, Inc.	
S-007894		1986	Maureen Steiner	Archeological Investigations of Assessor's Parcel Nos. 420-150-13, 22 and 23 in Contra Costa County (letter report)	Woodward-Clyde Consultants	
S-007988		1986	Robert I. Orlins	A Cultural Resource Investigation for the San Pablo Dam Road Widening Project, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.	07-000068
S-008100		1986	Suzanne Baker	Archaeological Reconnaissance of the Tyson Property, Parcel #425-170-025, El Sobrante, Contra Costa County.	Archaeological Consultants	

Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-008186		1986	Peter Banks	Subsurface Archaeological Investigations for the Appian Way Widening Project, El Sobrante, Contra Costa County, California.	California Archaeological Consultants, Inc.	07-000097, 07-000276
S-010228		1988	Alice F. Wood	The Archaeological Monitoring of Excavations for Three Electrical Vaults on Appian Way, El Sobrante, Contra Costa County, California	California Archaeological Consultants, Inc.	
S-011534	Submitter - ARS 88-65	1988	Katherine Flynn	Archaeological survey of property located at 4247 Appian Way, El Sobrante, Contra Costa County (letter report)	Archaeological Resource Service	
S-012297	Submitter - ARS 90-73	1991	Katherine Flynn	Archaeological evaluation of 4201 Garden Lane, El Sobrante, Contra Costa Co., Project No. MS 192-90 (letter report)	Archaeological Resource Service	
S-013803		1991	Miley Paul Holman	Archaeological Field Inspection of the Property at 3995 Garden Road, El Sobrante, Contra Costa County, California (letter report)	Holman & Associates	07-000098
S-014541		1992	Suzanne Baker, Eric Wohlgemuth, and Cindy Desgrandchamp	Archaeological Test Excavations at CA-CCO-156, El Sobrante, California	Archaeological/Historical Consultants	07-000098
S-022273	Submitter - Project 50001-109/99	1999	Stacey Schneyder	A Cultural Resources Study of 4439 Appian Way (APN# 425-110-021), El Sobrante, Contra Costa County, California	Anthropological Studies Center, Sonoma State University	07-000839
S-027935		2004	John Holson	Archaeological Survey and Record Search Results for 4150 Appian Way, El Sobrante (APN 425-170-030) (letter report)	Pacific Legacy, Inc.	
S-038237	Other - LSA Project No. NCE1001	2011	Heather Blind	Cultural Resources Study for the Via Verde Sinkhole Repair Project, Richmond, Contra Costa County, California	LSA Associates, Inc.	
S-038251	Caltrans - EA 3A7761; Caltrans - EA 3A7771	2011	Jack Meyer	Buried Archaeological Site Assessment and Extended Phase I Subsurface Explorations for the I-80 Integrated Corridor Mobility Project, Caltrans District 04, Alameda and Contra Costa Counties, California, 04-ALA-CC-80, P.M. ALA 1.99/P.M. ALA 8.04, P.M. CC 0.0/P.M. CC 13.49, EA 3A7761 / EA 3A7771	Far Western Anthropological Research Group, Inc.	

Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-043527	Caltrans - EA 0A0800; Caltrans - EA 0A0811; Other - EFIS 0413000365	2008	Dean Martorana	Archaeological Survey Report Interstate 80/San Pablo Dam Road Interchange Project, Contra Costa County, California, 4-CC-80 PM 3.8/5.3 EA 0A0800	URS Group Inc.	
S-043527a		2008	Stephen Wee	Historical Resources Evaluation Report Interstate 80/San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0800 4-CC-80 PM 3.8/5.3	JRP Historical Consulting, LLC	
S-043527b		2014	Kathleen Kubal	Supplemental Historic Property Survey Report Interstate 80/ San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0811; EFIS 0413000365 4-CC-80, PM 3.8/5.3	URS Group Inc.	

Report Detail: S-001475

Identifiers

Report No.:	S-001475	
Other IDs:	*Type*	*Name*
	Other	County File #3065-78
Cross-refs:		

Citation information

Author(s): Randy Milliken
Year: 1979 (Mar)
Title: County File #3065-78, cultural resource field reconnaissance conducted on a 0.79 acre parcel at 3741 San Pablo Dam Road in El Sobrante, Contra Costa County (letter report)
Affliliation: Cultural Resources Facility, Sonoma State University
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: 0.79 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond

Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3741 San Pablo Dam Road	El Sobrante		

PLSS:

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	1/8/2018	hagell	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-001581

Identifiers

Report No.: S-001581
Other IDs:
Cross-refs:

Citation information

Author(s): Paul E. Amaroli
Year: 1979 (Jun)
Title: An Archaeological Reconnaissance of Two Acres in El Sobrante, Contra Costa County, California.
Affliliation: The Cultural Resources Facility, Sonoma State University
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c 2 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:
PLSS:

Database record metadata

	Date	User
Entered:	4/7/2005	nwic-main
Last modified:	7/6/2017	hagell

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-004950

Identifiers

Report No.: S-004950

Other IDs:

Type	*Name*
Caltrans	04209-400211
Voided	S-5750

Cross-refs: See also S-005750

Citation information

Author(s): Margaret Buss

Year: 1982 (May)

Title: Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from Bay Bridge to Carquinez Bridge, 04-ALA/CC-80 2.0/8.0, 0.0/14.1, 04209-400211

Affliliation: Caltrans, District 4

No. pages:

No. maps:

Attributes: Archaeological, Field study

Inventory size: c 20 li mi

Disclosure: Not for publication

Collections: No

Sub-desig.: a

Author(s): Mara Melandry

Year: 1982 (Dec)

Title: First Addendum Archaeological Survey Report for Proposed High Occupancy Vehicle Lanes from the Bay Bridge to Carquinez Bridge in Alameda and Contra Costa Counties 04-Ala/CC 80 2.0/8.0; 0.0/14.1, 04209-400211

Affiliation: Caltrans, District 4

Report type(s): Archaeological, Field study

Inventory size:

No. pages:

Disclosure: Not for publication

Collections: No

PDF Pages: 33-35

General notes

The report contains several oversized maps that were not scanned.

Associated resources

Primary No.	*Trinomial*	*Name*
P-01-000081	CA-ALA-000304	Nelson No. 304
P-01-000082	CA-ALA-000305	Nelson No. 305; Barker's El Cerr
P-01-000087	CA-ALA-000310	Nelson's 310
P-07-000179	CA-CCO-000302	Nelson No. 302
P-07-000180	CA-CCO-000303	Nelson No. 303
P-07-000318	CA-CCO-000547	[none]
P-07-000672	CA-CCO-000246	Nelson #432, Loud #432

No. resources: 7

Has informals: No

Location information

County(ies): Alameda, Contra Costa

USGS quad(s): Benicia, Mare Island, Oakland West, Richmond

Address:

PLSS:

Report Detail: S-004950

Database record metadata

	Date	User	
Entered:	4/7/2005	nwic-main	
Last modified:	1/8/2018	hagell	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	3/24/2015	hagell	edited database
	5/25/2017	hagell	edited title & affiliation
	6/2/2017	raelync	Report verified; awaiting verification of 1 resource: P-07-000672.
	11/21/2017	moored	added additional citation 'a'
	12/13/2017	raelync	Final resource verified; set report to 'Verified'.
Record status:	Verified		

Report Detail: S-006214

Identifiers

Report No.:	S-006214
Other IDs:	
Cross-refs:	

Citation information

Author(s):	C. Michael Elling
Year:	1983 (Oct)
Title:	An Archaeological Survey of the Triplett Property, 3640 San Pablo Dam Road, El Sobrante, Contra Costa County, California.
Affliliation:	Elling and Associates
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c 2 ac
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3640 San Pablo Dam Road	El Sobrante		
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	4/11/2016	mikulikc	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-006592

Identifiers

Report No.: S-006592
Other IDs:
Cross-refs:

Citation information

Author(s): Peter M. Banks
Year: 1984 (May)
Title: An Archaeological Reconnaissance of the Appian Way Widening Project, El Sobrante, Contra Costa County, California.
Affiliation: California Archaeological Consultants, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c. 1 li. mi.
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:
PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	6/30/2017	neala

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-007131

Identifiers

Report No.: S-007131
Other IDs:
Cross-refs:

Citation information

Author(s): Peter Banks
Year: 1985 (Feb)
Title: An Archaeological Reconnaissance of the Appian Way Widening Project: Phase II, El Sobrante, Contra Costa County, California.
Affliliation: California Archaeological Consultants, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c. 1 li. mi.
Disclosure: Not for publication
Collections: No

General notes

Associated resources

Primary No.	*Trinomial*	*Name*
P-07-000097	CA-CCO-000155	El Sobrante Library Site
P-07-000276	CA-CCO-000505	The Pinella Site

No. resources: 2
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:
PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	6/30/2017	neala

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-007573

Identifiers

Report No.:	S-007573
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Peter M. Banks
Year:	1985 (Aug)
Title:	An Archaeological Reconnaissance of the Rancho Plaza Project, Richmond, Contra Costa County, California.
Affliliation:	California Archaeological Consultants, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c. 7 ac.
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	4/7/2016	mikulikc	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-007894

Identifiers

Report No.: S-007894
Other IDs:
Cross-refs:

Citation information

Author(s): Maureen Steiner
Year: 1986 (Mar)
Title: Archeological Investigations of Assessor's Parcel Nos. 420-150-13, 22 and 23 in Contra Costa County (letter report)
Affliliation: Woodward-Clyde Consultants
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c 0.5 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:

Address	*City*	*Assessor's parcel no.*	*Zip code*
		420-150-13	
		420-150-22	
		420-150-23	

PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	4/7/2016	mikulikc

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-007988

Identifiers

Report No.:	S-007988
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Robert I. Orlins
Year:	1986 (Mar)
Title:	A Cultural Resource Investigation for the San Pablo Dam Road Widening Project, El Sobrante, Contra Costa County, California.
Affliliation:	California Archaeological Consultants, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	0.7 li mi
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000068	CA-CCO-000126	[none]
No. resources:	1		
Has informals:	No		

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	6/30/2017	neala

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	6/30/2017	neala	added resource
Record status:	Verified		

Report Detail: S-008100

Identifiers

Report No.: S-008100
Other IDs:
Cross-refs:

Citation information

Author(s): Suzanne Baker
Year: 1986 (May)
Title: Archaeological Reconnaissance of the Tyson Property, Parcel #425-170-025, El Sobrante, Contra Costa County.
Affliliation: Archaeological Consultants
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c 0.5 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:

Address	*City*	*Assessor's parcel no.*	*Zip code*
	El Sobrante	425-170-025	

PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	7/6/2017	hagell

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	7/6/2017	hagell	added month, APN

Record status: Verified

Report Detail: S-008186

Identifiers

Report No.: S-008186
Other IDs:
Cross-refs:

Citation information

Author(s): Peter Banks
Year: 1986 (Apr)
Title: Subsurface Archaeological Investigations for the Appian Way Widening Project, El Sobrante, Contra Costa County, California.
Affliliation: California Archaeological Consultants, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Excavation
Inventory size:
Disclosure: Not for publication
Collections: No

General notes

Associated resources

Primary No.	Trinomial	Name
P-07-000097	CA-CCO-000155	El Sobrante Library Site
P-07-000276	CA-CCO-000505	The Pinella Site

No. resources: 2
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:
PLSS:

Database record metadata

	Date	User
Entered:	4/7/2005	nwic-main
Last modified:	1/12/2016	simsa

IC actions:	Date	User	Action taken
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	1/11/2016	poskar	Study is site-specific, boundary changed to better reflect report.

Record status: Verified

Report Detail: S-010228

Identifiers

Report No.: S-010228
Other IDs:
Cross-refs:

Citation information

Author(s): Alice F. Wood
Year: 1988 (Aug)
Title: The Archaeological Monitoring of Excavations for Three Electrical Vaults on Appian Way, El Sobrante, Contra Costa County, California
Affiliation: California Archaeological Consultants, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Field study, Monitoring
Inventory size:
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:

Address	*City*	*Assessor's parcel no.*	*Zip code*
Appian Way	El Sobrante		

PLSS:

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	7/5/2017	rinerg

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-011534

Identifiers

Report No.:	S-011534	
Other IDs:	*Type*	*Name*
	Submitter	ARS 88-65
Cross-refs:		

Citation information

Author(s):	Katherine Flynn
Year:	1988 (Aug)
Title:	Archaeological survey of property located at 4247 Appian Way, El Sobrante, Contra Costa County (letter report)
Affiliation:	Archaeological Resource Service
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c 0.5 ac
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	4247 Appian Way	El Sobrante		
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	7/3/2017	moored	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-012297

Identifiers

Report No.: S-012297

Other IDs:

Type	Name
Submitter	ARS 90-73

Cross-refs:

Citation information

Author(s): Katherine Flynn

Year: 1991 (Jan)

Title: Archaeological evaluation of 4201 Garden Lane, El Sobrante, Contra Costa Co., Project No. MS 192-90 (letter report)

Affliliation: Archaeological Resource Service

No. pages:

No. maps:

Attributes: Archaeological, Field study

Inventory size: c 0.5 ac

Disclosure: Not for publication

Collections: No

General notes

Associated resources

No. resources: 0

Has informals: No

Location information

County(ies): Contra Costa

USGS quad(s): Richmond

Address:

Address	City	Assessor's parcel no.	Zip code
4201 Garden Lane	El Sobrante	425-122-007	
		425-122-012	
		425-122-011	

PLSS:

Database record metadata

	Date	User
Entered:	4/7/2005	nwic-main
Last modified:	7/5/2017	rinerg

IC actions:

Date	User	Action taken
4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-013803

Identifiers

Report No.:	S-013803
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Miley Paul Holman
Year:	1991 (Feb)
Title:	Archaeological Field Inspection of the Property at 3995 Garden Road, El Sobrante, Contra Costa County, California (letter report)
Affiliation:	Holman & Associates
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	c 2 ac
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000098	CA-CCO-000156	Garden Road Cul-de Sac Site
No. resources:	1		
Has informals:	No		

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	3995 Garden Road	El Sobrante		
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	1/8/2018	hagell	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-014541

Identifiers

Report No.:	S-014541
Other IDs:	
Cross-refs:	

Citation information

Author(s):	Suzanne Baker, Eric Wohlgemuth, and Cindy Desgrandchamp
Year:	1992 (Oct)
Title:	Archaeological Test Excavations at CA-CCO-156, El Sobrante, California
Affliliation:	Archaeological/Historical Consultants
No. pages:	
No. maps:	
Attributes:	Archaeological, Excavation
Inventory size:	
Disclosure:	Not for publication
Collections:	Yes

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000098	CA-CCO-000156	Garden Road Cul-de Sac Site
No. resources:	1		
Has informals:	No		

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	4/11/2016	mikulikc	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	4/7/2016	hagell	added month, collections info
	4/8/2016	simsa	Updated GIS: expanded shape to the NE to match map in report
Record status:	Verified		

Report Detail: S-022273

Identifiers

Report No.:	S-022273	
Other IDs:	*Type*	*Name*
	Submitter	Project 50001-109/99
Cross-refs:		

Citation information

Author(s):	Stacey Schneyder
Year:	1999 (Oct)
Title:	A Cultural Resources Study of 4439 Appian Way (APN# 425-110-021), El Sobrante, Contra Costa County, California
Affliliation:	Anthropological Studies Center, Sonoma State University
No. pages:	
No. maps:	
Attributes:	Archaeological, Architectural/historical, Field study
Inventory size:	
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

	Primary No.	*Trinomial*	*Name*
	P-07-000839		Lu Farm Complex
No. resources:	1		
Has informals:	No		

Location information

County(ies):	Contra Costa			
USGS quad(s):	Richmond			
Address:	*Address*	*City*	*Assessor's parcel no.*	*Zip code*
	4439 Appian Way	El Sobrante	425-110-021	
PLSS:				

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	7/7/2017	hagell	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
	1/4/2016	castrom	update DB
	1/11/2016	poskar	Report was mapped incorrectly based on the address, APN, and report content. Submitter's map was also incorrect.
Record status:	Verified		

Report Detail: S-027935

Identifiers

Report No.: S-027935
Other IDs:
Cross-refs:

Citation information

Author(s): John Holson
Year: 2004 (Jan)
Title: Archaeological Survey and Record Search Results for 4150 Appian Way, El Sobrante (APN 425-170-030) (letter report)
Affliliation: Pacific Legacy, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: c 3 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:

Address	*City*	*Assessor's parcel no.*	*Zip code*
4150 Appian Way	El Sobrante	425-170-30	

PLSS: T1N R4W

Database record metadata

	Date	*User*
Entered:	4/7/2005	nwic-main
Last modified:	7/3/2017	moored

IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.

Record status: Verified

Report Detail: S-038237

Identifiers

Report No.:	S-038237	
Other IDs:	*Type*	*Name*
	Other	LSA Project No. NCE1001
Cross-refs:		

Citation information

Author(s):	Heather Blind
Year:	2011 (Aug)
Title:	Cultural Resources Study for the Via Verde Sinkhole Repair Project, Richmond, Contra Costa County, California
Affliliation:	LSA Associates, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Field study
Inventory size:	
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Contra Costa
USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	10/19/2011	hagell
Last modified:	4/8/2016	simsa
IC actions:		
Record status:	Verified	

Report Detail: S-038251

Identifiers

Report No.:	S-038251	
Other IDs:	*Type*	*Name*
	Caltrans	EA 3A7761
	Caltrans	EA 3A7771
Cross-refs:		

Citation information

Author(s):	Jack Meyer
Year:	2011 (Sep)
Title:	Buried Archaeological Site Assessment and Extended Phase I Subsurface Explorations for the I-80 Integrated Corridor Mobility Project, Caltrans District 04, Alameda and Contra Costa Counties, California, 04-ALA-CC-80, P.M. ALA 1.99/P.M. ALA 8.04, P.M. CC 0.0/P.M. CC 13.49, EA 3A7761 / EA 3A7771
Affliliation:	Far Western Anthropological Research Group, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Excavation, Field study
Inventory size:	
Disclosure:	Not for publication
Collections:	No

General notes

Associated resources

No. resources:	0
Has informals:	No

Location information

County(ies):	Alameda, Contra Costa
USGS quad(s):	Benicia, Mare Island, Oakland West, Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	10/19/2011	jordanl
Last modified:	9/28/2017	moored
IC actions:		
Record status:	Verified	

Report Detail: S-043527

Identifiers

Report No.: S-043527

Other IDs:

Type	Name
Caltrans	EA 0A0811
Other	EFIS 0413000365
Caltrans	EA 0A0800

Cross-refs:

Citation information

Author(s): Dean Martorana

Year: 2008 (Jul)

Title: Archaeological Survey Report Interstate 80/San Pablo Dam Road Interchange Project, Contra Costa County, California, 4-CC-80 PM 3.8/5.3 EA 0A0800

Afflliation: URS Group Inc.

No. pages:

No. maps:

Attributes: Archaeological, Architectural/historical, Evaluation, Field study

Inventory size:

Disclosure: Not for publication

Collections: No

Sub-desig.: a

Author(s): Stephen Wee

Year: 2008 (Jul)

Title: Historical Resources Evaluation Report Interstate 80/San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0800 4-CC-80 PM 3.8/5.3

Affiliation: JRP Historical Consulting, LLC

Report type(s): Architectural/historical, Evaluation

Inventory size:

No. pages: 156

Disclosure: Not for publication

Collections: No

PDF Pages: 257-398

Sub-desig.: b

Author(s): Kathleen Kubal

Year: 2014 (Jan)

Title: Supplemental Historic Property Survey Report Interstate 80/ San Pablo Dam Road Interchange Project Contra Costa County, California EA 0A0811; EFIS 0413000365 4-CC-80, PM 3.8/5.3

Affiliation: URS Group Inc.

Report type(s): Architectural/historical, Evaluation

Inventory size:

No. pages: 40

Disclosure: Not for publication

Collections: No

PDF Pages: 399-438

General notes

The 2008 Historic Property Survey was not included in the submission packet and is not on file at the NWIC.

Associated resources

No. resources: 0

Has informals: No

Location information

County(ies): Contra Costa

Report Detail: S-043527

USGS quad(s):	Richmond
Address:	
PLSS:	

Database record metadata

	Date	*User*
Entered:	4/22/2014	intern2
Last modified:	1/8/2018	hagell

IC actions:	*Date*	*User*	*Action taken*
	6/20/2014	castrom	metadata form - partial printed copy of the report.
Record status:	Verified		

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-000595		1974	R.F. King	A Report on the Status of Generally Available Data Regarding Archaeological, Ethnographic, and Historical Resources Within a Five Mile Wide Corridor Through Portions of Colusa, Yolo, Solano, and Contra Costa Counties, California		07-000091, 48-000009, 48-000010, 48-000011, 48-000012, 48-000013, 48-000018, 48-000020, 57-000130, 57-000131
S-000848	Agency Nbr - Contract AA550-CT6-52	1977	David A. Fredrickson	A Summary of Knowledge of the Central and Northern California Coastal Zone and Offshore Areas, Vol. III, Socioeconomic Conditions, Chapter 7: Historical & Archaeological Resources	The Anthropology Laboratory, Sonoma State College; Winzler & Kelly Consulting Engineers	
S-001978		1960	Anthony V. Aiello	The Islands of Contra Costa		

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-002458		1981	Neil Ramiller, Suzanne Ramiller, Roger Werner, and Suzanne Stewart	Overview of Prehistoric Archaeology for the Northwest Region, California Archaeological Sites Survey: Del Norte, Humboldt, Mendocino, Lake, Sonoma, Napa, Marin, Contra Costa, Alameda	Anthropological Studies Center, Sonoma State University	01-000080, 01-000084, 01-000086, 01-000104, 01-000119, 01-000124, 01-000125, 01-000126, 01-000127, 01-000137, 01-000139, 01-002053, 01-002104, 07-000047, 07-000079, 07-000080, 07-000081, 07-000082, 07-000083, 07-000092, 07-000093, 07-000105, 07-000131, 07-000146, 07-000147, 07-000148, 07-000149, 07-000150, 07-000151, 07-000168, 07-000173, 07-000175, 07-000177, 07-000185, 07-000186, 07-000190, 07-000323, 07-000440, 07-000447, 07-000448, 07-000449, 07-000462, 07-000470, 07-000474, 07-000476, 07-000481, 07-000674, 07-000710, 07-000724, 07-004621, 08-000015, 08-000018, 08-000021, 08-000090, 12-000125, 12-000175, 12-000186, 12-000194, 12-000199, 12-000202, 12-000207, 12-000209, 12-000210, 12-000211, 12-000263, 12-000264, 12-000266, 12-000336, 12-000442, 12-000445, 12-000458, 17-000006, 17-000026, 17-000035, 17-000072, 17-000114, 17-000177, 17-000286, 17-000287, 17-000289, 17-000290, 17-000307, 17-000320, 17-000392, 17-000407, 17-000437, 17-000446, 17-000470, 17-000531, 17-000535, 17-000546, 17-000550, 17-000551, 17-000554, 17-000572, 17-000610, 17-000639, 17-000640, 17-000673, 17-000787, 17-000812, 21-000017, 21-000034, 21-000039, 21-000051, 21-000053, 21-000057, 21-000058, 21-000106, 21-000143, 21-000163, 21-000177, 21-000217, 21-000221, 21-000235, 21-000242, 21-000245, 21-000252, 21-000262, 21-000283, 21-000290, 21-000291, 21-000295, 21-000332, 21-000335, 21-000342, 21-000346, 21-000347, 21-000368, 21-000369, 21-000370, 21-000651, 21-000653, 21-002539, 23-000143, 23-000450, 23-000475, 23-000478,

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
						23-000492, 23-000534, 23-000535, 23-000536, 23-000537, 23-000539, 23-000590, 23-000786, 23-000789, 23-000790, 23-000791, 23-000792, 23-000793, 23-000796, 23-000835, 23-001034, 23-001060, 23-001063, 23-001520, 23-002898, 23-002915, 23-002936, 23-002945, 28-000015, 28-000027, 28-000028, 28-000029, 28-000032, 28-000045, 28-000061, 28-000063, 28-000066, 28-000077, 28-000088, 28-000092, 28-000093, 28-000097, 28-000123, 28-000125, 28-000150, 28-000199, 28-000209, 28-000218, 28-000222, 28-000310, 28-000311, 28-000329, 28-000330, 28-000362, 28-000418, 28-000419, 28-000420, 28-000421, 28-000422, 28-000428, 28-000828, 28-000912, 49-000073, 49-000079, 49-000112, 49-000135, 49-000194, 49-000228, 49-000264, 49-000265, 49-000271, 49-000291, 49-000292, 49-000295, 49-000318, 49-000329, 49-000330, 49-000340, 49-000342, 49-000360, 49-000362, 49-000363, 49-000369, 49-000371, 49-000423, 49-000424, 49-000434, 49-000483, 49-000512, 49-000521, 49-000548, 49-000620, 49-000653, 49-000671, 49-000682, 49-000683, 49-000730, 49-000731, 49-000732, 49-000733, 49-000846, 49-000860, 49-000887, 49-000913, 49-000914, 49-000915, 49-000916, 49-000917, 49-000959, 49-000970, 49-000976, 49-000978, 49-000981, 49-000982, 49-000983, 49-000990, 49-000992, 49-001081, 49-001082, 49-001083, 49-001084, 49-001085, 49-001086, 49-001087, 49-001109, 49-001121
S-002458a		1982	Suzanne Ramiller	Prehistoric Archaeology Overview Northwest Region; California Archaeological Inventory, Volume I: Humboldt and Del Norte Counties	Anthropological Studies Center, Sonoma State University	

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-002458b		1982	Roger H. Werner	Archaeological Overview of Mendocino and Lake Counties	Anthropological Studies Center, Sonoma State University	
S-002458c		1982	Suzanne Stewart	Prehistoric Archaeology Overview Northwest Region; California Archaeological Inventory, Volume I: Napa and Sonoma Counties	Anthropological Studies Center, Sonoma State University	
S-002458d		1982	Suzanne B. Stewart	Archaeological Overview of Alameda, Contra Costa, and Marin Counties	Anthropological Studies Center, Sonoma State University	
S-002458e		1982	Neil Ramiller	Environmental Overview of The Northwest Region	Anthropological Studies Center, Sonoma State University	
S-009462		1977	Teresa Ann Miller	Identification and Recording of Prehistoric Petroglyphs in Marin and Related Bay Area Counties	San Francisco State University	07-000323, 21-000087, 21-000376, 21-000378, 21-000379, 21-000380, 21-000381, 21-000382, 21-000383, 21-000384, 21-000386, 21-000387, 21-000388, 21-000389, 21-000390, 21-000391, 21-000392, 21-000393, 21-000394, 21-000395, 21-000396, 21-000397, 21-000398, 21-000399, 21-000400, 21-000401, 21-000402, 21-000546, 23-000434, 23-000789, 23-000790, 49-000629, 49-000785, 49-000787
S-009583		1978	David W. Mayfield	Ecology of the Pre-Spanish San Francisco Bay Area	San Francisco State University	
S-009795		1986	Thomas Lynn Jackson	Late Prehistoric Obsidian Exchange in Central California	Stanford University	06-000025, 07-000047, 07-000080, 07-000188, 07-000440, 17-000320, 17-000601, 21-000163, 21-000218, 21-000235, 21-000242, 21-000283, 21-000290, 21-000368, 21-000423, 21-000628, 23-001589, 23-001659, 23-003068, 23-003119, 28-000015, 28-000068, 28-000199, 28-000205, 28-000828, 49-000135, 49-000360, 49-000423, 49-000424, 49-000518, 49-000521, 49-000533, 49-000536, 49-000558, 49-000801, 57-000114

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-015529		1993	Robert L. Gearhart II, Clell L. Bond, Steven D. Hoyt, James H. Cleland, James Anderson, Pandora Snethcamp, Gary Wesson, Jack Neville, Kim Marcus, Andrew York, and Jerry Wilson	California, Oregon, and Washington: Archaeological Resource Study	Espey, Huston & Associates, Inc.; Dames & Moore	01-000033, 01-000034, 01-000084, 01-000086, 01-000104, 07-000133, 07-000173, 07-000175, 07-000177, 17-000072, 17-000392, 21-000048, 21-001915, 23-001704, 27-000100, 27-000236, 27-000335, 27-000356, 27-000386, 27-000485, 38-000028, 38-000072, 38-000085, 38-000098, 41-000080, 41-000265, 44-000179
S-016660		1992	Jeffrey B. Fentress	Prehistoric Rock Art of Alameda and Contra Costa Counties, California	California State University, Hayward	01-000035, 01-000039, 01-000071, 01-000080, 01-000128, 01-000137, 01-000138, 01-000144, 01-000195, 01-000198, 01-000199, 01-002112, 07-000029, 07-000094, 07-000189, 07-000193, 07-000212, 07-000216, 07-000219, 07-000230, 07-000242, 07-000255, 07-000260, 07-000271, 07-000301, 07-000302, 07-000323, 07-000344, 07-000345, 07-000346, 07-000347, 07-000348, 07-000356, 07-000362, 07-000374, 07-000725, 07-000726, 07-000727, 07-000730, 07-000734, 07-000736, 07-000738, 07-000739
S-017835		1975	Judy Myers Suchey	Biological Distance of Prehistoric Central California Populations Derived from Non-Metric Traits of the Cranium	University of California, Riverside	01-000086, 01-000104, 01-000105, 06-000025, 07-000080, 07-000081, 07-000083, 07-000087, 21-000017, 21-000193, 21-000242, 21-000252, 48-000010, 57-000145
S-018217		1996	Glenn Gmoser	Cultural Resource Evaluations for the Caltrans District 04 Phase 2 Seismic Retrofit Program, Status Report	California Department of Transportation	01-000014, 01-000023, 01-000227, 07-000108, 07-000119, 38-000002, 38-000004, 41-000273, 43-000106, 43-000297, 43-000624, 43-001078, 44-000010, 44-000201, 44-000300, 49-000195

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-020395		1998	Donna L. Gillette	PCNs of the Coast Ranges of California: Religious Expression or the Result of Quarrying?	California State University, Hayward	07-000094, 07-000323, 12-000050, 17-000071, 17-001315, 21-000087, 21-000376, 21-000378, 21-000379, 21-000381, 21-000382, 21-000383, 21-000384, 21-000386, 21-000387, 21-000388, 21-000389, 21-000390, 21-000391, 21-000392, 21-000393, 21-000394, 21-000395, 21-000396, 21-000397, 21-000398, 21-000399, 21-000400, 21-000401, 21-000402, 21-000419, 21-000433, 21-000546, 21-000620, 21-000621, 21-000624, 21-000661, 23-000434, 23-000809, 23-000810, 23-001698, 23-001725, 23-001792, 23-001798, 23-001799, 23-001803, 23-001804, 23-001930, 23-001942, 23-001950, 23-001963, 35-000013, 43-000067, 43-000080, 43-000287, 43-000289, 43-000504, 49-000046, 49-000240, 49-000533, 49-000550, 49-000629, 49-000785, 49-000787, 49-000868, 49-000960, 49-000975, 49-001004, 49-001087, 49-001239, 49-002121
S-030204		2003	Donna L. Gillette	The Distribution and Antiquity of the California Pecked Curvilinear Nucleated (PCN) Rock Art Tradition.	University of California, Berkeley	01-002148, 21-000384, 23-000810
S-032596	Caltrans - EA No. 447600; Other - Contract #04A2098	2006	Randall Milliken, Jerome King, and Patricia Mikkelsen	The Central California Ethnographic Community Distribution Model, Version 2.0, with Special Attention to the San Francisco Bay Area, Cultural Resources Inventory of Caltrans District 4 Rural Conventional Highways	Consulting in the Past; Far Western Anthropological Research Group, Inc.	
S-033545		1994		Draft Comprehensive Management and Use Plan and Environmental Impact Statement, Juan Bautista de Anza National Historic Trail, Arizona and California	National Park Service	38-002967, 41-002192, 43-002628

Report List

'Other' Reports list

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-033600	Agency Nbr - Contract No. 04A2098; Caltrans - EA No. 447600	2007	Jack Meyer and Jeff Rosenthal	Geoarchaeological Overview of the Nine Bay Area Counties in Caltrans District 4	Far Western Anthropological Research Group, Inc.	01-000001, 01-000002, 01-000014, 01-000063, 01-000064, 01-000067, 01-000080, 01-000124, 01-000139, 01-000140, 01-001795, 01-002110, 01-002160, 01-002162, 01-002245, 07-000019, 07-000024, 07-000037, 07-000047, 07-000075, 07-000079, 07-000088, 07-000089, 07-000108, 07-000182, 07-000185, 07-000186, 07-000217, 07-000239, 07-000401, 07-000721, 21-000010, 21-000048, 21-002615, 28-000009, 28-000028, 28-000301, 28-000967, 38-000006, 38-000028, 38-000101, 38-000102, 38-000119, 41-000080, 41-000284, 43-000016, 43-000189, 43-000296, 43-000308, 43-000310, 43-000423, 43-000424, 43-000448, 43-000451, 43-000485, 43-000561, 43-000604, 43-000608, 43-000614, 43-000623, 43-001015, 43-001058, 43-001080, 43-001163, 43-001194, 43-001576, 48-000007, 48-000157

Resource List

Primary No.	Trinomial	Other IDs	Type	Age	Attribute codes	Recorded by	Reports
P-07-000097	CA-CCO-000155	Resource Name - El Sobrante Library Site	Site	Prehistoric	AP15	1950 (T. Bolt, [none]); 1985 (Peter Banks, [none])	S-007131, S-008186
P-07-000098	CA-CCO-000156	Resource Name - Garden Road Cul-de Sac Site	Site	Prehistoric	AP09; AP15	1950 (T. Bolt, [none]); 1985 (Peter Banks, [none]); 1988 (Richard Schwartz, [none])	S-013803, S-014541
P-07-000839		Resource Name - Lu Farm Complex; Other - 4439 Appian Way	Building, Structure	Historic	HP33	1999 (Mike Newland, Stacy Schneyder, Noelle Storey, Anthropological Studies Center, Sonoma State University)	S-022273
P-07-004605		Resource Name - Map Reference #7; Other - 3058 Judith Court	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	
P-07-004606		Resource Name - Map Reference #6; Other - 3066 Judith Court	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	
P-07-004607		Resource Name - Map Reference #5; Other - 3072 Judith Court	Building	Historic	HP02	2008 (Bryan Larson, JRP Historical Consulting)	
P-07-004608		Resource Name - Map Reference #4; Other - 3144 Rollingwood Drive	Building	Historic	HP02	2008 (Bryan Larson, JRP Historical Consulting)	
P-07-004609		Resource Name - Map Reference #3; Other - 3152 Rollingwood Drive	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	
P-07-004610		Resource Name - Map Reference #2; Other - 3160 Rollingwood Drive	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	
P-07-004611		Resource Name - Map Reference #1; Other - 3168 Rollingwood Drive	Building	Historic	HP02	2007 (Cheryl Brookshear, Damany Fisher, JRP Historical Consulting)	

CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM

ALAMEDA
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SONOMA
YOLO

Northwest Information Center
Sonoma State University
150 Professional Center Drive, Suite E
Rohnert Park, California 94928-3609
Tel: 707.588.8455
nwic@sonoma.edu
http://www.sonoma.edu/nwic

11/21/2018 NWIC File No.: 18-0871

Molly Laitinen
NCE
P.O. Box 1760
Zephyr Cove, NV 89448

Re: Via Verdi Slope Stabilization Project

The Northwest Information Center received your record search request for the project area referenced above, located on the Richmond USGS 7.5’ quad(s). The following reflects the results of the records search for the project area and a one-quarter mile radius:

Resources within project area:	None
Resources within ¼-mile radius:	No archaeological resources
Reports within project area:	S-35664
Reports within ¼-mile radius:	S-01610, S-33596, S-49682

Resource Database Printout (list): ☐ enclosed ☐ not requested ☒ nothing listed

Resource Database Printout (details): ☐ enclosed ☐ not requested ☒ nothing listed

Resource Digital Database Records: ☐ enclosed ☐ not requested ☒ nothing listed

Report Database Printout (list): ☒ enclosed ☐ not requested ☐ nothing listed

Report Database Printout (details): ☒ enclosed ☐ not requested ☐ nothing listed

Report Digital Database Records: ☒ enclosed ☐ not requested ☐ nothing listed

Resource Record Copies: ☐ enclosed ☐ not requested ☒ nothing listed

Report Copies: ☐ enclosed ☒ not requested ☐ nothing listed

OHP Historic Properties Directory: ☒ enclosed ☐ not requested ☐ nothing listed

Archaeological Determinations of Eligibility: ☐ enclosed ☐ not requested ☒ nothing listed

CA Inventory of Historic Resources (1976): ☐ enclosed ☐ not requested ☒ nothing listed

Caltrans Bridge Survey: ☐ enclosed ☒ not requested ☐ nothing listed

Ethnographic Information: ☐ enclosed ☒ not requested ☐ nothing listed

Historical Literature: ☐ enclosed ☒ not requested ☐ nothing listed

Historical Maps:	☐ enclosed ☒ not requested ☐ nothing listed
Local Inventories:	☐ enclosed ☒ not requested ☐ nothing listed
GLO and/or Rancho Plat Maps:	☐ enclosed ☒ not requested ☐ nothing listed
Shipwreck Inventory:	☐ enclosed ☒ not requested ☐ nothing listed

Please forward a copy of any resulting reports from this project to the office as soon as possible. Due to the sensitive nature of archaeological site location data, we ask that you do not include resource location maps and resource location descriptions in your report if the report is for public distribution. If you have any questions regarding the results presented herein, please contact the office at the phone number listed above.

The provision of CHRIS Data via this records search response does not in any way constitute public disclosure of records otherwise exempt from disclosure under the California Public Records Act or any other law, including, but not limited to, records related to archeological site information maintained by or on behalf of, or in the possession of, the State of California, Department of Parks and Recreation, State Historic Preservation Officer, Office of Historic Preservation, or the State Historical Resources Commission.

Due to processing delays and other factors, not all of the historical resource reports and resource records that have been submitted to the Office of Historic Preservation are available via this records search. Additional information may be available through the federal, state, and local agencies that produced or paid for historical resource management work in the search area. Additionally, Native American tribes have historical resource information not in the CHRIS Inventory, and you should contact the California Native American Heritage Commission for information on local/regional tribal contacts.

Should you require any additional information for the above referenced project, reference the record search number listed above when making inquiries. Requests made after initial invoicing will result in the preparation of a separate invoice.

Thank you for using the California Historical Resources Information System (CHRIS).

Sincerely,

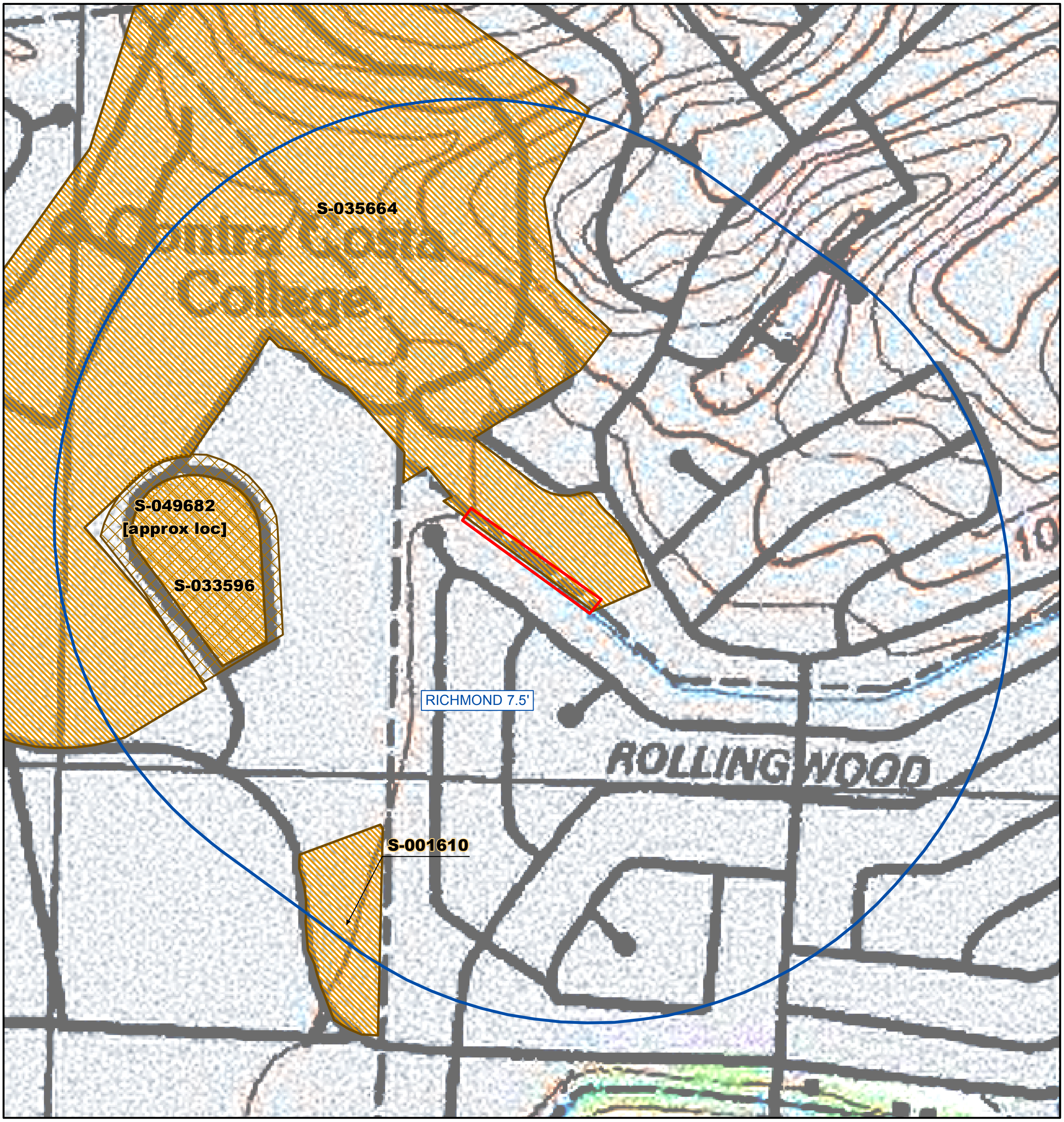
Jessika Akmenkalns, Ph.D.
Researcher

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS............	NAMES............................	CITY.NAME........	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
							PROJ.REVW.	FHWA020717A	08/16/02	6Y	
096117	07-001830	2600 BARRETT AVE	RICHMOND CITY HALL	RICHMOND	M	1949	HIST.RES.	DSA-07-SPS-3116	04/17/95	7K	
							HIST.SURV.	4802-0020-0000		3S	
132187		1341 BATTERY ST		RICHMOND	P	1944	HIST.RES.	DOE-07-02-0021-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702M	07/10/02	6Y	
184563		1513 BISSEL AVE		RICHMOND	P		PROJ.REVW.	HUD100914K	09/29/10	6Y	
132337		214 BISSELL AVE		RICHMOND	P	1905	HIST.RES.	DOE-07-02-0039-0000	07/18/02	6Y	
							PROJ.REVW.	HUD020712L	07/18/02	6Y	
132341		221 BISSELL AVE		RICHMOND	P	1907	HIST.RES.	DOE-07-02-0043-0000	07/18/02	6Y	
							PROJ.REVW.	HUD020712P	07/18/02	6Y	
068473	07-001283	229 BISSELL AVE		RICHMOND	U	1918	PROJ.REVW.	HUD900801A	09/11/90	6Y	
069258	07-001288	317 BISSELL AVE		RICHMOND	U	1928	PROJ.REVW.	HUD901023H	11/26/90	6Y	
067492	07-001270	325 BISSELL AVE		RICHMOND	P	1915	PROJ.REVW.	HUD900618F	07/18/90	6Y	
069796	07-001294	409 BISSELL AVE		RICHMOND	U	1915	PROJ.REVW.	HUD901205B	12/27/90	6Y	
129182	07-002524	1608 BISSELL AVE		RICHMOND	P	1905	HIST.RES.	DOE-07-01-0027-0000	11/20/01	6Y	
							PROJ.REVW.	HUD011005E	11/20/01	6Y	
012787	07-001163	BRICKYARD COVE RD	OLD BRICKWORKS	RICHMOND	P		HIST.SURV.	4802-0004-0000		7N	
067463	07-001265	260 BROADWAY		RICHMOND	P	1941	PROJ.REVW.	HUD900525D	06/19/90	6Y	
076229	07-001592	112 BUENA VISTA AVE		RICHMOND	P	0	HIST.SURV.	4802-0003-0183	11/05/79	1D	C
076000	07-001527	126 BUENA VISTA AVE		RICHMOND	P	0	HIST.SURV.	4802-0003-0118	11/05/79	1D	A
076430	07-001700	135 BUENA VISTA AVE		RICHMOND	P	0	HIST.SURV.	4802-0003-0360	11/05/79	1D	C
075952	07-001503	207 BUENA VISTA AVE		RICHMOND	P	0	HIST.SURV.	4802-0003-0094	11/05/79	1D	A
076441	07-001706	211 BUENA VISTA AVE		RICHMOND	P	0	HIST.SURV.	4802-0003-0366	11/05/79	1D	C
076018	07-001536	221 BUENA VISTA AVE		RICHMOND	P	0	HIST.SURV.	4802-0003-0127	11/05/79	1D	A
126471	07-002488	1308 CANAL (POINT POTRERO)	RICHMOND SHIPYARD FIRST AID STATIO	RICHMOND	DM		HIST.RES.	SHL-1032-0011	08/11/00	1CL	AC
							HIST.RES.	NPS-00000364-0011	04/28/00	1D	AC
076402	07-001686	110 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0346	11/05/79	1D	C
076236	07-001596	111 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0187	11/05/79	1D	C
076404	07-001687	122 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0347	11/05/79	1D	C
076398	07-001684	128 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0344	11/05/79	1D	C
076397	07-001683	134 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0343	11/05/79	1D	C
075929	07-001491	200 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0082	11/05/79	1D	A
076447	07-001709	210 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0369	11/05/79	1D	C
075925	07-001489	218 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0080	11/05/79	1D	A
076010	07-001532	224 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0123	11/05/79	1D	A
076303	07-001636	230 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0296	11/05/79	1D	C
076166	07-001559	236 CASTRO ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0150	11/05/79	1D	C
184600		2619 CENTER AVE		RICHMOND	P	1936	PROJ.REVW.	HUD100914I	09/29/10	6Y	
076297	07-001633	218 CHANSLOR AVE		RICHMOND	U	1915	PROJ.REVW.	HUD920325E	04/21/92	6Y	
070282	07-001304	332 CHANSLOR AVE		RICHMOND	U	1920	PROJ.REVW.	HUD910408H	05/09/91	6Y	
070323	07-001305	332 CHANSLOR AVE		RICHMOND	U	1920	PROJ.REVW.	HUD910408H	05/09/91	6Y	
127053	07-002497	1300 CHANSLOR AVE		RICHMOND	P	1919	HIST.RES.	DOE-07-00-0012-0000	06/09/00	6Y	
							PROJ.REVW.	HUD000606H	06/09/00	6Y	
141060		425 CHESLEY AVE		RICHMOND	P	1930	HIST.RES.	DOE-07-03-0029-0000	06/23/03	6Y	
							PROJ.REVW.	HUD030522B	06/23/03	6Y	
084842	07-001757	325 CIVIC CENTER PLAZA	RICHMOND PUBLIC LIBRARY; CARNEGIE	RICHMOND	C	1910	PROJ.REVW.	HUD060622A	06/23/06	2S	AC
							HIST.SURV.	4802-0027-0000	11/12/89	3S	
143440		403 CIVIC CENTER PLAZA	RICHMOND CIVIC CENTER AUDITORIUM	RICHMOND	M	1951	HIST.RES.	DOE-07-03-0036-0000	09/08/03	6Y	
							PROJ.REVW.	FCC030731F	09/08/03	6Y	
175034		6430 CLAREMONT AVE		RICHMOND	P	1922	PROJ.REVW.	HUD100323I	04/19/10	6Y	
							PROJ.REVW.	HUD100323I	04/19/10		
							PROJ.REVW.	HUD090225A	03/18/09	6Y	
076024	07-001539	220 CLARENCE ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0130	11/05/79	1D	A
075901	07-001477	225 CLARENCE ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0068	11/05/79	1D	A
075927	07-001490	421 CLARENCE ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0081	11/05/79	1D	A
076440	07-001705	25 CONTRA COSTA ST		RICHMOND	P	0	HIST.SURV.	4802-0003-0365	11/05/79	1D	C

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS............	NAMES...........................	CITY.NAME........	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
155420		550 SAN PABLO AVE		RODEO	P	1947	PROJ.REVW.	HUD050822C	09/26/05	6Y	
106577	07-001916	3801 SR 4	BARRY RANCH	RODEO	P	1923	HIST.RES.	DOE-07-97-0003-0000	01/17/97	6Y	
							PROJ.REVW.	FHWA961211A	01/17/97	6Y	
171850		311 VALLEJO AVE		RODEO		1941	PROJ.REVW.	HUD080609H	06/13/08	6Y	
106758	07-001919		RODEO CREEK BRIDGE, BRIDGE #28-003	(VIC) RODEO			HIST.RES.	DOE-07-97-0005-0000	01/17/97	6Y	
							PROJ.REVW.	FHWA961211A	01/17/97	6Y	
010625	07-001132	SR 80	OLEUM	(VIC) RODEO	P	1895	HIST.SURV.	4572-0002-0000		7R	
129337	07-002539	3200 11TH ST		SAN PABLO	P	1949	HIST.RES.	DOE-07-02-0003-0000	01/14/02	6Y	
							PROJ.REVW.	HUD020110N	01/14/02	6Y	
147279		3409 11TH ST		SAN PABLO	P	1954	HIST.RES.	DOE-07-04-0010-0000	01/23/04	6Y	
							PROJ.REVW.	HUD031231D	01/23/04	6Y	
146036		1816 14TH ST		SAN PABLO	P	1924	HIST.RES.	DOE-07-04-0002-0000	02/03/04	6Y	
							PROJ.REVW.	HUD040130C	02/03/04	6Y	
141058		1614 15TH ST		SAN PABLO	P	1935	HIST.RES.	DOE-07-03-0028-0000	07/03/03	6Y	
							PROJ.REVW.	HUD030606A	07/03/03	6Y	
135837		1875 15TH ST		SAN PABLO	P	1952	HIST.RES.	DOE-07-02-0075-0000	12/16/02	6Y	
							PROJ.REVW.	HUD021203B	12/16/02	6Y	
169781		2759 15TH ST		SAN PABLO	P	1951	PROJ.REVW.	HUD071213L	01/08/08	6Y	
129257	07-002534	1740 16TH ST		SAN PABLO	P	1934	HIST.RES.	DOE-107-01-0037-0000	12/31/01	6Y	
							PROJ.REVW.	HUD011226J	12/31/01	6Y	
132825		1881 16TH ST		SAN PABLO	P	1953	HIST.RES.	DOE-07-02-0061-0000	08/05/02	6Y	
							PROJ.REVW.	HUD020729C	08/05/02	6Y	
138782		1958 16TH ST		SAN PABLO	P	1946	HIST.RES.	DOE-07-03-0021-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411A	04/15/03	6Y	
131423		2721 18TH ST		SAN PABLO	P		HIST.RES.	DOE-07-02-0017-0000	06/06/02	6Y	
							PROJ.REVW.	HUD020522K	06/06/02	6Y	
161654		2972 19TH ST		SAN PABLO	P	1953	PROJ.REVW.	HUD060317A	03/21/06	6Y	
136783		2024 20TH ST		SAN PABLO	P	1948	HIST.RES.	DOE-07-03-0014-0000	02/03/03	6Y	
							PROJ.REVW.	HUD030128J	02/03/03	6Y	
166216		2996 20TH ST		SAN PABLO	P	1954	PROJ.REVW.	HUD070529E	06/04/07	6Y	
132819		2331 22ND ST		SAN PABLO	P	1929	HIST.RES.	DOE-07-02-0060-0000	08/05/02	6Y	
							PROJ.REVW.	HUD020729D	08/05/02	6Y	
012818	07-001191	ALVARADO SQUARE	BLUME HOUSE	SAN PABLO	P	1905	HIST.SURV.	4806-0011-0000		7R	
012808	07-001181	ALVARADO SQUARE	TEXIERA HOME	SAN PABLO	M	1890	HIST.SURV.	4806-0001-0000		7R	
171428		1524 AMADOR ST		SAN PABLO	P	1948	PROJ.REVW.	HUD080421D	04/25/08	6Y	
132457		2900 ARUNDEL WY		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0001-0000	07/19/02	6Y	
							PROJ.REVW.	HUD020705Q	07/19/02	6Y	
136070		2445 BANCROFT LANE		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0006-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216M	01/06/03	6Y	
132190		6211 BAYVIEW AVE		SAN PABLO	P	1951	HIST.RES.	DOE-07-02-0024-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702D	07/10/02	6Y	
161955		150 BONNIE DR		SAN PABLO	P	1954	PROJ.REVW.	HUD060428A	05/03/06	6Y	
166244		321 BONNIE DR		SAN PABLO	P	1954	PROJ.REVW.	HUD070702S	07/06/07	6Y	
146035		1300 BROOKSIDE AVE		SAN PABLO	P	1949	HIST.RES.	DOE-07-04-0001-0000	02/03/04	6Y	
							PROJ.REVW.	HUD040120B	02/03/04	6Y	
134262		1811 BUSH AVE		SAN PABLO	P	1940	HIST.RES.	DOE-07-02-0067-0000	10/01/02	6Y	
							PROJ.REVW.	HUD020926I	10/01/02	6Y	
170080		2600 CASTRO RD	ORGANIZATIONAL MANTAINANCE SHOP	SAN PABLO	F	1952	PROJ.REVW.	USA070613A	07/16/07	6Y	
170079		2600 CASTRO RD	COLONIAL HUNTER HALL USAR CENTER	SAN PABLO	F	1952	PROJ.REVW.	USA070613A	07/16/07	6Y	
182102		468 CHRISTINE DR		SAN PABLO	P	1963	PROJ.REVW.	HUD110309F	03/16/11	6Y	
012809	07-001182	1825 CHURCH LANE	ST PAULS CATHOLIC CHURCH & GRAVEYA	SAN PABLO	P	1863	HIST.SURV.	4806-0002-0000		7N	
012819	07-001192	1901 CHURCH LANE	OLD RECTORY	SAN PABLO	P	1875	HIST.RES.	DOE-07-97-0011-0000	07/17/97	2S2	C

PROPERTY-NUMBER	PRIMARY-#	STREET.ADDRESS............	NAMES...........................	CITY.NAME........	OWN	YR-C	OHP-PROG..	PRG-REFERENCE-NUMBER	STAT-DAT	NRS	CRIT
							PROJ.REVW.	HUD950522F	07/17/97	2S2	C
							HIST.SURV.	4806-0014-0000	05/30/80	3S	
							HIST.SURV.	4806-0012-0000		7N	
184209		1845 CHURCH LN	ST PAUL CHURCH	SAN PABLO	P	1931	PROJ.REVW.	FCC091123E	02/25/10	6Y	
131422		1501 COLIN ST		SAN PABLO	P		HIST.RES.	DOE-07-02-0016-0000	06/06/02	6Y	
							PROJ.REVW.	HUD020522E	06/06/02	6Y	
012814	07-001187	930 CR 20	RUMRILL HELMS HOUSE	SAN PABLO	P	1884	HIST.SURV.	4806-0007-0000		3S	
147278		2009 CR 20		SAN PABLO	P	1951	HIST.RES.	DOE-07-04-0009-0000	01/23/04	6Y	
							PROJ.REVW.	HUD031231B	01/23/04	6Y	
012815	07-001188	2022 CR 20	STANLEY ALTER HOME	SAN PABLO	P		HIST.SURV.	4806-0008-0000		7R	
169728		1401 DOVER AVE		SAN PABLO	P	1948	PROJ.REVW.	HUD071213K	01/07/08	6Y	
134260		2418 DOVER AVE		SAN PABLO	P	1943	HIST.RES.	DOE-07-02-0066-0000	10/01/02	6Y	
							PROJ.REVW.	HUD020926J	10/01/02	6Y	
129336	07-002538	1514 EMERIC AVE		SAN PABLO	P	1941	HIST.RES.	DOE-07-02-0002-0000	01/14/02	6Y	
							PROJ.REVW.	HUD020110M	01/14/02	6Y	
138783		1807 EMERIC AVE		SAN PABLO	P	1935	HIST.RES.	DOE-07-03-0022-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411B	04/15/03	6Y	
136544		2201 EMERIC AVE		SAN PABLO	P	1930	HIST.RES.	DOE-07-03-0013-0000	01/27/03	6Y	
							PROJ.REVW.	HUD030115A	01/27/03	6Y	
182264		179 JENNIFER DR		SAN PABLO	P	1946	PROJ.REVW.	HUD110419E	04/25/11	6Y	
136071		1108 JOHN AVE		SAN PABLO	P	1942	HIST.RES.	DOE-07-03-0007-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021210B	01/06/03	6Y	
158312		1439 KAREN RD		SAN PABLO	P	1954	PROJ.REVW.	HUD051216M	12/30/05	6Y	
171431		1110 LETTIA RD		SAN PABLO	P	1953	PROJ.REVW.	HUD080410A	04/25/08	6Y	
144729		240 LINDA DR		SAN PABLO	P	1953	HIST.RES.	DOE-07-03-0037-0000	10/20/03	6Y	
							PROJ.REVW.	HUD031003B	10/20/03	6Y	
179036		2664 MACARTHUR AVE		SAN PABLO	P	1943	PROJ.REVW.	HUD100330G	04/23/10	6Y	
137730		1601 MANOR DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-03-0017-0000	03/07/03	6Y	
							PROJ.REVW.	HUD030303E	03/07/03	6Y	
012810	07-001183	2650 MARKET AVE	1906 EARTHQUAKE CAMP SITE	SAN PABLO	P	1906	HIST.SURV.	4806-0003-0000		7N	
138784		1830 MASON ST		SAN PABLO	P	1951	HIST.RES.	DOE-07-03-0023-0000	04/15/03	6Y	
							PROJ.REVW.	HUD030411C	04/15/03	6Y	
012811	07-001184	5739 MCBRYDE AVE	BOUQUET CHATEAU	SAN PABLO	P	1911	HIST.SURV.	4806-0004-0000		7R	
178682		2639 MERRITT AVE		SAN PABLO	P	1944	PROJ.REVW.	HUD100203A	02/03/10	6Y	
132191		24 MONTALVIN DR		SAN PABLO	P	1950	HIST.RES.	DOE-07-02-0025-0000	07/10/02	6Y	
							PROJ.REVW.	HUD020702I	07/10/02	6Y	
136069		2584 O'HARTE RD		SAN PABLO	P	1952	HIST.RES.	DOE-07-03-0005-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216E	01/06/03	6Y	
137729		2596 O'HARTE RD		SAN PABLO	P	1952	HIST.RES.	DOE-07-03-0016-0000	03/07/03	6Y	
							PROJ.REVW.	HUD030303F	03/07/03	6Y	
161880		2634 OHARE AVE		SAN PABLO	P	1943	PROJ.REVW.	HUD060403C	04/05/06	6Y	
180163		941 PALMER AVE		SAN PABLO	P	1945	PROJ.REVW.	HUD101004H	10/28/10	6Y	
147571		1919 PINE AVE		SAN PABLO	P	1951	HIST.RES.	DOE-07-04-0013-0000	02/23/04	6Y	
							PROJ.REVW.	HUD040213B	02/23/04	6Y	
012812	07-001185	1841 PULLMAN ST	PULLMAN STREET RECTORY	SAN PABLO	P	1875	HIST.SURV.	4806-0005-0000		3S	
012813	07-001186	918 RANDY LANE	ANDRATA HOUSE	SAN PABLO	P	1900	HIST.SURV.	4806-0006-0000		3S	
150832		2009 RD 20		SAN PABLO	P	1950	HIST.RES.	DOE-07-04-0022-0000	07/29/04	6Y	
							PROJ.REVW.	HUD040712B	07/29/04	6Y	
150539		2778 ROLLINGWOOD DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-04-0020-0000	07/12/04	6Y	
							PROJ.REVW.	HUD040301C	07/12/04	6Y	
136068		2797 ROLLINGWOOD DR		SAN PABLO	P	1943	HIST.RES.	DOE-07-03-0004-0000	01/06/03	6Y	
							PROJ.REVW.	HUD021216I	01/06/03	6Y	
164754		2807 ROLLINGWOOD DR		SAN PABLO	P	1943	PROJ.REVW.	HUD070126A	01/30/07	6Y	
012816	07-001189	SAN PABLO AVE	ALVARADO ADOBE	SAN PABLO	M	1826	HIST.SURV.	4806-0009-0000		7N	
							HIST.RES.	SHL-0512-0000	11/06/53	7L	

Report Map (no archaeological resources)
Via Verdi Slope Stabilization Project



Northwest Information Center
File #18-0871 21 Nov 2018 J. Akmenkalns
May depict confidential cultural resource locations.
Do not distribute.

Feet: 0, 160, 320, 480, 640
Meters: 0, 30, 60, 90, 120, 150

N

Project Area
One-Quarter Mile Radius
Quad outlines
Reports (polygons)
Reports approx loc

Report List

Via Verdi Slope Stabilization Project

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-035664	Submitter - Project #CTD0802	2008	E. Timothy Jones and Michael Hibma	A Cultural and Paleontological Resources Study for the Contra Costa College Facilities Master Plan Project, San Pablo, Contra Costa County, California	LSA Associates, Inc.	

Report Detail: S-035664

Via Verdi Slope Stabilization Project

Identifiers

Report No.: S-035664

Other IDs:

Type	*Name*
Submitter	Project #CTD0802

Cross-refs:

Citation information

Author(s): E. Timothy Jones and Michael Hibma

Year: 2008 (Sep)

Title: A Cultural and Paleontological Resources Study for the Contra Costa College Facilities Master Plan Project, San Pablo, Contra Costa County, California

Affiliation: LSA Associates, Inc.

No. pages:

No. maps:

Attributes: Archaeological, Field study

Inventory size: c 83 ac

Disclosure: Not for publication

Collections: No

General notes

Associated resources

No. resources: 0

Has informals: No

Location information

County(ies): Contra Costa

USGS quad(s): Richmond

Address:

Address	*City*	*Assessor's parcel no.*	*Zip code*
2600 Mission Bell Drive	San Pablo		

PLSS:

Database record metadata

	Date	*User*
Entered:	7/1/2009	guldenj
Last modified:	4/8/2016	simsa

IC actions:

Record status: Verified

Report List

Via Verdi Slope Stabilization Project

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-001610		1979	Peter M. Banks	An Archaeological Investigation of a Parcel on El Portal Drive, San Pablo, Contra Costa County, California.	California Archaeological Consultants, Inc.	
S-033596	OHP PRN - USA070613A; Submitter - Contract No. W912C8-05-P-0052	2007	Mary L. Maniery and Cindy L. Baker	Cultural Resource Inventory and Evaluation of United States Army Reserve 63D Regional Readiness Command Facilities; Contract No. W912C8-05-P-0052	PAR Environmental Services, Inc.	01-001830, 01-001833, 01-010830, 01-010831, 07-002752, 07-002753, 43-000728, 43-001836, 43-001837, 48-000752
S-033596a		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve Heroic War Dead USAR Center/Area Maintenance Support Activity 85 (G), Oakland, California; P-01-[010831], 63D Regional Readiness Command Facility CA036, Contract No. W912C8-05-P	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596b		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve Oakland USAR Center #2, Oakland, California; P-01-01830, 63D Regional Readiness Command Facility CA-125, Contract No. W912C8-05-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596c		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve PFC Bacciglieri Armed Forces Reserve Center, Concord, California; P-07-002752, 63 D Regional Readiness Command Facility CA007, Contract No. W912C8-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596d		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve Col. Hunter Hall USAR Center, San Pablo, California; P-07-002753, 63D Regional Readiness Command Facility CA 070, Contract No. W912C8-05-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596e		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve Fort Ord USAR Center, Marina, California; 63D Regional Readiness Command Facility CA012, Contract No. W912C8-05-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	

Report List

Via Verdi Slope Stabilization Project

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
S-033596f		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve Moss Landing Local Training Area, Moss Landing, California; 63D Regional Readiness Command Facility CA189, Contract No. W912C8-05-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596g		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve Jones Hall USAR Center, Mountain View, California; P-43-001836, 63D Regional Readiness Command Facility CA031, Contract No. W912C8-05-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596h		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve Richey Hall USAR Center, San Jose, California; P-43-000728, 63D Regional Readiness Command Facility CA069, Contract No. W912C8-05-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596i		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve Moffett USAR Center, Mountain View, California; P-43-001837, 63D Regional Readiness Command Facility CA120, Contract No. W912C8-05-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596j		2007		Cultural Resources Inventory and Evaluation of the United States Army Reserve PFC Young USAR Center, Vallejo, California; P-[48-000752], 63D Regional Readiness Command Facility CA-090, Contract No. W912C8-05-P-0052	U.S. Army Reserve; PAR Environmental Services, Inc.	
S-033596k		2007	Milford Wayne Donaldson and James O. Anderson	USA070613A; Inventory and Evaluation of Historic Resources at 63D Regional Readiness Command, US Army Reserve Center in California	Office of Historic Preservation; US Army	
S-049682	OHP PRN - USA_2017_0206_00			Colonel Hunter Hall, United States Army Reserve Center, Facility ID No. CA070		
S-049682a		2017	Julianne Polanco, Laura M. Caballero, and Susan K. Stratton	USA_2017_0206_002, Real Property Exchange of Hunter Hall Army Reserve Center, 2600 Castro Road, San Pablo, California	Office of Historic Preservation; Department of the Army	

Report Detail: S-001610

Via Verdi Slope Stabilization Project

Identifiers

Report No.: S-001610
Other IDs:
Cross-refs:

Citation information

Author(s): Peter M. Banks
Year: 1979 (Apr)
Title: An Archaeological Investigation of a Parcel on El Portal Drive, San Pablo, Contra Costa County, California.
Affliliation: California Archaeological Consultants, Inc.
No. pages:
No. maps:
Attributes: Archaeological, Field study
Inventory size: 3.7 ac
Disclosure: Not for publication
Collections: No

General notes

Associated resources

No. resources: 0
Has informals: No

Location information

County(ies): Contra Costa
USGS quad(s): Richmond
Address:
PLSS:

Database record metadata

	Date	*User*	
Entered:	4/7/2005	nwic-main	
Last modified:	4/4/2016	paganob	
IC actions:	*Date*	*User*	*Action taken*
	4/7/2005	jay	Appended records from NWICmain bibliographic database.
Record status:	Verified		

Report Detail: S-033596

Via Verdi Slope Stabilization Project

Identifiers

Report No.:	S-033596	
Other IDs:	*Type*	*Name*
	Submitter	Contract No. W912C8-05-P-0052
	OHP PRN	USA070613A
Cross-refs:	See also S-049682	

Citation information

Author(s):	Mary L. Maniery and Cindy L. Baker
Year:	2007 (Jun)
Title:	Cultural Resource Inventory and Evaluation of United States Army Reserve 63D Regional Readiness Command Facilities; Contract No. W912C8-05-P-0052
Affiliation:	PAR Environmental Services, Inc.
No. pages:	
No. maps:	
Attributes:	Archaeological, Architectural/historical, Field study
Inventory size:	
Disclosure:	Not for publication
Collections:	No

Sub-desig.:	a
Author(s):	
Year:	2007 (Jun)
Title:	Cultural Resources Inventory and Evaluation of the United States Army Reserve Heroic War Dead USAR Center/Area Maintenance Support Activity 85 (G), Oakland, California; P-01-[010831], 63D Regional Readiness Command Facility CA036, Contract No. W912C8-05-P
Affiliation:	U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s):	Architectural/historical, Evaluation, Field study
Inventory size:	
No. pages:	
Disclosure:	Not for publication
Collections:	No
PDF Pages:	93-127

Sub-desig.:	b
Author(s):	
Year:	2007 (Jun)
Title:	Cultural Resources Inventory and Evaluation of the United States Army Reserve Oakland USAR Center #2, Oakland, California; P-01-01830, 63D Regional Readiness Command Facility CA-125, Contract No. W912C8-05-P-0052
Affiliation:	U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s):	Architectural/historical, Evaluation, Field study
Inventory size:	
No. pages:	
Disclosure:	Not for publication
Collections:	No
PDF Pages:	128-150

Sub-desig.: c
Author(s):
Year: 2007 (Jun)
Title: Cultural Resources Inventory and Evaluation of the United States Army Reserve PFC Bacciglieri Armed Forces Reserve Center, Concord, California; P-07-002752, 63 D Regional Readiness Command Facility CA007, Contract No. W912C8-P-0052
Affiliation: U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s): Architectural/historical, Evaluation, Field study
Inventory size:
No. pages:
Disclosure: Not for publication
Collections: No
PDF Pages: 151-176

Sub-desig.: d
Author(s):
Year: 2007 (Jun)
Title: Cultural Resources Inventory and Evaluation of the United States Army Reserve Col. Hunter Hall USAR Center, San Pablo, California; P-07-002753, 63D Regional Readiness Command Facility CA 070, Contract No. W912C8-05-P-0052
Affiliation: U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s): Architectural/historical, Evaluation, Field study
Inventory size:
No. pages:
Disclosure: Not for publication
Collections: No
PDF Pages: 177-198

Sub-desig.: e
Author(s):
Year: 2007 (Jun)
Title: Cultural Resources Inventory and Evaluation of the United States Army Reserve Fort Ord USAR Center, Marina, California; 63D Regional Readiness Command Facility CA012, Contract No. W912C8-05-P-0052
Affiliation: U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s): Architectural/historical, Evaluation, Field study
Inventory size:
No. pages:
Disclosure: Not for publication
Collections: No
PDF Pages: 199-209

Sub-desig.: f
Author(s):
Year: 2007 (Jun)
Title: Cultural Resources Inventory and Evaluation of the United States Army Reserve Moss Landing Local Training Area, Moss Landing, California; 63D Regional Readiness Command Facility CA189, Contract No. W912C8-05-P-0052
Affiliation: U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s): Architectural/historical, Evaluation, Field study
Inventory size:
No. pages:
Disclosure: Not for publication
Collections: No
PDF Pages: 210-220

Sub-desig.: g
Author(s):
Year: 2007 (Jun)
Title: Cultural Resources Inventory and Evaluation of the United States Army Reserve Jones Hall USAR Center, Mountain View, California; P-43-001836, 63D Regional Readiness Command Facility CA031, Contract No. W912C8-05-P-0052
Affiliation: U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s): Architectural/historical, Evaluation, Field study
Inventory size:
No. pages:
Disclosure: Not for publication
Collections: No
PDF Pages: 221-244

Sub-desig.: h
Author(s):
Year: 2007 (Jun)
Title: Cultural Resources Inventory and Evaluation of the United States Army Reserve Richey Hall USAR Center, San Jose, California; P-43-000728, 63D Regional Readiness Command Facility CA069, Contract No. W912C8-05-P-0052
Affiliation: U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s): Architectural/historical, Evaluation, Field study
Inventory size:
No. pages:
Disclosure: Not for publication
Collections: No
PDF Pages: 245-265

Sub-desig.: i
Author(s):
Year: 2007 (Jun)
Title: Cultural Resources Inventory and Evaluation of the United States Army Reserve Moffett USAR Center, Mountain View, California; P-43-001837, 63D Regional Readiness Command Facility CA120, Contract No. W912C8-05-P-0052
Affiliation: U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s): Architectural/historical, Evaluation, Field study
Inventory size:
No. pages:
Disclosure: Not for publication
Collections: No
PDF Pages: 266-297

Sub-desig.: j
Author(s):
Year: 2007 (Jun)
Title: Cultural Resources Inventory and Evaluation of the United States Army Reserve PFC Young USAR Center, Vallejo, California; P-[48-000752], 63D Regional Readiness Command Facility CA-090, Contract No. W912C8-05-P-0052
Affiliation: U.S. Army Reserve; PAR Environmental Services, Inc.
Report type(s): Architectural/historical, Evaluation, Field study
Inventory size:
No. pages:
Disclosure: Not for publication
Collections: No
PDF Pages: 298-343

Report Detail: S-033596

Via Verdi Slope Stabilization Project

Sub-desig.: k
Author(s): Milford Wayne Donaldson and James O. Anderson
Year: 2007 (Jun)
Title: USA070613A; Inventory and Evaluation of Historic Resources at 63D Regional Readiness Command, US Army Reserve Center in California
Affiliation: Office of Historic Preservation; US Army
Report type(s): OHP Correspondence
Inventory size:
No. pages:
Disclosure: Unrestricted
Collections: No
PDF Pages: 344-345

General notes

The project extends outside the NWIC service area (into Los Angeles, Orange, San Bernardino, San Diego, and Santa Barbara counties). Appendix A: Arizona and Appendix C: Nevada were not included in this copy of the report.

Associated resources

Primary No.	*Trinomial*	*Name*
P-01-001830	CA-ALA-000077H	Oakland USAR Center #2
P-01-001833	CA-ALA-000080	Voided: Copy of P-01-010831
P-01-010830		VOIDED, see P-01-001830
P-01-010831		Heroic War Dead USAR Center,
P-07-002752		PFC Baccigleiri AFRC
P-07-002753		Col. Hunter Hall USAR Center
P-43-000728		Army Reserve or National Guard
P-43-001836		Jones Hall, USAR Center
P-43-001837		Moffett USAR Center
P-48-000752		PFC Young USAR Center

No. resources: 10
Has informals: No

Location information

County(ies): Alameda, Contra Costa, Monterey, Other, Santa Clara, Solano
USGS quad(s): Cordelia, Marina, Moss Landing, Mountain View, Oakland West, Richmond, San Jose West, Walnut Creek
Address:
PLSS:

Database record metadata

	Date	*User*
Entered:	9/24/2007	guldenj
Last modified:	11/20/2018	moored

IC actions:	*Date*	*User*	*Action taken*
	4/8/2016	hagell	verified
	5/11/2016	paganob	added additional citation 'k'
	4/10/2017	hagell	edited notes
	5/4/2017	rinerg	Recode "Concurrence Correspondence" in additional citation title to Type=OHP Correspondence
	9/5/2017	raelync	Report verified; awaiting verification of 2 resources.
	11/7/2018	moored	No authors submitted for 'a' thru 'j' additional citations

Record status: Verified

Report Detail: S-049682

Via Verdi Slope Stabilization Project

Identifiers

Report No.: S-049682

Other IDs:

Type	*Name*
OHP PRN	USA_2017_0206_002

Cross-refs: See also S-033596

Citation information

Author(s):

Year:

Title: Colonel Hunter Hall, United States Army Reserve Center, Facility ID No. CA070

Affiliation:

No. pages:

No. maps:

Attributes: Archaeological, Architectural/historical, Field study

Inventory size:

Disclosure: Not for publication

Collections: No

Sub-desig.: a

Author(s): Julianne Polanco, Laura M. Caballero, and Susan K. Stratton

Year: 2017 (Feb)

Title: USA_2017_0206_002, Real Property Exchange of Hunter Hall Army Reserve Center, 2600 Castro Road, San Pablo, California

Affiliation: Office of Historic Preservation; Department of the Army

Report type(s): OHP Correspondence

Inventory size:

No. pages:

Disclosure: Unrestricted

Collections: No

PDF Pages: 9-16

General notes

Mapping Note: This report is mapped in the GIS in "approximate" because the reports says area surveyed was 2 acres, but the document map shows an area approximately 8 acres (JJS 09/24/18).

Associated resources

No. resources: 0

Has informals: No

Location information

County(ies): Contra Costa

USGS quad(s): Richmond

Address:

Address	*City*	*Assessor's parcel no.*	*Zip code*
2600 Castro Road	San Pablo		

PLSS:

Database record metadata

	Date	*User*
Entered:	1/3/2018	vickeryn
Last modified:	11/20/2018	moored

IC actions:

Date	*User*	*Action taken*
1/3/2018	vickeryn	No author, affliation or date was submitted for main report. Added additional citation "a".
11/20/2018	moored	Corrected other id, added additional citation authors and pdf page range.

Record status: Verified

Appendix D

Photo Log

CULTURAL RESOURCES PHOTOGRAPH RECORD

Project Name: Via Verdi Slope Stabilization Project
Project Number: 568.41.55

Date	Frame Number	Site / Iso Number	Feature Number	Description	View
11/5/2018	20181105_ProjectArea_01.JPG	-	-	Overview of eastern project area at south end looking towards San Pablo Creek	NE
11/5/2018	20181105_ProjectArea_02.JPG	-	-	Example of modern refuse throughout project area	NE
11/5/2018	20181105_ProjectArea_03.JPG	-	-	Overview of steeply sloped landscape of eastern project area	S
11/5/2018	20181105_ProjectArea_04.JPG	-	-	Overview of eastern project area at north end looking towards Mozart Drive	NE
11/13/2018	20181206_ProjectArea_05.JPG	-	-	Overview of densely vegetated steep slopes on north side of San Pablo Creek	SW
12/6/2018	20181206_ProjectArea_06.JPG	-	-	Overview of western project area at east end looking towards I-80	W
12/6/2018	20181206_ProjectArea_07.JPG	-	-	Overview of eastern project area at southeast end looking down steep slope to San Pablo Creek with dense vegetation	S
12/6/2018	20181206_ProjectArea_08.JPG	-	-	Overview of eastern project area at southeast end looking down steep slope to San Pablo Creek with dense vegetation	S
12/6/2018	20181206_ProjectArea_09.JPG	-	-	Looking up steep slope from San Pablo Creek	SW
12/6/2018	20181206_ProjectArea_10.JPG	-	-	Overview San Pablo Creek and dense vegetation	W
12/6/2018	20181206_ProjectArea_11.JPG	-	-	Overview of eastern project area at central location looking towards San Pablo Creek	SW
12/6/2018	20181206_ProjectArea_12.JPG	-	-	Overview of Via Verdi Drive from western end of project area	NE
4/17/2019	20181206_ProjectArea_13.JPG	-	-	Overview of project area from eastern reach at Mozart Drive intersection	W
4/17/2019	20181206_ProjectArea_14.JPG	-	-	Overview of project area from northeast boundary looking towards San Pablo Creek	SE
4/17/2019	20181206_ProjectArea_15.JPG	-	-	Overview of project area from northeast boundary looking towards San Pablo Creek	S
4/17/2019	20181206_ProjectArea_16.JPG	-	-	Overview of project area from northeast boundary looking towards El Portal Drive	SW
4/17/2019	20181206_ProjectArea_17.JPG	-	-	Overview of project area from north central boundary looking towards Mozart Drive	SE
4/17/2019	20181206_ProjectArea_18.JPG	-	-	Overview of project area from north central boundary looking towards San Pablo Creek	S
4/17/2019	20181206_ProjectArea_19.JPG	-	-	Overview of project area from north central boundary looking towards El Portal Drive	SW
4/17/2019	20181206_ProjectArea_20.JPG	-	-	Overview of project area from southwest boundary looking towards Via Verdi and San Pablo Creek	E
4/17/2019	20181206_ProjectArea_21.JPG	-	-	Overview of project area from northwest boundary looking towards El Portal Drive	SE
4/17/2019	20181206_ProjectArea_22.JPG	-	-	Overview of project area from northwest boundary looking towards Via Verdi and San Pablo Creek	SE
4/17/2019	20181206_ProjectArea_23.JPG	-	-	Overview of project area from west boundary along Via Verdi looking towards San Pablo Creek and Mozart Drive	E
4/17/2019	20181206_ProjectArea_24.JPG	-	-	Overview of project area from west boundary along Via Verdi looking towards I-80	NW
11/5/2018	20181105_RheemMit_01.JPG	-	-	Overview of Rheem Creek mitigation area from south end looking west	NW
11/5/2018	20181105_RheemMit_02.JPG	-	-	Evidence of modern debris in creek channel: dumped vacuum cleaner	SW
11/5/2018	20181105_RheemMit_03.JPG	-	-	Evidence of modern debris next to creek channel: modern open topped glass container	-
11/5/2018	20181105_RheemMit_04.JPG	-	-	Overview of Rheem Creek mitigation area on south bank looking east	SE
4/17/2019	20181105_RheemMit_05.JPG	-	-	Overview of Rheem Creek mitigation area on south bank looking west	NW
4/17/2019	20181105_RheemMit_06.JPG	-	-	Overview of Rheem Creek mitigation area on south bank looking towards the north bank	N
4/17/2019	20181105_RheemMit_07.JPG	-	-	Overview of Rheem Creek mitigation area on south bank looking east with present landscaping	SE
4/17/2019	20181105_RheemMit_08.JPG	-	-	Overview of Rheem Creek mitigation area on south bank looking west with present landscaping	NW
4/17/2019	20181105_RheemMit_09.JPG	-	-	Overview of Rheem Creek mitigation area on north bank looking west	NW
4/17/2019	20181105_RheemMit_10.JPG	-	-	Overview of Rheem Creek mitigation area on north bank looking west towards culvert	NW
4/17/2019	20181105_RheemMit_11.JPG	-	-	Overview of Rheem Creek mitigation area on north bank looking east from culvert	SE

CULTURAL RESOURCES PHOTOGRAPH RECORD

Project Name: Via Verdi Slope Stabilization Project
Project Number: 568.41.55

Date	Frame Number	Site / Iso Number	Feature Number	Description	View
4/17/2019	20181105_RheemMit_12.JPG	-	-	Overview of Rheem Creek mitigation area on north bank looking east towards culvert	SE
4/17/2019	20181105_RheemMit_13.JPG	-	-	Overview of Rheem Creek mitigation area on north bank looking west from culvert	NW
4/17/2019	20181105_RheemMit_14.JPG	-	-	Overview of Rheem Creek mitigation area on north bank from northern reach	SE
4/17/2019	20181105_RheemMit_15.JPG	-	-	Overview of Rheem Creek mitigation area on north bank from northern reach	SE
4/17/2019	20181105_RheemMit_16.JPG	-	-	Overview of Rheem Creek mitigation area on north bank from northern reach	SE


20181105_ProjectArea_01.JPG

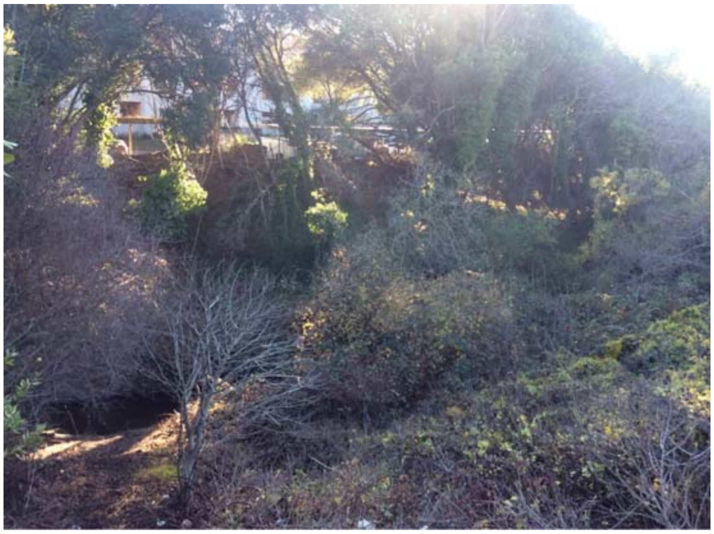

20181105_ProjectArea_02.JPG


20181105_ProjectArea_03.JPG


20181105_ProjectArea_04.JPG


20181113_ProjectArea_05.JPG


20181113_ProjectArea_06.JPG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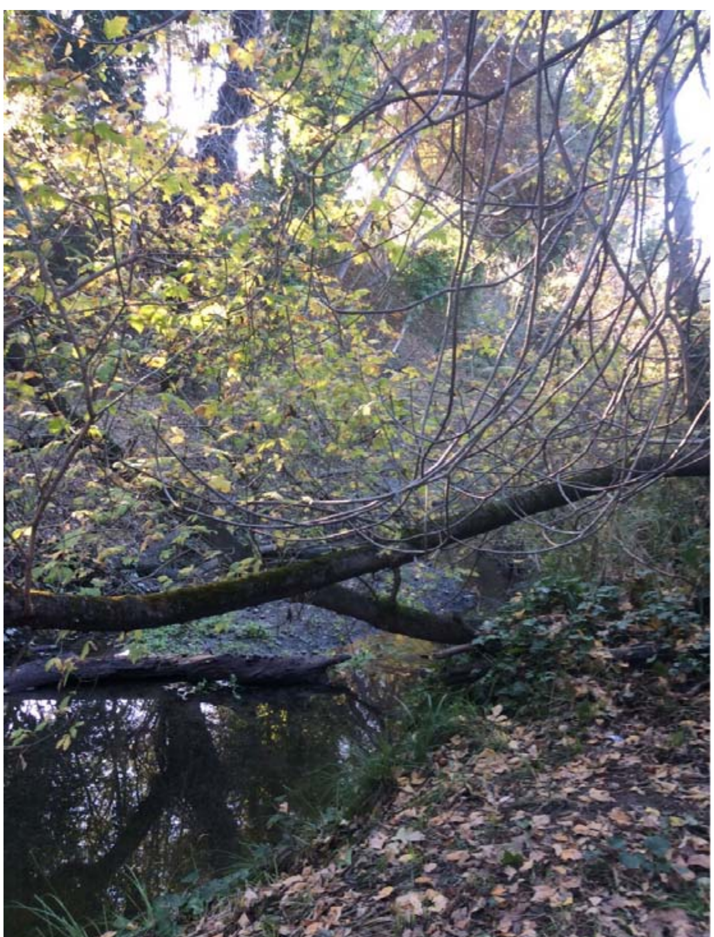
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20181105_RheemMit_01.JPG


20181105_RheemMit_02.JPG

20181105_RheemMit_03.JPG


20181105_RheemMit_04.JPG


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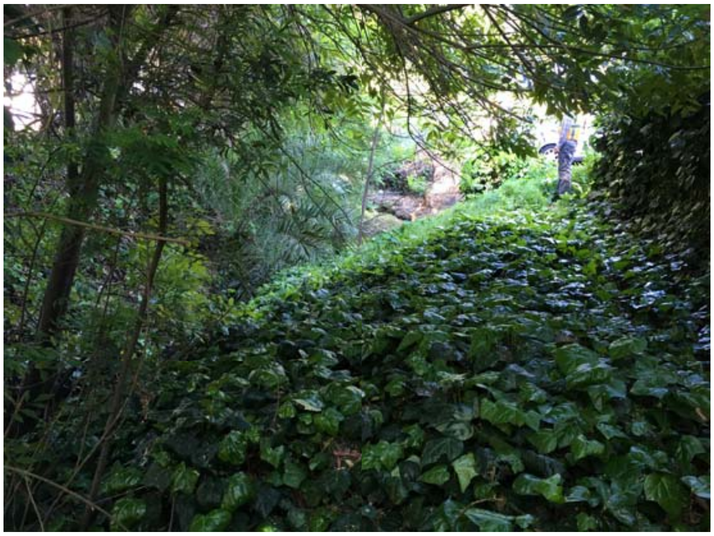
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20190417_RheemMit_13.JPG


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20190417_RheemMit_15.JPG


20190417_RheemMit_16.JPG