APPENDIX F

Subsurface Geoarchaeological Testing Report

Subsurface Geoarchaeological Testing for the Caltrain Guadalupe River Bridge Replacement Project, San Jose, California

By:
Philip Kaijankoski

May 2020 FINAL

Prepared for:
Peninsula Corridor
Joint Powers Board
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San Carlos, CA 94070

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SUMMARY OF FINDINGS

The Caltrain Guadalupe River Bridge Replacement Project will require localized deep impacts from bridge foundation construction. While no previously recorded archaeological sites are within or adjacent to the project area, it was considered sensitive for buried prehistoric sites due to the youthful age of surface sediments and proximity to the Guadalupe River where many such sites are located. For these reasons, subsurface archaeological testing was conducted in advance of project construction. Testing consisted of drilling hydraulic continuous cores adjacent to proposed project deep impacts. All cores were drilled to depths sufficient to reach a landform too old to harbor archaeology. Select samples from the cores were processed to test for the presence of archaeological materials with negative results. Based on these findings, the area tested does not contain a prehistoric archaeological site and no further prehistoric archaeological identification efforts are recommend for the project as currently designed.

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INTRODUCTION

The Peninsula Corridor Joint Powers Board (JPB) proposes to replace the MT-1 railroad bridge and extend the MT-2 railroad bridge over the Guadalupe River in the City of San Jose, Santa Clara County, California (Figure 1). Constructed in 1935, the MT-1 Bridge is in deteriorating structural condition, exacerbated by repeated bank failure events at the abutments and a fire on the bridge in November 2017. The adjacent MT-2 Bridge will not be replaced, but will be lengthened on the south side to help address geomorphic stability issues at the bridge abutments.

The nature of the proposed project activities requires compliance with: (1) Section 106 of the National Historic Preservation Act of 1966 (NHPA; 36 CFR 800, revised); and, (2) the California Environmental Quality Act (CEQA; Public Resources Code, Section 21000 et seq., revised 2009), both of which mandate public agencies to consider the effects of projects on historical (including archaeological) resources. This study was conducted by Far Western Anthropological Research Group, Inc., (Far Western) on behalf of WSP USA Solutions, Inc. for the Federal Transit Administration and the JPB, the federal and state lead agencies, respectively.

The project is situated on the floodplain of the Guadalupe River which, based on archaeological modeling and from previous nearby investigations, is considered to be highly sensitive for buried Native American archaeology sites. As project construction will involve substantial deep impacts, subsurface geoarchaeological testing was conducted in advance of project construction to identify any archaeological sites that may be present. Due to access constraints and potential for archaeological deposits at considerable depth, subsurface testing was conducted by drilling a series of hydraulic continuous cores within or immediately adjacent to proposed locations of project deep impacts followed by laboratory analysis. No archaeological materials were identified by this investigation. This report documents the methods and results of subsurface testing within the Study Area. Relevant environmental background information is presented in Appendix A.

PROJECT DESCRIPTION

The following project description is based on 35 percent design plans as shown in Figure 2. The existing 57-meter (187-foot) MT-1 Bridge will be replaced by an 80.8-meter (265-foot) pre-cast concrete structure. The center span over the main channel will be 33.5 meters (110 feet) in length. The bridge piers will consist of two 1.2-meter (4-foot) diameter cast-in-drilled-hole piles. Channel widening will occur under the south side of the MT-1 Bridge to reduce scour/increase flow capacity.

The existing MT-2 Bridge will be extended by 27.4 meters (90 feet) at the southern end, resulting in a new total bridge length of 74.5 meters (244.5 feet). In order to accommodate this extension, the existing MT-2 abutment #5 would be removed and replaced by a new pier and the channel widened. The existing northern abutment #1, and piers #2, #3, and #4 would remain in place. The proposed project also includes the relocation of existing fiber optic lines on the MT-1 Bridge by horizontal direction drilling below the Guadalupe River.

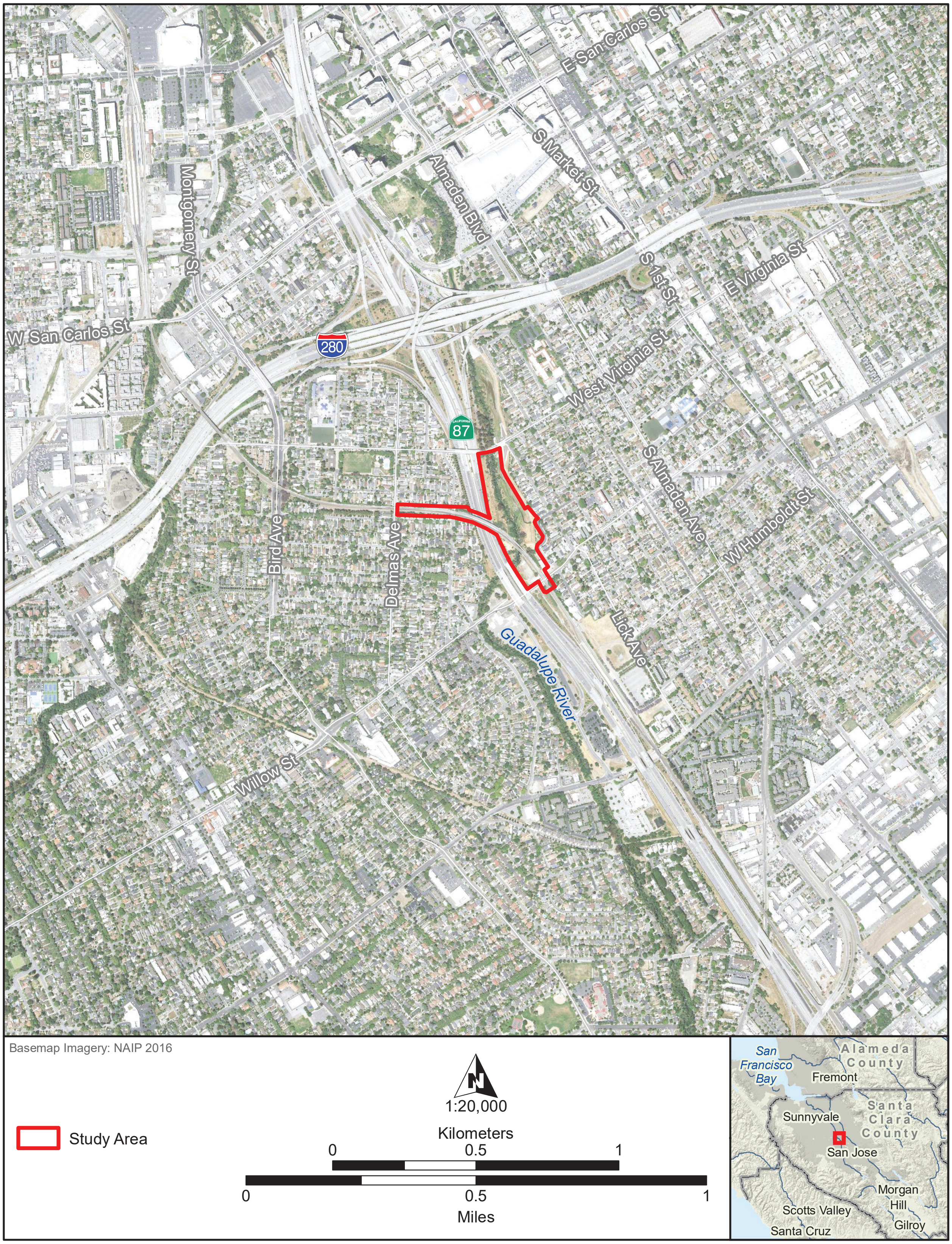
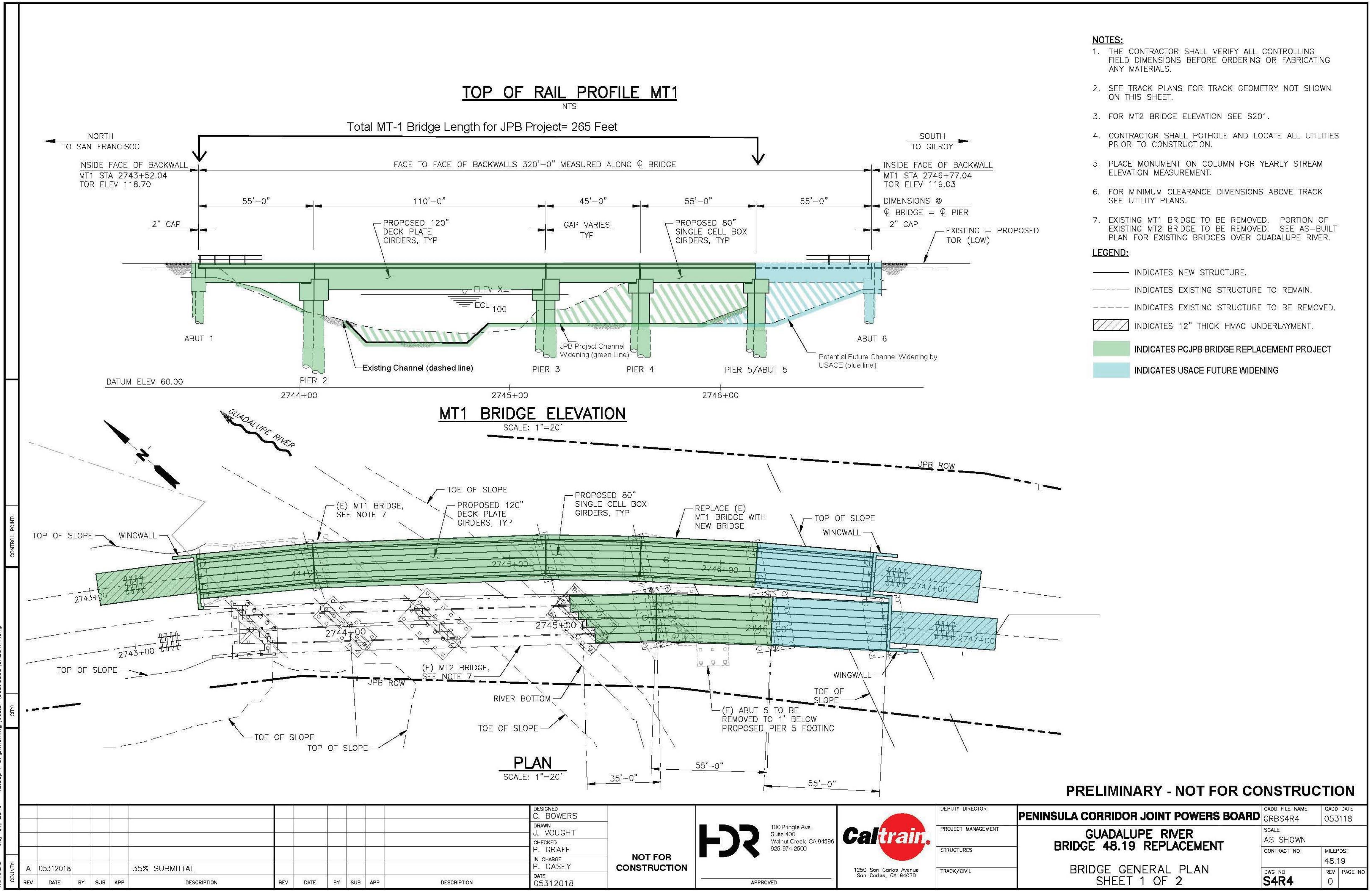


Figure 1. Project Location.



NOTES:

1. THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIALS.
2. SEE TRACK PLANS FOR TRACK GEOMETRY NOT SHOWN ON THIS SHEET.
3. FOR MT2 BRIDGE ELEVATION SEE S201.
4. CONTRACTOR SHALL POTHOLE AND LOCATE ALL UTILITIES PRIOR TO CONSTRUCTION.
5. PLACE MONUMENT ON COLUMN FOR YEARLY STREAM ELEVATION MEASUREMENT.
6. FOR MINIMUM CLEARANCE DIMENSIONS ABOVE TRACK SEE UTILITY PLANS.
7. EXISTING MT1 BRIDGE TO BE REMOVED. PORTION OF EXISTING MT2 BRIDGE TO BE REMOVED. SEE AS-BUILT PLAN FOR EXISTING BRIDGES OVER GUADALUPE RIVER.

LEGEND:

- ——— INDICATES NEW STRUCTURE.
- —·—·— INDICATES EXISTING STRUCTURE TO REMAIN.
- – – – INDICATES EXISTING STRUCTURE TO BE REMOVED.
- ▨ INDICATES 12" THICK HMAC UNDERLAYMENT.
- 🟩 INDICATES PCJPB BRIDGE REPLACEMENT PROJECT
- 🟦 INDICATES USACE FUTURE WIDENING

REV	DATE	BY	SUB	APP	DESCRIPTION
A	05312018				35% SUBMITTAL

DESIGNED C. BOWERS
DRAWN J. VOUGHT
CHECKED P. GRAFF
IN CHARGE P. CASEY
DATE 05312018

NOT FOR CONSTRUCTION

HDR
100 Pringle Ave.
Suite 400
Walnut Creek, CA 94596
925-974-2500
APPROVED

Caltrain
1250 San Carlos Avenue
San Carlos, CA 94070

DEPUTY DIRECTOR
PROJECT MANAGEMENT
STRUCTURES
TRACK/CIVIL

PENINSULA CORRIDOR JOINT POWERS BOARD
GUADALUPE RIVER
BRIDGE 48.19 REPLACEMENT
BRIDGE GENERAL PLAN
SHEET 1 OF 2

CADD FILE NAME GRBS4R4
CADD DATE 053118
SCALE AS SHOWN
CONTRACT NO
MILEPOST 48.19
DWG NO S4R4
REV 0
PAGE NO

Figure 2. Project 35 Percent Design Plans (1 of 2).

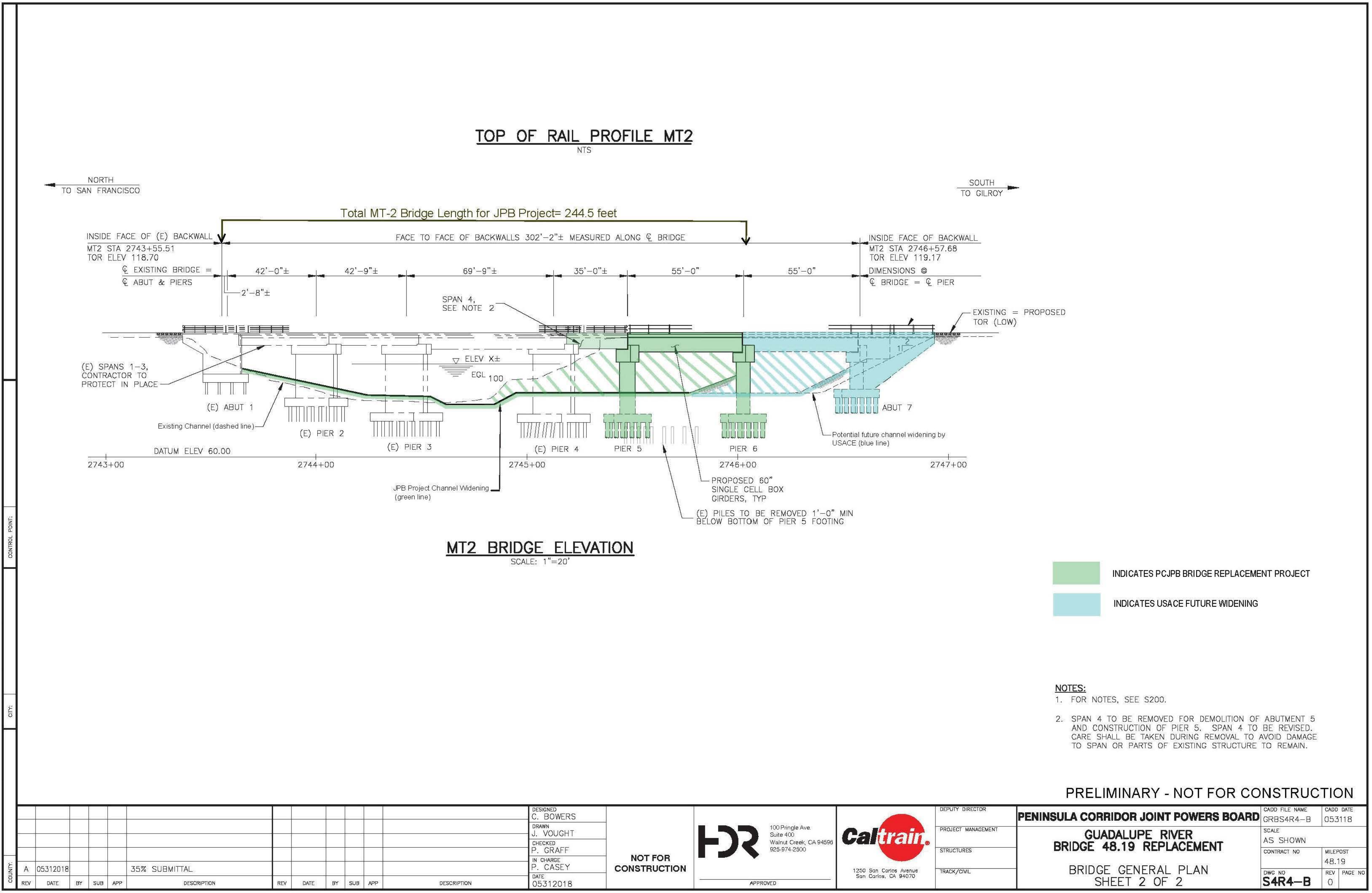


Figure 2. Project 35 Percent Design Plans (2 of 2).

FIELD METHODS

The objective of this investigation was to test for the presence or absence of deeply buried archaeological sites within or adjacent to the area of project deep impacts. Due to limited access and the significant depths below surface that needed to be reached, subsurface testing was conducted with a hydraulic coring device. Cores were drilled at close intervals immediately adjacent to where localized deep impacts are planned for bridge foundation construction and can therefore reliably determine the presence or absence of buried prehistoric archaeological sites in the three-dimensional project area.

PREFIELD WORK

Prefield activities included obtaining a permit for coring from the Santa Clara Valley Water District and encroachment permits from the California Department of Transportation (Caltrans) and the Santa Clara Valley Water District. A site visit was made to review and mark out core locations. Lastly, an Underground Service Alert was initiated in advance of fieldwork to check for underground utilities in or near the proposed test areas.

EXPLORATORY CORING

From January 13 to 15, 2020, a hydraulic coring device (known commercially as a Geoprobe 8040) was used to extract six continuous cores (Figure 3). Two cores were drilled in the northwest, northeast and southeast quadrants of the bridge (Figure 4); cores were not drilled in the southwest quadrant as no deep impacts are planned in this location; cores were numbered sequentially in the order they were recovered and their locations recorded in the field with a Global Positioning System (GPS) unit. Cores were drilled to depths ranging from 7.0 to 17.7 meters (23 to 58 feet) (Table 1). The samples from subsurface deposits were recovered and stored in hard plastic (PVC) liners that were 1.5 meters (five feet) long, and 7.6 centimeters (3 inches) in diameter. Each liner was placed in a dual-walled push tube that was hydraulically driven to the appropriate depth to capture a continuous core sample for the desired interval. The liners were then extracted from the push tube and labeled to indicate their location, depth interval, and orientation (i.e., top or bottom).

Table 1. Core Summary.

CORE	MAXIMUM DEPTH		SAMPLES PROCESSED
	METERS	FEET	
1	17.7	58	Wet-screened modern surface (A horizon) 0.0-0.8 meters (0.0-2.5 feet), buried wetland soil (3Ag horizon) 3.4-3.5 meters (11.0-11.5 feet), and deeply buried wetland soil (5Ag horizon) 8.2-8.8 meters (27.0-29.0 feet).
2	12.8	42	Wet-screened weakly developed modern surface (AC horizon) 0.0-0.8 meters (0.0-2.5 feet), weakly developed buried soil (4AC horizon) 3.4-3.5 meters (11.0-11.5 feet), and deeply buried wetland soil (6Ag horizon) 8.4-8.5 meters (27.5-28.0 feet). Flotation processed ephemeral buried soil (2Ab horizon) 0.8-0.9 meters (2.5-3.0 feet).
3	17.4	57	Wet-screened disturbed natural deposits (Ap horizon) 0.0-1.5 meters (0.0-5.0 feet), intact surface soil (A horizon) 1.5-2.4 meters (5.0-8.0 feet), and buried wetland soil (3Ag horizon) 4.3-5.2 meters (14.0-17.0 feet). Flotation processed deeply buried terrestrial soil (7Ab horizon) 15.7-16.0 meters (51.5-52.5 feet).
4	14	46	Wet-screened disturbed natural deposits (Ap horizon) 0.0-1.8 meters (0.0-6.0 feet) and buried wetland soil (4Ag horizon) 7.9-8.5 meters (26.0-28.0 feet).
5	17.4	57	Wet-screened modern surface (A horizon) 0.0-0.9 meters (0.0-3.0 feet), buried soil (3Ab horizon) 4.4-5.0 meters (14.5-16.5 feet), and a portion of deeply buried marsh deposit (3Cg horizon) 9.4-9.8 meters (31.0-32.0 feet). Flotation processed buried soil (2Ab horizon) 1.7-2.4 meters (5.5-8.0 feet).
6	7	23	Wet-screened weakly developed modern surface (AC horizon) 0.6-2.1 meters (2.0-7.0 feet), buried soil (2Ab horizon) 2.1-2.4 meters (7.0-8.0 feet), and buried soil (3Ab horizon) 4.0-4.4 meters (13.0-14.5 feet).

Drilling Core 2, view to the north.

Drilling Core 6, view to the south.

Figure 3. Coring Photos.

Figure 4. Core Locations.

All cores were transported to the Far Western lab, where they were opened, described, photographed, and subsampled. All cores were compared to determine the nature and variability of the underlying stratigraphy. To assess whether the deposits contained any identifiable archaeological materials, all buried soils, in addition to selected disturbed and marsh deposits, were flotation processed or wet-screened through 1/16-inch mesh and sorted for archaeological materials (see Table 1). Although relatively small, the core samples can reliably determine the: (1) presence or absence of potential archaeological materials; and (2) nature and extent of subsurface deposits. Detailed core descriptions are provided in Appendix B.

Stratigraphic Identification and Soil Description

Natural and/or cultural stratigraphy was identified whenever possible by carefully examining the deposits exposed in the cores. Stratigraphic units (strata) were identified on the basis of physical composition, superposition, relative soil development, and/or textural transitions (i.e., upward-fining sequences) characteristic of discrete depositional cycles. Each stratum exposed in a core was assigned a Roman numeral beginning with the oldest or lowermost stratum and ending with the youngest or uppermost stratum. Buried soils (also called paleosols), representing formerly stable terrestrial ground surfaces, were identified based on color, structure, horizon development, bioturbation, lateral continuity, and the nature of the upper boundary (contact) with the overlying deposit, as described by Birkeland et al. (1991), Holliday (1990), Retallack (1988), and Waters (1992), among others.

Master horizons describe in-place weathering characteristics and are designated by upper-case letters. These are sometimes preceded by Arabic numerals when the horizon is associated with a different stratum (i.e., 2Cu); Number 1 is understood but not shown. The upper part of a complete soil profile is usually called the A horizon, with a B horizon being the zone of accumulation in the middle of a profile, and the C horizon representing the relatively unweathered parent material in the lower part of a profile. Lower-case letters are used to designate subordinate soil horizons (Table 2).

Table 2. Key for Subordinate Soil Horizons.

SUBORDINATE HORIZONS	DESCRIPTION
p	Disturbed zone (e.g., artificial fill or plow zone).
g	Gleying from reduction or removal of iron.
ox	Oxidized iron and other materials (subsurface).
k	Enriched with pedogenic calcium carbonate

Combinations of these numbers and letters indicate the important characteristics of each major stratum and soil horizon; they are consistent with those outlined by Birkeland et al. (1991), Schoeneberger et al. (2012), and the USDA Soil Survey Staff (2014). Due to the different processes involved in each landform's formation, any one core may contain only a portion of the representative stratigraphy for an area. For this reason, after analyzing all strata identified in each core, strata of the same geologic origin (e.g.; wetland, river channel, etc.) were grouped into larger geologic units for the purposes of discussion. These units were designated with an Arabic numeral (1, 2, 3 etc.), beginning with the oldest unit identified and listed in Appendix B.

Radiocarbon Samples and Dating

Four samples of Non-cultural organic sediment were selected from Core 3 for radiocarbon analysis. The selection and submission of these samples were based on a careful consideration of the stratigraphy, with the goal of constraining the age of the larger geologic units underlying the Study Area. These samples were submitted to Direct Accelerator Mass Spectrometer in Bothell, Washington, and valid dates were obtained on each sample using the Accelerator Mass Spectrometer (AMS) method. The dating methods and results are provided in Appendix C and Table 3. A high-precision calibration program known as CALIB ver. 7.0.4 was used to convert conventional 14C ages into calibrated years according to Reimer et al. (2013). Unless otherwise indicated, the radiocarbon results are reported as the calculated median probability before present (Telford et al. 2004). By convention, zero years before present (0 BP) equals 1950 AD.

Table 3. Radiocarbon Dating Results from Organic Sediment in Core 3.

SOIL HORIZON	DEPTH IN METERS (FEET)	CONVENTIONAL RADIOCARBON AGE BP	AGE CAL BP (MEDIAN PROBABILITY)	AGE RANGE CAL BP (2-SIGMA)	LABORATORY NO.
3Ag (top)	4.3 (14)	1996±34	1945	2005-1875	D-AMS 037486
3Ag (bottom)	5.2 (17)	4367±35	4930	5040-4855	D-AMS 037487
4Ag (top)	7.5 (24.5)	9338±44	10,555	10,680-10,420	D-AMS 037488
7Ab (top)	15.7 (51.5)	27,376±114	31,240	31,430-31,050	D-AMS 037489

Note: BP - Before Present; conventional radiocarbon age provided by the lab; cal BP - calibrated years before present; calibrated dates rounded to the nearest 5.

RESULTS

No prehistoric archaeological materials were identified as a result of the exploratory coring. The stratigraphic findings are summarized below, followed by a discussion of landscape evolution of the Guadalupe River floodplain.

STRATIGRAPHIC FINDINGS

Six distinct geologic units underlie the Study Area and are described in detail below from oldest/deepest to youngest. These consist of: Lower Pleistocene Alluvium (Geologic Unit 1); River Channel (Geologic Unit 2); Upper Pleistocene Alluvium (Geologic Unit 3); Freshwater Wetland (Geologic Unit 4); Alluvial Basin (Geologic Unit 5); and Alluvial Floodplain (Geologic Unit 6). Artificial fill was not observed and shallow surficial disturbance was only noted in two cores. The presence/absence and depth of these units in each fore is summarized in Table 4.

Table 4. Summary of Geologic Units Identified in Cores in Meters (Feet).

CORE	STUDY AREA GEOLOGIC UNITS					
	6. ALLUVIAL FLOODPLAIN	5. ALLUVIAL BASIN	4. FRESHWATER WETLAND	3. UPPER PLEISTOCENE ALLUVIUM	2. RIVER CHANNEL	1. LOWER PLEISTOCENE ALLUVIUM
1	0-1.8 (0-6)	1.8-6.2 (6-20.5)	6.2-10.2 (20.5-33.5)	10.2-11.6 (33.5-38)	11.6-16.2 (38-53)	16.2-17.7 (53-58)
2	0-1.5 (0-5)	1.5-6.1 (5-20)	6.1-10.8 (20-35.5)	-	10.8-12.8 (35.5-42)	-
3	0-4.3 (0-14)	-	4.3-8.5 (14-28)	8.5-12.2 (28-40)	12.2-15.7 (40-51.5)	15.7-17.4 (51.5-57)
4	1.8-5.5 (6-18)	-	5.5-10.1 (18-33)	10.1-12.5 (33-41)	12.5-14.0 (41-46)	-
5	0-2.4 (0-8)	2.4-5.0 (8-16.5)	5.0-10.1 (16.5-33)	10.1-12.5 (33-41)	12.5-17.4 (41-57)	-
6	0.6-2.4 (2-8)	4.0-5.8 (13-19)	5.8-7.0 (19-23)	-	-	

Note: No sample recovered from 2.4-4.0 meters (8-13 feet) in Core 6; Surficial disturbance observed in Core 4 from 0-1.8 meters (0-6 feet) and Core 6 from 0-0.6 meters (0-2 feet).

Geologic Unit 1—Lower Pleistocene Alluvium

Geologic Unit 1 consists of a single stratum of alluvium identified at the base of two cores (see Table 1). In Core 3 it exhibited a buried surface horizon (7Ab horizon, Figure 5) of black fine-grained alluvium that graded to alluvial parent material enriched in calcium carbonate (7Ck horizon, Figure 5) However, in Core 1 this geologic unit was devoid of a buried surface horizon and consisted only of alluvial parent material enriched in calcium carbonate. A sample of organic sediment from the top of the 7Ab horizon in Core 3 returned a radiocarbon date of 31,240 cal BP (see Table 3; Figure 5). Therefore this soil represents a period of landform stability during the Late Pleistocene that was buried by a river channel (Geologic Unit 2 described below) around 30,000 years ago. While the buried soil (7Ab horizon) in Core 3 was processed for archaeological materials, the subsequent radiocarbon dating results indicated that this unit is far too old to harbor cultural deposits.

Geologic Unit 2—River Channel

Geologic Unit 2 consists of a laterally extensive single stratum of loose waterworn gravels and sand deposited within an active fluvial (i.e.; river or stream) channel (see 6C horizon Figure 5). It was identified in all cores at depths ranging from 10.8 to 17.4 meters (35.5 to 57 feet) below surface with the exception of Core 6 that encountered refusal above these depths. As this unit does not represent a stable terrestrial landform, it was not selected for processing to search for archaeological materials. Furthermore, radiocarbon dating of underlying and overlying geologic units indicate this river channel was active during the Late Pleistocene and is too old to contain archaeological materials.

Geological Unit 3—Upper Pleistocene Alluvium

Geologic Unit 3 consists of a single stratum of oxidized alluvial parent material devoid of a surface horizon (see 5Cox horizon Figure 5). It was identified in most cores at depths ranging from 8.5 to 12.5 meters (28 to 41 feet) below surface. The oxidized nature of this unit indicates it was deposited in a terrestrial environment, although given the lack of surface (A) horizon development it was not processed for archaeological materials. Radiocarbon dates from below and above this unit indicates that it was deposited during the terminal Pleistocene and therefore it has a low potential to harbor archaeological deposits.

Geological Unit 4—Freshwater Wetland

Geologic Unit 4 consists of multiple strata of soft fine-grained wetland deposits including black, organic-rich, marsh surfaces and gleyed (minerals in their reduced state due to deposition underwater in anoxic environment) aquatic sediments (see 3Ag/3Cg/4Ag/4ACg Figure 5). This geologic unit was identified in every core at depths ranging from 4.3 to 10.8 meters (14 to 33.5 feet) below surface. Prominent marsh surfaces were selected from several cores for wet screening for archaeological materials with negative results. Three radiocarbon dates were acquired from this geologic unit in Core 3 (Table 3; Figure 5). A date of 10,555 cal BP from a marsh surface near the base of this unit (4Ag horizon) indicates this wetland began to form at the onset of the Holocene. Above this, samples from the bottom and top of a thick stratified marsh surface horizon (3Ag horizon) returned dates of 4930 and 1945 cal BP, respectively. Collectively, this indicates that this wetland environment persisted in the Study Area for approximately 9000 years and spanned much of the Holocene. While this wetland and the resources within it would have been attractive to Native Americans in the vicinity, archaeological deposits are unlikely to be present due to the aquatic nature of this geologic unit.

Geological Unit 5—Alluvial Basin

Geologic Unit 5 consists of multiple strata of variable firm, fine-grained (clay) alluvium devoid of gravels with sporadic ephemeral soil development. The common presence of oxidization, calcium carbonate, and root holes demonstrates that this was a terrestrial landform distinct from the underlying wetland (Geologic Unit 4). The nature of this unit indicates that it is an alluvial basin characterized by fine-grained, low energy deposition far from an active river channel, which are common geomorphic features in central California floodplains. Geologic Unit 5 was only observed in four cores at consistent depths of 1.5 to 6.2 meters (5 to 20.5 feet) below surface. Given that it was limited in extent suggests that it was a transitional feature between the underlying wetland and overlying floodplain (Geologic Unit 6 described below). Radiocarbon dates underlying this unit indicate it was deposited after 1900 cal BP and therefore could harbor archaeological materials. However, weakly developed surface (A) soil horizons were sampled and processed in all four cores with negative results.

Geological Unit 6—Alluvial Floodplain

Geologic Unit 6 consists of variable brown loam with weakly developed surface and buried soils (see Ap/A/C/2Cg horizons Figure 5). It was distinguished from underlying Unit 5 primarily by coarser texture and friable consistency. It was identified at the surface of each core extending to depths of 1.5 to 5.5 meters (5 to 18 feet). As with Unit 5, radiocarbon dates directly below this unit indicate it was deposited after 1900 cal BP, and therefore could harbor archaeological materials. Furthermore, recent excavations by the author at site SCL-690, Tamien Station, 0.5 kilometers (0.3 miles) south of the Study Area (reporting in

Note: Red numbers = radiocarbon dates (cal BP, median probability), white numbers/letters = soil horizons.

Study Area Geologic Units represented by the following soil horizons:

Unit 1 - Lower Pleistocene Alluvium (7Ab/7Ck)
Unit 2 - River Channel (6C)
Unit 3 - Upper Pleistocene Alluvium (5Cox)
Unit 4 - Freshwater Wetland (3Ag/3Cg1/3Cg2/3Cg3/4Ag/4ACg)
Unit 5 - Alluvial Basin (Absent in Core 3)
Unit 6 - Alluvial Floodplain (Ap/A/C/2Cg)

Figure 5. Core 3 Stratigraphy, Soil Horizons, and Radiocarbon Dates.

progress) identified that site as associated with a similar surface stratum as Unit 6 in the Study Area. Therefore, this unit had the greatest potential to harbor archaeological materials; however, none were identified despite processing disturbed surface layers, intact surface soils, and/or buried soils from Unit 6 in each core.

PALEOENVIRONMENTAL RECONSTRUCTION

Stratigraphic and radiocarbon findings from this investigation indicate that Late Pleistocene age deposits (Geologic Units 1-3) too old to harbor archaeological materials underlie the Study area at depths below approximately 12.5 meters (33 feet). Furthermore, the vast majority of the Holocene (11,700 years ago to present) is represented by a freshwater wetland (Geologic Unit 4) that formed at the onset of the Holocene and persisted until about 1,900 years ago. After this time alluvial deposition by the Guadalupe River transitioned the landform of the Study Area to a terrestrial environment first by formation of an alluvial basin (Geologic Unit 5), and then a coarse-grained floodplain (Geologic Unit 6). Given this, it is probable that the freshwater marsh shown on the historical ecology map (see Appendix A) was previously much larger in extent and reduced in size by Late Holocene alluvial deposition. Lastly, as Units 5 and 6 are the only terrestrial Holocene age landforms underlying the Study Area, they are the only units that would be suspected to harbor archaeological deposits although none were identified during this investigation.

SUMMARY AND RECOMMENDATIONS

Archaeological testing was conducted for the Caltrain Guadalupe River Bridge Replacement Project as it was considered by archaeological modeling and from previous nearby investigations to be highly sensitive for prehistoric archaeological resources. Identification efforts including drilling six cores within or adjacent to the proposed area of deep impacts. Cores were drilled to depths of 7.0 to 17.7 meters (23 to 58 feet) in order to reach a landform too old to harbor archaeological materials. Select samples from the cores (e.g., buried soils) were wet screened and/or flotation processed to test for the presence of prehistoric archaeological materials with negative results. Based on these findings, the area tested does not contain a prehistoric archaeological site and no further prehistoric archaeological identification efforts are recommend for the project as currently designed.

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APPENDIX A
ENVIRONMENTAL BACKGROUND

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ENVIRONMENTAL BACKGROUND

The following summarizes background information relevant for this geoarchaeological investigation including paleoenvironmental reconstruction, a discussion of deeply buried archaeological sites in the Santa Clara Valley, followed by a buried site sensitivity assessment of the Study Area.

PALEOENVIRONMENTAL RECONSTRUCTION (WITH JACK MEYER)

The Study Area is located in the Northern Santa Clara Valley, approximately 12 kilometers (7.5 miles) south of the historic margin of the San Francisco Bay. Specifically it is situated on the generally level alluvial floodplain of the Guadalupe River at an elevation of 33.5 meters (110 feet). The Bay Area has undergone a series of significant large-scale environmental changes since the Late Pleistocene when people first colonized the region. These changes included rising sea levels, widespread sediment deposition, and corresponding fluctuations in the distribution and availability of important natural resources.

During the last glacial maximum some 22,000 years ago, vast ice sheets covered the northern part of the continent, and the climate in central California was considerably cooler than at any time since. Worldwide sea levels were at least 100 meters (325 feet) lower than today, and the California coastline was located some 25 to 50 kilometers (16 to 31 miles) west of its current position (Atwater et al. 1977; Bard et al. 1996; Helley et al. 1979). At that time, the combined runoff from the Sacramento and San Joaquin Rivers merged to form the "California River" (Howard 1979), which passed through the Carquinez Straits and into the "Franciscan Valley" (Axelrod 1981), now occupied by San Francisco Bay. Smaller streams and rivers draining the South Bay also joined this massive drainage as it flowed west through the Golden Gate and across the continental shelf, where it eventually emptied into the Pacific Ocean near the modern-day Farallon Islands (Atwater et al. 1977; Axelrod 1981). Thus, instead of a "bay," there was a broad inland valley that supported grassland and riparian plant and animal communities.

As the continental ice sheets began to melt about 16,000 years ago, the world's oceans rose rapidly, causing the Pacific shoreline to migrate eastward. For instance, between 13,500 and 11,000 calibrated years before present (cal BP), sea levels rose about 40 meters (131 feet), at an astounding average rate of about 16 meters (52 feet) every 1,000 years (Bard et al. 1996). This dating coincides with the earliest known evidence for human occupation in the region. The sea continued to rise at an average rate of about 6.7 meters (22 feet) per 1,000 years between 11,000 and 9000 cal BP, submerging much of the continental shelf. Over the next 2,000 years (9000–7000 cal BP), sea level rose about 10 meters (33 feet) at a more modest rate of roughly five meters (16 feet) per 1,000 years. Thus, there was a cumulative ~70-meter (~230-foot) rise in sea level during the Latest Pleistocene and Early Holocene. As the waters rose, freshwater marshes began to form, and sediments carried by the California River accumulated on the floor of the Franciscan Valley, marking the transition from valley to bay.

Between 7000 and 6000 cal BP, there was a dramatic decrease in the rate of sea-level rise worldwide (Stanley and Warne 1994). During this time, the sea inundated the Franciscan Valley at a more gradual rate of about 1.3 meters (4.3 feet) every 1,000 years, for a total of 8.0 meters (26 feet) over the past 6,000 years. This allowed sedimentation to keep pace with inundation, which permitted the formation of extensive tidal-marsh deposits during the Middle Holocene (Atwater et al. 1979). As base levels rose, the lower reaches of the stream and river channels became choked with sediments that spilled onto the surface of existing fans and floodplains, forming large alluvial floodplains (Helley et al. 1979). As a result, bay and marsh deposits now cover many formerly stable Holocene-age land surfaces documented in core samples from beneath the Bay (Atwater et al. 1977:Plate 1; Lee and Praszker 1969:60–63; Louderback 1951:90; Story et al. 1966; Treasher 1963).

Several studies confirm that Late Pleistocene and Early Holocene land surfaces located around the Bay were overlain by younger alluvium generally less than 6,000 years old (Borchardt 1992; Gmoser et al. 1999; Helley et al. 1979; McIlroy et al. 2001; Meyer 2000; Stewart et al. 2002). Stratigraphic and radiocarbon evidence indicates that Holocene-age alluvial deposits average two to three meters (~seven to 10 feet) thick, with localized deposits 10 meters (~33 feet) thick. Older land surfaces usually exhibit well-developed buried soils (paleosols), representing stratigraphic unconformities that are recognizable throughout the region. As a result, older archaeological sites in and around the Bay were submerged by sea-level rise and/or buried by sediment deposition. During the Late Holocene (past 4200 years), the Bay grew as marshlands expanded in response to higher sea levels and the decomposition, compaction, and subsidence of intertidal deposits. These processes resulted in the formation of large tidal mudflats and peat marshes, which further promoted the deposition of sediment around the margins of the Bay.

Recent geoarchaeological investigations in downtown San Jose provide direct evidence for substantial alluvial deposition during the Holocene. These investigations include widespread deep coring and trenching along the Santa Clara Street corridor approximately 2 kilometers north of the Study Area supplemented by over 25 radiocarbon dates on buried soils (Kaijankoski 2015, 2019; Meyer 2000, 2002; Ruby et al. 2010). These investigations reveal that this portion of the Northern Santa Clara Valley, between Coyote Creek and the Guadalupe River, is underlain by a deeply incised canyon extending to over 12 meters (40 feet) below current surface. This canyon was eroded during the Late Pleistocene as Coyote Creek and the Guadalupe River flowed to lower sea levels. As the San Francisco Bay formed and base levels of watercourses rose, alluvial deposition began infilling this canyon during the Early Holocene (11,700-8200 cal BP). A laterally extensive Middle Holocene (8200-4200 cal BP) age buried soil is present throughout this canyon, which formed on younger alluvium inset into the incised canyon at depths of 4.5 to 7.5 meters (15 to 25 feet) below current surface. As this buried soil represents a long period of landscape stability within a topographically lower floodplain through which flowed the Guadalupe River and Coyote Creek, its presence indicates this area is highly sensitive for deeply buried archaeological sites.

More recent changes along San Francisco Bay include the appearance of introduced (non-native) plant species, which generally coincided with the arrival of Spanish and other Euro-American settlers during the 1700s and 1800s (Reidy 2001; West 1989). An intense drought during the late 1800s reduced vegetation cover and made the landscape susceptible to erosion (Burcham 1982:171), as did many of the activities associated with historic-period settlement. Hydraulic-mining in the Sierra Nevada increased the amount of sediment deposited within the Bay (Gilbert 1917). Lasting evidence of these changes is found in estuarine deposits and along many stream channels where lowest terraces are often composed of historic-age sediment (Knudsen et al. 2000; Mudie and Bryne 1980). Finally, thick deposits of artificial fill were placed around the margins of the Bay to reclaim the marshes and wetlands for human development (Lee and Praszker 1969; Witter et al. 2006). While some archaeological resources may have been partially or completely destroyed by urban development, others are likely buried and protected by artificial fill laid-down during the historic and modern eras.

This summary illustrates that large-scale environmental changes played a major role in the evolution of the Bay Area landscape over the past 22,000 years. Many of these changes undoubtedly affected the distribution of human populations and buried and/or submerged large segments of the landscape that were once available for human occupation, particularly those that are Middle Holocene-age and older (>7700 cal BP). Thus, the relatively incomplete nature of the Bay Area archaeological record is almost certainly related to the sequence of changes that led to the formation of the current landscape.

THE ISSUE OF BURIED ARCHAEOLOGICAL SITES IN SANTA CLARA VALLEY

The magnitude and nature of geomorphological change in Santa Clara Valley's recent past make it difficult to determine precisely where prehistoric sites are preserved within the region's landforms; past geomorphic processes also influence the archaeological methods capable of identifying those locations. Of greatest consequence to archaeology are regional periods of prolonged landform stability and soil development (Rosenthal and Meyer 2004:29). These stable periods were in turn followed by an episode of alluvial deposition, including several localized intervals of natural levee and floodplain aggradation during the middle and late Holocene (4050–115 cal BP) and into the historic period (Meyer 2000:43; Rosenthal and Meyer 2004:28–29).

A large number of prehistoric sites in Santa Clara Valley and adjacent areas formed on stable land surfaces subject to rapid burial (i.e., buried soils). A high percentage of these sites were found by accident or happenstance, not as a result of deliberate archaeological investigations (Rosenthal and Meyer 2004:3). The best known of these include the "BART skeleton" found 22.9 meters below the modern surface of the San Francisco Civic Center (Henn and Schenk 1970; Henn et al. 1972); the "Stanford Man" skull found 6.1 meters below ground on the Stanford Campus (Heizer 1950); University Village where materials were recovered from four to six meters below the ground (Gerow 1968); and Sunnyvale man, found nearly three meters below the surface (Moratto 1984). Other buried sites throughout the Santa Clara Valley have been reported by Anastasio (1988:401), Hildebrandt (1983), Hylkema (1998:20–26; see also Meyer 2000:11), and Rosenthal and Meyer (2004:Table 1), further illustrating the extent to which natural processes have obscured the prehistoric archaeological record in this region. In fact, Meyer (2000) estimates that within 2.5 miles of the Guadalupe River, sixty percent of the known prehistoric sites are buried by late Holocene age alluvium. Meyer's (2000) analysis of major soil development episodes in Santa Clara Valley landforms, and review of the age, location, and depth of archaeological sites lead to the conclusion that late Holocene archaeological sites may be buried under as little as one meter (3.3 feet) of sediment, while middle and early Holocene ones may be under as much as four to six meters (13–20 feet) of alluvium.

Exploratory backhoe trenching has been used a number of times in attempts to discover or delimit buried archaeological sites, and more recently to identify buried soils and generally to test and refine the South Bay Area geoarchaeological model proposed by Meyer (Allen et al. 1999; Meyer 2000). Many times, this approach has succeeded in discovering a buried site (e.g., Baker 1996; Baker and Parsons 1996; Cartier et al. 1994, 1995; Kaijankoski et al. 2018; and many more). The more recent studies, though, aim to accomplish more than establishing simple site presence/absence, and attempt to provide useful information for reconstructing past landscapes on local and regional levels, reconstructing past environmental conditions, and understanding the nature and completeness of the archaeological record (e.g., Gmoser et al. 1999; Meyer 2000; Meyer and York 2002; Rosenthal 2000; Rosenthal and Fitzgerald 2002; Rosenthal and Meyer 2004; White and Thomas 1999; York 2000). Combined, they have afforded considerable evidence of the timing and nature of floodplain development along Coyote Creek, the Guadalupe River, several fans that extend from the western slope of the Diablo Range, and the overall filling of Santa Clara Valley during the late Pleistocene and Holocene.

BURIED PREHISTORIC SITE SENSITIVITY ASSESSMENT

The Study Area is situated in the northern Santa Clara Valley, a dense urban area with abundant Native American archaeological sites resulting from a presumably high prehistoric population. Predicting exactly where an archaeological site will be located is difficult under the best circumstances. However, this flat valley with historically complex hydrology is covered by youthful sediments and a major American city, making predicting site locations even more arduous. Below is a summary of Far Western's the standardized approach to buried site sensitivity modeling in alluvial settings, followed by a consideration of historical ecology as an additional predictor of site locations.

Landform Age

Many lowland depositional landforms in California were formed during the Holocene (11,700 years ago to present) after prehistoric people had occupied the region and, therefore, have a general "geologic potential" to contain buried sites. Conversely, there is little or no potential for buried sites to occur in landforms that pre-date the Holocene because few, if any, people were present in the region at that time. Formerly stable land surfaces buried late in time (e.g., past 4000 years) have a higher probability of containing archaeological material than those buried earlier in time due to higher population densities in later time periods. Therefore, landform age can be used as a relative measure of the potential (i.e., probability) for buried archaeological sites not visible on the surface.

Far Western has developed detailed late Quaternary landform age mapping for California based on soil and geologic mapping, cross-referenced with an extensive radiocarbon database (Meyer and Rosenthal 2008; Meyer et al. 2010, 2011; Rosenthal and Meyer 2004). As shown on Figure 1, the Study Area is situated on alluvium deposited during the Latest (2200–1150 BP) Holocene. Given the youthful age of this landform, it may overlie deeply buried archaeological sites.

Buried Site Sensitivity Model

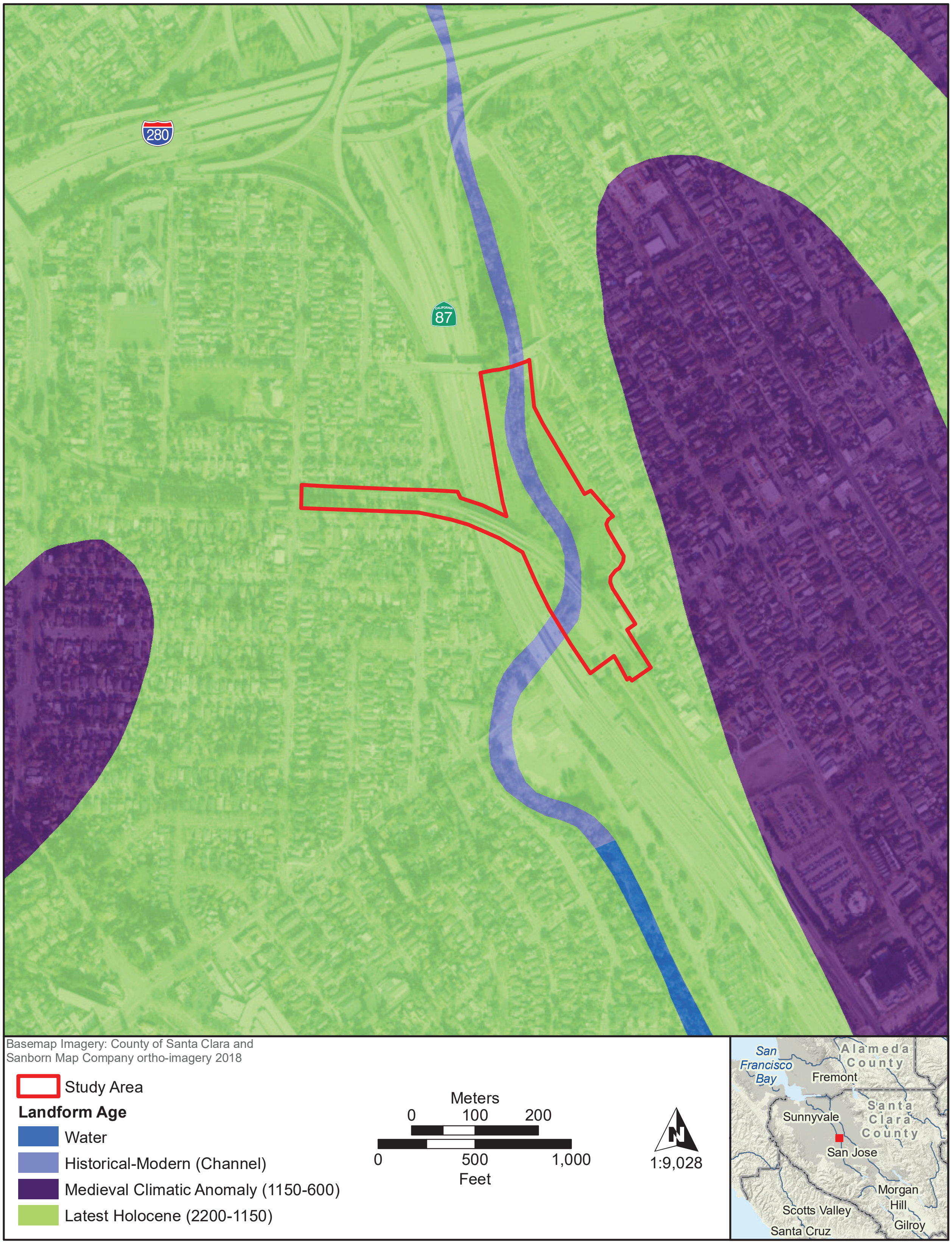
Using the detailed landform age mapping, Far Western has developed a standardized approach to buried site sensitivity modeling that has proven effective in subsurface archaeological presence/absence testing conducted for Cultural Resources Management studies throughout the state (e.g., Byrd et al. 2010; Hildebrandt et al. 2012; Kaijankoski et al. 2015). This model is built on the assumption that archaeological deposits are not distributed randomly throughout the landscape, but tend to occur in specific geo-environmental settings (Foster et al. 2005:4; Hansen et al. 2004:5; Pilgram 1987; Rosenthal and Meyer 2004). For example, it is well known that prehistoric occupation sites are most often associated with level landforms near perennial streams, and particularly near the confluence of two or more streams (Pilgram 1987:44–47).

Recently, Meyer (2013) assessed a variety of factors influencing prehistoric site location and found that distance to water, slope, and distance to watercourse confluence accurately predicted the majority of known prehistoric sites. Based on these findings, the buried site sensitivity model applies a landform age multiplier to these three factors to determine buried site potential. Based on this modeling, the Study Area was estimated to have a high to very high sensitivity for buried archaeological sites.

Historical Ecology

A recent historical ecology study of the Coyote Creek watershed (Grossinger et al. 2006) provides detailed information on the vegetation and hydrology of Santa Clara Valley at the time of European contact. This mapping indicates that freshwater wetlands with no defined creek channel occupied large portions of the lowland areas in northern Santa Clara Valley. Specifically, these wetlands included alkali and wet meadows, willow groves, freshwater marshes, and ponds. This compares to the "uplands"—elevated landforms inhabited by oak woodlands, oak savanna/grasslands, sycamore groves, and chaparral. Geomorphically, these different habitats are the result of fine-grained, poorly drained alluvial basins (wetlands), and coarse-grained, well-drained alluvial fans and natural levees (uplands).

Prior to the twentieth century, the majority of these wetlands were drained by enlarging existing channels and artificially connecting others. This "re-plumbing" was done to reduce flooding and reclaim



Basemap Imagery: County of Santa Clara and Sanborn Map Company ortho-imagery 2018

Figure 1. Landform Age Mapping of Study Area and Vicinity.

wetlands for agriculture (Grossinger et al. 2006:II–33). As a result, when the first detailed topographic maps of the region were prepared by the US Geological Survey in 1899, the wetlands had largely disappeared and many watercourses were in constructed channels.

Archaeologists have long recognized that prehistoric sites tend to be situated at ecotone interfaces due to proximity of a variety of resources. Recently, several prehistoric archaeological sites have been discovered in the northern Santa Clara valley at this wetland/upland interface, yet far from a defined creek channel (Kaijankoski and Rosenthal 2019). These sites appear to have been occupied on a multi-season or year-round basis, suggesting that inhabitants may have relied on shallow ground water for many of their needs. As shown in Figure 2, the Study Area is situated at the archaeologically sensitive wetland/upland interface, with the majority within a former sycamore grove adjacent to a wet meadow in the west. This mapping also indicates that the location of the Guadalupe River in this area was not altered substantially during the historic-era. Additionally, the substantial Native American village of CA-SCL-690 is located within this former sycamore grove at Tamien Station 0.5 kilometers (0.3 miles) south of the Study Area (Hylkema 2007), demonstrating the attractiveness of this ecotone for Native American occupation.

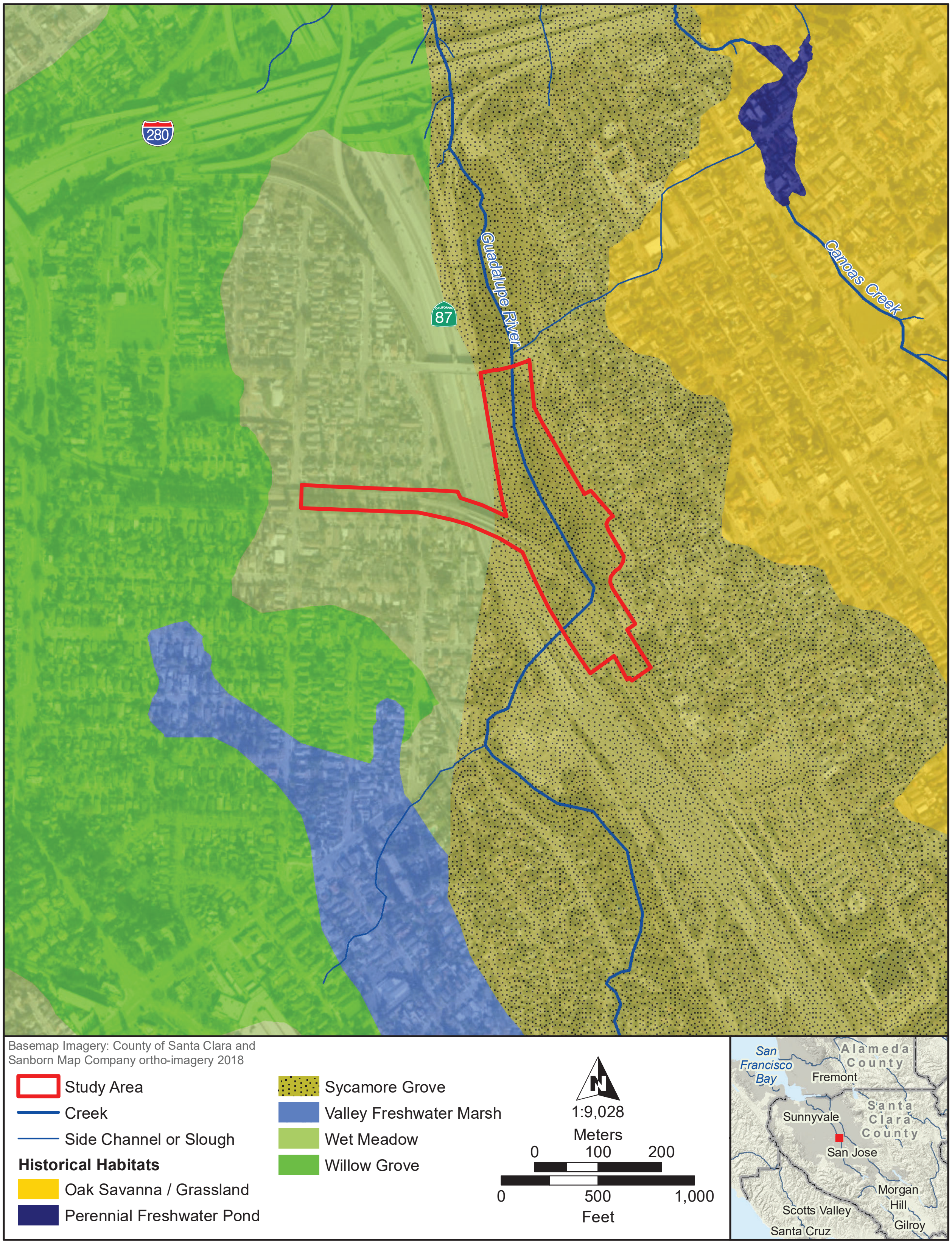


Figure 2. Study Area Overlain on Historical Ecology Map.

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APPENDIX B
CORE DESCRIPTIONS

Appendix A. Core Descriptions.

Core No.	Min. Depth (feet)	Max. Depth (feet)	Min. Depth (meters)	Max. Depth (meters)	Study Area Geologic Unit	Soil Horizon	Color Type-Munsell Designation	Color Name (Munsell or General)	Structure Grade	Structure Size	Structure Type	Gravel %	Gravel Size	Gravel Shape	Consistency Moist	Consistency Dry	Texture 1	Clay Film Amount	Clay Film Visibility	Clay Film Location	Contact Transition	Additional Comments
Core 1	0	2.5	0.0	0.8	6	A	10YR 3/3	dark brown	-	-	gr	0	-	-	fr	-	SiL	-	-	-	g	-
Core 1	2.5	6	0.8	1.8	6	C	10YR 5/3	brown	m	-	-	0	-	-	fi	-	SiL	-	-	-	c	-
Core 1	6	11	1.8	3.4	5	2C	10YR 5/2	grayish brown	m	-	-	0	-	-	fi	-	SiC	-	-	-	a	few charcoal inclusions, CaCO3 filaments along root holes, common oxidization
Core 1	11	11.5	3.4	3.5	5	3Ag	10YR 2/1	black	m	-	-	0	-	-	fi	-	SiC	-	-	-	c	-
Core 1	11.5	20.5	3.5	6.2	5	3C	-	variable	m	-	-	0	-	-	fr	-	SiC	-	-	-	c	stratified alluvial basin deposits
Core 1	20.5	27	6.2	8.2	4	4Cg	Gley 1	dark greenish gray	m	-	-	0	-	-	fr	-	SiC	-	-	-	a	two very thin marsh surfaces at 23 and 23.5 feet
Core 1	27	29	8.2	8.8	4	5Ag	Gley 1 2.5/N	black	m	-	-	0	-	-	fr	-	SiC	-	-	-	c	-
Core 1	29	33.5	8.8	10.2	4	5Cg	Gley 1 5/5GY	greenish gray	m	-	-	0	-	-	fi	-	L/SiC	-	-	-	a	becomes coarser in lower 2 feet
Core 1	33.5	38	10.2	11.6	3	6C	Gley 1 5/10Y	greenish gray	m	-	-	<10	S	-	fi	-	L	-	-	-	a	-
Core 1	38	53	11.6	16.2	2	7C	10YR 5/2	grayish brown	-	-	sg	75	-	-	vfr	-	L	-	-	-	a	-
Core 1	53	54	16.2	16.5	1	8C	Gley 1 3/10Y	very dark greenish gray	m	-	-	0	-	-	fr	-	C	-	-	-	c	-
Core 1	54	57	16.5	17.4	1	9Ck1	Gley 1 7/1	light gray	m	-	-	0	-	-	fr	-	CL	-	-	-	g	-
Core 1	57	58	17.4	17.7	1	9C2	Gley 1 4/10Y	dark greenish gray	m	-	-	0	-	-	fr	-	SL	-	-	-	-	-
Core 2	0	2.5	0.0	0.8	6	AC	10YR 4/3	brown	m	-	-	0	-	-	fr	-	SiL	-	-	-	c	-
Core 2	2.5	3	0.8	0.9	6	2Ab	10YR 3/2	very dark grayish brown	2	f	sbk	0	-	-	fr	-	SiL	-	-	-	c	ephemeral buried soil
Core 2	3	5	0.9	1.5	6	2C	10YR 5/3	brown	m	-	-	0	-	-	fr	-	SiL	-	-	-	g	-
Core 2	5	11	1.5	3.4	5	3C	10YR 4/3	brown	m	-	-	0	-	-	fi	-	SiC	-	-	-	c	common oxidization throughout
Core 2	11	11.5	3.4	3.5	5	4AC	10YR 3/1	very dark gray	m	-	-	0	-	-	fi	-	SiC	-	-	-	c	common oxidization throughout, ephemeral buried soil
Core 2	11.5	20	3.5	6.1	5	4C	-	variable	m	-	-	0	-	-	fi	-	SiC	-	-	-	a	stratified alluvium
Core 2	20	27.5	6.1	8.4	4	5Cg	Gley 1	variable	m	-	-	0	-	-	fr	-	SiC	-	-	-	a	stratified wetland deposits
Core 2	27.5	28	8.4	8.5	4	6Ag	Gley 1	black	m	-	-	0	-	-	fr	-	SiC	-	-	-	c	-
Core 2	28	35.5	8.5	10.8	4	6Cg	Gley 1 5/10gy	greenish gray	m	-	-	0	-	-	fr	-	L/SiC	-	-	-	a	coarsening with depth
Core 2	35.5	42	10.8	12.8	2	7C	-	variable	m	-	sg	50	-	-	lo/vfr	-	L	-	-	-	-	-

Appendix A. Core Descriptions.

Core No.	Min. Depth (feet)	Max. Depth (feet)	Min. Depth (meters)	Max. Depth (meters)	Study Area Geologic Unit	Soil Horizon	Color Type-Munsell Designation	Color Name (Munsell or General)	Structure Grade	Structure Size	Structure Type	Gravel %	Gravel Size	Gravel Shape	Consistency Moist	Consistency Dry	Texture 1	Clay Film Amount	Clay Film Visibility	Clay Film Location	Contact Transition	Additional Comments
Core 3	0	5	0.0	1.5	6	Ap	10YR 4/3	brown	-	-	-	-	-	-	-	-	-	-	-	-	a	disturbed natural deposits
Core 3	5	8	1.5	2.4	6	A	10YR 4/3	brown	-	-	-	<10	S	-	fr	-	SiL	-	-	-	a	-
Core 3	8	11	2.4	3.4	6	C	10YR 6/3	pale brown	-	-	sg	<10	S	R	lo	-	S	-	-	-	a	-
Core 3	11	14	3.4	4.3	6	2Cg	-	variable	m	-	-	0	-	-	vfr	-	SiC	-	-	-	a	-
Core 3	14	17	4.3	5.2	4	3Ag	gley 1 2.5/N	black	m	-	-	0	-	-	fi	-	SiC	-	-	-	c	-
Core 3	17	23	5.2	7.0	4	3Cg1	gley 1 4/10GY	dark greenish gray	m	-	-	0	-	-	vfr	-	SiC	-	-	-	c	-
Core 3	23	24	7.0	7.3	4	3Cg2	gley 1 4/10GY	dark greenish gray	m	-	-	0	-	-	lo	-	SC	-	-	-	c	-
Core 3	24	24.5	7.3	7.5	4	3Cg3	-	variable	m	-	-	0	-	-	vfr	-	SiC	-	-	-	a	variable color transitional layer with charcoal
Core 3	24.5	27	7.5	8.2	4	4Ag	Gley 1 2.5/N	black	m	-	-	0	-	-	fr	-	SiC	-	-	-	g	marsh surface
Core 3	27	28	8.2	8.5	4	4ACg	-	variable	m	-	-	0	-	-	fr	-	SiC	-	-	-	g	variable dark greenish gray and black silty clay
Core 3	28	40	8.5	12.2	3	5Cox	10YR	yellowish brown	m	-	-	0 to 25	-	-	fr	-	L	-	-	-	c	variable oxidization
Core 3	40	51.5	12.2	15.7	2	6C	10YR	brown	m	-	sg	0 to 75	S	R to WR	lo to fr	-	S and SCL	-	-	-	a	channel facies. Variable lenses of clean sand, WR gravels in sand matrix, WR gravels in SCL matrix
Core 3	51.5	52.5	15.7	16.0	1	7Ab	Gley 1 2.5/N	black	m	-	-	0	-	-	fr	-	SiC	-	-	-	c	-
Core 3	52.5	57	16.0	17.4	1	7Ck	gley 1 7/10GY	light greenish gray	m	-	-	0	-	-	fr	-	CL	-	-	-	-	-
Core 4	0	6	0.0	1.8	6	Ap	-	variable	-	-	-	-	-	-	-	-	-	-	-	-	c	-
Core 4	6	18	1.8	5.5	6	2C	-	variable	1	f	sbk	0	-	-	fi	-	L	-	-	-	c	stratified terrestrial alluvium
Core 4	18	26	5.5	7.9	4	3C	-	variable	m	-	-	0	-	-	fi	-	SiC	-	-	-	a	stratified fine grain alluvium
Core 4	26	28	7.9	8.5	4	4Ag	Gley 1 2.5/N	black	m	-	-	0	-	-	fi	-	SiC	-	-	-	c	-
Core 4	28	33	8.5	10.1	4	4Cg	Gley 1 4/10GY	dark greenish gray	m	-	-	<10	-	WR	vfr	-	L	-	-	-	c	-
Core 4	33	41	10.1	12.5	3	5C	10YR 7/3	very pale brown	m	-	-	0	-	-	fr	-	SiCL to SL	-	-	-	c	few CaCO3 throughout increasing oxidization with depth
Core 4	41	46	12.5	14.0	2	6C	-	-	-	-	sg	>75	S to M	WR	lo	-	S	-	-	-	-	-

Appendix A. Core Descriptions.

Core No.	Min. Depth (feet)	Max. Depth (feet)	Min. Depth (meters)	Max. Depth (meters)	Study Area Geologic Unit	Soil Horizon	Color Type-Munsell Designation	Color Name (Munsell or General)	Structure Grade	Structure Size	Structure Type	Gravel %	Gravel Size	Gravel Shape	Consistency Moist	Consistence Dry	Texture 1	Clay Film Amount	Clay Film Visibility	Clay Film Location	Contact Transition	Additional Comments
Core 5	0	3	0.0	0.9	6	A	10YR 5/3	brown	1	f	sbk	0	-	-	fi	-	SiL	-	-	-	g	-
Core 5	3	5.5	0.9	1.7	6	C	10YR 6/4	light yellowish brown	m	-	-	0	-	-	fr	-	SiL	-	-	-	c	-
Core 5	5.5	8	1.7	2.4	6	2Ab	10YR 3/2	very dark grayish brown	1	f	sbk	0	-	-	fr	-	SiL	-	-	-	c	-
Core 5	8	14.5	2.4	4.4	5	2Cox	-	variable	m	-	-	0	-	-	fi	-	SiC	-	-	-	a	prominent oxidization throughout
Core 5	14.5	16.5	4.4	5.0	5	3Ab	10YR 2/1	black	m	-	-	0	-	-	fi	-	SiC	-	-	-	c	common oxidization throughout
Core 5	16.5	33	5.0	10.1	4	3Cg	-	variable	m	-	-	0	-	-	fr	-	SiC	-	-	-	c	stratified wetland. Multiple buried marsh surfaces including prominent one at 31-32 feet
Core 5	33	37	10.1	11.3	3	4Cox1	-	variable	m	-	-	>10	S	WR	fi	-	L	-	-	-	g	-
Core 5	37	41	11.3	12.5	3	4Cox2	-	variable	m	-	-	<10	S	WR	fi	-	CL	-	-	-	c	-
Core 5	41	57	12.5	17.4	2	5C	-	variable	-	-	sg	75	-	-	lo	-	CL	-	-	-	-	channel
Core 6	0	2	0.0	0.6	6	Ap	10YR 3/1	very dark gray	m	-	-	25	-	-	fr	-	CL	-	-	-	c	-
Core 6	2	7	0.6	2.1	6	AC	10YR 3/3	brown	m	-	-	0	-	-	fr	-	SiL	-	-	-	a	-
Core 6	7	8	2.1	2.4	6	2Ab	10YR 3/2	very dark grayish brown	m	-	-	0	-	-	fr	-	SiL	-	-	-	?	common charcoal and CaCO3
Core 6	8	13	2.4	4.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NO SAMPLE
Core 6	13	14.5	4.0	4.4	5	3Ab	10YR 2/1	black	1	f	sbk	0	-	-	fi	-	SiC	-	-	-	c	common oxidization
Core 6	14.5	19	4.4	5.8	5	3Cox	10YR 5/2	grayish brown	m	-	-	0	-	-	fi	-	SiC	-	-	-	c	common oxidization on ped faces and root holes
Core 6	19	23	5.8	7.0	4	4Cg	Gley 1 3/N	very dark gray	m	-	-	0	-	-	fr	-	SiC	-	-	-	-	-

APPENDIX C
RADIOCARBON DATING

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Report: **1600-037486-037489** 4 March 2020

Customer: 1600
Laura Harold
Far Western Anthropological Research Group, Inc.
2727 Del Rio Place, Suite A
Davis, CA 95618
USA

Samples submitted for radiocarbon dating have been processed and measured by AMS. The following results were obtained:

DirectAMS code	Submitter ID	Sample type	Fraction of modern		Radiocarbon age	
			pMC	1σ error	BP	1σ error
D-AMS 037486	2369	sediment (bulk)	78.00	0.33	1996	34
D-AMS 037487	2370	sediment (bulk)	58.06	0.25	4367	35
D-AMS 037488	2371	sediment (bulk)	31.27	0.17	9338	44
D-AMS 037489	2372	sediment (bulk)	3.311	0.047	27376	114

Results are presented in units of percent modern carbon (pMC) and the uncalibrated radiocarbon age before present (BP). All results have been corrected for isotopic fractionation with an unreported δ^{13}C value measured on the prepared carbon by the accelerator. The pMC reported requires no further correction for fractionation.