Volume 1 of 3: Final Report Submittal Package

Volume 2 of 3: Final General Reevaluation Report and Environmental Impact Statement

Volume 3 of 3: Technical Appendices

March 2014

Berryessa Creek Element
Coyote and Berryessa Creek, California
Flood Control Project
Santa Clara County, California

FINAL REPORT

Prepared by:

US Army Corps
of Engineers
Sacramento District

In partnership with:

Santa Clara Valley
Water District

BERRYESSA CREEK ELEMENT
COYOTE AND BERRYESSA CREEKS, CALIFORNIA
FLOOD CONTROL PROJECT
SANTA CLARA COUNTY, CALIFORNIA

FINAL GENERAL REEVALUATION REPORT AND ENVIRONMENTAL IMPACT STATEMENT

Prepared by:

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MARCH 2014

COVER SHEET*

Berryessa Creek Element
Final General Reevaluation Report/ Environmental Impact Statement
Santa Clara County, California

LEAD FEDERAL AGENCY: U.S. Army Corps of Engineers, Sacramento District

COOPORATING AGENCY: Santa Clara Valley Water District

ABSTRACT:

This document is in the format of an integrated General Reevaluation Report (GRR) and Environmental Impact Statement (EIS) and addresses the proposed modifications to the federally authorized Berryessa Creek Element of the Coyote and Berryessa Creeks, California flood control project located within the cities of San Jose and Milpitas in Santa Clara County, California. This GRR-EIS identifies, evaluates, and documents the alternatives evaluated as well as the potential direct and indirect environmental, social, and economic effects of the proposed action.

The Berryessa Creek Element, as authorized by Congress in 1990, is a single-purpose flood risk management project that includes mitigation of adverse effects on fish and wildlife habitat. The authorized project extends approximately 4.5 miles along Berryessa Creek from 600 feet upstream of Old Piedmont Road to 50 feet downstream of Calaveras Boulevard (Highway 237). The proposed modifications in this GRR-EIS include flood risk management primarily along 2.2 miles of Berryessa Creek extending from Interstate 680 (I-680) to Calaveras Boulevard. The more environmentally sensitive reach upstream of I-680 would be deferred due to lack of current economic justification.

The tentatively selected plan would provide capacity to convey median 0.01 exceedance probability discharge from I-680 to Calaveras Boulevard and would cost approximately $26 million. The plan would consist of an earthen trapezoidal channel section with varying bottom width and 2H:1V sideslopes. Free-standing concrete floodwalls would be constructed in the immediate vicinity of Montague Expressway as well as between the Piedmont Creek confluence and Calaveras Boulevard. The existing railroad trestle would be replaced with a triple barrel concrete box culvert.

Public Review and Comment: The public review period for the draft GRR-EIS began on March 8, 2013, and the official closing date for receipt of comments was April 21, 2013. All comments received were considered and incorporated into the final GRR-EIS, as appropriate. For further information, please contact the U.S. Army Corps of Engineers at the following address: U.S. Army Corps of Engineers, Sacramento District; Attn: Tyler M. Stalker; 1325 J Street; Sacramento, California 95814-2922, or by e-mail: Tyler.M.Stalker@usace.army.mil or by phone at (916) 557-5107.

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(Volume 2)

Note to reader: This document is in the format of an Integrated General Reevaluation Report (GRR) and Environmental Impact Statement/Environmental Impact Report (EIS). An asterisk (*) in the Table of Contents notes the sections that are required for compliance with the National Environmental Policy Act.

TECHNICAL APPENDICES

(Volume 3)

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

AAHU	average annual habitat units
ac-ft	acre-feet
APE	area of potential effects
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit
CALTRANS	California Department of Transportation
CDFW	California Department of Fish and Wildlife
cfs	cubic feet per second
CNP	conditional non-exceedance probability
CO	carbon monoxide
CWA	Clean Water Act
Corps	U.S. Army Corps of Engineers
EAD	expected annual damages
EGM	Economic Guidance Memorandum
EIS	environmental impact statement
EIR	environmental impact report
EM	Engineer Memorandum
EQ	Environmental Quality
ER	Engineer Regulation
ESA	Endangered Species Act
ESA	Environmental Site Assessment
ESU	evolutionarily significant units
FEMA	Federal Emergency Management Agency
GDM	General Design Memorandum
GIS	Geographical Information Systems
GRR	general reevaluation report
GRRC	General Reevaluation Review Conference
HEP	habitat evaluation procedure
HTRW	hazardous, toxic, and radiological waste
Ldn	day-night average sound level
LERRD	lands, easements, rights-of-way, relocations, and disposal areas
LPP	locally preferred plan
LRT	lightrail transit
LUST	leaking underground storage tank
µg/m3	micrograms per cubic meter
mg/l	milligrams per liter
NED	National Economic Development
NER	National Ecosystem Restoration
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program

NFP	Natural Flood Protection
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Association
O3	ozone
OSE	Other Social Effects
PAC	Post-Authorization Change
PED	Preconstruction Engineering and Design
PM10	particulate matter
ppt	parts per thousand
PSP	project study plan
RED	Regional Economic Development
SCVWD	Santa Clara Valley Water District
SFRWQCB	San Francisco Bay Regional Water Quality Control Board
SHPO	State Historic Preservation Officer
SO2	sulfur dioxide
SPD	South Pacific Division
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VTA	Valley Transportation Authority
WRDA	Water Resources Development Act

POST AUTHORIZATION CHANGE SUMMARY

PAC 1. INTRODUCTION

This post authorization change (PAC) summary is prepared as the result of an interim general reevaluation study of the Coyote and Berryessa Creeks, California flood control project that identifies changes to the federally authorized project element for Berryessa Creek located in the cities of San Jose and Milpitas, California. These modifications include flood risk management primarily along 2.2 miles of Berryessa Creek.

The authorized project is undergoing reevaluation because detailed design and coordination with the Santa Clara Valley Water District (SCVWD), interested environmental groups, and community members after project authorization indicated that the project did not have economic justification or wide support in the community. During pre-construction studies in 1993, project refinements sought to alleviate adverse effects through the use of rectangular concrete channel to minimize removal of the riparian zone in the greenbelt reach compared to the previously authorized trapezoidal concrete channels. However, this refined project met with opposition from the community and was subsequently not considered for construction pending the findings of additional feasibility-level reevaluation studies. Furthermore, at that time, refined costs and benefits resulted in a project with costs that exceeded the benefits, thereby precluding Federal involvement. In 2001, the SCVWD requested that the Corps reevaluate flood risk management alternatives along Berryessa Creek to find a more economical and environmentally acceptable solution.

The Berryessa Creek Element being recommended for implementation, consistent with the original project authorization, would provide capacity to convey median 0.01 exceedance probability discharge from I-680 to Calaveras Boulevard. The more environmentally sensitive reach upstream of I-680 would be deferred due to lack of current economic justification.

The following provides a comparison of the authorized project to the NED Plan (ER-1105-2-100, Appendix G, Amendment #2, September 2007, par. G-16).

PAC 2. DESCRIPTION OF AUTHORIZED PROJECT

a. Project Location

The Berryessa Creek Element of the Coyote and Berryessa Creeks flood control project, as authorized by Congress in 1990, is a single-purpose flood risk management project that includes mitigation of adverse effects. As shown in Figure 1-2, the authorized project begins 600 feet upstream of the upstream face of Old Piedmont Road, to 50 feet downstream of the downstream face of Calaveras Boulevard Bridge.

b. Project Sponsor

The non-Federal sponsor for the project and general reevaluation study is the Santa Clara Valley Water District (SCVWD).

c. Authorized Project Features

The authorized project is a single purpose flood risk management project with an authorized total cost of $9,213,000 (prices at time of 1986 cost estimate). The project includes the following features:

- A 500-by-160-foot reinforced-concrete-walled sedimentation basin 600 feet upstream of Old Piedmont Road
- A box culvert under Old Piedmont Road
- A trapezoidal concrete-lined channel from Old Piedmont Road to Piedmont Road/Cropley Avenue with a bottom width of 8 feet and 2H:1V bank slopes (The existing 400-foot-long box culvert under the Piedmont Road/Cropley Avenue intersection would be retained. A service road along the east bank would be maintained, and the riparian vegetation along the west bank would be retained as much as possible.)
- Enlarged debris basin lined with concrete walls as a secondary sedimentation basin Downstream of Cropley Avenue
- Raised levees in greenbelt area
- A transition area leading into another trapezoidal concrete-lined channel downstream to Cropley Avenue that joins the existing concrete-lined channel at the downstream end of the greenbelt (approximately 600 feet upstream of Morrill Avenue)
- A trapezoidal concrete-lined channel from the existing concrete-lined channel at Highway 680 all the way downstream to Calaveras Boulevard
- A rock transition to transition flows from the concrete channel into the existing earth-bottomed channel at Calaveras Boulevard
- Riparian vegetation mitigation plantings at a rate of two plants per each plant removed in the Berryessa Creek Park and the greenbelt
- Landscape screening plantings at all street crossings to minimize the adverse aesthetic effect of the concrete-lined channel

PAC 3. AUTHORIZATION

The Coyote and Berryessa Creeks Flood Control Project was authorized to be carried out under Section 101(a)(5) of the Water Resources Development Act (WRDA) of 1990, Public Law 101-640.

PAC 4. FUNDING SINCE AUTHORIZATION

Funding information since authorization is shown in Table 1.

Table 1 Funding Since Authorization			
Fiscal Year	Phase	Federal	Non-Federal
		Appropriated Amount	
1991		$225,000	-
1992		$500,000	-
1993		$470,412	-
1994		$127,400	-
1995		$100,000	-
1996		$176,000	-
1997		-	-
1998		$322,088	$36,529
1999		-	$155,000
2000		$300,000	-
2001	Feasibility	$598,000	-
2002	Feasibility	$724,000	$450,700
2003	Feasibility	-	-
2004	Feasibility	$127,000	$467,000
2005	Feasibility	$367,000	$372,900
2006	Feasibility	$371,000	$345,300
2007	Feasibility	$100,000	-
2008	Feasibility	$704,000	$460,000
2008	PED	$433,000	-
2009	PED	$138,000	$30,000
2010	PED	$389,346	$22,688
2011	PED	$41,699	$750,000
2012	PED	$276,000	$214,000

PAC 5. CHANGES IN SCOPE OF AUTHORIZED PROJECT

USACE guidance defines changes in scope as increases or decreases in the outputs for the authorized purpose of a project (ER 1105-2-100, Appendix G, Amendment 2, paragraph G-11.c.). Outputs are the project's physical effects that have associated benefits.

The scope of the Berryessa Creek Element of the project falls within the scope of the authorized project. The economic reevaluation conducted to assess continued Federal interest in the authorized project has revealed that not all elements of the project are presently economically feasible. Subsequently, those FRM features located in the upstream extent of the project, although they remain authorized, are not being recommended for implementation at this time.

Table 2 presents the summation and comparison of the recommended plan to the authorized project. Those features not recommended will be placed into the deferred classification consistent with ER-1105-2-100 guidance.

PAC 6. CHANGES IN PROJECT PURPOSE

The project purpose of flood risk management (flood damage reduction) has not changed from the authorized project.

PAC 7. CHANGES IN LOCAL COOPERATION REQUIREMENTS

In the 1989 Chief of Engineers Report, the recommended cost-sharing requirements for the non-Federal sponsor were in accordance with WRDA 1986, as follows:

"Based on current laws and regulations, the basic requirements for non-Federal participation in flood control projects are as follow:

- *Provide a cash contribution equal to 5 percent of structural flood control features.*
- *Provide all LERRD.*
- *If the sum of the above two items is less than 25 percent of the costs assigned to flood control, non-Federal sponsors will pay the difference in cash. If it is greater than 25 percent, total non-Federal costs shall not exceed 50 percent of total project costs assigned to flood control. Contributions in excess of 50 percent will be reimbursed by the Federal Government to the non-Federal sponsor."*

The project was authorized in WRDA 1990 with these cost-sharing requirements. WRDA 1996, Pub. L. No. 104-303, § 202(a)(1)(B), 110 Stat. 3673 (1996) modified cost-sharing requirements for new flood risk management projects to a minimum cost-sharing requirement of 35 percent from the non-Federal sponsor of the total project cost .

PAC 8. CHANGES IN LOCATION OF PROJECT

The location has not changed. The authorized project extends from approximately 600 feet upstream of Old Piedmont Road to Calaveras Boulevard Bridge. As part of this GRR-EIS, the reach was separated in two separable geographic areas: upstream of I-680 and downstream of I-680. An incremental analysis was conducted on these separable reaches. Consideration of economic benefits for the reach upstream of I-680 was limited to those below the Sierra Creek confluence, within which the minimum flow criteria are exceeded (ER 1165-2-21). The analysis indicated that no flood risk management alternative upstream of I-680 is economically justified. Thus, the reach downstream of I-680 is proposed for implementation as a separable element of the authorized project.

PAC 9. DESIGN CHANGES

The 1990 authorized project was designed to provide a 100-year level of flood control to the surrounding cities of San Jose and Milpitas. The authorized project extends approximately 4.5 miles of Berryessa Creek from 600 feet upstream of Old Piedmont Road to 50 feet downstream to Calaveras Boulevard. This plan, as authorized, was designed using the freeboard design concepts in establishing the hydraulic design of project features. Risk and uncertainty concepts were not applied. The authorized project consisted of a sediment basin constructed upstream of Old Piedmont Road, modifications (deepening) of the existing sediment basin, earthen levees in the Greenbelt, and a concrete trapezoidal channel downstream of I-680.

This General Reevaluation Report (GRR) and Post Authorization Change Summary (PAC) provide a reaffirmation that the recommend modification to the Berryessa Project are consistent with that authorized by Congress and indicate continued Federal interest in the authorized Flood Risk Management (FRM) features. The HQUSACE guidance utilized for the development of this report is intended to be the "decision document" for budgeting of a construction new start project. In addition, it directed the U.S. Army Corps of Engineers, Sacramento District (District) is prepared to initiate preconstruction engineering and design activities subsequent to funding and entering into a Design Agreement. The GRR provides the economic analysis of the project.

The purpose of the ongoing reevaluation study is to assess the feasibility of modifying the Federally-authorized project to reduce flood risks in the Berryessa Creek study area. Within the primary purpose, the specific goal of this study is to identify a complete plan that will yield an economically justified and environmentally acceptable project. In comparison to the authorized plan, risk and uncertainty concepts were applied in the formulation of the NED Plan. The NED Plan was designed to convey the 0.010 exceedance probability event (nominally a "100-year" plan) with a 50 percent conditional non-exceedance probability (CNP). Based on interpolation, at an assurance level of 90%, the NED Plan would be able to contain the equivalent of about a 0.03 exceedance probability event ("33-year" flood).

Furthermore, unlike the authorized project, the NED Plan does not include any project component upstream of I-680; it consists of earthen levees and bridge modifications along approximately 2.2 miles of Berryessa Creek from the downstream face of I-680 to Calaveras Boulevard.

A comparison of the major design features of the NED Plan to the authorized project is provided in Table 2. As shown in the table, no flood risk management alternative upstream of I-680 was determined to be economically justified. Additional information on the incremental economic analysis completed for this GRR is presented in Section 3.7.4.3.

Table 2 Comparison of the Authorized Project and the NED Plan							
Authorized Project (1987 Feasibility Report)				GRR Study (March 2013) NED Plan			
Reach	Location	Major Design Feature	Description	Reach	Location	Major Design Feature	Description
1	From 600 feet upstream of Old Piedmont Road to Old Piedmont Road	Primary sediment basin	Sediment basin with concrete walls, earth bottom, and outside dimensions of 500 feet by 160 feet	9	From 600 feet upstream of Old Piedmont Road to Old Piedmont Road	No flood risk management alternative is economically justified.	
2	From Old Piedmont Road to intersection of Cropley Avenue and Piedmont Road	Concrete-lined channel	Trapezoidal concrete channel with single service road on the east side of the creek, channel bottom width would be 8 feet with sideslopes of 2 feet horizontal by 1 foot vertical	8	From Old Piedmont Road to intersection of Cropley Avenue and Piedmont Road		
3	From intersection of Cropley Avenue and Piedmont Road to 1,000 feet upstream of Morrill Avenue (greenbelt area)	Stilling basin (secondary sediment basin in EIS) Levees Bank protection Channel stabilization	Existing stilling basin improved with concrete walls and enlarged to 144 feet by 80 feet (outer dimensions) Raise levees; inboard slope of 2 feet horizontal by 1 foot vertical; outboard slope of 1.5 feet horizontal by 1 foot vertical; levee on south side of creek is a raised road and levee top width would be 12 feet; on north side of creek, where levee is a grassed levee, top width could be as narrow as 6 feet; all levees inboard slope of 2 feet horizontal by 1 foot vertical; outboard slope of 1.5 feet horizontal by 1 foot vertical No structural bank protection No structural channel stabilization	7, 6 7 6	From intersection of Cropley Avenue and Piedmont Road to 1,000 feet upstream of Morrill Avenue (greenbelt area) Pedestrian Bridge to Cropley Avenue and Piedmont Road intersection Morrill Avenue to Pedestrian Bridge		
4	800 feet upstream of Morrill Avenue to Cropley Avenue	Secondary sediment basin Concrete-lined channel	No sediment basin in EIS Trapezoidal concrete channel with service road on either side of the creek	5	800 feet upstream of Morrill Avenue to Cropley Avenue I-680 to Morrill Avenue		
5	Cropley Avenue to I-680	Existing trapezoidal concrete-lined channel	No change		Cropley Avenue to I-680 I-680 to Morrill Avenue		
6	I-680 Bridge I-680 to Montague Expressway Montague Expressway to Piedmont Creek	I-680 Bridge Trapezoidal Concrete-lined channel Trapezoidal Concrete-lined channel Replacement (UPRR Trestle) Railroad Culvert	Remove sediment at downstream face Trapezoidal concrete channel, where right-of-way permits, service roads to be provided on each side of the creek Trapezoidal concrete channel, where right-of-way permits, service roads to be provided on each side of the creek Remove existing timber trestle; replace with triple 15-foot-by-12-foot concrete box culvert with wingwalls Construct transition to existing wingwalls	4 3	I-680 Bridge I-680 to Montague Expressway Montague Expressway to Piedmont Creek	I-680 Bridge Trapezoidal channel w/ cellular bank protection Trapezoidal channel w/ cellular bank protection Replacement (UPRR Trestle) Railroad Culvert	Remove accumulated sediment at downstream face Excavate 6- to 22-foot bottom width with cellular bank protection at 2H:1V sideslopes; construct 200 lineal feet of free-standing concrete floodwall to maximum height of 2 feet. Service roads to be provided on each side of the creek Excavate 12-foot bottom width with cellular bank protection at 2H:1V sideslopes. Service roads to be provided on each side of the creek Remove existing timber trestle; replace with triple 15-foot-by-12-foot concrete box culvert with wingwalls Construct transition to existing wingwalls

Table 2 Comparison of the Authorized Project and the NED Plan							
Authorized Project (1987 Feasibility Report)				GRR Study (March 2013) NED Plan			
Reach	**Location**	**Major Design Feature**	**Description**	**Reach**	**Location**	**Major Design Feature**	**Description**
		Ames Avenue Bridge	At Ames Avenue Bridge, excavate bottom width for concrete liner; construct abutment and pier protection			Ames Avenue Bridge	At Ames Avenue Bridge, excavate 12-foot bottom width earthen channel; construct abutment and pier protection
		Yosemite Drive Bridge	At Yosemite Drive Bridge, excavate bottom width for concrete liner; construct abutment and pier protection			Yosemite Drive Bridge	At Yosemite Drive Bridge, excavate 15-foot bottom width channel beneath bridge transitioning to 24-foot bottom width; construct abutment and pier protection
		Piedmont Creek	Construct transition to existing section			Piedmont Creek	Construct transition to existing structure
	Piedmont Creek to Los Coches Street Bridge	Trapezoidal Concrete-lined channel	Trapezoidal concrete channel, where right-of-way permits, service roads to be provided on each side of the creek	2	Piedmont Creek to Los Coches Street Bridge	Trapezoidal channel w/ cellular bank protection	Excavate 24-foot bottom width with cellular bank protection at 2H:1V sideslopes. Service roads to be provided on each side of the creek
		Los Coches Street Bridge	At Los Coches Street Bridge, excavate bottom width for concrete liner; construct abutment and pier protection			Los Coches Street Bridge	At Los Coches Street Bridge, excavate 24-foot bottom width; construct abutment and pier protection
	Los Coches Street Bridge to Approx. 50 feet downstream of Calaveras Boulevard	Trapezoidal Concrete-lined channel	Trapezoidal concrete channel, where right-of-way permits, service roads to be provided on each side of the creek	1	Los Coches Street Bridge to Approximately 50 feet downstream of Calaveras Boulevard	Earthen trapezoidal channel	From Los Coches Street Calaveras Boulevard, excavate 40-foot bottom width with cellular bank protection at 2H:1V sideslope; access road along left bank slope; free-standing concrete floodwalls to maximum height of 4 feet
		Calaveras Boulevard Bridge	Construct transition to existing section			Calaveras Boulevard Bridge	Construct transition to existing section
		Channel reach downstream of Calaveras Boulevard	Construct transition to downstream project			Channel reach downstream of Calaveras Boulevard	Construct transition to downstream project

PAC 10. CHANGES IN TOTAL PROJECT FIRST COSTS

As shown in Table 3, the authorized project costs totaled $9,213,000 at October 1986 price levels; adjusting for inflation to 2012, the estimated costs total increased to $19,721,000. The current first cost of the authorized project is estimated at $90,923,000. The increase in the current first cost of the authorized project primarily originates from the increase in unit costs of construction materials as compared to 1986 costs. In addition, the costs of contingency, planning, engineering, and design, and construction management were increased based on experiences with recent Corps contracts and reflect a conservative approach to the estimate.

Table 3 Comparison of Project First Costs

	Authorized Project					NED Plan (October 2014[3] Prices)	
		Mar 1986 Prices	**Oct 2012 Prices[1]**		**GRR-EIS (Oct 2012 Prices)[2]**		
Construction Costs		$5,828,872	$12,780,000		$25,890,000		$9,002,000
Contingency	25%	1,457,128	$3,195,000	35%	$8,991,000	22.51%	$2,282,000
Planning, Engineering, & Design	8%	583,000	$1,022,400	18.33%	$4,745,000	16.24%	$7,716,000
Construction Management/SA	7%	510,000	$894,600	11.69%	$3,027,000	10.62%	$1,122,000
Lands and Damages (LERRD)		834,000	1,829,000		$48,270,000		$13,078,000
Total First Cost		**$9,213,000**	**$19,721,000**		**$90,923,000**		**$27,200,000**

[1] Escalated with the Civil Works Construction Cost Indexing System (CWCCIS) – CWBS 11
[2] Alternative-comparison level estimate
3 Price level based on MII cost estimates

The costs associated with LERRD increased significantly. The cost estimates for the 1990 authorized project were limited to the land (2.5 acres) required for the sedimentation basin upstream of the Old Piedmont Road. The costs of the remainder of the right-of-way, currently in flood control use in existing improved and unimproved channels, were not included.

In this GRR-EIS, the LERRD costs included the acquisition of channel improvement easements (CIE) and temporary work area easements (TWAE) and use of existing rights-of-way (ROW) owned and/or controlled by the SCVWD, existing easements to public roads and highways, public utilities, railroads, and pipelines, and relocation of existing utilities/facilities. There are no federally-owned lands or other Federal projects in or partially in the study area. The SCVWD owns approximately 15.88 acres within the TSP/NED Plan study area. The approximate LERRDs required for construction and subsequent operation and maintenance of the authorized project and the TSP/NED Plan are summarized in the table below. More detailed information on the real estate requirements is presented in Appendix E.

Table 4 Real Estate Requirements				
Alternative	**Owned by SCVWD (ac)**	**Temporary Easement (ac)**	**Permanent Easement (ac)**	**Total Required Area (ac)**
Authorized Project	20.51	N.A.	N.A.	62.14[1]
NED Plan	15.88[2]	11.91	25.00	36.91
[1] Includes parcels upstream of I-680; total required area downstream of I-680 is approximately 29 acres. [2] 4.31 acres – temporary easement; 11.57 acres – permanent easement N.A. – information not available at the time of Final Report.				

PAC 11. CHANGES IN PROJECT BENEFITS

Table 5 shows a comparison of the benefits presented in the 1987 Feasibility Report and benefits based on the reevaluation completed to support the recommended modifications to the authorized project.

As shown in the table, over 1,000 more structures (increase in multi-family residences) are currently at risk than shown in the 1987 Feasibility Report. In total, the study area has just under $2.3 billion worth of estimated damageable property. Factors leading to this increase include additional structures, general increases in valuation from 1986 to 2011, improvements in existing structures, and increased labor and construction costs in the area.

PAC 12. BENEFITS-COST RATIO

For the benefit-cost analysis in this GRR study, the project costs were amortized over the 50-year period of analysis using the current Federal discount rate of 3.75 percent. As shown in Table 5, the benefit-to-cost ratio for the authorized project, which includes unjustified elements located in the upper reach, is 3.1 to 1, while the ratio for the NED Plan is 8.5 to 1.

PAC 13. CHANGES IN COST ALLOCATION

Table 6 shows the allocation of cost among the project purposes for the authorized project as authorized in 1990; the authorized project with costs updated to the current price levels; and the NED Plan. The costs for the authorized project and the NED Plan were allocated to a single purpose of flood risk management.

Table 5 Comparison of Economic Results				
Category	Authorized Project (1987 Feasibility Report)			General Reevaluation Study (August 2013)
	Values in 1986 Prices	Values at 2012 Factors[1]	Values in Oct 2012 Prices[2]	NED Plan (Oct 2012 Prices)
Structures or Parcels in 500-year	1,728	1,728	2,979	2,979
Total Value of Damageable Property	122 million	267 million	2,274 million	2,274 million
Damage 100-year Event	21 million	46 million	590 million	527 million[3]
Damage 500-year Event	40 million	88 million	826 million	755 million[4]
Price Level	October 1986	October 2012	October 2012	October 2012
Interest Rate	8.625%	3.75%	3.75%	3.75%
Period of Analysis	100 years	50 years	50 years	50 years
Risk-Based	No	No	Yes	Yes
EAD – Without-Project (existing)	1.31 million	2.87 million	14.36 million	11.82 million
EAD – With-Project	0.04 million	0.09 million	0.77 million	0.89 million
Benefits (Future & FIA Included)	1.35 million	2.96 million	13.59 million	10.95 million
Annual Costs	0.98 million	2.15 million	4.33 million	1.30 million[5]
Net Benefits	0.37 million	0.81 million	9.29 million	9.65 million
B/C	1.4	1.4	3.1	8.5

[1] Escalated with the Civil Works Construction Cost Indexing System (CWCCIS) – CWBS 11
[2] Property values updated by Marshall & Swift, FY 12 discount rate and analysis period.
[3, 4] Total damages in economic impact areas (E and F) downstream of I-680.
[5] Based on alternative-comparison level costs.

Table 6 Cost Allocation and Cost Apportionment Comparison of Authorized Project and NED Plan						
Item	**Authorized Project**				**NED Plan**	
	(1986 Prices)		**(October 2012 Prices)**		**(October 2014 Prices[b])**	
	Federal	**Non-Federal**	**Federal**	**Non-Federal**	**Federal**	**Non-Federal**
Construction[a] (Flood Risk Management)	$8,379,000		$42,653,000	-	$13,687,000	-
LERRD		$834,000	-	$48,270,000	-	$13,513,000
Total First Cost (Flood Risk Management)	**$8,379,000**	**$834,000**	**$42,653,000**	**$48,270,000**	**$13,687,000**	**$13,513,000**
Mandatory 5% Cash	-$461,000	$461,000	-$4,546,150	$4,546,150	-$1,353,000	$1,353,000
Subtotals	$7,918,000	$1,295,000	$38,106,580	$52,816,150	$12,334,000	$14,866,000
Percentage of Total Cost-Shared Amount	*86%*	*14%*	*42%*	*58%*	*45%*	*55%*
Additional Cash to Provide Minimum 35% Non-Federal Share of Total Project Costs	-$1,008,000	$1,008,000	NA	NA	NA	NA
Adjustment to Meet Maximum Non-Federal Share of 50%	NA	NA	$7,354,650	-$7,354,650	$1,266,000	-$1,266,000
Total Cost Shared Cost (Flood Risk Management)	**$6,910,000**	**$2,303,000**	**$45,461,500**	**$45,461,500**	**$13,600,000**	**$13,600,000**
Percentage of Total Cost-Shared Amount	*75%*	*25%*	*50%*	*50%*	*50%*	*50%*
Cultural Resources Preservation[c]					$137,000	
TOTAL FIRST COSTS	**$6,910,000**	**$2,303,000**	**$45,461,500**	**$45,461,500**	**$13,737,000**	**$13,600,000**

[a] Does not include IDC or OMRR&R
[b] Price levels based on MII cost estimate
[c] 100% Federal Cost.

PAC 14. CHANGES IN COST APPORTIONMENT

Also shown in Table 6 is the apportionment of costs between the Federal Government and the non-Federal sponsor. In the 1990 authorized project, the cost associated with LERRD was minimal compared to the total construction cost. As shown in the table, the non-Federal LERRD cost and the 5 percent minimum cash contribution totaled to less than 35 percent of the project cost. Based on the cost-sharing requirements under WRDA 1996, Pub. L. No. 104-303, § 202(a)(1)(B), 110 Stat. 3673 (1996) the minimum cost-sharing requirement from the non-Federal sponsor is 35 percent of the total project cost. Thus, an additional non-Federal cash contribution would be required for 65-35percent cost sharing between the Federal Government and non-Federal sponsor, respectively.

As shown in the table, with the costs associated with the LERRD, the non-Federal sponsor contributions would be 55 percent for the authorized project. Based on the cost-sharing requirements under WRDA 1986 (codified at 33 U.S.C § 2213(a)(3), the non-Federal sponsor's maximum cost-sharing cannot exceed 50 percent of the total project cost. Hence, a reimbursement for excess LERRD cost would be required to provide 50-50 percent cost sharing. Accordingly, the costs for the Authorized Project as well as the NED Plan have been apportioned to reflect a 50 percent contribution requirement from the non-Federal sponsor. A reimbursement for excess LERRD cost would be necessary to effect the appropriate cost-sharing requirements.

PAC 15. ENVIRONMENTAL CONSIDERATIONS IN RECOMMENDED CHANGES

An EIS is being prepared because of the modifications to the authorized project and new circumstances and information relevant to the environmental concerns previously identified in the EIS prepared with the 1987 Feasibility Report. This document supersedes the 1987 EIS. Comparison of the environmental effects between the various alternative plans is shown in Table 7.

Table 7 Comparison of Environmental Effects of Authorized Project and NED Plan		
Environmental Resource	**Authorized Project**	**NED Plan**
Geology, and Seismicity		
Effect	**No effect.**	**No effect.**
Significance	Not applicable.	Not applicable.
Mitigation	Not applicable.	Not applicable.
Topography and Soils		
Effect	Temporary soils disturbance during construction.	Temporary soils disturbance during construction.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Use of best management practices to minimize loss of soil.	Use of best management practices to minimize loss of soil.
Land Use, Socioeconomics, and Environmental Justice		
Effect	**No effect.**	**No effect.**
Significance	Not applicable.	Not applicable.
Mitigation	Not applicable.	Not applicable.
Air Quality		
Effect	ROG, NOx, CO, and PM emissions would temporarily increase due to operation of construction equipment and vehicles. Project exceeds BAAQMD air quality NOx thresholds.	Temporary increase in ROG, NOx, CO, and PM emissions due to operation of construction equipment and vehicles.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Compliance with BAAQMD mitigation. State mitigation fee payments for excess NOx emissions.	Compliance with BAAQMD mitigation.
Climate Change		
Effect	CO_2e emissions would occur during project construction.	CO_2e emissions would occur during project construction.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Compliance with BAAQMD mitigations.	Compliance with BAAQMD mitigations.
Water Resources and Quality		
Effect	Potential increase in sediment load, suspended solids, and nutrients due to soil erosion. Possible accidental spills or leaks from equipment or vehicles. Possible slight temporary increase in water temperature. Permanent effects to 2.42 acres of riparian habitat.	Potential increase in sediment load, suspended solids, and nutrients due to soil erosion. Possible accidental spills or leaks from equipment or vehicles. Possible slight temporary increase in water temperature.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**

Table 7 Comparison of Environmental Effects of Authorized Project and NED Plan		
Environmental Resource	**Authorized Project**	**NED Plan**
Mitigation	Use of best management practices to minimize soil erosion and accidental spills/leaks. Implementation of all requirements of regulatory agreements, permits, and plans.	Use of best management practices to minimize soil erosion and accidental spills/leaks. Implementation of all requirements of regulatory agreements, permits, and plans.
Biological Resources		
Effect	Temporary loss of grassland and loss of 2.42 acres of riparian habitat. Displaced wildlife during construction. Potential temporary disturbance of western pond turtle, Cooper's hawk, white-tailed kite, western big-eared bat, and Myotis bats	Temporary loss of grassland. Wildlife disturbed and displaced during construction. Potential temporary disturbance of western pond turtle, Cooper's hawk, and white-tailed kite.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Implementation of recommendation proposed by USFWS. Site restoration; reseed grasses, planting of wetland vegetation. Surveys conducted prior to construction to determine presence of species of concern. Specific avoidance measures implemented, if needed. Reestablishment of 2.63 acres of riparian habitat in the greenbelt area.	Surveys conducted prior to construction to determine presence of species of concern. Specific avoidance measures implemented, if needed.
Cultural Resources		
Effect	Disturbance of sites CA-SCL-593 and C-167. Changes to bridges, culverts, and trestle.	Disturbance of sites CA-SCL-593 and C-167. Changes to bridges, culverts, and trestle.
Significance	**Significant if determined eligible for listing in National Register.**	**Significant if determined eligible for listing in National Register.**
Mitigation	Cultural resources monitor onsite near CA-SCL-156 and P-43001136. Mitigation program for eligible sites. Possible Historic American Engineering Recordation for eligible bridges, culverts, or trestle.	Cultural resources monitor onsite near CA-SCL-156 and P-43001136. Mitigation program for eligible sites. Possible Historic American Engineering Recordation for eligible bridges, culverts, or trestle.
Traffic and Circulation		
Effect	Contribute to an overall increase in traffic volumes on the roadway network on a localized and temporary basis.	Construction activities would contribute to an overall increase in traffic volumes on the roadway network on a localized and temporary basis.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Develop a Traffic Control Plan prior to construction and coordinate all use of public roads with the City of Milpitas and City of San Jose, or other responsible agencies.	Develop a Traffic Control Plan prior to construction and coordinate all use of public roads with the City of Milpitas, or other responsible agencies.
Noise		
Effect	Increased noise levels during construction. Noise generated by construction equipment, haul trucks, and	Increased noise levels during construction. Noise generated by construction equipment, haul trucks, and

Table 7 Comparison of Environmental Effects of Authorized Project and NED Plan		
Environmental Resource	**Authorized Project**	**NED Plan**
	worker vehicles. Noise levels exceed local objectives.	worker vehicles. Noise levels exceed local objectives.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Implement measures to reduce adverse effect on sensitive receptors**.**	Implement measures to reduce adverse effect on sensitive receptors.
Recreation and Public Access		
Effect	Informal public access to the creek disrupted during construction. Quality of recreational experience in Berryessa Creek Park diminished during construction.	Informal public access to the creek disrupted during construction.
Significance	**Less-than-significant effect**.	**Less-than-significant effect.**
Mitigation	Not applicable.	Not applicable.
Aesthetics and Visual Resources		
Effect	Permanent change to visual character of the creek to include a concrete lined channel. Temporary visual effect of construction equipment.	Permanent change to visual character of the creek. Temporary visual effect of construction equipment.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Trees would be replanted on site. Disturbed areas would be reseeded with native grasses.	Disturbed areas would be reseeded with native grasses.
Hazardous, Toxic, and Radiological Waste		
Effect	Potential groundwater contamination from three HTRW sites downstream of I-680. Possible accidental spills or leaks from equipment or vehicles.	Potential groundwater contamination from three HTRW sites downstream of I-680. Possible accidental spills or leaks from equipment or vehicles.
Significance	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Ongoing monitoring for groundwater contaminants. Implement Hazardous and Toxic Materials Contingency Plan, if needed. Use of best management practices to minimize soil erosion and accidental spills/leaks.	Ongoing monitoring for groundwater contaminants. Implement Hazardous and Toxic Materials Contingency Plan, if needed. Use of best management practices to minimize soil erosion and accidental spills/leaks.

PAC 16. PUBLIC INVOLVEMENT

Public involvement activities associated with the Berryessa Creek Element include public meetings, agency meetings, and distribution of the draft GRR-EIS for public review and comment.

A public scoping meeting was held in 2001, at the beginning of the general reevaluation. The meeting was publicized in a Notice of Intent (NOI) published in the Federal Register October 15, 2001. A Notice of Preparation was filed with the State Clearing House on October 29, 2001 and mailed to interested parties and residents in proximity to the project area. The SCWVD will be preparing a separate Environmental Impact Report (EIR) in compliance with the California Environmental Quality Act (CEQA). The purpose of the scoping meeting was to continue the flow of information on the Berryessa Creek Element, while gathering additional information and community comments from citizens who live, work, and commute near the project area. The public was encouraged to submit written comments.

Additional public workshops were conducted in 2004 and 2005. The public raised concerns about flood risk management included various issues, such as flood damage to private and public properties and facilities, potential high maintenance costs for a flood control project along Berryessa Creek, the length of time required to complete the project, noise impacts on adjacent landowners during construction, and removing properties from the 100-year floodplains. Furthermore, there were concerns over the location and cost of property acquisition.

As previously discussed, full implementation of the authorized project was delayed because of local community concerns on the recommended concrete channel features, especially in the upstream reach. Issues of controversy included the likely damages to the riparian zone from the proposed trapezoidal concrete channel and loss of aesthetics, recreational values, and natural resources. Environmental issues included public concerns about the biological effects of the project on vegetation, wildlife, and fish, for example.

Coordinated with the U.S. Fish and Wildlife Service (USFWS), the State Historic Preservation Officer (SHPO) is ongoing. The Corps is working with the SHPO to negotiate treatment of affected historic properties to mitigate and resolve those effects.

Concerns from the public, as well as those of the participating resource agencies, helped guide the development and reformulation of the final array of alternative plans. Additional engineering, design, cost estimating, and analysis of potential impacts were developed for each alternative and ultimately resulted in the conclusions presented in this PACR summary and the GRR.

The draft GRR-EIS was circulated for a 45-day public review to Federal, State, and local agencies; organizations, and individuals who have an interest in the project. Public workshops were held during this 45-day period to provide additional opportunities for comments on the GRR-EIS. All comments received during this public review period were considered and incorporated into the final GRR-EIS, as appropriate. A comment and response appendix is included in the final GRR-EIS.

PAC 17. HISTORY OF PROJECT

The Berryessa Creek Element was authorized by the WRDA of 1990, Pub. L. No. 101-640, § 101(a)(5), 103 Stat. 4604 (1990), which approved construction of the project as described in the Chief of Engineer's Report on Coyote and Berryessa Creeks dated February 7, 1989. After Congressional authorization in WRDA 1990, discussions with the SCVWD and interested environmental groups and community members showed that the project did not have wide support in the community. Issues included the likely damages to the riparian zone from a trapezoidal concrete channel and loss of aesthetics, recreation, and natural resources. Pre-construction engineering and design efforts resulted in project refinements that had higher costs than benefits and work stopped in 1993. In 2001, the SCVWD requested that the Corps reevaluate existing flooding potential along Berryessa Creek to reassess potential Federal interest to implement the authorized flood risk management measures. .Although construction of the Berryessa Creek portion of the project has not begun, the Coyote Creek portion of the project has been completed and was transferred to the SCVWD in 1996.

PAC 18. PROJECT SCHEDULE

The following table indicates the schedule for the remaining milestones for the study, design, and anticipated construction.

Table 8 Schedule of Project Milestones

Milestone/Item	Date
Feasibility Scoping Meeting	April 2004
Alternative Review Conference	May 2005
GRR Conference and Tour	July 2006
Draft GRR-EIS Report for Public and HQUSACE Circulation	Mar-Apr 2013
Public Meeting/Hearing for Draft GRR-EIS	April 2013
Final GRR-EIS Public Review	September2013
Final GRR-EIS Submittal to South Pacific Division	August 2013
MSC/SPD Commander's Approval	January 2014

PAC 19. APPROVAL AUTHORITY

The final GRR-EIS will be submitted to the Chief of Engineers. Once the final report is approved and a Record of Decision (ROD) signed, construction funds must be appropriated by Congress before a Project Partnership Agreement can be signed by USACE and the sponsor in order to begin construction.

PAC 20. SPONSOR RESPONSIBILITIES

The sponsoring agency, SCVWD, will be responsible to provide cash contribution of not less than 5 percent of the project cost; provide a minimum of 35 percent, but not to exceed 50 percent, of total project costs; provide all necessary lands, easements, rights-of-way, access routes, relocation of utilities necessary for project construction and subsequent operation maintenance of the project; and assume all responsibilities and costs for operation and maintenance of the project. Detailed non-Federal responsibilities are presented in Chapter 10 of the GRR.

PAC 21. CONCLUSIONS AND RECOMMENDATIONS

The analysis indicates that the NED Plan is Alternative 2A/d with annual net benefits of $9.65 million and a benefit-to-cost ratio of 8.5 to 1.

Recommend approval of Alternative 2A/d of the authorized Berryessa Creek Element of the Coyote and Berryessa Creeks, California flood control project, with deferral of the portion of the authorized project upstream from I-680 until further action is warranted. The total first cost of the project is currently estimated at $26,626,000 (under October 2012 prices). The Federal share is currently estimated at $13,380,000.

The scope of the proposed project modifications is substantially in accordance with the authorized project. Based on reevaluation of the project costs and the economic benefits, and consideration of the design refinements, the Berryessa Creek Element FRM project is economically justified and considered sound economic investments for the Government.

This report also recommends additional studies to investigate reduction of the residual flood risk in the vicinity of Berryessa Creek upstream of I-680, which may be undertaken as part of or coordinated with any future comprehensive investigation of the Berryessa and Coyote Creeks watershed, or a portion thereof.

It is recommended that this report be approved and that the project continue toward project implementation, subject to cost sharing, financing, and other applicable requirements of Federal and State laws and policies, including Public Law 99-663, the Water Resources Development Act of 1986, as amended by Section 202 of Public Law 104-303, the Water Resources Development Act of 1996, and in accordance with the following requirements, which the non-Federal sponsor must agree to prior to project implementation.

CHAPTER 1 – INTRODUCTION*

This document is in the format of an Integrated General Reevaluation Report (GRR) and Environmental Impact Statement (EIS). This document will serve to assess potential Federal interest and environmental compliance of the Berryless authorized project in support of a recommendation to budget and implement its construction.

This General Reevaluation Study is underway to determine the acceptability and feasibility of modifying a flood risk management project along Berryessa Creek that was authorized in 1990 but not constructed. It presents the results of efforts by the U.S. Army Corps of Engineers (Corps) in partnership with the Santa Clara Valley Water District (SCVWD) to define pertinent engineering, environmental, social, and economic concerns at a critical stage of the planning process. Agency decision makers will consider the material and findings to assess the status and direction of the reevaluation study.

This document addresses proposed modifications to the federally authorized Berryessa Creek Element of the Coyote and Berryessa Creeks, California flood control project within the cities of San Jose and Milpitas, California. These modifications include flood risk management primarily along 2.2 miles of Berryessa Creek. This GRR-EIS will support decision making by the Corps, SCVWD, and other responsible agencies to implement the proposed project modifications and ensure compliance with the National Environmental Policy Act (NEPA), and other pertinent laws and regulations. The SCWVD will be preparing a separate Environmental Impact Report (EIR) in compliance with CEQA. Potential direct and indirect environmental, social, and economic effects of the proposed action and alternatives are evaluated. This document supersedes the EIS prepared with the 1987 Feasibility Report. This document has been prepared by the Corps Sacramento District and the SCVWD, which are the Federal and non-Federal lead agencies, respectively.

1.1 SCOPE AND PURPOSE OF REEVALUATION STUDY

Following completion of the February 1989 Report of the Chief of Engineers and subsequent Authorization by Congress in the Water Resources Development Act (WRDA) of 1990 (detailed in Section 1.2.2, "Project Authorization," of this GRR), the Corps conducted pre-construction engineering and design studies in 1993 to refine the project. However, the authorized project was then-met with disfavor in the local community due to the design and excessively high costs of the concrete channel features. In 2001, the SCVWD signed a Reevaluation Cost-Sharing Agreement with the Corps to initiate this GRR effort to find a more environmentally-acceptable solution.

This GRR and PAC provide a reaffirmation that the recommend modification to the Berryessa Project are consistent with that authorized by Congress and indicate continued Federal interest in the authorized Flood Risk Management (FRM) features. The HQUSACE guidance utilized for the development of this report is intended to be the "decision document" for budgeting of a construction new start project. In addition, it directed the U.S. Army Corps of Engineers, Sacramento District (District) is prepared to initiate preconstruction engineering and design activities subsequent to funding and entering into a Design Agreement. The GRR provides the economic analysis of the project.

The purpose of the ongoing reevaluation study is to assess the feasibility of modifying the Federally-authorized project to reduce flood risks in the Berryessa Creek study area. Within the primary purpose, the specific goal of this study is to identify a complete plan that will yield an economically justified and environmentally acceptable project that accomplishes the following:

- Reduces flood damages to populated areas.
- Reduces sedimentation and maintenance requirements.
- Provides access and recreation to the public, as feasible.
- Restore environmental values wherever possible through the study reach consistent with the flood reduction purpose of the project.
- Avoids and minimizes effects to riparian and aquatic habitat.
- Complements other Federal, state, and local plans and projects for Berryessa creek and vicinity.

1.2 BACKGROUND

The Coyote and Berryessa Creeks, California Flood Control Project was authorized by the Water Resources Development Act of 1990, Pub. L. No. 101-640, § 101(a)(5), 103 Stat. 4604 (1990), which approved construction of the project as described in the Chief of Engineer's Report on Coyote and Berryessa Creeks dated February 7, 1989. The Chief of Engineer's Report was transmitted by the Secretary of the Army to Congress in December 1989. After Congressional authorization in WRDA 1990, discussions with the SCVWD and interested environmental groups and community members showed that the project did not have wide support in the community. Issues included the likely damages to the riparian zone from a trapezoidal concrete channel and loss of aesthetics, recreation, and natural resources. Pre-construction engineering and design efforts resulted in project refinements that had higher costs than benefits, and work stopped in 1993. In 2001, the SCVWD requested that the Corps reevaluate flood risk management alternatives along Berryessa Creek to find a more economical and environmentally acceptable solution. The reevaluation of Berryessa Creek renewed public and non-Federal sponsor support for the project.

1.2.1 Location of Study Area

The Berryessa Creek watershed is located in Santa Clara County, California, south of San Francisco Bay. Berryessa Creek is a tributary to the Coyote Creek system, which flows into the southernmost end of San Francisco Bay. Berryessa Creek flows west out of the Diablo Range and into the residential neighborhoods of San Jose and Milpitas, finally turning north through industrial portions of Milpitas before joining Lower Penitencia Creek. Figure 1-1 depicts the study area[1].

1.2.2 Project Authorization

A study of Coyote and Berryessa Creeks was initiated to focus on flood and related problems and solutions along lower Coyote Creek, downstream of Interstate 880, and on Berryessa Creek. The authorization, the Flood Control Act of 1941, Pub. L. No. 77-228, § 4, 55 Stat. 638 (1941), reads:

[1] Bing Maps (Microsoft Corporation 2011) were used to delineate the study area.

Figure 1-1 Study Area

"Section 4. The Secretary of War is hereby authorized and directed to cause preliminary examinations and surveys for flood control, to be made under the direction of the Chief of Engineers, in drainage areas, the United States and its territorial possessions, which include the following name localities: Coyote River and tributaries, California; San Francisquito Creek, San Mateo and Santa Clara Counties, California; Matadero Creek, Santa Clara County, California; and Guadalupe River and tributaries, California."

In June 1945, the Chief of Engineers commenced a flood control investigation of survey scope that combined the study of all the streams draining into San Francisco Bay south of the Dumbarton Narrows. This included the Guadalupe River, Coyote Creek, San Francisquito Creek, Berryessa Creek, and numerous other creeks addressed collectively as Guadalupe River and Adjacent Streams. Various studies, including the Guadalupe River Interim Feasibility Report, were completed under that authority.

In December 1989, the Chief of Engineers transmitted an Interim Feasibility Report for Coyote Creek and Berryessa Creek to Congress. The Coyote and Berryessa Creeks flood control project was authorized by the Water Resources Development Act of 1990, Pub. L. No. 101-640, § 101(a)(5), 103 Stat. 4604 (1990), which states::

"(a) Projects With Report of the Chief of Engineers. -- Except as provided in this subsection, the following projects for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plans, and subject to the conditions, recommended in the respective reports designated in this subsection:

> *(5) Coyote and Berryessa Creeks, California. -- The project for flood control, Coyote and Berryessa Creeks, California: Report of the Chief of Engineers, dated February 7, 1989, at a total cost of $56,300,000, with an estimated first Federal cost of $39,000,000 and an estimated first non-Federal cost of $17,300,000."*

In November 1993, Congress authorized an exception to Section 902 of the Water Resources Development Act of 1986. See National Defense Authorization Act for Fiscal Year 1994, Pub. L. No. 103-160, § 2855, 107 Stat. 1547 (1993).

1.2.3 Description of Authorized Project

The Berryessa Creek Element of the Coyote and Berryessa Creeks, California project, as authorized by Congress in 1990, is a single-purpose flood risk management project that includes mitigation of adverse effects on fish and wildlife habitat. As shown on Figure 1-2, the authorized project begins 600 feet upstream of the upstream face of Old Piedmont Road, to 50 feet downstream of the downstream face of Calaveras Boulevard Bridge.

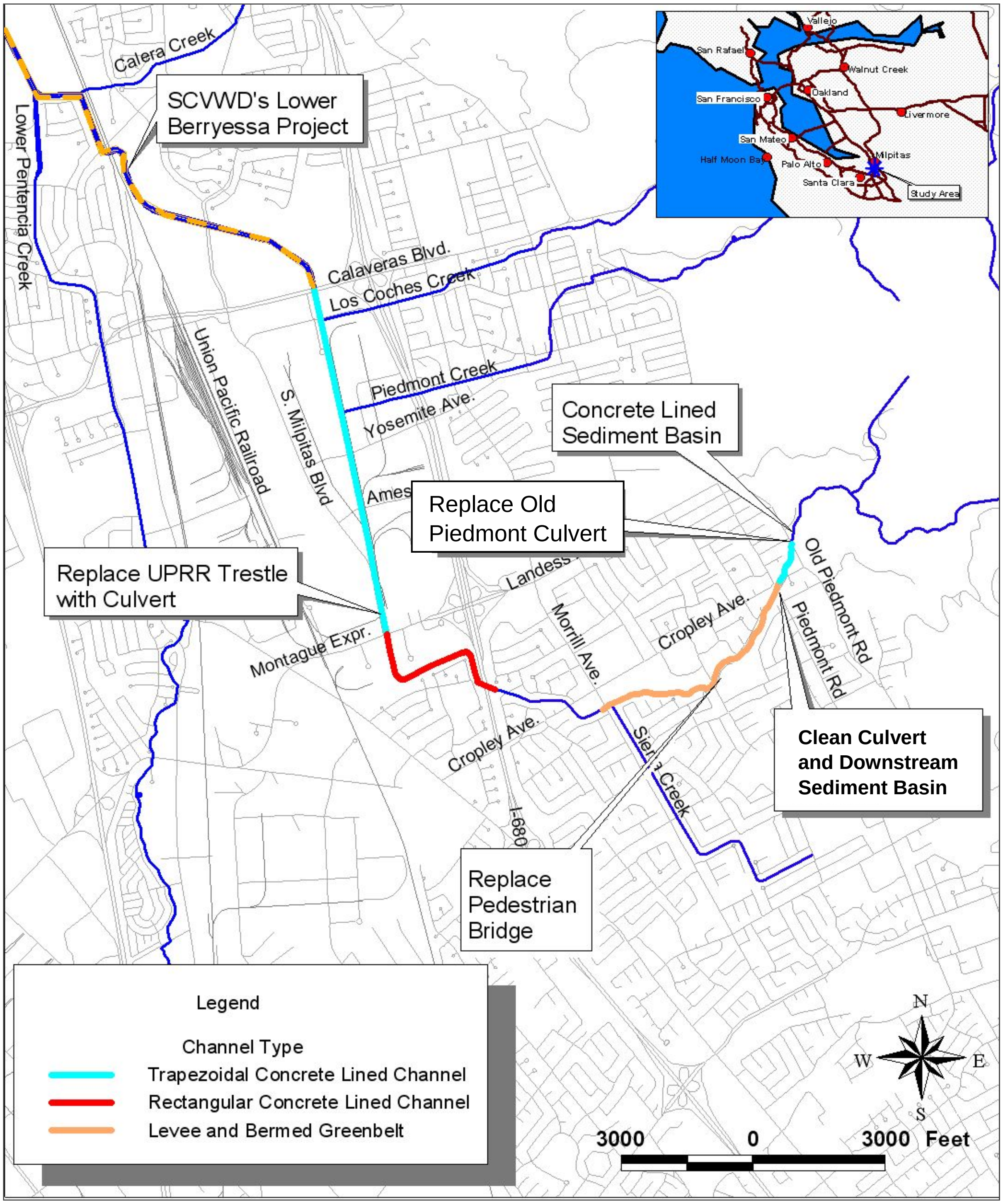


Figure 1-2 Authorized Project

The authorized project is a single purpose flood risk management project with an authorized total cost of $9,213,000 (1986 prices). The project includes the following features:

- A 500-by-160-foot reinforced-concrete-walled sedimentation basin 600 feet upstream of Old Piedmont Road
- A box culvert under Old Piedmont Road
- A trapezoidal concrete-lined channel from Old Piedmont Road to Piedmont Road/Cropley Avenue with a bottom width of 8 feet and 2H:1V bank slopes (The existing 400-foot-long box culvert under the Piedmont Road/Cropley Avenue intersection would be retained. A service road along the east bank would be maintained, and the riparian vegetation along the west bank would be retained as much as possible.)
- Enlarged debris basin lined with concrete walls as a secondary sedimentation basin Downstream of Cropley Avenue
- Raised levees in greenbelt area
- A transition area leading into another trapezoidal concrete-lined channel downstream to Cropley Avenue that joins the existing concrete-lined channel at the downstream end of the greenbelt (approximately 600 feet upstream of Morrill Avenue)
- A trapezoidal concrete-lined channel from the existing concrete-lined channel at Highway 680 all the way downstream to Calaveras Boulevard
- A rock transition to transition flows from the concrete channel into the existing earth-bottomed channel at Calaveras Boulevard
- Riparian vegetation mitigation plantings at a rate of two plants per each plant removed in the Berryessa Creek Park and the greenbelt
- Landscape screening plantings at all street crossings to minimize the adverse aesthetic effect of the concrete-lined channel

The authorized project also includes flood risk management and recreation measures on Coyote Creek. The Chief of Engineers' Report did not include any recreation measures on Berryessa Creek.

1.2.4 Status of Authorized Project

The authorized project element for Berryessa Creek has not been constructed. This GRR-EIS will address results of the reevaluation study and proposed modifications to the authorized project element for Berryessa Creek. The authorized project element for Berryessa Creek has not been constructed. This GRR-EIS will address results of the reevaluation study and proposed modifications to the authorized project element for Berryessa Creek . The PAC is considered a decision document for continued and future budgeting of the project. The economic reevaluation as required by ER 1105-2-100 and the budget EC assessed the continued Federal interest in the

Berryessa project. The project consists of two separable elements with features in the upper reaches deemed lacking benefits to offset project costs. Therefore those features cannot be recommended for implementation at this time and are deferred pending further analysis. The project being recommended for implementation is consistent with the original project authorization and assumes adequate delegated approval authority of the U.S. Army Corps of Engineers, Chief of Engineers to implement the project. Future budgeting for reevaluation and implementation will be reassessed as merited

Construction of the authorized project element for Coyote Creek has been completed. Therefore, throughout the remainder of this document, the term "authorized project" will refer only to the authorized, but unconstructed project element for Berryessa Creek.

1.3 STUDY/PROJECT PARTICIPANTS AND COORDINATION

The reevaluation study is being accomplished with close coordination with the local sponsor/partner, the SCVWD. The planning process is being coordinated with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), and input has been sought from the San Francisco Bay Regional Water Quality Control Board (SFRWQCB), the U.S. Environmental Protection Agency (USEPA), and the California Department of Fish and Wildlife (CDFW) [to ensure compliance with environmental laws and regulations], the California Department of Transportation (CALTRANS), and other stakeholders in the affected community.

1.4 RELATED STUDIES AND REPORTS

The following studies and reports provided valuable reference information and were used in completion of this reevaluation study to date.

Gill & Pulver Engineers, Inc. 1982. *Berryessa Creek Preliminary Design Summary Report and Cost Estimate*

> In 1982, Gill and Pulver Engineers conducted a preliminary design and cost estimate study for the Berryessa Creek Flood Control Channel between Old Piedmont Creek in the City of San Jose and Calaveras Boulevard in the City of Milpitas. The study included a brief general description of the data and criteria used and the significant factors and alternatives considered.

Santa Clara Valley Water District. 1982. *Lower Penitencia Creek Planning Study (Coyote Creek to Montague Expressway)*. November 1982

> In November 1982, the Santa Clara Valley Water District concluded a planning study to address the flooding, erosion, sedimentation, and channel maintenance problems associated with the lower Penitencia Creek between Coyote Creek and Montague Expressway. Alternative solutions were studied, and the recommended alternative consisted of constructing channel modifications to increase the creek's capacity. Modifications included channel widening, channel concrete lining, culvert enlargement, and constructing earth levees and floodwalls. The proposed project was estimated at $5.4 million in 1982.

Gill & Pulver Engineers, Inc. 1983. *Section 205 Draft Report for Flood Control on Berryessa Creek, San Jose, Milpitas, Santa Clara County, California. Preliminary Designs for Channel Modifications (Old Piedmont Road to Calaveras Boulevard)*. January 1983

In January 1983, Gill & Pulver completed a study for the U.S Army Corps of Engineers, Sacramento District, to summarize the preliminary studies and cost estimates prepared for the Berryessa Creek Flood Control Channel between Old Piedmont Creek in the City of San Jose and Calaveras Boulevard in the City of Milpitas. Preliminary designs and estimates have been prepared for the 50-year, 100-year, and Standard Project Flood frequency for channel levee and for structure modifications to approximately 21,200 feet of existing channel.

U.S. Army Corps of Engineers, Sacramento District. 1983. *Section 205 Draft Report for Flood Control on Berryessa Creek, San Jose, Milpitas, Santa Clara County, California. Preliminary Designs for Channel Modifications (Old Piedmont Road to Calaveras Boulevard)*. February 1983

In February 1983, the U.S. Army Corps of Engineers, Sacramento District, revised the preliminary studies and cost estimates prepared for the Berryessa Creek by Gill & Pulver, Inc.

U.S. Army Corps of Engineers, Sacramento District. 1984. *Concrete Materials. Berryessa Creek, California*

In March 1984, the U.S. Army Corps of Engineers concluded field and office investigations and documented past laboratory tests and service record surveys covering the proposed materials for the concrete structures in the Berryessa Creek Element, Milpitas, California. The study provided a general description of available aggregate and other concrete materials sources.

U.S. Army Corps of Engineers, San Francisco District. 1987. *Interim Feasibility Report and Environmental Impact Statement, Coyote Creek and Berryessa Creek, Santa Clara County, California*

In November 1987, the U.S. Army Corps of Engineers, San Francisco District, prepared an interim feasibility report and an environmental impact statement for the flood damage reduction project on Coyote and Berryessa Creeks. The recommended plan for flood control on the Coyote Creek had a benefit/cost ratio of 1.6 and had reduction in future flood damages to public and private property, business activities, and reduction in future development costs. The plan included mitigation measures to minimize adverse environmental impacts on fish and wildlife habitat. The major adverse impacts were the loss of 13.6 acres of riparian vegetation along Coyote Creek and the removal of three potentially significant historic buildings. The recommended plan for flood control protection on Berryessa Creek had a benefit/cost ratio of 1.4 with benefits of flood damage reduction in public and private properties and business activities and the improvement of the Creek Park and greenbelt. The major adverse impact of the Berryessa Creek flood control project was the removal of riparian vegetation, for which planting of replacement trees were included as mitigation.

Harvey and Stanley Associates, Inc., and Kinetic Laboratories, Inc. 1988. *Lower Coyote Creek Fisheries Evaluation*

In 1988, an evaluation study was conducted by Harvey and Stanley Associates, Inc., and Kinetic Laboratories, Inc., on the fisheries of the Lower Coyote Creek. The study was prepared for the Santa Clara Valley Water District to investigate the impacts of the proposed flood control project. The study revealed that fisheries values in Coyote Creek had been substantially degraded by past development within the watershed. The impact of the proposed flood control project was relatively low on the fisheries in the Coyote Creek (between Montague Expressway and San Francisco Bay) compared to those impacts present due to urban development. No rare, threatened, or endangered fish species were present in Coyote Creek.

Northwest Hydraulics Consultants Inc. 1990. *HEC-2 Data Deck Development, Berryessa Creek, Santa Clara County, California*. May 1990

In May 1990, Northwest Hydraulic Consultants Inc. concluded the development of a HEC-2 data deck for Berryessa Creek, Santa Clara County, California, to be submitted to the U.S. Army Corps of Engineers, Sacramento District. The study area included a 4.2-mile reach beginning at Calaveras Boulevard and extending upstream of Old Piedmont Road.

Northwest Hydraulic Consultants Inc. 1990. *Sediment Engineering Investigation and Preliminary Hydraulic Design of the Berryessa Creek Flood-Control Project*. September 1990

In September 1990, Northwest Hydraulic Consultants Inc. concluded a sediment engineering investigation and preliminary hydraulic design of the Berryessa Creek Flood-Control Project. The study investigated existing sediment transport conditions through the 4.2-mile study reach. It also identified potential short- and long-term impacts with respect to sedimentation and channel stability. The preliminary hydraulic design was developed for flood control features to safely convey a 100-year discharge through the study reach under the imposed sediment load.

U.S. Army Corps of Engineers, Sacramento District. 1993. *Draft General Design Memorandum, Coyote and Berryessa Creeks, Volume I of II (Berryessa Creek), California*. November 1993

In November 1993, the U. S. Army Corps of Engineers completed the draft General Design Memorandum (GDM) for the Berryessa Creek flood control project. The draft GDM presented the results of engineering and design studies conducted for flood improvements along the Berryessa Creek element of the Coyote and Berryessa Creeks flood control project. The design and studies contained in the draft GDM were conducted to determine the most economical plan for safely conveying the design flood, mitigation measures for environmental impacts, and meeting government standards for the flood control improvements. The GDM outlines the basis of project design, provides recommendation for the sequence of construction, and summarizes cost and benefit data for the entire Berryessa Creek Element.

U.S. Army Corps of Engineers, Sacramento District. 1993. *Draft General Design Memorandum, Coyote and Berryessa Creeks, Volume II of II, California*. November 1993

This report presents the results of field and office investigations, laboratory test results, and service record surveys pertaining to the stone protection and proposed materials for the concrete structures in the Coyote and Berryessa Creeks flood control project. Included in this volume is an environmental assessment addressing the changes and refinements to the authorized project, description of real property requirements, and hydrologic report.

U.S. Army Corps of Engineers, Sacramento District. 1994. *Value Engineering Study on Coyote and Berryessa Creeks, Berryessa Creek Element, Santa Clara County, California*

In 1994, a value engineering study was conducted on the proposed project, which included new confluence structures where Los Coches Street and Piedmont Creeks intersect Berryessa Creek. The project also included the augmentation of existing levees of a greenbelt reach to achieve specified heights to maintain certain riparian vegetation requirements. The project also included reorientation of sediment basins from their previous design.

Kennedy/Jenks Consultants. 1996. *Phase II Hazardous Materials Investigation, Calaveras Boulevard to Old Piedmont Road, Berryessa Creek Flood Control Project*. February1996

In February 1996, Kennedy/Jenks conducted a Phase II Hazardous Materials Investigation for the Santa Clara Valley Water District to collect additional data at the sites of concern. This data was used to assess the potential presence of chemically-impacted areas within the project alignment. The investigation concluded that soil containing potentially hazardous concentrations of pesticide may be generated during construction if not remediated prior to construction. It was recommended that the Water District remediate or remove soils of elevated hazardous concentrations, which may require additional sampling to delineate these sites of high concentrations. It was also recommended that environmental monitoring and separation of impacted soil from non-impacted soil should be implemented during construction.

Kennedy/Jenks Consultants. 1996. *Preliminary Health Risk Assessment, Berryessa Creek Flood Control Project*. October 1996

In October 1996, Kennedy/Jenks prepared a preliminary health risk assessment for the Santa Clara Valley Water District in connection with the proposed flood control improvements along Berryessa Creek from Calaveras Boulevard in Milpitas to Old Piedmont Road in San Jose, California. The assessment concluded that for five chemicals, the calculated airborne concentrations at the water/air interface are above the Permissible Exposure Limits (PELs). This was not considered of concern due to the dilution effect that will occur before reaching the breathing zone. None of the calculated airborne chemical concentrations exceeded the PEL in the breathing zone. It was concluded that level D Personal Protective Equipment (PPE) is appropriate for construction activities along the portion of the Berryessa Creek studied.

Harvey, H.T. and Associates. 1997. *Santa Clara Valley Water District: California Red-Legged Frog Distribution and Status*. 1997

This 1997 report (H.T. Harvey and Associates) provides a general description of the California red-legged frog and its various life stages, the life history and ecology of the frog, and the history and distribution of the frog within the Santa Clara Valley Water District. The report describes the current threats to this frog in the Bay Area.

City of Milpitas. 2000. *Berryessa Creek Trail and Coyote Creek Trail Feasibility Report*. May 2000

This feasibility report evaluates Berryessa Creek and Coyote Creek to determine the feasibility of constructing pedestrian and bicycle trails along these two creek corridors. The study analyzes the benefits of the trails to the community, describes feasible trail alignments, and provides budget estimates for designing and constructing the trails. This report builds upon the 1997 Trail Master Plan, which identified Berryessa Creek and Coyote Creek as the two top trail priorities in the City of Milpitas. The study concluded that a seasonal trail could be developed along the entire 5.10 miles of Coyote Creek and that a seasonal trail could be constructed along approximately 70 percent of the 5.45 miles of Berryessa Creek.

U.S. Army Corps of Engineers, Sacramento District. 2005. *Value Engineering Report, Berryessa Creek Flood Control Project, Santa Clara County, California*. May 2005.

In April 2005, The Value Engineering Team (representatives from the Corps and SCVWD) performed a Value Engineering Study on the Berryessa Creek Element. The team executed the following: identified, evaluated, and classified project features and functions; determined and evaluated values to each function; developed a FAST Diagram based on the classification and evaluation of each function; proposed remedial alternatives for each function; evaluated the plausibility of each proposal and selected the most viable proposals for submittal; and provided documentation for alternatives on original design and VE proposals, costs comparison, savings, and justification for the selected proposal. The Value Engineering Team identified 15 proposals/alternatives. Of these, five were carried forward for further analysis and/or incorporation into the alternative plans.

1.5 REPORT ORGANIZATION

The document has been divided into nine primary chapters, each dealing with a specific subject area relating to the project components, alternatives, and the planning process. As previously mentioned, chapters noted in the report by an asterisk (*) are listed in the Council of Environmental Quality's Regulations for Implementing the National Environmental Policy Act. Three appendices, Environmental, Engineering and Design, and Economics, provided under separate cover, include technical and supplemental information.

<u>Chapter 1, Introduction</u>, provides background information concerning the purpose of and need for the project modification, project authorization, and project status, as well as the scope of the reevaluation study. This chapter also notes linkages with other related studies and reports.

<u>Chapter 2, Problems and Opportunities</u>, identifies current and expected problems and opportunities in the Berryessa Creek study area based on the reevaluation of existing and expected future without-project conditions.

<u>Chapter 3, Formulation of Alternative Plans</u>, describes the Corps planning process with respect to the selection of candidate alternative plans for detailed analysis. In this chapter, planning goals

are set, objectives are established, and constraints are identified. This chapter also identifies a range of potential management measures that address specific problems identified in Chapter 2 and identifies various combinations to create a series of alternative plans that adequately address the goals and objectives established. Likewise, a discussion is also provided for why alternatives were eliminated from further consideration.

Chapter 4, Affected Environment, provides a detailed presentation of the existing environmental conditions within the study area. This chapter also includes a complete discussion of environmental resources that would be affected by implementation of project alternatives.

Chapter 5, Evaluation of Alternative Plans and Potential Environmental Consequences, qualitatively and quantitatively describes potential impacts on the environment as a result of implementation of the alternative plans relative to existing conditions.

Chapter 6, Comparison of Alternative Plans, explains the criteria applied to the alternative screening process and the rationale and methodology behind the identification of final alternatives for detailed evaluation. This chapter includes a comparison and analysis of the final array of alternative plans and preliminary selection of one alternative plan that best meets the authorized project's objectives.

Chapter 7, Details of Recommended Plan, summarizes the environmental, economic, and social benefits and costs of the recommended plan.

Chapter 8, Public Involvement, describes the numerous coordination and public involvement activities conducted throughout the course of the reevaluation study. These activities include information workshops, status reports, informal briefings, presentations, and correspondence with various resource agencies.

Chapter 9, Remaining Reviews, Approvals, Implementation, and Schedule, identifies the estimated project timeline for future actions, defines commitments and responsibilities, and verifies the fulfillment of procedural notice and review requirements.

Chapter 10, Recommendations, presents the study conclusions and recommendations by the District Engineer.

Chapter 11, List of Preparers, identifies the list of individuals and organizations that contributed to the preparation of this report.

Chapter 12, Document Recipients, lists the individuals and organizations that will receive a copy of the Final GRR-EIS.

Chapter 13, References, lists references including studies, reports, analyses, and other reference materials used in the preparation of this report.

Chapter 14, Index, includes an alphabetical listing of important terms, phrases, and acronyms to aid the reader in understanding the document.

TECHNICAL APPENDICES (Volume 3)

Appendix A, Environmental, includes resource information related to environmental studies along the study reach.

Appendix B, Engineering and Design, is broken into four parts covering hydraulic analysis, floodplain development, geomorphology and sediment transport assessment, and design and cost of alternatives.

Appendix C, Economics, presents information regarding the social and economic resources that exist in the vicinity of the study area. This appendix also provides analyzes the flood damages for both the with- and without-project conditions as well as with-project benefits.

Appendix D, HTRW Assessment, provides the findings, conclusions, and results of the HTRW assessment. This was conducted to determine the potential existing and historical influence of contamination from activities in the area and the need for further action by the Corps, SCVWD, or other parties.

Appendix E, Real Estate, provides the Preliminary Real Estate Plan, which presents the baseline real estate cost estimates based on the analysis and assumptions made during the process of formulating and developing the alternatives.

Appendix F, Traffic and Circulation Analysis, provides the description of the existing street and transit systems, traffic volumes and levels of service, bicycle and pedestrian facilities, and planned improvements in the study area. This appendix also evaluates transportation impacts relative to conditions projected to exist when construction activities would likely to occur.

CHAPTER 2 – PROBLEMS AND OPPORTUNITIES

Water resources projects are planned and implemented to solve problems, meet challenges, and seize opportunities. In the planning setting, a problem can be thought of as an undesirable condition, while an opportunity offers a chance for progress or improvement. The identification of problems and opportunities gives focus to the planning effort and aids in the development of planning objectives. Planning objectives are statements of what a plan is attempting to achieve; they communicate to others the intended purpose of the planning process. Problems and opportunities can also be viewed as local and regional resource conditions that could be modified in response to expressed public concerns.

This chapter identifies the problems and opportunities in the study area based on the assessment of existing and expected future without-project conditions. The main areas of concern include the continued flooding on Berryessa Creek and resulting flood damages in the watershed, creek instability, degradation of riparian habitat areas, limited available water to support healthy riparian habitats, and the loss of recreation opportunities. Opportunities addressing the problems that are identified as potentially having Federal interest include: reduction of flooding damages, restoration of riparian areas that are incidental to the flood reduction features, and provision of recreation amenities.

2.1 WATERSHED DESCRIPTION AND LOCATION

The Berryessa Creek drainage basin covers 22.4 square miles in northeastern Santa Clara County. Berryessa Creek flows westerly from its origin in Mt. Hamilton of the Diablo Range through the cities of San Jose and Milpitas. It then turns north and channels into Lower Penitencia Creek, which is a tributary to Coyote Creek that flows into San Francisco Bay. The watershed area in the Diablo Range has clay surface soils that are potentially highly erodible and are subject to slope failure, settlement, and sedimentation. The basin consists of a large proportion of flat valley and foothill areas that have been urbanized rapidly and a significant percentage of steep mountainous areas that are utilized primarily for agricultural and resource extraction purposes.

The study area extends approximately 4.5 miles along Berryessa Creek, beginning downstream where Berryessa Creek meets Calaveras Boulevard (Highway 237) and ending 600 feet upstream of Old Piedmont Road at the base of the Diablo Range (see Figure 1-2). For the purposes of this chapter, Berryessa Creek, both upstream and downstream of the study area, is described. The creek flows west out of the Diablo Range and runs through an area comprised of undisturbed grazing land shaded by mature sycamore and eucalyptus trees. At Old Piedmont Road, the creek enters a predominantly residential section of San Jose. From Piedmont Road to Morill Avenue, the creek flows through a riparian greenbelt that includes a park. From Morill Avenue, the creek continues to flow west through earth and concrete-lined channels maintained by the Santa Clara Valley Water District. The creek then abruptly turns north after flowing under the Interstate 680 (I-680) and continues on through earth channels until reaching Calaveras Boulevard.

The study watershed is divided by the I-680 located approximately midway in the study reach into two distinct study sub-watersheds. The I-680 in the vicinity of the study area is raised with concrete sound walls lining each side of the freeway. This creates a barrier which prevents overland flooding from continuing to the lower portions of the watershed. The only opening in this barrier is the existing Berryessa Creek culvert under the freeway.

2.2 DESCRIPTION OF BERRYESSA CREEK REACHES

2.2.1 Main Project and Hydraulic Reaches

The study area has been divided into nine main reaches for overall description, analysis, and reporting purposes, as shown by Table 2-1. These nine reaches also correspond to the hydraulic reaches and reach descriptions throughout most of this document including descriptions of alternatives. The reaches are shown on Figure 2-1, and are referred to as "project reaches."

2.2.2 Analysis-Specific Reach Designations

In addition to the project reach designation, three other reference methods are used in this document. This is primarily due to how respective study surveys and analyses were divided within the natural differences within and surrounding the Creek. These additional reach or area designations exist for low-flow surveys, habitat surveys, and the analysis of economic impact areas. The following tables indicate the Low-Flow Index Reaches (Table 2-2) and the Habitat Reaches (Table 2-3). Table 2-4 shows how the reach delineations used in the low-flow and habitat studies correspond to the nine reaches described in Table 2-1. Finally, the economic analysis, discussed in Section 2.3.2.3 identifies flood zones by Economic Impact Areas.

Table 2-1 Berryessa Creek Study Area Reaches

Reach No.[1]	Location	Length (feet)	Description
0	Confluence with Lower Penitencia Creek to approx. 50 feet downstream of Calaveras Boulevard (Stream Miles 0.00 to 1.68)	8,850	The creek is bordered by residential development on both sides and parallels the Union Pacific Railroad (UPRR) for much of this reach. The creek crosses the Hetch Hetchy pipeline near Hillview Avenue downstream of Calaveras Boulevard. This reach is currently part of another study and is not part of the modeled study reaches for this reevaluation.
1	Approx. 50 feet downstream of Calaveras Boulevard to Los Coches Street Bridge (Stream Miles 1.68 to 1.77)	500	The existing channel is a trapezoidal earth channel through a highly industrialized area of Milpitas.
2	Los Coches Street Bridge to Piedmont Creek (Stream Miles 1.77 to 2.18)	2,150	The existing channel is a trapezoidal earth channel through a highly industrialized area of Milpitas.
3	Piedmont Creek to Montague Expressway (Stream Miles 2.18 to 3.15)	5,150	The existing channel is a trapezoidal earth channel through a highly industrialized area of Milpitas.
4	Montague Expressway to I-680 (Stream Miles 3.15 to 3.81)	3,450	The existing channel is a trapezoidal earth channel very close to the Milpitas-San Jose city limits. More residential development is present along this

Table 2-1 Berryessa Creek Study Area Reaches			
Reach No.[1]	**Location**	**Length (feet)**	**Description**
			reach.
5	I-680 to Morrill Avenue (Stream Miles 3.814 to 4.43)	3,200	The reach between I-680 and Cropley Avenue is a trapezoidal concrete channel; the reach from Cropley Avenue to Morrill Avenue is a trapezoidal earth channel. This area is primarily residential and has poor access to the creek.
6	Morrill Avenue to Pedestrian Bridge (Stream Miles 4.43 to 5.02)	3,200	This reach is a combination of constructed channels. The downstream portion is a rectangular concrete channel; the middle a trapezoidal channel; the upstream portion a drop structure with concrete channel bottom. This reach includes the Sierra Creek confluence, the control structure, and the lower reaches of the Greenbelt area.
7	Pedestrian Bridge to Cropley Avenue & Piedmont Road Intersection (Stream Miles 5.02 to 5.45)	2,300	The existing channel is This reach includes the park, upper half of the Greenbelt area, and the sediment basin immediately below the Cropley Avenue and Piedmont Road intersection.
8	Cropley Avenue & Piedmont Road Intersection to Old Piedmont Road (Stream Miles 5.45 to 5.64)	1,000	This is an incised channel section that includes the Cropley Avenue culvert, and a segment of steep channel to the Old Piedmont Road Bridge.
9	Old Piedmont Road to Upper Project Boundary (600 feet from upstream face of Old Piedmont Road Bridge) (Stream Miles 5.64 to 5.74)	500	This short reach includes the most natural riparian habitat.
[1] The authorized project being reevaluated by the GRR study consists of Reaches 1 through 9; locations are approximate.			

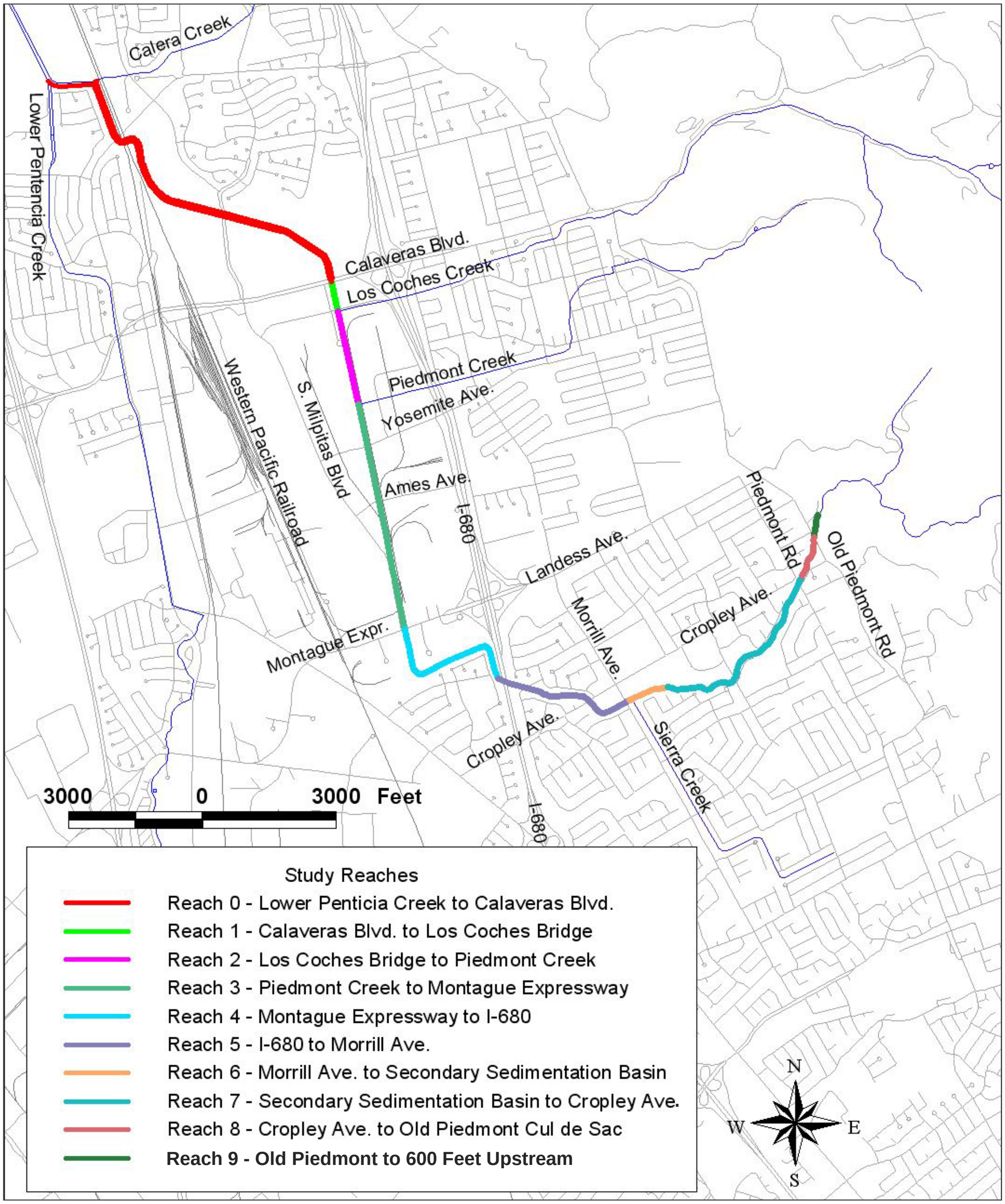


Figure 2-1 Berryessa Creek Study Area Reaches

Table 2-2 Low-Flow Index Reach Descriptions			
Reach No.	**Location**	**Length**	**Description**
1	Upstream of Old Piedmont Road	500 feet	Natural channel; forested with native and non-native species.
2	Old Piedmont Road to Piedmont-Cropley Culvert	700 feet	Artificial trapezoidal channel; unlined; steep dirt banks; no riparian.
3	Piedmont-Cropley Culvert	400 feet	Concrete box culvert.
4	Piedmont-Cropley Culvert to Drop Structure	4,700 feet	Natural channel; forested riparian although mowed in some areas; low levees present.
5	Drop Structure to Cropley Avenue	1,600 feet	Artificial trapezoidal channel; concrete-lined at corners; no riparian.
6	Cropley Avenue to I-680	2,000 feet	Artificial trapezoidal channel; concrete-lined.
7	I-680 to Calaveras Boulevard	11,500 feet	Artificial trapezoidal channel; unlined; steep dirt banks; no riparian.
Locations are approximate.			

Table 2-3 Habitat Reach Description			
Reach No.	**Location**	**Length**	**Description**
H-1	Coyote/Lower Penitencia Creeks Confluence to Berryessa/Lower Penitencia Creeks Confluence	7,100 feet	Artificial trapezoidal channel; tidally influenced; herbaceous wetland species present.
H-2	Berryessa/Lower Penitencia Creeks Confluence to Arroyo de Las Coches	6,400 feet	Artificial trapezoidal channel; very wide with sediment deposits forming floodplain and perennial flow; minimal riparian
H-3	Arroyo de Las Coches to Montague Expressway	7,200 feet	Straight artificial channel; no riparian; no perennial flow upstream of Piedmont Creek.
H-4	Montague Expressway to 100 feet upstream of Morrill Avenue	5,900 feet	Artificial trapezoidal channel with concrete lining; no riparian zone; no perennial flow.
H-5	100 feet upstream of Morrill Avenue to Old Piedmont Road	6,100 feet	Greenbelt; mostly natural channel with low levees; good riparian zone present.
H-6	Upstream of Old Piedmont Road	3,200 feet	Natural channel; well-developed riparian zone although dominated by eucalyptus at lower 200 feet; gravel/sand substrate with boulders and moderate amount of wood.
Locations are approximate.			

Table 2-4 Comparison of Low-Flow and Habitat Reaches			
Reach No.	**Location**	**Corresponding Low-Flow Index Reaches**	**Corresponding Habitat Reaches**
0	Confluence with Lower Penitencia Creek to Calaveras Boulevard (Stream Miles 0.00 to 1.68)	N/A	H2
1	Calaveras Boulevard to Los Coches Street Bridge (Stream Miles 1.68 to 1.77)	7	H2
2	Los Coches Street Bridge to Piedmont Creek (Stream Miles 1.77 to 2.18)	7	H3
3	Piedmont Creek to Montague Expressway (Stream Miles 2.18 to 3.15)	7	H3
4	Montague Expressway to Interstate 680 (Stream Miles 3.15 to 3.81)	7	H3
5	Interstate 680 to Morrill Avenue (Stream Miles 3.814 to 4.43)	~ 5, 6	H4
6	Morrill Avenue to Pedestrian Bridge (Stream Miles 4.43 to 5.02)	~ 5	H5
7	Pedestrian Bridge to Cropley Ave. & Piedmont Road Intersection (Stream Miles 5.02 to 5.45)	~ 4	H5
8	Cropley Avenue and Piedmont Road Intersection to Old Piedmont Road (Stream Miles 5.45 to 5.64)	2, 3	H5
9	Old Piedmont Road to Upper Project Boundary (Stream Miles 5.64 to 5.74)	1	H6
Locations are approximate.			

2.3 FLOODING AND FLOOD DAMAGE

2.3.1 Related Water Resources Projects

2.3.1.1 Coyote Creek Projects

Coyote Creek was the first element of the Coyote/Berryessa Flood Control Project to be implemented. Coyote Creek drains Santa Clara County's largest watershed, encompassing most of the eastern foothills, the City of Milpitas, and portions of the cities of San Jose and Morgan Hill. For many years, inadequate and unstable levees constructed by farmers existed along lower Coyote Creek providing uncertain protection to communities in Alviso, North San Jose, and Milpitas. Never intended to meet modern flood risk management criteria, the levees were unreliable and posed a great potential hazard to adjacent development. The Coyote Creek Project, authorized in 1990, was completed and turned over to the SCVWD in 1996. The project extends from San Francisco Bay to Montague Expressway. The project included levee construction, excavation of a parallel overflow channel, and extensive environmental mitigation designed in compliance with the Endangered Species Act.

Mitigation of impacts associated with the Coyote Creek Project was completed in 2000. Mitigation consisted of revegetating 22 acres of riparian forest habitat, of which twenty acres were planted to mitigate for project impacts, and the additional two acres were planted at the SCVWD's request (on behalf of the City of Milpitas to offset a portion of the impacts from the construction of the Tasman Drive Bridge Overcrossing). An additional 5.2-acre site and a 7-acre site of riparian forest habitat were planted and established downstream of Highway 237 to mitigate for project impacts. Therefore, a total of 32.2 acres of riparian forest habitat were planted to mitigate for the flood risk management improvements. In addition, the project included features designed to protect and improve habitat in an area of approximately 52 acres for the state- and Federally-endangered Salt Marsh Harvest Mouse and to mitigate for loss of salt pond habitat. The improvements included creation of seasonal wetlands and construction of a 16.5-acre brackish water bird pond. Environmental research conducted along the project has led and continues to lead to improvements in design for flood risk management projects for the SCVWD and others. Ongoing monitoring of the mitigation sites is conducted by the SCVWD.

2.3.1.2 Lower Berryessa Creek Project

Downstream of the authorized project, the SCVWD is concurrently investigating the need for improvements to existing flood risk management facilities (existing levees and floodwalls) for an approximately 8,800-foot reach along Berryessa Creek, from just downstream of Calaveras Boulevard downstream to Lower Penitencia Creek.

This 1.7-mile-long project is bordered by residential development on both sides and traverses the center of Milpitas in a highly developed area. Because flooding is a major problem in this area, a hydraulic analysis was performed in 1993 to assess the flood risk management capacity of the creek downstream of Calaveras Boulevard. The analysis showed the creek downstream of Calaveras Boulevard was unable to handle the design 1-percent or 100-year flood event. The primary objectives of this project include (1) providing flood control from the 100-year flood event; (2) improving access for creek maintenance; (3) improving the levees' durability; (4) enhancing environmental values; (5) improving water quality; (6) and providing recreational access to the public in cooperation with the City of Milpitas.

The SCVWD is currently evaluating existing creek conditions and developing alternatives that meet the project's objectives. These alternatives may include one or a combination of the following: increasing levee heights, constructing floodwalls or setback levees, and enlarging the creek. The Draft EIS/ER was made available for public review on June 28 through August 12, 2011. Construction is scheduled to begin in fall 2013. The Lower Berryessa Creek Project is assumed to be part of the without-project conditions for this study.

2.3.1.3 Upper and Lower Penitencia Creeks Projects

(a) Upper Penitencia Creek

Upper Penitencia Creek is a major tributary of Coyote Creek and drains a portion of the city of San Jose. The Upper Penitencia Creek project is approximately 4.2 miles long that begins at the confluence with Coyote Creek and ends at Dorel Drive. Over the past 20 years, Upper Penitencia

Creek has experienced severe flooding that resulted in damage to residential, commercial and industrial properties, as well as erosion of the creek's levees.

Because flooding is a major problem in this area, the Santa Clara Valley Water District requested the Corps to evaluate alternatives that would provide flood risk management in an environmentally sensitive manner. As a result, the Corps is preparing a feasibility study for Upper Penitencia Creek as authorized by Section 4 of the 1941 Flood Control Act (Public Law 77-228).

The primary objectives of the project are to:

- Provide flood control from a 1-percent or 100-year flood event
- Enhance native riparian and fisheries habitat
- Improve creek maintenance
- Improve water quality
- Provide recreational access to the public in cooperation with the City of San Jose

The Corps is currently evaluating existing creek conditions and will develop alternatives that meet the project's objectives. These alternatives may include a combination of the following:

- Modifications to floodplains
- Levees and floodwalls
- Bypass channels
- Bridge replacements and modifications
- Realignment of the creek

The preconstruction engineering and design phase was anticipated to begin in 2011, with construction anticipated to begin in 2015 (ESA 2011).

(b) Lower Penitencia Creek

Lower Penitencia Creek experienced severe flooding in the past especially in 1982 and 1983. Since then, channel modifications have been made to contain the 1-percent flood event with three feet of freeboard. This design significantly limits the overflow of Lower Penitencia into the adjacent floodplain of Berryessa Creek. Lower Penitencia Creek capacity is 6,700 cfs immediately downstream of Berryessa Creek, and 7,000 cfs at the confluence with Coyote Creek. The bank full capacity of Lower Penitencia Creek downstream of the Berryessa Creek confluence is about 10,000 cfs.

2.3.2 Historical and Existing Conditions

2.3.2.1 Historical Flooding

Flooding within the Berryessa Creek watershed and vicinity has occurred often during the past decades. Stormwater flooding inundating streets and yards is estimated to occur on an average of at least once every four years. Overflow channel flooding, causing damage to structures, infrastructure, etc., is estimated to occur along Berryessa Creek on the average of once every 10 to 20 years.

(a) Flood of 1982

The March 31, 1982, storm caused high rainfall and extensive flooding and damage to the east and central portions of San Jose and Milpitas and other areas. Flows overtopped the banks of Coyote Creek, Lower Penitencia Creek, Guadalupe River, and to a lesser degree, Berryessa Creek and South Babb Creek. Berryessa Creek overflowed its banks approximately 1,000 feet upstream of Calaveras Boulevard, but no specific damage estimates were reported. The estimated peak flow for Berryessa Creek above Calaveras Boulevard was 870 cfs, which is approximately a 2-year event. The recorded peak since 1970 was 1,002 cfs.

(b) Flood of 1983

Significant flooding occurred in Santa Clara County as a result of the storms of January 22-30, February 5-8, and February 28 through March 4, 1983. After the January flooding, the Governor of California issued a State of Emergency Declaration, and the President of the United States issued a Declaration of a Major Disaster for Public Assistance. Both documents included Santa Clara County and were extended to cover the storms of February and March. The inclusive dates of the declarations are January 21 through March 30, 1983.

The January storm caused flooding in many areas of the valley. On the east side of the valley, significant flooding occurred from Coyote Creek, Berryessa Creek, Lower Penitencia Creek, Upper Penitencia Creek, Los Coches Creek, and Sweigert Creek, causing property damage in the cities of San Jose and Milpitas.

Although no dollar value was recorded, Berryessa Creek experienced major flooding on January 22, 1983. Debris and sediment transported by the floodwaters blocked the culvert at Old Piedmont Road and impeded the flow through other culverts downstream, causing overbank and extensive street flooding. Overbanking also occurred immediately upstream and downstream of Montague Expressway and between Yosemite Drive and Calaveras Boulevard in Milpitas. It was reported that at least six businesses suffered water and sediment damage from flooding in this commercial/industrial area. Floodwaters eventually made their way westerly and flooded the streets and parking lots in the vicinity of Abel and Marylinn Streets in Milpitas. Berryessa Creek peak flows above Calaveras Boulevard were estimated to be 1,045 cfs, 210 cfs, and 300 cfs, for the January 22-30, February 5-8, and February 23-March 4, floods, respectively. The 1,045 cfs exceeded the historical peak flow recorded since the records began in 1970.

(c) Flood of 1998

On February 3, 1998, precipitation from a storm of an approximate 10-year return frequency caused flooding in several locations throughout Santa Clara County (Schaaf & Wheeler 1998). During high tide in San Francisco Bay, water from Berryessa Creek backed up into Calera Creek and overflowed through a low point in the levee adjacent to the Union Pacific Railroad tracks. Water from this levee breach and a coincident failure of a stormwater pump station caused flooding of up to four feet in the California Landing area of Milpitas.

2.3.2.2 *Problem Areas*

The descriptions and problems presented herein are a result of reviewing historic flood information, field inspections, professional judgment of the Project Delivery Team (PDT); technical analyses especially involving detailed hydraulic modeling of the system, and review of available data and reports. Table 2-5 provides information on the channel capacities by reach.

Table 2-5 Channel Flows and Capacities					
GRR Study Reach	**Description**	**FLO-2D Grid Element/HEC-RAS Station**[1]	**100-Year Flow** [2] **(cfs)**	**Channel Capacity (cfs)**	**Average Channel Capacity (cfs)**
9	Upstream Old Piedmont Road	Upstream 3106	1,430	420-2,140	1,430
6/7/8	Sweigert Creek – Old Piedmont Road	2850 – 3106	1,430	1,040 – 1,925	1,180
6	Crosley Creek – Sweigert Creek	2334-2850	1,530	590 – 2,330	1,110
6	Sierra Creek – Crosley Creek	1375-2334	1,740	1,030 – 1,440	1,100
5/6	Cropley Ave. – Sierra Creek	890-1375	2,140	1,410 – 1,870	1,580
5	I-680 – Cropley Avenue	43-890	2,140	2,500 – 3,140	3,000
4	Montague Expressway – I-680	21738 – 25575	2,140	830 – 3,140	2,000
3	Ames Avenue – Montague Expressway	18843 – 21738	2,780	1,350 – 3,500	2,500
3	Piedmont Creek – Ames Avenue	16654 – 18843	2,780	1,350 – 3,500	1,500
2	Los Coches Street – Piedmont Creek	14388 – 16654	3,880	840 – 2,250	1,500
1	Calaveras – Los Coches Street	13804 – 14388	4,990	1,600 – 2,550	1,600

[1]The Berryessa Creek channel was modeled using FLO-2D upstream of I-680 and HEC-RAS downstream.
[2] Source: NHC 2006

Figure 2-2 and Figure 2-3 depict the 0.01 and 0.002 exceedance probability event floodplain inundation maps, respectively, for Berryessa Creek. Please refer to Appendix B, Engineering and Design Appendix, for detailed descriptions of the analysis procedures and results that were used to help identify and describe the without-project flood conditions.

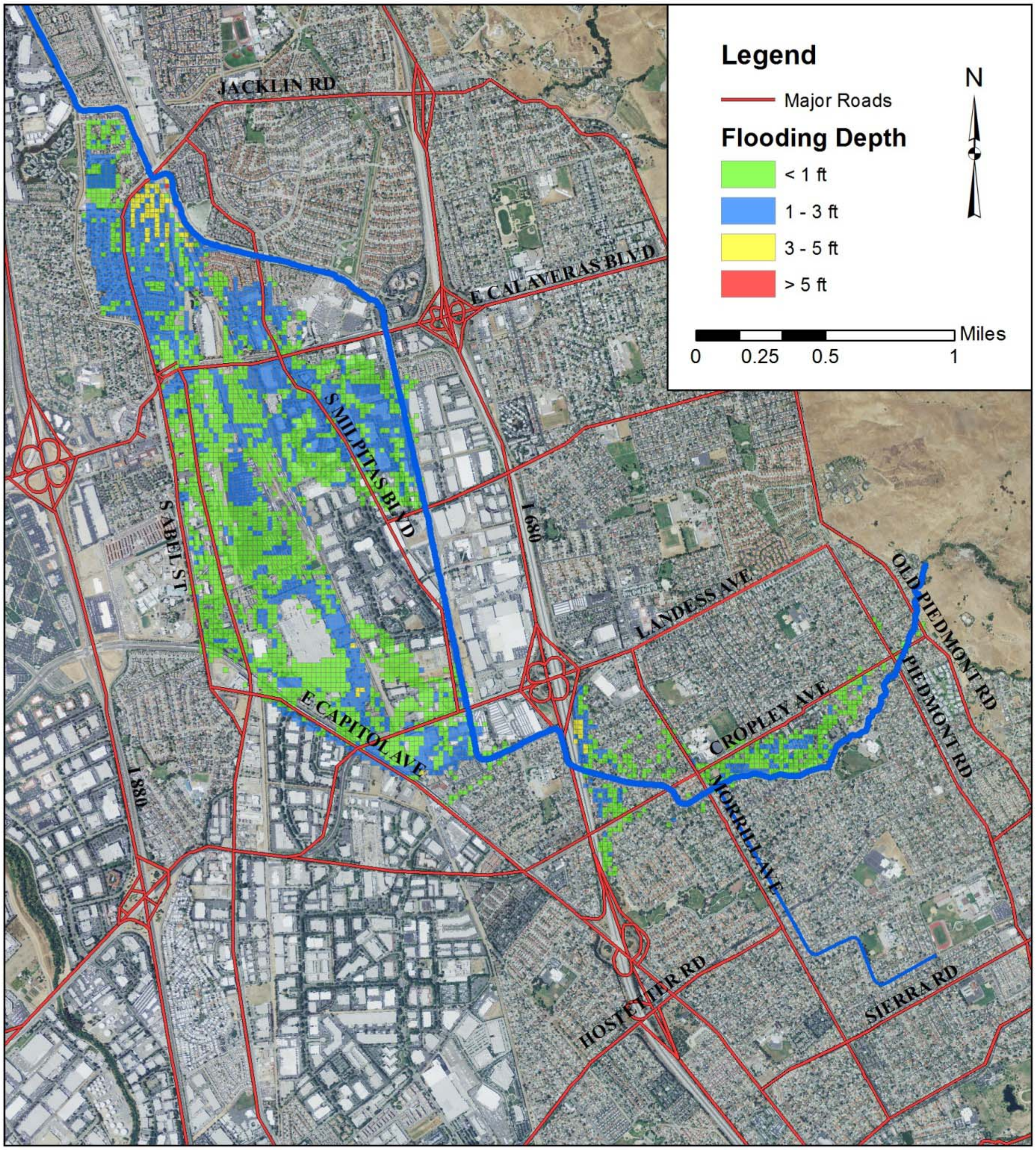


Figure 2-2 0.010 Exceedance Probability Event Floodplain

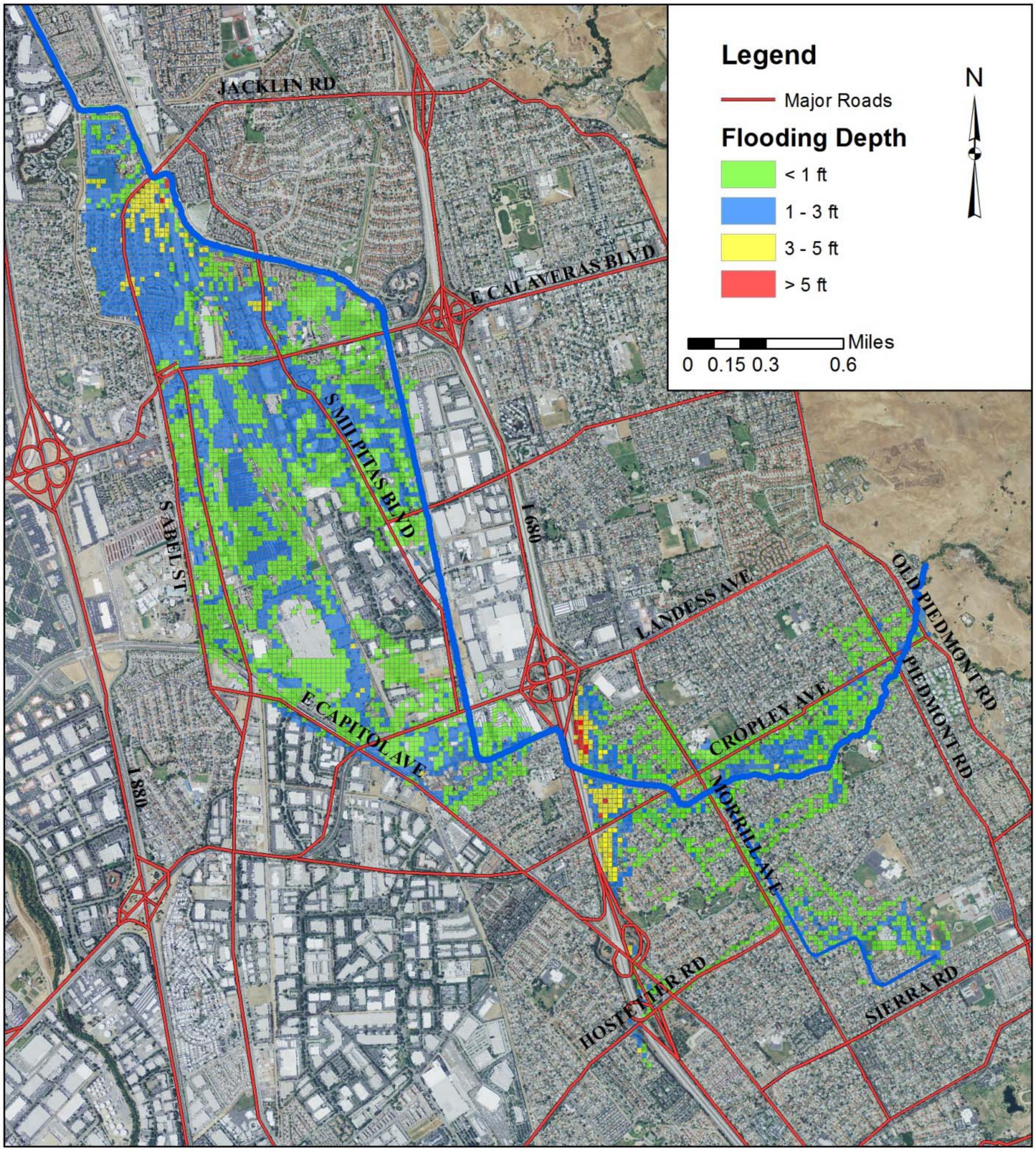


Figure 2-3 0.002 Exceedance Probability Event Floodplain

(a) Comparison of FEMA Floodplain with Current Corps' Reevaluation Study

Figure 2-4 compares the 0.010 exceedance probability without-project floodplain with the currently accepted FEMA 100-year floodplain. The FEMA floodplain is mapped on the following FEMA map panels.

- Panel 9 of 64 of City of San Jose, Santa Clara County California FIRM, Community Panel Number 060349 0009G, revised August 17, 1998
- Panel 10 of 64 of City of San Jose, Santa Clara County California FIRM, Community Panel Number 060349 0010E, revised August 17, 1998
- Panel 1 of 4 of the City of Milpitas, Santa Clara County, California FIRM, County Panel Number 060344 0001G, revised June 22, 1998
- Panel 3 of 4 of the City of Milpitas, Santa Clara County, California FIRM, County Panel Number 060344 0003G, revised June 22, 1998

The FEMA floodplain shows the results of a commingled floodplain resulting from Berryessa Creek overflows and a number of other contributing flood sources in the study area including Sweigert Creek, Sierra Creek, and Penitencia Creek. (The Penitencia Creek floodplain no longer occurs due to the Penitencia Creek Project.) Floodplains specific to the Upper Sweigert and Sierra Creeks are not part of the current study, although consideration was made to the capacity of the culvert inlets for discharges associated with Sweigert and Sierra Creeks that are conveyed to Berryessa Creek.

Sweigert Creek is conveyed entirely through a culvert under the urbanized portion of its floodplain to Berryessa Creek while Sierra Creek is conveyed partially through the urban area in a culvert then through an open channel to Berryessa Creek. The current study accounted for the capacity in the inlet to the Sweigert Creek culvert, conveying only the flow in the culvert to Berryessa Creek. Note that the inlet to the culvert is located outside of the study area; therefore the flooding from this source was not modeled. In addition, the current study included updating the FLO-2D modeling to include the Sierra Creek channel from its culvert outlet to Berryessa Creek. The flow in the Sierra Creek channel was allowed to break out the channel, and this flooding was included as part of the floodplain mapping.

Upstream of I-680, as seen in Figure 2-4, the without-project and FEMA floodplains generally agree, considering that the majority of the flooding to the southeast of the creek upstream of Morrill Avenue is the result of Upper Sierra Creek and Sweigert Creek flooding. However, the following differences were observed between the two floodplains. Except as noted above (commingling and independent tributary floodplains) and in the individual items below, the differences are due to the increased accuracy of the FLO-2D model as well as where the breakouts were assumed to occur in the older HEC-2 model.

- The current without-project floodplain shows a small amount of additional flooding from the Old Piedmont Road Bridge breakout to the northwest that is not present in the FEMA floodplain.

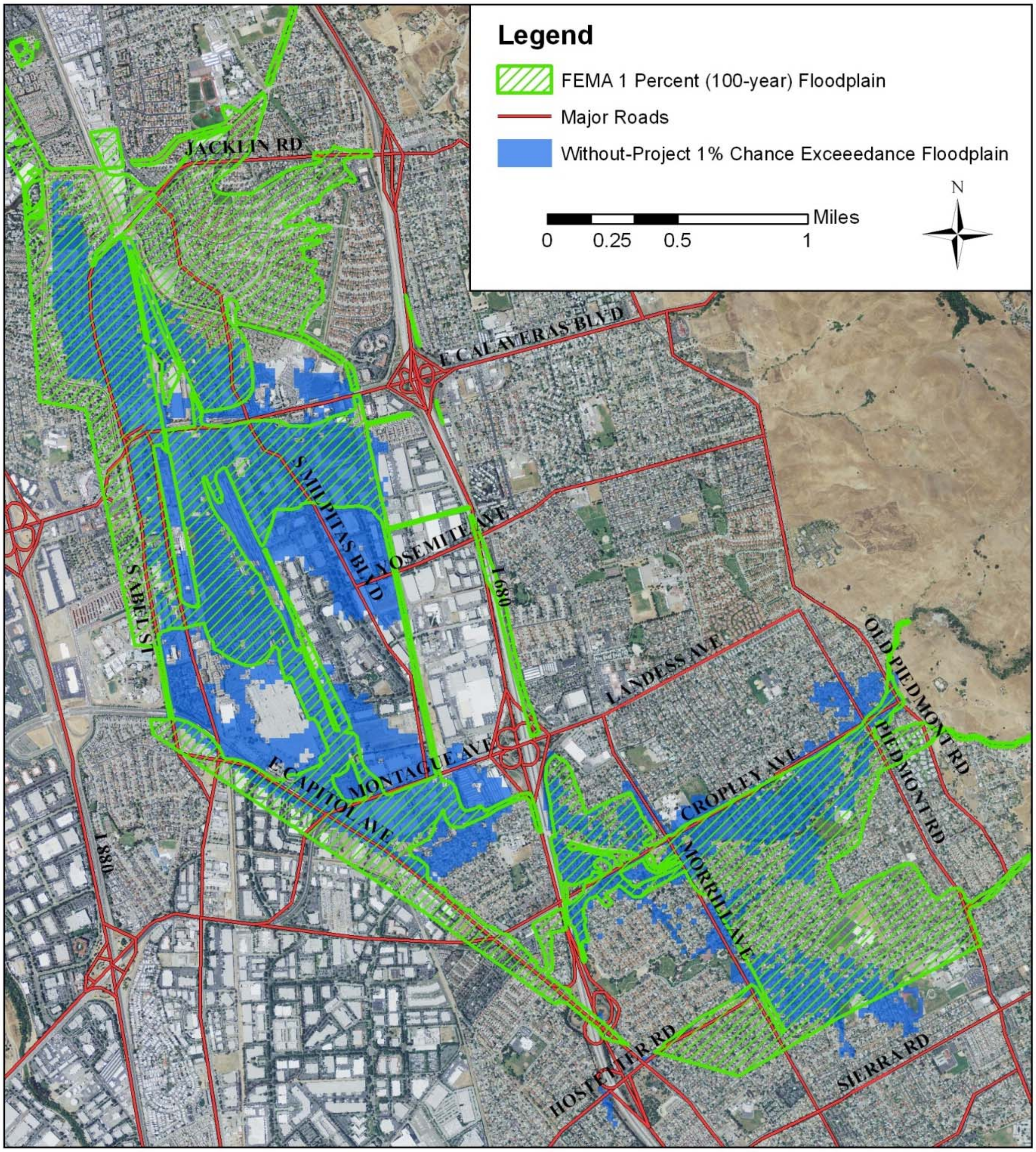


Figure 2-4 Comparison of the FEMA 100-Year Floodplain and Without-Project 0.010 Exceedance Probability Event Floodplain

- The current without-project floodplain shows a small amount of flooding to the north of Cropley Avenue upstream of Morrill Avenue.

- A small breakout from Berryessa Creek is present in the current without-project floodplain just downstream of the I-680 culvert.

- The breakout from upstream of Montague Expressway in the current without-project floodplain shows flooding to the northwest that is not in the FEMA floodplain. This flow follows the prevailing topography and is considered more accurate.

- The current without-project floodplain shows the area just north of Montague Expressway and east of Capitol Avenue to be flooded where the FEMA floodplain contains areas that are not flooded. The FEMA floodplain assumed that a railroad embankment contained flows in this area, whereas the area actually consists of low-lying land that receives water from surrounding and adjacent overflow areas.

- The current without-project floodplain shows breakouts near Yosemite Drive flowing to the northwest and west, compared to the FEMA floodplain. This flow follows the prevailing topography and is considered more accurate.

(b) Berryessa/Penitencia Creek Interaction

FEMA floodplain maps for both Berryessa and Penitencia Creeks indicate that limited interaction exists between the floodplains. Some commingled flow in Zone D, "undetermined, but possible," is shown near Montague Expressway and Capital Avenue resulting from an Upper Penitencia breakout; however the slope in the overall area would cause this flooding to be more likely due to Berryessa Creek. Throughout the overall area, both Berryessa and Penitencia Creeks have been rerouted to cut across the terrain. The same reason that Berryessa only floods to the west in the region would also be true for Penitencia Creek to a point.

Another area of commingled flow on the FEMA maps is due to a breakout from Lower Penitencia Creek at the extreme downstream end of the project. Topographic data covering the Upper Penitencia Creek and Berryessa Creek floodplains has been reviewed to evaluate the possibility of co-mingling floodplains. Topographic data (floodplain slopes and flow paths) and natural and man-made barriers (Lower Penitencia Creek, Capitol Avenue, and I-880) indicate that co-mingling floodplains will have no measurable impacts.

(c) Description of Reaches and Associated Problems

Upstream of Old Piedmont Road (Reach 9)

The authorized upper project limit is 500 feet above Old Piedmont Road. Erosion upstream of the study area and resulting sediment transport through this reach into the lower system is a major problem. Much of the sediment appears to come from hillside erosion. Stream bank erosion is also noted in several locations (NHC 2003). If no action is taken it is assumed that sediment will continue to be transported from this reach into the downstream reaches of

Berryessa Creek. The riparian habitat is likely to degrade with potential development of agricultural lands in the future.

Old Piedmont Road to Piedmont-Cropley Avenue Culvert (Reach 8)

The upper end of the reach is the Old Piedmont Road Bridge. The bridge has been overtopped several times, most noticeably in 1983. Floodwaters overtopping the bridge and road flood adjacent streets and yards and in some instances may inundate structures. However, not all the flow overtopping the bridge will escape into the floodplain; rather flow will split with some escaping and flowing down adjacent streets, with the remaining flow returning to the channel. Once flow escapes the channel at Old Piedmont Road and flows down adjacent streets, it was assumed that the flow would return to the channel further downstream, just upstream of I-680.

The bridge has an existing concrete apron and drop structure which likely precludes all fish passage. Downstream of the bridge the channel is steep, bends to the left, and shows noticeable degradation to the channel bottom and side slopes. The erosion along the right bank threatens the adjacent residential yards. The SCVWD service road follows the stream adjacent to the top of the left bank. Erosion of both bed and banks is likely to continue to occur in this reach.

The existing 400 feet Cropley and Piedmont Culvert at the downstream end of the reach is the major problem feature of the Berryessa Creek system above I-680. It is located diagonally under the intersection of Cropley Avenue and Piedmont Road. The 12-feet-by-7-feet reinforced concrete box (RCB) culvert capacity is currently significantly reduced due to sediment deposition throughout its length. During a 2004 site visit, it was 50- and 25-percent blocked at the upstream inlet and downstream outlet, respectively. The existing culvert capacity is therefore estimated capable of carrying less than the 2-percent event flow. The adjacent residences near the inlet of the culvert are threatened when flows overtop the headwall of the culvert. Velocities are estimated to exceed 5-6 feet per second (fps) some 1,600 feet down Cropley Avenue, flooding the street and yards. The overflows pond in the low residential areas along Berryessa Creek between Morrill Avenue and I-680 and inundate numerous structures. The culvert is located at a natural alluvial fan area where sediment deposition rates are commonly high (as the steep channel suddenly transitions to the flatter valley).

If flood damage reduction measures and other actions are not implemented, the existing conditions will likely degrade into the future with more stream bank erosion and sediment deposition at the Cropley Avenue culvert. The threat from overtopping of the Old Piedmont Road Bridge and the Cropley Avenue culvert will continue as will the associated flooding of residential structures adjacent to the stream and from Morrill Avenue to I-680. The velocities and depths of the overflows down Cropley Avenue also present a serious threat to the traffic and cross traffic from the numerous flooded intersections.

Piedmont-Cropley Culvert to Morrill Avenue, also called the Greenbelt Area (Reach 6 and Reach 7)

This upper end of Reach 7 begins just downstream of the Cropley Avenue culvert at the existing sediment basin. The creek flows through the only remaining floodplain with a moderate-to-high quality riparian community of grasses and trees until it reaches the park near the school at the lower limits of Reach 7. A pedestrian footbridge crosses the stream near the upper limits of Reach 8. The channel and floodplain are relatively stable throughout both reaches until the drop structure located upstream of Sierra Creek some 600 feet above Morrill Avenue. This lower segment is concrete-lined. A major control structure exists just upstream of the confluence with Sierra Creek. Flows through these two reaches are intermittent, although pools are present in the greenbelt for most of the year.

Continued maintenance activities in the floodplain such as mowing and clearing are degrading the riparian habitat and contributing to the erosion of the floodplain and stream banks. Uncontrolled public use is also damaging the stream banks.

Morrill Avenue to Highway 680 (Reach 5)

A concrete lined channel begins 150 feet upstream of the reach at Sierra Creek and continues to Morrill Avenue. The flow in Berryessa Creek will overflow at Morrill Avenue Culvert for the larger events due to the large inflow from Sierra Creek. Due to the configuration of the Morrill Avenue Bridge a headwall serves to direct overflows at the culvert away from the creek and down Morrill Avenue.

The flow overtopping the Morrill Avenue Culvert flows south of the channel and west toward I-680. North of the channel the Cropley-Piedmont culvert overflow flows west toward I-680, then south, back into the channel just upstream of I-680. I-680 is assumed to act as a barrier to flow in the downstream direction. From Cropley Avenue to I-680, the trapezoidal channel is concrete.

The flooding of residential structures in this reach is due to the overflows from Morrill Avenue and the Cropley Avenue culverts. If upstream actions are not taken to limit the Cropley Avenue culvert overflows, the flood threat to the low lying structures and associated contents in the vicinity of Berryessa Creek will continue.

I-680 to Montague Expressway (Within Reach 4)

The channel in this reach is earthen trapezoidal from under I-680 through the Montague Expressway Bridge. The two 90-degree bends are concrete-lined showing areas of bank erosion at the transitions. The channel through the 90-degree bends has the capacity to carry only a 20- to 25-year event with reasonable certainty. Flows breaking out of the main channel will flow to the areas of lowest elevation near Lower Penitencia Creek and continue north to its confluence with Berryessa Creek. These overflows will cause significant damage to commercial and industrial structures and contents. If no actions are taken, the future flood threat and bank erosion will continue.

Montague Expressway to Piedmont Creek (Reach 3)

This reach has an earthen, generally trapezoidal shaped channel with bank erosion along parts of the stream. The channel is estimated to have the capacity to carry the 25-year event with reasonable certainty. The existing conditions overflow occurring in the reach above the Montague Expressway limits the channel flows through this reach. Overflow from the channel is thus limited. The Union Pacific Railroad trestle crossing the channel is in poor condition. There is a breakout resulting from backwater at the trestle just downstream of Montague Expressway and another breakout near the Yosemite Drive Bridge. There is essentially no floodplain or riparian zone in this reach.

Piedmont Creek to Los Coches Creek (Reach 2)

The existing channel is generally of a trapezoidal shape with bank erosion occurring in various areas. The inflow from Piedmont Creek and a low 1,500-foot segment along the left bank result in channel overflows from an estimated 5-year event. The overflows cause shallow flooding but significant damage to nearby commercial and industrial buildings and their contents. There is essentially no floodplain or riparian zone in this reach.

Los Coches Creek to Calaveras Boulevard (Reach 1)

The existing channel is generally of a trapezoidal shape with bank erosion occurring in various areas. The inflow of Los Coches Creek adds to the limited capacity of the existing channel and the Calaveras Bridge capacity. However, the overflows from the upstream reach below Piedmont Creek somewhat limit the existing conditions flood threat in the reach. Still, under without project conditions, the Calaveras Boulevard Bridge could be overtopped from coincident Berryessa and Los Coches Creeks flows. There is essentially no floodplain or riparian zone in this reach.

2.3.2.3 Existing Without-Project Flood Damages

(a) Impact Areas

For economic evaluation and project performance purposes, the study area was divided into six economic impact areas. The impact areas delineations, as described below, were established to address changes in hydrology, hydraulics, and economic conditions throughout the study area. The delineations also took into consideration the types and locations of potential flood damage reduction measures and actions that may be formulated and evaluated during the next phase of the process. A map of the six impact areas is shown in Figure 2-5.

- *Impact Area A (73.90 acres)* lies farthest east and runs from Old Piedmont Road to the intersection of Cropley Avenue and Piedmont Road. Inundation in this impact area is limited to street flooding.

- *Impact Area B (132.14 acres)* includes Cropley Avenue and runs along the right bank from Piedmont Road to Morrill Avenue. The area is primarily residential.

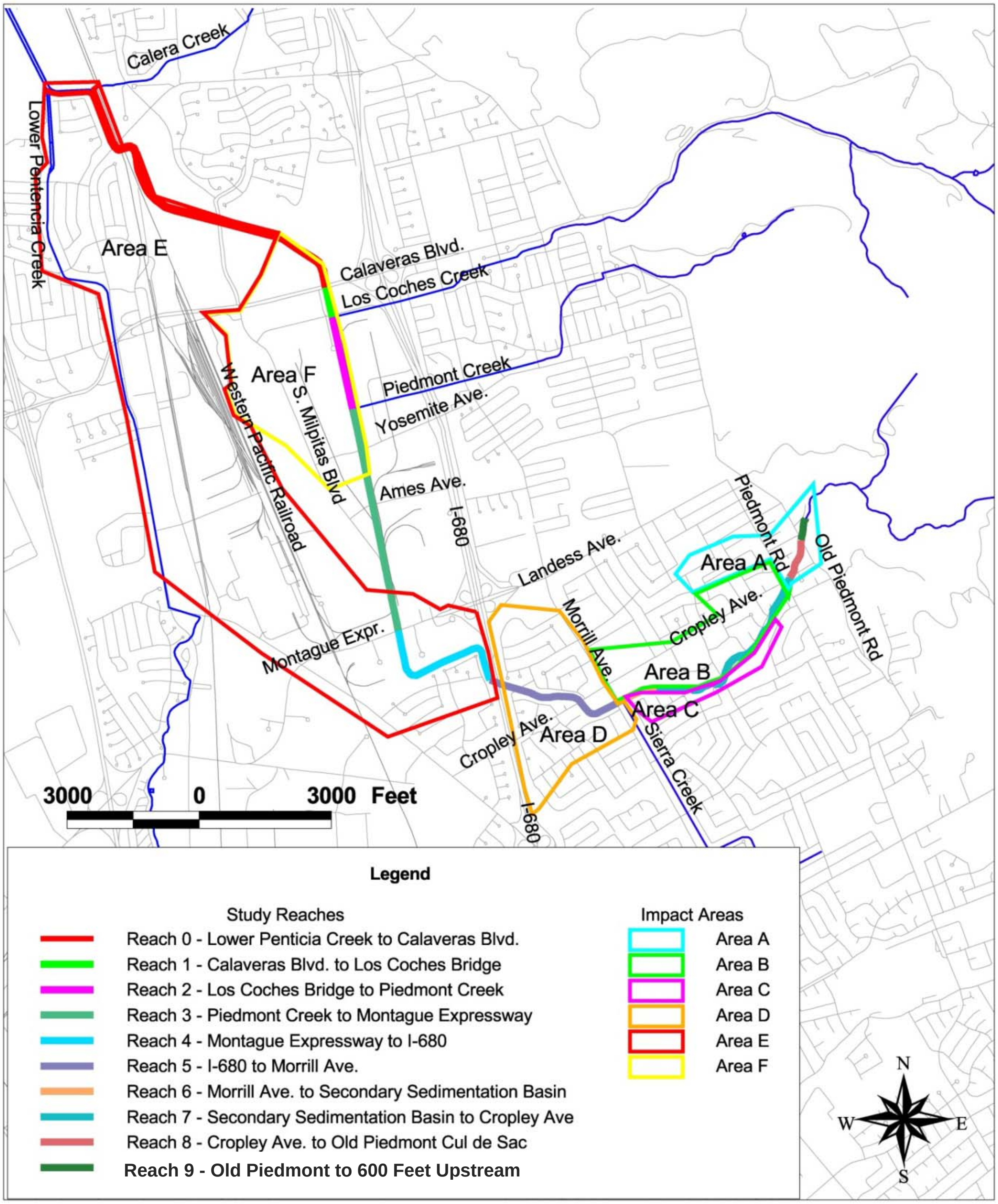


Figure 2-5 Economic Impact Areas

- *Impact Area C (30.53 acres)* runs along the left bank just past Majestic Elementary and Berryessa Creek Park downstream just east of Morrill Avenue.

- *Impact Area D (193.79 acres)* runs from Morrill Avenue to the I-680 Freeway. This area in San Jose is entirely residential.

- *Impact Area E (1,216.28 acres)* is the largest impact area in the study and begins just west of I-680. The area is bounded by Capitol Avenue, Abel Street, and Berryessa Creek. This area includes the Midtown region on Milpitas and includes residential, commercial, public, and industrial land uses.

- *Impact Area F (368.68 acres)* runs along a short section of the left bank of Berryessa from Yosemite Drive to near Los Coches Street and east of the Union Pacific railroad line. This impact area is highly industrial with many hi-tech firms in addition to some commercial and limited residential.

(b) Inventory

The structural inventory was based on data gathered from assessor's parcel data and on-site inspection of the structures within the floodplain. Structures were determined to be within the economic data area by using Geographical Information Systems (GIS) to compare the 0.002 exceedance probability floodplain boundary with the spatially referenced assessor parcel numbers (APN). Information from the assessor's parcel database (such as land use, building square footage, and address) was supplemented during field visits for each parcel within the floodplain. Parcels, with structures, were categorized by land use and grouped into the following structural damage categories.

- Single Family Residential includes all parcels represented by a single unit such as detached single family homes, individually owned condominiums, and townhouses.

- Multiple Family Residential includes residential parcels with more than one unit such as apartment complexes, duplexes, and quadplex units. Each parcel may have multiple structures.

- Commercial includes retail, office buildings, and restaurants.

- Industrial includes warehouses and light and heavy manufacturing facilities. This also includes many computer and bio-tech industries that are in the Milpitas area.

- Public includes both public and semi-public uses such as post office, fire department, government buildings, schools, and churches.

All parcels with structures were assigned to one of the listed categories. Some parcels have more than one physical structure and some structures, such as condominiums, are represented by multiple parcels. Table 2-6 displays the total number of parcels with structures by category. In total, there are 1,000 more units at risk than shown in the 1987 Feasibility Report. The biggest difference is the inclusion of multi-family residences that have increased in the area[2].

Table 2-6 Structural Inventory

Economic Impact Area	Acreage	Number of Parcels with Structures within the 0.002 Exceedance Probability Floodplain by Land Use						
		Single Family Residential	Multiple Family Residential	Commercial	Industrial		Public	Total
					General	Tech		
Area A	73.90	64	0	0	0	0	0	64
Area B	132.14	96	287	0	0	0	1	384
Area C	30.53	14	0	0	0	0	0	14
Area D	193.79	378	105	0	0	0	0	483
Area E	1,216.28	723	1,110	95	22	17	15	1,982
Area F	368.68	1	0	14	8	25	4	52
Total	**2,015.32**	**1,276**	**1,500**	**109**	**30**	**42**	**20**	**2,979**
		Number of Parcels with Structures within the 0.010 Exceedance Probability Floodplain by Land Use						
Area A	73.90	35	0	0	0	0	0	35
Area B	132.14	77	257	0	0	0	1	335
Area C	30.53	12	0	0	0	0	0	12
Area D	193.79	231	26	0	0	0	0	257
Area E	1,216.28	589	1,050	82	22	16	13	1,772
Area F	368.68	1	0	14	8	25	4	52
Total	**2,015.32**	**945**	**1,333**	**96**	**30**	**41**	**18**	**2,463**

(c) Value of Damageable Property – Content Value

In addition to structures, building contents can also be at risk of flood damages. For this study, content values were estimated as a percentage of depreciated structure value based on land use. In the 1992 study, detailed content surveys were made to determine content percentages specific to the Milpitas/San Jose area. For this reevaluation study, additional content surveys were completed to confirm or adjust values used in the original study. Based on these survey results, the content percentages from the 1992 study are determined to be reasonable.

[2] New development that occurred since 1991 has been consistent with the FEMA requirements for first floor elevations, and is eligible for consideration as benefits in project justification. No adjustments are necessary due to the restrictions in Section 308 of WRDA 1990.

Total value of damageable property includes the structural and content values described for the parcels within the 0.002 exceedance probability floodplain. Table 2-7 shows the total structure and content values by category and economic impact area. In total, the study area has just under $2.3 billion worth of estimated damageable property. Total value of $1 billion for structures within the floodplain is over eight times the value presented in the 1987 feasibility study. Factors leading to these increases include additional structures, general increases in valuation from 1986 to 2011, improvements in existing structures, and increased labor and construction costs in the area.

Table 2-7 Value of Damageable Property within the 0.002 Exceedance Probability Floodplain
$1,000s, October 2011 Prices

Structure Category	Area-A	Area-B	Area-C	Area-D	Area-E	Area-F	Total
SFR-Structure	11,700	17,600	2,400	63,300	123,300	400	218,700
SFR-Content	5,800	8,800	1,200	31,700	61,700	200	109,400
MFR-Structure	0	27,300	0	11,400	224,600	0	263,300
MFR-Content	0	13,600	0	5,700	112,300	0	131,600
Commercial-Structure	0	0	0	0	227,600	30,600	258,200
Commercial-Content	0	0	0	0	246,000	29,100	275,100
Industrial-General Structure	0	0	0	0	74,100	30,900	105,000
Industrial-Tech Structure	0	0	0	0	82,500	161,000	243,500
Industrial- General Content	0	0	0	0	97,100	40,400	137,500
Industrial-Tech Content	0	0	0	0	154,300	301,100	455,400
Public- Structure	0	8,300	0	0	30,300	14,200	52,800
Public- Content	0	3,700	0	0	13,600	6,400	23,700
Total Value	**17,500**	**79,300**	**3,600**	**112,100**	**1,447,400**	**614,300**	**2,274,200**

(d) Expected Annual Damage – Existing Without-Project Conditions

Expected annual damages (EAD) were estimated using the risk-based Monte Carlo simulation program HEC-FDA. The HEC-FDA program integrates hydrology, hydraulics, geotechnical, and economic relationships to determine damages, flooding risk, and project performance. Uncertainty is incorporated for each relationship, and the model samples from a distribution for each observation to estimate damage and flood risk. The model is described in detail in Appendix C, Economics. The Berryessa Creek model has the following relationships built for each economic impact area.

- Probability-Discharge (with uncertainty determined by period of record)
- Stage-Discharge (stage in the channel with estimated error in feet)
- Stage-Damage (computed internally within HEC-FDA)

The derived probability damage functions from the HEC-FDA model for each impact area is provided in Table 2-8. These damage values differ from the calculated damages by event shown in the stage-damage curves (detail in Appendix E, Economics) due to uncertainties in each relationship.

Table 2-8 Probability Damage Functions from the HEC-FDA Model
$1,000s, October 2011 Prices

Exceedance Probability	Total Damage by Economic Impact Area and Event					
	A	B	C	D	E	F
0.200	0	0	0	0	0	0
0.100	0	221	11	116	0	0
0.050	0	11,423	506	13,475	4,522	0
0.040	0	15,046	659	18,765	15,843	0
0.020	171	22,292	967	29,346	141,546	102,657
0.015	333	24,104	1,043	31,991	228,245	157,756
0.010	837	25,916	1,120	34,636	314,944	212,855
0.004	1,447	28,089	1,212	37,810	418,983	278,974
0.002	2,897	28,814	1,243	38,868	453,662	301,014
0.001	4,333	29,176	1,258	39,397	471,002	312,034

EAD, under existing without-project conditions, was estimated for each damage category for all six impact areas. Results are summarized in Table 2-9.

Table 2-9 Expected Annual Damage – Existing Without-Project Conditions
$1,000s, October 2011 Prices

Damage Category	EAD by Economic Impact Area						
	A	B	C	D	E	F	Total
Single Family Residential	20	282	37	1,008	987	3	2,337
Multi-Family Residential	0	453	0	178	518	0	1,149
Commercial	0	0	0	0	1,370	374	1,744
Industrial	0	0	0	0	1,792	6,071	7,863
Public	0	133	0	0	166	118	417
Automobile	2	136	4	185	251	0	578
Emergency	0.4	50	1	47	43	0	141
Total EAD	**22**	**1,054**	**42**	**1,418**	**5,127**	**6,566**	**14,229**

2.3.3 Future Without-Project Conditions

The future without-project condition is defined as that condition expected to exist over the 50-year period of analysis in the absence of any action taken (by the Federal government) to solve the identified problems. It consists of the base year (2017 – see Section 6.1.1) conditions projected to a future year when it is assumed that a proposed plan's construction would be complete and operating, and how conditions may change during this period if no Federal action takes place. Forecasting this condition is important to the evaluation and comparison of alternative plans and the identification of impacts (both beneficial and adverse) attributable to the proposed project.

For the purposes of this analysis, it is assumed that no new flood risk management project would be constructed on upper Berryessa Creek in the absence of a federally cost-shared and locally-supported project. The SCVWD's Lower Berryessa Creek Project is assumed to be part of the without-project conditions.

It is also assumed that the project will not be affected by a potential rise in sea level. A sensitivity analysis was conducted based on the highest possible sea level increase of 2.13 feet calculated for the South San Francisco Bay Shoreline Study. When that value is added to the downstream boundary in the hydraulic model downstream of the Berryessa project, the increase tapers off up to less than 0.5 feet downstream of Calaveras. The Calaveras crossing effectively resets flow conditions for the design event, so the slight increase for the maximum sea level rise scenario is not carried further upstream.

2.3.3.1 Expected Annual Damage – Future Without-Project Conditions

The City of Milpitas currently has a redevelopment plan for Midtown area, with some of the land lying within economic Impact Area E of this study. Primarily along the South Main and Abel Street corridors, the plan calls for renovation of many of the existing buildings and new high density residential and commercial construction on existing vacant acres near the light rail and proposed BART stations. Development is projected to be complete by 2020. The City of Milpitas' Transit Area Specific Plan borders Berryessa Creek at South Milpitas Blvd. The Transit Area Specific Plan is a plan for the redevelopment of an approximately 437-acre area in the southern portion of the City that currently includes a number of industrial uses near the Great Mall shopping center. Development is projected to be complete by 2030.

(a) Annual Damage

Future development was estimated to occur through the full build out (year 2020) for the Milpitas Midtown area. Future development for this area was entered into the HEC-FDA model and EAD values were calculated for the future without-project economic condition. Future hydrology was evaluated and the change in flow was determined to be insignificant. Therefore, all increases in EAD under future conditions were attributable to future growth. Both existing and future EAD estimates are displayed in Table 2-10. The average annual equivalent represents the present value of future damages amortized over the 50-year period of economic analysis at the fiscal year 2013 Federal discount rate of 3.75 percent. The "Total EAD Future" shown in the table is amortized over the period of analysis to arrive at average annual equivalent damages.

Table 2-10 Average Annual Equivalent Damages (Economic Impact Area E) – Future Without-Project Conditions $1,000s – October 2011 Prices, 50-Year Period of Analysis				
Damage Category	**Expected Annual Damages**			**Average Annual Equivalent at 3.75%**
	Existing	**Future Midtown**	**Total EAD Future (2020)**	
Single Family Residential	987	0	987	987
Multi-Family Residential	518	157	675	644
Commercial	1,370	6	1,376	1,375
Industrial	1,792	0	1,792	1,792
Public	166	0	166	166
Automobile	251	0	251	251
Emergency	43	0	43	43
Total EAD	**5,127**	**163**	**5,290**	**5,258**

(b) Project Performance

In addition to damages estimates, HEC-FDA reports flood risk in terms of project performance. Three statistical measures are provided, in accordance with ER 1105-2-101, to describe performance risk in probabilistic terms. These include annual exceedance probability, long-term risk, and conditional non-exceedance probability by events.

- Annual exceedance probability measures the chance of having a damaging flood in any given year.
- Long-term risk provides the probability of having one or more damaging floods over a period of time.
- Conditional non-exceedance probability indicates the chance of not having a damaging flood given a specific event.

Table 2-11 presents the project performance results for each impact area.

Table 2-11 Project Performance - Without-Project Conditions								
Economic Impact Area	Annual Exceedance Probability	Long-Term Risk			Conditional Non-Exceedance Chance by Events			
		10-Year Period	25-Year Period	50-Year Period	10%	2%	1%	0.2%
A	0.0336	29%	57%	82%	99%	31%	9%	1%
B	0.1964	89%	100%	100%	42%	20%	19%	18%
C	0.2461	94%	100%	100%	35%	18%	17%	17%
D	0.1967	89%	100%	100%	42%	20%	19%	18%
E	0.0696	51%	84%	97%	68%	27%	22%	18%
F	0.0292	26%	52%	77%	88%	83%	82%	79%

2.4 ECOSYSTEM DEGRADATION

2.4.1 Historical and Existing Conditions

Berryessa Creek has been modified from its historic condition and alignment. Berryessa Creek and other small streams from the Los Buellis Hills flowed out onto alluvial fans and had wide floodplains with frequently braiding channels. It is likely that extensive wetland habitats were present in the floodplains and in the flat lowlands of Lower Penitencia and Coyote Creeks. Berryessa Creek now flows approximately 2 miles further north and has a completely human-made channel shape and alignment below the greenbelt area. Downstream of the greenbelt, the vegetation consists of patchy annual grasses separated by bare dirt. Maintenance practices in this area include removal of vegetation and sediment from the bottom of the channel and the use of herbicides on the stream banks. Frequent spraying or mowing of creek bank vegetation prevents the establishment of riparian species. In general, the habitat quality and quantity is limited below the greenbelt, although the lowest end of Berryessa Creek has redeveloped marsh characteristics and vegetation and now provides a patch of habitat for a variety of wildlife species.

The stream is intermittent with flow in winter and low to no flow in summer. Winter flows tend to be turbid, due to sediment loading from the surrounding foothills and from bank erosion along the creek. Sources of summer flows include runoff from the watering of lawns, industrial discharges, and limited groundwater discharge. Low summer flows lead to stagnant water condition, low dissolved oxygen content, and higher water temperatures. The creek is completely dry in Reaches 2 through 6 during the summer and fall months.

Environmental problems affecting the creek include adjacent urban development and potential soil contamination; poor water quality; uniform aquatic habitat in trapezoidal or rectangular channels; limited flows in long reaches of the channel; lack of riparian zone; almost complete disconnection from the floodplain; water availability and sediment movement in the system minimizes aquatic vegetation/habitat from establishing; fish passage barriers; and poor aesthetic and recreational conditions for human use. More detailed information on without-project ecosystem conditions is presented in Sections 4.5 and 5.5 of this document.

Opportunities for environmental protection, improvement, and mitigation include riparian revegetation; creation of an inset vegetated floodplain within the channel and protection of the one remaining undeveloped floodplain (greenbelt); removal of concrete lining to allow riparian and upland revegetation; removal of fish passage barriers; creation of more diverse floodplain habitats such as wetlands and ponds in the greenbelt, protection of the moderate to high quality habitat upstream of Old Piedmont Road; removal of non-native species, cleanup of contaminated soils; and creation of public access and recreation via trails or viewing points.

2.4.2 Future Without-Project Conditions

Without a Federal project, it is likely that the SCVWD would continue their maintenance of the existing channel, including sediment removal and periodic bank and channel stabilization with rock or concrete. A local school group or other public group might undertake minor revegetation efforts in the greenbelt, but significant changes are not likely. The City of Milpitas may construct a bike/pedestrian trail downstream of I-680 along Berryessa Creek, and some minor revegetation could occur with trail construction to make the channel area more aesthetically pleasing. Existing sources of water pollution would be expected to remain the same. Erosion in the upper watershed would continue, with ongoing sediment deposition in the study area. Existing water temperatures in the creek would not be expected to change. Overall, however, the habitats of the study area will most likely decline slightly in quality, and most of the environmental problems would not be addressed.

2.5 RECREATION AND PUBLIC ACCESS

2.5.1 Related Recreation and Public Access Projects

In 1999, the City of Milpitas conducted a study to determine the feasibility of constructing pedestrian and bicycle trails along the Berryessa Creek (and Coyote Creek) corridors. This study analyzed the benefits of the trails to the community, described feasible trail alignments, and provided budget estimates for designing and constructing the trails. This study concluded that a seasonal trail could be developed along approximately 70 percent of the 5.45 miles of Berryessa Creek. The trail would extend from the confluence with Penitencia Creek to I-680 in San Jose and would be aligned along the creek corridor and along city streets. The route would connect many residential areas, schools, shopping districts, and employment centers in the northern section of the city and to the regional recreational opportunities found along the Coyote Creek Trail. The proposed Berryessa Creek Trail alignment includes two underpasses, two overpasses, three pedestrian/bicycle bridges, and numerous at-grade street crossings.

2.5.2 Historical and Existing Conditions

A greenbelt, including a park, extends from Cropley Avenue to about 600 feet upstream of Morrill Avenue. Children from adjacent schools and other residents use the greenbelt area for passive recreation such as walking and bird watching. The City of Milpitas would like to extend its bike trail system along the lower portion of the study area, downstream of I-680 (meeting with Mr. Greg Armendariz, City Engineer with the City of Milpitas, 6/13/05; City of Milpitas'

Berryessa Creek Trail and Coyote Creek Trail Feasibility Report dated 2001; Rene Langis, SCVWD, pers. comm. 7/12/00). Currently, most of the study area is gated and fenced off to public access. The City of San Jose does not anticipate additional recreational development in the areas adjacent to Berryessa Creek (meeting with Mr. Yves Zsutty, City of San Jose, 1/24/05; Metha Sizemore, City of San Jose personal communication, 2/7/02).

The upper study area upstream of Old Piedmont Road is privately owned and currently not accessible to the public but could be a scenic resource with the dense riparian zone and views to undeveloped agricultural lands upstream. The greenbelt is also a scenic area with its mature tree canopy. Downstream of the greenbelt, there is little to no aesthetic value to the trapezoidal channel.

2.5.3 Future Without-Project Conditions

Recreational opportunities within the watershed would remain substantially unchanged, and recreational experiences would not be enhanced. Recreational benefits both regionally and locally would not be attained. Furthermore, the opportunity to restore habitat resources and decrease the dependency on the automobile as a primary form of transportation would not be realized. The City of Milpitas may construct a bike/pedestrian trail downstream of I-680 along Berryessa Creek.

2.6 SUMMARY OF PROBLEMS AND OPPORTUNITIES

The analysis of a wide range of technical issues, numerous meetings, and site visits identified a number of problem areas in the study area that have resulted from a variety of natural and human-induced changes. These problems are summarized below.

- Flood damage on the left bank to commercial and industrial buildings/contents and to infrastructure as a result of channel overtopping in the vicinity of the Piedmont Creek confluence for flood events greater than the 0.10 exceedance probability. Depth of flooding of up to two feet can occur in the lower areas, causing significant damage.

- Flood damage on the left bank to commercial and industrial buildings/contents and to infrastructure as a result of channel overtopping downstream of I-680 in the vicinity of the 90-degree bends for flood events greater than the 0.04 exceedance probability. Depth of flooding of up to three feet can occur in the lower areas, causing significant damage.

- Flood damage to residential buildings/contents and to infrastructure as a result of the Cropley Avenue and Piedmont Road culvert overtopping from 0.04 or greater exceedance probability events and flowing down Cropley Avenue to the Morrill Avenue and I-680 vicinity. Depth of flooding of up to three feet can occur in the lower areas, causing significant damage.

- Risks to public safety resulting from flood flows from the Cropley Avenue and Piedmont Road culvert overflows from events of 0.04 exceedance probability or greater.

- Bank erosion and stability problems in the reach above the Cropley Avenue and Piedmont Road culvert and also below I-680 to Calaveras Boulevard.

- Perennial base flow conditions, critical to the needs of native vegetation, does not exist in the river corridor specifically in Reaches 2 through 6.
- Human activities have significantly impacted the area downstream of I-680 by modification of the natural channel via straightening and channel hardening throughout its reach.
- Public access for much of the Berryessa Creek system is limited by fences and lack of trails along the creek.

Based upon information obtained in the without-project assessment and understanding of public's concerns, opportunities were identified. These are summarized below.

- Provide publicly-acceptable and economically-justified flood risk management measures.
- Incorporate environmental protection features as part of the design of flood risk management features.
- Incorporate a recreational corridor associated with flood risk management features.

CHAPTER 3 – FORMULATION OF ALTERNATIVE PLANS

The process for the development and evaluation of alternatives to the authorized project was conducted in accord with standard Federal procedures for planning water resources projects (i.e., Principles and Guidelines), regulations (i.e., Corps' ER 1105-2-100), and laws, and the requirements of NEPA. An array of potential management measures and preliminary alternative project modifications was considered that would better meet the authorized project's objectives for flood control and environmental compliance and acceptability while avoiding and mitigating adverse effects to the maximum extent practicable. An array of alternative plans have been developed and evaluated to meet the specific planning objectives in consideration of the concerns of the resource agencies and other interested persons that were highlighted during the public scoping process. This chapter describes the plan formulation and evaluation criteria, screening of the management measures and preliminary alternatives, and criteria for the selection of the Recommended Plan/Proposed Action.

3.1 PLAN FORMULATION PROCESS

The plan formulation process was used to develop measures and elements used in solving identified problems and ultimately to develop an array of comprehensive alternatives from which a plan is recommended for implementation.

This chapter presents the rationale used thus far towards the development of a recommended plan. It describes the Corps iterative six-step planning process used to develop, evaluate, and compare the array of management measures and preliminary alternatives considered. The six steps used in the plan formulation process include:

1) The specific problems and opportunities to be addressed in the study are identified, and the causes of the problems are discussed and documented. Planning goals are set, objectives are established, and constraints are identified. This has been accomplished for the current study stage.

2) Existing and future without-project conditions are identified, analyzed, and forecast. The existing condition resources, problems, and opportunities critical to plan formulation, impact assessment, and evaluation are characterized and documented. This has been accomplished for the current study stage.

3) Alternative plans are formulated that address the planning objectives. An initial set of alternatives was developed and evaluated at a preliminary level of detail, and were subsequently screened into a more final array of alternatives. The public involvement program is used to obtain public input to the alternative identification and evaluation process. This has also been accomplished for the current study stage. Each plan is evaluated for its costs, potential effects, benefits, and compared with the No Action Alternative.

4) Alternative project plans are evaluated for their potential to meet specified objectives and constraints, effectiveness, efficiency, completeness, and acceptability. The impacts of alternative plans are evaluated using the system of accounts framework (National Economic Development, Environmental Quality, Regional Economic Development, Other Social

Effects) specified in the Principles and Guidelines and ER 1105-2-100. This has taken place for the final array of alternatives and Recommended Plan during this phase of study.

5) Alternative plans are compared with one another and the No Action Alternative. Results of analyses are presented (e.g., benefits and costs, potential environmental effects, trade-offs, risks and uncertainties) to prioritize and rank flood damage reduction alternatives. For the current study thus far, benefits and costs have been evaluated for the final array of alternatives, and a rationale is provided to justify selection of a recommended plan.

6) A plan is selected for recommendation, and related responsibilities and cost allocations are identified for project approval and implementation.

3.2 PLANNING CRITERIA AND OBJECTIVES

3.2.1 Planning Criteria

3.2.1.1 Federal Planning Criteria

The primary Federal goal in water and related land resources project planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Water and related land resource project plans shall be formulated to alleviate problems and take advantage of opportunities to contribute to this objective. NED contributions include increases in the net value of national output of goods and services and can be measured in terms of monetary outputs such as reductions in flood damages and emergency response costs. (P&G 1983)

Ecosystem restoration is also one of the primary missions of the Corps Civil Works Program. The Corps objective is to contribute to National Ecosystem Restoration (NER) through increasing the net quality and/or quantity of desired ecosystem resources. NER measurements are based upon changes in ecological resource quality as a function of improvement in habitat quality or quantity and expressed quantitatively in physical units or indexes (not monetary units). The Corps has reaffirmed its commitment to the environment by formalizing a set of Environmental Operating Principles applicable to all its decision-making and programs. These principles foster unity of purpose on environmental issues, reflect a new tone and direction for dialogue on environmental matters, and ensure that conservation, environmental preservation, and restoration are considered in all Corps activities.

Federal, State, and local environmental quality goals and policies are considered to evaluate the long-term effect that the alternatives may have on significant environmental resources. Significant environmental resources are defined by the Water Resources Council as those components of the ecological, cultural, and aesthetic environments which, if affected by the alternatives, could have a material bearing on the decision-making process. Avoidance of adverse impacts, followed by minimization and then mitigation of unavoidable, significant adverse impacts is the formulation direction that is called for within NEPA.

3.2.1.2 Local Planning Criteria

Use the SCVWD's Natural Flood Protection (NFP) objectives when evaluating the alternatives and selecting the preferred project alternative. These objectives and criteria became effective March 1, 2005 and apply to all of the Water District's Clean, Safe *Creeks and Natural Flood Protection Program* projects. They consist of the following nine objectives:

1) <u>Flood control</u>: Focuses on providing protection to lives and property against the potential damages from large floods

2) <u>Ecology</u>: Examines the potential to protect, enhance, or restore the natural resource benefits of streams and the watershed in ecological terms

3) <u>Geomorphology/Stable channel</u>: Addresses the ability to effectively manage the water and sediment from the watershed under both extremely high flows and routine low flows

4) <u>Maintenance</u>: Focuses on minimizing the long-term obligation of operating and maintaining capital projects once they are constructed

5) <u>Watershed context</u>: Assesses how appropriate a project is to its location within the watershed and the physical, ecological, and social contexts

6) <u>Water quality and quantity</u>: Addresses water supply related goals, including quality and quantity of surface and groundwater associated with streams

7) <u>Local partner agencies</u>: Measures how effectively a potential project meets goals of both the Water District and the partner communities affected by the project

8) <u>Community Benefits</u>: Addresses the full range of community benefits beyond flood control that might be integrated into a creek project.

9) <u>Life-cycle costs</u>: Examines project costs as a long-term investment rather than a one-time cost

3.2.2 <u>Specific Planning Objectives</u>

The Corps and SCVWD jointly developed the following objectives which provide the basis for potential modifications to complete the authorized project.

- Reduce flood damages from Berryessa Creek upstream of Calaveras Boulevard throughout the study reach, during the 50-year period of analysis beginning in 2017.

- Use environmentally sustainable design practices in addressing the flood risk management purpose of the project wherever possible within the study reach, including taking advantage of restoration opportunities that may be pursued incidental to the flood damage reduction purpose.

In addition, the alternatives developed during this study were formulated to meet all requirements for an integrated Corps GRR-EIS, the NEPA process, and other planning considerations identified below.

- Use the SCVWD's Natural Flood Protection (NFP) objectives, as identified in Section 3.2.1.2 above, when evaluating the alternatives and selecting the locally preferred project alternative.

- Coordinate closely with affected cities on their recreational projects to avoid design conflicts to the extent practical, and provide opportunities for cities to incorporate recreational features into the project.

- Reduce maintenance requirements especially due to sedimentation, primarily at the Cropley Avenue and Piedmont Road culvert and the sediment basin immediately downstream.

- Improve water quality by reducing sedimentation within the creek.

- Cooperate with the mutually beneficial goals of related plans, projects, and agencies.

- Fully coordinate with other Federal, State, local agencies, and stakeholders.

Recreation and ecosystem restoration are recognized and generally supported as project purposes by the Corps, but are not included in the existing Coyote and Berryessa Creeks, California project authorization. Adding these purposes to the authorized project would require additional authority from Congress, which would require a potentially lengthy process. Because no potential sponsor has supported adding any purposes to the authorized project, additional purposes have not been evaluated or proposed in this GRR. Instead, the Corps and the SCVWD have sought to provide an environmentally sensitive design and opportunities for future recreation improvements within the scope of the currently authorized flood risk management project. Recreation and ecosystem restoration could be added to the project as non-Federally funded betterments without additional Congressional authority.

3.2.3 Guidance on Levee Certification for the National Flood Insurance Program

Within the category of NED contributions that increase the net value of national output of goods and services, mentioned above, is the savings of administrative costs of the National Flood Insurance Program (NFIP) which establishes minimum Federal standards for floodplain management adopted by State and local governments. Any alternative that removes the flood insurance requirements established by the Federal Emergency Management Agency (FEMA) would accrue this benefit by reducing the number of policies required.

Technical and procedural guidance in support of certification determinations by the Corps for NFIP is provided in the Engineer Circular (EC) 1110-2-6067, dated 30 September 2008. This EC supplements and clarifies existing policy, procedural, and technical guidance on Corps-wide standard and procedures for certifying that a levee has been adequately designed and constructed to provide "100-year protection" (conveyance of the 1 percent event based on conditional non-exceedance probabilities). It also provides an overview of documentation requirements; outlines an Independent Technical Review (ITR) process; and summarizes authority and funding mechanisms.

As defined in the EC: *"To be certified, a levee must have at least a 90 percent assurance of providing protection from overtopping by the 1 percent annual chance exceedance flood for all reaches of the levee system. If top of levee elevation is less than three feet above the expected FEMA base flood stage, then the levee can only be certified if the assurance (conditional non-exceedance probability or CNP) is 95 percent or greater. Top of levee elevation shall not be less than two feet above the expected FEMA base flood elevation, even if assurance is 95 percent or greater. As risk methodologies improve and more data are gathered, the two feet minimum requirement will be revisited. It is important to note that this assurance is only for containment; it does not include the probability of failure by any other mode or the combined probability of all failure modes."*

3.3 PLANNING CONSTRAINTS

Unlike planning objectives that represent desired positive changes, planning constraints represent restrictions that should not be violated. The planning constraints identified in this study are described in the following sections.

3.3.1 Limited Rights-of-Way

It is recognized that urban development and land use surrounds and abuts the Berryessa Creek right-of-way. Thus, planning efforts intend to minimize the purchase of temporary or permanent additional rights-of-way during the formulation of alternative plans. The high cost of lands in San Jose and Milpitas, lack of public and private acceptance, and time requirements for purchasing additional rights-of-way generally are major negatives associated with any given plan. For Berryessa Creek, it is recognized that construction activities will require purchase of temporary rights-of-way and in some cases permanent rights-of-way. However, alternatives involving any significant additional purchase of permanent rights-of-way for bypass channels, sediment basins, etc., should be avoided in the formulation process if possible.

3.3.2 Corps Policy on Minimal Flow Requirements for Cost Sharing

Under ER 1165-2-21, "Flood Damage Reduction Measures in Urban Areas," water damage problems associated with a natural stream or modified natural waterway may be addressed under the flood control authorities downstream from the point where the flood discharge is greater than 800 cfs for the 10-percent flood event under conditions expected to prevail during the period of analysis. Under certain circumstances, the Division Engineer may grant an exception to the 800 cfs, 10-percent flood discharge criteria if both of the following criteria are met.

- The discharge for the 1-percent flood event exceeds 1,800 cfs.
- The reason the 10-percent flood discharge is less than 800 cfs is attributable to a hydrologic disparity as defined in the reference.

ER 1165-2-21 specifies, "flood reduction measures … may be located upstream of the particular point where the hydrologic criteria (and area criterion, if appropriate) are met, if economically justified by benefits derived within the stream reach which does qualify for flood control improvement. Similarly, the need to terminate flood control improvements in a safe and economical manner may justify the extension of some portions of the improvements, such as levee tiebacks, into areas upstream of the precise point where Federal flood control authorities become applicable."

3.3.3 Public Health and Safety

The alternatives must be designed in consideration of public health and safety. In addition, flood control facilities and habitat improvements must be designed to prevent loss of life. For example, access structures must be included to allow egress from the open channels as water rises in the early flood stages. In addition, flood control structures should be designed to reduce the potential risk to public health and safety due to transience along the channel.

3.3.4 Endangered Species Act Compliance

Under the Endangered Species Act, any potential project would be required not to jeopardize the continued existence of threatened or endangered species or to destroy or adversely modify their designated critical habitat. Projects should be sited so that habitation by those species does not adversely impact the non-Federal sponsor's ability to maintain flood control function and perform maintenance on channels.

3.3.5 Clean Water Act Compliance

The Clean Water Act governs pollution control and water quality of waterways throughout the United States. Its intent, in part, is to restore and maintain the biological integrity of the nation's waters. Any potential project would be required to comply with State-adopted, USEPA-approved water quality standards contain in the San Francisco Bay Basin Plan. Further, any potential project would be required not to substantially increase suspended solids in and turbidity of the creek.

3.3.6 Heritage Values

The alternatives must be designed to protect cultural and historic resources. This protection will be accomplished primarily through increased flood control of all structures, including cultural and historic resources near the river.

The San Jose 2020 General Plan contains goals and policies which encourage historic preservation. In 1975, the City adopted the Historic Preservation Ordinance (Chapter 13.48 of the Municipal Code) that specifies the following actions:

- Establish an Historic Landmarks Commission
- Maintain an Historic Resources Inventory

- Preserve historic properties using a Landmark Designation process
- Require Historic Preservation Permits and provide financial incentives through Historic Property Contracts

Protection of heritage values also includes local tree removal ordinances. The City of Milpitas adopted a Tree and Planting Ordinance (Ord. 201.1) in 1988. The City recognizes substantial economic, environmental and aesthetic importance of the trees and plantings within the community and works to provide methods and procedures required to preserve plantings of significant size, age, and/or benefit to the community at large. The designation of "Heritage and Specimen Planting" refers to any tree, grove, shrub, hedge or other planting which is determined to have special significance to the community, generally defined by the following.

- A planting of historic value, unique quality, significant girth or height, or protected species identified in the development process as a City resource
- A planting designated by resolution of the City Council to be of historical value or community benefit
- A planting located on the Register of Cultural Resources

If any vegetation within the study area would require removal and qualifies as a "Heritage Specimen," then the appropriate local ordinances for tree removal or preservation shall be followed.

3.4 REVIEW OF PREVIOUS ALTERNATIVES AND AUTHORIZED PLAN

3.4.1 Previous Alternatives

This section describes the alternative plans previously considered for implementation to alleviate flood damages from Berryessa Creek. These alternatives were previously considered in the Feasibility Study on Coyote and Berryessa Creeks (USACE 1987).

3.4.1.1 Non-Structural

(a) Flood Insurance

The Federal Emergency Management Agency (FEMA) has directed the Federal Insurance Administration to provide federally subsidized flood insurance for those residences and businesses projected to be impacted by flooding, under the authority of the Flood Insurance Act of 1968, as amended, and provide emergency assistance, under the Flood Disaster Protection Act of 1973. This measure has been implemented in the study area and is part of the future without-project condition analysis.

(b) Flood Forecast, Warning, and Evacuation

This alternative allows the residents of the floodplain to escape from the flood-ravaged area. This is a low-cost alternative but was determined to be infeasible because there is not enough time lag from when a storm hits to the flows rising rapidly in the system. This is mainly due to the surrounding industrial area and barren channel. With very little area available for ground infiltration (i.e. a lot of hardscape in the area) that as soon as the storm hits, runoff flows to the creek.

(c) Floodproofing

A plan was developed to floodproof large commercial structures by constructing a wall around their perimeters and to raise and relocate existing residential structures located in the 100-year floodplain. Approximately 193 commercial structures would be protected by the wall, and 420 residential structures would be raised. The total cost of the plan was estimated at $60 million with an annual cost of about $5.3 million (October 1986 price level; 8.625 percent interest rate). With annual benefits of $1.2 million, the plan was rejected with a benefit-to-cost ratio of 0.2.

(d) Removal of Existing Structures from the Floodplain

This alternative is extremely costly due to the large number of structures involved. Approximately 235 commercial structures and 420 residential structures are located within the 100-year floodplain. The value of these structures was estimated at $41 million (October 1986 price level). Furthermore, the area most severely impacted by flooding from Berryessa Creek consists of a large and cohesive community, which would resist relocation. This plan was determined to be economically infeasible and socially unacceptable.

(e) Protecting Movable, Damageable Property

Flood damage reduction is limited to property that can be moved or rearranged. When combined with a flood forecast, warning, and evacuation system, the rearrangement of movable, damageable contents within flood-prone structures provides a low-cost non-structural alternative. However, since there is not enough advance warning, properties would have to be relocated on a permanent basis. This alternative was determined as non-effective in reducing flood damages.

3.4.1.2 Channel Modification

(a) Rectangular Concrete Channel

This alternative proposed rectangular concrete-lined channels for the length of the project, except for the greenbelt, where a trapezoidal concrete-line channel was proposed. This plan was determined to be economically justified and carried forward for further analysis.

(b) Rectangular Concrete Channel with Articulated Concrete Matting

This alternative is similar to the plan described above, with the exception of the use of articulated concrete matting through the greenbelt area. This was eliminated from further consideration after it was determined that the design floodwater velocities exceeded those allowed by the matting.

(c) Earth Channel

This alternative proposed an earthen channel for the length of the project. Real estate constraints made this alternative physically infeasible and economically unjustified.

(d) Combination Channel

A combination of trapezoidal concrete and earthen channels was found to be economically unjustified due to the significant real estate requirements.

(e) Trapezoidal Concrete Channel Plan and Slope Protection

This alternative proposed offset levees utilizing the existing levees wherever possible along the length of the greenbelt as well as channel slope protection, in the form of riprap or gabions to stabilize the creek banks in a number of locations. This alternative was carried forward and analyzed along with the 1990 authorized project.

(f) Trapezoidal Concrete Channel Plan

This alternative proposed augmentation of existing levees as well. However, it does not have the slope protection component. This alternative was carried forward and analyzed along with the 1990 authorized project.

3.4.2 Authorized Project

This section describes the plan that was recommended in the 1987 Feasibility Report and subsequently became the authorized project. This plan was authorized for construction in the Water Resources Development Act of 1990.

Starting at the upstream project limit, approximately 600 feet upstream of Old Piedmont Road, the authorized plan would feature a 500-foot by 160-foot reinforced-concrete-walled sedimentation basin with earth bottom. This would transition to a box culvert under Old Piedmont Road. A trapezoidal reinforced-concrete-lined channel would lead out of the culvert and continue for about 800 feet to the existing 400-foot long box culvert under the intersection of Piedmont Road and Cropley Avenue. The bottom width would be 8 feet with side slopes of 1 vertical to 2 horizontal. The trapezoidal channel would be constructed with a single service road on the east side of the creek to save the riparian vegetation on the west bank.

An existing debris basin at the upstream portion of the greenbelt would be improved with concrete walls and enlarged to 144 feet by 80 feet. This basin would serve as a secondary sediment basin. A stilling basin is incorporated into the design of this sediment basin to reduce the stream flow velocity to a subcritical level. Throughout the remainder of the greenbelt (approximately 4,200 feet), the existing berms and levees would be augmented to bring them to the specified height for each section. On the south side of the creek, the levee top width would be 12 feet. On the north side of the creek, the top width could be as narrow as 6 feet. The inboard slope for all levees would be 2 feet horizontal to every 1 foot vertical. Within Berryessa Creek Park, the berms would be raised in accordance with the present landscape design.

From 600 feet upstream of Morrill Avenue, a short transition would lead into a trapezoidal concrete section flanked by a service road on either side of the creek. This would continue for a distance of approximately 1,550 feet downstream to Cropley Avenue. North of Cropley, an existing 1,800-foot trapezoidal concrete-lined channel, which continues to 100 feet upstream of I-680, would be utilized. At this point, another trapezoidal concrete channel would be constructed for a distance of 4,300 feet. Downstream of the railroad bridge and continuing for approximately 1,100 feet to the point where South Milpitas Boulevard veers west, a trapezoidal concrete channel would be built with no service roads due to the rigid right-of-way constraints. A 6,100-foot trapezoidal concrete channel, with a service road on each side of the creek, would continue from this point to the downstream project limit. From there, a rock transition would be constructed to the earthen trapezoidal channel immediately downstream of Calaveras Boulevard.

The purpose of the authorized plan was to provide flood control for flow events up to and including the design (100-year) flood event. The plan, as authorized, was designed using the freeboard design concepts in establishing the hydraulic design of project features. Risk and uncertainty concepts were not applied.

Table 3-1 presents the major design features of the authorized project. Figure 1-2 in Chapter 1 displays a schematic of the Project.

Table 3-1 Major Design Features of the Authorized Project				
Reach		**Location**	**Major Design Feature**	**Description**
1987 Feasibility Report	**GRR Study**			
1	9	From 600 feet upstream of Old Piedmont Road to Old Piedmont Road	Primary Sediment Basin	Sediment basin with concrete walls, earth bottom, and outside dimensions of 500 feet by 160 feet
2	8	From Old Piedmont Road to intersection of Cropley Avenue and Piedmont Road	Concrete-Lined Channel	Trapezoidal concrete channel with single service road on the east side of the creek, channel bottom width would be 8 feet with sideslopes of 2 feet horizontal by 1 foot vertical
3	7, 6	From intersection of Cropley Avenue and Piedmont Road to 1,000 feet upstream of Morrill Avenue (greenbelt area)	Stilling Basin (Secondary Sediment Basin in EIS)	Existing stilling basin improved with concrete walls and enlarged to 144 feet by 80 feet (outer dimensions)
			Levees	Raise levees; inboard slope of 2 feet horizontal by 1 foot vertical; outboard slope of 1.5 feet horizontal by 1 foot vertical; levee on south side of creek is a raised road and levee top width would be 12 feet; on north side of creek, where levee is a grassed berm, top width could be as narrow as 6 feet; all levees inboard slope of 2 feet horizontal by 1 foot vertical; outboard slope of 1.5 feet horizontal by 1 foot vertical
			Bank Protection	No structural bank protection
			Channel Stabilization	No structural channel stabilization
4	5	800 feet upstream of Morrill Avenue to Cropley Avenue	Secondary Sediment Basin	No sediment basin in EIS
			Concrete-Lined Channel	Trapezoidal concrete channel with service road on either side of the creek
5	5	Cropley Avenue to 100 feet upstream of I-680	Existing Trapezoidal Concrete-Lined Channel	No change
6	4, 3, 2, 1	100 feet upstream of I-		

Table 3-1 Major Design Features of the Authorized Project				
Reach		**Location**	**Major Design Feature**	**Description**
1987 Feasibility Report	**GRR Study**			
		680 to Calaveras Boulevard		
	4	100 feet upstream of I-680 and Montague Expressway	Concrete-Lined Channel	Trapezoidal concrete channel, where right-of-way permits, service roads to be provided on each side of the creek
	3	Montague Expressway downstream for 4,630 feet	Same	Same
	2, 1	4,630 feet downstream of Montague Expressway to Calaveras Boulevard	Same	Same

3.5 DESCRIPTION OF MANAGEMENT MEASURES

The plan formulation process proceeded with identification of potential management measures following review of (1) the without-project conditions in the affected environment, (2) problems and opportunities, and (3) the planning goals, objectives, and constraints that exist for this study and within the study area. Management measures are actions or stand-alone features that address a specific problem. There are numerous measures that can be utilized to solve problems or improve habitat depending upon site location, technical considerations, environmental conditions, and a host of other factors. Examples of typical measures developed in this study include the use of floodwalls, setback levees, and detention basins.

A wide variety of measures were initially identified early in the formulation process in order to address water and related land resource problems in the study area. These were considered and screened by the study team, and if appropriate, were subsequently carried forward into the formation of preliminary alternatives. The following section presents the list of management measures developed by the study team, their evaluation, and the measures screened as appropriate for combination into preliminary alternatives. They are grouped according to the categories of flood damage reduction, environmental protection/improvement, and recreation measures, as discussed in the following sections.

3.5.1 Flood Damage Reduction Measures

3.5.1.1 Non-structural Measures

- Relocation of existing structures (buy-out and removal)
- Floodproofing of existing structures
- Flood warning system
- Emergency response and preparedness

3.5.1.2 Structural Measures

- Detention/retention
- Set-back levees
- Rectangular concrete channel
- Trapezoidal concrete channel
- Trapezoidal earthen channel
- Bio-engineering methods
- Channel/bank stabilization
- Channel lining
- Raise/create levees
- Floodwall

- Bypass channel/pipe/box
- Raise, modify, replace bridge crossings
- Enlarge/modify channel culverts

3.5.2 Habitat Measures

- Plantings in channel
- Plantings on terraces
- Plantings on banks of channel
- Plantings on riparian fringe overbanks
- Wildlife corridor re-establishment
- Off-channel water storage for environmental purposes
- Low-flow modification for water supply to restored areas
- Channel widening and bank lay-back
- Aquatic habitat restoration
- Fish passage improvements
- Invasive species management
- Land acquisition
- Wetland construction
- Open water/marsh
- Non-native plant species eradication

3.5.3 Recreation and Public Access Measures

- Habitat buffer for recreational purposes
- Educational/cultural interpretive
- Parcourse
- Land acquisition for recreational purposes
- Recreation connectivity
- Park interface
- Trail interface
- Trail access
- Wildlife viewing

3.6 SCREENING OF MANAGEMENT MEASURES

3.6.1 Screening Criteria

Following identification of the management measures above, the Corps and SCVWD developed a set of criteria for the evaluation and screening of measures. Selection of practicable measures—and subsequently, alternatives—is based on assessments of (1) the effectiveness and/or applicability of a measure in meeting study objectives and constraints and (2) the measure's potential environmental, economic, and social effects. The following screening criteria were developed for group assessment of the management measures, and are refined from/consistent with the study objectives and constraints.

- Reduce flood damages
- Provide ecological functions/environmental values
- Provide natural physical stream functions and processes
- Avoid and minimize effects to riparian and aquatic habitat
- Minimize O&M especially due to sedimentation
- Integrate watershed processes
- Provide access and recreation to the public
- Cooperate with mutually beneficial goals of related plan, projects, and agencies
- Maximize community benefits beyond flood control
- Minimize life cycle costs
- Assumed community acceptability
- Property availability/rights-of-way
- Implementation cost

3.6.2 Rating of Management Measures

Following development of these screening criteria, the project delivery team evaluated the effectiveness of the various management measures thus far developed. Table 3-2 displays the results of the qualitative ratings developed for the measures, based on how effective they are in meeting the stated objectives (e.g. measures with a score of 3 as highly effective in meeting the objectives and a score of 0 as not effective in meeting the objectives) and how much they are affected by the constraints. For example, some of the assumptions in the exercise were that (1) 100-year flood control was desired; (2) a majority of a proposed alternative should be within existing rights-of-way or in rights-of-way that could be reasonably acquired; (3) maintenance access would be provided at least on one side with an 18-foot width; and (4) environmental protection/improvement features could provide a mitigation component to several different flood damage reduction alternatives.

3.6.3 Refinement of Measures by Reach

Refinement of measures took place to eliminate those that were (1) inappropriate for Federal participation or unsupported by non-Federal sponsorship, (2) had little to no potential for meeting study objectives, or (3) were less productive compared to other, more efficient elements. Measures eliminated from further study, therefore, included the following:

- Non-structural measures such as widespread buy-out within the floodplain and individual floodproofing – due to cost inefficiency. However, emergency response and preparedness information would in fact provide a viable component of any of the alternatives in order to help control ingress and egress, as well as provide assistance to those that are caught within flooded areas, and will therefore be carried forward.

- Plantings in channel bottom – due to increased channel capacity that would be required.

The effectiveness of the various management measures was then considered on a reach-by-reach basis in order to begin the process of identifying how the measures could be grouped into preliminary alternatives. The following list provides these refined measures that are developed into preliminary alternatives in the subsequent section.

3.6.3.1 Reach 9. Upstream of Old Piedmont Road

- Sediment source prevention/reduction by protective actions at the mine/quarry, hillside erosion areas, and bank erosion sites.

- Add seasonal aquatic habitat features, cascades, and pools.

3.6.3.2 Reach 8. Cropley Avenue Culvert to Old Piedmont Road

- Retrofit Old Piedmont Road Bridge by installing upstream levees and headwalls.

- Replacement of Old Piedmont Road Bridge.

- Concrete rectangular channel with service road remaining on the left bank.

- Widened trapezoidal channel with terrace for service road on left side. Geotech mats with grass to lined sideslopes and soft/earthen bottom.

- Clean out Cropley Avenue Culvert of sediment, maintain between events, add retaining/ headwall at upstream face for efficiency and safety.

- Add a second barrel to Cropley Avenue Culvert.

Table 3-2 Preliminary Management Measures, Planning Objectives, and Constraints											
MEASURES AND PROJECT PURPOSE	**OBJECTIVES**									**CONSTRAINTS**	
	Flood control	**Ecological Functions**	**Physical Stream Functions and Processes**	**Minimize O&M**	**Watershed Integration**	**Agency Cooperation and Mutually Beneficial Goals**	**Maximize Community Benefits beyond Flood control**	**Minimize Life Cycle Costs**	**Assumed Community Acceptability**	**Minimize Loss of Property/ Rights-of-Way**	**Minimize Cost**
EXISTING AUTHORIZED PLAN	3	1	1	3	1	1	1	3	0	3	2
FLOOD DAMAGE REDUCTION MEASURES											
Relocation of existing structures (buy-out and removal)	3	2	1	2	2	2	1	1	1	1	1
Flood proofing of existing structures	3	1	1	2	2	2	1	1	1	2	1
Flood warning system	1	0	0	1	2	1	0	0	1	2	2
Emergency Response and Preparedness	1	0	0	0	0	2	3	1	3	1	1
Detention/retention	1	1	1	2 (u/s Piedmont offers sediment improvements)	2	1.5 (depends on whether impact existing habitat)	2	2	3	3	2
Levees	3	1 (higher if rest features added)	1.5 (depends on u/s or d/s and width)	2	1	2	1	2	2	2	2
Concrete channel	3	0	0	3	0	1 (still provides flood control)	1 (trail)	2	0	3	1
Trapezoidal earthen channel	3	1 (higher if rest features added)	1.5 (depends on u/s or d/s and width)	2	1	1	1	2	1	3	2
Floodwall	3	2	2	2	1.5	1.5	1	2	2	3	2
Bio-engineering methods	would be added as a subfeature in select locations, if appropriate										
Channel/bank stabilization	would be added as a subfeature in select locations, if appropriate										
Channel lining	would be added as a subfeature in select locations, if appropriate										
Grade control structures	would be added as a subfeature in select locations, if appropriate										
Bypass channel/pipe/box	3	1	1	1	1	2	1	1	1.5	1	0
Raise, modify, replace bridge crossings	would be added as a subfeature in select locations, if appropriate										
Enlarge/modify channel culverts	would be added as a subfeature in select locations, if appropriate										
HABITAT MEASURES											
Plantings in channel bottom	0	3	2	0	3	3	3	1	3	2 (may need additional r/w)	2
Plantings on terraces	0	3	1	0	3	3	3	1	3	2 (may need additional r/w)	2
Plantings on banks of channel	0	3	2	0	3	3	3	1	3	2 (may need additional r/w)	2
Plantings on riparian fringe overbanks	0	3	1	0	3	3	3	2	3	3	2
Wildlife corridor re-establishment and/or continuous corridor maintenance	0	3	2	1	3	3	3	1	3	2 (may need additional r/w)	2
Off-channel water storage for environmental values	0	2	1	1	2	3	3	1	3	1	1

Table 3-2 Preliminary Management Measures, Planning Objectives, and Constraints											
MEASURES AND PROJECT PURPOSE	**OBJECTIVES**									**CONSTRAINTS**	
	Flood control	**Ecological Functions**	**Physical Stream Functions and Processes**	**Minimize O&M**	**Watershed Integration**	**Agency Cooperation and Mutually Beneficial Goals**	**Maximize Community Benefits beyond Flood control**	**Minimize Life Cycle Costs**	**Assumed Community Acceptability**	**Minimize Loss of Property/ Rights-of-Way**	**Minimize Cost**
Low-flow modification for water supply to restored areas	0	2	2	1	3	3	3	1	3	3	2
Channel widening and bank lay-back	1	2	2	0	3	3	3	2	3	1	1
Aquatic habitat restoration	0	3	3	1	3	3	3	1	3	2	2
Fish passage improvements	0	3	3	1	3	3	3	1	3	3	2
Invasive species management	1	3	3	1	3	3	3	1	3	3	1
Land acquisition	0	3	2	1	3	3	3	1	3	1	1
Wetland construction	0	3	2	0	3	3	3	1	3	1	1

Effectiveness Legend: 3 = high; 2 = moderate; 1 = low; 0 = not effective / not applicable

3.6.3.3 Reach 7. Greenbelt Park to Cropley Avenue Culvert

- Clean out and maintain existing sediment basin immediately downstream of Cropley Avenue culvert.
- Enlarge sediment basin immediately downstream of Cropley Avenue culvert.
- Increase height of levees on one or both sides to pass design flows with reasonable certainty. Pave service roads.
- Replace riparian invasive species with native species, including grasses, trees, etc.
- Improve channel to more natural status including adding bank stability, cover, and creation of aquatic habitat.
- Develop seasonal wetland area in floodplain with stream connection. Excavated materials are used for increasing height of service roads.

3.6.3.4 Reach 6. Morrill Avenue to Greenbelt Park

- Replacement of pedestrian bridge at Messina Drive to maintain pedestrian access due to impacts from increased upstream channel conveyance.
- Replace existing drop structure upstream of Sierra Creek and replace with rock weirs for fish passage.
- Increase height of levees on one or both sides to pass design flows with reasonable certainty. Pave service roads.
- Replace riparian invasive species with native species, including grasses, trees, etc.
- Improve channel to more natural status including adding bank stability, cover, and aquatic habitat.
- Develop seasonal wetland area in floodplain with stream connection. Excavated materials are used for increasing height of service roads.

3.6.3.5 Reach 5. I-680 to Morrill Avenue

- Develop levees or similar means to funnel Cropley Avenue overflows directly back into Berryessa Creek to minimize damage to residential structures.
- Replace concrete channel segment with lined trapezoidal channel with grass-filled geotech mats and earthen bottom.
- Pave existing service roads.

3.6.3.6 Reach 4. Montague Expressway to I-680

- Implement enlarged trapezoidal channel within right-of-way using geotech mats, buried riprap toe downs, and earthen bottom. Sized to pass design flow with reasonable certainty. Side walls are grass with plantings along top of banks as space allows. Retain service road along right bank.

- Implement enlarged trapezoidal channel with channel wall, pilot channel and terrace along right bank within right-of-way. Sized to pass design flow with reasonable certainty. Service road along terrace and along top of right bank as space allows through reach. Channel is protected using geotech mats, buried riprap toe downs, and earthen bottom. Side walls are grass with plantings on terrace and along top of banks as space available.

- Implement enlarged trapezoidal channel with extended walls on sides to carry design flow within right-of-way. Sized to pass design flow with reasonable certainty. Channel is protected using geotech mats, buried riprap toe downs, and earthen bottom. Sloped side walls are grass with plantings placed along top of banks as space available. Service road along top of right bank.

- Using existing channel configuration, implement walls along both banks to pass design flow with reasonable certainty, all within right-of-way. Retain existing service roads.

- Pedestrian bridge crossing Berryessa Creek at apartments on left bank in vicinity of third 90-degree bend downstream of Highway 680. The bridge ties into the Milpitas Master Plan pedestrian/bike trail along the service road along Berryessa Creek right bank.

3.6.3.7 Reach 3. Piedmont Creek to Montague Expressway

- Implement enlarged trapezoidal channel within right-of-way using geotech mats, buried riprap toe downs, and earthen bottom. Sized to pass design flow with reasonable certainty. Side walls are grass with plantings along top of banks as space allows. Retain service road along right bank.

- Implement enlarged trapezoidal channel with channel wall, pilot channel and terrace along right bank within right-of-way. Sized to pass design flow with reasonable certainty. Service road along terrace and along top of right bank as space allows through reach. Channel is protected using geotech mats, buried riprap toe downs, and earthen bottom. Side walls are grass with plantings on terrace and along top of banks as space available.

- Implement enlarged trapezoidal channel with extended walls on sides to carry design flow within right-of-way. Sized to pass design flow with reasonable certainty. Channel is protected using geotech mats, buried riprap toe downs, and earthen bottom. Sloped side walls are grass with plantings placed along top of banks as space available. Service road along top of right bank.

- Using existing channel configuration, implement walls along both banks to pass design flow with reasonable certainty, all within right-of-way. Retain existing service roads.

- Using existing channel, implement levees (or wall if necessary on right bank) on both banks to carry design flow within right-of-way. Sized to pass design flow with reasonable certainty. Service roads along top of both banks.

- Implement enlarged channel with terraces along pilot channel with set-back levees along both top banks to carry design flow. Channel is lined with geotech mat with earth bottom. Assumes additional right-of-way as needed. Sized to pass design flow with reasonable certainty. Plantings on terraces with grass planting along sideslopes and levees. Service roads along top of both levees.

- Replace Railroad Bridge.

- Incorporate Milpitas Master Plan trail along Berryessa Creek right bank and would provide an additional beneficial point of access to the planned Milpitas BART station.

3.6.3.8 Reach 2. Los Coches Creek to Piedmont Creek

- Implement enlarged trapezoidal channel within right-of-way using geotech mats, buried riprap toe downs, and earthen bottom. Sized to pass design flow with reasonable certainty. Side walls are grass with plantings along top of banks as space allows. Retain service road along right bank.

- Implement enlarged trapezoidal channel with channel wall, pilot channel and terrace along right bank within right-of-way. Sized to pass design flow with reasonable certainty. Service road along terrace and along top of right bank as space allows through reach. Channel is protected using geotech mats, buried riprap toe downs, and earthen bottom. Side walls are grass with plantings on terrace and along top of banks as space available.

- Implement enlarged trapezoidal channel with extended walls on sides to carry design flow within right-of-way. Sized to pass design flow with reasonable certainty. Channel is protected using geotech mats, buried riprap toe downs, and earthen bottom. Sloped side walls are grass with plantings placed along top of banks as space available. Service road along top of right bank.

- Using existing channel configuration, implement walls along both banks to pass design flow with reasonable certainty, all within right-of-way. Retain existing service roads.

- Using existing channel, implement levees (or wall if necessary on right bank) on both banks to carry design flow within right-of-way. Sized to pass design flow with reasonable certainty. Service roads along top of both banks.

- Implement enlarged channel with terraces along pilot channel with set-back levees along both top banks to carry design flow. Channel is lined with geotech mat with earth bottom. Assumes additional right-of-way as needed. Sized to pass design flow with reasonable certainty. Plantings on terraces with grass planting along sideslopes and levees. Service roads along top of both levees.

- Incorporate Milpitas Master Plan trail and along Berryessa Creek right bank.

3.6.3.9 Reach 1. Calaveras Boulevard to Los Coches Creek

- Implement enlarged trapezoidal channel within right-of-way using geotech mats, buried riprap toe downs, and earthen bottom. Sized to pass design flow with reasonable certainty. Side walls are grass with plantings along top of banks as space allows. Retain service road along right bank.

- Implement enlarged trapezoidal channel with channel wall, pilot channel and terrace along right bank within right-of-way. Sized to pass design flow with reasonable certainty. Service road along terrace and along top of right bank as space allows through reach. Channel is protected using geotech mats, buried riprap toe downs, and earthen bottom. Side walls are grass with plantings on terrace and along top of banks as space available.

- Implement enlarged trapezoidal channel with extended walls on sides to carry design flow within right-of-way. Sized to pass design flow with reasonable certainty. Channel is protected using geotech mats, buried riprap toe downs, and earthen bottom. Sloped side walls are grass with plantings placed along top of banks as space available. Service road along top of right bank.

- Using existing channel configuration, implement walls along both banks to pass design flow with reasonable certainty, all within right-of-way. Retain existing service roads.

- Using existing channel, implement levees (or wall if necessary on right bank) on both banks to carry design flow within right-of-way. Sized to pass design flow with reasonable certainty. Service roads along top of both banks.

- Implement enlarged channel with terraces along pilot channel with set-back levees along both top banks to carry design flow. Channel is lined with geotech mat with earth bottom. Assumes additional right-of-way as needed. Sized to pass design flow with reasonable certainty. Plantings on terraces with grass planting along sideslopes and levees. Service roads along top of both levees.

- Increase Calaveras Bridge capacity to pass design flow with reasonable certainty by implementing upstream levees and heighten headwall.

- Increase Calaveras Bridge capacity to pass design flow with reasonable certainty by installing additional barrel/capacity through bridge.

- Incorporate Milpitas Master Plan trail and along Berryessa Creek right bank.

3.7 DESCRIPTION OF ALTERNATIVE PLANS*

The list of management measures above demonstrates a large number of components that could be applied to meet the objectives and constraints and address the problems and opportunities in the study area. Note that the measures are either mutually exclusive—as with either a trapezoidal earthen channel or a rectangular channel—or they are additive as potential components of certain overall channel modifications, as with enlarged culverts, recreation trails, or wetland areas. Thus, the *combination* of measures as the means by which to achieve the study objectives became the objective of the next phase of the plan formulation effort.

Three preliminary alternative plans were formulated from the screened management measures previously discussed. These alternatives were developed to encompass the broadest range of potential alternatives that could be formulated to address flood damage reduction opportunities in Berryessa Creek. Where justified and feasible, these alternatives were formulated to provide an opportunity for environmentally-sustainable design and future recreation consistent with the flood reduction purpose of the project. Each of these preliminary alternative plans is configured to address the planning goals and objectives defined by the study. Furthermore, each is formulated to provide a reasonable chance of containing the 0.01 exceedance probability event should it occur. A discussion of the preliminary alternative plans follows. Note that the key features presented in Section 3.7.1 were initially used in the development of preliminary alternative plans and were further refined in the development of the final array of alternatives.

3.7.1 Preliminary Alternative Plans

3.7.1.1 Alternative 1 – No Action Alternative

A "No-Action Alternative" is required pursuant to NEPA. Herein called the No-Action Alternative, and synonymous with the "without-project condition" described in Chapter 2, this alternative considers the future conditions in the study area in the absence of a federally cost-shared and locally supported project. Future conditions include:

- Commercial and industrial development especially in Milpitas per their Master Plan
- Continuance and likely increase of the existing flood threat to Milpitas and San Jose
- Continued loss of riparian habitat areas and native species in the floodplain and stream
- Greater O&M cost especially due to sediment deposition and bank erosion, flood fighting, and emergency costs

3.7.1.2 Alternative 2 – Earthen Trapezoidal Channel (Old Piedmont Road to Calaveras)

This plan provides flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the 0.01 exceedance probability event within banks and undeveloped floodplain areas. It includes a variety of measures and actions from upstream of Old Piedmont Road to just below Calaveras Boulevard where it transitions into the SCVWD channel and levee system presently under design. The plan includes features for environmental mitigation in the greenbelt area by improving riparian habitat. Downstream of I-680, the channel is designed with a trapezoidal shape with side-slopes protected by geotextile mats and native grasses. It has an earthen channel bottom. The alternative potentially reduces sediment transport entering the system from above Old Piedmont Road, thus assuring better project performance and reduced O&M costs. The existing service road alignments are retained but with the road surfaces hardened and adjacent areas re-vegetated. The design is consistent with the pedestrian and bike trail proposed in Milpitas Community Master Plan for Berryessa Creek (City of Milpitas 1999).

This alternative would protect and improve environmental and aesthetic features in the study area to provide an environmentally-acceptable alternative. The existing medium quality habitat above Old Piedmont Road and in the greenbelt would be protected to the maximum extent practicable. Any adverse effects of the project, such as tree removal, would be mitigated by re-vegetation in the floodplain and riparian zone of the greenbelt, which would further help prevent bank erosion. The channel downstream of the greenbelt would also be modified with aesthetic features such as vegetative screening as well as shading for the stream channel.

Figure 3-1 and Figure 3-2 depict a schematic of the key features and typical cross sections of the plan, respectively.

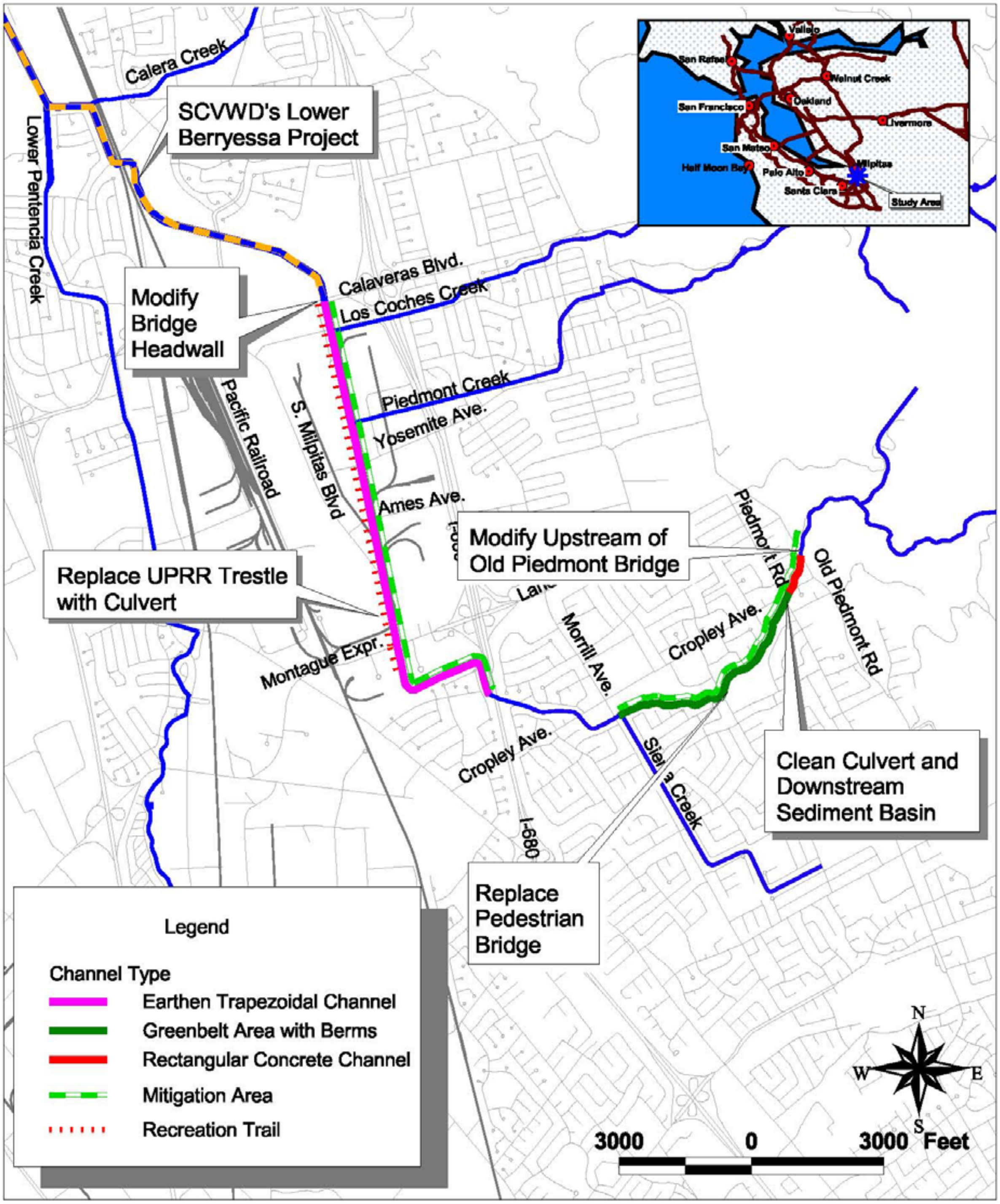


Figure 3-1 Alternative 2 – Earthen-Trapezoidal Channel with Mitigation (Old Piedmont Road to Calaveras Boulevard)

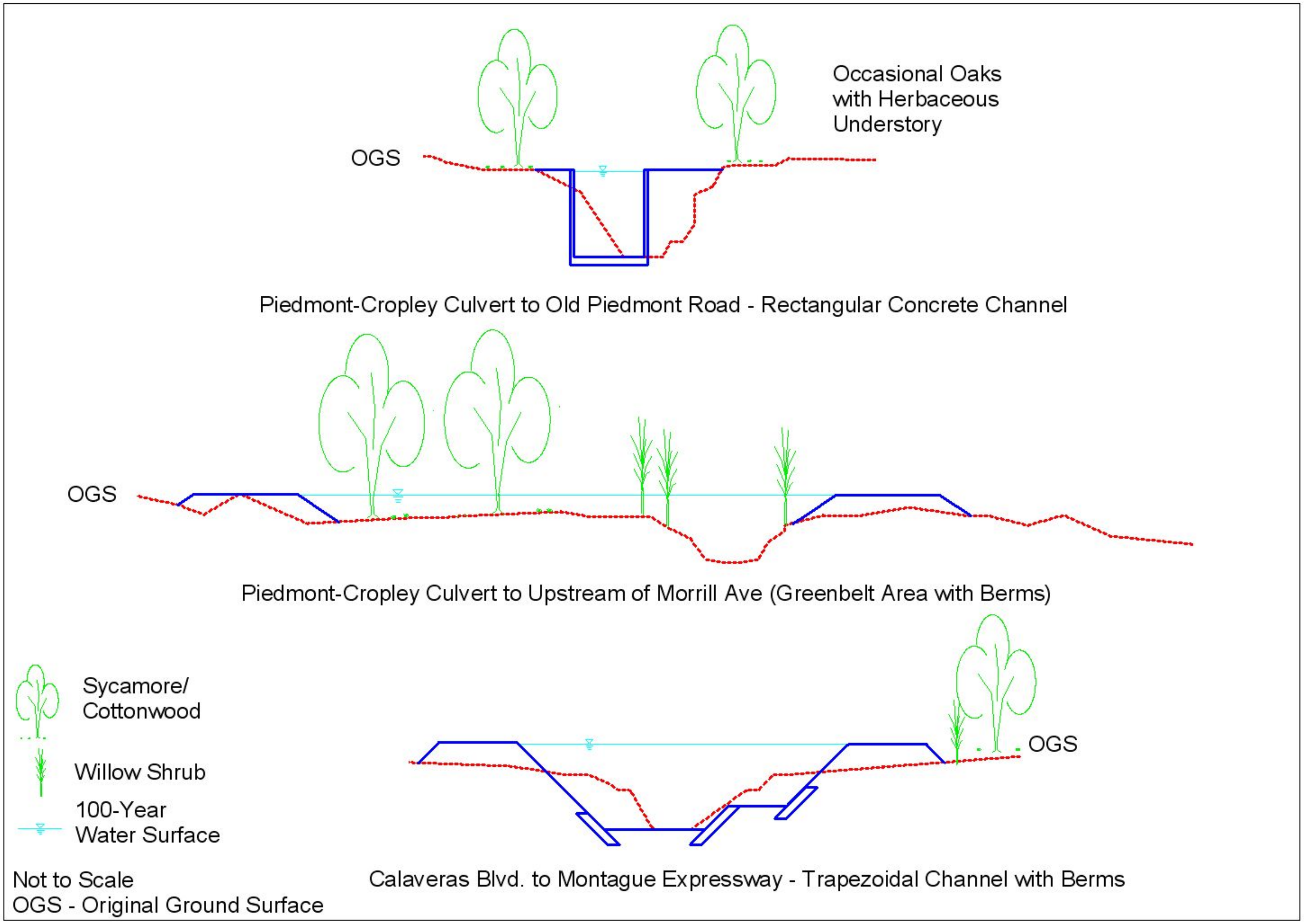


Figure 3-2 Alternative 2 – Typical Cross Sections

3.7.1.3 Alternative 3 – Earthen Terraced and Leveed Channel (Old Piedmont Road to Calaveras)

Similar to the first alternative, this plan provides flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the 0.01 exceedance probability event within banks and undeveloped floodplain areas. It also includes a variety of measures and actions from upstream of Old Piedmont Road to just below Calaveras Boulevard, where it transitions into the SCVWD channel and levee system presently under design. The plan adds another culvert at the Cropley Avenue and Piedmont Road intersection. The plan includes the same features for environmental mitigation in the Greenbelt area as the first alternative. Downstream of I-680, the channel is designed with an earthen bottom pilot channel, planted terraces along each side, and set-back levees on the top banks. The alternative requires additional ROW through these reaches. The channel is lined with geotextile mats and native grasses. The alternative potentially reduces sediment transport entering the system from above Old Piedmont Road, resulting in better project performance and reduced O&M costs. The existing service road alignments are retained, but with the road surfaces hardened and adjacent areas revegetated. The design is consistent with the Pedestrian and Bike Trail proposed in the Milpitas Community Master Plan.

This alternative would protect and enhance environmental and aesthetic features in the study area to provide an environmentally-acceptable alternative. The existing high quality habitat above Old Piedmont Road and in the greenbelt would be protected to the maximum extent practicable. Any adverse effects of the project, such as tree removal, would be mitigated by re-vegetation in the floodplain and riparian zone of the greenbelt, which would further help prevent bank erosion. The channel downstream of the greenbelt would also be modified with aesthetic features such as vegetative screening as well as shading for the stream channel.

Figure 3-3 and Figure 3-4 depict a schematic of the key features and typical cross sections of the plan, respectively.

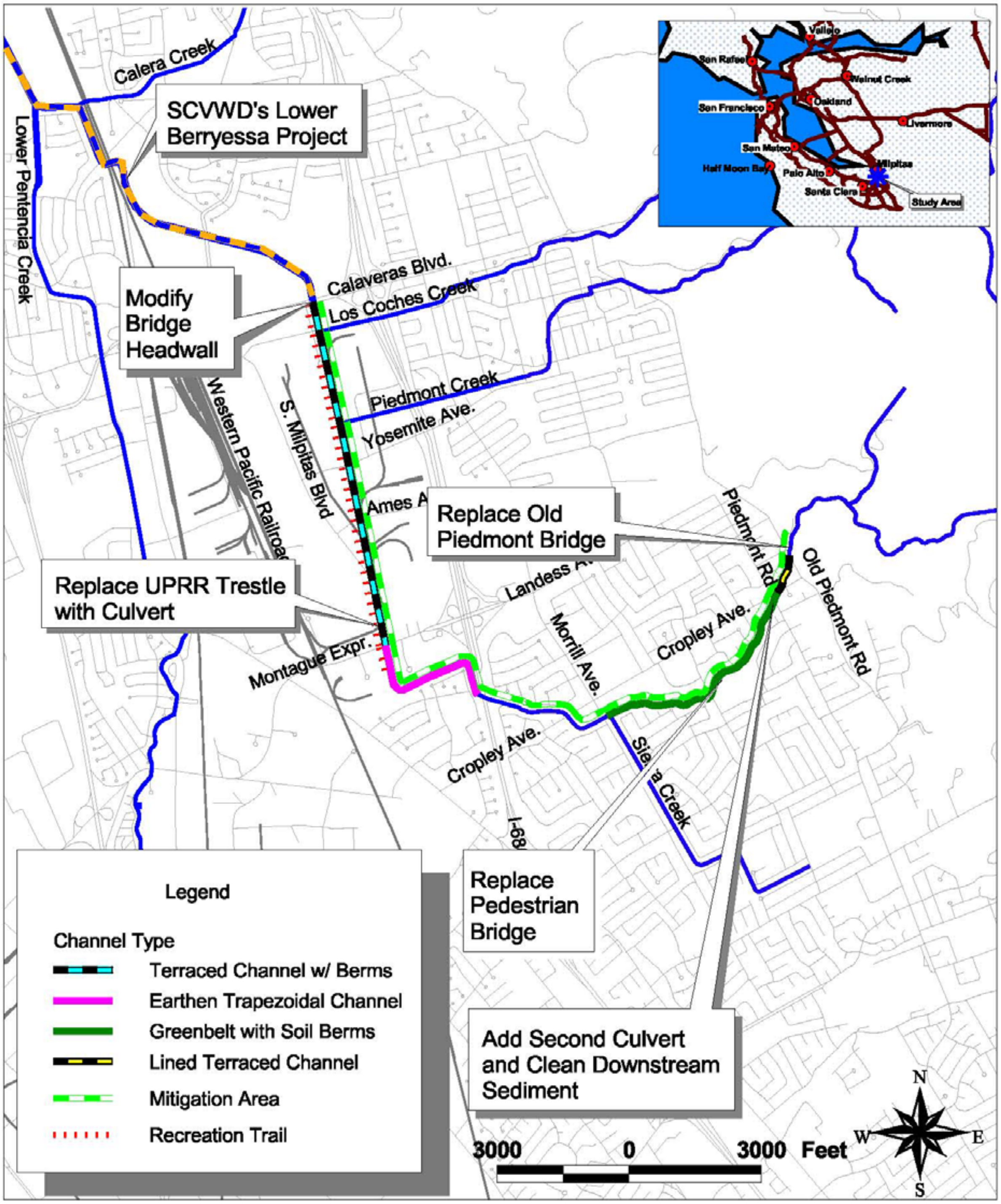


Figure 3-3 Alternative 3 – Earthen-Terraced and Leveed Channel with Mitigation (Old Piedmont Road to Calaveras Boulevard)

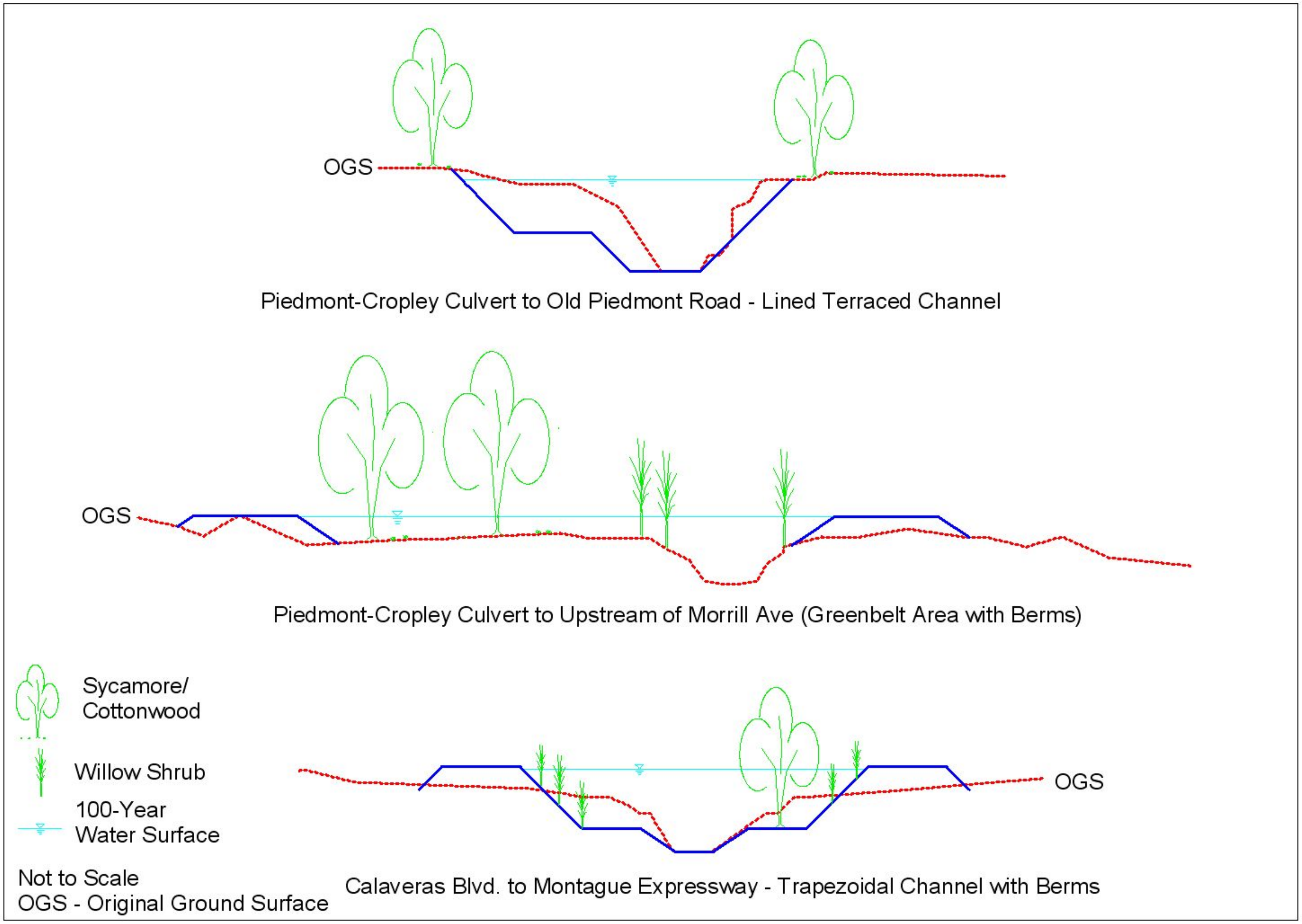


Figure 3-4 Alternative 3 – Typical Cross Sections

3.7.1.4 Alternative 4 – Earthen and Walled Terraced Channel (Highway 680 to Calaveras)

Unlike the other two alternatives presented, this alternative would provide flood control only from downstream of I-680 to Calaveras Boulevard. It would provide flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the 0.01 exceedance probability event within banks. It would transition into the SCVWD channel and levee system presently under design immediately below Calaveras Boulevard. The channel is designed with planted terraces and side walls to add capacity and bank protection within existing ROW. The channel is also protected with geotextile mats planted with native grasses. It will have an earthen channel bottom. The existing service road alignments would be retained but with the road surfaces hardened and with adjacent areas revegetated with riparian forest vegetation. The design is consistent with the Pedestrian and Bike Trail proposed in Milpitas Master Plan for Berryessa Creek.

This alternative would protect and enhance environmental and aesthetic features in the study area to provide an environmentally-acceptable alternative. The existing high quality habitat above Old Piedmont Road and in the greenbelt would be protected to the maximum extent practicable. Any adverse effects of the project, such as tree removal, would be mitigated by re-vegetation in the floodplain and riparian zone of the greenbelt, which would further help prevent bank erosion. The channel downstream of the greenbelt would also be modified with aesthetic features such as vegetative screening as well as shading for the stream channel.

Figure 3-5 and Figure 3-6 depict a schematic of the key features and typical cross sections of the plan, respectively.

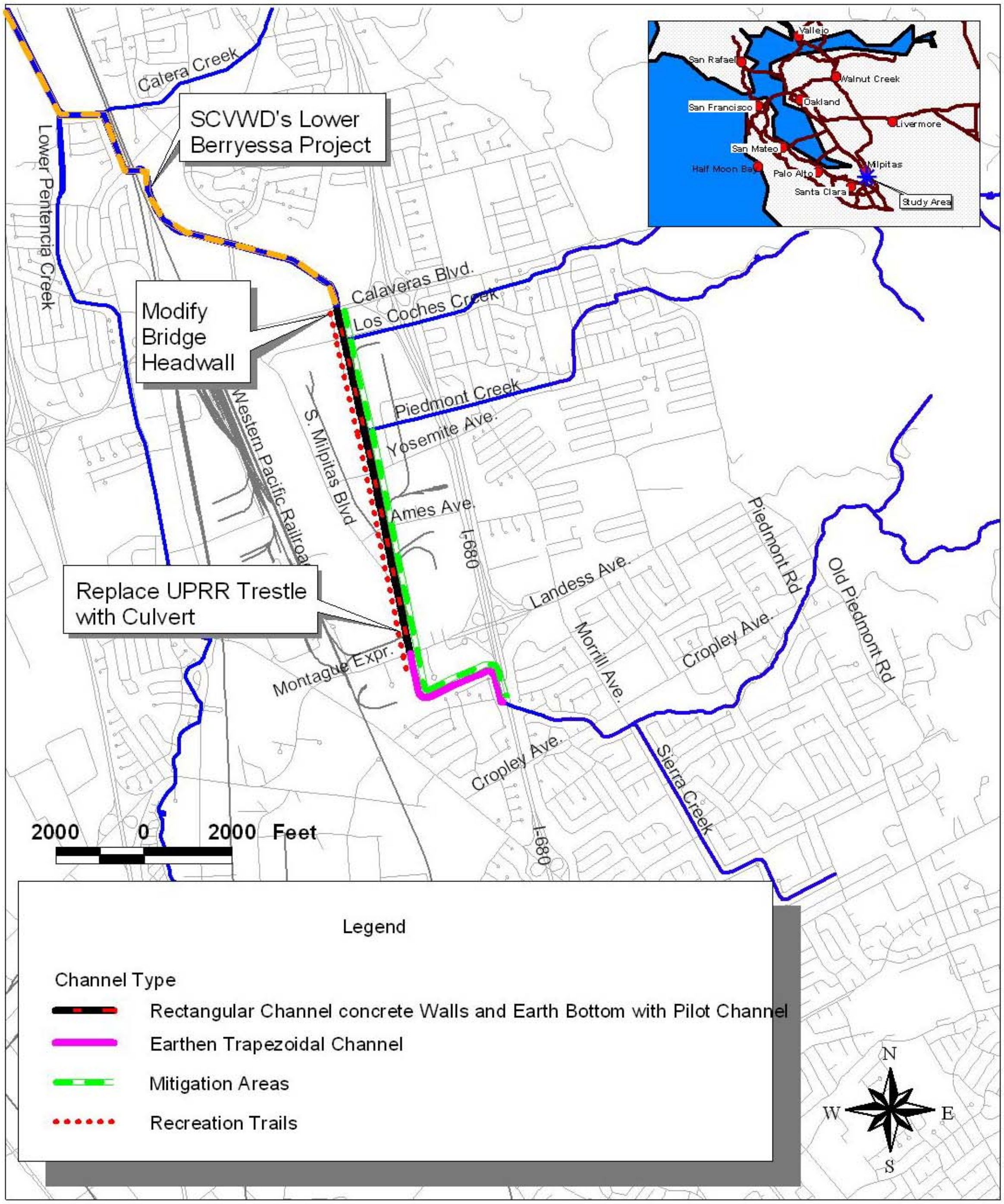


Figure 3-5 Alternative 4 – Earthen and Walled Terraced Channel (Highway 680 to Calaveras Boulevard)

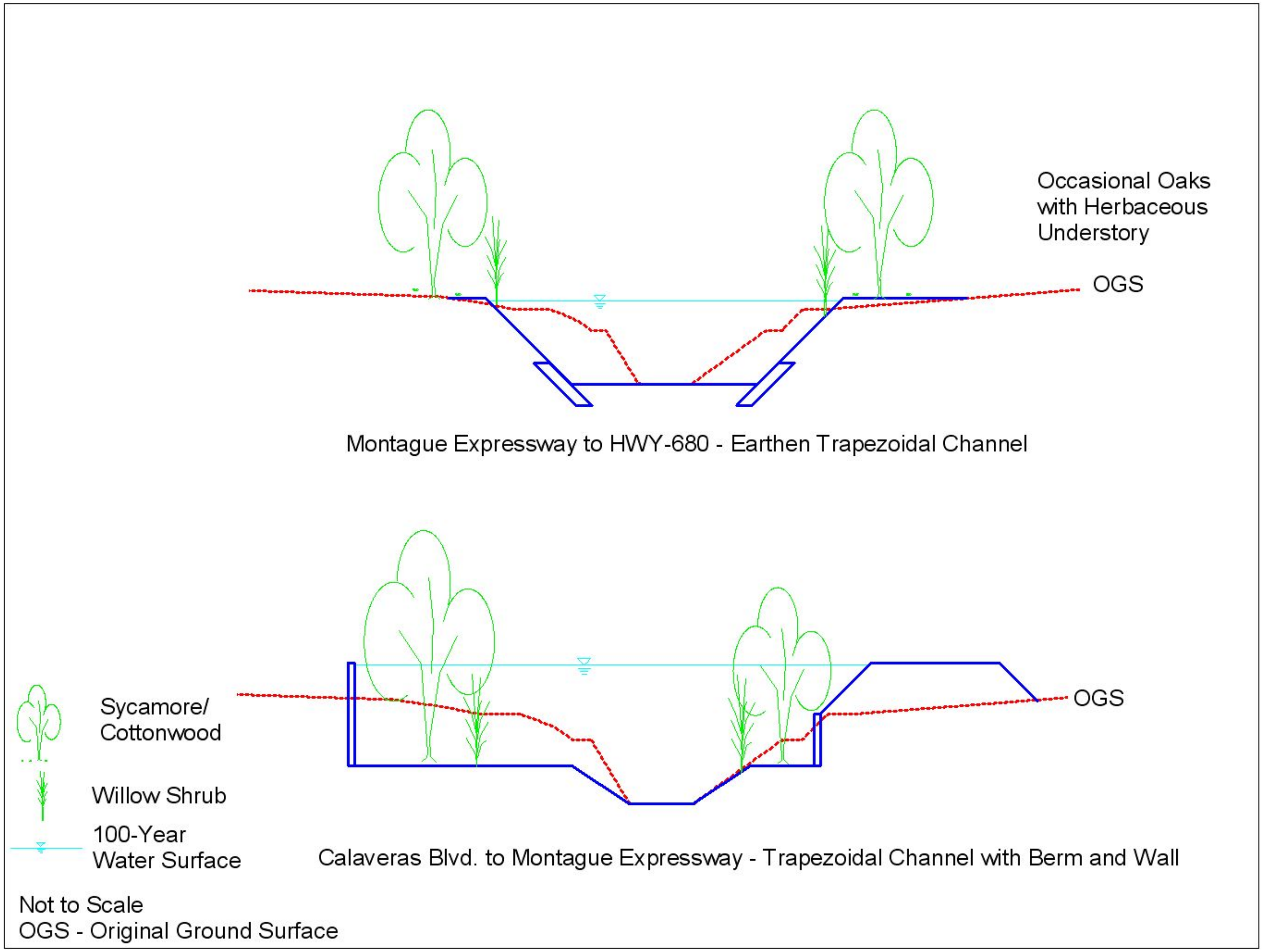


Figure 3-6 Alternative 4 – Typical Cross Sections

3.7.1.5 Non-Structural Alternatives

Based on the preliminary screening, it was determined that the previously identified non-structural measures were either economically infeasible or ineffective. It was determined that the relocations of existing structures from the floodplain as well as floodproofing of structures are extremely costly due to the large number of structures involved, thereby eliminating both measures from further consideration. It was also determined that a flood warning system would be a low-cost alternative. However, this plan was determined to be infeasible because of insufficient advance time for warning and evacuation since the study area is immediately below the foothills in the upper part of the watershed. There is no time lag from when a storm hits to the flows rising rapidly in the system, which is mainly due to the surrounding hardscaped area and barren channel. Limited area is available for ground infiltration such that as soon as the storm hits, runoff flows to the creek. Additional investigation resulted in an alternate non-structural measure that could be further pursued for implementation. This measure is the preparation of an emergency response plan that would provide for the dispatch of emergency services, and a framework within which local agencies would operate during a flood event. This does not alleviate or solve the issue of flood inundation; it simply seeks to provide for public safety and spot treatment of problem areas. Although a fairly efficient use of funds, emergency response does not reduce damages in the affected floodplain. An emergency response plan is not a complete solution to the flooding problems in the study area; however, this can be combined and incorporated into the Recommended Plan.

Certain components of an emergency response plan are already being implemented at the county and city level. Currently, the cities, county, and the SCVWD utilize the Emergency Broadcast System (EBS) and other forms of public information such as radio and television to transmit emergency and warning transmissions for the area. Also, a local emergency/information phone number (408.265.2600) has been established to answer the public's questions or receive important flood information from residents. The SCVWD's Emergency Operations Center (EOC) is located on the main campus at 5750 Almaden Expressway, San Jose, California. The EOC is responsible for carrying out the emergency response program. They also utilize a website to show where flooding is occurring.

3.7.2 Screening of Preliminary Alternative Plans

The screening process tests the performance of alternatives using criteria that identify whether an alternative is reasonable, i.e., an alternative that is technically and economically feasible and that meets the project's purpose and need.

In order to provide the level of detail necessary to compare the four preliminary alternative plans, additional engineering, design, cost estimating, and incremental analysis, were conducted.

3.7.2.1 Incremental Analysis of Flood Risk Reduction Component

An incremental analysis was conducted in 2006 to identify the economic justification of flood risk management components. Benefits were calculated on an incremental basis. The first was to determine the feasibility of separable geographic areas: upstream of I-680 consisting of areas A, B, C, and D, and downstream of I-680 consisting of areas E and F. The second was to determine optimal project sizing.

The objectives of the incremental analysis were to determine if there is a Federal interest to construct a continuous project providing flood risk management to all impact areas, and determine the optimal size of project for such areas. For this analysis, benefits were evaluated for basic trapezoidal earthen channel improvements with varying capacity to reflect different sizing. Additional improvements such as levees and bridge improvements were included in some reaches or creek sections of the channel when needed to allow for full target conveyance.

It should be noted that the 2006 incremental analysis did not consider the effect of the Corps "800 cfs rule," which limits Corps participation in flood risk management on streams that do not meet minimum flow requirements. Because of the 800 cfs rule, the benefits in Areas A, B, and C were later excluded from the identification of the NED Plan. Additional information is presented in Section 3.7.4.3.

The analysis was based on the following methodology.

1) Identify locations of channel breakouts as discharge is incrementally increased

2) Identify floodplain associated with breakouts

3) Identify costs of structural improvements to preclude the breakouts

4) Identify flood damage reduction benefits from precluding the breakouts

5) Determine benefit-to-cost ratio and net benefits for each increment

Preliminary iterations ranged from the non-damaging event through the 95 percent conditional non-exceedance probability (CNP) for the 0.01 event (generally equal to the 50 percent CNP of the 0.002 event). It was determined that frequencies associated with increasingly larger discharges could generally be associated with the following frequency categories.[3]

- Project designed to pass flows (without uncertainty) equivalent to a minimum of 0.03

- Project designed to pass flows (without uncertainty) equivalent to a minimum of 0.02

- Project designed to pass flows (without uncertainty) equivalent to a minimum of 0.01

- Additional components to the 0.01 project design to meet project performance criteria of 90 percent CNP of the 0.01 event

[3] The probabilities (0.03, 0.02, and 0.01) refer to project performance and indicate the chance that the event is exceeded in any one year. Therefore, the previous nomenclature of the "100-year flood" is more properly defined as the flood having a 1 percent or **0.01 chance** of being exceeded in any one year. Similarly, the 0.03 flow was previously called the "33-year" flow, the 0.02 flow was previously called the "50-year" flow, and the 0.002 flow was called the "500-year" flow.

- Additional components to the 0.01 project design to meet project performance criteria of 95 percent CNP of the 0.01 event

Ten project increments (five events for each of the two separable areas) were run in HEC-FDA. The residual damages and benefits are presented in Table 3-3. Annual benefits shown in the table represent the difference between the without- and with-project equivalent annual damages for each increment. The incremental benefits show the difference between benefits from one increment to the next larger increment. The greatest incremental benefits occur with the first increment – the more frequent 0.03 exceedance probability – and again with the 0.01 exceedance probability event. The channel improvements would not only eliminate damages from the more frequent events but would also reduce the magnitude of damage for the larger residual events. Additional incremental analysis was determined to not be necessary to move forward with the formulation of the subsequent array of alternative plans. Hence, the damages and benefits shown in the following tables are in 2005 prices to reflect the results when the previous analysis was completed.

Table 3-3 Annual Benefits by Increment
$1,000s, October 2005 Prices, 5.375% Interest Rate, 50-Year Period of Analysis

Increment	Equivalent Annual Damage		Annual Benefits	Incremental Benefits
	Without-Project	With-Project		
Upstream of I-680 – Damage Areas A, B, C, and D				
Without-Project	581	581	0	0
Pass 0.03 exceedance probability	581	326	255	255
Pass 0.02 exceedance probability	581	280	301	46
Pass 0.01 exceedance probability	581	65	516	215
Meet 90% CNP	581	14	567	51
Meet 95% CNP	581	10	571	4
Downstream of I-680 – Damage Areas E and F				
Without-Project	9,863	9,863	0	0
Pass 0.03 exceedance probability	9,863	5,643	4,220	4,220
Pass 0.02 exceedance probability	9,863	3,981	5,882	1,662
Pass 0.01 exceedance probability	9,863	530	9,333	3,451
Meet 90% CNP	9,863	160	9,703	370
Meet 95% CNP	9,863	60	9,803	100

(a) Annual Costs

Project costs were developed for both the downstream and upstream of I-680 reaches. In addition, costs were estimated for different components and capacity sizing which provide different project performance for each incremental alternative. These components were identified to be able to pass specific frequencies of flow and are labeled as such in Table 3-4 and

Table 3-5. For the downstream reach, costs for each increment were based on the design of an incised channel (preliminary Alternative 2). It was decided that the relationship of benefits and costs for each capacity size analyzed for preliminary Alternative 2 would be representative of preliminary Alternatives 3 and 4, as well.

For the benefit cost analysis, these project costs need to be described in terms of annual costs. The project costs were amortized over the 50-year period of analysis using the current federal discount rate of $5^3/_8$ percent. Interest during construction was based on a two-year construction schedule assuming uniform expenditure over the period. Annual cost estimates are shown in Table 3-4 for the five increments upstream and in Table 3-5 for the five increments downstream.

Table 3-4 Annual Costs – Upstream Project Incremental Alternatives
$1,000s, October 2005 Prices, 5.375% Interest Rate, 50-Year Period of Analysis

	Incremental Alternatives –Upstream of I-680 Areas (A, B, C, and D)				
	Pass 0.050 Exceedance Probability Event	Pass 0.030 Exceedance Probability Event	Pass 0.020 Exceedance Probability Event	Pass 0.010 Exceedance Probability Event	Pass 0.002 Exceedance Probability Event
Construction Costs[1]	418	533	762	3,263	4,221
Contingency	126	160	228	979	1,266
Planning, Engineering and Design	63	80	114	490	633
Construction Management	33	43	61	261	338
LERRD	11	7	5	8	694
First Costs	**651**	**823**	**1170**	**5,001**	**7,152**
Interest During Construction	93	117	167	715	1,023
Investment Costs	744	940	1,338	5,716	8,175
Interest & Amortization	43	54	77	331	474
OMRRR	72	72	72	73	74
Annual Costs	115	126	149	404	548

[1]Includes environmental mitigation costs

Table 3-5 Annual Costs – Downstream Project Incremental Alternatives $1,000s, October 2005 Prices, 5.375% Interest Rate, 50-Year Period of Analysis					
	Incremental Alternatives –Downstream of I-680 Areas (E and F)				
	Pass 0.050 Exceedance Probability Event	**Pass 0.030 Exceedance Probability Event**	**Pass 0.020 Exceedance Probability Event**	**Pass 0.010 Exceedance Probability Event**	**Pass 0.002 Exceedance Probability Event**
Construction Costs[1]	356	1,073	2,166	9,667	16,524
Contingency	107	322	649	2,900	4,957
Planning, Engineering and Design	54	161	325	1,450	2,479
Construction Management	29	86	173	773	1,322
LERRD	9	13	15	25	2,715
First Costs	**555**	**1,655**	**3,328**	**14,815**	**27,997**
Interest During Construction	79	236	476	2,118	4,003
Investment Costs	634	1,891	3,804	16,933	32,000
Interest & Amortization	37	109	221	982	1,856
OMRRR	36	40	43	49	56
Annual Costs	73	149	264	1,031	1,912
[1]Includes environmental mitigation costs					

(b) Benefits

Savings in Flood Insurance Administration Costs

In addition to flood damages reduced, there is potential benefit from savings in the administration costs for the National Flood Insurance Program (NFIP). Any alternative that removes the FEMA requirement can claim this benefit by reducing the number of policies required. Economic Guidance Memorandum 05-07 lists the current operating cost per policy at $163. Based on the most recent FEMA data, Milpitas has 2,493 policies in force, and based on the total estimated number of structures inundated from various sources to include Berryessa and Penitencia Creeks within Milpitas, the participation rate for the area in the NFIP would be around 40 percent. Based on this participation rate, potential benefits from savings in NFIP administration costs may be around $160,000 for any alternative that would remove the existing structures in the Berryessa Creek Element from the 100-year FEMA floodplain. Based on Corps criteria, the only alternative that would completely remove the need for some flood insurance meets the 95 percent CNP of the 0.01 exceedance probability event. This alternative would add an additional $35,000 for upstream of I-680 and $125,000 for downstream of I-680. Including the future residential units in midtown, which would no longer be required to carry flood insurance with the project, and amortizing the future savings over the period of analysis, could add another $60,000 in benefits. For smaller projects, savings in flood insurance administration costs were limited by the residual flooding and were determined proportionally to the number of structures removed from the corresponding project floodplain.

Advance Bridge Replacement Benefits

For any alternative that requires major reconstruction or replacement of any bridge crossing and extends the useful life of that bridge, advance bridge replacement benefits can be claimed. For example, if bridge "A" has to be replaced in 10 years and the project extends its life by 50 years, part of the replacement cost can be taken as a benefit because the replacement extends its transportation purpose in addition to providing flood damage reduction. Calculation of replacement benefit is a function of interest rate, projected replacement bridge life, remaining bridge life, and cost of replacement. In total, four bridges need to be replaced upstream to be able to pass the 0.01 exceedance probability event. Downstream replacements, five in total, vary by frequency in terms of being able to pass a given flow; all need to be replaced to pass the 0.005 exceedance probability event.

Table 3-6 Advance Bridge Replacement Benefits
$1,000s, October 2005 Prices, 5.375%, 50-Year Period of Analysis

Upstream of I-680						
Increment	**Old Piedmont Road**	**Piedmont Road and Cropley Avenue**	**Morrill Avenue**	**Cropley Avenue**		**Total Benefits**
0.030	0	0	0	0		0
0.020	0	0	0	0		0
0.010	**18.0**	**36.4**	**20.9**	**16.8**		**92.1**
0.005	18.0	36.4	20.9	16.8		92.1
0.002	18.0	36.4	20.9	16.8		92.1
Downstream of I-680						
Increment	**Montague Expressway**	**UPRR Trestle**	**UPRR Culvert**	**Los Coches Street**	**Calaveras Boulevard**	**Total Benefits**
0.030	0	0	0	0	0	0
0.020	0	37.2	0	0	0	37.2
0.010	**64.1**	**37.2**	**0**	**0**	**0**	**101.3**
0.005	64.1	37.2	22.4	34.7	88.2	246.6
0.002	64.1	37.2	22.4	34.7	88.2	246.6

Additional Flood Related Risks

In addition to the monetary losses to categories listed above, flooding from Berryessa Creek could have other damage impacts and place many public services at risk , and if reduced would provide additional non-monetary benefit. Emergency costs (about 1 percent of total damages) evaluated in this study were limited to evacuation, relocation, and temporary assistance based on examples of similar flood risks found on other flood damage studies in Northern California. Administrative costs and increased public services such as police and fire were not included in these emergency cost estimates primarily due to lack of available data regarding any comparable historical flooding within the Bay Area. Nationwide, where depth of flooding and duration of event were much greater, some studies have estimated total emergency costs (including temporary relocation, evacuation, public administration, additional emergency healthcare and increased labor) as high as 15 percent of the total without-project damages. While the emergency costs listed for Berryessa do not capture the total potential loss, these non-quantified losses are an incrementally-small portion of the overall losses and would not change the feasibility or formulation of any of the alternatives.

Potential traffic delays and temporary interruption in public services were also not quantified. I-680 runs through the study area but would not be closed from flooding along Berryessa Creek. However, flooding from Berryessa Creek could cut off access by non-motorized and other traffic to the proposed BART station, which would impair access to a key intermodal transportation center. Minor roads within the floodplain may be closed for short durations due to flooding, but alternate routes would not add significant time loss or additional resource consumption to the NED account.

The area could suffer from significant business losses which could be included as Regional Economic Development (RED) damages in the analysis. Because most of these income losses could not be included in the NED analysis, and therefore would not change the determination of the NED plan, RED benefits were not explicitly quantified as part of this study.

Other non-monetary risks could also occur from a flood event but are not included in the NED evaluation. General reductions in risks to health, safety, and public welfare are typically associated with flood conditions and are further reasons why flood control serves the Federal interest and the public good. Within the Berryessa Creek floodplain there are several elementary schools, two fire stations, a hospital, several medical clinics, police station and Milpitas City Hall that could lose vital public services due to flooding of at least one-foot above the first floor.

(c) Net Benefits

Based on preliminary analysis, there are several alternatives with positive net benefits indicating that flood damage reduction for Berryessa Creek can be justified and is in the Federal interest. Increments of various project size and location were analyzed to determine costs and benefits for alternatives listed in Table 3-7 and Table 3-8.

Table 3-7 Annual Benefits and Costs by Incremental Alternative (Upstream of I-680) **$1,000s, October 2005 Prices, 5.375%, 50-Year Period of Analysis**					
	Benefits and Costs by Incremental Alternative				
	Exceedance Probability*				
	0.050	**0.030**	**0.020**	**0.010**	**0.002**
Upstream of I-680 (Areas A, B, C, and D)					
First Cost	651	823	1,170	5,001	7,152
Annual Benefits Flood Damage Reduction	182	255	301	516	571
Savings in NFIP Administration Costs	0	0	0	22	32
Advanced Bridge Replacement	0	0	0	92	92
Total Annual Benefits	182	255	301	630	695
Annual Costs	115	126	149	404	548
Net Benefits	**67**	**129**	**152**	**226**	**147**
B/C Ratio	*1.6*	*2.0*	*2.0*	*1.6*	*1.3*
*Designed to convey the median discharge associated with the corresponding exceedance probability event.					

Table 3-8 Annual Benefits and Costs by Incremental Alternative (Downstream of I-680) **$1,000s, October 2005 Prices, 5.375%, 50-Year Period of Analysis**					
	Benefits and Costs by Incremental Alternative				
	Exceedance Probability*				
	0.050	**0.030**	**0.020**	**0.010**	**0.002**
Downstream of I-680 (Areas E, F)					
First Cost	555	1,655	3,328	14,815	27,997
Annual Benefits Flood Damage Reduction	3,293	4,220	5,882	9,333	9,803
Savings in NFIP Administration Costs	0	0	16	168	208
Advanced Bridge Replacement	0	0	37	101	247
Total Annual Benefits	3,293	4,220	5,935	9,602	10,258
Annual Costs	73	149	264	1,031	1,912
Net Benefits	**3,220**	**4,071**	**5,671**	**8,571**	**8,346**
B/C Ratio	*45.1*	*28.3*	*22.5*	*9.3*	*5.4*
*Designed to convey the median discharge associated with the corresponding exceedance probability event.					

Based on reasonable maximization of net benefits, the maximum upstream net benefits are $226,000 for the 0.01 exceedance probability increment. As shown in Table 3-7, the costs increase for the 0.01 exceedance probability design compared to the 0.02 exceedance probability design almost fourfold. This is due to the full replacement of the structures and adjacent channel sections at four bridge/culvert crossings in the 0.01 design upstream of I-680 compared to the lower-cost modifications to headwalls and adjacent channel sections in those same locations for the 0.02 design. Importantly, no increment exists between the two levels of discharge to optimize structural modifications. The Old Piedmont Road Bridge and Piedmont-Cropley culvert are the "first" locations where overtopping occurs in the upstream of I-680 reach. Once these crossings are replaced, increased conveyance would be necessary downstream to maintain channel capacity. The costs associated with the bridge/culvert modifications for each project increment (upstream of I-680) are presented in Table 3-9. As shown, the construction cost, associated with the bridge/culvert modifications upstream of I-680, from the 0.02 exceedance probability design to 0.01 exceedance probability design increases almost five times. Based on reasonable maximization of net benefits, the incremental alternative that conveys the median discharge associated with the 0.01 exceedance probability event reasonably maximizes upstream net benefits at $226,000.

Table 3-9 Incremental Costs – Bridge/Culvert Modifications
$1,000s, October 2005 Prices

	0.050	**0.030**	**0.020**	**0.010**	**0.002**
	Incremental Alternatives – Upstream of I-680				
Bridge/Culvert Construction Cost	146.3	191.9	358.1	2,610.4	3,419.0
	Incremental Alternatives – Downstream of I-680				
Bridge/Culvert Construction Cost	14.2	278.9	996.4	2,706.8	8,592.5

As shown in Table 3-8, the costs increase for the 0.01 exceedance probability design downstream of I-680 compared to the 0.02 exceedance probability design almost fourfold. This is due to the full replacement of the structures and adjacent channel sections at two bridge/culvert crossings in the 0.01 exceedance probability design downstream of I-680 compared to the lower-cost modifications to headwalls and adjacent channel sections in those same locations for the 0.02 exceedance probability design. As previously mentioned, the Old Piedmont Road Bridge and Piedmont-Cropley culvert are the "first" locations where overtopping occurs in the upstream of I-680 reach. Once these crossings are replaced, increased conveyance would be necessary downstream to maintain channel capacity. Also shown is the increase of cost from the 0.01 exceedance probability design to the 0.002 exceedance probability design. This is due to the full replacements of all five bridge/culvert crossings in the 0.002 design compared to the two bridge/culvert crossing replaced in the 0.01 design. The costs associated with the bridge/culvert modifications for each project increment (downstream of I-680) are presented in Table 3-9. As shown, the construction cost, associated with the bridge/culvert modifications downstream of I-680, from the 0.02 exceedance probability design to the 0.01 exceedance probability design increases almost three times, and again increases from the 0.01 exceedance probability design to the 0.002 exceedance probability design almost three times.

The downstream net benefits, shown in Table 3-8, optimize at $8.57 million and are similar for the 0.01 and 0.002 exceedance probability increments, with costs approximately doubling for the 0.002 design frequency. Thus, the incremental alternative that conveys the median discharge associated with the 0.01 exceedance probability event reasonably maximizes downstream net benefits.

Based on these results, the preliminary NED plan (that reasonably maximizes net benefits) would include an upstream and downstream increment that conveys the median discharge associated with the 0.01 exceedance probability event.

3.7.3 Second Array of Alternative Plans

In order to provide the level of detail necessary to compare the resulting array of alternative plans, more detailed engineering, design, cost estimating, and analysis of potential project impacts were developed for each remaining alternative. The resulting information was utilized to make plan formulation decisions regarding the potential removal of alternatives from further consideration, or their progression into a final array of alternatives subject to further refinement and analysis.

Once the preliminary flood risk management optimization project conveyance size was determined based on flood damage reduction costs and benefits, a second array of alternative plans was developed and evaluated. Two levels of performance were evaluated for each alternative:

- Moderate performance based on previous economic optimization, providing 50 percent non-exceedance for the 0.01 exceedance probability event for the entire project reach – designated as Group A (i.e., Alternatives 2A, 3A, and 4A)

- NFIP-certifiable performance provided 90 percent non-exceedance for the 0.01 exceedance probability event for the entire project reach – designated as Group B (i.e., Alternative 2B, 3B, and 4B)

The second array of alternative plans is presented in Table 3-10.

Table 3-10 Second Array of Alternative Plans

Alternative	Description
1	No Action
2A	Incised Trapezoidal Channel – Moderate Performance
2B	Incised Trapezoidal Channel – NFIP-Certification Performance
3A	Terraced Trapezoidal Channel – Moderate Performance
3B	Terraced Trapezoidal Channel – NFIP-Certification Performance
4A	Walled Trapezoidal Channel – Moderate Performance
4B	Walled Trapezoidal Channel – NFIP-Certification Performance

The scenario for the Group A level of containment would include channel modification in addition to modification and/or complete replacement at bridge and culvert crossings. The modification or retrofitting work include shoring and transition structures (Cropley Avenue Culvert, Ames Avenue Bridge, and Yosemite Drive Bridge); headwall extensions with transition structure (Old Piedmont Road Bridge, Piedmont-Cropley Culvert, Morrill Avenue Culvert, UPRR Culvert, Los Coches Street Bridge, and Calaveras Boulevard Bridge); and bridge replacement (Old Piedmont Road Bridge, Piedmont-Cropley Culvert, Morrill Avenue, Cropley Avenue, UPRR Trestle and Montague Expressway Culvert). Modifications within channel reaches will include channel widening, bank stabilization, and levee/floodwall construction.

The scenario for the Group B level of containment would involve complete replacement of all bridges and culverts with the exception of the I-680 crossing and Ames Avenue and Yosemite

Drive crossings, which would require shoring/stabilization of existing abutments and construction of transition structures. Modifications within channel reaches will include excavation and construction of levees/floodwalls.

All project features upstream of I-680 (including both channel work and bridge and culvert modifications) are similar among the alternative plans. Likewise, structural modification and replacement scenarios downstream of I-680 are similar among the alternative plans; the alternatives differ only in the configuration of the channel reaches between the structures.

3.7.3.1 Alternative 1: No Action

The No Action Alternative is carried forward and analyzed to provide a basis from which to assess the advantages and disadvantages of the other study alternatives. This alternative assumes the likely future conditions in the study area without implementation of any of the action alternatives. Under this alternative, the authorized project would not be completed, objectives for flood control would not be met, and an unacceptable public health and safety hazard – flooding in the cities of Milpitas and San Jose – would continue to occur. As previously discussed, likely future conditions include:

- Commercial and industrial development especially in Milpitas per their Master Plan
- Continuance and likely increase of the existing flood threat to the cities of Milpitas and San Jose
- Continued loss of riparian habitat areas and native species in the floodplain and stream
- Greater O&M cost especially due to sediment deposition and bank erosion, flood fighting, and emergency costs

3.7.3.2 Alternative 2A: Incised Trapezoidal Channel – Moderate Performance

Alternative 2A provides flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the median discharge associated with the 0.01 exceedance probability event for the entire project reach. This alternative would provide flood control utilizing channel excavation and bridge modifications to increase conveyance in the project footprint that could be constructed within the existing right-of-way. Levees are extended, as needed, to maintain consistent capacity throughout the project. Alternative 2A would involve modification and/or replacement of bridge and culvert crossings and modification of channel reaches downstream of I-680 with an earthen trapezoidal shape.

3.7.3.3 Alternative 2B: Incised Trapezoidal Channel – NFIP-Certification Performance

Alternative 2B provides flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the median discharge associated with the 0.002 exceedance probability event for the entire project reach. Similar to Alternative 2A, this alternative would provide flood control utilizing channel excavation and bridge modifications to increase conveyance in the project footprint that could be constructed within the existing right-of-way. Levees are extended, as needed, to maintain consistent capacity throughout the project. Alternative 2B would involve modification of structures and channel reaches downstream of I-680 with an earthen trapezoidal shape.

3.7.3.4 Alternative 3A: Terraced Trapezoidal Channel – Moderate Performance

Alternative 3A would provide a more environmentally-sensitive project with a smaller inner channel with a capacity on the order of a 2-year event or less. This alternative would allow for the construction of benches above the main channel that act as a floodplain. These benches may be vegetated. Due to the reduced main channel size, Alternative 3A would require higher levees than Alternative 2A in order to confine the same design flow. The project footprint encroaches on adjacent parcels, and additional right-of-way acquisition would be required for Alternative 3A. Project features upstream of I-680 are as described in Alternative 2A. The structural modifications downstream of I-680 are also similar with those described in Alternative 2A.

3.7.3.5 Alternative 3B: Terraced Trapezoidal Channel – NFIP-Certification Performance

Alternative 3B provides flood damage reduction benefits along Berryessa Creek by incorporating channel and other improvements designed to convey the median discharge associated with the 0.002 exceedance probability event for the entire project reach. Similar to Alternative 3A, Alternative 3B would provide a more environmentally-sensitive project with a smaller inner channel with a capacity on the order of a 2-year event or less. Alternative 3B would allow for the construction of benches above the main channel that act as a floodplain. Due to the reduced main channel size, Alternative 3B would require higher levees than Alternative 2B in order to confine the same design flow.

3.7.3.6 Alternative 4A: Walled Trapezoidal Channel – Moderate Performance

Alternative 4A takes the concepts from Alternative 3A (vegetated floodplain benches); however, instead of utilizing levees to confine the flows, concrete floodwalls would be extended vertically from the outer edges of the floodplain bench. This would allow Alternative 4A to be constructed within the existing right-of-way. In some locations, the right-of-way restrictions require adaptation of the typical section to accommodate the access road within the available right-of-way. In areas with limited right-of-way (e.g. in the vicinity of Montague Expressway), the access road would need to be located on the channel side of the floodwall to allow for additional conveyance area. Transition ramps would be needed in areas where the access road location changes.

3.7.3.7 Alternative 4B: Walled Trapezoidal Channel – NFIP-Certification Performance

Alternative 4B takes the concepts from Alternative 3B (vegetated floodplain benches); however, instead of utilizing levees to confine the flows, concrete floodwalls would be extended vertically from the outer edges of the floodplain bench. This would allow Alternative 4B to be constructed within the existing rights-of-way. Because Alternative 4B involves replacement of bridge and culvert crossings, which would create backwater conditions in the 0.01 flow profile (Alternative

4A), with open-span structures that would pass the discharge, the 0.002 water surface elevations are lower than those of 0.01 in much of the channel reach.

3.7.4 Screening of Second Array of Alternative Plans

Based on (1) results of the 2006 Alternative Formulation Briefing (AFB), (2) additional coordination with resource agencies and local stakeholders, and (3) revised Corps guidance and technical refinements, the second array of alternative plans was revised and further developed. Additional considerations and refinements include the following:

- Retention of the authorized project (hereinafter designated as Alternative 5) as an alternative was identified as a requirement at the AFB. In order to be policy-compliant, the authorized project must be included in the array of alternative plans and compared at the same level of analysis. The benefits and costs for the authorized project were updated using the same design as in the 1987 Feasibility Report. The authorized project is described in Section 1.2.3 and Section 3.4.2 of this GRR.

- Review and evaluation of the geomorphic design refinements presented by the SCVWD in July 2006. The proposed design includes step pools, invert modifications, bridge/culvert modifications, and floodplain terrace excavation, all upstream of I-680.

- Evaluation of a vegetated access road option for the northwest side of the creek at the Park Row condominiums in the Greenbelt reach upstream of I-680.

- Review and evaluation of alternative sediment basin configuration along Berryessa Creek upstream of I-680.

- Use of updated peak discharge values for the Piedmont Creek and Los Coches Creek tributaries.

- Adjustment of the downstream starting boundary condition based on the updated future conditions modeling of the adjacent downstream project (SCVWD's Lower Berryessa Creek Project).

- Incorporation of supplemental (greenbelt topography) survey into the baseline model.

- Utilization of risk and uncertainty principles in the development and refinement of the "B" alternatives. The goal of these alternatives is to ensure that the resulting designs were certifiable for the FEMA National Flood Insurance Program. This was accomplished using the criteria developed by EC 1110-2-6067, Certifications of Levee Systems for the National Flood Insurance Program, dated 30 September 2008.

- Adoption Draft ETL 1110-2-571 as interim guidance for vegetation-free zones along levees and floodwalls.

3.7.4.1 Refined Second Array of Alternative Plans

The results from the more detailed engineering analysis indicated that Alternatives 3A and 4A would provide the same flood control benefits at higher costs in comparison with Alternative 2A. Alternatives 3A and 4A are not potential NED plans and are not preferred by the SCVWD since they would not provide NFIP-certifiable performance. Since Alternatives 3A and 4A would not meet the Federal objective of maximizing net economic benefits, or the SCVWD objective of NFIP certification, neither are required to be considered in detail under NEPA since they do not meet the purpose and need for the project. Furthermore, neither Alternative 3A nor 4A provides any substantial environmental advantages compared to Alternative 2A. Therefore, Alternatives 3A and 4A were not carried forward for further consideration. Accordingly, Alternative 3B and 4B were redesignated as 3 and 4, respectively. The refined second array of alternative plans carried forward and analyzed is presented in Table 3-11.

Table 3-11 Refined Second Array of Alternative Plans

Alternative	Description
1	No Action
2A	Incised Trapezoidal Channel – Moderate Performance
2B	Incised Trapezoidal Channel – NFIP-Certification Performance
3	Terraced Trapezoidal Channel – NFIP-Certification Performance
4	Walled Trapezoidal Channel – NFIP-Certification Performance
5	Authorized Project

3.7.4.2 Project Costs

Project costs were refined for Alternatives 2A, 2B, 3, and 4, while project costs for Alternative 5 (authorized project) were updated to the 2008 price levels. Cost estimates are shown in Table 3-12.

Table 3-12 Annual Costs

October 2008 Prices, 4.625% Interest Rate, 50-Year Period of Analysis

	2A	2B	3	4	5
Upstream of I-680					
Construction	6,834,300	8,823,700	8,823,700	8,823,700	7,154,800
Contingency (30%)	2,050,300	2,647,100	2,647,100	2,647,100	2,146,400
PED (15%)	1,025,100	1,323,500	1,323,500	1,323,500	1,073,200
Construction Mgmt	546,700	705,900	705,900	705,900	572,400
LERRD	23,017,000	23,128,800	23,136,100	23,136,100	29,964,000
Total First Costs	**33,473,400**	**36,629,000**	**36,636,300**	**36,639,000**	**37,910,800**
Annualized First Costs	1,728,400	1,891,300	1,891,700	1,891,800	1,957,500
IDC (annualized)	206,800	226,300	226,400	226,400	234,200
OMRRR	93,800	95,400	95,300	95,100	93,800
Annual Costs	*2,029,000*	*2,213,000*	*2,213,400*	*2,213,300*	*2,285,500*
Downstream of I-680					
Construction	14,090,100	28,043,200	28,930,900	38,486,600	17,257,400

Table 3-12 Annual Costs October 2008 Prices, 4.625% Interest Rate, 50-Year Period of Analysis					
	2A	**2B**	**3**	**4**	**5**
Contingency (30%)	4,227,000	8,413,000	8,679,300	11,546,000	5,177,200
PED (15%)	2,113,500	4,206,500	4,339,600	5,773,000	2,588,600
Construction Mgmt	1,127,200	2,243,500	2,314,500	3,078,900	1,380,600
LERRD	45,209,600	53,015,700	109,282,800	42,957,700	41,091,200
Total First Costs	**66,767,400**	**95,921,900**	**153,547,100**	**101,842,200**	**67,495,000**
Annualized First Costs	3,447,500	4,952,900	7,928,400	5,258,600	3,485,100
IDC (annualized)	412,600	592,700	948,800	629,300	417,000
OMRRR	60,100	67,600	78,100	80,100	60,100
Annual Costs	*3,920,200*	*5,613,200*	*8,955,300*	*5,968,000*	*3,962,200*

3.7.4.3 Incremental Analysis of Net Benefits

Under Title 33 Code of Federal Regulations (CFR) Part 238 and ER 1165-2-21, water damage problems associated with a natural stream or modified natural waterway may be addressed under the flood risk management authorities downstream from the point where the flood discharge is greater than 800 cfs for the 0.10 exceedance probability flood events under conditions expected to prevail during the period of analysis.

This Federal Regulation, known as the “800 cfs rule,” limits Corps involvement in flood risk management on small streams in urban areas. One effect of the rule is that economic benefits that occur upstream of the point where a 0.10 exceedance probability flood even discharge (“10-year peak flow”) first exceeds 800 cfs cannot be used in identifying the NED Plan. In areas of hydrologic disparity, a 0.01 exceedance probability discharge of 1,800 cfs may be used as the minimum flow criterion, if an exception is granted. The NED Plan may extend upstream of the point where the minimum flow criterion is met if economically justified by benefits within the downstream reach, or if necessary to terminate proposed improvements in a safe and economical manner.

Based on the hydraulic analysis, the 10-percent flood event discharge along Berryessa Creek does not exceed 800 cfs until the confluence of Sierra Creek at Morrill Avenue (790 and 830 cfs for existing and future conditions, respectively). Further, Sierra Creek is also the most upstream hydrologic analysis node location where the 0.01 exceedance probability flood event discharge of 1,800 cfs is exceeded (2,100 and 2,140 cfs for existing and future conditions, respectively). Therefore, economic benefits upstream of the I-680 are limited to the reach below the Sierra Creek confluence, which corresponds to economic impact area D (Morrill Avenue to the I-680), within which the minimum flow criteria specified by 33 CFR 238 and ER 1165-2-21 are exceeded.

An incremental analysis was then conducted on the reaches upstream and downstream of I-680. Consideration of economic benefits for the reach upstream of I-680 was limited to those below the Sierra Creek confluence (economic impact area D), within which the minimum flow criteria are exceeded. Table 3-13 shows the resulting net benefits.

Table 3-13 Net Benefits **October 2008 Prices, 4.625% Interest Rate, 50-Year Period of Analysis**					
Upstream of I-680					
	2A	**2B**	**3**	**4**	**5**
Annual Costs	2,029,000	2,213,000	2,213,400	2,213,300	2,285,500
Annual Benefits	262,600	334,900	334,900	334,900	334,900
Net Annual Benefits	**-1,766,400**	**-1,878,100**	**-1,878,500**	**-1,878,400**	**-1,950,600**
B/C Ratio	0.13	0.15	0.15	0.15	0.15
Downstream of I-680					
	2A/d	**2B/d**	**3/d**	**4/d**	**5**
Annual Costs	3,920,200	5,613,200	8,955,300	5,968,000	3,962,200
Annual Benefits	9,873,900	10,893,700	10,660,500	10,622,200	8,357,900
Net Annual Benefits	**5,953,700**	**5,226,500**	**1,705,200**	**4,654,200**	**4,395,700**
B/C Ratio	2.52	1.93	1.19	1.78	2.11

As shown above, the analysis indicated that no flood risk management alternative upstream of I-680 is economically justified. By comparison, all the alternatives downstream of I-680 were determined to be economically justified. The portions downstream of I-680 were designated as Alternatives 2A/d, 2B/d, 3/d, and 4d. Alternative 5 will remain and include both reaches upstream and downstream of I-680, as authorized.

3.7.5 Final Array of Alternative Plans

As shown in Table 3-13, Alternative 2A/d provides the greatest net benefits and a benefit-to-cost ratio of 2.52. Among the NFIP-certifiable alternatives, Alternatives 4/d and 2B/d provide the highest net benefits at $4.65 and $5.23 million, respectively, with benefit-to-cost ratios of 1.78 and 1.93 respectively. Alternative 3/d provides the lowest net benefit and benefit-to-cost ratio of the NFIP-certifiable alternative plans by a large margin. In addition, Alternative 3/d also has the highest implementation cost.

As part of the incremental analysis, each of the alternative plans downstream of I-680, as well as Alternative 5, was analyzed to determine the potential environmental effects that could result if the alternatives were implemented. The results indicated that the potential effects for Alternative 2B/d, 3/d, and 4/d would be similar except that Alternative 3/d and 4/d would include horizontal terraces suitable for planting trees or other vegetation. Alternative 3/d would produce approximately 6.7 acres for tree or shrub planting, while Alternative 4/d would produce approximately 8.1 acres. Alternative 3/d would provide more grassland acreage than Alternative 4/d. However, grassland is not a regionally significant resource that would justify the reduction in tree-plantable acreage and additional cost of Alternative 3/d.

It should be noted that the inverse relationship of project costs and tree-plantable acreages between Alternatives 3/d and 4/d is expected to remain as design refinements continue. Alternative 3/d will continue to require more land acquisition than Alternative 4/d, so the estimated cost for Alternative 3/d is expected to remain higher. With the lack of significant economic or environmental advantage relative to Alternative 4/d, Alternative 3/d was therefore eliminated from consideration for further analysis. As a result, the alternative plans carried forward as the final array are shown in Table 3-14. The project features comprising the final array of alternatives are summarized in the following sections. Figure 3-20 at the end of Section 3.7.5 shows a diagram summarizing the development and screening of individual alternatives from the preliminary alternative plans to the final array of alternative plans.

Table 3-14 Final Array of Alternative Plans

Alternative	Description
1	No Action
2A/d	Incised Trapezoidal Channel (Moderate Protection)
2B/d	Incised Trapezoidal Channel (FEMA-Certification Protection)
4/d	Walled Trapezoidal Channel (FEMA-Certification Protection)
5	Authorized Project

3.7.5.1 Vegetation Management Requirements

Design of Alternatives 2A/d, 2B/d, and 4/d adopted the vegetation management guidelines set forth in ETL 1110-2-571. Since the Corps and SCVWD would not have the ability to influence future planting or vegetation growth along the adjacent parcels located outside the project easements or rights-of-way, measures must be adopted in the design to avoid the potential for root intrusion that could potentially undermine the flood control works.

The proposed designs generally utilize the entire available channel easement, and in some areas the required 15-foot vegetation-free (obstruction-free) zone outside of the proposed levee toes or floodwalls would require acquisition of additional rights-of-way. The first method analyzed for a variance from the guidance was use of a root barrier along the project boundary. The second method sought to avoid a variance through construction of a floodwall in lieu of a levee, or the purchase of additional, permanent right-of-way that would be kept vegetation free throughout the project life (Tetra Tech 2011).

Preliminary costs were developed for both methods. Tree removal costs only account for trees outside the proposed permanent right-of-way; existing vegetation within the proposed right-of-way is assumed to be removed under either method. It was determined that the cost increase for constructing a floodwall in lieu of an earthen levee exceeds the cost of obtaining a temporary easement, removing the affected trees, and compensating the owner for the loss in value. Likewise, the cost of obtaining additional permanent right-of-way in the first method exceeds the cost of installing a root barrier, even without additional improvements (Tetra Tech 2011). Although obtaining a variance may be more cost-effective, the savings would be a small percentage of the overall project cost. Given the uncertainty regarding the outcome of the variance process, the Corps elected to eliminate alternative designs that would require an approved variance to ETL 1110-2-571.

3.7.5.2 Revised FLO-2D Inflow Methodology

The revised methodology accounted for the effects of upstream attenuation on breakout flows. The Upper FLO-2D model (upstream of I-680) was extended to encompass the urban channelized portions of Sierra Creek, a major tributary to Berryessa Creek. The revised methodology used FLO-2D to model both the channel and overbank flows in the Upper model and use an unsteady HEC-RAS model with FLO-2D for overbank flow in the Lower model (downstream of I-680). The methodology is presented in detail in Part II, Floodplain Development, of Appendix B.

Hydrologic inputs were developed assuming that no future improvements, federally or locally, are constructed on the Berryessa Creek system upstream of I-680. Future upstream improvements would be dependent upon the current Berryessa Creek Element being built first to avoid induced flooding; thus, the economic evaluation of the current Berryessa Creek alternatives cannot assume that future upstream improvements will be built. The local and tributary inflow hydrographs for the future without improvements were taken from the future conditions 2003 HEC-HMS model corresponding to the values published in the NHC hydrology report (NHC 2003). Alternative 2A/d was designed using the future without-improvement conditions hydrologic inputs.

Hydrologic inputs were also developed assuming that future improvements (i.e., bypass channel), under consideration by the SCVWD upstream of I-680, are constructed on the Berryessa Creek system. The local and tributary inflow hydrographs were taken from the future conditions 2006 HEC-HMS model corresponding to the values published in the NHC hydrology report (NHC 2006). The bypass channel design resulted in higher flow rates at I-680 subsequently resulting in Alternatives 2B/d and 4/d to be designed with a larger conveyance capacity, allowing both alternative plans to convey up to the 0.002 exceedance probability event. This methodology was performed to address SCVWD's preference that the Berryessa Creek Element remains NFIP-certifiable, even if future upstream improvements are made to convey 0.01 exceedance probability peak flows.

Benefits for each of the alternative plans were derived by comparing the damages from each to those of the No Action Alternative. It should be noted that although Alternatives 2B/d and 4/d were designed using different hydrologic assumptions all alternative plans were economically evaluated using the same assumptions (i.e. consistent with Corps planning process of no future upstream improvements). Alternatives 2B/d and 4/d resulted in no residual damages, since these alternatives were designed for a higher flow regime than was used in the economic evaluation.

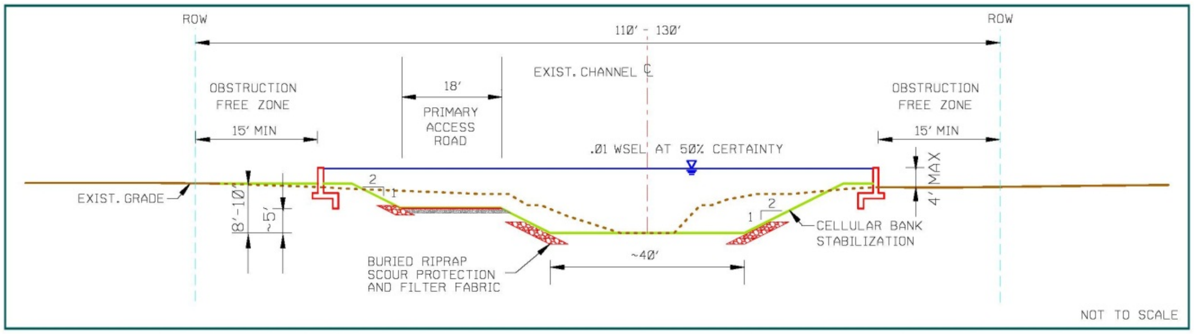
3.7.5.3 Alternative 1: No Action

As previously discussed, the No Action alternative assumes the future conditions in the study area without implementation of any of the action alternatives. Under this alternative, the authorized project would not be completed, and objectives for flood risk management would not be met.

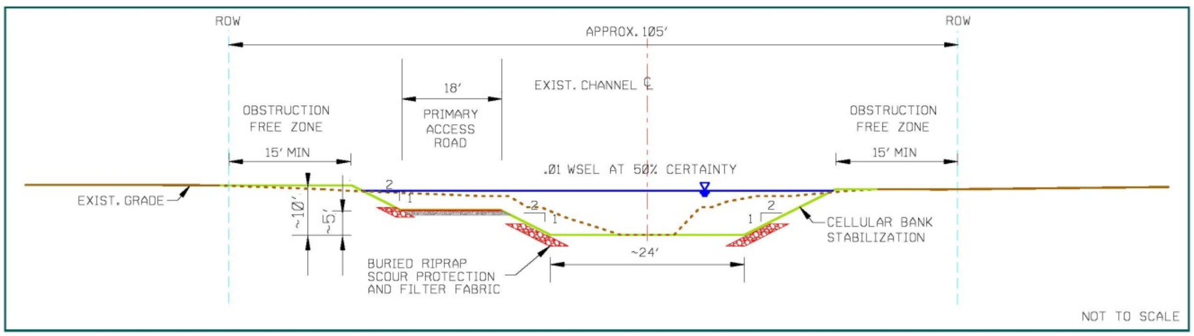
3.7.5.4 Alternative 2A/d: Incised Trapezoidal Channel (Moderate Protection)

Alternative 2A/d proposes an earthen trapezoidal channel section with varying bottom width. Free-standing concrete floodwalls would be constructed as needed due to real estate constraints, and an in-channel access road constructed where suitable. This alternative is designed assuming no project upstream of I-680, locally or federally developed, is in place. Typical sections showing the overall configuration of Alternative 2A/d are shown in Figure 3-7. The primary features of Alternative 2A/d are as follows:

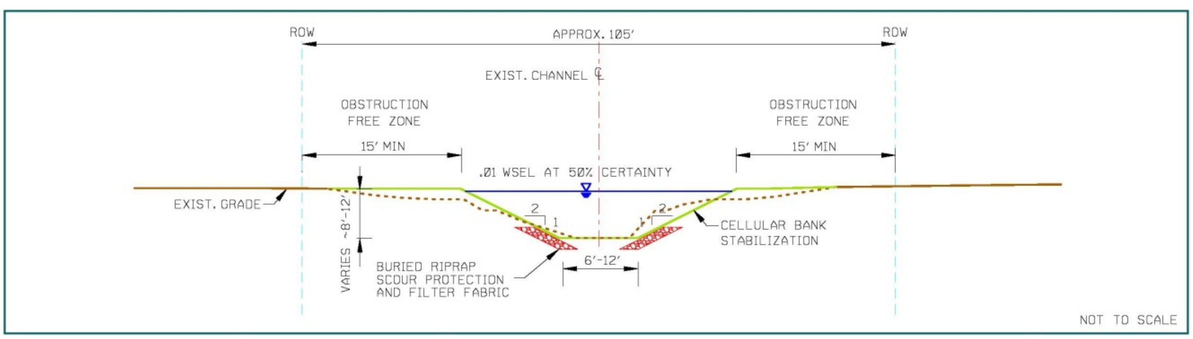
- Channel excavation and earthen levee construction to the water surface level of the 50 percent certainty, 0.01 exceedance probability event discharge from I-680 to Calaveras Boulevard
- 2H:1V sideslopes with cellular bank protection and buried riprap scour protection
- Free-standing concrete floodwalls in the immediate vicinity of Montague Expressway as well as between the Piedmont Creek confluence and Calaveras Boulevard
- Access road located along the left bank channel slope downstream of Yosemite Drive
- Replacement of UPRR trestle with triple box culvert
- Construction of transition structures at Montague Expressway, UPRR culvert, Los Coches Street, and Calaveras Boulevard
- Shoring of bridge abutments and construction of transition structures at Ames Avenue and Yosemite Drive to accommodate widened channel
- Utility relocations for storm drains entering the channel or running parallel to the channel located within the channel excavation areas



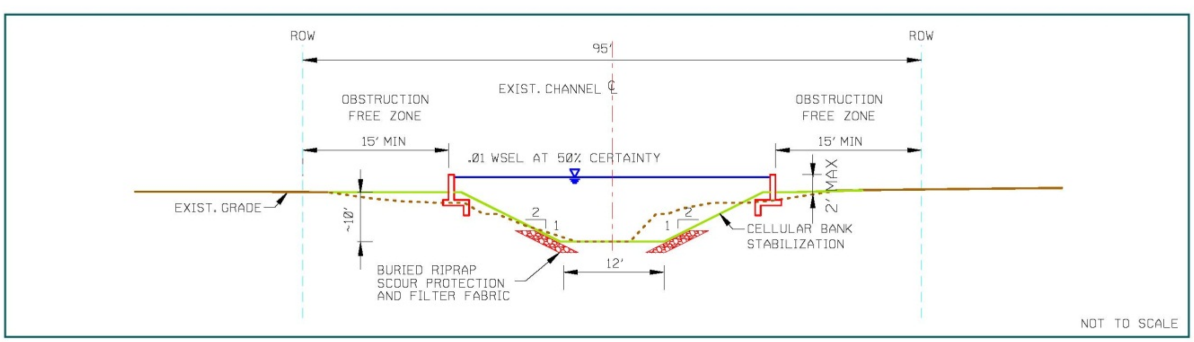
TYPICAL CROSS SECTION, CALAVERAS BLVD TO PIEDMONT CREEK (STA 130 TO 160)



TYPICAL CROSS SECTION, PIEDMONT CREEK TO YOSEMITE DR (STA 160 TO 170)



TYPICAL CROSS SECTION YOSEMITE DR TO I-680 (STA 170 TO 212 AND 214 TO 237)



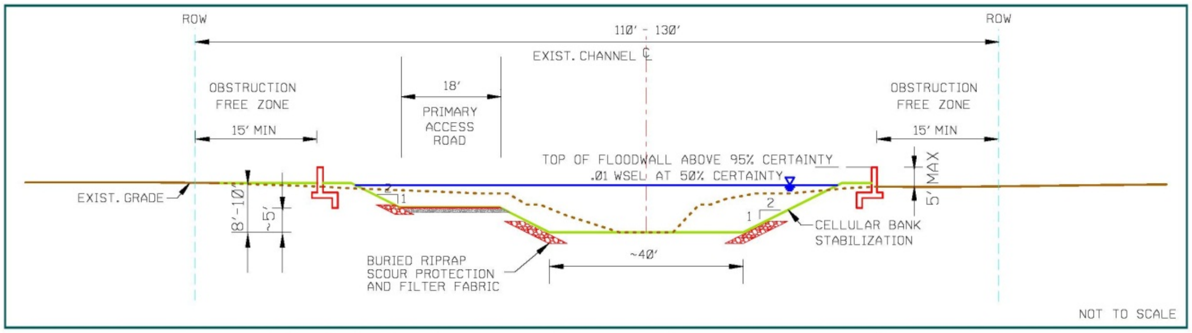
TYPICAL CROSS SECTION, MONTAGUE EXPY TO 200' UPSTREAM (STA 212 TO 214)

Figure 3-7 Alternative 2A/d Typical Sections

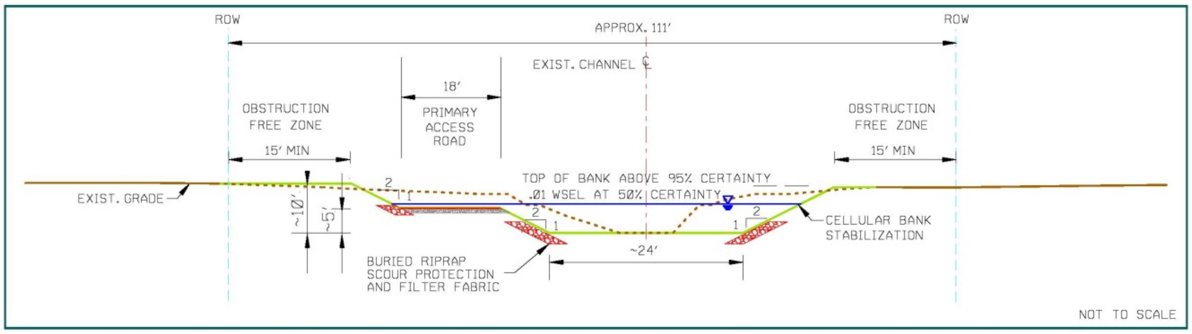
3.7.5.5 Alternative 2B/d (Incised Trapezoidal Channel (FEMA-Certification Protection)

Alternative 2B/d proposes an earthen trapezoidal channel section with varying bottom width. This alternative is designed assuming a bypass structure is in place along Berryessa Creek upstream of I-680. The structure will route high flows around the Greenbelt reach to reduce flooding in the upper watershed. The bypass structure will be developed and implemented by the SCVWD as a locally funded project. Typical sections showing the overall configuration of Alternative 2B/d are shown in Figure 3-8. The primary features of Alternative 2B/d are as follows:

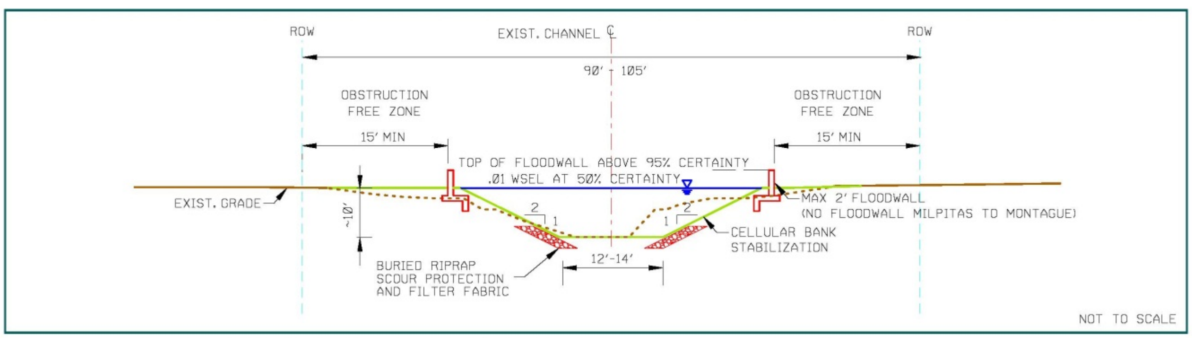
- Channel excavation and earthen levee construction to the water surface level of the 95 percent certainty, 0.01 exceedance probability event discharge from I-680 to Calaveras Boulevard
- 2H:1V sideslopes with cellular bank protection and buried riprap scour protection
- Free-standing concrete floodwalls in the immediate vicinity of Montague Expressway and between Yosemite Drive and Calaveras Boulevard
- Access road intermittently along one or both banks, within the channel (between the 0.1 and 0.04 exceedance probability events)
- Replacement of Montague Expressway culvert crossing with 60-foot span
- Replacement of UPRR trestle with triple 15-foot box culvert
- Replacement of UPRR culvert with 60-foot span
- Shoring of bridge abutments at Ames Avenue and Yosemite Drive to accommodate widened channel
- Replacement of Los Coches Street Bridge with 100-foot span
- Replacement of Calaveras Boulevard Bridge with 100-foot span
- Utility relocations, as required



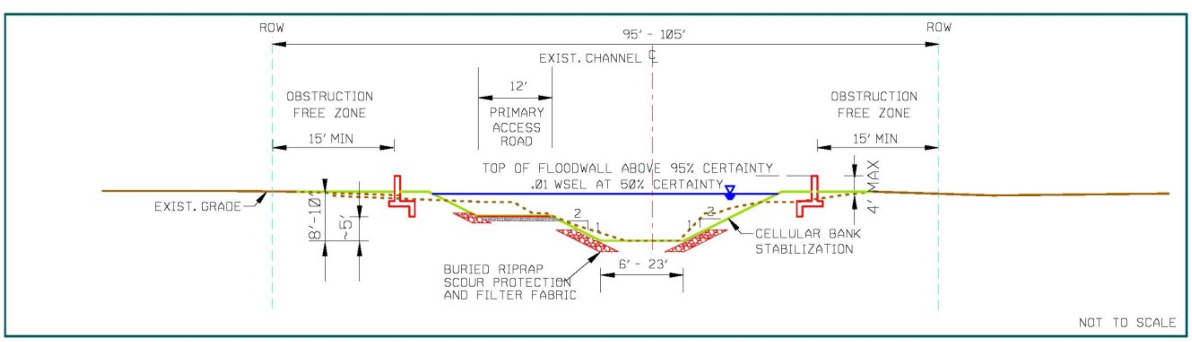
TYPICAL CROSS SECTION, CALAVERAS BLVD TO YOSEMITE DR (STA 130 TO 170)



TYPICAL CROSS SECTION, YOSEMITE DR TO MILPITAS BLVD (STA 170 TO 195)



TYPICAL CROSS SECTION MILPITAS BLVD TO I-680 (STA 195 TO 212 AND 230 TO 248)



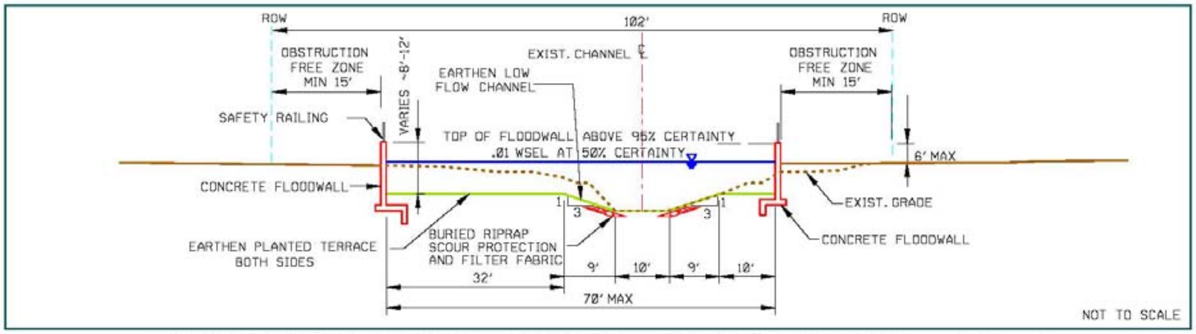
TYPICAL CROSS SECTION, MONTAGUE EXPY TO LAKEWOOD CT (STA 212 TO 230)

Figure 3-8 Alternative 2B/d Typical Sections

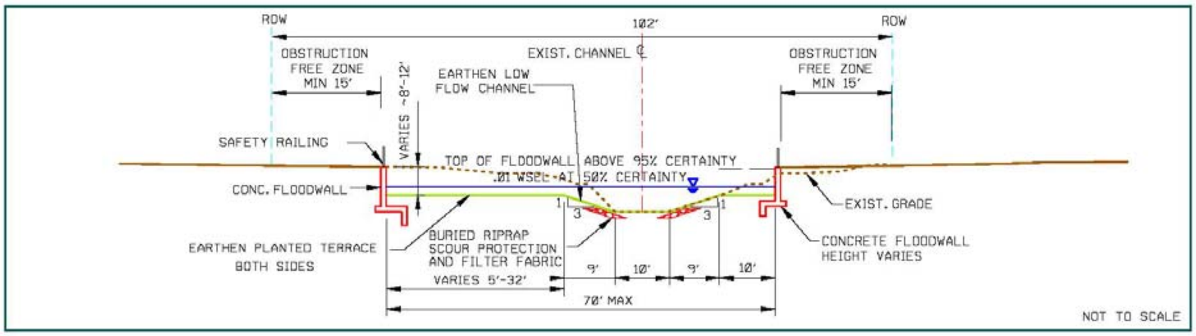
3.7.5.6 Alternative 4/d - Walled Trapezoidal Channel (FEMA-Certification Protection)

Alternative 4/d proposes an earthen trapezoidal channel section with varying bottom width. Alternative 4/d involves the construction of vertical concrete floodwalls to contain flows. Similar to Alternative 2B/d, this alternative is designed assuming a bypass structure is in place along Berryessa Creek upstream of I-680. The structure will route high flows around the Greenbelt reach to reduce flooding in the upper watershed. The bypass structure will be developed and implemented by the SCVWD as a locally funded project. The primary features of Alternative 4/d are as follows:

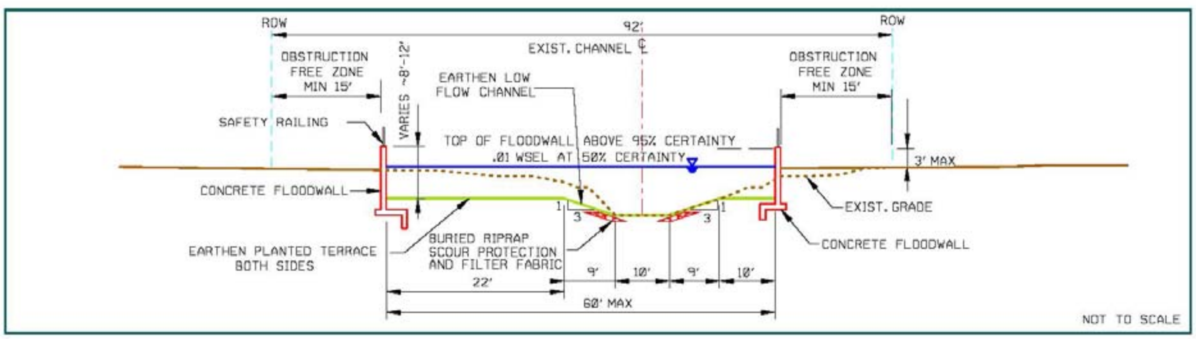
- Channel excavation and earthen levee construction to the water surface level of the 95 percent certainty, 0.01 exceedance probability event discharge from I-680 to Calaveras Boulevard
- Concrete retaining walls to the existing ground surface and above-ground floodwall extensions, as required
- 3-foot deep, 10-foot bottom width earthen low-flow channel with 3H:1V sideslopes
- Two vegetated floodplain benches, 32 feet wide on left bank and 10 feet wide on right bank, bounded by vertical concrete floodwalls
- Replacement of Montague Expressway culvert crossing with 60-foot span
- Replacement of UPRR trestle with triple 15-foot box culvert
- Replacement of UPRR culvert with 60-foot span
- Shoring of bridge abutments at Ames Avenue and Yosemite Drive to accommodate widened channel
- Replacement of Los Coches Street Bridge with 100-foot span
- Replacement of Calaveras Boulevard Bridge with 100-foot span
- Utility relocations, as required



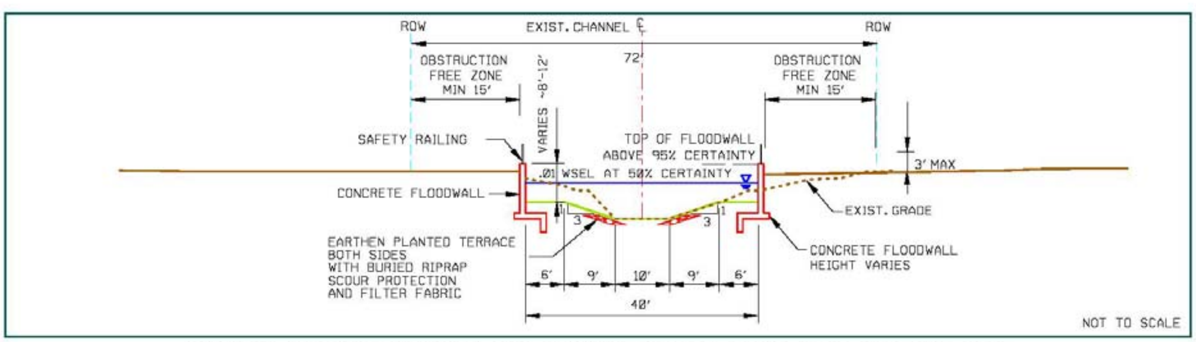
TYPICAL CROSS SECTION, CALAVERAS BLVD TO AMES AVE (STA 130 TO 182)



TYPICAL CROSS SECTION, AMES AVE TO MILPITAS BLVD (STA 182 TO 195)



TYPICAL CROSS SECTION, MILPITAS BLVD TO LAKEWOOD CT (STA 195 TO 230)



TYPICAL CROSS SECTION LAKEWOOD CT TO I-680 (STA 230 TO 248)

Figure 3-9 Alternative 4/d Typical Sections

3.7.5.7 Alternative 5: Authorized Project

The authorized project consists of a sediment basin constructed upstream of Old Piedmont Road, modifications (deepening) of the existing sediment basin, earthen levees in the Greenbelt, and a concrete trapezoidal channel downstream of I-680. Alternative 5 was not redesigned based on the current hydrology or Corps' vegetation management requirements.

3.7.5.8 Features Common to the Alternative Plans 2A/d, 2B/d, and 4/d

The following features were applied to all of the alternatives, as they form the minimum structural support for the flood risk management alternatives. Table 3-15, at the end of this section, summarizes the project features that make up each of the alternative plans.

(a) Channel Modifications

Channel widening is proposed in combination with floodwalls under the project alternatives to meet the desired level of performance for the alternatives. The channel excavation templates are depicted in the typical sections above. The extent of proposed armoring, including toe-down depths and armor rock gradation, may vary from section to section as the design is refined. In narrow reaches, the toe protection may be continuous to maintain the integrity of the channel. The channel profile may require grade control at bridge or utility crossing locations to prevent downcutting of the channel. Further geomorphic and sediment transport analyses may determine whether there is a need for additional grade control.

The typical sections for Alternatives 2A/d and 2B/d include an intermittent access road within the channel at the approximate level of the 0.1 to 0.04 exceedance probability event in order to increase the effective conveyance area within the available right-of-way for larger events and allow maintenance equipment to have closer access to the channel (Figure 3-10). Alternative levels for the access road may be considered as the design of the selected alternative proceeds. The access road surface would need to be graded and compacted to withstand flood flows, and a cross slope for drainage would be required. Although the access road location is generally shown on the left bank in the cross sections, it may alternatively be located on right bank if deemed appropriate during the design phase, and a secondary access road may be located along the opposite bank. Several tributaries enter the channel from the right, and access to local streets is required along both sides of the tributaries. Final placement should consider findings from additional utility investigations; the final access road configuration may vary from reach to reach.

Alternative 4/d includes vegetated floodplain terraces (Figure 3-11). Vegetation would need to be drought-tolerant and/or require irrigation for establishment. Selection of vegetation types should also account for the required root depth and the size of the inner channel. While the overall project configuration has been designed to fall within the existing public rights-of-way, the acquisition of several small parcel areas is required to maintain continuous access along the channel. These areas are shown in further detail in the accompanying plan/profile views in Part IV, Design and Cost of Alternatives, in Appendix B. Additionally, temporary construction easements, staging areas, and access routes are required for all three project alternatives.

Figure 3-10 Schematic View of Channel Configuration of Alternatives 2A/d and 2B/d

Figure 3-11 Schematic View of Floodwalls and Channel Configuration of Alternative 4/d

(b) I-680 Bridge

The I-680 Bridge marks the upstream extent of the project. Some debris is present at the downstream face of the bridge (Figure 3-12). This debris should be removed regularly to ensure that the conditions do not produce higher than anticipated water surface elevations along the channel banks downstream of the bridge. No modifications are proposed for the culvert except that any deferred maintenance will be performed by the local sponsor.

Figure 3-12 I-680 Bridge (Looking Upstream)

(c) Montague Expressway

Montague Expressway is a six-lane arterial crossing over a double-barrel 12-foot-by-10-foot culvert. The existing bridge allows sufficient capacity for Alternative 2A/d, provided the channel walls tie into the existing structure. For Alternatives 2B/d and 4/d, a replacement span of 70 feet would be required to contain the flow in the channel and prevent breakouts. The deck would be raised approximately 3 feet, requiring extensive roadway work, and the headwall would tie into upstream and downstream floodwalls (Figure 3-13). The maintenance road (not shown) would need to transition out of the channel and over the levees or floodwalls.

Figure 3-13 Schematic View of Montague Channel Excavation for Alternative 2B/d

(d) UPRR Trestle

The existing UPRR trestle is a timber railroad crossing with four sets of piers. There is some discrepancy in the deck height that significantly affects the existing capacity of the trestle (Tetra Tech 2005). Due to the condition of the existing structure, excavation around the bed or banks is assumed to be unacceptable, and complete replacement of the trestle is assumed under all project alternatives. A triple barrel concrete box culvert is included in the project scenarios, with replacement configurations applied and modeled using the 1990 authorized project designs (Figure 3-14).

Figure 3-14 Schematic View of UPRR Trestle Replacement for Alternative 2B/d

(e) UPRR Culvert

The channel transitions to a wider available right-of-way where Milpitas Boulevard veers away from the channel upstream of the UPRR culvert. The existing UPRR culvert is a triple 11-foot-by-11-foot box culvert that crosses Berryessa Creek at a skew angle of almost 60 degrees. The existing structure has sufficient conveyance to meet the requirements of Alternative 2A/d, provided the channel banks are tied into the existing concrete wingwalls. Alternatives 2B/d and 4/d include the complete reconstruction of the culverts with a 60-foot wide span (Figure 3-15). The cost estimates assume that a temporary shoo-fly structure would be needed during construction.

Figure 3-15 Schematic View of UPRR Culvert Replacement of Alternative 2B/d

(f) Ames Avenue Bridge

The Ames Avenue Bridge is a two-lane bridge with a single continuous pier. The span is approximately 80 feet; however, the existing ground blocks much of the cross section below the bridge deck. The existing bridge is retained under all project scenarios. The proposed channel modifications in this reach for Alternatives 2A/d and 2B/d include an access road on the overbank rather than within the channel. The design cross section under the bridge proceeds at 2H:1V from the outside of the span. Figure 3-16 shows the bridge along with a typical with-project scenario showing the maximum excavated footprint extending vertically down from the edge of the bridge deck and requiring some shoring to protect the bridge abutments.

Figure 3-16 Schematic View of Ames Avenue Bridge Modifications

(g) Yosemite Drive Bridge

Yosemite Drive carries a two-lane road over Berryessa Creek. Along the upstream face of the bridge, a major pipeline is supported by cantilevers (Figure 3-17). The span is approximately 80 feet with a single continuous pier; however, the existing ground blocks much of the cross section below the bridge deck. The existing bridge is retained under all project scenarios. The proposed channel modifications in this reach for Alternatives 2A/d and 2B/d include an access road on the overbank rather than within the channel. The design cross section under the bridge proceeds at 2H:1V from the outside of the span. The bridge is shown along with a typical with-project scenario showing the maximum excavated footprint extending vertically down from the edge of the bridge deck and requiring some shoring to protect the bridge abutments. The existing bridge is retained under all project alternatives.

In conjunction with the proposed channel excavation, the bridge passes the required channel flow using the existing deck and soffit heights. The depth and configuration of the existing foundation is unknown, and shoring or other stabilization of existing abutments is assumed to be required. Conservative estimates of the required materials have been included in the cost estimate.

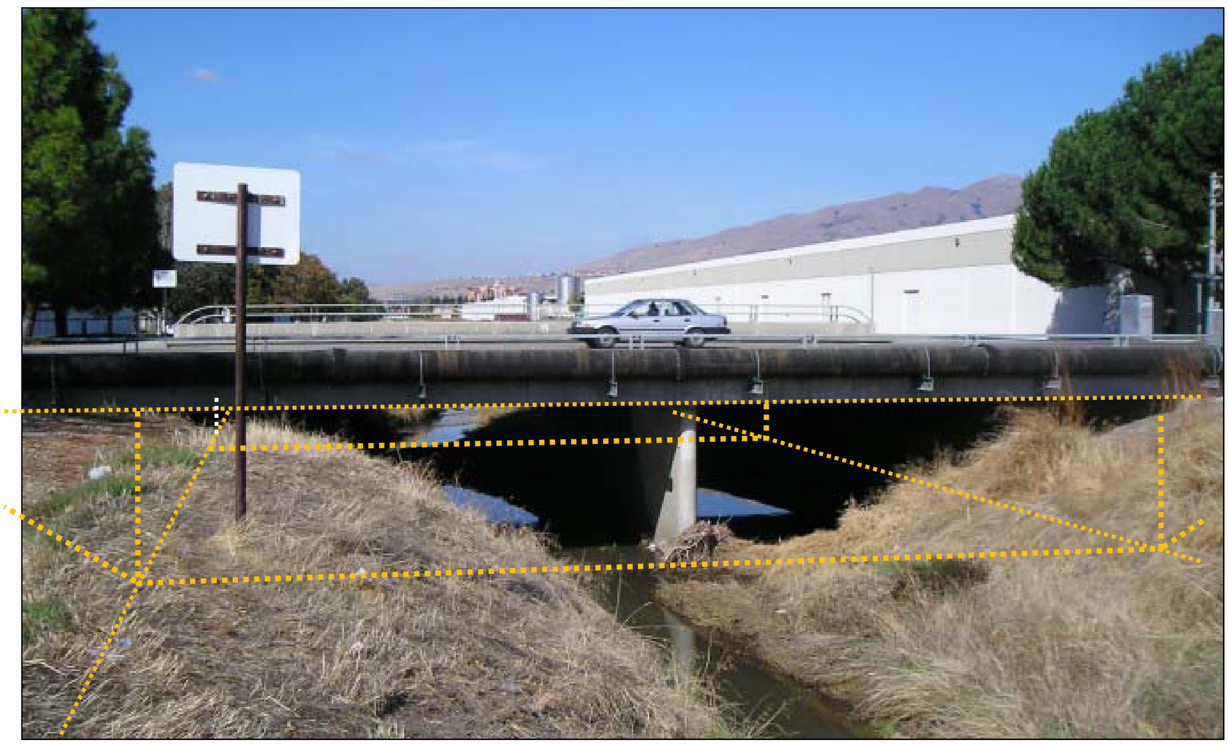


Figure 3-17 Schematic View of Yosemite Drive Bridge Modifications

(h) Los Coches Street Bridge

The Los Coches Street Bridge carries two lanes of traffic over a trapezoidal cross section with a single continuous pier at the center. The left side of the channel is concrete, and the right side of the channel is earthen. The Arroyo de los Coches tributary enters at the upstream face on the right bank.

The existing structure allows sufficient conveyance to accommodate Alternative 2A/d, provided the channel walls are tied into the existing structure. For Alternatives 2B/d and 4/d, complete replacement of the Los Coches Street Bridge with a 100-foot open, raised span would be required to provide the required conveyance capacity (Figure 3-18). Any modifications in the upstream channel would also necessitate reconstructing the Arroyo de los Coches confluence area. In addition, the existing pedestrian bridge cantilevered on the upstream face would need to be reconstructed, and some rerouting of the bicycle path may be required. Raising the deck requires extensive roadway work. The actual height of the existing deck is unknown and should be verified, as the original hydraulic survey data show a solid deck that appears to include the bridge rails.

Figure 3-18 Schematic View of Los Coches Street Bridge Replacement for Alternative 2B/d

(i) Calaveras Boulevard Bridge

The Calaveras Boulevard Bridge is an eight-lane divided roadway. The crossing comprises four 8-foot-high-by-11-foot wide culvert barrels. The outer two barrels are partially filled with the earthen sideslope that projects to the outside toe of the middle culvert barrels. Debris has accumulated to a depth of 1 to 2 feet within the inner two barrels. It is assumed that the apparent reverse grade through the culvert barrel is a result of deposition or survey error, and that the actual concrete invert is at a flat or downstream slope. The existing bridge provides sufficient conveyance to accommodate Alternative 2A/d, provided the sediment in the outer barrels is excavated, and the channel walls are tied into the existing structure. In order to provide the necessary conveyance capacity for Alternatives 2B/d and 4/d, the culvert barrels would need to be replaced by a 100-foot open span bridge. The bridge soffit would need to be raised several feet; however, an arched bridge or other configuration with a similar effective conveyance area may also be acceptable. Figure 3-19 shows the crossing along with a schematic view of the replacement scenario. The sideslopes would be 2H:1V to match the excavated channel footprint for Alternative 2B/d, and vertical abutments would be needed for Alternative 4/d. The downstream project is assumed to be constructed prior to the initiation of any of the project alternatives under consideration. The downstream project extends to the existing Calaveras Boulevard Bridge but does not include modifications to the structure itself; as such, the project improvements proposed for Alternatives 2B/d and 4/d include a transition to match the downstream project approximately 50 feet downstream of Calaveras Boulevard Bridge.

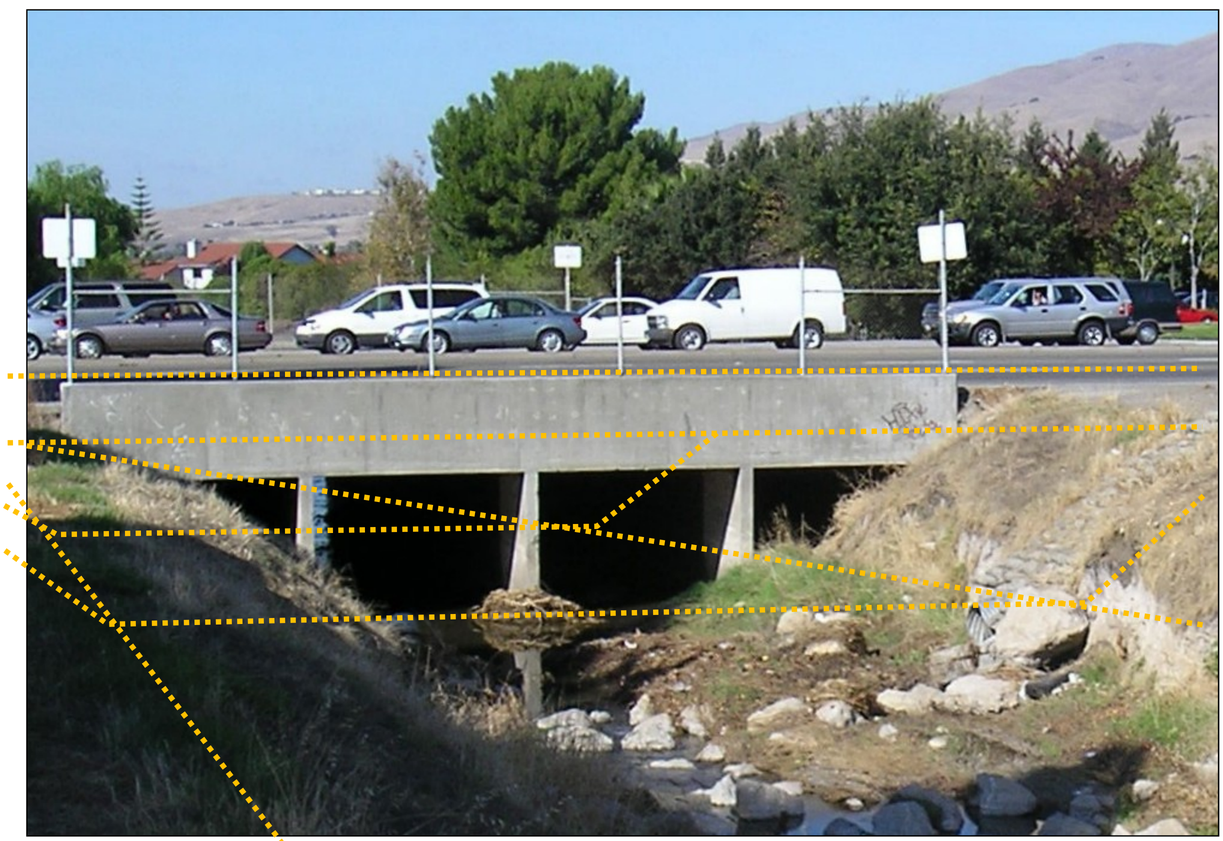


Figure 3-19 Schematic View of Calaveras Boulevard Bridge Replacement for Alternative 2B/d

Table 3-15 Summary of Project Alternative Features – 2A/d, 2B/d, and 4/d			
Reach/Structure	**Alternative Project Features**		
	Alternative 2A/d Incised Trapezoidal Channel	**Alternative 2B/d Incised Trapezoidal Channel**	**Alternative 4/d Walled Trapezoidal Channel**
I-680 Bridge (Sta 248+00)	Remove accumulated sediment at downstream face	Remove accumulated sediment at downstream face	Remove accumulated sediment at downstream face
Channel Reach from I-680 to Montague Expressway (Sta 248+00 – 210+90)	Excavate 6- to 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope; construct 200 lineal feet of free-standing concrete to maximum height of 2 feet	Excavate 6- to 22-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope; construct free-standing concrete floodwall to maximum height of 4 feet	Excavate 10-foot earthen channel with 10 and 22-foot vegetated terraces and vertical concrete walls extending a maximum of 3 feet above existing ground
Montague Expressway Culvert (Sta 210+90)	Tie floodwall into existing headwall at upstream face of structure; construct transitions to existing wingwalls	Remove existing box culvert; construct raised 60-foot span bridge	Remove existing box culvert; construct raised 60-foot span bridge
Channel Reach from Montague Expressway to UPRR Trestle (Sta 213+90 – 206+05)	Excavate 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope	Excavate 14-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope; construct free-standing concrete floodwall to maximum height of 2 feet	Excavate 10-foot earthen channel with 10 and 22-foot vegetated terraces and vertical concrete walls extending a maximum of 3 feet above existing ground
UPRR Railroad Trestle Bridge (Sta 206+05)	Remove existing timber trestle; Construct triple 15-foot span by 12-foot rise concrete box culvert with wingwalls	Remove existing timber trestle; construct triple 15-foot span by 12-foot rise concrete box culvert with wingwalls	Remove existing timber trestle; construct triple 15-foot span by 12-foot rise concrete box culvert with wingwalls
Channel Reach from UPRR Trestle to UPRR Culvert (Sta 206+05 - 186+80)	Excavate 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope	Excavate 10 to 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope	Excavate 10-foot earthen channel with 10- and 32-foot vegetated terraces and vertical concrete walls extending to existing ground
UPRR Railroad Culvert (Sta 186+80)	Construct transition to existing wingwalls	Remove existing triple box culvert; construct 60-foot span 12-foot rise bridge	Remove existing triple box culvert; construct 60-foot span 12-foot rise bridge
Channel Reach from UPRR Culvert to Ames Avenue (Sta 186+80 – 182+10)	Excavate 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope	Excavate 17-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope	Excavate 10-foot earthen channel with 10- and 32-foot vegetated terraces and vertical concrete walls extending to existing ground
Ames Avenue Bridge (Sta. 182+10)	Excavate 12-foot bottom width channel beneath bridge; construct abutment and pier protection	Excavate 17-foot bottom width channel beneath bridge; construct abutment and pier protection	Excavate channel and construct walls beneath bridge; construct abutment and pier protection
Channel Reach from Ames Avenue to	Excavate 15-foot bottom width earthen channel with cellular bank protection at	Excavate 24-foot bottom width earthen channel with cellular bank protection at	Excavate 10-foot earthen channel with 10- and 32-foot vegetated

Table 3-15 Summary of Project Alternative Features – 2A/d, 2B/d, and 4/d			
Reach/Structure	**Alternative Project Features**		
	Alternative 2A/d Incised Trapezoidal Channel	**Alternative 2B/d Incised Trapezoidal Channel**	**Alternative 4/d Walled Trapezoidal Channel**
Yosemite Drive (Sta 182+10 – 168+80)	2H:1V sideslope	2H:1V sideslope and access road along left bank slope	terraces; construct concrete floodwall to extend maximum of 6 feet above existing ground
Yosemite Drive Bridge (Sta 168+80)	Excavate 15-foot bottom width channel beneath bridge transitioning to 24-foot bottom width; construct abutment and pier protection	Excavate 38-foot bottom width earthen channel beneath bridge; construct abutment and pier protection	Excavate channel and construct walls beneath bridge; construct abutment and pier protection
Channel Reach from Yosemite Drive to Los Coches Street (Sta 168+80 – 137+50)	Excavate 26-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope	Excavate 38-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope; construct free-standing concrete floodwall to maximum height of 5 feet	Excavate 10-foot earthen channel with 10- and 32-foot vegetated terraces; construct concrete floodwall to extend maximum of 6 feet above existing ground
Los Coches Street Bridge (Sta 137+50)	Construct transition to existing structure	Remove existing bridge; construct 100-foot span bridge with raised deck and 4-foot high solid bridge face	Remove existing bridge; construct 100-foot span bridge with raised deck and 4-foot high solid bridge face
Channel Reach from Los Coches Street to Calaveras Boulevard (Sta 137+50-131+05)	Excavate 40-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope; free-standing concrete floodwalls to maximum height of 4 feet	Excavate 38-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope; construct free-standing concrete floodwall to maximum height of 5 feet	Excavate 10-foot earthen channel with 10- and 32-foot vegetated terraces; construct concrete floodwall to extend maximum of 6 feet above existing ground
Calaveras Boulevard Bridge (Sta 131+05)	Construct transition to existing structure	Remove existing box culvert; construct 100-foot span bridge with raised deck	Remove existing box culvert; construct 100-foot span bridge with raised deck
Channel Reach Downstream of Calaveras Boulevard (Sta 131+05 – 129+80)	Construct transition to downstream project	Construct transition to downstream project	Construct transition to downstream project

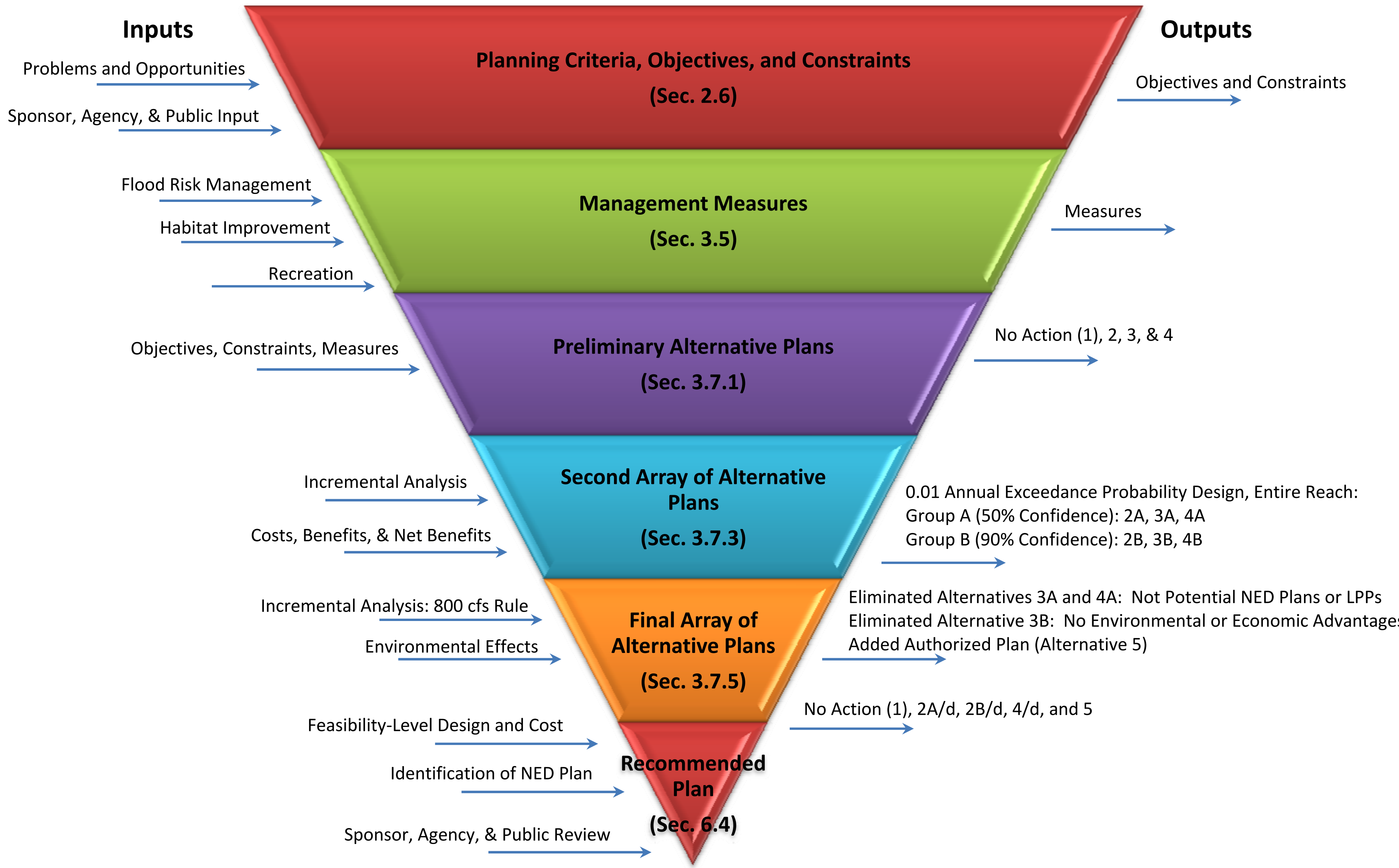


Figure 3-20 Alternative Formulation and Screening Diagram

3.7.6 Residual Flood Risk

Residual flood risk is regarded as what might happen when a flood event occurs that is larger than a design event. For example, if a levee is designed to provide protection from overtopping due to the 0.01 exceedance probability flood, then residual flooding would occur from an event that exceeds that design event. There is always the risk of residual flooding regardless of how large a project is built. Mitigating this risk can take the form of both structural and non-structural measures. Structural measures to mitigate risk are generally those alternatives that have been formulated and considered earlier in this report that increase the level of performance above the without-project condition. The economic evaluation comparing the project costs with the damage reduction benefits results in a tentatively recommended plan. Additional construction of structural measures to further reduce the residual risk could be undertaken by increasing the size of the tentatively recommended plan or by building additional flood risk management measures—for example if a project were extended upstream, or if a reservoir or diversion conveyance were constructed.

For Alternative 2A/d, approximately 370 structural parcels out of the more than 1,100 will experience flooding at the 0.002 mean frequency event. Flooding will cause property damage to slightly more than 200 of these parcels. Approximately 100 residential structures will be damaged by flooding. The average depth of flooded parcels is slightly below 0.4 feet with flood depths ranging from 0.01 feet to 2.17 feet. On the other hand, there is no residual flooding for Alternatives 2B/d and 4/d as their designs exceed the 0.002 exceedance probability event – the upper limit of the study's analysis.

Non-structural measures to mitigate residual risk are typically associated with: floodproofing using local flood walls, ring levees, and/or elevation of structures; source control using collection systems such as cisterns, detention swales, bioretention ponds, and/or filter strips; flood preparedness planning that includes flood warning systems in conjunction with a response plan, as described below; rezoning flood prone areas as well as upgrading building codes to reduce potential damages; and outright relocation of structures and infrastructure subject to flood risk.

3.7.6.1 Emergency Response and Preparedness

This is one of the preliminary non-structural measures kept as a viable component to be added to any structural alternative. While it does not reduce flood damages, it could reduce threats to health and safety through the specific implementation of features that would be combined and incorporated into any plan selected for recommendation.

As previously mentioned, certain components of an emergency response plan are already being implemented at the county and city level. Currently, the cities, county, and the SCVWD utilize the Emergency Broadcast System (EBS) and other forms of public information such as radio and television to transmit emergency and warning transmissions for the area. Also, a local emergency/information phone number (408-265-2600) has been established to answer the public's questions or receive important flood information from residents. The SCVWD's Emergency Operations Center (EOC) is located on the Main Campus at 5750 Almaden Expressway, San Jose, California. The EOC is responsible for carrying out the emergency response program. They also utilize a website to show where flooding is occurring.

As part of the existing emergency response plan, a framework within which local agencies would operate during a flood event would help define responsibility and locations for dispatch of emergency services. For example, closures could take place preventing ingress to areas of flooding at locations such as at Piedmont Road, Cropley Avenue, Morrill Avenue, Montague Expressway, Capital Avenue, Great Mall Drive, Yosemite, Drive, Los Coches Street, Calaveras Boulevard, Milpitas Boulevard, and other major crossings into and out of inundated areas.

The existing emergency response plan would also benefit from the identification of expected breakout areas and the associated floodplains that would be expected during flood events exceeding the design capacity of the Recommended Plan. The plan could include monitoring of these breakout locations during the early stages of a flood threat followed by implementation of the closure plan mentioned above, as appropriate. This non-structural component represents the information and recommendations to the relevant county and city departments rather than direct revisions to their emergency response plan.

3.7.6.2 Floodplain Management Plan

Pursuant to Section 402 of WRDA 1986, the SCVWD must prepare a Floodplain Management Plan (FPMP) designed to reduce the impacts of future flood events in the Berryessa Creek study area no later than one year after the date of signing the Project Partnership Agreement (PPA). This plan must be implemented within one year after project construction is complete. The primary focus of the FPMP should be to address potential measures (structural and non-structural), practices, and policies that will reduce the impacts of future residual flooding, help preserve levels of protection provided by the Corps project, and preserve and enhance natural floodplain values. The Corps further requires the preparation of a FPMP to follow procedures similar to the NFIP minimum standards.

CHAPTER 4 – AFFECTED ENVIRONMENT*

This chapter describes the environmental setting, consisting of the physical, biological, socio-cultural, and economic conditions in the area under investigation and the environmental relationships that exist within the Berryessa Creek. It also defines the significant resources and other environmental characteristics that would be affected by the final array of alternatives. The focus of the environmental analysis is the downstream segment from I-680 to Calaveras Boulevard.

Alternative 5 is the authorized project, which included the upstream segment from I-680 to Old Piedmont Road. For post-authorization studies, Corps policy requires that the authorized plan be retained in the final array of alternatives in order to evaluate and compare proposed changes to that plan. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection. Elements of the currently-authorized Coyote and Berryessa Creeks Project that are not approved under this GRR-EIS will be deferred indefinitely.

4.1 RESOURCES NOT EVALUATED IN DETAIL

Initial evaluation of the effects of the project indicated that there would likely be little to no effect on several resources. These resources are discussed in Sections 4.1.1 through 4.1.4 to add to the overall understanding of the area. These resources will not be considered more fully in this document. Sections 4.2 through 4.11 describe the existing conditions for the resources that may be significantly affected by implementation of the proposed alternatives.

4.1.1 Fisheries

4.1.1.1 Aquatic Habitats

Berryessa Creek's aquatic habitat generally degrades from upstream to downstream. Downstream of I-680 is a completely human-created channel with very little natural habitat. The downstream segment of Berryessa Creek has been highly altered to a trapezoidal channel and levees that are regularly maintained by removal of sediment and vegetation. The instream habitat diversity is extremely low and the riparian zone within this area provides little to no cover for the creek or wildlife habitat.

Upstream of I-680, in the greenbelt area, is moderately to highly disturbed, but has a higher habitat value because it remains a more natural stream alignment. Several large pools are present in the greenbelt with areas of habitat for a variety of amphibians. The majority of the substrate is sand, which might provide spawning habitat for some fish species (although not steelhead). The riparian vegetation lacks strata diversity, but has a large number of trees (including mature elderberry). Above Old Piedmont Road, is the least altered reach along Berryessa Creek, but has been altered due to livestock grazing and residential development at the lower end. There was a larger abundance and diversity of aquatic habitats including riffles, pools, runs, and boulder cascades compared to the greenbelt area. The riparian vegetation mimicked a natural stream corridor with a greater diversity of cover types, including good shading and overhanging vegetation for insect and detrital input into the stream.

4.1.1.2 Fish Populations

Berryessa Creek, from Calaveras Boulevard, is an intermittent stream with occasional flows in the winter, but middle reaches of the creek are dry throughout most of the year. The only portion of the creek with perennial flow and suitable habitat for small, warm water fish species is downstream of the confluence with Piedmont Creek. But even this reach has seasonally high water temperatures and low dissolved oxygen that would be lethal to anadromous fish and most other fish species during the summer months. The proposed project would have no effect on fisheries.

Potential use of Berryessa Creek by steelhead (*Oncorhynchus mykiss*) is limited by several physical conditions. Continuous flows of suitable depth (at least 7 inches) for adult steelhead passage occurred for only an estimated 2 to 5 days during the 2-year flow monitoring study. Reaches with a normally dry creek bed, low flows, sheetflows over concrete channels, poor spawning substrate, and physical barriers to passage preclude steelhead migration into Berryessa Creek.

4.1.2 Land Use and Socioeconomics

This section presents information regarding the social and economic resources that exist in the vicinity of the study area. A description of the population characteristics, including land use, population, ethnicity, housing trends, and employment rates. In addition, environmental justice issues are presented. The data presented herein are based on information obtained from the 2010 Census Bureau surveys for the Santa Clara County and for the tracts adjacent to the Berryessa Creek in the vicinity of the study area.

4.1.2.1 Land Use

Land uses in the Berryessa Creek area include agricultural, residential, industrial, and commercial. Specifically, the area upstream of the study area is agricultural land used for cattle grazing, while downstream the creek flows through developed areas of the cities of San Jose, Milpitas, and Alviso.

Currently, the San Jose area adjacent to Berryessa Creek is fully developed as a medium density residential community from Old Piedmont Road to Interstate I-680. The San Jose General Plan (1994) specifies that protection from a 0.01 exceedance probability flood (100-year flood) should be achieved in accordance with the Federal Flood Insurance Program design standards.

The creek flows through a rapidly expanding light industrial and commercial section of Milpitas from the Montague Expressway to the project boundary at Calaveras Boulevard. The City's Master Plan (1994) includes recreational and aesthetic values along the creek. Projections for future development in the Berryessa Creek study area include light manufacturing/industrial park and retail development. The City of Milpitas' TASP redevelopment plan is located adjacent to the study area along Montague Expressway. This area would be redeveloped in to mixed use, urban, and high density residential.

There is no farmland within the study area; therefore there would not be any adverse effects on agricultural resources. The land use in and around the study area, would not change as a result of construction of the proposed project. Therefore, the project would have no effect on land use.

4.1.2.2 Socioeconomics

The study area is in the heart of Silicon Valley. The Silicon Valley has largely recovered from the 2008-2009 recession. Job growth, income, and home values continue to increase and are near pre-recession levels (Joint Venture Silicon Valley 2013).

(a) Population

The study area lies within the cities of Milpitas and San Jose in Santa Clara County, California. Table 4-1 shows the 2010 population and household family structure for the Santa Clara County and the study area. The 2010 population living in the census tracts in the study area makes up approximately 1.8 percent of the Santa Clara County population.

Table 4-1 Population and Household Characteristics in the Vicinity of the Study Area

Jurisdiction	Population	Number of Households	Person per Household	Number of Families	Persons per Family
Santa Clara County	1,781,642	620,093	2.9	395,561	3.41
City of Milpitas	66,790	17,132	3.47	14,002	3.72
City of San Jose	945,942	276,598	3.20	203,681	3.62
Study Area	**34,320**	**9,824**	**21.42**	**6,694**	**22.58**
Tract 5043.15	6,562	1,966	3.52	1,692	3.78
Tract 5043.20	2,903	844	3.70	749	3.85
Tract 5044.10	4,431	1,221	3.71	994	4.03
Tract 5044.11	5,450	1,535	3.68	1,334	3.74
Tract 5044.14	5,092	1,509	3.77	1,321	3.82
Tract 5045.04	9,882	2,749	3.04	604	3.36

Source: 2010 U.S. Census Bureau

(b) Ethnicity

Table 4-2 shows the ethnic makeup of the county and the study area in 2010. The ethnic composition of the study area resembles but does not mirror that of the county as a whole. Most notable, the Asian population is higher within the study area while the white population is lower than that of the county as a whole.

Table 4-2 Ethnic Population Characteristics in the Vicinity of the Study Area

Jurisdiction	White	Black or African American	American Indian or Alaskan Native	Asian	Native Hawaiian or other Pacific Islander	Other	Hispanic or Latino	Two or more Races
Santa Clara	836,616	42,331	4,042	565,466	6,252	3,877	479,210	53,555

Table 4-2 Ethnic Population Characteristics in the Vicinity of the Study Area								
Jurisdiction	**White**	**Black or African American**	**American Indian or Alaskan Native**	**Asian**	**Native Hawaiian or other Pacific Islander**	**Other**	**Hispanic or Latino**	**Two or more Races**
County								
% of County Total	*35.2%*	*2.4%*	*0.2%*	*31.7%*	*0.4%*	*0.2%*	*26.9%*	*3.0%*
City of Milpitas	9,751	1,836	137	41,308	316	93	11,240	2,109
City of San Jose	371,382	27,508	2,255	300,022	3,492	1,820	313,636	25,827
Study Area	**7,311**	**1,230**	**136**	**20,631**	**148**	**702**	**5,464**	**1,143**
% of Study Area Total	*19.89%*	*3.35%*	*0.37%*	*56.12%*	*0.40%*	*1.91%*	*14.86%*	*3.11%*
Tract 5043.15	2,364	310	57	3,586	50	397	976	310
Tract 5043.20	463	34	4	1,961	9	5	338	92
Tract 5044.10	565	144	10	2,652	7	4	953	96
Tract 5044.11	2,131	146	33	2,720	21	283	802	268
Tract 5044.14	538	66	2	3,992	28	1	345	120
Tract 5045.04	1,250	530	30	5,720	33	12	2,050	257

Source: 2010 U.S. Census Bureau

(c) Housing

The housing within the study area is characterized by residential and public uses. Table 4-3 shows the housing data for the county and study area for 2010. The study area includes approximately 1.2 percent of the housing within the county and has a higher occupancy rate than the county as a whole. The housing units within the study area show a lower median value compared to the county as a whole. According to the California Employment Development Department, median price of existing homes sold in the county is $430,000.

Table 4-3 Occupancy Rates in the Vicinity of the Study Area					
Jurisdiction	**Households**	**Housing Units**	**Occupied Housing Units**	**Occupancy (%)**	**Median Value ($)**
Santa Clara County	565,863	631,920	604,204	97.7	446,400
City of Milpitas	17,132	17,364	17,132	98.7	372,900
City of San Jose	276,598	281,841	276,598	98.1	394,000
Study Area	**7,750**	**9,824**	**9,516**	**96.9**	**347,600**
% of County Total	*1.4%*	*1.6%*	*1.6%*	-	-
Tract 5043.15	2,007	1,966	1,919	97.6	341,400
Tract 5043.20	840	844	823	97.5	429,100
Tract 5044.10	1,187	1,221	1,191	97.5	320,200

Tract 5044.11	1,522	1,535	1,495	97.4	353,800
Tract 5044.14	1,429	1,509	1,451	96.2	459,100
Tract 5045.04	765	2,749	2,637	95.9	274,300

Source: 2010 U.S. Census Bureau

(d) Employment

Table 4-4 and Table 4-5 show the employment in Santa Clara County and the study area, respectively. The information was obtained from the 2010 U.S. Census Bureau surveys for the county and the tracts located within the vicinity of Berryessa Creek study area.

According to the California Employment Development Department, the unemployment rate in Santa Clara County was 8.4 percent in 2012.

Table 4-4 Industry Employment in Santa Clara County

	Population	Percent of Total
Santa Clara County		
Population (16 years and over)	1,308,666	-
Civilian Labor Force	878,106	67.1
Employed	843,912	64.5
Unemployed	34,194	2.6
Armed Forces	826	0.1
Not in Labor Force	429,734	32.8
Industry		
Agriculture, forestry, fishing and hunting, and mining	4,364	0.5
Construction	42,232	5.0
Manufacturing	231,784	27.5
Wholesale trade	25,515	3.0
Retail trade	83,369	9.9
Transportation and warehousing, and utilities	23,546	2.8
Information	39,098	4.6
Finance, insurance, real estate, and rental and leasing	38,715	4.6
Professional, scientific, management, administrative, and waste management services	131,015	15.5
Educational, health and social services	123,890	14.7
Arts, entertainment, recreation, accommodation and food services	49,186	5.8
Other services (except public administration)	29,987	3.6
Public administration	21,211	2.5

Source: 2010 U.S. Census Bureau

Table 4-5 Industry Employment in the Vicinity of the Study Area		
	Population	**Percent of Total**
Study Area		
Population (16 years and over)	24,327	-
Civilian Labor Force	14,908	61.3
Employed	14,282	58.7
Unemployed	626	2.6
Armed Forces	0	0.0
Not in Labor Force	9,419	38.7
Industry		
Agriculture, forestry, fishing and hunting, and mining	8	0.1
Construction	338	2.4
Manufacturing	5,890	41.2
Wholesale trade	420	2.9
Retail trade	1,192	8.3
Transportation and warehousing, and utilities	502	3.5
Information	777	5.4
Finance, insurance, real estate, and rental and leasing	597	4.2
Professional, scientific, management, administrative, and waste management services	1,617	11.3
Educational, health and social services	1,682	11.8
Arts, entertainment, recreation, accommodation and food services	478	3.3
Other services (except public administration)	421	2.9
Public administration	360	2.5

Source: 2010 U.S. Census Bureau

(e) Income

Table 4-6 shows median household income for residents within Santa Clara County, the cities of Milpitas and San Jose, and the study area from the data obtained from the 2010 U.S. Census Bureau surveys.

Table 4-6 Median Income in the Vicinity of the Study Area	
Jurisdiction	**Median Household Income ($)**
Santa Clara County	85,569
City of Milpitas	92,205
City of San Jose	78,660
Study Area	85,357

Source: 2010 U.S. Census Bureau

No actions associated with the proposed project would limit either current or future opportunities for agriculture, business, employment, or housing. Therefore, there would be no effect on the socioeconomics as a result of the proposed project.

4.1.2.3 Environmental Justice

In 1994, the President of the United States issued Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. The objective of this EO include developing Federal agency implementation strategies, identifying minority and low-income populations where proposed Federal actions could have disproportionately high and adverse human health and environmental effects, and encouraging the participation of minority and low-income populations in the NEPA process.

Two types of data must be reviewed to evaluate environmental justice effects: minority populations and income levels. Minority data for census tracts located within the study area were obtained from the 2010 census. Countywide statistics were reviewed to determine the percentage of the population not classified as White and the percentage classified as Hispanic. Using the county average for comparison, each of the census tracts in the study area was evaluated to determine whether the minority and/or Hispanic population percentages were greater than the county average. If a census tract percentage exceeded the county average, the tract was evaluated for environmental justice effects based on its minority population.

Census data shows that 70 percent of the county's population is classified as not Hispanic or Latino, 35 percent of which is classified as White. Twenty-seven percent of the county's population is classified as Hispanic or Latino. No census track with in the study area had a greater than county average of minority and/or Hispanic population percentage.

The second criterion for an environmental justice analysis is income. Income data were obtained from the 2010 census and used in this analysis. To determine the locations of low-income populations, county income data were reviewed to determine the countywide percentage of households that have incomes below poverty levels. Then, the individual census tracts were evaluated to determine the percentage of households within the tract that incomes below poverty levels. If a census tract percentage exceeded the county average, the tract was included in the analysis based on income levels.

Based on the 2010 census, 4.9 percent of families in Santa Clara County have incomes below the poverty levels. Within the study area, one census tract (5044.10) was determined to have families with incomes below the poverty levels greater than the County average. Tract 5044.10, shown on Figure 4-1, has 9.1 percent of families with income below the poverty levels. No populations would be displaced as a result of project construction, and no local industry would be disrupted by project activities. There would be no disproportionately adverse effects to minorities or low-income populations.

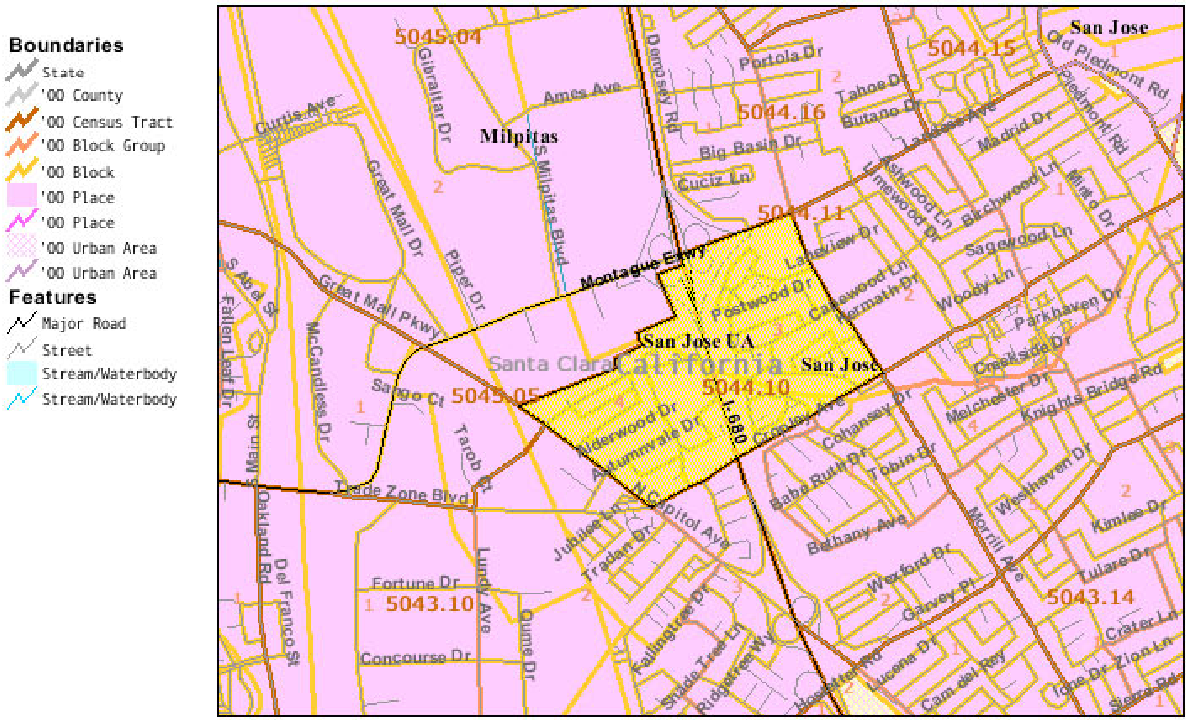


Figure 4-1 Census Tract 5044.10

4.1.3 Topography and Soils

4.1.3.1 Topography

The Berryessa Creek watershed (Figure 4-2) covers a 22.4-square-mile area and is located on the eastern side of the Santa Clara Valley near Milpitas, California. Approximately half of the watershed covers upland, mountainous areas, whereas the other half is located in the Santa Clara Valley. Mountainous areas of the watershed are largely undeveloped and used mainly for cattle grazing. Areas in the upper basin along tributary streams and in valleys exhibit tree cover consisting primarily of oak and madrone in the uplands and willows and sycamores in the riparian zone. Grasslands dominate much of the upper basin hill slopes away from drainage networks. In contrast, the lower part of the basin in Santa Clara Valley is heavily populated, consisting of residential housing tracts and light industry.

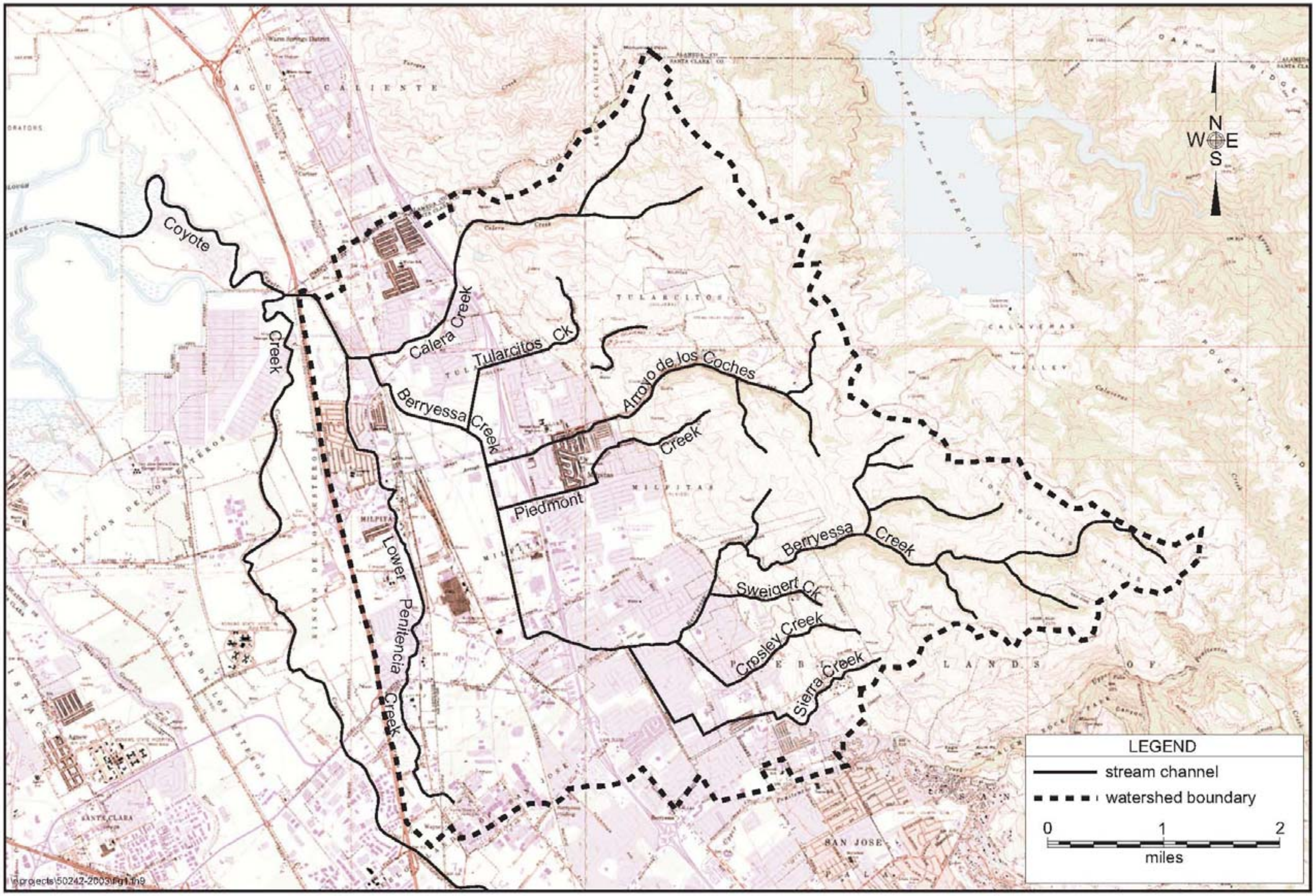


Figure 4-2. Berryessa Creek Watershed

Berryessa Creek flows west into the Santa Clara Valley then turns northeast to flow in a manmade channel until it reaches its terminus at the confluence with Lower Penitencia Creek. Major tributaries to Berryessa Creek are Arroyo de Los Coches and Calera, Crosley, Piedmont, Sierra, Sweigert, and Tularcitos Creeks. Monument Peak, at 2,594 feet, is the highest point in the Berryessa Creek basin, and the lowest point is an elevation of 3 feet at the confluence with Lower Penitencia Creek. There are no major reservoirs in the Berryessa Creek watershed. The downstream 3,500 feet of Berryessa Creek are affected by tidal action from the confluence with Lower Penitencia Creek to North Abel Street.

The removal of sediment within the channel and construction of the flood walls and/or levees would not change the overall topography of the area. Due to their size and nature, the proposed project would have no effect on the major topographic features in the area.

4.1.3.2 Soils

Specific soil series (soil types) in the study area are associated with Holocene deposits of specific age and manner of deposition. Soils in the study area were formed by either basin or alluvial deposition. Basin deposition consists of sediment that settles out of standing or slow-moving water. Alluvial fan deposition occurs when sediment is deposited by streams emanating from canyons onto alluvial valley floors or alluvial plains. Alluvial deposits typically result from debris flows, concentrated mudflows, braided stream flows, or overbank flooding (USGS, 2000).

Soil types in the study area include Mocho gravelly loam (1 to 3 percent slope), Mocho loam (1 to 3 percent slope), Mocho clay loam (1 to 3 percent slope), Sunnyvale clay loam (0 to 1 percent slope), Orestimba silty clay loam (0 to 1 percent slope), and Clear Lake clay (0 to 1 percent slope). The Mocho soil types are associated with steeper gradient stream reaches upstream of I-680. The Sunnyvale, Orestimba, and Clear Lake soil types are associated with shallower gradient stream reaches downstream of I-680. Historically, soils in the study area were suitable for agriculture, especially the cultivation of apricots, prunes, and peaches (USDA, 1958).

Construction of the proposed project would temporarily expose disturbed areas to erosion caused by wind or early-season rainfall events. Soil types have a moderate to high erosion potential; the active excavation and grading of soil during construction activities could result in erosion. Potential erosion during construction would be addressed through the implementation of BMPs. Further discussion of potential erosion concerns and the associated BMPs are addressed in Section 4.4, Water Resources and Quality.

Localized areas of the study area would be disturbed during construction due to channel excavation and earthen levees and floodwall construction. All suitable material from excavation would be reused in the study area to the extent feasible and all disposal material would be temporarily stockpiled at the staging area(s). All non-useable material would be disposed of by the contractor at a State-permitted disposal facility approved in writing by the Corps. As a result, the proposed project would have no effect on the overall soil conditions in and near the study area.

4.1.4 Geology and Seismicity

4.1.4.1 Geology

The project site is in the southeastern portion of the San Francisco Bay area in the Coast Range geomorphic province of California. Three prominent geologic blocks dominate the San Francisco Bay Area: the Santa Cruz Mountains (western block), the San Francisco Bay (central block), and the East Bay Hills/Diablo Range (eastern block). The site is located along the northern margin of the Santa Clara Valley, approximately five miles south of San Francisco Bay.

4.1.4.2 Seismicity

The project site is located in a seismically active part of northern California. The Santa Clara Valley and the Diablo Range are separated by the Hayward Fault zone, a branch of the San Andreas Fault zone. The Diablo Range was formed by uplifting along the fault zone, while the valley down faulted. These processes took place in the late Pliocene epoch several million years ago. Many faults exist in the San Francisco Bay Area, which are capable of producing earthquakes. Significant earthquakes, which have occurred in this area, are generally associated with crustal movements along well-defined active fault zones. Faults in the vicinity of the site with a moderate to high potential for surface rupture include the Hayward Fault, Calaveras Fault, San Andreas Fault, Greenville Fault, and Concord-Green Valley Fault. Figure 4-3 presents the locations of the fault systems relative to the project site.

The U.S. Geological Survey (2005) estimated the following probabilities of a magnitude 6.7 or greater earthquake occurring at the faults located in the study vicinity before 2032: Hayward Fault (27 percent), San Andreas Fault (21 percent), Greenville Fault (3 percent) and Concord-Green Valley Fault (4 percent). Moreover, using newly collected and updated theories of earthquake activity, the USGS has concluded that there is a 62 percent chance of at least one magnitude 6.7 or greater quake (capable of causing widespread damage) striking somewhere in the San Francisco Bay region before 2032 (USGS 2005).

Active faults have been mapped and are classified as A, B, or C type faults specifically for use with the California Building Standards Code. Faults are classified based on the magnitude of earthquakes typically associated with the fault, and the fault's slip rate. Type A faults cause the greatest potential destruction; Type C cause the least. The closest known active faults to the study area are listed in Table 4-7. In addition, the approximate distance to the study area, probable maximum moment magnitude that could be generated, fault class, and slip rate are identified.

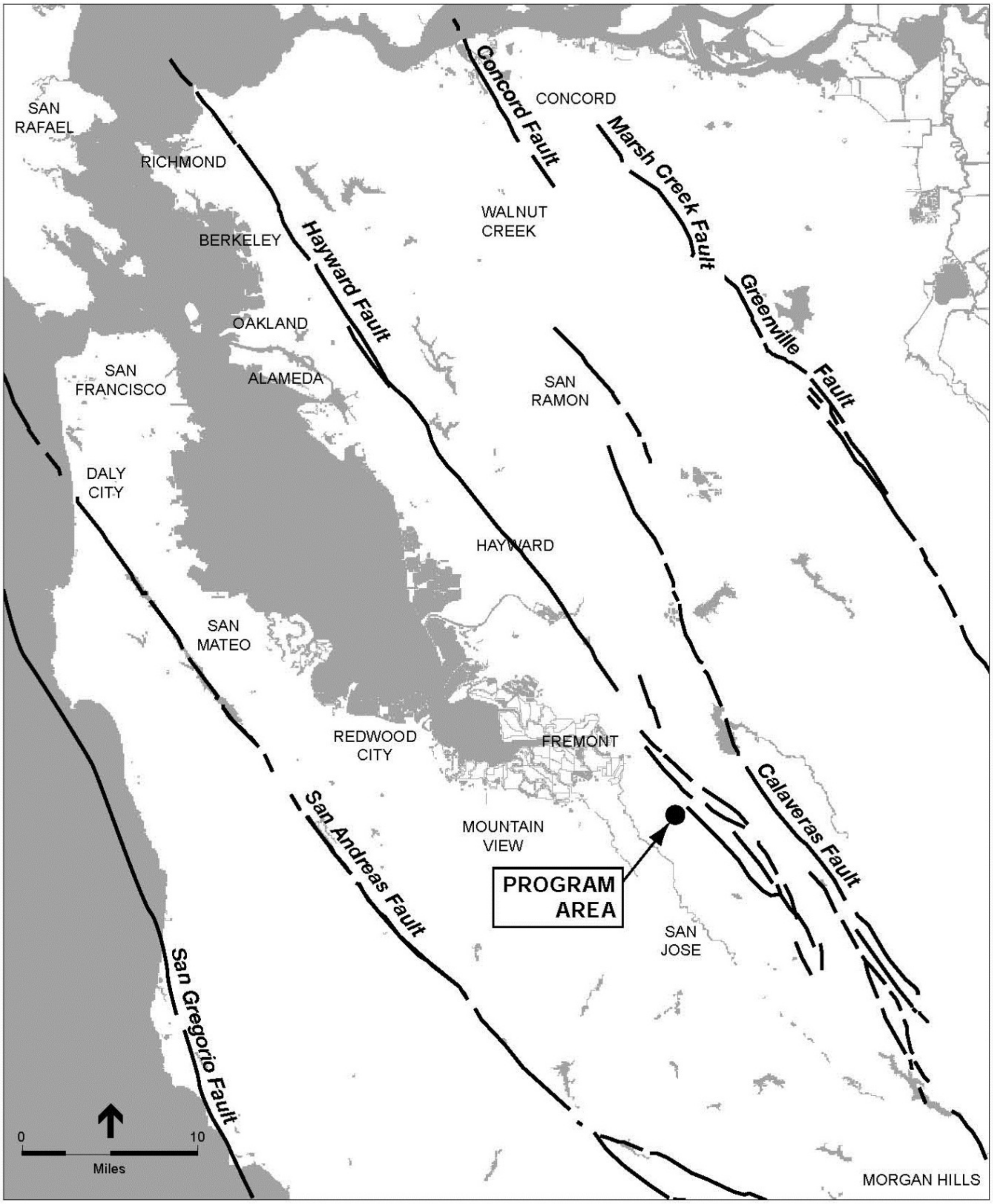


Figure 4-3 Fault Map

Table 4-7 Maximum Credible Earthquake Magnitudes				
Fault	**Estimated Distance from Project Site**	**Maximum Credible Earthquake2**	**Fault Class1**	**Slip Rate (mm/yr)**
Hayward Fault (Strike-Slip Fault)	1.2 miles	7.1	A	9
Calaveras Fault (Strike-Slip Fault)	4.7 miles	6.8	B	6
San Andreas Fault (Strike-Slip Fault)	15.6 miles	6.7	A	17
Greenville Fault (Strike-Slip Fault)	17.6 miles	6.9	B	2
Concord-Green Valley Fault (Strike-Slip Fault)	33.8 miles	6.8	B	4-5

Notes:
1 Faults with an "A" classification are capable of producing large magnitude (M) events (M greater than 7.0), have a high rate of seismic activity (e.g., slip rates greater than 5 millimeters per year), and have well-constrained paleoseismic data (e.g., evidence of displacement within the last 700,000 years). Class B faults are those that lack paleoseismic data necessary to constrain the recurrence intervals of large-scale events. Faults with a "B" classification are capable of producing an event of M 6.5 or greater.
2 The moment magnitude scale is used by seismologists to compare the energy released by earthquakes. Unlike other magnitude scales, it does not saturate at the upper end, meaning that there is no particular value beyond which all earthquakes have about the same magnitude, which makes it a particularly valuable tool for assessing large earthquakes.
Sources: Cao et al. 2003; Jennings 1994; Petersen et al. 1996; data compiled by USACE in 2011

4.1.4.3 Seismic Hazards

No active faults have been mapped within the study area by the California Geological Survey or U.S. Geological Survey (Jennings 1994). The study area is not located within the one of the Alquist-Priolo Earthquake Fault Zones, and therefore the Alquist-Priolo Earthquake Fault Zoning Act does not apply to this project (California Geological Survey 2007).

Seismic ground shaking is an unavoidable hazard for facilities within the Bay Area. It is likely the proposed project would experience at least one major earthquake within the life of the project. Design, construction, and maintenance must comply with the regulatory standards of the Corps, the latest industry standards and building code requirement for seismic design. The design and construction of the floodwalls and/or levees would meet or exceed applicable design standards for static and dynamic stability, seismic ground shaking, liquefaction, subsidence, and seepage, minimizing the potential for significant damage. Therefore, the existing geology and seismicity of the area would not affect the proposed project.

4.2 AIR QUALITY

4.2.1 Regulatory Setting

4.2.1.1 Federal

(a) Clean Air Act

The Clean Air Act (42 U.S.C. 7401, et seq.) delegates primary enforcement to the states, with direct oversight by the U.S. Environmental Protection Agency (EPA). The CAA which was last amended in 1990, requires EPA to set National ambient air quality standards (NAAQS) (40 CFR part 50) for pollutants considered harmful to public health and the environment. The CAA established two types of NAAQS. Primary standards were established to promote human health with an adequate margin of safety to protect those most vulnerable such as asthmatics, infants, and elderly persons. More stringent secondary standards were established to promote human welfare to prevent impaired visibility, building and crop damage, etc.

4.2.1.2 State

(a) California Clean Air Act

The California Air Resources Board (ARB) is the agency responsible for coordination and oversight of State and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA). The CCAA, which was adopted in 1988, required ARB to establish California ambient air quality standards (CAAQS). The standards for criteria pollutants established by CARB are generally more restrictive than the NAAQS. CARB has also established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the criteria air pollutants described below. Differences in the standards are generally explained by the health effects studies considered during the standard-setting process and the interpretation of the studies. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The CCAA requires that all local air districts in the State endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that local air districts should focus particular attention on reducing the emissions from transportation and area wide emission sources, and provides districts with the authority to regulate indirect sources (i.e., sources that are not stationary or regulated as a stationary source, such as construction sources).

Other CARB responsibilities include:

- Overseeing local air district compliance with California and Federal laws
- Approving local air quality attainment plans (AQAPs)
- Submitting State Implementation Plans (SIPs) to the U.S. Environmental Protection Agency (EPA)

- Monitoring air quality
- Determining and updating area designations and maps
- Setting emissions standards for new mobile sources, consumer products, small utility engines, off-road vehicles, and fuels

4.2.1.3 Local

The Bay Area Air Quality Management District (BAAQMD) has local jurisdiction over the study area. BAAQMD is responsible for bringing and/or maintaining air quality in the Basin within Federal and State air quality standards. Specifically, BAAQMD has the responsibility to monitor ambient air pollutant levels throughout the Basin and to develop and implement strategies to attain the applicable Federal and State standards.

The CAA and the CCAA require SIPs to be developed for areas designated as non-attainment (with the exception of areas designated as non-attainment for the state PM10 standard). For State air quality planning purposes, the Bay Area is classified as a serious non-attainment area for the 1-hour ozone standard. The "serious" classification triggers various plan submittal requirements and transportation performance standards. One such requirement is that the Bay Area update the Clean Air Plan (CAP) every three years to reflect progress in meeting the air quality standards and to incorporate new information regarding the feasibility of control measures and new emission inventory data.

The Bay Area 2010 CAP serves to:

- Update the Bay Area 2005 Ozone Strategy in accordance with the requirements of the California Clean Air Act to implement "all feasible measures" to reduce ozone
- Consider the impacts of ozone control measures on particulate matter, air toxics, and greenhouse gases in a single, integrated plan
- Review progress in improving air quality in recent years
- Establish emission control measures to be adopted or implemented in the 2010 to 2012 timeframe

4.2.2 Environmental Setting

Air quality is affected by the rate, amount, and location of pollutant emissions and the associated meteorological conditions that influence pollutant movement and dispersal. Atmospheric conditions (wind speed, wind direction, and air temperature) in combination with local surface topography (geographic features such as mountains and valleys) determine how air pollutant emissions affect local air quality.

Air pollution potential in the Santa Clara Valley is high. High summer temperatures, stable air, and mountains surrounding the valley combine to promote ozone formation. In addition to the many local sources of pollution, ozone precursors from San Francisco, San Mateo, and Alameda Counties are carried by prevailing winds to the Santa Clara Valley. The shape of the valley tends to channel pollutants to the southeast. In addition, on summer days with low level temperature inversions, ozone can be recirculated by southerly drainage flows in the late evening and early morning and by the prevailing northwesterly winds in the afternoon. A similar recirculation pattern occurs in the winter, affecting levels of CO and particulate matter. This movement of the air up and down the valley increases the impact of the pollutants significantly.

4.2.2.1 Criteria Air Pollutants

The CAA established NAAQS for several air pollutants. The six non factors pollutants that are analyzed when examining air quality include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), inhalable particulate matter (PM_{10} and $PM_{2.5}$ - particulates 10 microns or less in diameter and 2.5 microns or less in diameter, respectively), and lead.

4.2.2.2 Ambient Air Quality Standards

Areas are classified as either *in attainment* or in *non-attainment* with respect to State and Federal ambient air quality standards. These classifications are made by comparing actual monitored air pollutant concentrations to State and Federal standards. If a pollutant concentration is lower than the State or Federal standard, the area is considered to be *in attainment* of the standard for that pollutant. If pollutant levels exceed a standard, the area is considered a *non-attainment* area. If data are insufficient to determine whether a pollutant is violating the standard, the area is designated *unclassified*.

To implement Section 176 of the CAA, the EPA issued the General Conformity Rule which states that a Federal action must not cause or contribute to any violation of the NAAQS, or delay timely attainment of air-quality standards. In order to meet this CAA requirement, a Federal agency must demonstrate that every action that it undertakes, approves, permits or supports will conform to the appropriate state implementation plan (SIP). A conformity determination is required for each pollutant where the total of direct and indirect emissions caused by a Federal action in a non-attainment (or maintenance) area exceeds *de minimus* rates listed in the rule (40 CFR 93.153).

The California Clean Air Act established CAAQS which are more stringent than Federal standards and also includes pollutants not listed in the NAAQS. All Federal projects in California must comply with the stricter California air quality standards. The California and National Standards are summarized in Table 4-8.

The BAAQMD is in non-attainment status for ozone under both the California (CAAQS) and Federal standards (NAAQS), and also is in non-attainment under the California standard for particulate matter (PM10 and PM2.5). The BAAQMD is in attainment for all other listed air pollutants under both the California and Federal standards (Bay Area Air Quality Management District 2008).

Table 4-8 Air Quality Standards and Attainment Status

Pollutant	Averaging Time	State Standard	Federal Standard
Ozone	1 Hour 8 Hour	0.09 ppm 0.070 ppm	– 0.075 ppm
Carbon Monoxide	1 Hour 8 Hour	20 ppm 9.0 ppm	35 ppm 9 ppm
Nitrogen Dioxide	1 Hour Annual	0.18 ppm 0.030 ppm	0.100 ppm[a] 0.053 ppm
Sulfur Dioxide	1 Hour 3 Hour 24 Hour Annual	0.25 ppm – 0.04 ppm –	– 0.5 ppm 0.14 ppm 0.03 ppm
Respirable Particulate Matter (PM_{10})	24 Hour Annual	50 μg/m^3 20 μg/m^3	150 μg/m^3 –
Fine Particulate Matter ($PM_{2.5}$)	24 Hour Annual	– 12 μg/m^3	35 μg/m^3 15.0 μg/m^3
Lead	Monthly Quarterly	1.5 μg/m^3 –	– 1.5 μg/m^3

ppm = parts per million
μg/m^3 = micrograms per cubic meter

[a] To attain this standard, the three-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

Source: Bay Area Air Quality Management District 2011

4.2.2.3 Current Status

Existing air quality conditions in the study area can be characterized by monitoring data collected in the region. The air quality monitoring station closest to the project alignment is the San Jose Central station which monitors for ozone, CO, NO_2, SO_2, PM10, and PM2.5.

Recent air quality monitoring results from the San Jose Central monitoring station are summarized in Table 4-9. Table 4-9 incorporates San Jose's air quality data from the BAAQMD. The table shows the number of times each year that each station records pollutant concentrations in excess of the Federal or California air quality standards. The table also lists the highest annual reading for each pollutant at each station. As indicated in Table 4-9, the San Jose Central monitoring station has experienced no violations of the Federal or State standards from 2004-2008.

Table 4-9 Air Quality Data Summary

Pollutant	Standard[a]	Monitoring Data by Year				
		2004	2005	2006	2007	2008
Ozone						
Highest 1-hour average, ppm		0.090	**0.113**	**0.118**	0.083	**0.118**
Days over state standard	0.09 ppm	0	1	5	0	1
Highest 8-hour average, ppm		0.069	**0.080**	**0.087**	0.068	**0.080**
Days over state standard	0.070 ppm	0	1	5	0	3
Days over national standard	0.075 ppm	0	1	3	0	2
Nitrogen Dioxide (NO_2)						
Highest 1-hour average, ppm		0.073	0.074	0.074	0.065	0.080
Days over state Standard	0.18 ppm	0	0	0	0	0
Annual Average (ppm)		--	0.019	0.018	0.017	0.017
Carbon Monoxide						
Highest 8-hour average, ppm		2.96	3.11	2.92	2.71	2.48
Days over state/national standard	9.0/9	0	0	0	0	0
PM_{10}						
Highest 24-hour average, state/ national, µg/m^3		**58.1**/55.4	**53.5**/49.9	**73.2**/68.9	**69.1**/64.7	**57.3**/55.0
Estimated days over state/national standard[b]	50/150	24.5/0	11.5/0	11.5/0	18.1/0	6.1/0
$PM_{2.5}$						
Highest 24-hour average, µg/m^3		**51.5**	**54.6**	**64.4**	**57.5**	**41.9**
Estimated days over national standard[b]	35	14.4	16.2	7.6	9.1	5.1

[a] Generally, state standards are not to be exceeded and federal standards are not to be exceeded more than once per year.
[b] Measurements are collected every six days. "Estimated days" represent an estimated number of days that the standard would have been exceeded if levels were sampled every day of the year.

NOTES: ppm = parts per million; µg/m^3 = micrograms per cubic meter
Bold values are in excess of applicable standards.
-- There was insufficient data available to determine this value.

Source: Bay Area Air Quality Management District

4.2.2.4 Sensitive Receptors

Air quality does not affect every individual in the population in the same way, and some groups are more sensitive to adverse health effects than other groups. Population subgroups sensitive to the health effects of air pollutants include the elderly and the young, those with higher rates of respiratory disease such as asthma and chronic obstructive pulmonary disease, and subgroups with other environmental or occupational health exposures (e.g. indoor air quality) that affect cardiovascular or respiratory diseases. Land uses such as schools, children's day care centers, hospitals, and nursing and convalescent homes are the most sensitive to poor air quality because the population groups associated with these uses have higher susceptibility to respiratory distress. Parks and playgrounds are considered moderately sensitive to poor air quality because persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality. However, exposure times are generally far shorter in parks and playgrounds than in residential locations and schools, which typically result in lower levels of pollutant exposure. Residential areas are more sensitive to air quality conditions compared to commercial and industrial areas because people generally spend more time at their residences, with greater associated exposure to ambient air quality conditions.

The project area is in a highly developed area. Downstream of I-680 is a commercial/industrial area, the sensitive receptors include the employees of the businesses, residential neighborhood located adjacent to the creek and, Northwood Elementary School located approximately 700 feet from the creek. There are no licensed childcare facilities within 1,000 feet of the either project site (the analytic zone of influence of the BAAQMD CEQA Guidelines). There are no hospitals or convalescent homes in the project vicinity. A map of the sensitive receptor for the downstream of I-680 is located in Appendix A

The sensitive receptors in the upstream of I-680 include local residents and visitors, recreationists at Berryessa Creek Park, Majestic Way Elementary School located approximately 100 feet from the creek, and occasional wildlife. These sensitive receptors would only be effect if Alternative 5, the Authorized Project, is implemented. Alternative 5 is used by the Corps for comparative reasons but is not a candidate for selection.

4.3 CLIMATE CHANGE

4.3.1 Regulatory Setting

4.3.1.1 Federal

Currently, there are no Federal laws related to greenhouse gas emissions (GHG) and climate change that are directly relevant to this analysis. The Council on Environmental Quality (CEQ), which serves under the Executive Office of the President, published in February 2010 a Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions. The Guidance memorandum advised Federal agencies to consider the impacts of and opportunities to reduce GHG emissions caused by proposed Federal actions. The Guidance memorandum established the basis for evaluation of any proposed action to be the "*reasonably anticipated direct emissions of 25,000 metric tons or more of CO_2-equivalent (CO_2e) GHG emissions*".

4.3.1.2 State

The CARB is responsible for the development, implementation, and enforcement of California's motor vehicle pollution control program, GHG statewide emission estimates and goals, and development and enforcement of GHG emission reduction rules.

California is the second largest contributor of GHG in the U.S. and the sixteenth largest in the world (CEC 2006). During 1990 to 2003, California's gross state product grew 83 percent while GHG emissions grew 12 percent. While California has a high amount of GHG emissions, it has low emissions per capita. The major source of GHG in California is transportation, contributing 41 percent of the State's total GHG emissions (CEC 2006). Electricity generation is the second largest generator, contributing 22 percent of the State's GHG emissions. Emissions from fuel use in the commercial and residential sectors in California decreased 9.7 percent over the 1990 to 2004 period (CEC 2006).

California has taken proactive steps, briefly described in Table 4-10, to address the issues associated with GHG emissions and climate change. A summary of the major California GHG regulations that will affect the project's GHG emissions are presented in Table 4-10.

Table 4-10 Summary of Relevant California GHG Regulations

Bill, Year	Description
Assembly Bill (AB) 4420, 1988	Directed California Energy Commission, in consultation with the CARB and other agencies, to "study and report…on how global warming trends may affect California's energy supply and demand, economy, environment, agriculture, and water supplies."
AB 1493, 2002	Requires CARB to develop and implement regulations to reduce automobile and light-truck GHG emissions. These stricter emissions standards apply to automobiles and light trucks beginning with the 2009 MY. Although litigation was filed challenging these regulations and EPA initially denied California's related request for a waiver, the waiver request has now been granted.
Executive Order (E.O.) S-3-05, 2005	The goal of E.O. S-3-05 is to reduce California's GHG emissions to: (1) year 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80% below the 1990 levels by 2050.
AB 32, California Global Warming Solutions Act of 2006	Sets overall GHG emissions reduction goals and mandates that CARB create a plan that includes market mechanisms and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Requires statewide GHG emissions be reduced to 1990 levels by 2020. (The 1990 CO2e level is 427 million metric tons of CO2e (CARB 2012a)). Directs CARB to develop and implement regulations to reduce statewide emissions from stationary sources. Specifies that regulations adopted in response to AB 1493 be used to address GHG emissions from vehicles. Requires CARB to adopt a quantified cap on GHG emissions representing 1990 emissions levels. Includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.
E.O. S-01-07, 2007	Requires the carbon intensity of California's transportation fuels to be reduced by at least 10% by 2020.
Senate Bill 97	This bill directed the Natural Resources Agency, in coordination with the Governor's Office of Planning Research, to address the issues through Amendments to the CEQA Guidelines. The revised Guidelines were adopted December 30, 2009 to provide direction to lead agencies about evaluating, quantifying, and mitigating a project's potential GHG emissions.

Source: CARB 2012a, 2012b, 2012c; Office of the Governor 2007

4.3.2 Environmental Setting

4.3.2.1 Global Climate Trends and Associated Impacts

The rate of increase in global average surface temperature over the last hundred years has not been consistent; the last three decades have warmed at a much faster rate—on average 0.32°F per decade. Eleven of the twelve years from 1995 to 2006 rank among the twelve warmest years in the instrumental record of global average surface temperature (going back to 1850) (IPCC 2007).

During the same period over which this increased global warming has occurred, many other changes have occurred in other natural systems. Sea levels have risen on average 1.8 millimeters per year (mm/yr); precipitation patterns throughout the world have shifted, with some areas becoming wetter and other drier; tropical cyclone activity in the North Atlantic has increased; peak runoff timing of many glacial and snow fed rivers has shifted earlier; as well as numerous other observed conditions. Though it is difficult to prove a definitive cause and effect relationship between global warming and other observed changes to natural systems, there is high confidence in the scientific community that these changes are a direct result of increased global temperatures (IPCC 2007).

4.3.2.2 California Climate Trends and Associated Impacts

Maximum (daytime) and minimum (nighttime) temperatures are increasing almost everywhere in California but at different rates. The annual minimum temperature averaged over all of California has increased 0.33°F per decade during the period 1920 to 2003, while the average annual maximum temperature has increased 0.1°F per decade (Moser *et al.* 2009). With respect to California's water resources, the most significant impacts of global warming have been changes to the water cycle and sea level rise. Over the past century, the precipitation mix between snow and rain has shifted in favor of more rainfall and less snow (Mote *et al.* 2005; Knowles *et al.* 2006) and snow pack in the Sierra Nevada is melting earlier in the spring (Kapnick and Hall 2009). The average early spring snowpack in the Sierra Nevada has decreased by about 10 percent during the last century, a loss of 1.5 million acre-feet of snowpack storage (DWR, 2008). These changes have significant implications for water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the state. During the same period, sea levels along California's coast rose seven inches (DWR, 2008).

Statewide GHG emissions in 2008 were approximately 477.74 million metric tons of CO_2e. Based on this estimate, statewide emissions would need to be reduced by approximately 50 million metric tons of CO_2e by 2020 to meet the AB 32 goal of achieving 1990 CO_2e levels (427 million metric tons of CO_2e) (CARB 2012a).

4.4 WATER RESOURCES AND QUALITY

4.4.1 Regulatory Setting

4.4.1.1 Federal

(a) Clean Water Act

The Clean Water Act (CWA) of 1972, as amended (EE U.S.C. 1251, et. seq.) is the Federal law regulating the quality of the Nation's waters and wetlands. Provisions of the CWA provide for delegation by the EPA of many permitting, administrative, and enforcement aspects of the law to state governments. In California, the State Regional Water Control Board (SWRCB) and its associated nine regional water quality control boards (RWQCB) implement various CWA programs, including the promulgation of Water Quality Control Plans (basin plans) containing California's water quality standards. Pursuant to the CWA, water quality standards are composed of two parts: (1) the designated beneficial uses of water and (2) criteria or objectives to protect those uses from pollution and degradation. The San Francisco Bay Regional Water Quality Control Board administers the hydrological basin containing the San Francisco Bay estuarine system and freshwater tributaries.

In addition to the basin plans, the regional water quality control boards administer the EPA's National Pollutant Discharge Elimination System (NPDES) permits required by the Clean Water Act. California regulations require that discharges of stormwater associated with construction activity disturbing more than 1 acre must be permitted under a General Permit for Discharges of Storm Water Associated with Construction Activity, known as a Construction General Permit. This permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must list best management practices (BMPs) that the contractor will use to control storm water runoff and reduce erosion and sedimentation. A sediment monitoring plan is also required if the site discharges to a water body with impaired or limited water quality (State Water Resources Control Board 2005d).

Sections 404 and 401 of the Clean Water Act regulate the discharge of dredged or fill material into wetlands and waters of the United States. Both the Corps and the EPA have responsibility for administering the Section 404 program and typically issue permits for these regulated activities. Although the Corps does not issue itself permits for its own Civil Works projects, Corps regulations require the Corps to apply the guidelines and substantive requirements of Section 404 to its activities. The State Water Resources Control Board implements the Section 401 water quality certification program. The Section 401 Program is intended to complement Section 404 goals and to encourage basin-level analysis and protection of wetlands and riparian areas (State Water Resources Control Board 2005a). A Wetland Delineation is included in Appendix A Part I.

4.4.1.2 State

(a) Porter-Cologne Water Quality Control Act and Clean Water Act (Section 402)

The SWRCB and RWQCBs regulate discharges of waste into waters of the United States through NPDES permits, authorized under Section 402 of the CWA, and regulate discharges of waste into waters of the state through waste discharge requirements (WDRs), authorized under California's Porter-Cologne Water Quality Control Act (Porter-Cologne Act). The RWQCBs issue NPDES permits and WDRs to ensure that projects that may discharge wastes to land or water conform to water quality objectives and policies and procedures of the applicable water quality control plans. The Porter-Cologne Act defines waters of the state as "any surface water or groundwater, including saline waters, within the boundaries of the state."

The SWRCB General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order 2009-009-Division of Water Quality [DWQ]) is applicable to all land-disturbing construction activities that would affect 1 acre or more. NPDES permits involve similar processes, including submittal of notices of intent (NOI) to discharge to the San Francisco Bay RWQCB and implementation of BMPs to minimize those discharges. The San Francisco Bay Regional Water Quality Control Board may also issue site-specific WDRs, or waivers to WDRs, for certain waste discharges to land or waters of the state.

Construction activities subject to the general construction activity permit include clearing, grading, stockpiling, and excavation. Dischargers are required to eliminate or reduce non-stormwater discharges to storm sewer systems and other waters. The permit also requires dischargers to consider the use of post-construction permanent BMPs that will remain in service to protect water quality throughout the life of the project. Types of BMPs include source controls, treatment controls, and site planning measures.

(b) Water Quality Control Plan

The San Francisco Bay Regional Water Quality Control Board adopted the current Water Quality Control Plan (Basin Plan) for the San Francisco Bay in 2007. The Basin Plan is the master policy document that contains descriptions of the legal, technical, and programmatic bases of water quality regulation in the San Francisco Bay region. The Basin Plan establishes (1) beneficial uses for waters within the basin, (2) water quality objectives to protect those beneficial uses, and (3) implementation plans and strategies designed to achieve the water quality objectives (State Water Resources Control Board 2005d).

4.4.2 Environmental Setting

4.4.2.1 Water Quality

The stream is intermittent with flow in winter and low to no flow in summer. Winter flows tend to be turbid, due to sediment loading from the surrounding foothills and from bank erosion along the creek. Sources of summer flows include runoff from the watering of lawns, industrial discharges, and limited groundwater discharge. Low summer flows lead to stagnant water conditions, low dissolved oxygen content, and higher water temperatures. The creek is completely dry downstream of I-680 during the summer and fall months.

Berryessa Creek is not reported on the 303(d) list of impaired waters; lower Penitencia Creek was visually observed to have petroleum product odors and films during a January 1987 fisheries study (Harvey & Stanley 1988).

4.4.2.2 Water Temperature

Tetra Tech (2003) conducted temperature monitoring in Berryessa Creek in 2002. A wide variety of water temperatures occur in the creek, from 38.3 to 84.7°F, depending on the season and location. The creek was monitored in three reaches: Upper Reach, above Old Piedmont Road; Middle Reach, from Old Piedmont Road to Calaveras Boulevard; and Lower Reach, downstream of Calaveras Boulevard. The upper reach had significantly cooler water temperatures than the middle and lower reaches, although water was only present from November through early June. Average temperatures during the potential steelhead spawning season (December through March) were 48.3°F in the upper reach, 55.1°F in the middle reach, and 54.7°F in the lower reach. During the steelhead spawning season, temperatures are generally within the range tolerated by steelhead, although occasional high temperatures (up to 71.3°F in the lower reach) were recorded, corresponding to warm days in late winter.

Average summer temperatures were significantly higher, both as a result of warmer air temperatures and of reduced flow in the creek that can heat up much more quickly from solar radiation gain. Because there was no flow in the upper reach during the summer and early fall months, no temperatures were recorded, although the maximum temperature reached in early June was approximately 78°F. Averages temperatures in the middle and lower reaches were 69.7 and 69.9°F, respectively. Maximum water temperatures reached 84.7°F in the middle reach. In general, water temperatures are directly correlated with air temperature in Berryessa Creek. The high water temperatures during most of the year likely reduce the habitat available to native fish and amphibians, which prefer cooler temperatures. The upper reach is most conducive to native fish and amphibian habitat. Temperature also affects the assemblage of benthic macroinvertebrates, which serves as the prey base for native fish and amphibians. The Water Temperature Monitoring Report in Appendix A Part II.

4.4.2.3 Sensitive Aquatic Habitat

Sensitive aquatic habitat includes those habitats that are of special concern to resource agencies or that are afforded specific consideration through ESA, Section 404 and 401 of the CWA, the Porter-Cologne Water Quality Control Act, or the Magnuson Stevens Fishery Conservation and Management Act (as amended). These habitats are of special concern because they may be of high value to plant, wildlife, and fish species and may have a higher potential to support special-status species. They also provide other important ecological functions, such as enhancing flood and erosion control and maintaining water quality.

(a) Jurisdictional Wetlands and Waters of the United States

Approximately 2.65 acres of waters of the United States, including Berryessa Creek are present in the study area. These waters are regulated under Section 404 of the Clean Water Act, since they are tributaries, and/or are adjacent to tributaries to navigable waters of the United States. Any discharge of dredge or fill material into these jurisdictional waters are subject to compliance under CWA Section 404 and 401 (33 U.S.C. § 1251 et seq. [1972]). All waters of the United States are also considered waters of the State and are subject to regulation under the Porter-Cologne Water Quality Control Act.

Wetland vegetation was located immediately downstream of the Calaveras Boulevard Bridge and downstream of I-680 between Yosemite and Ames Avenues and covers an area of about 0.79 acres. The site is characterized as semi permanently flooded freshwater marsh. Wetlands vegetation at these sites was only found in the stream channel below the ordinary high water mark. The wetland sites are dominated by cattail, an obligate wetland species. Other wetland plant species include horsetail, watercress, and smartweed. These hydrophytic species are present in the low-flow channel in places where surface water is flowing or forms shallow, stagnant, intermittent pools during the dry season. Based on a review of aerial photography, the extent of wetland vegetation appears to vary slightly from year to year.

Wetlands are generally characterized by the presence of three basic parameters: soils, hydrology, and vegetation. Water is present at the surface or within the root zone for at least a portion of the growing season. As a result of the saturated conditions, the soils present in wetlands develop characteristics that are different from those of upland soils. Consequently, wetlands support vegetative species that are adapted to living in wet conditions. However, hydric soils usually require hundreds of years for development. The stream channel alignment downstream of I-680 is artificial and was constructed in 1961. The presence of hydric soils was not verified.

4.4.2.4 Hydrology

(a) Sub basin Delineation

The Berryessa Creek and Lower Penitencia Creek drainage basins were divided into two general categories: urbanized and rural. Descriptions of these categories are provided below.

<u>Urban Areas</u>

The majority of urban development in the Berryessa Creek basin is located in the lower elevation and western portion of the basin within the Milpitas city limits. Essentially the entire Lower Penitencia Creek basin is urbanized. Single-family housing, apartment complexes, shopping centers, schools, and industrial areas create a high percentage of impervious cover. All conveyance features are improved to some degree. These features vary from slightly improved open channels to complex underground storm drain systems. Urban areas are characterized by ground slopes of about one percent (0.01 ft/ft). Soils maps of the area (USDA 1958) indicate that younger clays are interspersed with smaller amounts of old San Francisco Bay mud in the vicinity of the creeks. Much of the soil in the urban area is either clay or clayey loam and is associated with very low infiltration rates when wetted, resulting in high runoff potential. Closer to Coyote Creek, the soil becomes loamier and is characterized by better infiltration characteristics and moderate to high runoff potential.

<u>Rural Areas</u>

Under existing conditions, the higher elevation portions of the Berryessa Creek basin, representing the foothills area east of Old Piedmont Road, are either undeveloped or sparsely developed. The tributary channels in the upper basin wind through gently rolling grass-covered hills. The upper basin is characterized by slopes of five to six percent (0.05 to 0.06 ft/ft) with minimal impervious cover. The soils are shallow with high clay content. Stream channels are commonly flanked by brush and deciduous trees. The width of the riparian zone along these channels varies from several hundred yards in the channels of Berryessa Creek and Arroyo de Los Coches to a few yards on the smaller tributaries.

For hydrologic modeling purposes, the study area was divided into 39 subbasins. The rural zone was divided into 16 subbasins, representing the foothill basins of Berryessa Creek, Piedmont Creek, Sierra Creek, Crosley Creek, Sweigert Creek, Arroyo de Los Coches, Tularcitos Creek, and Calera Creek. The lower (urban) region was divided into 23 subbasins, each representing an area of similar flow patterns and urbanization. The drainage divides defining these subbasins were established by referencing U.S. Geological Survey quadrangles, county storm drainage design maps, field inspections, the Milpitas Master Drainage Plan, and consultations with City staff familiar with the area (Schaaf and Wheeler 2001; Delorme 2000).

(b) Breakout Flow Routing

The existing Berryessa Creek channel has insufficient capacity to convey all of the flow during large storm events. When floods greater than approximately a 5-year recurrence interval occur under existing conditions, flow overtops the banks and spills onto the floodplain at some locations. This allows significant attenuation of the flood hydrograph, reducing the peak flow downstream of breakout locations. Since the goal of the project is to reduce flooding by improving channel capacity, the hydrologic analysis assumed that Berryessa Creek would be able to convey all of the simulated design flows without overtopping. This is a necessary assumption to be able to predict appropriate peak flow rates for project design purposes along the entire length of the creek channel.

In the 2003 NHC hydrology report, several breakout flow locations were identified along tributary streams in the study area. A culvert on Piedmont Creek immediately upstream of I-680 was calculated to have a maximum capacity of 900 cfs; flows greater than 900 cfs would break out of the channel and travel north along South Park Victoria Drive, eventually entering Los Coches Creek. The culvert under I-680 on Los Coches Creek was calculated to have a maximum capacity of 800 cfs, and excess flows would break out and flow north along South Park Victoria Drive. Based on available topography and field investigations, the assumed overland flow path of the breakout flows from Los Coches Creek is west along Calaveras Boulevard. A portion of the breakout flow would enter Berryessa Creek at the Calaveras Boulevard Bridge, and the remainder of the flow would continue west along the roadway, ultimately reaching the Wrigley Creek subbasin. The reach of Tularcitos Creek downstream of I-680 was calculated to have a maximum capacity of 700 cfs. Flows greater than 700 cfs will overtop the channel and travel north. This flow would end up in Subbasin B20, which is drained by the Berryessa pump station.

(c) Discharges

The conversion of the GRR HEC-RAS Berryessa Creek model from steady to unsteady required the development of hydrographs representing various inflows to the Berryessa Creek Channel. The primary inflow hydrograph to the revised HEC-RAS model is the outflow from the I-680 culvert. The remaining inflow hydrographs consist of subarea runoff and tributary creeks. The inflow hydrographs were taken from the future conditions 2003 HEC-HMS model corresponding to the values published in the NHC (2003) hydrology report. Table 4-11 lists the peak discharges for each inflow hydrograph used in the without-project model, HEC-RAS inflow station, and HEC-HMS model nodes used to develop the inflow hydrographs.

Table 4-11 Discharges and Flow Change Locations Used as Model Input										
RAS Sta.	HMS Node	Description	Peak Discharge by Exceedance (cfs)							
			0.50	0.20	0.10	0.04	0.02	0.01	0.005	0.002
254+71	-na-	I-680 Outflow from FLO-2D model	490	701	953	1,145	1,403	1,544	1,610	1,771
218+32	B13 RM 3.73	Subarea B12	269	382	461	692	811	928	1,073	1,227
174+48	B15 RM 2.96	Subarea B14	96	149	176	245	275	317	361	414
166+54	B17 RM 2.76	Piedmont Creek	244	387	450	715	821	858	900	900
144+67	B17a RM 2.58	Los Coches Creek	264	429	559	833	868	928	911	951
141+21	B19 RM 2.43	Calaveras Blvd Overflow	0	0	0	0	197	400	400	400
124+03	B21 RM 2.21	Tularcitos Creek	208	332	408	595	652	660	678	685
89+53	B23 RM 1.52	Berryessa Pump	107	150	150	150	150	150	150	150
74+53	B25 RM 1.22	Wrigley-Ford Pump	251	378	432	432	432	432	432	432
59+53	B27 RM 0.94	Calera Creek	180	292	367	521	669	869	1,099	1,261
56+53	B29 RM 0.77	Abbot Pump	583	851	1,041	1,330	1,436	1,568	1,676	1,710
51+53	B31 RM 0.14	Jurgens Pump	127	150	150	150	150	150	150	150
49+74	B 33 RM 0.00	Cal Circle Pump	22	30	34	42	48	56	63	71

(d) Low-Flow Monitoring Survey

Two years of low-flow monitoring was performed on Berryessa Creek from March 2002 until February 2004. Five specific index reaches were surveyed. These reaches were previously identified in Table 2-2. Collectively, the five index reaches provided for an adequate representation of the flow conditions within the Berryessa Creek study area.

Flows were observed and documented including approximate flow width, flow depth, pool width, and pool depth along with characteristics such as braiding and substrate. The flow rates were calculated in cubic feet per second by multiplying a measured flow length, the flow width, and the flow depth (in feet) and dividing the product by the time it took a floating object to travel the measured length (in seconds). Other types of measuring devices, such as mechanical velocity meters, were unusable due to the lack of flow and minimal depths within the creek during most of the years.

With flow rates dependent on rain, fewer surveys were required during the dry (summer) months than the fall, winter, and spring months because of the lack of rainfall and the associated flow. Only following rain events were continuous flows observed throughout the entire five reaches. During other monitoring events, continuous flow was only observed in some reaches. The low-flow monitoring indicates that Berryessa Creek only possesses continuous flow during rain events and should be considered an intermittent creek. The reaches are described below.

Within the Berryessa Creek study area, Reach LF-1, upstream of Old Piedmont Road, most closely resembled a natural stream condition. The channel substrate consisted of gravel, sand, cobble, and boulders. The average flow rate for all sampling dates was 4.4 cfs with a maximum flow measurement of 66.6 cfs. Without the high flow events (>10 cfs), the average flow rate for this reach is reduced to 1.0 cfs. Pools present within the reach ranged from a maximum depth of 3 inches to over 2 feet, depending on flow conditions. Shallow pools were more clearly observed during low flows.

Reach LF-2, from Old Piedmont Road to the Piedmont-Cropley Culvert at Cropley Avenue, is channelized with a substrate of sands and fines throughout the reach. An active outfall was located approximately 200 yards downstream from the park bridge (350 yards upstream from Morill Road), which supplied water into the creek on a frequent basis. This reach only possessed continuous flow during and following rain events. During the driest times of the year, the outfall provided minimal amounts of water into the creek, which mostly consisted of urban runoff.

Reach LF-3, from Cropley Avenue to I-680, consisted of a concrete-lined trapezoidal channel that displayed flow only during rain events. Typically, Reach LF-3 had a very minimal amount of urban runoff that would be just enough to dampen half of the width of the channel bottom. No pools were observed.

Reach LF-4, from Montague Expressway to Ames Avenue, is a highly channelized soft-bottom channel with a silt and sand substrate. Like Reaches 2 and 3, this reach only had continuous flow during rain events, but pools are present during much of the year. An outfall located 50 yards downstream from Montague Expressway provided flow to the creek that averaged 2.7 cfs (during the site visits). On October 23, 2002, construction on the outfall diverted the runoff water that had been discharged into Berryessa Creek to another location. Post diversion, the water in this reach is only present during rain events.

Reach LF-5, from Piedmont Creek to Calaveras Boulevard, was a highly channelized soft-bottom channel with a substrate consisting mostly of sand and gravel mixed with a trace existence of cobble and boulders. This reach was the only reach within the project site that displayed continuous flow all year around. The average flow within this section was 14.4 cfs for all measured flows, which was provided mostly by the influence of Piedmont Creek and Los Coches Creek. Excluding high flow events, the average flow drops to 1.4 cfs. Habitats present were primarily glides with few deeper pools.

Average overall flow through Berryessa Creek for the 2 year period was 7.2 cfs. Excluding rain events, the average flow rate for Berryessa Creek was less than 1 cfs. In general, Berryessa Creek could be described as an intermittent creek that possesses continuous flow only during rainstorms and for a few hours or days following these rain events. Tributary flow and urban runoff from irrigation supply perennial flow to the lower end of the creek below Piedmont Creek. The dramatic rerouting and lengthening of the Berryessa Creek alignment has caused Berryessa Creek to become much more intermittent than has occurred historically when the alignment flowed directly west into Lower Penitencia Creek.

4.4.2.5 Groundwater Hydrology

In the past, removal of groundwater led to land subsidence in the Santa Clara Valley, especially in the Alviso District of San Jose. Several measures have been taken in recent years to supplement groundwater including the importation of water from outside the basin and the construction of water conservation reservoirs, which release water to streams and thereby replenish the aquifers.

The study area is generally characterized by relatively shallow groundwater. Sampling performed by Kennedy/Jenks showed groundwater in 14 of 26 borings at a depth of between 15 and 20 feet below ground surface. In the five monitoring wells installed, the groundwater was between 6.7 and 11.5 feet below ground surface. Kennedy/Jenks attributes the difference between the elevations established by the borings and the wells to a difficulty in determining the depth of the groundwater due to low permeability silts and clays as well as to higher precipitation prior to the sampling of the wells.

Groundwater quality was sampled by Kennedy/Jenks (1996) in Reach 7. Halogenated organic compounds were detected including TCE; PCE; 1,1-DCA; 1,1-DCE; and freon-113. Petroleum hydrocarbons as diesel were detected in one well. Treated groundwater appears to be discharged from Jones Chemical Company near Montague Expressway.

4.4.2.6 Hydraulics and Floodplains

(a) Hydraulic Analysis

HDR, Inc. developed a without-project HEC-RAS model of the Berryessa Creek channel extending from just above Old Piedmont Road to the confluence with Penitencia Creek (HDR, 2004a)[4]. The model was developed using existing HEC-2 data, where available, with the addition of new data where needed. The HEC-RAS model utilized the lateral weir capability of the program to determine the location and magnitude of breakouts from the channel. Breakouts were determined for the 0.20, 0.10, 0.05, 0.04, 0.02, 0.01, 0.005, and 0.002 exceedance probability events. The without-project model was further refined by Tetra Tech, Inc. during the alternative analysis portion of this reevaluation study. The without-project HEC-RAS model is detailed in Part I, Hydraulic Analysis of Alternatives of Appendix B.

<u>Key Assumptions</u>

Channel Maintenance

Due to heavy sedimentation within the creek, the channel invert is continuously changing in the natural reaches. Existing channel conditions were assumed to be the state of the channel during the 2001 SCVWD topographic survey except near bridge crossings. The existing condition was updated to reflect the 2004 SCVWD thalweg and cross section surveys in the Greenbelt reach.

[4] Hydrology was not updated for with-project scenarios; the 2003 NHC hydrology report applies to both the with- and without-project conditions. Watershed delineations, rainfall-runoff relations, and peak flow hydrology were not updated for the 2012 hydraulic analysis. Discharges used as input into the hydraulic model are taken from the future conditions values published in the NHC hydrology report (2003).

SCVWD has a stream maintenance program that requires removal of debris and sediment at various locations along the creek. SCVWD obtains permits for stream maintenance from regulatory agencies that are expected to last for ten years. Actual stream maintenance varies from year to year, but includes sediment removal activities designed to restore flood conveyance capacity, vegetation management in and around streams and canals, and bank protection.

For the hydraulic analysis, it was assumed that the channel is in its maintained state with the sedimentation basin downstream of Piedmont-Cropley cleaned out and the invert of bridges the same as those in the USACE model. The channel invert upstream and downstream of most bridge crossings was reduced down to the invert contained in the USACE model to simulate a maintained channel. These assumed conditions of the model were agreed upon between the Corps and the SCVWD.

Channel Levees

The hydraulic analysis does not reflect levee breaches. It was assumed that due to the minimal levee heights, breaching the levee would have an insignificant impact on floodplain delineation.

Lower Berryessa Creek

The HEC-RAS model below Calaveras Boulevard is modeled using the HEC-RAS model for the SCVWD's Lower Berryessa Creek Project. A key assumption in the SCVWD model is that the designated alternative for the lower project has proceeded to a 60-percent level of design, and no major change to the designated alternative are anticipated. The HEC-RAS model provided contains channel improvements to contain the 0.01 exceedance probability event. The model simulates levees on the left and right banks with elevations higher than the calculated water surface elevations preventing breakout flooding. The current channel geometry is different from the Lower Berryessa Creek Project-designated project in that, should flows higher than the existing channel capacity occur, then the flow would not be contained and breakouts would occur. For purposes of this analysis, the 60-percent design for the Lower Berryessa Creek Project was used for the lower reach. No changes were made to the SCVWD 60-percent design HEC-RAS model except for minor changes in hydraulic modeling parameters to facilitate unsteady flow modeling and revision of stationing to match those used in the GRR study's HEC-RAS model.

Results

Hydraulic Parameters

The average hydraulic parameters for the without-project conditions discharges between each set of bridge or culvert crossings are shown in Table 4-12. These parameters are shown graphically in Figure 4-4 and Figure 4-5.

The parameters show that the highest velocities are encountered in the trapezoidal reach between the UPPR trestle and culvert. In addition, higher, localized velocities are observed between the Ames Avenue and Yosemite Drive bridges. A comparison of the 0.50 to the 0.01 exceedance probability event parameters in Figure 4-5 indicate that the bridges and culverts upstream of

Yosemite Avenue cause the flows to backup, increasing the flow depths upstream for the 0.01 exceedance probability event. Detailed information is presented in Part I, Hydraulic Analysis of Alternatives of Appendix B.

Table 4-12 Without-Project Hydraulic Results

Bounding Bridge or Culvert		Exceedance Probability			
		0.50		0.01	
From	To	Vel (ft/s)	Depth (ft)	Vel (ft/s)	Depth (ft)
I-680	Montague Expressway	5.2	3.2	6.1	3.4
Montague Expressway	UPRR Trestle	6.4	4.3	7.0	6.2
UPRR Trestle	UPRR Culvert	6.4	3.4	8.1	5.3
UPRR Culvert	Ames Avenue	4.7	3.7	6.0	5.2
Ames Avenue	Yosemite Drive	6.3	3.2	7.3	3.9
Yosemite Drive	Los Coches Street	5.8	3.6	5.7	3.0
Los Coches Street	Calaveras Boulevard	7.3	3.2	5.3	4.0

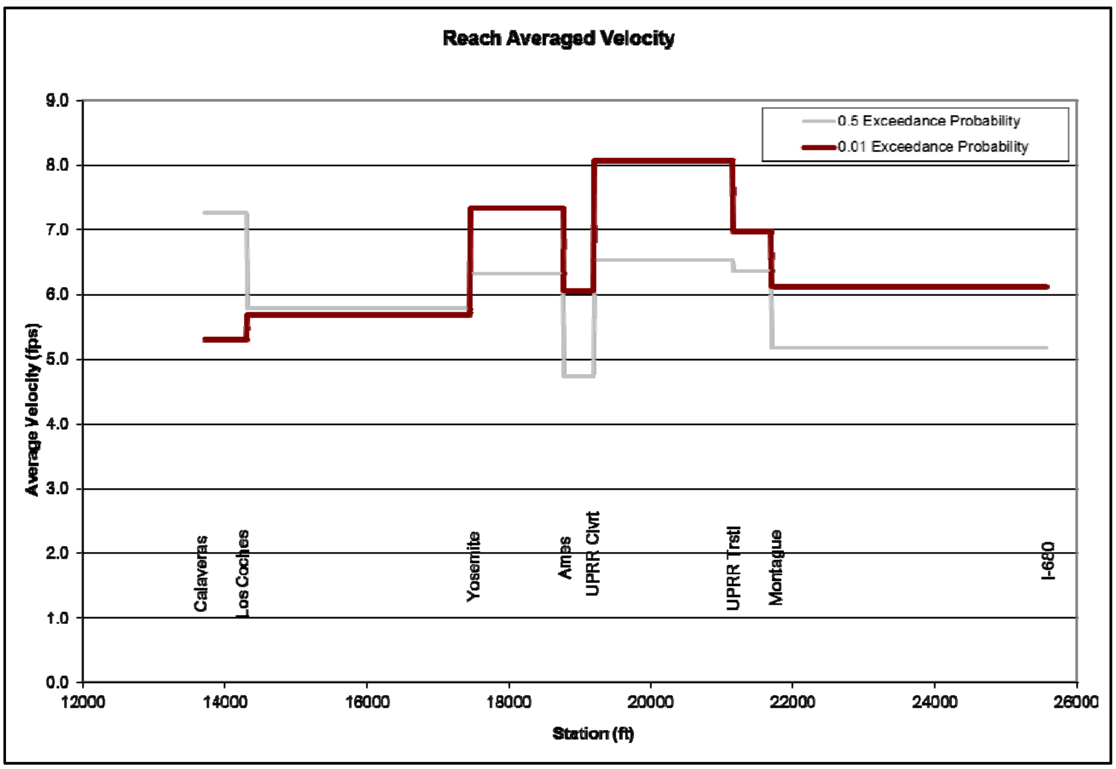


Figure 4-4 Average Channel Velocities between Bridges and Culverts

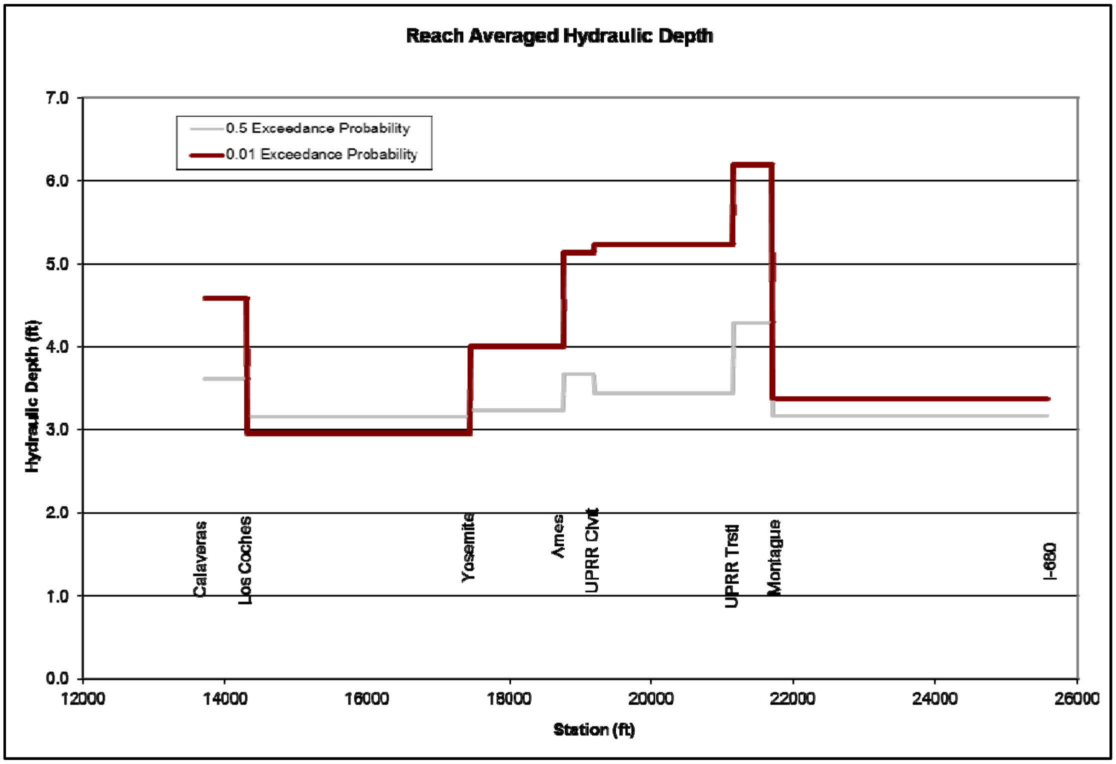


Figure 4-5 Average Hydraulic Depth between Bridges and Culverts

(b) Floodplain Development

Floodplains for Berryessa Creek were developed for the 0.20, 0.10, 0.04, 0.02, 0.01, 0.005, and 0.002 exceedance probability events. The project study reach for Berryessa Creek extends from upstream of the Old Piedmont Road in the City of San Jose to just upstream of the Calaveras Boulevard in the City of Milpitas. Floodplains for the 0.01 and 0.002 exceedance probability events are shown in Figure 2-2 and Figure 2-3, respectively. The remaining floodplain maps are presented in Part II, Floodplain Development, of Appendix B.

The study area watershed was divided into two distinct sub-areas by the I-680 embankment located approximately midway through the study reach. The embankment forces breakout flow upstream to either pond in low areas along the embankment or return to the creek channel. Thus, the embankment was used to divide the study area into two separate floodplains, each modeled with a separate FLO-2D model. The first floodplain encompasses the study area from Old Piedmont Bridge to the I-680 embankment and is referred to as the Upper Model. The second floodplain encompasses the study area downstream of the I-680 embankment to Calaveras Boulevard (with the modeling extending to Penitencia Creek) and is referred to as the Lower Model.

The methodology used for modeling Berryessa Creek overflows was determined through discussions with the Corps Sacramento District and the SCVWD. The original GRR methodology was built on the premise of using the available F3 pre-Feasibility Scoping Meeting without-project conditions (pre-FSM) report steady state HEC-RAS channel (HDR 2004b) and HEC-HMS watershed modeling (NHC 2003, 2006) coupled with FLO-2D for overbank modeling. The study methodology was extensively revised in 2010 to account for the effects of upstream attenuation on breakout flows. It was determined that the Upper FLO-2D model should be extended to encompass the urban channelized portions of Sierra Creek, a major tributary to Berryessa Creek. The study methodology was revised to use FLO-2D to model both the channel and overbank flows in the Upper Model and use an unsteady HEC-RAS model coupled with FLO-2D for overbank flow in the Lower Model.

4.4.2.7 Geomorphology and Sediment Transport

(a) Geomorphology

There is a distinct difference between the profile of Berryessa Creek in the uplands and on the alluvial fan within the Santa Clara Valley. Figure 4-6 shows the profile for the entire length from the estuary downstream from the confluence with Coyote Creek, upstream to the headwaters. Within the valley reach, which coincides with the study area, the channel gradient averages less than 1 percent. In contrast, the upland reach averages over 6 percent.

Within the study area, the gradient follows the expected pattern of downstream reduction, with one exception. Starting at the upstream end of the project reach, channel gradients are listed below.

- Old Piedmont Road to Cropley Avenue 0.0271
- Cropley Avenue to D/S of Piedmont Sediment Basin 0.0180
- D/S of Sediment Basin to U/S of Sierra Cr. Drop 0.0156
- Drop Structure to Cropley Avenue 0.0135
- Cropley Avenue to I-680 0.0106
- I-680 to Montague Expressway 0.0035
- Montague Expressway to Calaveras Boulevard 0.0049

The channel leaves the uplands at a gradient of about 3 percent and gradually reduces to a slope on the order of 1 percent at I-680. However, below I-680, the gradient abruptly decreases by a factor of 3 to 0.35 percent between I-680 and Montague Expressway. Below Montague Expressway, the slope increases to approximately 0.5 percent.

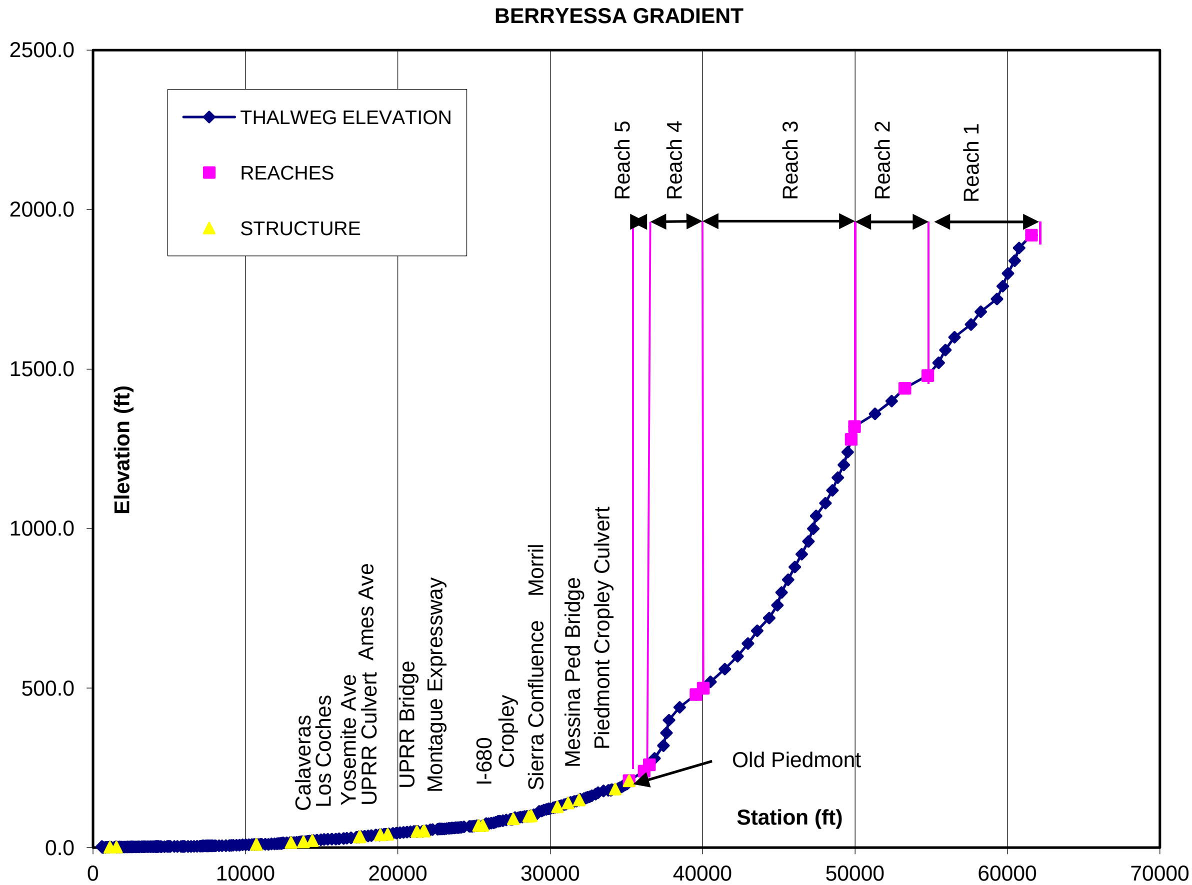


Figure 4-6 Berryessa Creek Profile from the Estuary to the Headwaters

There are numerous bed controls throughout the project reach. These are formed by bridges or box culverts with concrete bottoms, drop structures, and segments of channels lined with concrete. Figure 4-7 identifies locations on the project reach profile that act as grade controls.

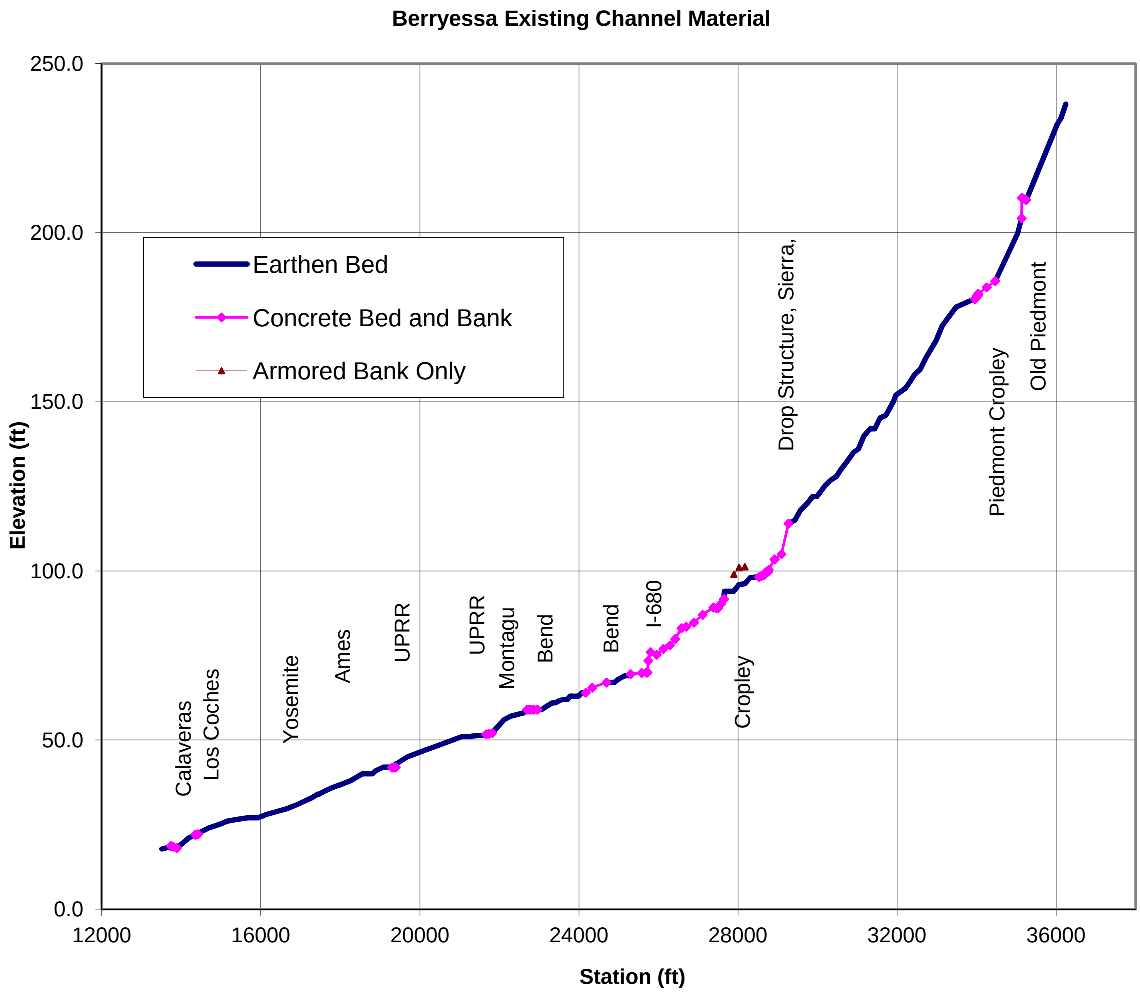


Figure 4-7 Location of Current Bed Controls within the Project Reach

The stream through the upper watershed was divided into five segments. For the upper 1.3 miles, the gradient averages 6.5 percent. For about a mile, the gradient flattens to 3 percent. The gradient increases for the next two miles, averaging 8 percent with a gradual decrease in the downstream direction. The gradient then picks up as the stream crosses the Hayward Fault zone and passes through the "canyon" reach. The average gradient thought this segment is 8 percent with a portion of the stream near the center of the reach with a gradient of 15 percent. In the downstream 1,500 feet above Old Piedmont Road, Berryessa Creek transitions from the uplands to the alluvial fan with an average gradient of 4 percent.

Within the study area, Berryessa Creek occupies a constructed channel that is heavily constrained by bridges, bank protection, channel lining and other constructed features. Thus, channel dimensions are more a result of these influences as opposed to natural geomorphic processes. For description of the channel geometry, the project reach was divided into six subreaches. Descriptions of each reach are provided in Part III, Geomorphic and Sediment Transport Assessment, of Appendix B.

Sediment Transport Model

Previous analyses of the sediment budget (NHC 1990), geomorphology (NHC 2001), and sediment transport (NHC 2003) for the without-project condition of Berryessa Creek indicated two potential problems. The first was potential areas of deposition and the second was potential areas of degradation.

An overall estimate of the sediment yield for Berryessa Creek was developed by NHC (1990). The results of this analysis indicated the following sediment yields:

Berryessa Creek at Old Piedmont Road	=	9,900 tons/year
Sweigert, Crosley, and Sierra Creeks	=	1,900 tons/year
Piedmont Creek	=	700 tons/year
Arroyo de los Coches	=	3,200 tons/year

The values provided for the tributaries are at their confluence with Berryessa Creek. The total yield is 15,700 tons/year. If a unit weight of 100 lbs/ft^3 is assumed for sediments, this would represent 11,600 cubic yards per year.

A sediment budget performed by NHC (1990) estimated that the mean annual inflowing sediment load at Calaveras Boulevard to be 9,200 tons/year or 6,800 cubic yards per year applying the previous conversions. This budget was based on deposition of 6,700 tons/year of sediment between Piedmont Road and Calaveras Boulevard. The study utilized a value of 5,000 cubic yards per year of sediment removal in the project reach. It should be noted that this earlier study had a value of 23,800 cubic yards of sediment removed in 1983 between Sierra Creek and Calaveras Boulevard, whereas values reported in more recent reports (NHC 2001) indicate no sediment removal in 1983. If this large volume of removal is not included, the average annual rate for the 10 year period referenced would be 2,620 cubic yards per year or 3,200 tons/year (NHC assumed 90 lbs/ft^3 for deposited sediments). The sediment budget would then indicate 12,400 tons/year of sediment passing Calaveras Boulevard.

Estimates of sediment yield and budget were provided in NHC (2003) based on integration of the HEC-6T simulated bed material load yields for the single storm events to determine average annual yields utilizing the method described by Mussetter *et al*. (1994). This resulted in an average annual bed material yield at Old Piedmont Road of 2,500 to 3,000 tons per year. The overall budget identified a total of 170 tons per year of net erosion from the reach, indicating the project reach is currently slightly degradational. This minimal amount of degradation translates into an average of 0.05 inches per year if spreads out over the entire reach. The sediment budget presented did not indicate it accounted for sediment removal that takes place at several locations throughout the reach. The budget also did not provide an indication of the simulated tributary inflows and how or if they were accounted for in the budget.

If the 9,900 tons per year average annual sediment yield at Old Piedmont Road is assumed to be 35 percent bed material load (sand, gravel, and cobble) and 65 percent wash load (silts and clays), the resulting average annual bed material supply at the upstream end of the project is 3,500 tons. This is in fairly close agreement with the HEC-6T study which indicated an average annual upstream loading on the order of 2,500 tons per year. In terms of the sediment balance in the reach, the HEC-6T modeling by NHC indicated a slight degradational trend. However, the modeling did not appear to include the sediment removal in the analysis. Accounting for sediment removal increases the degradational trend by several thousand tons per year. An overall degradational trend is supported by comparisons of the 1968 and 1998 channel thalweg profiles (NHC 2001). Comparison of these profiles indicates that the 1998 profile is at or below the 1967 profile throughout the project reach. Continued sediment removal prevents the areas of deposition from being revealed on the profile comparison.

Because of the highly manipulated nature of the Berryessa Creek channel within the study area, its ability to transport sediment varies widely. Though there are segments of considerable deposition that require sediment removal to maintain flood conveyance capacity, there are areas with higher sediment transport capacity that result in channel degradation. This is supported by the comparison of the 1967 and 1998 thalweg profiles presented by NHC (2001). The HEC-6T sediment modeling results show similar behavior with a slight overall trend for degradation, but a mixture of aggradation and degradation scattered throughout the study area.

The HEC-6T model results indicated that the bed material load from a single 0.01 exceedance probability event would be on the order of 13,000 tons at Old Piedmont Road, which is on the order of four to five times the estimated average annual bed material loading. During this event, the maximum predicted aggradation is over 4 feet at the Piedmont/Cropley culvert and over 2 feet just upstream of the Ames Avenue Railroad trestle. At all other locations the aggradation is on the order of one foot or less. The maximum predicted degradation is 2 feet in the Greenbelt reach just downstream of the sediment basin and just over one foot about 500 to 1,000 feet upstream of Los Coches Street. Based on these results the modeling indicates a mixture of aggradation and degradational areas. Though the actual historic profiles indicate primarily equilibrium or degradational reaches, the model did not appear to account for the sediment removal in the aggradation areas. If all sediment deposits indicated by the model results are removed, the required sediment removal would be on the order of 3,700 cubic yards per year.

4.5 BIOLOGICAL RESOURCES

4.5.1 Regulatory Setting

4.5.1.1 Federal

Biological resources are protected by numerous Federal regulations. The following Federal laws related to biological resources are relevant to this analysis.

(a) Endangered Species Act

The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have jurisdiction over species listed as threatened or endangered under the Federal Endangered Species Act (ESA) of 1973, as amended and candidate species proposed for listing. The ESA protects listed species from harm, or "take," which is broadly defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." For any project with a Federal nexus that affects a listed species, the Federal agency must consult with the USFWS and/or NMFS Fisheries under Section 7 of the ESA. The USFWS issues a Biological Opinion and, if the project does not jeopardize the continued existence of that species, issues an "incidental take statement."

(b) Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) of 1958, as amended ensures that fish and wildlife receive consideration equal to that of other project features for projects that are constructed, licensed, or permitted by Federal agencies. The FWCA requires that the views of USFWS, NMFS, and the applicable state fish and wildlife agency (in this case, the California Department of Fish and Wildlife [CDFW]) be considered when impacts are evaluated and mitigation needs determined.

(c) Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918 implements a series of international treaties that provide for migratory bird protection. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds. The act provides that it shall be unlawful, except as permitted by regulations, “to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird…” (16 USC 703). This prohibition includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by the MBTA includes several hundred species and essentially includes all native birds. Permits for take of nongame migratory birds can be issued only for specific activities, such as scientific collecting, rehabilitation, propagation, education, taxidermy, and protection of human health and safety and personal property.

4.5.1.2 *State*

(a) California Endangered Species Act

Pursuant to the California Endangered Species Act (CESA), a permit from CDFW is required for projects that could result in the take of a plant or animal species that is State-listed as threatened or endangered. Under CESA, "take" is defined as an activity that would directly or indirectly kill an individual of a species. The CESA definition of take does not include "harming" or "harassing," as the Federal ESA definition does. Therefore, the threshold for take is higher under CESA than under ESA. The project proponent will coordinate with CDFW to discuss CESA compliance requirements and, if required, will apply to CDFW for take authorization under Section 2081 of the CDFW Code.

(b) California Fish and Wildlife Code Sections 3503 and 3503.5—Protection of Bird Nests and Raptors

Section 3503 of the California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Section 3503.5 specifically states that it is unlawful to take, possess, or destroy any raptors (i.e., species in the orders Falconiformes and Strigiformes), including their nests or eggs. Typical violations of these codes include destruction of active nests resulting from removal of vegetation in which the nests are located. Violation of Section 3503.5 could also include failure of active raptor nests resulting from disturbance of nesting pairs by nearby project construction. This statute does not provide for the issuance of any type of incidental take permit.

(c) California Fish and Wildlife Code—Fully Protected Species

Protection of fully protected species is described in Sections 3511, 4700, 5050, and 5515 of the California Fish and Wildlife Code. These statutes prohibit take or possession of fully protected species and do not provide for authorization of incidental take of fully protected species.

4.5.2 Environmental Setting

4.5.2.1 *Vegetation and Wildlife*

Berryessa Creek has discontinuous patches of wildlife habitat. The study area downstream of I-680 has poor to non-existent wildlife habitat due to channelization. Moderate quality habitat can be found upstream of I-680 in the greenbelt section and near Old Piedmont Road. Field surveys conducted in the study area have documented some of the common species that inhabit the area. Bird species observed include: the great egret (*Ardea alba*), black-crowned night heron (*Nycticorax nyticorax*), western scrub jay (*Aphelocoma californica*), mallard (*Anas platyrhynchos*) and mourning dove (*Zenaida macroura*). Amphibians found in the creek include: Pacific treefrog (*Hyla regilla*) and western toad (*Bufo boreas*). Mammals observed include: ground squirrels (*Ostospermophilus beecheyi*) and muskrat (*Ondatra zibethicus*). Berryessa Creek is located adjacent to highly urbanized areas; feral cats (*Felis domesticus)* were also observed (SCVWD 2005).

Vegetation downstream of I-680 consists of patchy annual grasses separated by bare dirt. The SCVWD maintains this area of the channel. Maintenance practices include removal of vegetation and sediment from the bottom of the channel and the use of herbicides on the stream banks. Frequent spraying or mowing of creek bank vegetation prevents the establishment of riparian species. Table 2-3 in Section 2.2.1 identifies the delineation of the study area into six reaches. Reach H-1 is downstream of the study area. Reaches H-2 through H-4 are located downstream of I-680 and H-5 through H-6 are located upstream of I-680. The vegetation types within these reaches are described below.

(a) Downstream of I-680

In Reach H-2, the riparian zone is very minimal, but the channel is much wider and emergent wetland species are present. Species include cattails, floating primrose willow (*Ludwigia peploides*), hyssop loosestrife (*Lythrum hyssopifolia*), watercress (*Rorippa nasturtium aquaticum*), brooklime (*Veronica americanum*), and knotweed (*Polygonum* sp.). A few very sparse trees are also present.

In Reach H-3, the riparian zone is minimal to non-existent, with weedy annuals such as rabbit foot grass (*Polypogon monspeliensis*) and barnyard grass (*Echinochloa crusgalli*). This reach has the highest banks (levees) and is entrenched in a narrow ditch.

In Reach H-4, the riparian zone is very similar to Reach H-3. The bank slopes are dominated by weedy annuals such as spiny sow thistle (*Sonchus asper*), dock (*Rumex* sp.), and perennial rye grass (*Lolium perenne*). This reach has the least vegetation present and the most channel alteration (concrete).

(b) Upstream of I-680

Vegetation upstream of I-680 would only be effect if Alternative 5, the authorized project, is implemented. Alternative 5 is used by the Corps for comparative reasons but is not a candidate for selection.

In Reach H-5, the riparian zone ranges from mostly bare dirt to forest in the greenbelt. Dominant species in the greenbelt include blue elderberry, California black walnut (*Juglans californica*), English walnut (*Juglans regia*), Coast live oak (*Quercus agrifolia*), and willows. Mowed grass is present within and adjacent to the riparian zone.

In Reach H-6, upstream of Old Piedmont Road, the riparian vegetation is diverse, including willows (*Salix* sp.), western sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), and blue elderberry (*Sambucus mexicana*). The herbaceous species included many non-natives such as pennyroyal (*Mentha pulegium*) and Canada thistle (*Cirsium arvense*). The lower end of this reach is dominated by eucalyptus, which may be a cause of the subsurface flow at the lower end of the reach, due to high rates of evapotranspiration.

4.5.2.2 Special Status Species

Special-status species addressed in this section include plants and animals legally protected or otherwise considered sensitive by Federal, State, or local resource conservation agencies and organizations. The following list provides more specific descriptions of the categories for sensitive species and their habitats:

- Plant and wildlife species are listed by CESA and/or ESA as "rare," "threatened," or "endangered."

- Plant and wildlife species are considered by ESA as "candidates for listing" or "proposed for listing.

- Wildlife species are identified by CDFW as "California Species of Special Concern" because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction; however, these species receive no formal protection under the California Fish and Game Code.

- Plants are considered by the California Native Plant Society (CNPS) to be "rare," "threatened," or "endangered."

Searches of the California Natural Diversity Database (CNDDB), CNPS database, and USFWS database were conducted to identify all special-status plant and wildlife species that may occur in the project region. The likelihood of each species' occurrence at the project element sites was then assessed in more detail based on the species' known distribution (i.e., the locations and recency of recorded occurrences) and the types and quality of habitat present at each project element site. There were no records of special status species animals or plants within the Berryessa Creek study area.

(a) Special Status Plants

A search of the CNDDB and the CNPS database identified two special-status plant species that may occur in the study area. No suitable habitat exists within the study footprint to support any special-status species. Table 4-13 lists each special-status plant species along with its regulatory and CNPS listing status, habitat requirements, and the potential for the species to occur within the study area.

Table 4-13 Special Status Plants Species with Potential to Occur in the Study Area

Species Name	Status	Habitat	Potential to Occur in Study Area
Plant			
Contra Costa goldfields *(Lasthenia conjugens)*	FE/--/1B.1	Vernal Pools. Usually occurs in wetlands, but occasionally found in non wetlands.	Unlikely to occur within the study area. Documented occurrence in Concord.
California sea blite *(Suaeda californica)*	FE	Endemic to the coastal zone of California.	Unlikely to occur; no suitable habitat is in study area.
(FE) Federal Endangered Species (1B) CNPS Plants Rare, Threatened, or Endangered in California and elsewhere			

(b) Special Status Fish and Wildlife

A search of the CNDDB and the USFWS database identified 22 special-status wildlife species and critical habitat with some potential to occur in the study area. No suitable habitat exists within the study footprint to support any special-status species. Table 4-14 summarizes the regulatory listing status, habitat requirements, and the potential for occurrence for each species.

Table 4-14 Special Status Species with Potential to Occur in the Study Area

Species Name	Status	Habitat	Potential to Occur in Study Area
Invertebrates			
Conservancy fairy shrimp *(Branchinecta conservatio)*	FE	Occur in vernal pools.	Unlikely to occur; no vernal pools are within the study area.
Bay checkerspot butterfly *(Euphydryas editha bayensis)*	FT	All habitat exits on shallow, serpentine-derived or similar soils.	Unlikely to occur; no suitable habitat is in study area.
Vernal pool tadpole shrimp *(Lepidurus Packardi)*	FE	Occur in vernal pools.	Unlikely to occur; no vernal pools are within the study area.
Fish			
Delta smelt *(Hypomesus transpacificus)*	FT, SE	Found in the brackish and freshwater habitat of the northeastern San Francisco Estuary.	Unlikely to occur; no suitable habitat is in study area.
Steelhead, Central California Coast *(Oncorhynchus mykiss)*	FT	Requires cold, freshwater streams with suitable gravel for spawning.	Unlikely to occur; no suitable habitat is in study area.
Steelhead, Central Valley *(Oncorhynchus mykiss)*	FT	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta	Unlikely to occur; no suitable habitat is in study area.
Chinook salmon, Central Valley spring-run *(Oncorhynchus tshawytscha)*	FT	Requires cold, freshwater streams with suitable gravel for spawning; rears seasonally in inundated floodplains, rivers, tributaries, and Delta	Unlikely to occur; no suitable habitat is in study area.
Reptiles			
Western Pond Turtle *(Actinmys marmorata)*	CSC	Shallow, flowing streams, with some cobble-sized substrate	Low. This species was not identified during surveys of the study area. Know to occur downstream of the study area.
Alameda whipsnake *(Masticophis lateralis euryxanthus)*	FT, ST	Chaparral, northern coastal sage scrub and coastal shrub cropping	Unlikely to occur; no suitable habitat is in study area.
Amphibians			
California tiger salamander *(Ambystoma californiese)*	FT, ST	Ponds, streams, drainages, and associated uplands	Unlikely to occur; no suitable habitat is in study area.
California red-legged frog *(Rana aurora draytonii)*	FT	Dense, shrubby, or emergent riparian vegetation and aquatic habitat	Unlikely to occur; no suitable habitat is in study area.
Birds			

Table 4-14 Special Status Species with Potential to Occur in the Study Area			
Species Name	**Status**	**Habitat**	**Potential to Occur in Study Area**
Cooper's hawk (*Accipiter cooperii*)	CSC	Nests in deciduous riparian forests, forges in open woodland.	Low; no suitable forging or nesting habitat is within the downstream of I-680 study area. Potential nesting habitat in the upstream of I-680 study area.
Tricolored blackbird *(Agelaius tricolor)*	CSC	Colonial nester in emergent freshwater marshes; heavy cattail, tulle growth.	Low; marginal nesting habitat is in study area. Known to occur downstream of the study area.
Western Burrowing Owl *(Athene cunicularia hypugaea)*	CSC	Found in open, dry annual or perennial grassland, deserts and scrublands characterized by low-growing vegetation, subterranean nester in small mammal burrows.	Unlikely to occur, no suitable habitat is in study area.
Western snowy plover *(Charadrius alexandrines nivosus)*	FT	Nest near tidal waters, forges in sandy coastal beaches salt ponds and gravel bars.	Unlikely to occur; no suitable habitat is in study area.
California clapper rail *(Rallus longirostris obsoletus)*	FE, SE	Requires saltwater marshes with tidal sloughs and forages in tidal mud flats. Usually associated with pickleweed.	Unlikely to occur; no suitable habitat is in study area.
California least tern *(Sterna antillarum brownie)*	FE, SE	Forges in shallow estuaries and lagoons	Unlikely to occur; no suitable habitat is in study area.
White Tailed Kite (*Elanus luecurus)*	FP	Large areas of open grasslands, meadows, marshes, dense-topped trees for napping.	Low; no suitable forging or nesting habitat is within the downstream of I-680 study area. Potential nesting habitat in the upstream of I-680 study area.
Mammals			
Townsend's big-eared bat (*Corynorhinus twonsedii*)	CSC	Roosts in caves, old building, and occasionally under bridges. Forages in edge habitats along streams and areas adjacent to and within a variety of woodland habitats.	Low. Some of the overpasses adjacent to the study area may provide suitable roosting habitat, however, this species is extremely sensitive to human disturbances.
San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens)*	CSC	Forest habitats of moderate canopy and moderate to dense understory. May prefer chaparral and redwood habitats. Constructs nests of shredded grass, leaves, and other material. May be limited by availability of nest-building materials.	Unlikely to occur; no suitable habitat is in study area. Known to occur downstream of the study area.
Salt marsh harvest mouse *(Reithrodontomys raviventris)*	FE, SE	Breeds and forges primarily in pickleweed marshes. Uses adjacent upland areas with tall vegetation for cover.	Unlikely to occur; no suitable habitat is in study area.
San Joaquin kit fox *(Vulpes macrotis mutica)*	FE, ST	Inhabits arid climates, like desert scrub, chaparral, and grasslands.	Unlikely to occur; no suitable habitat is in study area.
(FE) Federal Endangered Species (FT) Federal Threatened Species (FP) State Fully Protected		(SE) State Endangered Species (ST) State Threatened Species (CSC) California Species of Special Concern	

Reptiles

Western Pond Turtle (*Clemmys marmorata*)

Western pond turtles, including both the northwestern (species *marmorata*) and southwestern (species *pallida*) subspecies, are State-listed species of concern. Western pond turtles occur in a variety of permanent and intermittent aquatic habitats such as ponds, marshes, rivers, streams, and ephemeral pools. Pond turtles require suitable basking and haul-out sites, such as emergent rocks or floating logs, which they use to regulate their temperature throughout the day. In addition to appropriate aquatic habitat, these turtles require an upland oviposition site in the vicinity of the aquatic habitat, often within 200 meters. Nests are typically dug in grassy, open fields with soils that are high in clay or silt fraction. Egg laying usually takes place between March and August. While turtles may be active all year along the coast, the turtles are more likely to be active between April and October in interior locations in the Central Valley. A variety of suitable habitats for this species are present within the Coyote Creek watershed. These habitats include aquatic, riparian woodland, and adjacent upland. Adults have been observed at various locations in Coyote Creek (Santa Clara County, 2005). The stream channel downstream from Los Coches Creek has a small, constant flow throughout the year, and may provide suitable aquatic habitat for the western pond turtle.

Amphibians

California Red-Legged Frog *(Rana aurora draytonii)*

The California red-legged frog is the largest native frog in the western United States, ranging from 1.5 to 5 inches in length. The California red-legged frog was listed by USFWS as threatened in 1996. The *Recovery Plan for the California Red-legged Frog (Rana aurora draytonii)* was established on May 28, 2002 and critical habitat was designated on April 13, 2006. There is no critical habitat within the Berryessa Creek study area.

The California red-legged frog occupies a fairly distinct habitat, combining both specific aquatic and riparian components. The adults require dense, shrubby, or emergent riparian vegetation closely associated with deep (greater than $2^{1}/_{3}$-foot deep) still or slow moving water.

The historic range of the California red-legged frog extended along the coast from the vicinity of Point Reyes National Seashore, Marin County, California, and inland from the vicinity of Redding, Shasta County, California, southward to northwestern Baja California, Mexico. California red-legged frogs have been documented in 46 counties in California, but now remain in only 238 streams or drainages in 31 counties. California red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the central coast. There is no recent scientific estimate on the rate of the decline, but many of the remaining populations appear to be declining at a rapid rate (USFWS Sacramento, 2004). Principal causes of the decline are habitat loss, and the introduction of non-native predators such as the sunfish, crayfish, and bullfrog (Jennings, 2006).

Wildlife surveys of Berryessa Creek have been carried out on an intermittent basis by SCVWD biologists since 1997. No California red-legged frogs have been observed in Berryessa Creek during these surveys. Frog species identified included bullfrogs (*Rana catesbeiana*), and Pacific treefrogs (*Hyla regilla*) (SCVWD, 2005).

Surveys for the California red-legged frog and foothill yellow-legged frog (*Rana boylii*) were conducted in 2006 for SCVWD. Mark R. Jennings, an expert recognized by various resource agencies on herpetology, conducted the assessments using current protocols (USFWS, 2005). The survey report is in Appendix A, Part III. The result of the found Pacific treefrogs (*Hyla regilla*) and California toads (*Bufo boreas halophilus*) to be common in several sections of the upstream of I-680 stream channel, especially in urbanized areas where residents water their lawns on a regular basis. The upstream of I-680 stream channel itself was poor habitat for CRLFs due to its intermittent nature, lack of deep (>2 feet) pools of water, and the presence of many raccoons throughout the area surveyed.

A breeding population of CRLFs was discovered in 3 of 5 grouped ponds located in the middle part of the drainage near the easternmost San Jose City Boundary. The ponds are located below a major spring on a hillside approximately 160 feet above the creek and 800 feet south of the creek proper. However, because of the distance from the Berryessa Creek proper and the intermittent nature of the creek itself (it apparently flows less than 7 months out of the year during normal rainfall years), no juvenile CRLFs are able to colonize the main creek channel. Since CRLFs do not inhabit the main channel of Berryessa Creek and CRLFs are unable to colonize the stream course, the proposed project in upper Berryessa Creek will not have any adverse effects on the species. Additionally, the project site is located in a densely urbanized area with many roads, fences, and foraging raccoons between the project site and the ponds with CRLFs.

Birds

Tricolored Blackbird *(Agelaius tricolor)*

The tricolored blackbird is a State-listed species of concern. This species is endemic to California and breeds mostly in the Central Valley, although breeding in the Sierra Nevada has also been documented. Tricolored blackbirds breed between mid-April and late July. They are also colonial nesters utilizing freshwater marsh vegetation such as cattails, tulles, and blackberry thickets. The cattails habitat within the creek is not likely dense enough for breeding. CNDDB reports known occurrences of this species within the City of Milpitas, approximately four and a half miles away.

Western Burrowing Owl (*Athene cunicularia hypugaea*)

The western burrowing owl is a State-listed species of concern. Burrowing owl habitat consists of annual and perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Suitable habitat also includes trees and shrubs if the canopy cover is less than 30 percent of the ground cover. Burrowing owls use burrows constructed by other animals such as California ground squirrels and may also use manmade structures such as culverts, debris piles, and holes beneath pavement. Burrowing owls are the only owl species that nests underground and are fairly tolerant of human presence. Within the Coyote Creek watershed, burrowing owls may be found in open grasslands with short vegetation (Santa Clara County, 2005). The grasslands in the project area below I-680 may contain suitable nesting and foraging habitat for the western burrowing owl. Surveys for burrowing owls were conducted during 2006 by SCVWD biologists. No owls were observed during these or any other previous surveys (SCVWD 2005, 2007).

White-Tailed Kite (*Elanus luecurus*)

The white-tailed kite is a fully protected species according to the California Fish and Wildlife Code. White-tailed kites nest in riparian forest and oak woodland habitats, and forage in a variety of open habitats such as grasslands and marshes. White-tailed kites feed primarily on small mammals including voles, pocket mice, and harvest mice. Potential nesting habitat is located in riparian corridors in the Coyote Creek watershed, including Berryessa Creek (Santa Clara Valley Transportation Authority, 2004). The riparian trees and shrubs in the greenbelt area may provide suitable nesting or foraging habitat for the white-tailed kite.

Mammals

San Francisco Dusky-Footed Woodrat *(Neotoma fuscipes annectens)*

The San Francisco Dusky-footed woodrat is a California species of special concern and is a medium-sized native rodent. Dusky-footed woodrats are widespread in chaparral, woodland, and forest habitats with well-developed undergrowth, where their conical stick houses are often visible. These houses (or middens) may be as much as six feet tall, and contain multiple chambers used for sleeping and food storage. Houses are usually occupied by single adults or females with young and can be used by successive generations of woodrats. Woodrat houses provide cover for many other animal species, including small mammals, reptiles, amphibians, and arthropods. Woodrats feed primarily on the foliage of evergreen broadleaf plants such as oaks, coffeeberry (*Rhamnus californica*), Mexican elderberry, toyon, and gooseberry (Ribes spp.). Reproduction occurs from February through September. Suitable habitat for San Francisco dusky-footed woodrat occurs within ; however, this species has not been documented within the study area.

Western Big-Eared Bat (*Plecotus townsendii*) and *Myotis* Bats

A variety of bat species, including the western big-eared bat, the Yuma myotis (*Myotis yumanensis*), the long-legged Myotis (*Myotis volans*), and the Pacific long-eared Myotis (*Myotis evotis*), may occur in the Coyote Creek watershed, including Berryessa Creek. The Yuma myotis is a Bureau of Land Management designated sensitive species. They use abandoned buildings and the underside of bridges for roosting and foraging (Santa Clara Valley Transportation Authority, 2004). A survey for bats completed in 2005 did not identify the presence of any bats roosting under bridges within the Berryessa Creek study area (Johnston, 2005).

4.6 CULTURAL RESOURCES

4.6.1 Regulatory Setting

4.6.1.1 Federal

(a) National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470 et seq.), and it's implementing regulations Protection of Historic Properties (36 CFR 800) require Federal agencies to consider the potential effects of their proposed undertakings on historic properties. Historic properties are cultural resources that are listed in, or are eligible for listing in, the National Register of Historic Places (NRHP) (36 CFR 800.16[l]). Undertakings include activities directly carried out, funded, or permitted by Federal agencies. Federal agencies must also allow the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the proposed undertaking and its potential effects on historic properties.

Federal agencies typically comply with Section 106 by performing the following actions:

- Initiating the Section 106 process (36 CFR Section 800.3) by identifying the undertaking (Federal action that could affect historic properties) and consulting parties such as the SHPO, Native American tribes, interested members of the public, and State and local agencies;
- Defining an area of potential effects (APE), the geographic area in which the undertaking could affect historic properties in consultation with the SHPO;
- Identifying historic properties, resources eligible for inclusion in the NRHP (36 CFR Section 800.4) within the APE;
- Assessing the effects of the undertaking on historic properties within the APE (36 CFR Section 800.5); and
- Resolving adverse effects on historic properties, if any (36 CFR Section 800.6). Adverse effects are resolved by identifying ways to minimize or avoid impacts on historic properties. Typical actions taken to resolve adverse effects include excavation of archaeological sites to retrieve materials before damage occurs, documentation (in photographic form) for historic buildings before they are altered, or preservation of such resources in place when possible.

4.6.1.2 State

CEQA requires that for public or private projects financed or approved by public agencies, the effects of the projects on historical resources and unique archeological resources must be assessed. Historical resources are defined as buildings, sites, structures, objects, or districts that have been determined to be eligible for listing in the California Register of Historical Resources. Properties listed in the NRHP are automatically eligible for listing in the California Register.

4.6.2 Environmental Setting

"Cultural resource" is a term that refers to the imprint of human occupation left on the landscape. This imprint is manifested in the form of prehistoric and historic archeological sites, and historic buildings, structures, and objects. Archeological sites consist of artifacts, plant and faunal remains, trash deposits, and many types of features. Artifacts are anything that was manufactured or modified by human hands. Features can include structural remains, fire pits, and storage areas. Prehistoric artifacts include flaked stone tools such as projectile points, knives, scrapers, and chopping tools; ground stone implements such as manos and metates; plain and decorated ceramics; and features or facilities that include subterranean and above ground architectural units, hearths, granaries and storage cistern, and trash deposits known as middens.

Historic archeological sites reflect occupation after the advent of written records. Material remains on historic archeological sites include refuse dumps, structure foundations, roads, privies, or any other physical evidence of historic occupation. Refuse consists of food waste, bottles, ceramic dinnerware, and cans. In a number of historic archeological situations, privies are important because they often served as secondary trash deposits. There is usually a strong interplay between historic archeological sites and written records. The archeological data are frequently used to verify or supplement historic records. Historic structures minimally include industrial facilities; roadways, bridges; and water transport or detention systems such as canals, ditches, aqueducts, pumps, and dams. Historic buildings include commercial, residential, agricultural, and ecclesiastical buildings.

4.6.2.1 Prehistory

Geologic evidence indicates that local estuaries and marshland began to appear in the region less than 8,000 years ago. As a result of the changing environment before that time, it is difficult to gain a clear picture of the prehistoric area around the San Francisco Bay region. Older sites may be buried under layers of sediment, and prehistoric information has likely been lost due to urban sprawl in the cities and suburbs of San Jose and Milpitas. Shell mounds and cemeteries have been discovered beneath existing buildings in some areas of San Jose and Milpitas, with other sites likely buried under businesses and the suburbs (Munzel 2000).

Although not tested for age, the Holiday Inn site in downtown San Jose reveals that there was a strong native presence in the region. SCI-128 was minimally investigated in 1973 and then in more depth in 1977. However, the results are largely out of context due to construction activities that destroyed much of the site as well as any integrity remaining. Archeologists were permitted to screen a small amount of the estimated 900 cubic meters of midden bulldozed from the site. The screening revealed a minimum of 29 individual skeletons although as many as 65 skeletons may have existed. Construction efforts make exact determinations impossible.

The Santa Theresa Complex in Santa Clara Valley encompasses two sites, SCI-64 and SCI-106. Surveys and testing within the south Bay area have revealed hundreds of sites with research potential, but these two sites have been investigated for age to help determine potential occupation dates. The SCI-64 lower component yielded a radiocarbon date of 6590 ± 200 B.P. when it was tested in 1977 and 1978. In 1979, the nearby SCI-106 site was radiocarbon tested and revealed dates as early as 4399 ± 570 B.C. Despite this information, a precise prehistory of the south Bay area may still be premature.

4.6.2.2 Ethnohistory and Ethnography

The early inhabitants of Santa Clara County were the Costanoan. The name Costanoan comes from the Spanish word costaños, which means "coast people." Before 1770 A.D., speakers of Coast Miwok, Patwin, Bay Miwok and Costanoan languages such as Tamyen, Matsun, and Chochenyo occupied the region. The Costanoan culture did not survive the Spanish and American invasions, but explorers, priests, and settlers duly recorded their earlier presence. In 1973, more than 200 persons of Costanoan descent were estimated within the region historically occupied by the Costanoan (Levy 1978).

In 1770 A.D., the Costanoan population was estimated to range between 7,000 and 10,200 people. The basic unit of the Costanoan was the triblet, with one or more socially linked villages and smaller settlements within a recognized territory. A chief and council of elders advised the triblet and community.

Subsistence activities of the Costanoan included both hunting and gathering methods. The region was nearly ideal for occupation due to the mild climate and abundant plant and animal resources. Natives gathered berries, greens, and bulbs like soap root, and they also harvested seeds and nuts, especially the acorn. They hunted a wide range of animals including elk, deer, pronghorn and various small mammals, and they also collected shellfish and caught various fish from the variety of bodies of water in the area.

The Costanoans made good use of the abundant rocks and minerals in the area, fashioning projectile points and knives from obsidian, using cinnabar for pigment, and also using Franciscan and Monterey chert (Moratto 1984).

4.6.2.3 History

Santa Clara County is named for Mission Santa Clara, which was established in the region in 1777. Before that, in 1769, Gasper de Portolá explored the region and found large native groups in the area. Portolá is credited with discovering San Francisco Bay while his original mission was to take possession and fortify the ports of San Diego and Monterey. In 1777, Europeans continued to settle the Milpitas area as the expedition led by Juan Baptista de Anza arrived overland (Hoover *et al.* 1990).

The Spanish settled the area, and land grants were mapped out for incoming settlers. In 1849, the City of San Jose was named the state capital, as well as the county seat for Santa Clara County, one of the original 27 counties of California. The name "San Jose" is Spanish in origin, referring to Saint Joseph, husband of the Virgin Mary. San Jose is often a popular place name in Spanish-speaking countries (SCVWD 2003).

The area of Milpitas was also explored during the de Anza expedition. Berryessa Creek was named for the family of Nicolas Berryessa, although the spelling often differs. Berryessa was granted the land grant Milpitas, through which the creek flows. The family came directly from Spain and settled in the Santa Clara Valley on May 6, 1834, and in 1842, Jose Reyes Berryessa received the land grant San Vicente (SCVWD 2003).

In 1835, 4,457 acres of land were granted to José Maria de Jésus Alviso, and he built the Rancho Milpitas, which occupied the central and southern portions of Milpitas. The city of Milpitas gained its name from Alviso's ranch, and the word itself comes from the Mexican-Indian phrase meaning "place where the corn grows." Alviso referred to his own ranch as his "corn patch," covering several square miles (Munzel 2000).

Those who followed Alviso to settle Milpitas included Michael Hughes, Joseph Weller, Dudley Wells, Joseph Murphy, Joseph Scott, and Frederick Creighton. Weller School, Murphy School, and Scott Creek all owe their names to these various individuals. Creighton started the first store in Milpitas on Mission Street, later known as Main Street. Hotels, stores, and restaurants followed as Milpitas grew despite setbacks such as the 1910 fire.

In 1867, progress continued in Milpitas as the Western Pacific Railroad built a depot near St. John's Catholic Church. Agriculture had become a booming business in Milpitas, which had become famous for peas, spinach, asparagus, beans, and strawberries. As a result of agricultural needs, the Santa Clara Valley Water Conservation District was formed in 1929 to see to the demands of farmers. Seven reservoirs were completed by 1936 while the population of the area continued to skyrocket and the demands on water for agriculture and residential use rose, as did flooding issues. Droughts in 1976 and 1977, as well as severe flooding in 1982, 1983, 1986, and 1995, contrast the various needs of the region (SCVWD 2003).

4.6.2.4 Records and Literature Search

The Corps requested a records and literature search of the area of potential effects (APE) from the Northwest Information Center at California State University, Sonoma, and the results were received on October 23, 2001. The search concentrated on a broad area that was presumed to be large enough to cover the future project footprint. The search identified three sites in the APE on the Calaveras Reservoir 7.5-minute topographic map (CA-SCL-156, SCL-157, and P-43-001136) and two sites on the Milpitas 7.5-minute topographic map. Site CA-SCL-593 contained a burial that was eroding out of the creek bank. In 1987 Richard Stradford from the San Francisco District and local archeologist Robert Cartier excavated the burial. Their work was limited to the burial recovery. They recorded the site, but did not completely define the site boundaries. The other site was a highly disturbed unrecorded midden deposit, temporarily designated as C-167 by the Northwest Information Center. The proximity of C-167 to CA-SCL-593 suggests that they may be the same site. In addition to the search from the Northwest Information Center, the National Register, the California Register, the California Historical Landmarks, and the California Points of Historical Interest were checked, all without results.

Basin Research Associates, Inc. recorded the two sites CA-SCL-156 and SCL-157 in 1974. SCl-156 was recorded as having only one flake and two shells. The location, an open field, was probably a former orchard. SCl-157 was only one flake found on fill material near a housing tract. Neither was worthy of being recorded as a site and should have been recorded as isolated finds. The third site, designated by a primary number P-43-001163 according to the California State Parks revised recording system, was a Native American reburial site conducted by Archaeological Resource Management in 1999. The reburial is approximately 50 feet from Berryessa Creek on property that is owned by the Santa Clara Valley Water District.

Altogether, 30 archeology surveys have been conducted and recorded in or near the APE. The APE has been nearly 100 percent surveyed. Berryessa Creek has been entirely surveyed, as well as much of the adjacent open space. Areas that will need to be surveyed center on some of the proposed detention basin locations in the southern part of the APE.

Twelve bridges, culverts, and railroad trestles have been identified in the study area that could be affected to some degree by the alternatives. Most of these structures were constructed fairly recently, but at a minimum the Old Piedmont Road Bridge and the Piedmont-Cropley culvert would need to be evaluated for their potential eligibility to the National Register.

4.7 TRAFFIC AND CIRCULATION

This section discusses the regulatory setting, and describes the local and direct access route to be used during construction, current capacities, traffic volumes, and levels of service for various roadway segments in and near the study area are identified.

4.7.1 Regulatory Setting

4.7.1.1 Federal

(a) Title 23 of the U.S. Code (USC)

Federal statutes specify the procedures that the U.S. Department of Transportation must follow in setting policy regarding the placement of utility facilities within the rights-of-way of roadways that received Federal funding. These roadways include expressways, most State highways, and certain local roads. In addition, 23 USC 116 requires State highway agencies to ensure proper maintenance of highway facilities, which implies adequate control over non-highway facilities, such as utility facilities. Finally, 23 USC 123 specifies when Federal funds can be used to pay for the costs of relocating utility facilities in connection with highway construction projects.

(b) Title 23 of the Code of Federal Regulations (CFR)

Federal Highway Administration (FHWA) regulations require that each state develop its own policy regarding the accommodation of utility facilities within the rights-of-way of such roads. After FHWA has approved a state's policy, the state can approve any proposed utility installation without referral to FHWA, unless utility installation does not conform to the policy.

Federal regulations do not dictate specific levels of operation or minimum delays, however, which are primarily established by local jurisdiction.

4.7.1.2 State

(a) California Streets and Highways Code

The California Streets and Highways Code authorize the California Department of Transportation (Caltrans), to control encroachment within the State highway right-of-way. Encroachments allow temporary or permanent use of a highway right-of-way by a utility, a public entity, or a private party.

Caltrans's Right of Way and Asset Management Program is primarily responsible for acquisition and management of property required for State transportation purposes. Transportation purposes may include highways, mass transit guideways and related facilities, material sites, and any other purpose that may be necessary for Caltrans operations. The responsibilities of the Right of Way and Asset Management Program include managing Caltrans' real property for transportation purposes, reducing the costs of operations, disposing of property no longer needed, and monitoring right-of-way activities on Federally assisted local facilities.

4.7.2 Environmental Setting

This section describes the environmental setting as it pertains to traffic and circulation. The study area is located in Santa Clara County, California, south of San Francisco Bay. This section describes highways and local roads in the vicinity of the study area, roadway segments, and classification criteria.

4.7.2.1 Functional Classification

Santa Clara Country uses a roadway classification system for long-range planning and programming. Roadways are classified based on the linkages they provide and their function, both of which reflect their importance to the land use pattern, traveler, and general welfare. The functional classification system recognizes differences in roadway function and standards between urban/suburban areas and rural areas. The following paragraphs define the linkage and functions provided by each class.

- **Freeways:** Operated and maintained by Caltrans, these facilities are designed as high-volume, high-speed facilities for intercity and regional traffic. Access to these facilities is limited, and in some cases on- and off-ramps are metered during peak-hour periods to reduce congestion caused by merging cars and trucks.

- **Arterials:** Major Arterials (four to six lanes) and Minor Arterials (four lanes)—are the principal network for through-traffic within a community and often between communities.

- **Collectors:** These two-lane facilities function as the main interior streets within neighborhoods and business areas. Collectors serve to connect these areas with higher classification roads (i.e., arterials, expressways, and freeways).

- **Local Streets:** These facilities are two-lane streets that provide local access and service. They include residential, commercial, industrial, and rural roads.

4.7.2.2 Level of Service

To evaluate a roadway's operational characteristics, a simple grading system is used that compares the traffic volume carried by a road with that road's design capacity. Roadways adjacent to the study area fall with in Santa Clara County, the City of Milpitas, and the City of San Jose jurisdiction. Roadways under Caltrans' jurisdiction are also adjacent to the study area. Each of these jurisdictions has adopted standards regarding the desires performance level of traffic conditions on the circulation system within its jurisdiction. A measure called "Level of Service" (LOS) is used to characterize traffic conditions. LOS is a measure of quality of operational conditions within a traffic stream based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience. Six LOS from A (best) to F (worst), define each type of transportation facility. Each LOS represents a range of operating conditions and the driver's perception of those conditions. These LOS thresholds, reflect at the local jurisdiction level through the County and City General Plans, define the minimum levels of acceptable traffic conditions.

Most analysis, design or planning efforts typically use service flow rates at LOS C or D or higher to ensure acceptable operating service for facility users. LOS E generally is considered unacceptable for planning purposes unless there are extenuating circumstances or attaining a higher LOS is not feasible or extremely costly. For LOS F, it is difficult to predict flow due to stop-and-start conditions. Levels of service are typically described in terms of traffic operating conditions for intersections and would be similarly applicable to roadway conditions as shown Table 4-15.

Table 4-15 Regulatory Criteria for Roads and Intersections

Level of Service (LOS)	Description of traffic conditions
A	Conditions of free flow; speed is controlled by the driver's desires, speed limits, or roadway conditions.
B	Conditions of stable flow; operating speeds beginning to be restricted; little or no restrictions on maneuverability from other vehicles.
C	Conditions of stable flow; speeds and maneuverability more closely restricted; occasional backups behind left-turning vehicles at intersections.
D	Conditions approach unstable flow; tolerable speeds can be maintained but temporary restrictions may cause extensive delays; little freedom to maneuver; comfort and convenience low; at intersection, some motorists, especially those making left turns, may wait through more than one or more signal changes.
E	Conditions approach capacity; unstable flow with stoppages of momentary duration; maneuverability severely limited
F	Forced flow conditions; stoppages for long periods; low operating speeds.

Source: Highway Capacity Manual. Transportation Research Board, Washington, D.C. 2000

LOS thresholds are based on daily volumes, number of lanes and facility type. These definitions and metrics are general transportation industry standards found in the Highway Capacity Manual (HCM), American Association of State Highway and Transportation Officials (AASHTO) and Institute of Transportation Engineers (ITE) guidelines and nomenclature.

4.7.2.3 Freeways

Interstate 880, Interstate 680 and State Route (SR) 237 provide regional access to the Berryessa Creek study area.

- **Interstate 880 (I-880)** is a six to eight lane north-south freeway in the vicinity of the Berryessa Creek study area. It connects the cities of Milpitas and San Jose with regional destinations such as Oakland and Fremont on the north and Campbell on the south. The average daily traffic (ADT) on I-880 in the vicinity of SR 237 is 133,000 to 174,000 vehicles per day. I-880 has interchanges with Calaveras Boulevard (SR 237), Montague Expressway and Great Mall Parkway near the study area.

- **Interstate 680 (I-680)** is an eight lane north-south freeway that runs parallel to I-880. Interstate 680 connects the cities of Milpitas and San Jose on the south to regional destinations such as Fremont on the north and the Pleasanton-Livermore Tri Valley area to the north east. In the vicinity of the Berryessa Creek study area, I-680 has interchanges with Jacklin Road, SR 237 and Montague Expressway. The average daily traffic on I-680 near SR 237 is 147,000 to 152,000 vehicles per day.

- **Calaveras Boulevard (SR 237)** is a major east-west signalized arterial roadway in the City of Milpitas, east of I-880. It runs for approximately 1.5 miles from I-880 on the west to I-680 on the east and serves as a regional freeway-to-freeway connector. It is a four to six lane road fronted mostly by retail and commercial uses. It continues east of I-680 to join Piedmont Road. The average daily traffic on SR 237 is 126,000 to 131,000 vehicles per day near its interchange with I-680.

4.7.2.4 Arterials, Collectors, and Local Roads by Jurisdiction

- **Montague Expressway** is a six to eight lane east-west expressway in the cities of Milpitas and San Jose. It runs for approximately 1.6 miles between I-880 and I-680. Montague Expressway has signalized intersections at South Main Street/Oakland Road, McCandless Drive/Trade Zone Boulevard, Great Mall Parkway/East Capitol Avenue and South Milpitas Boulevard.

  During the a.m. peak period from 6:00 a.m. to 9:00 a.m., one westbound through lane is restricted for high-occupancy vehicle (HOV) use; during the p.m. peak period from 3:00 p.m. to 7:00 p.m., one eastbound lane is restricted for HOV use. The HOV lanes are located east of the I-880 interchange and continue until just west of the I-680 interchange. The HOV lanes are currently in a three-to-five year trial period, but are assumed to still be in operation when the 2017 Berryessa Creek modifications take place.

- **Great Mall Parkway** is a major six-lane east-west arterial roadway in the city of Milpitas. It provides access to the Great Mall and the Great Mall Transit Center. It forms a signalized intersection with Montague Expressway.

- **Jacklin Road** is a four-lane east-west minor arterial roadway that connects to I-680 on the east and North Milpitas Boulevard on the west. West of North Milpitas Boulevard, Jacklin Road curves to become North Abel Street.

- **Abel Street** is a minor north-south arterial roadway that runs approximately 2.5 miles to connect to Milpitas Boulevard on the north and Main Street on the south. It serves a variety of land uses to the east and west.

- **Milpitas Boulevard** is a four-lane north south minor arterial roadway that joins Dixon Landing Road on the north and ends at Montague Expressway on the south.

- **Main Street** is a two to four lane collector roadway that joins Weller Lane on the north. It merges into Abel Street south of Great Mall Parkway and joins Montague Expressway. It becomes Oakland Road south of Montague Expressway.

- **Cropley Avenue** is a two to four lane east-west minor arterial roadway in the City of San Jose. The land use along Cropley Avenue is primarily residential. It forms a four lane overpass over I-680 and a signalized intersection with Morrill Avenue. It joins East Capitol Avenue on the west and runs approximately 1.8 miles to join Piedmont Road on the east.

- **Morrill Avenue** is a two-lane major collector roadway with a center two-way left turn lane. It is fronted primarily by residential uses on both sides. This segment will not be affected by the project.

- **Piedmont Road** is a two-lane north south minor arterial roadway that connects to East Calaveras Boulevard on the north and Penitencia Creek Road on the south. This segment will not be affected by the project.

- **Old Piedmont Road** is a two-lane local street that dead ends near Landess Avenue. It serves residential uses on the northeast edge of San Jose.

- **Los Coches Street** is a two-lane local street that joins Milpitas Boulevard to the west and curves to become Sinclair Frontage Road on the east.

- **Yosemite Avenue** is a four-lane minor collector roadway that joins Piedmont Road on the east and curves into Gibraltar Drive on the west. It provides access to residential areas in east Milpitas and offices west of I-680.

- **Ames Avenue** is a two-lane local street that provides access to the Ames Industrial Park including technology companies. It joins Sinclair Frontage Road on the east and Milpitas Boulevard on the west.

4.7.2.5 Roadway Segments

Table 4-16 shows the roadway segments analyzed and the existing LOS. Study area roadways range from two to six lanes and have speed limits from 35 to 55 miles per hour. The study area roads provide access to the industrial and residential uses in the vicinity of the project.

Table 4-16 Roadway Segments

Intersection	AM Peak		PM Peak	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
1. Jacklin Road & I-680 Northbound Ramps	N/A		B	16.2
2. Jacklin Road & I-680 Southbound Ramps	N/A		B+	11.5
3. Calaveras Boulevard/ I-880 NB Ramps	B	12.6	B	16.8
4. Calaveras Boulevard/ Abel Street	D+	38.1	D	44.1
5. Calaveras Boulevard & Milpitas Boulevard	D	40.2	D	44.1
6. Great Mall Parkway & I-880 NB Ramps	C	27.1	C+	20.3
7. Great Mall Parkway & Abel Street	D	40.7	D+	36.7
8. Montague Expressway & Capitol Avenue	D	49.7	E+	56.6
9. Montague Expressway & Milpitas Boulevard	D	39.6	D+	35.1
10. Montague Expressway & I-680 Northbound Ramps	D	40.5	D	46.2
11. Montague Expressway & Main Street/Old Oakland	E	68.1	D-	54.8
12. Montague Expressway & Trade Zone Boulevard	F	94.8	F	81.4

The intersection of Montague Expressway and Trade Zone Boulevard operates at LOS F during both the AM and PM peak hours. The intersection of Montague Expressway and Main Street/Old Oakland operates at LOS E during the AM peak hour, while the intersection of Montague Expressway and Capitol Avenue operates at LOS E+ during the PM peak hour. All other study intersections operate at LOS D or better. Figure 4-8 shows the study intersections and roadway segments.

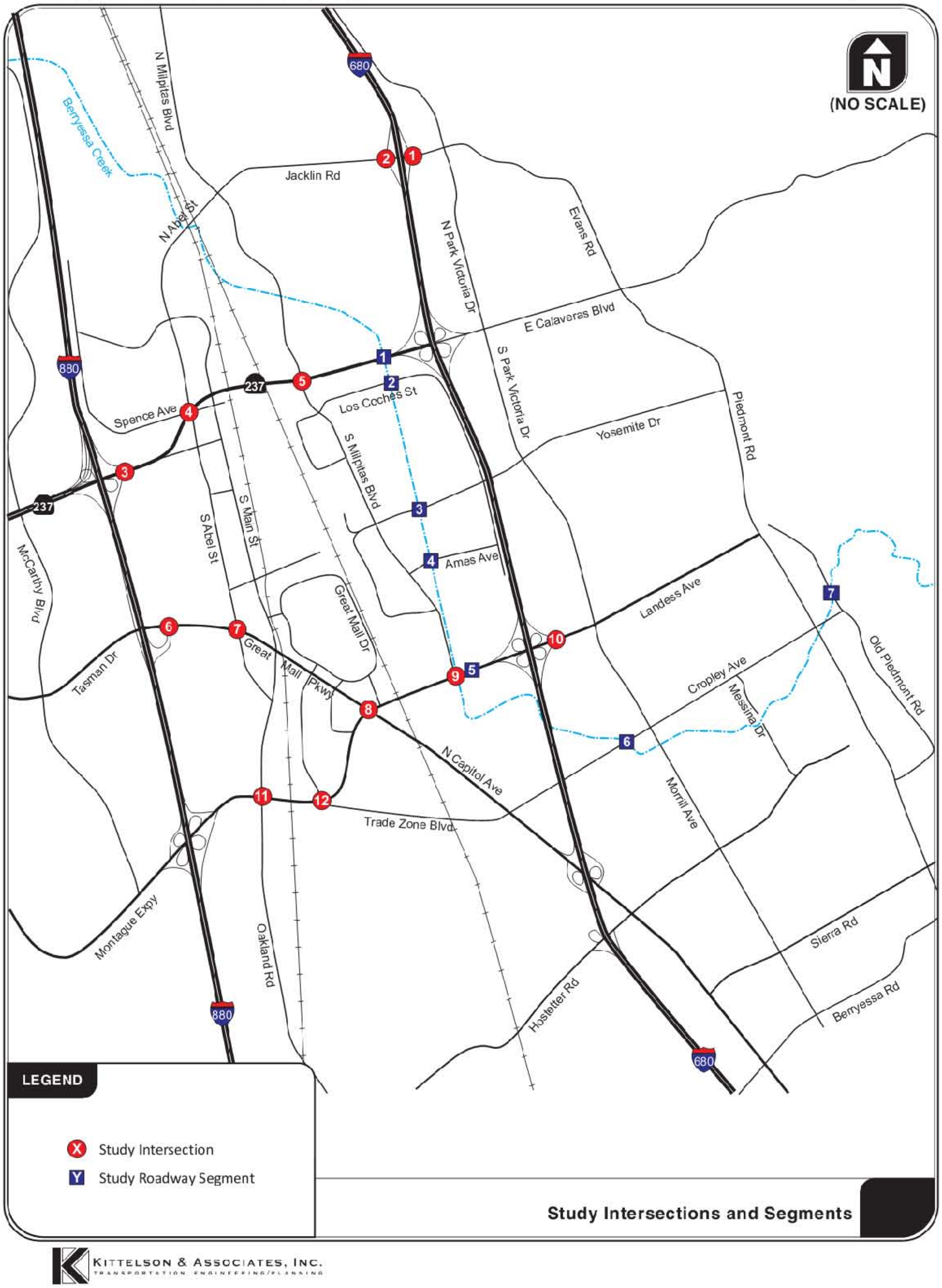


Figure 4-8 Study Intersections and Segments

4.7.2.6 Public Transit Facilities

Regional and local bus service in the study area is provided by the Santa Clara Valley Transportation Authority (VTA). The following VTA transit bus routes use streets and bus stops in the study area.

- **Route 46** operates between the Great Mall transit center and the Milpitas High School. The route uses Montague Expressway, Calaveras Boulevard, and Jacklin Road. On weekdays, it operates from 6:00 a.m. to 8:00 p.m. at frequencies of 30 minutes. On Saturdays, it operates from 8:00 a.m. to 7:00 p.m. at frequencies of 60 minutes. On Sundays, it operates from 9:00 a.m. to 6:00 p.m. at frequencies of 60 minutes. It crosses Berryessa Creek at Montague Expressway east of Milpitas Boulevard.

- **Route 47** operates between the Great Mall transit center and the McCarthy Ranch Shopping Center via Montague Expressway, Park Victoria, and Calaveras Boulevard. On weekdays, it operates from 6:00 a.m. to 10:00 p.m. at frequencies of 30 minutes. On Saturdays, it operates from 8:00 a.m. to 8:00 p.m. at frequencies of 30 minutes. On Sundays, it operates from 9:00 a.m. to 8:00 p.m. at frequencies of 30 minutes. It crosses Berryessa Creek at Calaveras Boulevard west of I-680 and Montague Expressway east of Milpitas Boulevard.

- **Route 70** operates between the Great Mall transit center near Great Mall Parkway in Milpitas and the Capitol LRT station near Capitol Expressway in San Jose. On weekdays, it operates from 5:00 a.m. to 11:00 p.m. at frequencies of 20 minutes. On weekends, it operates from 6:00 a.m. to 10:00 p.m. at frequencies of 30 minutes. It crosses Berryessa Creek at Montague Expressway just east of Milpitas Boulevard and Morrill Avenue south of Cropley Avenue.

- **Route 71** operates between the Great Mall transit center near Great Mall Parkway in Milpitas and the Eastridge Transit Center near Capitol Expressway in San Jose. On weekdays, it operates from 5:00 a.m. to 10:00 p.m. at frequencies of 30 minutes. On weekends, it operates from 7:00 a.m. to 9:00 p.m. at frequencies of 30 minutes. It crosses Berryessa Creek at Montague Expressway east of Milpitas Boulevard and Piedmont Road south of Cropley Avenue.

- **Route 104** Express operates between Deer Creek Road in Palo Alto and the Penitencia Creek Transit Center south of Berryessa Road in San Jose. On weekdays, two buses provide westbound service—from Penitencia Creek to Deer Creek—during the a.m. peak, from 6:00 a.m. to 8:00 a.m. Eastbound service is offered in the p.m. peak between 4:00 p.m. and 6:00 p.m. The route crosses over Berryessa Creek at Montague Expressway and Milpitas Boulevard.

- **Route 180** Express operates between the Fremont BART station and the San Jose Diridon Transit Center. On weekdays, it operates from 5:00 a.m. to 12 midnight at frequencies of 15 minutes. On Saturdays, it operates from 6:00 a.m. to 12 midnight at frequencies of 30 minutes. On Sundays, it operates from 7:00 a.m. to 12 midnight at frequencies of 30 minutes. Route 180 crosses over Berryessa Creek at Montague Expressway east of Milpitas Boulevard.

- **Route 217** AC Transit Route 217 connects the Fremont BART with the Great Mall Transit Center. On weekdays, it operates from 5:00 a.m. to 11:00 p.m. at frequencies of 30 minutes. On weekends, it operates from 7:00 a.m. to 8:00 p.m. at 40 minute headways. It crosses Berryessa Creek at Calaveras Boulevard, just east of Milpitas Boulevard.

- **Regional Transit** Regional and local light rail transit (LRT) service is also provided by VTA through the Alum Rock-Santa Teresa LRT line. The proposed VTA Bus Rapid Transit (i.e., Valley Rapid) will not serve the study area (8). A Bay Area Rapid Transit (BART) station at Montague Expressway and Capitol Avenue has recently begun construction and is slated to be completed by 2018. Depending on the exact construction schedule, the modifications at Berryessa Creek may impact BART's construction efforts.

4.7.2.7 Pedestrian and Bicycle Facilities

In addition to conventional on-street pedestrian and bicycle facilities, the City of Milpitas offers several recreational trails. These trails typically run along the creeks, including the Berryessa Creek.

4.8 NOISE

4.8.1 Regulatory Setting

Federal and state governments provide guidelines for construction noise in regards to worker protection and, for this project, traffic noise. Jurisdictions in California are required to have noise elements in their general plans; the noise elements used are planning guides to ensure that noise levels are compatible with adjacent land uses. Most jurisdictions also have noise ordinances, which serve as enforcement mechanisms for controlling noise. The proposed project is located in the vicinity of two convergent jurisdictions: the City of San Jose and City of Milpitas.

The cities of San Jose and Milpitas both have noise elements in their general plans. San Jose has established the objectives of 55 decibels (dB) (average day/night noise level) as the long-term exterior noise level and 60 dB as the short-term exterior noise level (City of San Jose 2005). Milpitas has established a standard to "avoid residential . . . exposure increases of more than 3 dB or more than 65 dB at the property line, whichever is more restrictive" (City of Milpitas 1994).

The City of Milpitas noise standards will be applied to this project because it is the closest jurisdiction with the most restrictive noise ordinance. Section V-213-3 of the Municipal Code provides restriction on the time of day noise can be produced in residential areas and limits construction noise to only occur within the hours of 7:00 a.m. to 7:00 p.m. daily except holidays (City of Milpitas 2008).

Construction noise from the project may impact noise sensitive receptors. These noise sensitive receptors consist of both human receptors and wildlife receptors. There are no established criteria available for the wildlife species known to occur in the study area. Many regulatory agencies recommend using 60 dBA L_{eq} hourly levels as the threshold for determining significant impacts for sensitive bird species at the edge of suitable habitat

4.8.2 Environmental Setting

Noise is generally defined as sound that is loud, disagreeable, or unexpected. Sound, as described in more detail below, is mechanical energy transmitted in the form of a wave caused by a disturbance or vibration. Because of the ability of the human ear to detect a wide range of sound pressure fluctuations, sound pressure levels are expressed in logarithmic units called decibels (dB).

Noise levels adjacent to the creek are typical of urban residential and industrial areas. Numerous roads and highways cross the creek downstream of Morrill Avenue. Vehicular traffic along the major arterials and railroads are the primary noise sources in the study area.

Noise levels from vehicular traffic in the study area range from 60 to 80 day-night average sound level (Ldn), based on information contained in the Midtown Milpitas Specific Plan and the Capital Corridor Light Rail Project EIRs. The upper end of this range may be expected during peak hours adjacent to I-680, while the lower values would be expected near arterials. One railroad runs parallel to the creek approximately 0.6 miles to the west of the lower study area. Noise levels due to freight operation adjacent to the track can be in excess of 70 Ldn; however, they decrease to 60 Ldn approximately 300 feet from the track.

The noise-sensitive land uses in or near the study area include residential areas, Majestic Way Elementary School, and Berryessa Creek Park. The sensitive receptors upstream of I-680 include local residents and visitors, students and faculty at the school, recreationists at the park, and occasional wildlife. In the more commercial/industrial area downstream of I-680, the sensitive receptors include the employees of the businesses, a few residents, and occasional wildlife.

4.9 RECREATION AND PUBLIC ACCESS

4.9.1 Regulatory Setting

Public recreation facilities in the project vicinity are provided by the County and area cities, consistent with their land use planning policies.

4.9.2 Environmental Setting

A greenbelt, including a park, extends downstream from Piedmont Avenue to about 600 feet upstream of Morrill Avenue. Residents, recreationist and commetuers use the greenbelt area for walking and bicycling, despite the fact that much of the greenbelt area is SCVWD right-of-way and is not officially open to the public. A gated maintenance road runs along the south side of Berryessa Creek between Piedmont Road and Morrill Avenue. Regardless of the gates, recreationist use the maintenance road as a bicycle trail and to access the Majestic Way Elementary School. There is open access (without gates) to the greenbelt area via a pedestrian bridge that connects the end of Messina Drive to Berryessa Creek Park on the south side. There are also no gates or fences to restrict public access along Parkhaven Drive on the north side of Berryessa Creek. The City of San Jose does not anticipate additional recreational development in the areas adjacent to Berryessa Creek (Metha Sizemore, City of San Jose pers. comm. 2/7/02).

The City of Milpitas would like to extend its bike trail system along the lower portion of the study area, downstream of I-680. Milpitas has proposed a bike trail along lower Berryessa Creek from the confluence of Coyote and Penitencia Creeks upstream to the pedestrian/bicyclist overpass at I-680. If constructed, such a trail would provide access to five city parks located within one-quarter mile of the creek corridor. The proposed Berryessa Creek Trail would link with the Hetchy Hetchy Trail and would provide direct access to the Community Center, City Library, and Town Center shopping and theater district (City of Milpitas 2001).

The upper study area upstream of Old Piedmont Road is privately owned and currently not accessible to the public but could be a scenic resource with the dense riparian zone and views to undeveloped agricultural lands upstream. The greenbelt is also a scenic area with its mature tree canopy. Downstream of the greenbelt, there is little to no aesthetic value to the trapezoidal channel.

4.10 AESTHETICS AND VISUAL RESOURCES

4.10.1 Regulatory Setting

There are no Federal or State laws and regulations associated with aesthetics and visual resources. Although local jurisdictions are not required to address visual resources as a separate topic in their general plans, several of the required general plan elements—including land use, conservation, and open space—relate indirectly to the aesthetic issues faced by communities as they manage their growth. General plans may also contain additional elements on topics of concern to the local community; common themes that bear on aesthetics and visual resources include recreation and parks, community design, and heritage or cultural resources.

4.10.2 Environmental Setting

Aesthetic resources are those natural resources, landforms, vegetation, and man-made structures in the environment that generate one or more sensory reactions and evaluations by the viewer. The regional viewshed in the Berryessa Creek area includes large areas of residential, commercial, and industrial development with some open areas and natural hillsides to the east. There are no State-designated visual resources such as scenic roadways in or near the study area.

The more meandering portions of Berryessa Creek upstream of I-680 support a band of riparian vegetation through this urbanized portion of San Jose. Residents consider the natural riparian greenbelt along the creek as an attractive amenity that helps to offset the effects of urbanization on the area's aesthetic quality. The downstream portion of Berryessa Creek is generally aesthetically unappealing, with bare ground, eroding slopes, or concrete linings.

The viewers upstream of I-680 include local residents and visitors, students and faculty at the school, recreationists at the park, and motorists. In the more commercial/industrial area downstream of I-680, the viewers include the employees of the businesses, a few residents, and motorists.

4.11 HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE

4.11.1 Regulatory Setting

4.11.1.1 Federal

The policy of the Corps regarding HTRW sites is presented in Engineering Regulation 1165-2-132, developed in response to the Federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended. This policy stipulates that each civil works project must include a phased and documented review to provide early identification of known and potential HTRW sites that may be affected by a proposed Federal project. In addition, the non-Federal sponsor must ensure cleanup of any identified HTRW prior to initiation of a Corps civil works project. When HTRW sites are identified, response actions must be acceptable to the U.S. EPA and applicable State regulatory agencies.

4.11.1.2 State

(a) Worker Safety Requirements

The California Occupational Health and Safety Administration (Cal/OSHA) assumes primary responsibility for developing and enforcing workplace safety regulations within California. Cal/OSHA regulations pertaining to the use of hazardous materials in the workplace (Title 8 of the California Code of Regulations [CCR]) include requirements for safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and preparation of emergency action and fire prevention plans. Cal/OSHA enforces regulations for hazard communication programs that contain training and information requirements, including procedures for identifying and labeling hazardous substances, communicating hazard information related to hazardous substances and their handling, and preparation of health and safety plans to protect workers and employees at hazardous-waste sites. The hazard communication program requires that employers make Material Safety Data Sheets available to employees and document employee information and training programs. Construction activities near high-priority installations located underground, such as the natural gas pipelines that penetrate the levee, are regulated by CCR Title 8, Section 1541 (8 CCR 1541).

4.11.2 Environmental Setting

For purposes of this section, the term “hazardous materials” refers to both hazardous substances and hazardous wastes. A “hazardous material” is defined as “a substance or material that…is capable of posing an unreasonable risk to health, safety, and property when transported in commerce” (49 CFR 171.8). California Health and Safety Code Section 25501 defines a hazardous material as follows:

> “Hazardous material” means any material that, because of its quantity, concentration, or physical, or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. “Hazardous materials” include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis

for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

"Hazardous wastes" are defined in California Health and Safety Code Section 25141(b) as wastes that:

> because of their quantity, concentration, or physical, chemical, or infectious characteristics, [may either] cause, or significantly contribute to an increase in mortality or an increase in serious illness[, or] pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

4.11.2.1 Reported Hazardous Waste Sites

Since there have been significant releases of hazardous materials in the past, the site reconnaissance was performed using guidelines set forth in the EPA rule concerning "All Appropriate Inquiries," the ASTM 1527-05, to locate any continuing or potential releases of hazardous materials. The use of ASTM 1597-05 is to identify recognized environmental conditions in order to establish the presence or likely presence of hazardous substances or petroleum products under conditions that indicate a likely release, a past release or a material threat of a release of those substances.

ASTM E 1527-05 requires that an Phase 1 Environmental Site Assessment consist of diligently conducting a reasonable search of all available information, performing a site reconnaissance and interviewing people who are knowledgeable about the current and past uses of the project site and surrounding area, its waste disposal practices and its environmental compliance history. The Phase 1 ESA is located in Appendix D.

4.11.2.2 Current Assessment

On June 21, 2011, USACE conducted site reconnaissance. The site reconnaissance was conducted using the EDR Data Map - Corridor Study generated by Environmental Data Resources Inc. The reconnaissance consisted of locating the sites with potential recognized environmental conditions (REC) and also walking the length of the creek. The scoping and the time factor prohibited obtaining access to buildings. During site reconnaissance USACE found the following:

1. Two gas stations, approximately 570 feet from the study area, which had historical releases, but the environmental sites are considered closed or no further action (NFA) is warranted.

2. Four industrial sites, approximately 1,080 feet from the study area, that had been listed as having releases but have changed hands since the listing. These are OEVCON Construction Co. which is now Grace Alliance Church, COMAC, now Iron Mountain Co., Landmark Labels now Emotion Co., Intersil Corp., now Peoples Associates, and "Industrial Building", now ODI.

3. One residential site was reported to have a release, presumably during construction, but this is not currently evident since the construction phase is complete and homes occupy the site. The site, located at 1260 Dempsey Rd, east of Interstate 680, is under land use controls. While this is counted as a REC, it is not considered to be close enough to affect the proposed project at Berryessa Creek.

4. Three industrial sites were listed as having released a hazardous substance (HS) and are still under the same company name: Flex interconnect Vector Fabrication, KML Engineering Corp., and Cordova Printed Circuits. These facilities were located all in the same court. Although they backed up to the creek, these facilities now are clean and exhibit no threat of a release.

5. One listed site, Kaiser Experimental Labs 1600 S. Main St., could not be located, but the presumed address is now a vacant lot. This site shows signs of distressed vegetation, which is a REC, but it is approximately 4,920 feet from the creek, and will not likely affect construction.

6. Other sites investigated, but were not listed in the EOR Report, include a CFN Gas Station, which is located within 100 feet of the creek, a distribution plant, which has an AST and a UST on site, a processing plant, which has five USTs.

7. There are many instances of transformers in the region studied. None of them is considered to be a REC, partly because they appear to be in good condition, secure, either by height above ground or by locked cabinets, and because they no longer contain PCBs.

The final segment of the reconnaissance involved walking along the creek. The creek and the immediate surroundings appear to be routinely maintained, since only two instances of discarded materials could be found. The 1-gallon container of antifreeze is not considered to be a REC due to its small size, and it was empty or nearly empty. There are a few bridges and a few power transmission lines that cross the creek. The properties that are immediately adjacent to the creek consist mostly of commercial structures, but there are also a few residential neighborhoods in the vicinity.

CHAPTER 5 – EVALUATION OF ALTERNATIVE PLANS AND POTENTIAL ENVIRONMENTAL CONSEQUENCES*

5.1 INTRODUCTION

This chapter discusses the potential effects of the alternative plans on the significant environmental resources described in Chapter 4. The environmental conditions for each resource are compared with future conditions with each alternative plan in place. Both beneficial and adverse effects are considered, including direct effects during construction and indirect effects resulting from the alternatives. The basis of significance (criteria) for each resource is used to evaluate the significance of any adverse effects, and measures are proposed to avoid, minimize, or mitigate any significant adverse effects for each resource.

The basis of significance is based on NEPA requirements. The Corps has integrated NEPA requirements into its regulations, policies, and guidance. Engineering Regulation 1105-2-100, "Planning Guidance Notebook," April 2000, establishes the following significance criteria:

- Significance based on institutional recognition means that the importance of the effect is acknowledged in the laws, adopted plans, and other policy statements of public agencies and private groups. Institutional recognition is often in the form of specific criteria.

- Significance based on public recognition means that some segment of the general public recognized the importance of the effect. Public recognition may take the form of controversy, support, conflict, or opposition expressed formally or informally.

- Significance based on technical recognition means that the importance of an effect is based on the technical or scientific criteria related to critical resource characteristics.

For this GRR-EIS, these three NEPA criteria apply to all resources and are not repeated under each resource. The CEQA requirements were also considerd since they are more specific to the resource and are listed in Appendix G of the CEQA Guidelines. The CEQA criteria relevant to an urban setting, as well as other agency criteria and thresholds of significance that apply to each resource, are identified under the appropriate resource.

The focus of the environmental analysis is on the downstream segment from I-680 to Calaveras Boulevard. Alternative 5 is the authorized project, which included the upstream segment from I-680 to Old Piedmont Road. For post-authorization studies, Corps policy requires that the authorized plan be retained in the final array of alternatives in order to evaluate and compare proposed changes to that plan. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection. Elements of the currently-authorized Coyote and Berryessa Creeks Project that are not approved under this GRR-EIS will be deferred indefinitely.

5.2 AIR QUALITY

5.2.1 Methodology

Emissions from the proposed project are entirely due to construction activities. To evaluate the appropriate level of air quality analysis, preliminary emission estimates were used to determine if levels may exceed the annual BAAQMD thresholds. Air emissions from construction-related activities were calculated by inputting construction-related data from Section 5.7 into the Sacramento Metropolitan Air Quality Management District's (SMAQMD) Road Construction Emissions Model (Road Mod) Version 7.1.1 (2012). The model was run two times to generate emission values for the following construction activities: (1) floodwall construction and other construction activities, and bridge construction downstream of I-680 starting in 2017, and (2) floodwall construction and embankment stabilization, and bridge construction upstream of I-680 for construction starting in 2017. Model results are provided in Appendix A, Part IV.

The model is calibrated for road construction projects and is the most accurate for modeling the excavation activities downstream of I-680. The modeling was conducted based on Alternative 2B/d as a maximum footprint for alternatives downstream on I-680 and Alternative 5 as an overall maximum alternative footprint. The modeling assumed that all construction activity would begin in 2017 and completed in two construction seasons, approximately 23 months. The estimated equipment to be used, volume of material, and disturbance acreages were compiled to determine the data to input into the emissions model. The emission calculations are based on standard vehicles emissions rates built into the model.

The Road Construction Emissions Model provided emission estimates for reactive organic gases (ROG), nitrogen oxides (NO_X), carbon monoxide (CO), carbon dioxide (CO_2), particulate matter less than 10 microns (PM_{10}) and particulate matter less than 2.5 microns ($PM_{2.5}$). ROG and NO_X are precursors to ozone formation. The emissions values for PM_{10} and $PM_{2.5}$ consist of a combination of exhaust particles, especially diesel exhaust, and fugitive dust. Federal standards refer to volatile organic compounds (VOC) instead of ROG, but both of these types of emissions are ozone precursors and function similarly in ozone formation.

Annual emissions were calculated based on assumptions on the type of construction equipment required. Construction activities and associated assumptions associated with air quality are estimated based on the current level of design and the activities and emissions may change based on the contractor. The contractor would coordinate with the air quality board prior to the start of construction.

5.2.2 Basis of Significance

Adverse effects on air quality were considered significant if an alternative would result in any of the following:

- Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
- Conflict with or obstruct implementation of the applicable air quality plan;
- Expose sensitive receptors to substantial pollutant concentrations; or
- Not conform to applicable Federal and State standards, and local thresholds on a long term basis.

The BAAQMD adopted CEQA Guidelines in June 2010, which were revised in May 2011. On March 5, 2012, the Court issued a ruling in *California Building Industry Association v. Bay Area Air Quality Management District* (Superior Court Case No. RG10548693). Pursuant to the ruling, the Court found that the adoption of the BAAQMD's CEQA Guidelines is a "project" requiring CEQA review. No CEQA review was conducted for the CEQA Guidelines prior to their adoption. Therefore, the Court set aside adoption of the BAAQMD CEQA Guidelines for determining the significance of air quality and greenhouse gas emissions. The Court also ordered BAAQMD to take no further action to disseminate those standards before performing CEQA review related to issuing the standards. While adoption of the thresholds was set aside until an environmental evaluation is conducted, the BAAQMD's GHG significance criteria, as outlined in their CEQA Guidelines, are supported by extensive studies and analysis (see http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx). Pursuant to its discretion under CEQA Guidelines section 15064 (b) ("lead agencies may exercise their discretion on what criteria to use"), the analysis used in this document relies on methodologies provided in the updated 2010 BAAQMD CEQA Guidelines.

The CEQA thresholds of significance were obtained from the BAAQMD CEQA Guide to Air Quality Assessment (BAAQMD 2010), which lists a threshold of 54 pounds per day or 10 tons per year for ROG, NO_X, and $PM_{2.5}$ construction emissions and a PM_{10} threshold of 82 pounds per day or 15 tons per year. There are no quantitative thresholds for construction dust emissions; instead, impacts are considered less than significant if the BAAQMD Best Management Practices are employed to control dust during construction activities, including demolition and excavation.

The BAAQMD TAC threshold is an increased cancer risk of more than 10 in 1,000,000 for a person with maximum exposure potential and increased non-cancer risk of 1.0 Hazard Index (chronic or acute). The BAAQMD also has a concentration threshold of 0.3 µg/m3 for $PM_{2.5}$. These thresholds are applicable to both construction emissions and operations emissions. Unlike the volume-based thresholds for criteria air pollutants, the TAC thresholds are used for specific receptor locations when a risk analysis is required for specific project components, such as stationary sources or the use of diesel-powered equipment, including construction equipment.

The 2010 BAAQMD CEQA Guidelines recommend analyzing localized CO concentrations for projects that would increase traffic volumes at affected intersections to more than 44,000 vehicles per hour. However, given the minimal increase in vehicle trips due to newly required maintenance activities, the proposed project would not affect local CO concentrations during operations Therefore, CO concentrations have not been quantified in this analysis.

BAAQMD considers projects that exceed these criteria air pollutant standards also to result in a cumulatively considerable air quality impact upon the region. According to BAAQMD, no further cumulative analysis should be required beyond the analysis of whether a proposed project's impacts would contribute considerably to ambient levels of pollutants or GHGs.

5.2.3 Impacts and Mitigation Measures

5.2.3.1 Alternative 1 (No Action)

Under the No Action Alternative, no construction activities would occur. Existing sources of air pollution would be expected to remain the same. Air quality would continue to be influenced by local and regional emissions from vehicles, local commercial and industrial land uses, and climate and geographic conditions.

Prior to implementing measures to reduce flood the current level of risk would remain for flooding in Milpitas and San Jose. The magnitude of the impact of flooding resulting from a flood event would depend on the severity of the storm. Cleanup actions in the event of a flood would require heavy use of construction equipment that would result in short-term, temporary emissions. Depending on the severity and extent of flood damage, emissions from cleanup activities could be minor or extensive.

5.2.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Construction of floodwalls, replacement of the UPRR Trestle Bridge, and excavation of the channel under Alternative 2A/d would result in temporary and short-term generation of ROG, NOx, PM_{10}, $PM_{2.5}$, and CO emissions from excavation, vegetation clearing, grading, motor vehicle exhaust associated with construction equipment, construction, employee commute trips, material transport, material handling and other construction activities. Annual emissions were calculated based on assumptions on the type of construction equipment required. Construction activities and associated assumptions associated with air quality are estimated based on the current level of design and the activities and emissions may change based on the contractor. The contractor would coordinate with the air quality board prior to the start of construction.

Modeling was based on Alternative 2B/d (Table 5-1) since impacts would be greater than Alternative 2A/d. Actual emissions (tons per construction period) for Alternative 2A/d would be approximately 1 percent less than the modeled emissions for Alternative 2B/d due to a shorter construction period. Based on the estimated presented in Table 5-1, Alternative 2A/d would not produce emissions that are greater than GCR *de minimums* values for criteria pollutants. The estimated worst-case annual emission generated from implementation of Alternative 2A/d would not exceed Federal or BAAQMD thresholds. Alternative 2A/d would not violate air quality standards or conflict with BAAQMD air quality plan; therefore, this impact would be less than significant.

The project would result in short-term generation of criteria pollutants concentrations, including diesel exhaust emissions, from the use of off-road construction equipment required for site preparation and other activities, and on-road haul and dump trucks used for hauling materials. Mobile equipment could operate within 100 feet to residents adjacent to the study area near Los Coches Street and Lakewood Drive. The duration of mobilized equipment used near sensitive receptors located near the study area would be approximately a few weeks in the two season construction period. Because sensitive receptors would not be exposed to substantial pollutants and emissions are below BAAQMD thresholds, the impact would be less than significant.

The proposed project is a short-term construction project. Operation and maintenance of proposed project would be similar to current maintenance practices. As a result, there would be no additional long-term increase in regional emissions of criteria pollutants associated with maintenance activities and vehicle trips. The proposed project would conform to applicable Federal and State standards, and local thresholds on a long term basis. This impact would be less than significant.

(a) General Conformity

The Federal CAA requires Federal agencies to ensure that their actions conform to applicable implementation plans for the achievement and maintenance of the NAAQS for criteria pollutants. To achieve conformity, a Federal action must not contribute to new violations of NAAQS, increase the frequency or severity of existing violations, or delay timely attainment of standards in the area of concern (for example, a state or a smaller air quality region).

The proposed project is located in an area that is in non-attainment status for ozone under both the CAAQS and Federal standards NAAQS, and also is in non-attainment under the California standard for particulate matter (PM_{10} and $PM_{2.5}$). As shown in Table 5-1, the proposed project would not produce emissions that are greater than the GCR *de minimus* values for criteria pollutants. Therefore, the proposed project falls into conformity with the EPA-approved State Implementation Plan and a written Conformity Determination is not required.

5.2.3.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

As described in Alternative 2A/d, annual construction emissions that would occur in Alternative 2B/d would result primarily from equipment operation associated with the construction of bridges, culverts, flood walls, and the excavation of the channel. Emissions associated with this alternative were calculated based on duration, estimated total fill material required, vegetation clearing, grading, motor vehicle exhaust associated with construction equipment, construction, employee commute trips, material transport, material handling, and other construction activities. Table 5-1 shows air emissions from construction activities based on results of the modeling.

Table 5-1 shows air emissions from construction activities based on results of the modeling. Alternative 2B/d would not produce emissions that are greater than GCR *de minimus* values for criteria pollutants. The estimated worst-case annual emissions generated from implementation of Alternative 2B/d would not exceed Federal or BAAQMD thresholds. Alternative 2B/d would not violate air quality standards or conflict with BAAQMD air quality plan; therefore, this impact would be less than significant.

Table 5-1 Alternative 2B/d Air Emissions from Construction of Downstream Activities

	Criteria Pollutant Emissions					
	ROG	CO	NO_X	PM_{10}	$PM_{2.5}$	CO_2
Activity beginning in 2017	1 lbs/day <1 ton/year	4.8 lbs/day <1 ton/year	45.7 lbs/day 4.8 ton/year	11.0 lbs/day 2.3 ton/year	2.6 lbs/day <1 ton/year	10,290 lbs/day 1,100ton/year
2010 BAAQMD Project Construction Thresholds	54 lbs/day	N/A	54 lbs/day	82 lbs/day	54 lbs/day	N/A
Federal Conformity Rule Thresholds	50 ton/year	100 ton/year	50 ton/year	100 ton/year	N/A	N/A
Exceed Thresholds	**No**	**No**	**No**	**No**	**No**	**No**

ROG = reactive organic gases NOx = nitrogen oxides
CO = carbon monoxide CO2= carbon dioxide
PM10 = particulate matter less than 10 microns PM2.5= particulate matter less than 2.5 microns

As discussed under Alternative 2A/d, there would be short-term generation of criteria pollutants concentrations, including diesel exhaust emissions, from the use of off-road construction equipment required for site preparation and other activities, and on-road haul and dump trucks used for hauling materials. Mobile equipment could operate within 100 feet to residents adjacent to the study area near Los Coches Street and Lakewood Drive. The duration of mobilized equipment used near sensitive receptors located near the study area would be approximately a few weeks during the two season construction period. Because sensitive receptors would not be exposed to substantial pollutants and emissions are below BAAQMD thresholds, this impact would be less than significant.

The proposed project is a short-term construction project. Operation and maintenance of proposed project would be similar to current maintenance practices. As a result, there would be no additional long-term increase in regional emissions of criteria pollutants associated with maintenance activities and vehicle trips. The proposed project would conform to applicable Federal and State standards, and local thresholds on a long term basis, therefore, this impact would be less than significant.

The proposed project would not produce emissions that are greater than the GCR *de minimus* values for criteria pollutants. Therefore, the proposed project falls into conformity with the EPA-approved State Implementation Plan and a written Conformity Determination is not required.

5.2.3.4 Alternative 4/d (Walled Trapezoidal Channel)

Alternative 4/d would have similar effects as described in Alternative 2B/d. Annual emissions were calculated based on assumptions on the type of construction equipment required. Modeling was based on Alternative 2B/d (Table 5-1) since impacts would be greater than Alternative 4/d.

Alternative 4/d requires less excavation of material than Alternative 2B/d and the same number of bridge and culvert replacements but slightly higher floodwalls. Emissions from Alternative 2B/d would be greater than those resulting from Alternative 4/d due to an increase in volume of earth-moving activities thus requiring a longer duration and an increase in material required (i.e., increase in haul truck trips) for proposed activities. Therefore, the types of effects and significance for Alternative 4/d would not be greater than Alternative 2B/d. Actual emissions (tons per construction period) for Alternative 4/d would be approximately 1 percent less than the modeled emissions for Alternative 2B/d. Emissions would not exceed Federal or BAAQMD thresholds; therefore, this impact would be less than significant.

As discussed under Alternative 2B/d, mobile equipment could operate within 100 feet to residents adjacent to the study area near Los Coches Street and Lakewood Drive. The duration of mobilized equipment used near sensitive receptors located near the study area would be approximately a few weeks during the two season construction period. Because sensitive receptors would not be exposed to substantial pollutants and emissions are below BAAQMD thresholds, the impact would be less than significant.

Operation and maintenance of proposed project would be similar to current maintenance practices. As a result, there would be no additional long-term increase in regional emissions of criteria pollutants associated with maintenance activities and vehicle trips. The proposed project would conform to applicable Federal and State standards, and local thresholds on a long term basis. This impact would be less than significant.

The proposed project would not produce emissions that are greater than the GCR *de minimus* values for criteria pollutants. Therefore, the proposed project falls into conformity with the EPA-approved State Implementation Plan and a written Conformity Determination is not required.

5.2.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the authorized plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

Annual construction emissions occur in Alternative 5 would result primarily from equipment operation associated with the modifications of bridges, and culverts, and construction of concrete lined channel. Table 5-2 shows air emissions from construction activities based on results of the modeling. The modeling was based on a worst case scenario for the upstream portion of Alternative 5. The upstream portion would not produce emissions that are greater than GCR *de* *minimus* values for criteria pollutants. Emissions from the up stream of I-680 activities would not exceed Federal or BAAQMD thresholds.

Table 5-2 Alternative 5 Air Emissions from Upstream Construction Activities

Construction Year	ROG (tons/year) (lbs/day)	CO (tons/year) (lbs/day)	NO_X (tons/year) (lbs/day)	PM_{10} (tons/year) (lbs/day)	$PM_{2.5}$ (tons/year) (lbs/day)	CO_2 (tons/year) (lbs/day)
Activity beginning 2017	< 1 lbs/day	1.6 lbs/day	3.6 lbs/day	10.4 lbs/day	32.1 lbs/day	1,043 lbs/day
	<1 ton/year	<1 ton/year	<1 ton/year	1.7 ton/year	<1 ton/year	147 ton/year

ROG = reactive organic gases
NOx = nitrogen oxides
CO = carbon monoxide
CO2= carbon dioxide
PM10 = particulate matter less than 10 microns
PM2.5= particulate matter less than 2.5 microns

Construction activities would result in short-term generation of criteria pollutants concentrations, including diesel exhaust emissions, from the use of off-road construction equipment required for site preparation and other activities, and on-road haul and dump trucks used for hauling materials. Mobile equipment could operate within 100 feet to residents adjacent to the Berryessa Creek during the eighteen month construction period. Because sensitive receptors would not be exposed to substantial pollutants and emissions are below BAAQMD thresholds the impact would be less than significant. Operation and maintenance of proposed project would be similar to current maintenance practices. As a result, there would be no additional long-term increase in regional emissions of criteria pollutants associated with maintenance activities and vehicle trips.

(b) Downstream of I-680

Downstream activities under Alternative 5 involves the modification bridges and culverts rather than their replacement as proposed in Alternative 2B/d. Emissions from Alternative 2B/d would be greater than those resulting from downstream of I-680 activities under Alternative 5 due to an increase in volume of earth-moving activities thus requiring a longer duration and an increase in total fill material required (i.e., increase in haul truck trips) for proposed activities. Therefore, the types of effects and significance for the downstream of I-680 activities under Alternative 5 would not be greater than Alternative 2B/d.

Table 5-3 compares project emissions with Federal Conformity Rule standards and California significance standards. As presented in the table, estimated worst case scenario emissions would Alternative 2B/d, and Alternative 5 would not exceed the BAAQMD regional thresholds. This alternative would not violate air quality standards or conflict with BAAQMD air quality plan; therefore, this impact would be less than significant.

Table 5-3 Comparison of Project Air Emissions with Federal Conformity Rule and State Significance Thresholds						
	Criteria Pollutant Emissions					
	ROG	**CO**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Downstream Activity	1 lbs/day <1 ton/year	4.8 lbs/day <1 ton/year	45.7 lbs/day 4.8 ton/year	11.0 lbs/day 2.3 ton/year	2.6 lbs/day <1 ton/year	10,290 lbs/day 1,100 ton/year
Upstream Activity	<1 lbs/day <1 ton/year	1.6 lbs/day <1 ton/year	3.6 lbs/day <1 ton/year	10.1 lbs/day 1.7 ton/year	2.1 lbs/day <1 ton/year	1,043 lbs/day 147 ton/year
Total	1.2 lbs/day <1 ton/year	6.4 lbs/day <1 ton/year	49.3 lbs/day 5.2 ton/year	21.1 lbs/day 4.0 ton/year	4.7 lbs/day <1 ton/year	11,333 lbs/day 1,247ton/year
2010 BAAQMD Project Construction Thresholds	54 lbs/day	N/A	54 lbs/day	82 lbs/day	54 lbs/day	N/A
Federal Conformity Rule Thresholds	50 ton/year	100 ton/year	50 ton/year	100 ton/year	N/A	N/A
Exceed Thresholds	**No**	**No**	**No**	**No**	**No**	**No**

ROG = reactive organic gases
VOC = volatile organic compounds
CO = carbon monoxide
NOx = nitrogen oxides
PM2.5= particulate matter less than 2.5 microns
CO2 = carbon dioxide
PM10 = particulate matter less than 10 microns

Downstream of I-680 activities for Alternative 5 would have similar effects to sensitive receptors as discussed under Alternative 2B/d. In addition, operation and maintenance effects would be the same as described under Alternative 2B/d.

5.2.3.6 Mitigation Measures

The contractor would be required to provide information on emission from construction equipment to BAAQMD and avoid the use of portable generators where power can be practically obtained from the local power grid. In accordance with BAAQMD guidelines, all proposed projects should implementation of the Basic Construction Mitigation Measures listed below whether or not construction-related emissions exceed applicable thresholds.

(a) Basic Construction Mitigation Measures Recommended for ALL Proposed Projects:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All 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.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.

- 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.

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.

- All construction equipment shall be maintained and properly tuned in accordance with manufacturer‘s specifications. All equipment shall be checked by a certified visible emissions evaluator.

- Post a publicly visible sign 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.

(b) Construction Area Particulate Matter Mitigation Measures

If the project's construction contractor determines that the construction activities would actively disturb more than 15 acres per day, then the contractor would be required to conduct PM_{10} and $PM_{2.5}$ dust modeling. If that modeling shows violations of BAAQMD's PM_{10} substantial CAAQS significance thresholds of the $PM_{2.5}$ CAAQS thresholds, then the contractor would be required to implement sufficient mitigation to eliminate any significant PM_{10} or $PM_{2.5}$ impacts.

(c) Fugitive Dust Emission Mitigation Measures

Fugitive dust mitigation would require the use of adequate measures during each construction activity and would include frequent water applications or application of soil additives, control of vehicle access, and vehicle speed restrictions. The Corps would implement the dust mitigation measures listed below.

- Limit vehicle speeds on unpaved roads to 15 miles per hour, or

- Water at least every two hours of active construction activities or sufficiently often to keep the area adequately wetted.

- Remove any visible track-out from a paved public road at any location where vehicles exit the work site: this removal effort shall be accomplished using wet sweeping of a HEPA filter-equipped vacuum device daily.

- Install one or more of the following track-out prevention measures:

    - A gravel pad designed using good engineering practices to clean the tires of exiting vehicles.

    - A tire shaker

- A wheel wash system
- Pavement extending for not less than 50 feet from the intersection with the paved public road, or
- Any other measure(s) as effective as the measures listed above.

♦ Pre-wet the ground to the depth of anticipated cuts, and

♦ Suspend any excavation operations when wind speeds are high enough to result in dust emissions across the property line, despite the application of dust mitigation measures.

♦ To mitigate stockpile handling and stockpile wind erosion fugitive dust emissions, active storage pile would be kept adequately wetted using wet suppression controls.

♦ To mitigate fugitive dust emissions from storage piles that would remain inactive for more than seven days, the Corps would ensure implementation of one or more of the following measures:

- Wet suppression controls
- Establishment and maintenance of surface crusting sufficient to satisfy the surface crusting test identified in the Asbestos ATCM
- Apply chemical dust suppressants or chemical stabilizers,
- Cover with tarp(s) or vegetative cover, and/or
- Install wind barriers across open areas.
- Install wind barrier of 50 percent porosity around three sides of storage piles, and/or
- Any other measure(s) as effective as the measures listed above.

♦ To mitigate fugitive dust emissions from in-dry blasting operations, water would be applied every 4 hours within 100 feet of the demolition area.

♦ To mitigate fugitive dust emissions from the rock crushing facility, wet suppression controls would be implemented.

♦ To mitigate fugitive dust emissions from the concrete batch plant operations, one or more of the following measures would be implemented:

- Apply water sprays,
- Set up enclosures, hoods, curtains, shrouds, movable and telescoping chutes, and/or
- Install a central dust collection system.

- To mitigate staging area or haul road emissions, the Corps would upon completion of the project, accomplish post-construction stabilization of disturbed surfaces by using one or more of the following measures:
- Establishing a vegetative cover,
- Placing at least 12 inches of non-asbestos-containing material,
- Paving, and/or
- Implementing any other measure deemed sufficient to prevent wind speeds of 10 miles per hour or greater from causing visible dust emissions.

5.3 CLIMATE CHANGE

5.3.1 Methodology

Emissions of GHG generated from construction equipment and on-road mobile sources resulting from the proposed project have been evaluated for their potential to contribute to climate change. GHG emissions generate by the proposed alternatives' would predominantly be in the form of CO_2 resulting from combustion sources (i.e. off-road equipment) during construction. The methodology used to analyze the proposed project alternatives' contribution to global climate change includes a calculation of GHG emissions using SMAQMD RoadMod, Version 7.1.1.

SMAQMD's RoadMod includes emissions factors for both on-road and off-road vehicles (i.e. light to heavy duty gasoline powered vehicles) and off-road construction equipment. The haul truck distance was estimated based on the approximate distance travelled to the disposal site which was assumed to be 20 miles round-trip. The number of trips was estimated based on the total amount of materials (i.e. rip rap, cellular confinement), hauling capacity, and trip length. The factors used to calculate emissions from off-road equipment, including all on-site off-road construction equipment, are based on 2011 fleet mix averages, as provided by RoadMod. Model results are provided in Appendix A Part IV.

5.3.2 Basis of Significance

Amendments to the CEQA guidelines for GHG emission, which became effective March 18, 2010, added new components to the CEQA Environmental Checklist presented in Appendix G. However, specific thresholds of significant have not been established and are left to the discretion of the lead agency to determine based on project characteristics and existing guidance. The size, scope, and purpose of the proposed project alternatives dictate that the following significant criteria to determine whether:

- The relative amount of GHG emission over the life of the project is small in comparison to the amount of GHG emissions for major facilities that are required to report GHG emissions (25,000 metric tons of CO_2e/yr) under EPA Final Mandatory Reporting of Greenhouse Gases Rule;

- The proposed project has the potential to conflict with or is consistent with plans to reduce or mitigate GHG; or
- The proposed project has the potential to contribute to a lower carbon future (i.e. improved energy efficiency or long-term emission reduction through implementation of GHG best management practices.

5.3.3 Impact and Mitigation Measures

5.3.3.1 Alternative 1 (No Action)

Under the No Action Alternative, no construction activities would occur. As a result, there would be no additional generation of GHGs from the construction activities associated with the proposed project, including operation of motorized equipment and vehicles. Climate change would be influenced by emissions due to local and regional emissions from vehicles, and local commercial and industrial land uses.

Prior to implementing measures to reduce flood damage to Milpitas and San Jose area, however, the current level of risk for flooding would remain the same. In the event of a flood, GHG emissions would be associated with the use of equipment during flood fighting, cleanup operations, and worker commute trips and haul trucks traveling to and from the site with remedial materials. A precise determination of significance is not possible and cannot be made because the extent of magnitude of impact is widely variable.

5.3.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Project construction would result in a net increase of GHG emissions over a finite period, approximately two years (2017-2018). CO_2 is produced during the burning of fossil fuels and is the predominant GHG generated during this project. Because no major sources exist for the other GHGs during the construction process, the other GHGs are not considered to be significant and no quantitative emission calculations were made for them. Table 5-1 in Section 5.2 summarizes CO_2 emissions from activities undertaken during construction. Modeling was based on a worst case scenario for Alternative 2B/d. Actual CO_2 emissions (tons per construction period) for Alternative 2A/d would be approximately 5 percent less than modeled emissions for Alternative 2B/d due to a shorter construction period.

The CO_2 emissions occur during the burning of fossil fuels from construction equipment. The amount of CO_2 emissions is estimated to be 1,046 tons per the year. This amount of CO_2 emission would not violate the 25,000 metric tons per year reporting level for any year of construction. Therefore, the proposed action would generate a less than significant amount of GHG emissions and would not have a significant environmental impact related to climate change.

The project is primarily a construction project resulting in a short-term, temporary GHG emissions from combustion associated with on and off road equipment. GHG emissions from maintenance would be negligible and are assumed not to have a significant impact on the regional GHG inventories. In addition, the project would not conflict with any plan, policy, or regulation of an agency adopted to reduce the emissions of GHGs, and the BMPs listed below would be implemented to contribute to a lower carbon footprint. As a result, any effects of Alternative 2A/d on climate change would be less than significant.

5.3.3.3 Alternative 2B/d (Incised Trapezoidal Channel- FEMA Certified Protection)

Table 5-1 in Section 5.2 summarizes CO_2 emissions from activities undertaken during construction. Modeling was based on a worst case scenario for Alternative 2B/d. The CO_2 emissions occur during the burning of fossil fuels from construction equipment. The amount of CO_2 emissions is estimated to be 1,046 tons per the year. This amount of CO_2 emission would not violate the 25,000 metric tons per year reporting level for any year of construction. Therefore, the proposed action would generate a less than significant amount of GHG emissions and would not have a significant environmental impact related to climate change.

The project is primarily a construction project resulting in a short-term, temporary GHG emissions from combustion associated with on and off road equipment. GHG emissions from maintenance would be negligible and are assumed not to have a significant impact on the regional GHG inventories. In addition, the project would not conflict with any plan, policy, or regulation of an agency adopted to reduce the emissions of GHGs, and the BMPs listed below would be implemented to contribute to a lower carbon footprint. As a result, any effects from Alternative 2B/d on climate change would be less than significant.

5.3.3.4 Alternative 4/d (Walled Trapezoidal Channel)

The types of effects and significance would be less than or equal to modeled emissions for Alternative 2B/d. Alternative 4/d requires less excavation of material and the same number of bridge and culvert replacements but slightly higher flood walls. Emissions from Alternative 2B/d would be greater than those resulting from Alternative 4/d due to an increase in volume of earth-moving activities thus requiring a longer duration and an increase in material required (i.e., increase in haul truck trips) for proposed activities. Actual emissions (tons per construction period) for Alternative 4/d would be approximately 5 percent less than the modeled emissions for Alternative 2B/d due to a shorter construction period. Therefore, the types of effects and significance for Alternative 4/d would not be greater than Alternative 2B/d.

The proposed project would not conflict with any plan, policy, or regulation of an agency adopted to reduce the emissions of GHGs, and the BMPs listed below would be implemented to contribute to a lower carbon footprint. As a result, any effects on climate change would be less than significant.

5.3.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the authorized plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

GHG emissions associated with Alternative 5 would be entirely associated with construction. Construction activities associated with removal of waterside vegetation would require construction activities including number of equipment, hours of operation, and total number of workers (worker trips), and would generate short-term GHG emissions. In addition to the construction vehicles, there would also be GHG emissions from the workforce vehicles. Workers would commute from their homes to the construction site and park in one of the staging areas.

Table 5-4 shows the results of the emissions modeling conducted based on the estimates for construction activities. The results of the modeling determined that Alternative 5 would not violate the 25,000 metric tons per year reporting level for any year of construction. Therefore, the proposed action would generate a less than significant amount of GHG emissions and would not have a significant environmental impact related to climate change.

Additionally, operational emissions associated with this alternative would be similar to current conditions. The proposed project would not conflict with any plan, policy, or regulation of an agency adopted to reduce the emissions of GHGs, and the BMPs listed below would be implemented to contribute to a lower carbon footprint. As a result, any effects on climate change would be less than significant.

Table 5-4 CO2 Emissions Impact Analysis

Total CO_2 Emission Rates	Alternative 5
For construction beginning 2017	11,333 lbs/day 1,247ton/year

(b) Downstream of I-680

As described under Alternative 2B/d, the project is primarily a construction project resulting in a short-term, temporary GHG emissions from combustion associated with mobile road equipment and concrete production. Impacts and effects for downstream of I-680 activities under Alternative 5 would be similar to Alternative 2B/d. GHG emissions from maintenance would be negligible and are assumed not to have a significant impact on the regional GHG inventories. In addition, the proposed project would not conflict with any plan, policy, or regulation of an agency adopted to reduce the emissions of GHGs, and the BMPs listed below would be implemented to contribute to a lower carbon footprint. As a result, any effects on climate change would be less than significant.

5.3.3.6 Mitigation Measures

Since there would be no significant effects on climate change, no mitigation would be required. However, the following measures could be implemented by the contractor to reduce GHG emissions from construction. These measures could be implemented to contribute a lower carbon footprint.

- Improve fuel efficiency from construction equipment by minimizing idling time either by shutting equipment off when not in use or reducing the time of idling to no more than three minutes (five minute limit is required by the state airborne toxics control measure [Title 13, Section 2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site.

- Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.
- Use equipment with new technologies (repowered engines, electric drive trains).
- Perform on-site material hauling with trucks equipped with on-road engines (if determined to be less emissive than the off-road engines).
- Encourage and provide carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.
- Produce concrete on-site if determined to be less emissive than transporting ready mix.

With the implementation of these mitigation measures, the CO_2 emissions would be reduced. Based upon the temporary and intermittent nature of the emissions, it was determined that the effects on climate change would be less than significant.

5.4 WATER RESOURCES AND QUALITY

5.4.1 Methodology

This analysis of the hydrologic and water quality impacts of the proposed project focuses on the effects of the construction of each alternative. Short-term impacts on hydrology and water quality could occur from ground-disturbing activities and other construction-related activities, many of them near local drainages and waterways. The focus of the hydrology and water quality analysis for short-term effects is on those portions of each reach that would be subject to ground disturbance during construction.

Additionally, proposed project impacts are assessed in light of existing regulatory requirements that would serve to mitigate potential impacts. The effectiveness of existing regulations in mitigating potential impacts is often affected by discretionary requirements, site characteristics or project features not yet detailed, and design-level considerations. Since some discretion exists in how these regulations are applied, the regulations are presented as mitigation measures to outline the specific process by which the Project would comply with these regulations.

The Corps and SCVWD are currently coordinating with the San Francisco Bay RWQCB, CDFW, and the U.S. EPA, Region 9, regarding water quality, stream geomorphology, sediment production, and sediment transport in Berryessa Creek. Agency recommendations are being incorporated into the design of project features and management measures. A Clean Water Act Section 404(b) (1) analysis is included in Appendix A Part V, and the Least Environmentally Damaging Practicable Alternative has been identified as Alternative 2A/d.

5.4.2 Basis of Significance

Adverse effects on water resources or quality would be significant if an alternative plan would result in any of the following:

- Substantially alter the existing drainage pattern of the area, including through the alternation of the course of a stream, in a manner which would result in substantial erosion or sedimentation on- or offsite;

- Violate any water quality standards or waste discharge requirements, including Section 401 of the CWA; create or contribute runoff water that would provide substantial additional sources of pollution runoff; or otherwise substantially degrade water quality; or

- Substantially degrade surface water or groundwater quality such that it would violate criteria or objectives identified in the San Francisco Bay RWQCB Basin Plan or otherwise substantially degrade water quality to the detriment of beneficial uses.

5.4.3 Impacts and Mitigation Measures

5.4.3.1 Alternative 1 (No Action)

Under the No Action Alternative, no construction activities would occur; therefore, the project would not impact water resources and water quality. Existing sources of water pollution would be expected to remain the same. Erosion in the upper watershed would continue, with ongoing sediment deposition in the study area. Existing water temperatures in the creek would not be expected to change.

Prior to implementing measures to reduce flood damage along Berryessa Creek the current level of risk would remain. A large storm event could cause overbank flooding, which could result in damage to structures and other facilities and introduce large quantities of contaminants (i.e., oil, gasoline, agricultural pesticides, and other hazardous materials) into waters and subsequently into the Berryessa Creek, Coyote Creek, and groundwater. Depending on the location and magnitude of a flood event, adverse effects could be localized or more widespread. To address damages, cleanup- and repair-related construction activities would occur. The location and extent of cleanup and repairs needed could be minor to extensive depending on the location, severity, and the duration of flooding. Repair-related construction activities are assumed to involve repairing damaged homes, utility infrastructure, roads, and highways. Repair-related construction activities have the potential to temporarily impair receiving water quality through the introduction of contaminants from stormwater runoff and erosion.

5.4.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Implementation of Alternative 2A/d would include ground-disturbing activities during construction, many of them near local drainages and waterways that could become contaminated by soil or construction substances. These waterways include Berryessa Creek, Arroyo de Los Coches, and Piedmont Creek. Construction activities would occur primarily during the dry season from May to the end of October.

Earth-moving and grading activities would remove vegetation and expose soils during construction. Activities associated with construction may require woody vegetation to be removed. Erosion of exposed soils could temporarily increase sediment load to the creek via surface runoff and direct deposition to the channel. Erosion at construction sites could also increase concentrations of suspended solids and nutrients such as phosphorus and nitrogen compounds. These nutrients are often attached to suspended particulate matter and contribute to increased water turbidity. However, this soil disturbance from construction would be temporary. Implementation of best management practices including erosion control measures would avoid or minimize any adverse effects from soil erosion and surface water runoff. Soil erosion during possible storm events also has the potential to temporarily increase turbidity and sedimentation in Berryessa Creek, but these effects would not be significant.

Alternative 2A/d would result in an increase in sediment transport through the I-680 to Montague and Montague to Calaveras. The increased transport results in a decrease in deposition in the I-680 to Montague reach. Overall, the total amount of sediment deposited in study area under Alternatives 2A/d is nearly equal to that under without-project conditions.

Construction activities have the potential to temporarily impair water quality if disturbed and eroded soil, petroleum products, or construction-related wastes (e.g., cement and solvents) are discharged into receiving waters or onto the ground where they can be carried into receiving waters. Soil and associated contaminants that enter receiving waters through stormwater runoff and erosion can increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat, and introduce compounds that are toxic to aquatic organisms. Accidental spills of construction-related substances such as oils and fuels can contaminate both surface water and groundwater. However, accidental spills would be avoided or minimized through the implementation of a Spill Prevention and Response Plan.

Since the project would disturb more than one acre of land, the contractor would be required to obtain a NPDES permit from the Regional Water Quality Control Board (RWQCB), Central Valley Region. As part of the permit, the contractor would be required to prepare a Storm Water Pollution Prevention Plan (SWPPP), identifying best management practices to be used to avoid or minimize any adverse effects during construction to surface waters. By obtaining the NPDES permit and implementing BMPs, water quality standards or waste discharge requirements associated with earth moving activities would be met; therefore, impacts would be less than significant.

Groundwater depths within the study area could be relatively shallow (approximately 11 feet below ground surface). In order to provide for clear and safe work areas, groundwater dewatering may be necessary for construction activities that would involve excavation work during: widening of channel, constructing earthen levees; reconstructing bridges at Los Coches, and Calaveras Boulevard and/or constructing box culvert at Montague Expressway, and UPRR trestle bridge.

All dewatering activities would be temporary in nature, confined to a small area, and occur only during dry season months (mid-April to mid-October). Accumulated water would be diverted around the work areas. The creek flow would be temporarily diverted around the work area by using one of the following types of diversions: temporary durable plastic K-rail barrier system, water-tight cofferdam, or inflatable bladder dam. These diversions would remain in place throughout the in-stream construction period. The locations and spacing of the diversions would be determined based on the type and length of construction activity. BMPs would be implemented to reduce impacts on groundwater supplies and discharge. The implementation of the BMPs ensures that dewatering impacts on groundwater supplies and recharge would be less than significant.

Discharge (i.e., through dewatering) or displacement of contaminated water or soil as a result of excavation could potentially impact the beneficial uses of surface water or groundwater identified by the San Francisco Bay RWQCB. Implementation of BMPs would minimize the potential for water quality impacts or water quality standards violations associated with construction dewatering. Therefore, dewatering impacts on groundwater quality would be less than significant.

Construction of Alternative 2A/d would likely disturb or eliminate 0.79 acres of wetlands vegetation dominated by cattails, a wetland obligate plant species. However, since stream hydrology would not be permanently affected, it is assumed the cattails would reestablish naturally within one to three years after construction, and the wetlands would reemerge in the channel. In addition, the Corps would replant wetland vegetation upon completion of the project, therefore, this impact would be less than significant.

5.4.3.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

The types of effects and significance for Alternative 2B/d would be similar to Alternative 2A/d. Alternative 2B/d would include constructing higher floodwalls, replacement of bridges and culverts and a larger volume of material removed from the channel than proposed in Alternative 2A/d. Alternative 2B/d would not substantially alter the existing drainage pattern of the area. As described in Alternative 2A/d, the total amount of sediment deposited in study area under Alternatives 2B/d is nearly equal to that under without-project conditions. Obtaining an NPDES permit and implementation of BMPs would reduce effects on water quality to less than significant levels. Accidental spills would be avoided or minimized through the implementation of a Spill Prevention and Response Plan.

As described in Alternative 2A/d, the implementation of Alternative 2B/d could disturb or eliminate 0.79 acres of wetland vegetation. However, since stream hydrology would not be permanently affected, and it is assumed the cattails would reestablish naturally within one to three years after construction, and the wetlands would reemerge in the channel. In addition, the Corps would replant wetland vegetation upon completion of the project, therefore would be less than significant.

5.4.3.4 Alternative 4/d (Walled Trapezoidal Channel)

The types of effects, mitigation, and significance of Alternative 4 would be similar to Alternative 2B/d. Alternative 4/d includes the option of planting channel terraces with moderate density riparian vegetation consisting of trees and shrubs. Growth of a mature canopy would result in shading of the creek. The planted terraces could trap sediment during high-water events and reduce the sediment load in the creek. The establishment of a riparian tree canopy could improve water quality by reducing sediment load during high flow events. Although beneficial, these effects are not expected to be significant.

5.4.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the authorized plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

Construction in the greenbelt area has the potential to reduce the amount of riparian canopy shading the creek. With increased sunlight on the creek channel, an increase in water temperature could occur during construction and for an indefinite period of time after construction. Lost riparian vegetation would be compensated to an amount according to consultation with the USFWS under the Fish and Wildlife Coordination Act. This vegetation would provide shade within five years of construction, and reach maturity and maximum shade density after year 40. Over time as plantings of trees and shrubs mature, the amount of riparian habitat shading the creek would equal or exceed preconstruction conditions. In the long term, water temperatures would not increase and may slightly decrease. The potential short-term increase in water temperature or the potential long-term decrease in water temperature would be less than significant.

(b) Downstream of I-680

The types of effects and significance for Alternative 5 downstream of I-680 would be similar to Alternative 2A/d. Alternative 5 downstream of I-680 would include constructing concrete-lined channel. Alternative 5 downstream of I-680 would not substantially alter the existing drainage pattern of the area. Obtaining an NPDES permit and implementation of BMPs would reduce effects on water quality to less than significant levels. Accidental spills would be avoided or minimized through the implementation of a Spill Prevention and Response Plan.

As described in Alternative 2A/d, the implementation of Alternative 5 downstream of I-680 would eliminate 0.79 acres of wetland vegetation. Wetland vegetation and native trees would be compensated to an amount according to consultation with the U.S. Fish and Wildlife Service under the Fish and Wildlife Coordination Act.

5.4.3.6 Mitigation Measures

Implementation of the below mitigation measures by the contractor would reduce the significant impacts on water quality, and jurisdictional waters to a less-than-significant level. Compliance and evaluation as a part of the provisions stated for the various permits discussed below would serve to minimize and mitigate potential hydrologic impacts due to construction activities.

- The project would comply with State-adopted, USEPA-approved water quality standards as contained in the Basin Plan. Clean Water Act Section 401 water quality certification and a NPDES General Permit for Discharges of Storm Water Associated with Construction

Activity would be obtained from the San Francisco Bay RWQCB. A SWPPP would be developed in accordance with the guidelines of the General Permit. The SWPPP would contain a visual monitoring program, a chemical monitoring program for non-visible pollutants if there is a failure of the best management practices, and a sediment monitoring plan. The SWPPP would list all best management practices to be implemented during construction activities for the control of erosion, siltation, and any other pollutants that could potentially enter stormwater or surface water of Berryessa Creek.

Best management practices would include, but not be limited to, the following:

- Install silt fences along Berryessa Creek to prevent silt and sediment from entering the creek channel.
- Stabilize and reseed with native grasses all soils and exposed areas disturbed by construction.
- Obtain dewatering permit from RWQCB and implement applicable water quality monitoring during dewatering activities.
- Prepare and implement an Erosion and Sediment Control Plan consistent with RWQCB policy and guidelines.

During project construction, erosion of bare soils would be managed by an Erosion and Sediment Control Plan. This plan would avoid and minimize the discharge of sediment to Berryessa Creek. The Erosion and Sediment Control Plan would require contractors to:

- Conduct all construction work in accordance with site-specific construction plans that minimize the potential for sediment to enter the stream
- Identify, with construction fencing, all areas that require clearing, grading, revegetation, or recontouring, and minimize the extent of areas to be cleared, graded, or recontoured
- Grade spoil sites to minimize surface erosion and apply erosion control measures, as appropriate, to prevent sediment form entering water courses or the stream channel to the maximum extent feasible
- Apply mulch to disturbed areas, as appropriate, and plant with appropriate plant species as soon as practical after disturbance
- Design and implement a dewatering plan to avoid operating equipment in flowing water by using temporary cofferdams or some other suitable diversion to divert channel flow around the channel and bank construction area
- Limit in-channel construction to the low-flow period between April 15 and October 31 to minimize soil erosion

Contractors would be required to implement a Spill Prevention and Response Plan. This plan would define requirements for storage, handling, and containment of hazardous materials. Key components of the plan stipulate that hazardous materials would be properly stored and construction equipment would be serviced and maintained outside of the creek channel.

Recommendations for mitigation from disturbance or loss of wetlands are contained in the USFWS Coordination Act Report. Native trees that could not be avoided would be compensated to an amount according to consultation with the USFWS under the Fish and Wildlife Coordination Act. To mitigate for the 0.39 acres of seasonal wetlands, wetland vegetation would be re planted onsite upon completion on the project.

5.5 BIOLOGICAL RESOURCES

5.5.1 Methodology

This section evaluates the temporary and permanent effects of the alternatives on vegetation and wildlife resources in the study area. Evaluation of the vegetation and water resources is based on information provided by technical maps, and reports. Impacts on biological resources downstream of I-680 resulting from implementation of the proposed project were analyzed based on biological field surveys, coordination with USFWS staff, and review of existing documentation that addresses biological resources on or near the study area. Impacts on biological resources upstream of I-680 resulting from implementation of the proposed project were analyzed based on biological surveys for a Habitat Evaluation Procedure (HEP) analysis.

5.5.2 Basis of Significance

The alternatives under consideration were determined to result in a significant impact related to biological resources if they would:

- 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;
- Have a substantial adverse effect, either directly or through habitat modification, on any species identified as endangered, threatened, candidate, rare, or of special concern in local or regional plans, policies, regulations, or on lists compiled by the CDFW or USFWS;
- Have a substantial adverse effect on Federally and State protected wetlands as defined by Section 404 of the CWA and as protected under the Porter-Cologne Water Quality Control Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means; or
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species, or with established native fish or wildlife migratory or dispersal corridors, or impede the use of native wildlife or fish nursery sites.

5.5.3 Impacts and Mitigation

5.5.3.1 Alternative 1 (No Action)

Under the No Action Alternative, vegetation removal would not occur beyond current maintenance practices. Furthermore, no construction activities would occur from the proposed project. Under these conditions, the vegetation in the study area is expected to remain the same and wildlife resources in the future are not expected to change.

Prior to implementing measures to reduce flood damage the current level of risk would remain the same. The number of species and life stages of fish and wildlife species that could be affected under this scenario would vary significantly depending on the time of year when a flood event occurred and the intensity of the flood event. Flooding could introduce sediments and contaminants into waterways potentially degrading aquatic habitats. Flooding could also result in the drowning of terrestrial species and degrade terrestrial habitat.

5.5.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Figure 5-1 through Figure 5-4 show aerial photographs of the study area downstream of I-680, starting at I-680 and progressing downstream to Calaveras Boulevard. The photographs primarily depict grassland along the channel corridor. The blue shading on the north or east side of the creek channel indicates the potential maximum width of the project right-of-way.

The existing habitat consists of a sparse cover of herbaceous vegetation and nonnative grasses. Herbaceous vegetation would be removed during construction; however, the project reaches would be re-vegetation by hydroseeding after construction. The riparian habitat within the study area is less than one acre and considered low-quality. The bank lacks any trees or shrubs, and does not provide cover or wildlife movement opportunities. The ability of the landside vegetation to function as wildlife movement corridors is limited because of residential and industrial development. The proposed project would have a less than significant impact on riparian habitat.

Figure 5-1 Berryessa Creek Habitat – Downstream of I-680 to Montague Expressway

Figure 5-2 Berryessa Creek Habitat – Downstream of Montague Expressway

Figure 5-3 Berryessa Creek Habitat – Ames Avenue to Yosemite Avenue

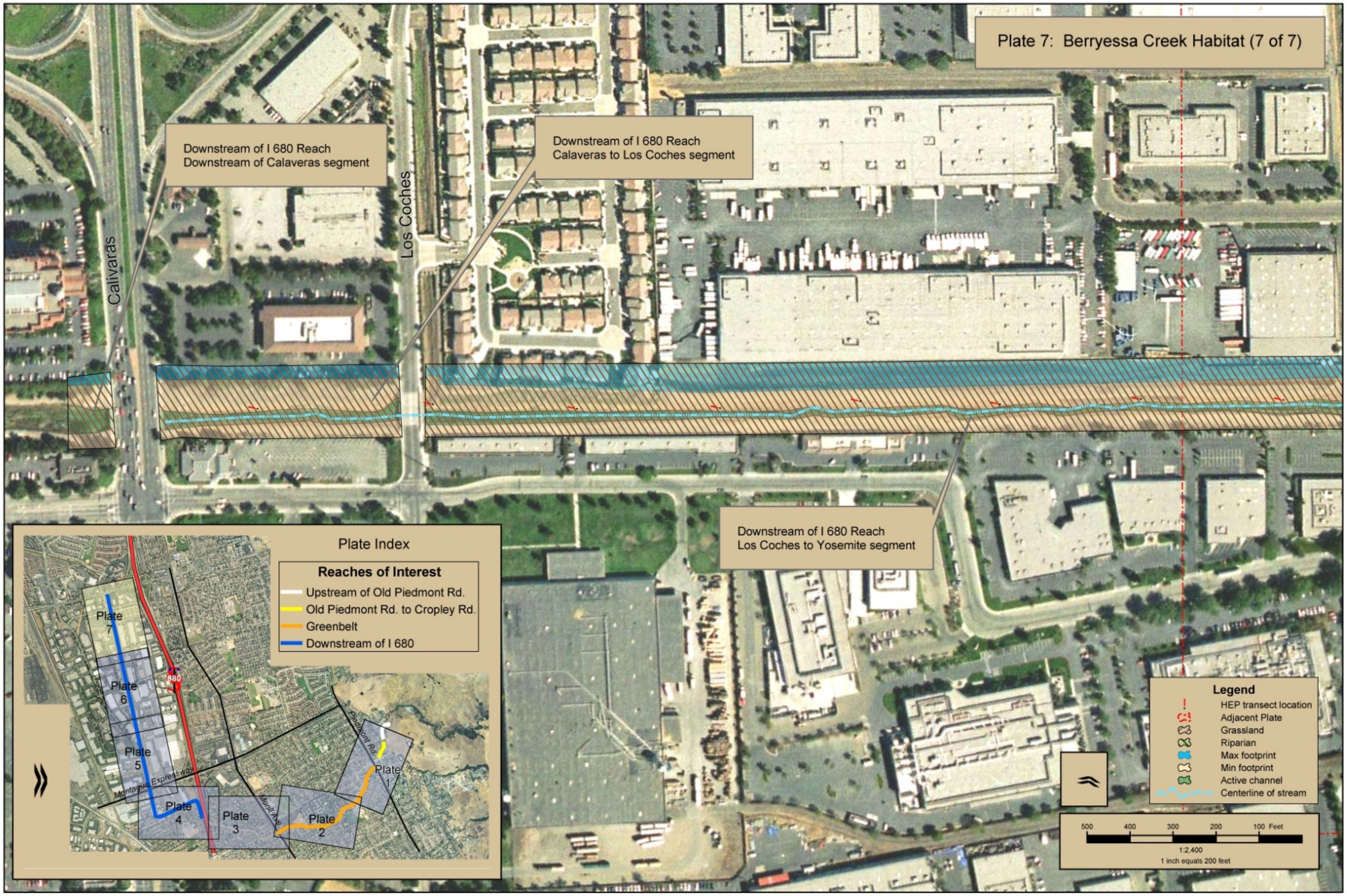


Figure 5-4 Berryessa Creek Habitat – Los Coches to Downstream of Calaveras Boulevard

Herbacious vegetation along the channel would be removed prior to construction. Approximately 15 trees, located between East Calaveras Blvd and Los Coches Street, could be removed for construction access. A map of the potential trees to be removed is located in Appendix A. These trees are located only on the landside of the floodwall. Landside trees include occasional small patches of non-native and/or invasive trees including Eucalyptus, Black Acacia, Mexican palm, Australian willows, fruit trees, and ornamental trees. The removal of landside vegetation woody vegetation in the study area would not substantially interfere with the movement of resident or migratory birds. SRA habitat would not be affected under Alternative 2A/d because no waterside woody vegetation would be removed. Alternative 2A/d would not substantially modify the existing habitat or adversely affect Federal and State listed species, therefore, would have a less than significant effect.

Approximately 0.79 acre of wetland vegetation was present within the study area and is confined to the low-flow channel and is dominated by cattails. Construction activities would temporarily disturb or eliminate the vegetation. It is assumed the cattails would reestablish naturally within one to three years after construction, and the wetlands would reemerge in the channel. In addition, the Corps would replant cattails and/or other wetland vegetation upon completion of the project. Therefore, the effects on wetlands vegetation would be less than significant.

Excavation work in the stream channel below Los Coches Creek has the potential to temporarily disturb aquatic habitat for the western pond turtle, a State-listed species of special concern, if present during construction. To ensure that there would be no effect, preconstruction surveys would be conducted prior to any work scheduled. If turtles are present near construction areas along the creek, they are anticipated to move away from areas of disturbance and CDFW would be consulted for further action prior to construction. Therefore, the effects on the western pond turtle would be less than significant.

5.5.3.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

The types of effects and significance of Alternative 2B/d would be the same as Alternative 2A/d. Alternative 2B/d has an increase in disturbance due to an increase in excavation and a larger number of bridge and culvert replacements.

As described in Alternative 2A/d, the existing habitat consists of sparse cover of herbaceous vegetations and non-native grasses. Vegetation would be removed during construction; however, the project reaches would be re-vegetation by hydroseeding after construction. The short-term effects of project construction would be temporary, and long-term effects would be less than significant.

Approximately 15 trees, located on the landside of the floodwall between East Calaveras Blvd and Los Coches Street, may need to be removed for construction access. The removal of landside vegetation woody vegetation in the study area would not substantially interfere with the movement of resident or migratory birds. Alternative 2B/d would not substantially modify the existing habitat or adversely affect Federal and State listed species, therefore, would have a less than significant effect.

As described in Alternative 2A/d, approximately 0.79 acre of wetland vegetation was present within the study area. Construction activities would likely temporarily disturb or eliminate the vegetation. However, it is assumed the cattails would reestablish naturally within one to three years after construction, and the wetlands would reemerge in the channel. The Corps would also replant wetland vegetation upon completion of the project. Therefore, effects on wetlands vegetation would be less than significant.

Replacement of the bridges could disturb *Myotis* or western big-eared bats if these species are using the bridges for roosting. To ensure that there would be no effect, preconstruction surveys would be conducted prior to any work scheduled. If bats are present CDFW would be consulted for further action prior to construction.

5.5.3.4 Alternative 4/d (Walled Trapezoidal Channel)

The types of effects and significance would be the same as Alternative 2B/d except that trees or shrubs would be planted on the terraces could have a beneficial effect on vegetation and wildlife.

5.5.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the authorized plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

Figure 5-5 through Figure 5-8 show aerial photographs of the study area upstream of I-680, starting upstream of Old Piedmont Road and progressing downstream to I-680. From above Old Piedmont Road downstream through the greenbelt area to Morrill Avenue, the photographs depict grassland and riparian vegetation along the channel corridor. Levee footprints are shown above Old Piedmont Road and in the greenbelt area.

Construction of the levees in the greenbelt area and long-term maintenance with grass cover would lead to the permanent loss of a relatively small amount of riparian forest, a total of approximately 0.62 acres. This number includes the area affected by the construction of two very small levees immediately above the Old Piedmont Road Bridge. Construction in the reach between Old Piedmont Road and the Piedmont/Cropley culvert and the placement of concrete matting on the channel sideslopes would also permanently remove some riparian trees and brush. The placement of grade structures and small quantities of buried riprap at approximately 500-foot intervals in the greenbelt area would disturb or remove small areas of riparian vegetation. Careful placement of the grade structures to avoid removing existing large trees could minimize disturbance. The loss of vegetation habitat would be potentially significant, however, with the implementation of mitigation, this would be considered less-than-significant. Reestablishment of 2.63 acres of riparian habitat in the greenbelt area would fully replace the habitat lost.

Replacement of the Old Piedmont Road Bridge and construction of grade control structures would temporarily disturb a relatively small amount of aquatic and riparian habitat in and adjacent to the creek channel. There have been no documented occurrences of federally and state-listed species in the study area. Berryessa Creek does not have suitable habitat to support special status species. Field surveys were completed for California red-legged frog (CRLF). No suitable habitat for the CRLF was found nor was any CRLF found to inhabit the Berryessa Creek study area. There would be no effect on listed species.

Construction activities and the removal of trees and shrubs in the greenbelt area have the potential to temporarily disturb raptors and other species of concern if the species are foraging or nesting during construction. Replacement work on the bridges and culverts would disturb *Myotis* or western big-eared bats if these species use the bridges and culverts for roosting. These construction activities have the potential to have temporary, significant adverse effect on species of concern. To ensure that there would be no effect, preconstruction surveys would be conducted prior to any work scheduled. If bats are present CDFW would be consulted for further action prior to construction.

(b) Downstream of I-680

Short term effect of Alternative 5 downstream of I-680 would be similar to Alternative 2b/d. Herbaceous vegetation would be removed during construction; however, the project reaches would be re-vegetation by hydroseeding after construction. The riparian habitat within the downstream of I-680 is less than one acre and considered low-quality. The bank lacks any trees or shrubs, and does not provide cover or wildlife movement opportunities. The ability of the landside vegetation to function as wildlife movement corridors is limited because of residential and industrial development.

As described in Alternative 2A/d, the implementation of Alternative 5 downstream of I-680 would eliminate 0.79 acres of wetland vegetation. Wetland vegetation and native trees would be compensated to an amount according to consultation with the U.S. Fish and Wildlife Service under the Fish and Wildlife Coordination Act.

Figure 5-5 Berryessa Creek Habitat – Upstream of Old Piedmont Road to Greenbelt Reach

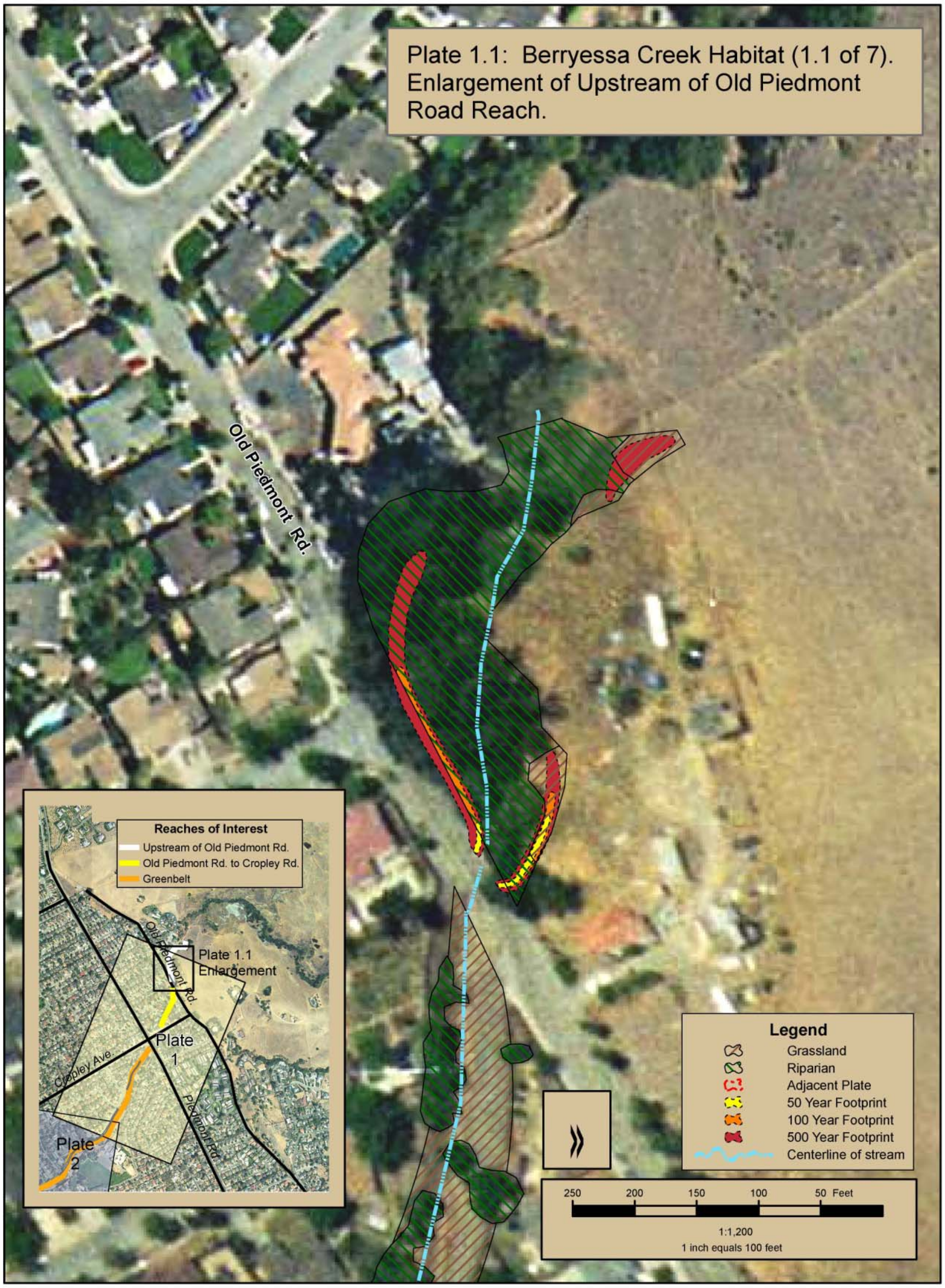


Figure 5-6 Berryessa Creek Habitat – Enlargement of Upstream of Old Piedmont Road Reach

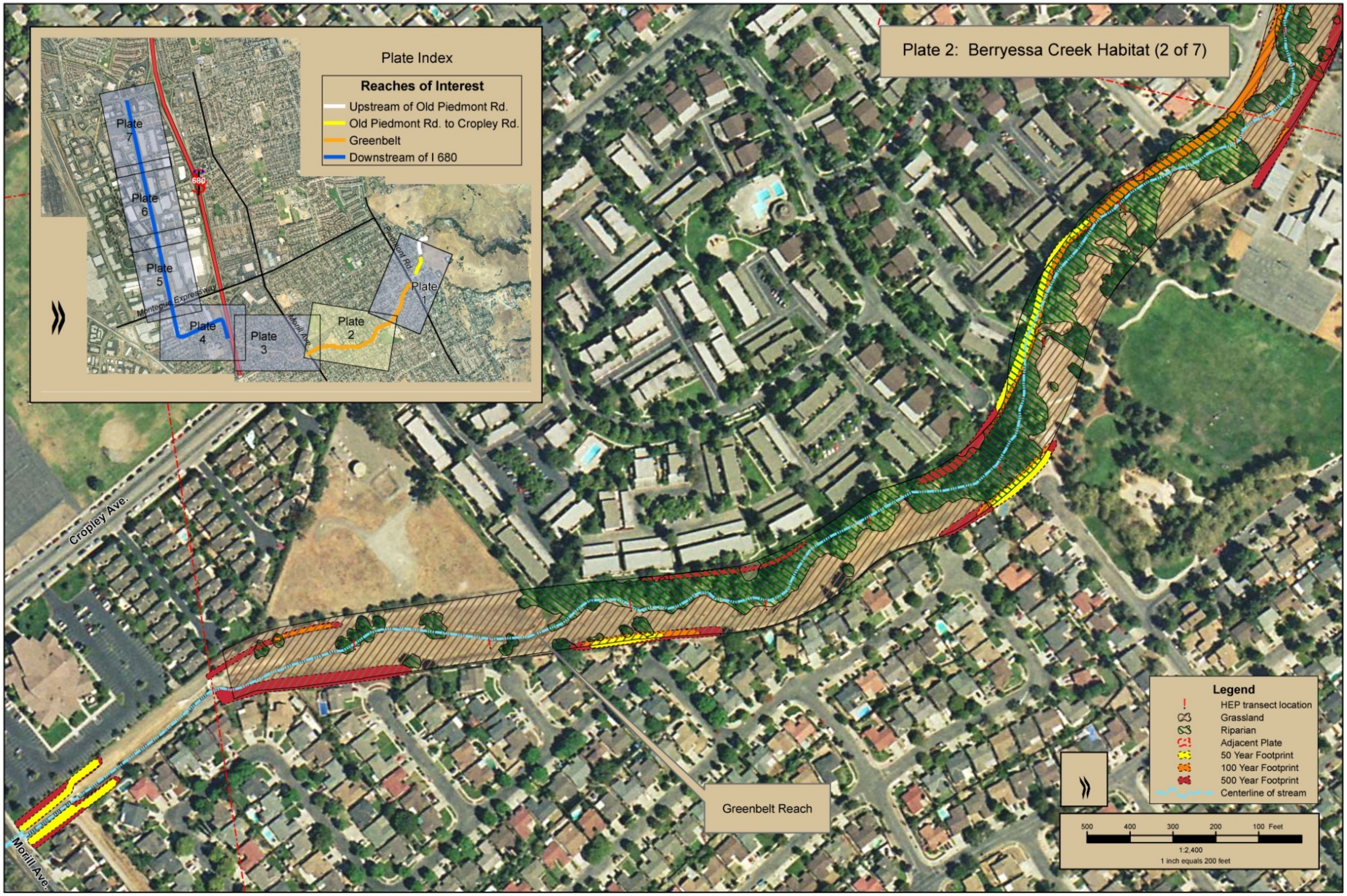


Figure 5-7 Berryessa Creek Habitat – Greenbelt Reach

Figure 5-8 Berryessa Creek Habitat – Morrill Avenue to Upstream of I-680

5.5.3.6 *Mitigation Measures*

(a) Downstream of I-680

Mitigation has been coordinated with the USFWS as required by the Fish and Wildlife Coordination Act. All annual grassland areas disturbed during construction would be re-seeded with native annual grasses. Corps guidance would require removing woody vegetation on the levee prism and within 15 feet of the toe of the levee. Native trees, shrubs, and aquatic vegetation within and adjacent to the site would be avoided to the extent possible. All required tree removal activities will be performed by or under the direct supervision of a certified arborist.

Native trees that cannot be avoided would be compensated to an amount according to consultation with the USFWS under the Fish and Wildlife Coordination Act. To mitigate for the 0.39 acres of seasonal wetlands, wetland vegetation would be re planted onsite upon completion on the project.

In addition, the contractor would be required to implement the following measures:

- Prior to ground-disturbing activities, a qualified biologist would instruct all project personnel in worker awareness training, including recognition of listed species.
- Survey protocols appropriate to raptors and listed birds would be followed. Surveys could be conducted prior to nesting, during nesting, or 30 days prior to construction, depending upon the specific protocol for that species.
- A qualified biologist would conduct pre-construction surveys for the western pond turtle within 24 hours prior to ground disturbance.
- Preconstruction surveys shall be conducted prior to ground-disturbing activities to determine if bat roosting sites are present.
- To the maximum extent practical, nesting sites would be avoided during construction.
- Trees suitable for nesting shall be removed between September 1 and February 15, when any nests would be unoccupied.
- If a listed species is encountered during excavations or any project activities, activities would cease until the species is removed and relocated by a USFWS-approved biologist. Any incidental take would be reported to the USFWS immediately by telephone.

(b) Upstream of I-680

Table 5-5 shows the amount of riparian habitat lost by construction and maintenance of earthen levees in the greenbelt area for Alternative 5 (100-year event project footprint). The mitigation acreage is a product of the HEP analysis conducted by USFWS and the Corps.

Table 5-5 Loss of Existing Riparian Habitat in the Greenbelt		
Alternative	**Area of Riparian Habitat Loss (acres)**	**Mitigation Area (acres)**
Alternative 5 (100-year event)	2.42	2.63

Under Alternative 5, there would be a loss of about 2.42 acres of riparian habitat in the upstream study area. Reestablishment of 2.63 acres of riparian habitat in the greenbelt area would fully replace the habitat value lost. The most promising site for mitigation tree planting would be the southern (downstream) end of the greenbelt area. The planting of native riparian tree species in open areas adjacent to Berryessa Creek could extend the linear distance of riparian tree canopy by about 700 feet.

5.6 CULTURAL RESOURCES

5.6.1 Methodology

Evaluation on cultural resources is based on information provided by literature review, records search, historic map research, field surveys, and consultation with Native American tribes and the State Historic Preservation Office.

There are two principal methods of locating cultural resources. Before a project is started, a records and literature search is conducted at any number of repositories of archeological site records. The search may show that an archeological or historical survey had been conducted and some cultural resources were identified. That information may be enough to proceed with the significance evaluation stage of the project. If a conclusion was reached that (1) no previous survey had been done or (2) a previous survey was either out of date or inadequate, the project cultural resources expert, either a historian or archeologist, carries out a survey to determine if any cultural resources are within the proposed study area boundaries.

After a cultural resource(s) has been identified during a survey, or record and literature search, the Federal agency overseeing the undertaking embarks on a process to determine whether the cultural resource is eligible for listing in the National Register of Historic Places (National Register). Section 106 of the National Historic Preservation Act mandates this process. The Federal regulation that guides the Section 106 process is 36 CFR 800. The criteria for evaluating resources for their National Register eligibility are defined under 36 CFR 60.4.

After a cultural resource has been determined eligible for listing in the National Register, it is accorded the same level of protection as any other property that is listed and becomes formally known as a "historic property," regardless of age. The term historic property refers exclusively to National Register eligible or listed properties.

5.6.2 Cultural Resources Survey Results

The area of potential effects (APE) was surveyed for cultural resources in its entirety in January 2009 (Basin Research Associates, Inc. 2010 (BRA)). The survey relocated one archeological site, CA-SCL-593, but failed to relocate prehistoric archeological site, CA-SCL-156. CA-SCL-593 was the location of a human burial that eroded out of the creek bank in 1987. The presence of prehistoric human remains invariably makes a site eligible for listing in the National Register. The bridges in the APE were recommended as being ineligible for listing in the National Register. They either did not have state bridge numbers, or in the case of the Old Piedmont Road Bridge, the numbers were inaccurate. In all cases, they were not included in the Caltrans statewide Bridge Inventory.

5.6.3 Basis of Significance

Effects are considered to be adverse if they alter, directly or indirectly, any of the characteristics of a historic property that qualify that property for the National Register so that the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association is diminished.

For the purposes of this analysis, an impact on cultural resources would be considered significant and would require mitigation if it would result in any of the following: (1) impacts to the integrity of the visual and physical setting of historic properties; (2) impacts to the structural integrity of historic buildings and structures from demolition; (3) impacts from earth moving activities; and (4) impacts from clearing, grubbing, and follow-on planting.

5.6.3.1 §60.4 Criteria for Evaluation

The criteria applied to evaluate properties for the National Register of Historic Places (NRHP) are listed below. These criteria are worded in a manner to provide for a wide diversity of resources. The following criteria shall be used in evaluating properties for nomination to the National Register, by NPS in reviewing nominations, and for evaluating National Register eligibility of properties.

Any adverse effect on cultural resources that are listed on, or are eligible for listing on the NRHP are considered to be significant. The criteria for the NRHP (36 CFR 60.4) are listed below:

5.6.3.2 NRHP Criteria for Evaluation

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and:

a) that are associated with events that have made a significant contribution to the broad patterns of our history; or

b) that are associated with the lives of persons significant in our past; or

c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d) that have yielded, or may be likely to yield, information important in prehistory or history.

5.6.4 Impact and Mitigation

5.6.4.1 Alternative 1 (No Action)

Archeological site CA-SCL-593 is on the creek bank and would suffer additional erosion from high velocity water flows. During the winter of 2009 channel erosion exposed additional human remains. Unrecorded archeological site C-167 is very close to CA-SCL-593 and may be part of the site. It may be impacted by continuing erosion as well.

5.6.4.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Two archaeological sites would be adversely affected by this alternative: CA-SCL-593 and C-167. Site CA-SCL-593 was determined eligible for the NRHP in 1994; C-167 has not yet been formally evaluated for NRHP eligibility. In order to evaluate C-167, test excavations should be undertaken to determine the nature and extent of the site, whether it is associated with CA-SCL-593, and what research potential exists. The Union Pacific Railroad bridge and culvert would be affected by construction. The Corps has determined that neither site is eligible for listing on the NRHP, the SHPO concurred with this finding in a letter dated January 25, 2012.

5.6.4.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

The effects and evaluations for listing would be the same as Alternative 2A/d.

5.6.4.4 Alternative 4/d (Walled Trapezoidal Channel)

The effects and evaluations for listing would be the same as Alternative 2A/d.

5.6.4.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the authorized plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

Two cultural sites are located in or near the creek upstream of I-680. Site CA-SCL-156 is not eligible for listing in the National Register. The other site is P-43-001136; a Native American burial was located at this site and subsequently reburied there. This site is located outside of the construction footprint and would not be affected by the alternative. A cultural resources monitor would be required to ensure that the location is avoided during construction.

One roadway bridge, three roadway culverts, and one pedestrian bridge are located upstream of I-60 and have been recommended as being ineligible for the National Register (Basin Research Associates, Inc. 2010). However, if a bridge or culvert is determined to eligible for the National

Register, Historic American Engineering Recordation (HAER) may be required for mitigation of adverse effects.

(b) Downstream of I-680

The effects and evaluations for listing would be the same as Alternative 2A/d.

5.6.4.6 Mitigation Measures

The mitigation would be the same for all alternatives. Additional subsurface excavation would be required on CA-SCL-593 to determine if the integrity of the site is intact or if it an isolated burial site. If it is a site, and has integrity, then a Historic Property Treatment Plan would be developed in consultation with the State Historic Preservation officer and interested local Native Americans to guide data recovery efforts.

The Union Pacific Railroad Trestle and associated culvert are located in the construction reach and will be required to be evaluated for their potential for listing in the NRHP. However, Basin Research Associates, Inc., 2010 recommended all bridges as being ineligible for the NRHP. In this scenario, no mitigation is required. If either is determined to eligible for the NRHP during consultation with SHPO, HAER recordation may be required that would fully mitigate adverse effects.

5.7 TRAFFIC AND CIRCULATION

5.7.1 Methodology

This analysis considers the range of foreseeable traffic conditions on roadways in relevant portions of the study area and identifies the primary ways that construction of the project could affect existing traffic conditions. This analysis focuses on construction-related traffic effects and effects of implementing the action alternatives on existing roadways. Therefore, any incremental transportation impacts associated with the project are limited to the proposed construction years. The project is expected to be under construction beginning 2017.

Available literature, including documents published by Federal, State, county, and city agencies that document traffic conditions, were reviewed for this analysis. The information obtained from these sources was reviewed and summarized to establish existing conditions and to identify potential environmental effects based on the significance criteria presented below.

Two components of traffic growth are typically considered when evaluating future year conditions. First, an annual background growth rate is determined based on historical data. Second, any increase in traffic volumes expected from approved development projects are added into the network.

To develop an existing scenario, current traffic counts, timings, and geometry data were obtained from various sources, including the VTA Traffix databases, tube counts conducted in 2008, and through correspondence with City of Milpitas, Caltrans, and City of San Jose officials. Starting from counts conducted in 2008 and 2010, an annual growth rate of 1 percent (not compounded) was applied and approved project trips from residential developments near the future Milpitas

BART station were added. On average, traffic volumes in 2017 were about 12 percent higher. Only one planned improvement is expected to be in place by 2017: an extension of Milpitas Boulevard that would connect Montague Expressway to Capitol Ave, providing access to the BART station.

5.7.2 Basis of Significance

Project alternatives under consideration would result in a significant impact related to transportation and circulation if they would:

- Substantially disrupt the flow and/or travel time of traffic.
- Substantially increase traffic in relation to existing traffic load and capacity of the roadway system.
- Increase delays on transit routes requiring reallocation of transit vehicles.
- Expose people to significant public safety hazards resulting from construction activities on or near the public road system.

5.7.3 Impacts and Mitigation Measures

5.7.3.1 Alternative 1 (No Action)

Under the No Action Alternative, no construction activities would occur; therefore, the project would not create addition traffic around the study area. The existing roadway network, types of traffic, and circulation patterns would be expected to increase traffic by 1 percent each year. This traffic growth is based on historical trends and a qualitative assessment of the Milpitas economic situation. In addition to this linear, area-wide growth, adjustments were made to account for several planned developments on Montague Expressway, near the future site of the Milpitas BART station.

Table 5-6 compares existing traffic to the projected 2017 traffic increases based on normal growth due to other unrelated development projects, general population job and household growth in the area at the study intersections. Table 4-16 presented in Section 4.7 identified only one intersection was below the LOS standard of E: Montague Expressway and Trade Zone Boulevard. Under the 2017 base conditions, this intersection is expected to operate at LOS F during the AM and PM peak hours.

Table 5-6 2017 Base Turning Movements at Study Intersections

(Delay in sec/veh)	Existing				2017 Base			
	AM Peak		PM Peak		AM Peak		PM Peak	
Intersection	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1. Jacklin Road & I-680 Northbound Ramps	N/A		B	16.2	N/A		B	16.3
2. Jacklin Road & I-680 Southbound Ramps	N/A		B+	11.5	N/A		B+	11.8
3. Calaveras Boulevard/ I-880 NB Ramps	B	12.6	B	16.8	B	13.3	B-	18.1
4. Calaveras Boulevard/ Abel Street	D+	38.1	D	44.1	D	40.0	D	46.5
5. Calaveras Boulevard & Milpitas Boulevard	D	40.2	D	44.1	D	42.5	D	48.8
6. Great Mall Parkway & I-880 NB Ramps	C	27.1	C+	20.3	C	29.9	C+	21.5
7. Great Mall Parkway & Abel Street	D	40.7	D+	36.7	D	40.7	D+	35.9
8. Montague Expressway & Capitol Avenue	D	49.7	E+	56.6	E+	57.6	E	61.0
9. Montague Expressway & Milpitas Boulevard	D	39.6	D+	35.1	D	50.7	D	43.2
10. Montague Expressway & I-680 Northbound Ramps	D	40.5	D	46.2	D	44.7	D-	51.1
11. Montague Expressway & Main Street/Old Oakland	E	68.1	D-	54.8	E-	75.7	E	64.8
12. Montague Expressway & Trade Zone Boulevard	F	94.8	F	81.4	F	96.3	F	91.9

5.7.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Alternative 2A/d would modify the Calaveras Boulevard Bridge, Los Coches Street Bridge, and the Montague Expressway Bridge. Under Alternative 2A/d, there would be partial closure of lanes on Montague Expressway, and Calaveras Boulevard. Closures would not be concurrent to reduce traffic congestion. Since these roads are major arterial routes, lane closures would be expected to cause diversions to alternate routes. The potential impacts of the partial closures were evaluated by estimating traffic diversions during the temporary closures and analyzing traffic operations with the diverted traffic.

(a) Traffic Volumes

Engineering judgment was used to determine the number of vehicles that would seek alternate routes given the partial closures at Calaveras Boulevard and Montague Expressway. It was assumed that 50 percent of the traffic in each direction at the closure locations would divert. The alternate routes for the Calaveras Boulevard closure were Great Mall Parkway and Montague Expressway. For the Montague Expressway closure, the alternate routes were assumed to be Great Mall Pkwy, Calaveras Boulevard, and Capitol Avenue. The diverted traffic was split evenly between northerly and southerly destinations (i.e., half were assumed to go north and half were assumed to go south).

(b) Calaveras Boulevard Diversion

Calaveras Boulevard Bridge construction would occur at the Berryessa Creek crossing east of North Hillview Drive. Alternatives 2A would modify the structure at Calaveras Boulevard, requiring closure of one of the six lanes for a period of 30 days. Partial traffic flow would be maintained at all times by restriping the open portion of the roadway to two lanes in each direction.

It is assumed that with partial closure of Calaveras Boulevard, 50 percent of the traffic in each direction would choose to divert from Calaveras Boulevard to alternative routes. Existing traffic counts at each intersection on Calaveras Boulevard were used to estimate the origins and destinations of traffic through the affected area. Based on proportions of turn movements, it was estimated that approximately 50 percent of the traffic in each direction is destined towards the north and 50 percent towards the south. Although several alternative routes would be available, as a conservative analysis all diverted traffic was assumed to use Great Mall Parkway and Montague Expressway to cross between I-880 and I-680 in each direction. Table 5-7 summarizes the level of service at the study intersections during a partial closure.

During the AM peak hour, the Montague/Capitol Avenue intersection would change from LOS of E to a LOS of F. During the AM and PM peak hour, Montague/Main Street/Old Oakland intersection LOS would change from an LOS of E to an LOS of F. During the AM and PM peak hour, the LOS at the Montague/Trade Zone intersection would be LOS F. The Calaveras closure would add more than 4 seconds of delay to the critical movements during the AM and PM peak.

(c) Montague Expressway Diversion

Alternatives 2A would modify the structure at Montague Expressway, requiring a partial closure for a period of 100 days. Partial traffic flow would be maintained at all times.

It is assumed that due to partial closure of Montague Expressway, 50 percent of the traffic in each direction would divert away from Montague Expressway onto parallel roadways like Calaveras Boulevard and Great Mall Parkway. Table 5-8 summarize the level of service at the study intersections during a partial closure. During the AM and PM peak hour, the LOS at the Montague/Trade Zone intersection would be LOS F.

Table 5-7 Year 2017 LOS with a Partial Closure of Calaveras Boulevard

(Delay in sec/veh)	2017 Base				2017 Calaveras Partial Closure			
	AM Peak		PM Peak		AM Peak		PM Peak	
Intersection	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1. Jacklin Road & I-680 Northbound Ramps	N/A		B	16.3	N/A		B	16.3
2. Jacklin Road & I-680 Southbound Ramps	N/A		B+	11.8	N/A		B+	11.8
3. Calaveras Boulevard/ I-880 NB Ramps	B	13.3	B-	18.1	B	12.5	B	13.9
4. Calaveras Boulevard/ Abel Street	D	40.0	D	46.5	D	39.2	D	44.8
5. Calaveras Boulevard & Milpitas Boulevard	D	42.5	D	48.8	D	40.0	D	43.0
6. Great Mall Parkway & I-880 NB Ramps	C	29.9	C+	21.5	C-	32.8	C-	34.2
7. Great Mall Parkway & Abel Street	D	40.7	D+	35.9	D	40.1	D+	35.8
8. Montague Expressway & Capitol Avenue	E+	57.6	E	61.0	F	83.8	E	63.0
9. Montague Expressway & Milpitas Boulevard	D	50.7	D	43.2	D-	54.6	D	50.6
10. Montague Expressway & I-680 Northbound Ramps	D	44.7	D-	51.1	D	44.7	D-	51.1
11. Montague Expressway & Main Street/Old Oakland	E-	75.7	E	64.8	F	97.3	F	98.7
12. Montague Expressway & Trade Zone Boulevard	F	96.3	F	91.9	F*	124.5	F*	114.8

Table 5-8 Year 2017 LOS with a Partial Closure of Montague Expressway

(Delay in sec/veh)	2017 Base				2017 Montague Partial Closure			
	AM Peak		PM Peak		AM Peak		PM Peak	
Intersection	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
1. Jacklin Road & I-680 Northbound Ramps	N/A		B	16.3	N/A		B	16.3
2. Jacklin Road & I-680 Southbound Ramps	N/A		B+	11.8	N/A		B+	11.8
3. Calaveras Boulevard/ I-880 NB Ramps	B	13.3	B-	18.1	B-	19.9	D+	37.0
4. Calaveras Boulevard/ Abel Street	D	40.0	D	46.5	D	42.0	D	49.7
5. Calaveras Boulevard & Milpitas Boulevard	D	42.5	D	48.8	D	48.0	E	59.7
6. Great Mall Parkway & I-880 NB Ramps	C	29.9	C+	21.5	C	31.4	C-	32.5
7. Great Mall Parkway & Abel Street	D	40.7	D+	35.9	D	39.9	D+	35.7
8. Montague Expressway & Capitol Avenue	E+	57.6	E	61.0	E-	79.5	E	63.3
9. Montague Expressway & Milpitas Boulevard	D	50.7	D	43.2	E+	57.7	D-	53.9
10. Montague Expressway & I-680 Northbound Ramps	D	44.7	D-	51.1	C-	33.8	D	47.3
11. Montague Expressway & Main Street/Old Oakland	E-	75.7	E	64.8	E-	78.3	E+	60.0
12. Montague Expressway & Trade Zone Boulevard	F	96.3	F	91.9	F*	146.7	F*	154.3

Construction has the potential to disrupt the flow and travel time at three locations, at the intersections of Montague Expressway with Capitol Avenue, Montague Expressway with Main Street and Montague Expressway with Trade Zone Boulevard. The contractor would coordinate with Santa Clara County to monitor traffic operations at the intersection of Montague and Capitol, and if necessary, revise signal timings and/or implement manual traffic control during peak periods at the intersection during the period of partial closure of Calaveras Boulevard. A traffic operations analysis using Traffix software indicated that optimizing the cycle length would bring the LOS from F to an acceptable LOS E. Implementation of this mitigation measure would reduce the temporary impact to a less than significant level.

Construction would cause temporary significant impacts at the intersection of Montague and Trade Zone Boulevard. The contractor would coordinate with Santa Clara County to monitor traffic operations. The impact at this location would be a temporary significant and unavoidable impact.

Partial closure of Los Coches Street would require diversion to alternative routes such as Yosemite Drive. The temporary diversion would last up to 30 days. The diverted vehicles would be within the capacity of the alternative routes. This impact would be less than significant.

Partial closure of Yosemite Drive would involve the closure of one traffic lane. Traffic would continue to use two lanes in one direction but only one lane in the other direction. This would add delays to traffic on Yosemite Drive but would not require diversion to alternative routes. This impact would be less than significant.

Partial closure of Ames Avenue would involve the closure of one traffic lane for a duration of up to 10 days. The traffic flow on Ames Avenue could be maintained on the single available lane using construction flagging during the period of lane closure. The use of construction flagging would add delay to the traffic on Ames Avenue as only one direction of traffic could be served at a time. A portion of this traffic may divert to alternate routes like Sinclair Frontage Road and Yosemite Avenue. This impact would be less than significant.

Partial closures of streets would temporarily increase delays for transit vehicles during the construction period. VTA transit bus routes that use streets and bus stops in the study area would be impacted due to partial lane closures. Routes 46, 70, 71, 104 and 180 would experience additional delays due to the partial closure of Montague Expressway. Route 47 would experience additional delays due to the partial closures of both Calaveras Boulevard and Montague Expressway. The contractor would coordinate with Santa Clara VTA to identify the schedule of lane closures and, if necessary, provide for temporary manual traffic control to give priority for transit vehicles through congested corridors during the construction period. Implementation of this mitigation measure would reduce this temporary impact to a less than significant.

Full closures of streets would temporarily require bicycles and pedestrians to use alternative routes during the construction period**.** Pedestrians would need to use alternate routes during these closure periods. The contractor would prepare a traffic management plans which include advance notice of street closures so that bicyclists who typically use the creek crossings can identify alternative routes. Implementation of this mitigation measure would reduce the temporary impact to a less than significant.

During the partial lane closures, it would be necessary to close the sidewalk on one side of the street at each location for safety reasons. Pedestrians would need to detour to the sidewalk on the other side of the street. This closure could cause some inconvenience at these locations but would not cause significant increases in delay for pedestrian movements.

5.7.3.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

Under Alternative 2B/d Calaveras Boulevard Bridge, Los Coches Street Bridge, and the Montague Expressway Bridge would be replaced. Partial road closures on Calaveras Boulevard, and the Montague Expressway would last up to 120 days. Los Coches Street would be closed for 60 days and partially closed for an additional 30 days.

Calaveras Boulevard bridge construction would occur at the Berryessa Creek crossing east of North Hillview Drive. Alternatives 2B would replace the structure at Calaveras Boulevard, requiring closure of three of the six lanes for a period of 120 days. Partial traffic flow would be maintained at all times by restriping the open portion of the roadway to two lanes in each direction.

Table 5-7 summarizes the level of service at the study intersections during a partial closure. During the AM peak hour, the Montague/Capitol Avenue intersection would change from LOS of E to a LOS of F. During the AM and PM peak hour, Montague/Main Street/ Old Oakland intersection LOS would change from an LOS of E to an LOS of F. During the AM and PM peak hour, the LOS at the Montague/Trade Zone intersection would be LOS F. The Calaveras closure would add more than 4 seconds of delay to the critical movements during the AM and PM peak.

The bridge on Montague Expressway would be replaced and involve partial road closure on Montague Expressway for a period of 120 days. Partial traffic flow would be maintained at all times by restriping the roadway to two lanes in each direction. It is assumed that due to partial closure of Montague Expressway, 50 percent of the traffic in each direction would divert away from Montague Expressway onto parallel roadways like Calaveras Boulevard and Great Mall Parkway. Table 5-8 summarizes the level of service at the study intersections during a partial closure. During the AM and PM peak hour, the LOS at the Montague/Trade Zone intersection would be LOS F.

Complete closure of Los Coches Street east of Piedmont Road would require traffic to divert to alternative routes. Closure of Los Coches Street would require diversion to alternative routes such as Yosemite Drive. The temporary diversion would last up to 60 days with the B alternatives. The number of vehicles impacted would be up to 550 during peak hours. The diverted vehicles would be within the capacity of the alternative routes. The out-of-direction travel would be up to 1.5 miles. This would be a less than significant impact.

Partial closure of Yosemite Drive would involve the closure of one traffic lane. Traffic would continue to use two lanes in one direction but only one lane in the other direction. This would add delays to traffic on Yosemite Drive but would not require diversion to alternative routes.

Partial closure of Ames Avenue would involve the closure of one traffic lane for a duration of up to 10 days. The traffic flow on Ames Avenue could be maintained on the single available lane using construction flagging during the period of lane closure. A portion of this traffic may divert to alternate routes like Sinclair Frontage Road and Yosemite Avenue (if the partial closure on Yosemite Avenue is not concurrent with Ames Avenue). This impact would be less than significant and no mitigation required.

Los Coches Street would be closed for 60 days. Full closures of streets would temporarily require bicycles and pedestrians to use alternative routes during the construction period**.** Pedestrians would need to use alternate routes during these closure periods. The contractor would prepare a traffic management plans which include advance notice of street closures so that bicyclists who typically use the creek crossings can identify alternative routes. Implementation of this mitigation measure would reduce the temporary impact to a less than significant.

During the partial lane closures, it would be necessary to close the sidewalk on one side of the street at each location for safety reasons. Pedestrians would need to detour to the sidewalk on the other side of the street. This closure could cause some inconvenience at these locations but would not cause significant increases in delay for pedestrian movements.

5.7.3.4 Alternative 4/d (Walled Trapezoidal Channel)

Under Alternative 4/d Calaveras Boulevard Bridge, Los Coches Street Bridge, and the Montague Expressway Bridge would be replaced. Partial road closures on Calaveras Boulevard, and the Montague Expressway would last up to 120 days. Los Coches Street would be closed for 60 days and partially closed for an additional 30 days. The types of effects and significance would be the same as Alternative 2B/d.

5.7.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the authorized plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) *Upstream of I-680*

Alternative 5 would require the complete closure of Old Piedmont Road. The closure of Old Piedmont Road would require diversion to alternative routes such as Piedmont Road, Bloomsbury Way and Tunis Road. The temporary diversion would last up to 30 days. The number of vehicles impacted would be less than 40 during peak hours. The diverted vehicles would be well within the capacity of the alternative routes. The out-of-direction travel would typically be less than one-half mile. Therefore, this impact would be a less than significant impact.

Full closures of streets would temporarily require bicycles to use alternative routes during the construction period. Alternative 5 includes full closure of Old Piedmont Road for 30 days. The contractor would prepare a traffic management plans which include advance notice of street closures so that bicyclists who typically use the creek crossings can identify alternative routes. Implementation of this mitigation measure would reduce the temporary impact to a less than significant.

(b) Downstream of I-680

The types of effects and significance would be the same as Alternative 2A/d.

5.7.3.6 Mitigation Measures

Mitigation measures would be incorporated into the construction plans in order to reduce effects to traffic. The contractor would be required to develop a Traffic Control Plan prior to construction, and coordinate all use of public roads with the City of Milpitas, or other responsible agencies. This plan would include the following measures:

- Construction vehicles would not be permitted to block any roadways or driveways.
- Access will be provided for emergency vehicles at all times.
- Signs and flagmen would be used, as needed, to alert motorists, bicyclists, and pedestrians to the presence of haul trucks and construction vehicles at all access points.
- Vehicles would be required to obey all speed limits, traffic laws, and transportation regulations during construction. Vehicles would not exceed 15 miles per hour on unpaved roads.
- Construction workers would be encouraged to carpool and park in designated staging areas.
- Closure of roads, staging areas, and construction sites would be clearly fenced and delineated with appropriate closure signage.
- The contractor would be required to repair any roads damaged by construction.

With the implementation of the above mitigation measures, all effects to traffic in the study area would be less-than-significant.

5.8 NOISE

5.8.1 Methodology

Construction of the proposed project would require the use of heavy equipment that would temporarily increase noise and ground vibration levels at properties near the work area. After the proposed project is constructed, project maintenance would likely require periodic use of smaller equipment to clean detention sites, channels, and culverts; however, the work would be much less extensive and would take place over a much shorter period (several hours or days) than project construction. Therefore, the analysis of noise impacts focused primarily on noise generation during construction of each project element.

5.8.2 Basis of Significance

Adverse effects on noise were considered significant if an alternative would result in any of the following:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Substantial temporary or permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or
- Substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

5.8.3 Impacts and Mitigation Measures

5.8.3.1 Alternative 1 (No Action)

Under the No Action Alternative, no construction activities would occur; therefore, no potential exists for the project to generate temporary and short-term construction noise. The types and levels of noise and vibration would continue to be influenced by roadway traffic, human activities, and other sources such as wind. Noise-sensitive receptors would be expected to be the same as under existing conditions.

Prior to implementing measures to reduce flood damage, the current level of risk would remain for flooding of areas within Milpitas and San Jose. In the event of a flood, flood fighting and repair-related construction activities would occur. The location and extent of repair related activities could be minor to extensive depending on the location, severity, and duration of flooding. Repair-related construction activities would likely involve repairing damaged homes, utility infrastructure, roads, and highways. Noise-sensitive land uses (i.e., residential uses) are scattered throughout the area in which repair-related construction could be needed.

5.8.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Noise impacts would be limited to the construction phase of the project. Construction activity noise levels at and near the study areas would fluctuate depending on the particular type, number, and duration of uses of various pieces of construction equipment and would result in short-term increases in ambient. Construction related material haul trips would raise ambient noise levels along haul routes, depending on the number of haul trips made and types of vehicles used. Noise related to operational and maintenance would be similar to current maintenance activities.

There are few noise-sensitive receptors since the majority of the study area is in commercial/industrial area. Sensitive receptors that could be affected by this increase include residents along Los Coches and Lakewood Drive, and wildlife. Based on their distance from the project site, residents and other sensitive receptors in the study area are anticipated to experience noise levels between 80 and 90 dBA, similar to those described in Table 5-9. Construction equipment that would be used for the proposed project includes: excavators, water trucks, haul trucks, and maintenance trucks. Construction activities associated with the proposed project would be temporary in nature and related noise impacts would be short-term.

Table 5-9 Construction Equipment Noise Emission Levels[1]

Equipment Type	Typical Noise Level (dB) at 50 Feet	Equipment Type	Typical Noise Level (dB) at 50 Feet
Air compressor	78	Generator	81
Asphalt paver	77	Grader	85
Backhoe	78	Hoe ram extension	90
Compactor	83	Jack hammer	89
Concrete breaker	82	Pneumatic tools	85
Concrete pump	81	Rock drill	81
Concrete saw	90	Scraper	84
Crane, mobile	81	Trucks	74–81
Dozer	82	Water pump	81
Front-end loader	79		

Notes: dB = A-weighted decibels
1 All equipment fitted with properly maintained and operational noise control device, per manufacturer specifications. Noise levels listed are
the actual measured noise levels for each piece of heavy construction equipment.
Sources: Bolt, Beranek, and Newman 1981:8-5; FTA 2006:12-6 to 12-7

Construction of the proposed project would occur between the hours of 7 a.m. and 7 p.m. Monday thru Saturday. The noise associated with the construction activities would fall within the city of Milpitas's construction exemption for noise. Construction activities could increase ambient noise at nearby sensitive receptors, but would be reduced to less than significant with the incorporation of mitigation measures. Long-term effects would be limited to occasional noise generated during visits by maintenance vehicles, which would not be considered significant.

5.8.3.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

The types of effects and significance for Alternative 2B/d would be the same as Alternative 2A/d. Alternative 2A/d would have an increase in truck trips due to more excavation work and bridge and culvert replacements. Construction would occur between the hours of 7 a.m. and 7 p.m. Monday thru Saturday which would fall within the city of Milpitas's construction exemption for noise. Construction activities could increase ambient noise at nearby sensitive receptors, but would be reduced to less than significant with the incorporation of mitigation measures. Long-term effects would be limited to occasional noise generated during visits by maintenance vehicles, which would not be considered significant.

5.8.3.4 Alternative 4/d (Walled Trapezoidal Channel)

The types of effects and significance for Alternative 4/d would be the same as Alternative 2B/d except with possibly a slight increase in truck trips from the construction of the vegetated terraces. Construction would occur between the hours of 7 a.m. and 7 p.m. Monday thru

Saturday which would fall within the city of Milpitas's construction exemption for noise. Construction activities could increase ambient noise at nearby sensitive receptors, but would be reduced to less than significant with the incorporation of mitigation. Long-term effects would be limited to occasional noise generated during visits by maintenance vehicles, which would not be considered significant.

5.8.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the authorized plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

Alternative 5 would cause noise disturbance to residents since this part of the study area has several noise-sensitive land uses and nearby noise-sensitive receptors. Mitigation measures would be implemented to reduce adverse effects. Long-term effects would be limited to occasional noise generated during visits by maintenance vehicles, which would not be considered significant.

(b) Downstream of I-680

The types of effects and significance would be the same as Alternative 2B/d.

5.8.3.6 Mitigation Measures

Implementation of the following measures would reduce noise-related impacts to less than significant:

- In accordance with the City Noise Ordinance exemptions for construction (City of Milpitas Municipal Code Section V-213-3) the construction activities shall be limited to between 7:00 a.m. and 7:00 p.m. daily except holidays.
- Construction equipment noise shall be minimized during project construction by muffling and shielding intakes and exhaust on construction equipment (per the manufacturer's specifications) and by shrouding or shielding impact tools.
- Turn off all equipment, haul trucks, and worker vehicles when not in use for more than 30 minutes.
- Notify residences about the type and schedule of construction.

Compliance with the local noise ordinance would minimize the exposure of residents to excessive noise. Therefore, the impact after mitigation is less than significant.

5.9 RECREATION AND PUBLIC ACCESS

5.9.1 Methodology

Recreational opportunities are limited to the upstream portion of the study area. Impacts on recreation are evaluated based on temporary and permanent changes to those resources that would occur with implementation of the proposed project.

5.9.2 Basis of Significance

The proposed project alternatives under consideration would result in a significant impact related to recreation if they would:

- 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;
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment;
- Substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity; or
- Implement operational or construction-related activities related to the placement of project facilities that would cause a substantial long-term disruption of any institutionally recognized recreational activities.

5.9.3 Impacts and Mitigation Measures

5.9.3.1 Alternative 1 (No Action)

The No Action Alternative would have no effect on recreation and public access in the study area. Existing nearby recreational facilities, opportunities, and use would be expected to remain the same. In addition, the public would continue to have informal access to those areas without fencing.

5.9.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Construction and maintenance of this alternative would have no effects on recreation downstream of I-680. This area has no recreational facilities and little opportunity or use by residents or employees. A trail could be designed and constructed along this section of the creek as part of the project. Such a trail would provide additional opportunities for bicycling, walking, and jogging. In addition, the trail could connect to existing trails, thus providing access to other areas in the region. The City of Milpitas has expressed interest in extending its bike trail system in this area.

5.9.3.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

The effect and significance would be the same as Alternative 2A/d.

5.9.3.4 Alternative 4/d (Walled Trapezoidal Channel)

The effect and significance would be the same as Alternative 2A/d.

5.9.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the Authorized Plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

Construction and maintenance of this alternative would have no effect on recreational facilities or access to those facilities upstream of I-680. No work would be conducted in Berryessa Creek Park, and construction-related vehicles would not affect public access to the park. During construction, informal access to and use of the creek, especially by children and teenagers, would be disrupted since the work areas would be fenced to ensure public safety. Thus, there would be less opportunity for walking and bicycling along the creek. In addition, the quality of the recreational experience of any nearby recreationists could be diminished by construction activity and noise.

However, these adverse effects would only be short-term during construction, and access to the creek would return to pre-project conditions once the project is completed. Construction would be conducted only on weekdays so recreationists in the park would not be disturbed on the weekends. As a result, these adverse effects would be considered less than significant. Long-term effects would be limited to occasional noise generated during visits by maintenance vehicles, which would not be considered significant.

A trail could be designed and constructed along this section of the creek as part of the project. Such a trail would provide additional opportunities for bicycling, walking, and jogging. To date, however, the City of San Jose does not anticipate additional recreational development in the areas adjacent to Berryessa Creek.

(b) Downstream of I-680

The types of effects and significance would be the same as Alternative 2A/d.

5.9.3.6 Mitigation Measures

Since there would be no significant adverse effects on recreation, no mitigation would be required.

5.10 AESTHETICS AND VISUAL RESOURCES

5.10.1 Methodology

Analysis of the proposed project effects were based on evaluation of the changes to the existing visual resources that would result from implementation of the proposed project. In making a determination of the extent and implications of the visual changes, consideration was given to:

- Specific changes in the visual composition, character, and valued qualities of the affected environment;
- The visual context of the affected environment;
- The extent to which the affected environment contained places or features that have been designated in plans and policies for protection or special consideration; and
- The numbers of viewers, their activities, and the extent to which these activities are related to the aesthetic qualities affected by the project-related changes.

It should be noted that an assessment of visual quality is a subjective matter, and reasonable people can disagree as to whether alteration in the visual character of the proposed project would be adverse or beneficial.

5.10.2 Basis of Significance

The proposed project alternatives under consideration would result in a significant impact related to visual resources if they would:

- Have a substantial adverse effect on a scenic vista;
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;
- Substantially degrade the existing visual character or quality of the site and its surroundings; or
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

5.10.3 Impacts and Mitigation Measures

5.10.3.1 Alternative 1 (No Action)

Under the No Action Alternative, there would be no potential for the project to degrade the existing visual character or quality of the site and its surroundings. The No Action alternative would have no effect on aesthetics or visual resources in the study area. The basic components, character, and quality of the regional and local viewsheds would be expected to remain the same.

Prior to implementing measures to reduce flood damage the current level of risk would remain for flooding of areas within Milpitas and San Jose. In the event of a flood, flood fighting and repair-related construction activities would occur. Damage to visual resources would depend on the extent and duration of a flood event and subsequent repair. Flooding could cause damage to structures, vegetation, and woodlands.

5.10.3.2 Alternative 2A/d (Incised Trapezoidal Channel–Moderate Protection))

There would be no indirect effects associated with construction of Alternative 2A/d. Direct effects from construction of Alternative 2A/d would have temporary and permanent effects on the aesthetics. During construction, the presence of construction equipment, workers, and activities would temporarily obscure the viewshed and change the visual character of the area. After construction is complete, the equipment and workers would leave the area, and scenic views would be unobstructed to the viewers in the area.

The visual character of the creek in most areas would change permanently. The shape of the channel would change to a trapezoidal configuration with floodwalls in some sections. However, this change would not degrade the visual character because the channel would continue to be earthen. Grasses and other vegetation would be removed to construct the trapezoidal channel and floodwalls. The side channels would be planted with a seed mix to control erosion and appear as annual grassland habitat. All modification and replacement of bridges and culverts would be consistent with existing bridge designs in the area so there would be no change in the visual character of the modified or new structures. Since there would be no substantial effects on scenic views or the visual character of the area, this alternative would have no significant adverse effects.

5.10.3.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

Under Alternative 2B/d temporary effects on the aesthetics would be the same as in Alternative 2A/d. However, under Alternative 2B/d the permanent visual quality of the site would be altered. The creek channel would be widened varying from 2 – 38 feet in width. Vertical concrete floodwalls with a maximum height of 4 feet would be installed, except from the reach from Yosemite Drive to Los Coches Street. At this location, the maximum height of the floodwall would be 5 feet. Although concrete would contrast with the earthen channel, the walls would be consistent with other concrete structures in the viewing area.

Grasses and other vegetation would be removed prior to construction. Upon completion of construction the site would be reseeded with native grasses to restore site conditions and help minimize erosion.

All existing culverts would be replaced, as well as, the UPRR Trestle Bridge, Los Coches Street Bridge, Calaveras Boulevard Bridge. The new structures would be consistent with existing bridge designs so there would be no change in the visual character. Sediment accumulated at the I-680 bridge, Ames Avenue bridge, and Yosemite bridge would be removed and abutment protect would be added.

5.10.3.4 Alternative 4/d (Walled Trapezoidal Channel)

The types of effects and significance for Alternative 4/d would be the same as Alternative 2B/d except the channel would be a 10 foot width, earthen low-flow channel. The location the concrete floodwalls would be the same as in Alternative 2B/d. Alternative 4/d would have floodplain benches (10ft and 32ft) bounded by 3 – 6 foot vertical floodwalls. The bridge and culvert modifications for Alternative 4/d would be the same as in Alternative 2B/d.

5.10.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the Authorized Plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

Construction of Alternative 5 would have temporary and permanent effects on the aesthetics upstream of I-680.

Construction would require the installation of sediment basin, low flow pipes, and a concrete lined channel. Small levees, with a maximum height of 3 feet, would be constructed along the creek. Some large trees, bushes, and other vegetation would be removed to construct the new levees in the greenbelt area. To mitigate for this effect, suitable species of trees would be planted onsite; it is assumed in areas currently without trees. In addition, the project site would be reseeded to replace grasses and help minimize erosion. Over time, the grasses and new trees would grow and mature, improving the visual character of the greenbelt. All modification and replacement of bridges and culverts would be consistent with existing bridge designs in the area so there would be no change in the visual character of the modified or new structures.

(b) Downstream of I-680

Alternative 5 would construct trapezoidal concrete channel with a varying bottom width. Construction would require the removal and/or relocation of several features within the proposed project footprint, including utilities, vegetation, and timber trestles. The bridge and culvert modifications for Alternative 5 would be similar to Alternative 2B/d. Although this alternative would replace the earthen channel with concrete, there would not be a significant change in the viewing area since the study area is in an industrial area and would be consistent with the other concrete structures.

5.10.3.6 Mitigation Measures

(a) Downstream of I-680

There would be no significant long-term effects on aesthetics or visual resources in the study area, therefore, no mitigation would be required. All areas impacted by the project would be revegetated and restored to remain consistent with preconstruction conditions.

(b) Upstream of I-680

Under Alternative 5, there would be a loss of 2.42 acres of riparian habitat. Once construction is completed, all disturbed areas would be restored. Disturbed areas would be reseeded with native grasses and forbs to promote revegetation. Trees and woody vegetation would be replanted in accordance to USFWS CAR. The grasses, as well as annuals and some small shrubs, would be expected to grow relatively quickly and improve that aspect of the viewshed within a year or two. As a result, the project would not be considered a significant effect on the visual character of the area.

5.11 HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE

5.11.1 Methodology

This section addresses potential sources of hazards and risks associated with hazardous materials that may be associated with implementation of the project. This analysis is based on the Phase 1 environmental site assessment (ESA) report.

5.11.2 Basis of Significance

The proposed project alternatives under consideration would result in a significant impact related to hazards and hazardous materials if they would:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment; or

- Locate the project on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and as a result, would create a significant hazard to the public or the environment.

5.11.3 Impact and Mitigation Measures

5.11.3.1 Alternative 1 (No Action)

Under the No Action Alternative, no construction activities would occur; therefore, no accidental spills of hazardous materials related to this project would occur. Existing sources of HTRW would be expected to remain the same. Downstream of I-680 are three sites of concern near the study area: Jones Chemical Company, Great Western Chemical Company, and a Shell gas station (Figure 2 of the HTRW Appendix). These sites contain plumes of contaminated groundwater. If the ongoing remediation efforts do not successfully contain or treat the groundwater plumes, then groundwater contamination could migrate into the study area in the future.

Prior to implementing measures to reduce flood damage, the current level of risk would remain for flooding of areas within Milpitas and San Jose. In the event of a flood, flood fighting and repair-related construction activities would occur. A flood event could result in flooding that could upset stored hazardous materials and spread agricultural pesticides, oil, gasoline, and other hazardous materials in flood waters, creating somewhat localized or widespread hazardous conditions for the public and the environment.

5.11.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

There are three HTRW sites of concern near the study area: Jones Chemical Company, Great Western Chemical Company, and a Shell gas station. These sites contain plumes of contaminated groundwater. Depending on the site, the plumes contain either MTBE, VOC or PAH. The ongoing remediation efforts may not successfully contain or treat the groundwater plumes; consequently, groundwater contamination potentially could migrate into the study area underneath Berryessa Creek. If contaminated groundwater intersects Berryessa Creek and further spreads contamination to subsurface soils or surface water, then excavation of the channel could potentially expose contaminated soils and create a hazard to construction workers, the public, or the environment. These effects could potentially be significant.

Project-related construction and maintenance activities would involve the use of potentially hazardous materials, such as fuels (gasoline and diesel), oils and lubricants, and cleaners (e.g., solvents, corrosives, soaps, detergents), which are commonly used in construction projects. During construction, accidental spills could occur, although minor spills are not likely to have significant effects. Accidental spills would be avoided or minimized through the implementation of a Spill Prevention and Response Plan.

Compliance with the applicable regulations would reduce the potential for accidental release of hazardous materials during their transport and during project construction activities. Consequently, the risk of significant hazards associated with the transport, use, and disposal of these materials is low.

5.11.3.3 Alternative 2B/d (Incised Trapezoidal Channel– FEMA Certified Protection)

The types of effects and significance for Alternative 2A/d would be the same as Alternative 2A/d.

5.11.3.4 Alternative 4/d (Walled Trapezoidal Channel)

The types of effects and significance for Alternative 2B/d would be the same as Alternative 2A/d.

5.11.3.5 Alternative 5 (Authorized Project)

As discussed in Chapter 3, Alternative 5 is the Authorized Plan and is evaluated for Corps planning purposes. Alternative 5 would be used by the Corps for comparative reasons but is not a candidate for selection.

(a) Upstream of I-680

Based on numerous assessments and extensive water and soil analysis within the study area, there are no substances in the water column, sediments, or embankment soils in sufficient concentrations to be classified as hazardous. Upstream of I-680, there are no HTRW sites of concern.

During construction, accidental spills of hazardous materials (diesel fuel, gasoline, oil, grease, hydraulic fluid, engine coolant, and concrete) could occur, although minor spills are not likely to have significant effects. Accidental spills would be avoided or minimized through the implementation of a Spill Prevention and Response Plan.

Project activities upstream of I-680 are not likely to create any significant HTRW hazards to the public or the environment.

(b) Downstream of I-680

The types of effects and significance for Alternative 5 downstream of I-680 would be the same as Alternative 2A/d.

5.11.3.6 Mitigation Measures

Soil characterization would occur during the Preconstruction Engineering and Design (PED) phase to verify the absence of contamination. In the event that constituents of concern have migrated into the project site in regulated concentrations, a remediation plan would be developed during PED and implemented by the sponsor prior to construction in the contaminated area.

To reduce health hazards associated with potential exposure to hazardous substances the following measures before initiating ground-disturbing activities:

- Prepare a plan that identifies any necessary remediation activities including excavation and removal of on-site contaminated soils and redistribution of clean fill material within the project site, if necessary. The plan shall include measures that ensure the safe transport, use, and disposal of contaminated soil and building debris removed from the site. In the event that contaminated groundwater is encountered during site excavation activities, the contractor shall report the contamination to the appropriate regulatory agencies, dewater the excavated area, and treat the contaminated groundwater to remove contaminants before discharge into the sanitary sewer system. The contractors shall be required to comply with the plan and applicable Federal, State, and local laws. The plan shall outline measures for specific handling and reporting procedures for hazardous materials and disposal of hazardous materials removed from the site at an appropriate off-site disposal facility.

- Notify the appropriate Federal, State, and local agencies if evidence of previously undiscovered soil or groundwater contamination (e.g., stained soil, odorous groundwater) is encountered during construction activities. Any contaminated areas shall be remediated in accordance with recommendations made by the San Francisco Bay Regional Water Quality Control Board, and/or other appropriate Federal, State, or local regulatory agencies.

5.12 GROWTH-INDUCING EFFECTS

The areas of San Jose and Milpitas adjacent to Berryessa Creek downstream of Old Piedmont Road are almost completely developed, and there is little remaining vacant land. Any future growth and development would be in accordance with City and County General Plans, and future growth in the area is not currently restricted by the potential for flooding from Berryessa Creek. As a result, none of the alternatives would remove any significant restrain to growth. Therefore, the alternatives would not induce growth in or near the study area.

5.13 CUMULATIVE EFFECTS

NEPA regulations require that an EIS discuss project effects that, when combined with the effects of other projects, result in significant cumulative effects. This section first identifies other existing, ongoing, or planned projects in or near the Berryessa Creek study area and then discusses any effects of the project that could result in significant cumulative effects with these other projects.

5.13.1 Existing, Ongoing, or Planned Projects

5.13.1.1 Santa Clara Valley Transportation Authority (VTA)

(a) Highway 237/I-880 Interchange Reconstruction Project

This transportation project includes two elements: (1) Carpool connectors from southbound I-880 to westbound Route 237 and from eastbound Route 237 to northbound I-880, and (2) a southbound "braided" exit ramp from I-880 to Tasman Drive. The project was completed during spring 2005.

(b) Bay Area Rapid Transit (BART) Extension Project

This project proposes a BART extension to Milpitas, San Jose and Santa Clara. The proposal includes a 16.3 mile extension along a railroad right-of-way through Milpitas to San Jose. Along the alignment, stations are proposed at the following seven locations: Montague/Capitol, Berryessa, Alum Rock, Market Street, Diridon/Arena, and Santa Clara. On April 16, 2010, the Final Environmental Impact Report was published for a two- station, 10 mile extension of BART. Construction began in 2012 and is ongoing.

(c) I-880 Widening from North First Street to Montague Expressway

This highway project widens I-880 between U.S. 101/North First Street and Montague Expressway from a four to a six-lane freeway. The project was completed in January 2004.

(d) Tasman East Light Rail Project

This project consists of a 4.9 mile light rail extension in two segments, the first from Baypointe Parkway to Alder Drive, and the second from Alder Drive to just south of Hostetter Road. Seven new light rail stations would be added. Segment one was completed in 1999; and segment two was completed in 2004.

(e) Capitol Light Rail Project

This project consists of a 3.3 mile light rail extension of the Tasman Light Rail Line. The project travels along Capitol Avenue from just south of Hostetter Road to Wilbur Avenue, north of Capitol Expressway. The Capitol Light Rail adds four new stations.

5.13.1.2 Santa Clara Valley Water District (SCVWD)

(a) Lower Berryessa Creek Flood Protection Project

The SCVWD proposes to construct a project that will provide protection from the 100-year flood event long Berryessa Creek between Lower Penitencia Creek confluence and Calaveras Boulevard. Included in this project are improvements to Calera Creek and Tularcitos Creek, both tributaries to Berryessa Creek. The total length of the project, including the tributaries, is approximately 4.1 miles. The project was initiated because the creek's channel capacity downstream of Calaveras Boulevard is not sufficient to convey the design flows from the upstream project without inducing flooding or violating FEMA freeboard requirements for levees. The lower portions of Calera and Tularcitos Creeks were added because project improvements would create a backwater effect that could induce flooding. The SCVWD is currently cooperating with the VTA (the local transportation agency) to construct the first phase of the work to begin in 2013 and be completed in two to four years.

(b) Coyote and Berryessa Creeks Flood Protection Project

The SCVWD has completed the first element of this project by constructing flood damage reduction features on lower Coyote Creek from Montague Expressway downstream to the San Francisco Bay. The second element is the proposed (Upper) Berryessa Creek Element described in this document.

(c) Coyote Creek Flood Protection Project (formerly Mid-Coyote Flood Protection)

The SCVWD proposes to improve Coyote Creek from Montague Expressway upstream to Interstate 280, a length of approximately 6.1 miles, to ensure flood protection from a 100-year event.

(d) Upper Penitencia Creek Flood Protection Project

The SCVWD is partnering with the U.S. Army Corps of Engineers, San Francisco District, to complete a feasibility study which will identify a plan to improve Upper Penitencia Creek from the confluence with Coyote Creek upstream to Dorel Drive, a length of approximately 4.1 miles, to ensure flood protection from a 100-year event. Construction of this project is currently scheduled to occur in 2012.

5.13.1.3 City of Milpitas

The Santa Clara County Valley Transportation Plan (VTP) 2040 is the countywide plan for transportation funding and service decisions for Santa Clara County through the year 2020. The plan includes a prioritized list of transportation projects, as well as long-range strategic recommendations for land use and transportation policies. The City of Milpitas is considering the following projects to be included in VTP 2040.

(a) Calaveras Boulevard Widening

The existing two bridges between Milpitas Boulevard and Abel Street would be replaced with a six-lane bridge complete with 10-foot sidewalks and 6-foot bike lanes.

(b) Montague Expressway and Great Mall Parkway Interchange Improvements

The intersection between Montague Expressway and Great Mall Parkway/Capitol Avenue has been operating at congested levels of service “F” since 1991. A grade separation of the Great Mall Parkway/Capitol Avenue through lanes over Montague Expressway would greatly enhance capacity and maintain compatibility with the existing elevated light rail structure and future BART. The resulting at-grade signalized intersection on Montague Expressway would accommodate a partial frontage road and left turn lanes.

(c) Montague Expressway BART Pedestrian Overcrossing

The project would span Montague Expressway from the future Milpitas BART Station parking structure to a planned development site east of Piper Drive as highlighted in the City of Milpitas Transit Area Specific Plan.

(d) Berryessa Creek Trail- Hillview Drive to City Limits

The project would continue the Berryessa Creek Trail from Hillview Drive south to the City Limits near Montague Expressway. The path is 1.86 miles long and would connect to the future Milpitas BART station area.

5.13.2 Cumulative Impact Analysis

5.13.2.1 Air Quality

Construction of the proposed project is not expected to have any long-term effects on air quality since the operational activities (including inspection and maintenance) are expected to be similar to existing conditions. However, construction would result in direct, short-term effects on air quality mainly related to combustion emissions and dust emissions. Implementation of mitigation measures during construction would reduce emissions to the extent possible. Since the project would not require a change in the existing land use designation, long-term projected emissions of criteria pollutants would be the same with or without the project. In addition, the project individually would not result in a significant effect on air quality.

However, construction of the Lower Berryessa Creek Flood Protection Project Phase 2, and the Upper Penitencia Creek Flood Protection Project has the potential to overlap with construction of the Project. These concurrent construction activities could have a significant cumulative effect on air quality. It is expected that effects from these projects would be similar to the current project in that effects would be primarily due to construction activities. Therefore, construction of these projects would increase emissions of criteria pollutants, including ROG, NO_X, CO, and PM emissions.

Individually these projects would mitigate emissions below significance threshold levels. If these construction projects are implemented concurrently, the combined cumulative effects could be above CEQA thresholds for air quality emissions and *de minimus* thresholds. To address these potential cumulative effects, the Corps would coordinate the scheduling and sequence of construction activities with the cities of Milpitas and San Jose and BAAQMD. For example, should activities such as excavation occur simultaneously for multiple projects in the area, the agencies would stagger the work in order to comply with the thresholds, reducing the potential for adverse cumulative effects. Coordination on this level would reduce any potential cumulative air quality effects to less than significant.

5.13.2.2 Climate Change

It is unlikely that a single project would have a significant effect on the environment with respect to GHGs. However, the cumulative effect of human activities has been clearly linked to quantifiable changes in the composition of the atmosphere, which, in turn, have been shown to be the main cause of global climate change (IPCC 2007). While the emissions of one single project would not cause global climate change, GHG emissions from multiple projects throughout the world could result in a cumulative effect with respect to global climate change.

With respect to global warming, CO_2 is tracked as a contributor to GHG emissions. GHG emissions generated by the proposed project would predominantly be in the form of CO_2. CO_2 emissions would be generated from combustion sources including operation of construction vehicles, mobile vehicles, and haul trucks. Construction emissions of CO_2 would be temporary and short-term and would have a less-than-significant impact.

During construction, best management practices required by the BAAQMD for all projects in the Berryessa and Coyote Creek watershed would reduce emissions of dust and equipment exhaust. The implementation of best management practices would reduce the potentially significant, cumulative effects of vehicle and construction equipment exhaust emissions the effects on air quality to less than significant, and the project is not expected to contribute significantly to cumulative climate change.

5.13.2.3 Water Resources and Quality

During construction, the incremental contributions of suspended solids, sediment loads, and nutrients would have less than significant effects because ground-disturbing activities would be conducted in compliance with approved Storm Water Pollution Prevention Plans, erosion and sediment control plans, and mitigation and monitoring plans. The implementation of best management practices would reduce the potentially significant, cumulative effects of soil erosion to a level that is less than significant.

Any temporary impairment of water quality resulting from spills of construction materials or equipment fluids would be avoided or minimized through the use of best management practices. Potential cumulative effects would be less than significant because toxic materials control and spill response plans would be implemented for major construction projects in the watershed.

Any adverse effects on wetlands effects caused by the Berryessa Creek Element or other projects in the watershed would be fully mitigated. Wetland loss would be mitigated by the creation of additional wetlands, and disturbed wetlands in the Berryessa Creek channel is assumed to reestablish naturally. With the implementation of wetland mitigation and replacement, the cumulative effects upon wetlands would be less than significant.

5.13.2.4 Biological Resources

Construction activities would cause a temporary loss of grasses in the Berryessa Creek watershed. This temporary loss of grasses would be mitigated by reseeding of grass. Cumulative effects upon vegetation in the Berryessa Creek watershed would be less than significant.

There would be a temporary disturbance of wildlife during project construction. The disturbance would be temporary and less than significant because wildlife would tend to reenter and/or repopulate the study area once construction is completed. Cumulative effects upon wildlife in the Berryessa Creek watershed would be less than significant.

The Berryessa Creek Element and other projects in the Berryessa and Coyote Creek watershed have the potential to temporarily disturb or harm special status animal species during project construction. Some habitat loss or disturbance could result from construction activities. Surveys would be conducted during spring and summer or prior to construction to determine species presence and location of nesting sites. To lessen potential adverse effects, mitigation plans would be developed in consultation with the USFWS and the CDFW. Cumulative effects on special status species would be reduced to a less than significant level through the implementation of mitigation plans and avoidance and minimization measures.

5.13.2.5 Cultural Resources

During construction, there is the potential for the Berryessa Creek Element and other projects to uncover previously unknown archeological sites. If these sites contain burial artifacts or human remains, there is the potential for significant, adverse effects upon cultural resources. The use of construction monitors, and implementation of inadvertent discovery procedures, including the notification of the SHPO and other authorities, would reduce any potential, cumulative effects to a level that is less than significant.

Implementation of the Section 106 of the NHPA process, including testing and evaluation of known archeological sites and evaluation for listing of bridges, culverts, and railroad trestles, would reduce any potential, cumulative effects on cultural resources to a level that is less than significant.

5.13.2.6 Traffic and Circulation

Construction of the Berryessa Creek Element would cause temporary significant impacts at three locations: at the intersections of Montague Expressway with Capitol Avenue, Montague Expressway with Main Street, and Montague Expressway with Trade Zone Boulevard.

The proposed construction activities would have short-term effects on traffic levels on local and regional roadways, which would temporarily decrease their LOS. While construction of the projects would temporarily increase traffic counts on roadways within the vicinity of the project, the volume of trucks associated with these projects would not be of sufficient magnitude to affect the LOS on these roadways. Through the implementation of best management practices and traffic control plans, the cumulative effects on traffic and circulation would be reduced to a level that is less than significant.

Following construction, the proposed project would not contribute to cumulative regional traffic and transportation impacts associated with other projects in the region. Minimization practices at all sites and the relative distances between multiple projects would reduce cumulative effects on local traffic and circulation to less than significant. The operation of the Berryessa Creek Element would have no cumulative effects on traffic.

5.13.2.7 Noise

The temporary effects of noise during the construction of flood control or transportation projects could be significant. However, operation of the Berryessa Creek Element would have no long-term, cumulative effects upon ambient noise levels in the Milpitas and San Jose urban areas. Construction involved with both the proposed project and the projects listed above are short-term and, therefore, there will be no long-term cumulative noise effects other than increases in noise levels during simultaneous construction activities.

5.13.2.8 Recreation and Public Access

Except for the greenbelt area, Berryessa Creek has relatively little, existing recreational use. During construction of the proposed project, public access would be temporarily limited, but access would be restored upon completion of construction. Future construction of a bicycle trail downstream of I-680 by the City of Milpitas has the potential to have a significant, positive effect upon recreation and public access. The proposed bicycle trail could create cumulative, recreational benefits in the Milpitas urban area.

5.13.2.9 Aesthetics and Visual Resources

Upon completion of the Berryessa Creek Element, the visual character of the creek would change to include small levees or floodwalls, but the project would have no significant, cumulative effects upon aesthetics or visual resources in the Milpitas and San Jose urban areas.

5.13.2.10 Hazardous, Toxic and Radiological Waste

During construction of the Berryessa Creek Element and other projects in the Milpitas and San Jose area, best management practices would be implemented to avoid and minimize the possibility of accidental spills of hazardous materials. Through the implementation of these best management practices, the cumulative effects would be less than significant.

Downstream of I-680, the Berryessa Creek Element could receive groundwater contamination from nearby groundwater plumes. The potential adverse effects would be avoided through ongoing monitoring and the implementation of a Hazardous and Toxic Materials Contingency Plan. Through the implementation of these best management practices, any potential, cumulative effects would be less than significant.

5.14 RELATIONSHIP OF SHORT-TERM USES AND LONG TERM PRODUCTIVITY

NEPA requires that an EIS consider the relationship between short-term uses of the environment and the impacts that such uses may have on the maintenance and enhancement of long-term productivity of the affected environment. This section compares the short- and long-term environmental effects of the proposed project.

Short-term uses of the environment resulting from construction of Alternatives 2A/d, 2B/d, 4/d, and 5 would narrow the range of beneficial uses of the environment and lead to some adverse effects on existing riparian vegetation. In the long term, planting to restore this habitat type would offset the loss of riparian vegetation and enhance the long-term productivity of Berryessa Creek. Other short-term environmental effects associated with construction activities, such as reduced air quality and increased noise and traffic, would occur only during the construction phase of the alternative and would not adversely affect the long-term productivity of the environment.

5.15 IRREVERSIBLE AND IRRETRIEVABLE ENVIRONMENTAL COMMITMENT OF RESOURCES

Alternatives 2A/d, 2B/d, 4/d, and 5 would result in the irretrievable commitment of land, construction materials, fossil fuels, and other energy resources needed to construct the channel modifications and bridges. The land needed to widen the channel and construct the levees and maintenance road would experience an irreversible change in land use. Modification and replacement of the bridges would also result in the irretrievable commitment of construction materials and fossil fuels during construction. Maintenance of the channel modifications and bridges is not expected to increase the use of construction materials or fossil fuels since maintenance activities are currently ongoing.

Onsite mitigation would require the irretrievable commitment of materials and fossil fuels to prepare the soils and install the plantings. Maintenance of the mitigation would also result in a small increase in use of materials and fossil fuels. All mitigation would contribute to the environmental sustainability of the creek corridor and be consistent with urban uses of the surrounding area.

5.16 COMPARISON OF ALTERNATIVES

Table 5-10 summarizes the environmental effects, levels of significance, and mitigation of Alternatives 2A/d, 2B/d, 4/d, and 5.

5.17 IDENTIFICATION OF THE ENVIRONMENTALLY PREFERRED AND ENVIRONMENTALLY SUPERIOR ALTERNATIVE

NEPA requires environmentally preferable alternative be identified in the alternatives which were considered. Environmentally preferred is defined as the alternative that will promote the national environmental policy as expressed in Section 101 of the National Policy Act, meaning the alternative that causes the least damage to the biological and physical environment. In addition, it means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources.

CEQA Guidelines (Section 15126.6(e)(2)) require that an environmentally superior alternative be identified among the alternatives considered. The environmentally superior alternative is generally defined as the alternative which would result in the least adverse environmental impacts to the project site and surrounding area. If the No Action Alternative is found to be the environmentally superior alternative, then the document must also identify an environmentally superior alternative among the other alternatives.

The No Action Alternative would not result in any physical impacts to the environment; however, the No Action Alternative, it would fail to meet the purpose and need of the project. The No Action Alternative would fail to provide the long-term flood reduction benefits associated with the construction of flood walls and would therefore not be considered an environmentally superior alternative.

Each design alternative meets the purpose of the project and the overall impacts associated with each alternative are similar with the exception of Alternative 5, which is not being carried forward. The main differences in impacts between Alternative 2A/d, Alternative 2B/d and Alternative 4 can be found in the areas of air quality, wetlands and water quality, and road closures.

Alternative 2A/d would have a shorter construction period resulting from replacing only the UPRR Trestle Bridge where as Alternative 2B/d and Alternative 4 require the replacement of the Montague Expressway culvert, the Los Coches Street Bridge, the Calaveras Boulevard Bridge, and the UPRR Trestle Bridge and culvert. The shorter construction period would result in fewer emissions and less impact on air quality. Alternative 2B/d would have increase emissions since the alternative requires more earth moving activities and import of materials as compared to Alternative 2A/d and Alternative 4.

Alternative 2A/d, Alternative 2B/d and Alternative 4 will result in impacts to 0.39 acres of jurisdictional wetlands. Alternative 2A/d and Alternative 2B/d would have approximately the same channel bottom width. Alternative 4 would have a narrow channel bottom with setback flood walls. All three alternatives would have side slopes with cellular bank protect and buried riprap to reduce erosion and improve water quality. Alternative 4 would have vegetative floodplain terraces which could benefit water quality.

Alternative 2A/d, Alternative 2B/d and Alternative 4 have a low potential to affect the western pond turtle and cause a temporary disturbance to wildlife habitat. Alternative 2B/d and Alternative 4 have the potential to disturb *Myotis* bats during bridge replacements.

Alternative 2A/d would result in the shortest duration of road closes and the least impact to traffic. Alternative 2A/d would modify the Calaveras Boulevard Bridge, Los Coches Street Bridge, and the Montague Expressway Bridge whereas; Alternative 2B/d and Alternative 4 require the replacement of these bridges. Alternative 2A/d would require the partial closure of Calaveras Boulevard for up to 30 days and Montague Expressway for up to 10 days. Los Coches Street could be partially close for up to 30 days. Alternative 2B/d and Alternative 4 would require the partial road closure of Calaveras Boulevard and Montague Expressway which could last up to 120 days. Los Coches Street could be fully close for up to 60 days and partially closed for an additional 30 days.

Based on a quantitative analysis of impacts presented in this document it can be determined the Alternative 2A/d would have the fewest environmental impacts and would therefore be considered the environmentally superior alternative.

Determination of the environmentally superior alternative does not preclude other alternatives from being selected. The lead agency may adopt a statement of overriding considerations which expresses the agency's views on the merits of approving a project despite its significant adverse environmental impacts. The statement of overriding considerations provides the justification for proceeding with a project despite its environmental impacts. The statement reflects the balancing of competing public objectives including factors such as environmental concerns, legal issues, technical, social, and economic factors. Since the Corps has selected the environmentally superior option, a statement of overriding considerations does not need to be provided.

Table 5-10 Summary of Environmental Effects, Levels of Significance, and Mitigation for Alternatives					
Environmental Resource	**Alternative 1 (No Action)**	**Alternative 2A/d**	**Alternative 2B/d**	**Alternative 4/d**	**Alternative 5 (Authorized Plan)**
Geology, and Seismicity					
Effects	Climatic, geologic, and seismic conditions expected to remain the same	**No effect.**	**No effect.**	**No effect.**	**No effect.**
Significance	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Mitigation	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Topography and Soils					
Effects	Topography and soil types expected to remain the same	Temporary soils disturbance during construction.	Temporary soils disturbance during construction.	Same as Alternative 2B/d.	Same as Alternative 2B/d.
Significance	Not applicable.	**Less-than-significant with mitigation**	**Less-than-significant with mitigation**	**Less-than-significant with mitigation**	**Less-than-significant with mitigation**
Mitigation	Not applicable.	Use of best management practices to minimize loss of soil.	Use of best management practices to minimize loss of soil.	Same as Alternative 2B/d.	Same as Alternative 2B/d.
Land Use, Socioeconomics, and Environmental Justice					
Effects	Land use expected to be consistent with City General Plans. Socioeconomics and ethnic diversity would change per social/economic trends.	**No effect.**	**No effect.**	**No effect.**	**No effect.**
Significance	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Mitigation	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Air Quality					
Effects	Air quality conditions expected to remain the same or deteriorate with continuing development.	Temporary increase in ROG, NOx, CO, PM_{10} and $PM_{2.5}$ emissions due to operation of construction equipment and vehicles.	Temporary increase in ROG, NOx, CO, PM_{10} and $PM_{2.5}$ emissions due to operation of construction equipment and vehicles.	Same as Alternative 2B/d.	ROG, NOx, CO, and PM emissions would temporarily increase due to operation of construction equipment and vehicles. Project exceeds BAAQMD air quality NOx thresholds.
Significance	Not applicable.	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation**	**Less-than-significant with mitigation.**
Mitigation	Not applicable.	Compliance with BAAQMD mitigation.	Compliance with BAAQMD mitigation.	Same as Alternative 2B/d.	Compliance with BAAQMD mitigation. State mitigation fee payments for excess NOx emissions.
Climate Change					
Effects	No effect.	CO_2e emissions would occur during project construction.	CO_2e emissions would occur during project construction.	Same as Alternative 2B/d.	CO_2e emissions would occur during project construction.
Significance	Not applicable.	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation**	**Less-than-significant with mitigation.**
Mitigation	Not applicable.	Compliance with BAAQMD mitigations.	Compliance with BAAQMD mitigations.	Same as Alternative 2B/d.	Compliance with BAAQMD mitigations.
Water Resources and Quality					
Effects	Water resources and water quality conditions expected to remain the same.	Potential increase in sediment load, suspended solids, and nutrients due to soil erosion. Possible accidental spills or leaks from equipment or vehicles. Possible slight temporary increase in water temperature.	Potential increase in sediment load, suspended solids, and nutrients due to soil erosion. Possible accidental spills or leaks from equipment or vehicles. Possible slight temporary increase in water temperature.	Same as Alternative 2B/d except possible minimal benefits on water temperature and sediment load from plantings on terraces.	Potential increase in sediment load, suspended solids, and nutrients due to soil erosion. Possible accidental spills or leaks from equipment or vehicles. Possible slight temporary increase in water temperature. Germinate effects to 2.42 acres of riparian habitat.

Table 5-10 Summary of Environmental Effects, Levels of Significance, and Mitigation for Alternatives					
Environmental Resource	**Alternative 1 (No Action)**	**Alternative 2A/d**	**Alternative 2B/d**	**Alternative 4/d**	**Alternative 5 (Authorized Plan)**
Significance	Not applicable.	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Not applicable.	Use of best management practices to minimize soil erosion and accidental spills/leaks. Implementation of all requirements of regulatory agreements, permits, and plans.	Use of best management practices to minimize soil erosion and accidental spills/leaks. Implementation of all requirements of regulatory agreements, permits, and plans.	Same as Alternative 2B/d.	Use of best management practices to minimize soil erosion and accidental spills/leaks. Implementation of all requirements of regulatory agreements, permits, and plans.
Biological Resources					
Effects	Vegetation and wildlife expected to remain the same.	Temporary loss of grassland. Wildlife disturbed and displaced during construction. Potential temporary disturbance of western pond turtle, Cooper's hawk, white-tailed kite, western big-eared bat, and Myotis bats.	Temporary loss of grassland. Wildlife disturbed and displaced during construction. Potential temporary disturbance of western pond turtle, Cooper's hawk, and white-tailed kite.	Same as Alternative 2B/d except potential benefit of 4.66 AAHU if plant terraces downstream of I-680.	Temporary loss of grassland and loss of 2.42 acres of riparian habitat. Displaced wildlife during construction. Potential temporary disturbance of western pond turtle, Cooper's hawk, white-tailed kite, western big-eared bat, and Myotis bats
Significance	Not applicable.	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Not applicable.	Implementation of recommendation proposed by USFWS. Site restoration; reseed grasses, planting of wetland vegetation. Surveys conducted prior to construction to determine presence of species of concern. Specific avoidance measures implemented, if needed.	Implementation of recommendation proposed by USFWS. Site restoration; reseed grasses, planting of wetland vegetation. Surveys conducted prior to construction to determine presence of species of concern. Specific avoidance measures implemented, if needed.	Same as Alternative 2B/d.	Implementation of recommendation proposed by USFWS. Site restoration; reseed grasses, planting of wetland vegetation. Reestablishment of 2.63 acres of riparian habitat in the greenbelt area Surveys conducted prior to construction to determine presence of species of concern. Specific avoidance measures implemented, if needed.
Cultural Resources					
Effects	Sites CA-SCL-156 and P-43-001136 remain the same. Archeology sites CA-SCL-593 and C-167 continue to be at risk from erosion.	Disturbance of sites CA-SCL-593 and C-167. Changes to bridges, culverts, and trestle.	Disturbance of sites CA-SCL-593 and C-167. Changes to bridges, culverts, and trestle.	Same as Alternative 2B/d.	Disturbance of sites CA-SCL-593 and C-167. Changes to bridges, culverts, and trestle.
Significance	Not applicable.	**Significant if determined eligible for listing in National Register.**	**Significant if determined eligible for listing in National Register.**	**Significant if determined eligible for listing in National Register.**	**Significant if determined eligible for listing in National Register.**
Mitigation	Not applicable.	Cultural resources monitor onsite near CA-SCL-156 and P-43001136. Mitigation program for eligible sites. Possible Historic American Engineering Recordation for eligible bridges, culverts, or trestle.	Cultural resources monitor onsite near CA-SCL-156 and P-43001136. Mitigation program for eligible sites. Possible Historic American Engineering Recordation for eligible bridges, culverts, or trestle.	Same as Alternative 2B/d.	Cultural resources monitor onsite near CA-SCL-156 and P-43001136. Mitigation program for eligible sites. Possible Historic American Engineering Recordation for eligible bridges, culverts, or trestle.
Traffic and Circulation					
Effects	Traffic expected to remain the same or increase with continuing development.	Contribute to an overall increase in traffic volumes on the roadway network on a localized and temporary basis.	Construction activities would contribute to an overall increase in traffic volumes on the roadway network on a localized and temporary basis.	Same as Alternative 2B/d.	Contribute to an overall increase in traffic volumes on the roadway network on a localized and temporary basis.
Significance	Not applicable.	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Not applicable.	Develop a Traffic Control Plan prior to construction and coordinate all use of public roads with the City of Milpitas and City of San Jose, or other responsible agencies.	Develop a Traffic Control Plan prior to construction and coordinate all use of public roads with the City of Milpitas, or other responsible agencies.	Same as Alternative 2B/d.	Develop a Traffic Control Plan prior to construction and coordinate all use of public roads with the City of Milpitas and City of San Jose, or other responsible agencies.

Table 5-10 Summary of Environmental Effects, Levels of Significance, and Mitigation for Alternatives					
Environmental Resource	**Alternative 1 (No Action)**	**Alternative 2A/d**	**Alternative 2B/d**	**Alternative 4/d**	**Alternative 5 (Authorized Plan)**
Noise					
Effects	Noise sources and sensitive receptors expected to remain the same. Noise levels could increase due to increases in traffic volumes.	Construction activities would occur during exempt hours. Increased noise levels generated by construction equipment, haul trucks, and worker vehicles.	Construction activities would occur during exempt hours. Increased noise levels generated by construction equipment, haul trucks, and worker vehicles.	Same as Alternative 2B/d.	Construction activities would occur during exempt hours. Increased noise levels generated by construction equipment, haul trucks, and worker vehicles.
Significance	Not applicable.	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Not applicable.	Implement measures to reduce short term effect on noise.	Implement measures to reduce adverse effect on sensitive receptors.	Same as Alternative 2B/d.	Implement measures to reduce adverse effect on sensitive receptors.
Recreation and Public Access					
Effects	Recreational facilities and access expected to remain the same.	Informal public access to the creek disrupted during construction.	Informal public access to the creek disrupted during construction.	Same as Alternative 2B/d.	Informal public access to the creek disrupted during construction. Quality of recreational experience in Berryessa Creek Park diminished during construction.
Significance	Not applicable.	**Less-than-significant effect.**	**Less-than-significant effect.**	**Less-than-significant effect.**	**Less-than-significant effect.**
Mitigation	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Aesthetics and Visual Resources					
Effects	Aesthetics and visual resources expected to remain the same.	Viewshed obscured during construction. Visual character of creek would change to include small floodwalls and earthen trapezoidal channel downstream of I-680	Temporary visual effect of construction equipment. Permanent change to visual character of the creek.	Same as Alternative 2B/d except earthen low-flow channel with flood plain benches bounded by vertical concrete floodwalls downstream of I-680	Permanent change to visual character of the creek to include a concrete lined channel. Temporary visual effect of construction equipment.
Significance	Not applicable.	**Less-than-significant effect.**	**Less-than-significant effect.**	**Less-than-significant effect.**	**Less-than-significant with mitigation.**
Mitigation	Not applicable.	Disturbed areas would be reseeded with native grasses.	Disturbed areas would be reseeded with native grasses.	Same as Alternative 2B/d.	Trees would be replanted on site. Disturbed areas would be reseeded with native grasses.
Hazardous, Toxic, and Radiological Waste					
Effects	Remediation of three existing HTRW sites downstream of I-680. HTRW sites outside study area expected to remain the same or undergo remediation.	Potential groundwater contamination from three HTRW sites downstream of I-680. Possible accidental spills or leaks from equipment or vehicles	Potential groundwater contamination from three HTRW sites downstream of I-680. Possible accidental spills or leaks from equipment or vehicles.	Same as Alternative 2B/d.	Potential groundwater contamination from three HTRW sites downstream of I-680. Possible accidental spills or leaks from equipment or vehicles.
Significance	Not applicable.	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**	**Less-than-significant with mitigation.**
Mitigation	Not applicable.	Ongoing monitoring for groundwater contaminants. Implement Hazardous and Toxic Materials Contingency Plan, if needed. Use of best management practices to minimize soil erosion and accidental spills/leaks.	Ongoing monitoring for groundwater contaminants. Implement Hazardous and Toxic Materials Contingency Plan, if needed. Use of best management practices to minimize soil erosion and accidental spills/leaks.	Same as Alternative 2B/d.	Ongoing monitoring for groundwater contaminants. Implement Hazardous and Toxic Materials Contingency Plan, if needed. Use of best management practices to minimize soil erosion and accidental spills/leaks.

5.18 U.S. FISH AND WILDLIFE SERVICE RECOMMENDATIONS

USFWS submitted a draft CAR for the Berryessa Creek Flood Control Project April 2012. The recommendations from that CAR are presented below and the Corps responses follow each recommendation. The preliminary draft CAR is included in Appendix A, Part VI. The USFWS recommends that the Corps:

- Avoid impacts to any native trees, shrubs, and aquatic vegetation within and adjacent to the site to the extent possible.

  Corps response: Native trees, shrubs, and aquatic vegetation will be avoided to the greatest extent possible.

- Avoid future impacts at the site by ensuring any fill material used for construction is free of contaminants.

  Corps response: The Corps would comply with CVRWQCB requirements in a 401 water quality certification for the project which would ensure contaminants are not added by fill material placement. No contaminants were identified in the HTRW assessment.

- Avoid impacts to migratory birds nesting in trees along the access routes and adjacent to the proposed sites by conducting preconstruction surveys for active nests along proposed haul roads, staging areas, and construction sites. This would be especially important if construction begins in the spring. Work activity around active nests should be avoided until young have fledged.

  Corps response: The Corps would avoid adverse effects to nesting migratory birds, by complying with the Migratory Bird Act and conduct surveys for all migratory bird nests within the study area prior to construction.

- Minimize impacts by reseeding all disturbed areas at the completion of construction with native forbs and grasses.

  Corps response: All disturbed areas that would be seeded with native grasses.

- Minimize the impact of removal and/or trimming of any trees and shrubs by having these activities supervised and/or completed by a certified arborist.

  Corps response: If tree removal and/or trimming activities are necessary, they would be performed by or under the direct supervision of a certified arborist.

- Work with the Service and other resource agencies to quantify project affects and determine mitigation needs for the selected project alternative.

  Corps response: The Corps will continue to coordinate with the Service and appropriate agencies throughout the project.

- Contact NOAA Fisheries for possible effects of the project on federally listed species under their jurisdiction.

  Corps response: The Corps has contacted NOAA Fisheries.

- Contact the California Department of Fish and Game regarding possible effects of the project on State listed species.

  Corps response: The Corps has contacted California Department of Fish and Game.

CHAPTER 6 – COMPARISON OF ALTERNATIVE PLANS

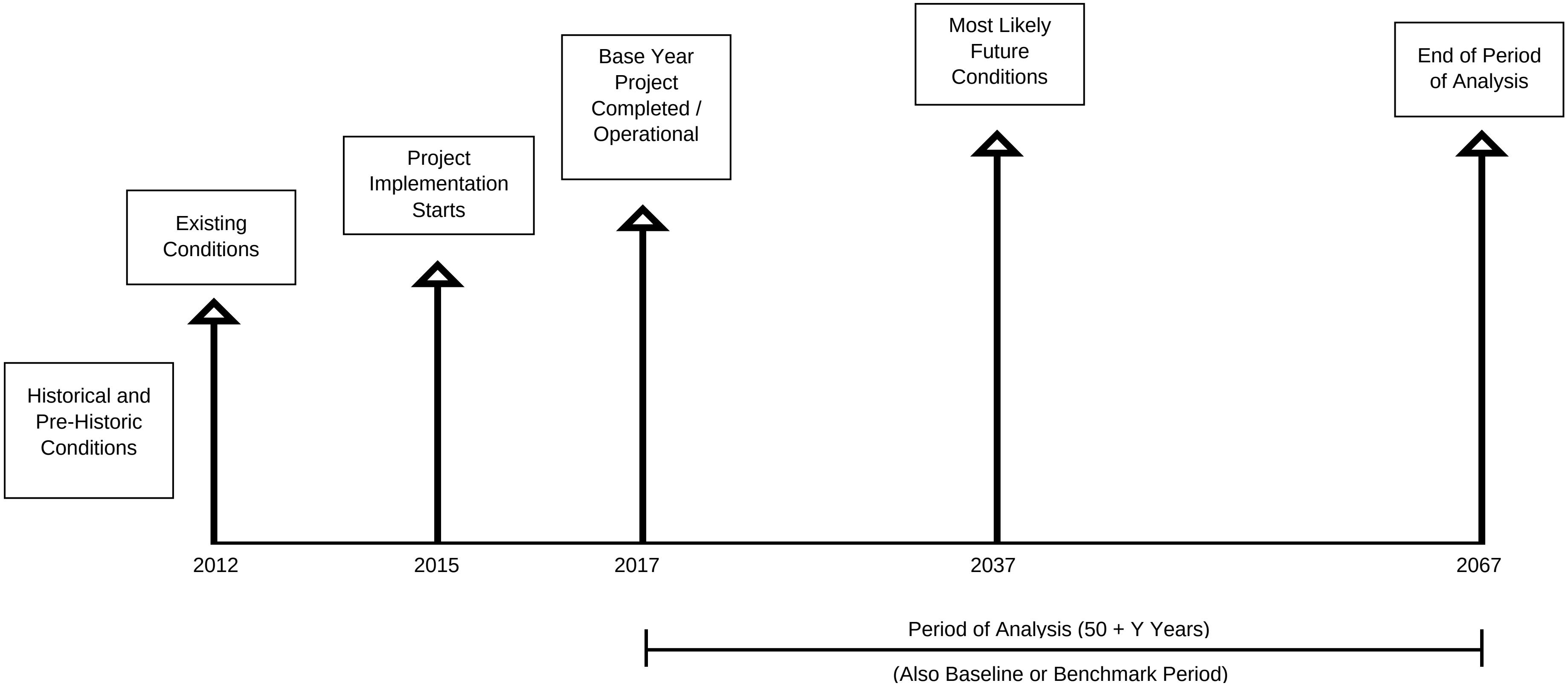
6.1 FINAL REEVALUATION PROCESS AND CRITERIA

The process for evaluation of alternatives to the authorized project was conducted in accordance with standard Federal procedures for planning water resources projects, regulations, and laws, and the requirements of NEPA. A selected set of alternative project modifications—at first preliminary alternatives followed by the final array of alternatives—were considered to better meet the authorized project's objectives for flood control and environmental compliance while avoiding and mitigating adverse effects to the maximum extent practicable. These alternatives were developed and evaluated specifically to meet the objectives described in Section 3.2 and in consideration of the concerns of the resource agencies and other interested persons raised during the public scoping process. The results presented show that there are alternatives to the authorized project that are most likely feasible and implementable and thus warrant more detailed evaluation.

6.1.1 Base Year and Economic Period of Analysis

Base year conditions are defined as those conditions which are expected to exist within the study area in the earliest year that a project could begin to produce benefits. For the Berryessa Creek Element, base year conditions begin immediately after construction, when operation begins. This period was chosen to coincide with the completion of the downstream Lower Berryessa Project (downstream of Calaveras) expected to be completed by the SCVWD in 2012.

A thorough assessment and evaluation was conducted for existing conditions in the study area, and this was brought forward in time based on expected future change in the study area and its resources over a fifty-year period of analysis. A base year of 2017 was chosen on the assumption that study completion, slated for 2013, would be funded for the plans and specifications phase of construction soon thereafter, and that the design would be completed approximately two years later. This construction would begin in 2015 and be completed in 2017. The period of analysis would end in 2067, as shown in Figure 6-1. These periods provide the basis for comparison and evaluation of alternatives. For the purposes of this analysis, a common base year was assumed for all plans to allow for an accurate comparison of costs and potential impacts.



WHERE:

Existing Conditions – year of inventory of what is presently there (2012)
Project Implementation Starts – assumed year when construction begins (2015)
Base Year – first year project is fully operational (2017)
Most Likely Future Conditions Year – specific future year targeted for analysis (typically 20 – 30 years from base year)
End of Period of Analysis Year – last year project assumed functional

Figure 6-1 Period of Analysis

6.2 COMPARISON OF ALTERNATIVE PLANS

The purpose of this step is to compare the results from the evaluations completed, for the purpose of developing a recommended plan that addresses the flooding problems in Berryessa Creek. A more detailed project footprint, including temporary construction easements, staging areas, and access routes, is presented in the overview exhibits at the end of Chapter 6.

6.2.1 Hydraulic Design

6.2.1.1 Hydrologic Effects

With-project discharges are actually higher within the creek than the without-project discharges. This is typical of flood risk management projects that maintain flow within the channel that otherwise would overflow onto the floodplain in the without-project condition. The discharges for the without- and with-project conditions upstream of I-680 remain the same in Alternatives 2A/d and 4. On the other hand, the difference between without- and with-project discharges upstream of I-680 is less pronounced in Alternative 5.

6.2.1.2 Water Surface Profiles

The with-project water surface elevations resulting from the additional discharge in Alternatives 2B/d, 4/d, and 5 are generally higher than in Alternative 2A/d, but the amount of increase is highly variable. These results are for fully contained flows. Comparison to existing conditions is therefore hypothetical only; the computed without-project (Alternative 1) water surface elevation at any point assumes full containment at each upstream section, and flows are restricted to the extent of each cross section in the event of breakout.

Among different alternatives, the different channel configurations downstream of I-680 affect water surfaces that vary by reach. The vegetated terraces in Alternative 4/d tend to reduce the available conveyance in the channel in comparison to Alternatives 2A/d and 2B/d.

6.2.2 Sediment Transport

The quantitative sediment analysis was conducted for the without-project, Alternatives 2A/d, 2B/d, and 4/d using hydraulic models developed for previous phases of this study for existing conditions between Old Piedmont Road and I-680. In addition, analyses were conducted for Alternatives 2B/d and 4/d assuming the proposed SCVWD bypass alternative was in place between Old Piedmont Road and I-680.

The analysis indicated an increase in sediment transport through the I-680 to Montague Expressway and Montague to Calaveras Boulevard for Alternatives 2A/d and 2B/d. The increased transport results in a decrease in deposition in the I-680 to Montague reach for the alternatives. With a larger amount of sediment being transported through the upstream reach, there is an increase in the amount of deposition in the Montague to Calaveras Boulevard reach for all alternatives over the without-project alternative. Overall, the total amount of sediment deposited in the study area for Alternatives 2A/d and 2B/d is nearly equal to that under the without-project conditions. In contrast, the analysis showed a marked increase in deposition in for Alternative 4/d.

The analysis also showed a significant reduction in the deposition in the sediment basin below the Piedmont-Cropley culvert over existing conditions. This is due to a majority of flood flows being transported through the proposed SCVWD bypass culvert. The reduction in the flood flows to the Greenbelt reach results in a significant reduction in the sediment supply to the downstream reach. The sediment supply conveyed through the bypass culvert adds to the supply to the downstream reach, but accounts for only a small portion of the reduced Greenbelt sediment supply. The sediment transport rate for the Morrill to I-680 reach is greater than the combined sediment supply for the Greenbelt and bypass culvert. Since the sediment transport capacity through the reach is greater than the incoming supply, no deposition is seen in the reach. For Alternatives 2B/d and 4/d, there is an increase in sediment transport through the I-680 to Montague and Montague to Calaveras reaches over the without-project alternative. The increased transport results in no deposition in the I-680 to Montague reach. Normally, a larger amount of sediment being transported through the upstream reach would result in an increase in the amount of deposition in the Montague to Calaveras Boulevard reach. But since the supply from the Greenbelt reach is limited, the transport capacity of Alternative 2B/d can transport the entire supply to the downstream reach with no deposition and Alternative 4/d showing a small amount of deposition.

Throughout the study area, there are large variations in velocities and shear stresses that can cause localized sedimentation and scour problems. During the design phase, the project design needs to be further refined to reduce the level of these changes. Additionally, the measures used to provide passage of the design event through bridges should be reviewed. There may be the creation of significant backwater conditions in cases in which walls were extended above the bridge deck to contain flows. The reduced velocity and shear stress may cause an additional potential for additional, localized deposition in an area that in some cases already experiences deposition.

Currently, the study area is a deposition zone, and a reduction in velocity will further increase deposition and the need for maintenance. Constructed features should facilitate removal of deposited sediments.

6.2.3 Floodplains

The final array of alternative plans was analyzed using the Lower Berryessa Creek FLO-2D model. Of the four project alternatives, only Alternatives 2A/d and 5 have breakouts from the Berryessa Creek channel for the modeled events. Alternatives 2B/d and 4/d were developed to meet FEMA certification requirements using risk-based principles assuming SCVWD's bypass structure upstream of I-680 is implemented. The bypass design resulted in higher flow rates at I-680 resulting in Alternatives 2B/d and 4/d to have a larger conveyance capacity allowing both alternatives to convey up to the 0.002 exceedance probability event. Thus, no residual floodplains were mapped for these alternatives.

6.2.3.1 Alternative 1 (No Action)

The floodplains developed for the No Action Alternative used the Lower FLO-2D model and the updated Upper FLO-2D model. The Upper FLO-2D model was extended to the south to include the area up to the Penitencia Creek watershed boundary. The Upper model also included a channel segment representing the Sierra Creek channel, which extended from the confluence with Berryessa Creek to the Sierra Creek culvert outlet. HEC-RAS models for the Berryessa and Sierra Creeks were used to calibrate the Upper model to ensure that the FLO-2D channel system was accurately simulating the in-channel flows as well as the three bridges (i.e., Old Piedmont Road, Piedmont Cropley culvert, and Morrill Avenue culvert) that are sources of breakout flows.

The FLO-2D models were run for the 0.20, 0.10, 0.04, 0.02, 0.01, 0.005, and 0.002 exceedance probability events. The resulting floodplains show flooding downstream of Piedmont Creek when the 0.20 and 0.10 exceedance probability events were routed. Breakouts from various locations upstream and downstream of I-680 occur when the 0.04 exceedance probability event was routed. The floodplains became larger as higher exceedance probability events were routed. The with-project conditions floodplain for the 0.002 exceedance probability event are shown in Figure 6-2. The maps for the other events may be found in Part II, Floodplain Development of Appendix B.

6.2.3.2 Alternative 2A/d (Incised Trapezoidal Channel –Moderate Protection)

Alternative 2A/d consists of a 0.01 exceedance probability event level of protection downstream of the I-680 culvert. The 0.005 and 0.002 exceedance probability floodplains were developed for Alternative 2A/d. For both events, the residual with-project conditions floodplains show residual flooding downstream of I-680. Breakouts occur from various locations upstream of I-680. The with-project conditions floodplain for the 0.002 exceedance probability event is shown in Figure 6-3.

6.2.3.3 Alternative 2B/d (Incised Trapezoidal Channel –FEMA Certified Protection)

As previously mentioned, the channel for Alternative 2B/d contains flows of up to 0.002 exceedance probability event; therefore, no residual floodplain occurs downstream of I-680. Upstream of I-680, breakouts occur at various locations.

6.2.3.4 Alternative 4/d(Walled Trapezoidal Channel)

Similar to Alternative 2B/d, the channel for Alternative 4/d contains flows of up to 0.002 exceedance probability event; therefore, no residual floodplain occurs downstream of I-680. Upstream of I-680, breakouts occur at various locations.

6.2.3.5 Alternative 5 (Authorized Plan)

Alternative 5 is the only plan in the final array of alternatives with project features upstream of I-680. The Upper FLO-2D model was modified to include the proposed channel improvements. The modified Upper model was used to develop the floodplain upstream of I-680. The breakout flows developed from the HEC-RAS model was routed through the Lower FLO-2D model to develop the floodplain downstream of I-680.

The 0.01, 0.005, and 0.002 exceedance probability floodplains were developed for Alternative 5. Breakouts occur at Calaveras Boulevard and Los Coches Avenue when the 0.01 exceedance probability event was routed. The floodplains increase as the remaining exceedance probability events were routed. The with-project conditions floodplain for the 0.002 exceedance probability event are shown on Figure 6-4. The maps for the other events may be found in Part II, Floodplain Development, of Appendix B.

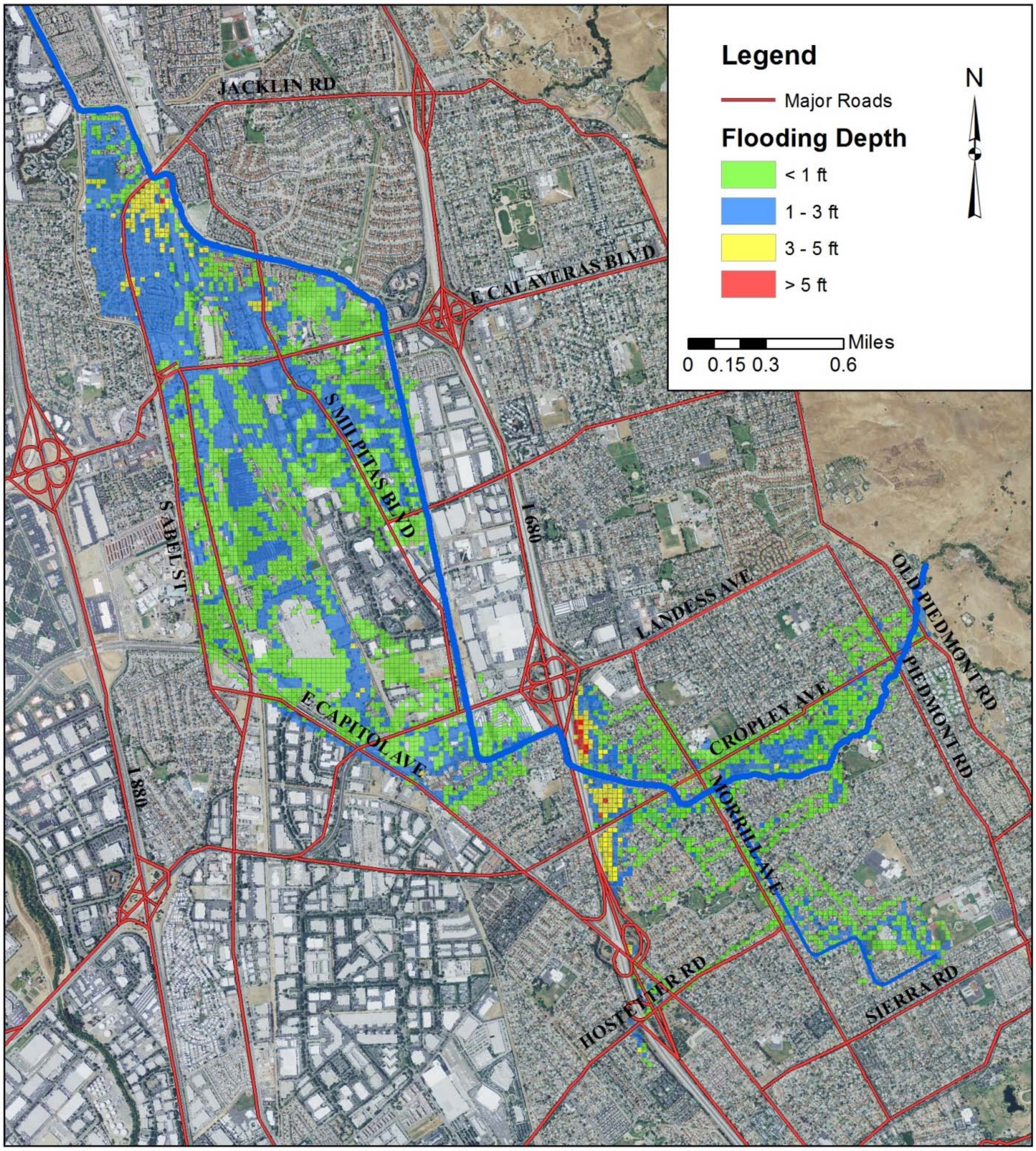


Figure 6-2 0.002 Exceedance Probability Event Floodplain – No Action Alternative

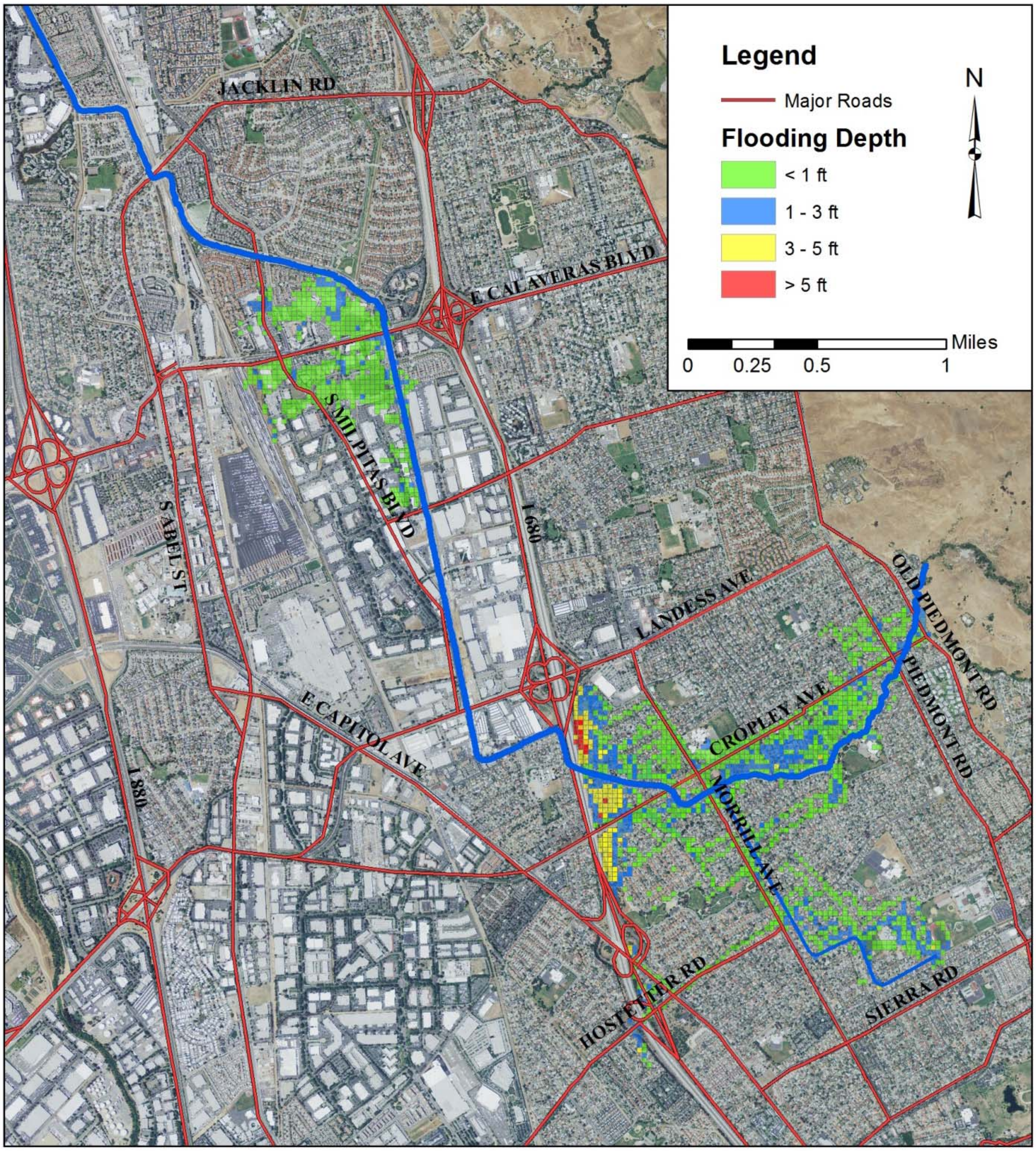


Figure 6-3 0.002 Exceedance Probability Event Floodplain – Alternative 2A/d

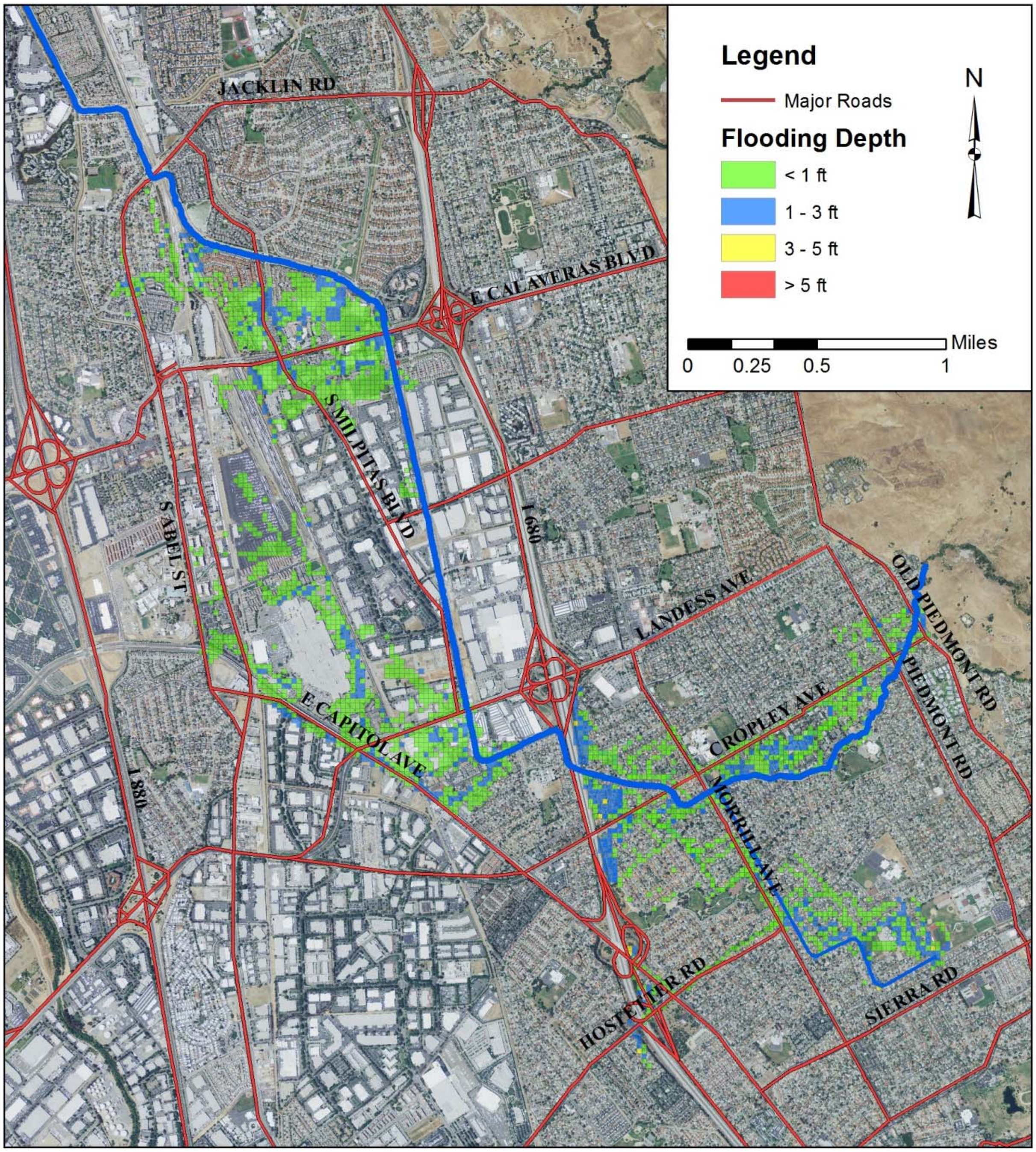


Figure 6-4 0.002 Exceedance Probability Event Floodplain – Authorized Project

6.2.4 Incidental Recreation Features

While the Berryessa Creek Element is a single-purpose flood risk management project, the constructed features may also provide some opportunity to achieve incidental recreational benefits. A 15-foot wide obstruction-free zone provides access for maintenance, inspection, and flood-fighting purposes along both sides of the channel throughout the entire reach downstream of I-680. Per Corps requirements for levees and floodwalls, the obstruction-free zone must be kept free of vegetation and any other obstructions; however, some recreational use may be accommodated within the obstruction-free zone without hindering the primary purposes.

The quantities and cost estimates developed assume the roadway in the obstruction-free zone is surfaced with compacted backfill, in-situ material, or coarse aggregate. A review of the City of Milpitas' Master Trail Plan (Sokale/Landry Collaborative 1997) was conducted to determine the feasibility of locating a multi-use recreation trail within the obstruction-free zone. The City of Milpitas was consulted in comparing the project features in the current design with the Master Plan criteria, and it was determined that additional paving would be required to allow the obstruction-free zone to serve as a recreational trail and meet the requirements of the American Disability Act (ADA) and City of Milpitas design criteria.

While the Master Plan generally recommends that a trail easement should include a 25-foot buffer between the trail and adjoining parcels, the 15-foot-wide obstruction-free zone in the current design is bounded intermittently along the project reach by buildings, roadways, and other infrastructure that would preclude the presence of a buffer zone. While not optimal, a City of Milpitas representative has stated that the current design widths will be adequate to meet the minimum standards of a recreation trail.

Only the routes on the upper channel banks are being considered for the multi-use recreational trail; the in-channel maintenance roads will not be utilized as the ramps would not necessarily provide ADA compliance; as such, undercrossings and stream access points are not being considered as incidental recreational features. It is anticipated that pedestrians users of the recreational trails would utilize existing at-grade street crossings; due to the proximity of the project alignment to the Milpitas Boulevard intersections, the installation of an additional pedestrian or bicycle crossing with signaling, striping, and other requirements, is not considered feasible, particularly for the high traffic-volume routes such at Montague Expressway and Calaveras Boulevard. Because there is currently no undercrossing at the I-680 Bridge, the proposed recreational trail extends only between Calaveras Boulevard and the Montague Expressway. Future improvements by others may connect the obstruction-free zones to the existing pedestrian bridge at I-680, allowing this reach to include a recreational trail; however, these features are considered beyond the scope of the current project.

The Master Plan cites that identity signs, use signs, safety signs, private property signs, interpretive and protective signs, and regional signs should be used to mark trails; however, the 15-foot obstruction-free zone must be free of any structures, which includes signage that might encroach on the available width. While some safety signage may be required by the project regardless of recreational use (near floodwalls, bridge crossings, or hydraulic structures, for example), any additional signage would need to be implemented by the non-Federal agency and would need to be placed in locations outside of the obstruction free-zone. The current cost estimate for recreational features assumes signage is located at each access point where the trail meets one of the roadway crossings. Benches are also included at the access points and would likewise need to be located outside of the primary access route. Safety fencing is included in the project costs where vertical concrete walls are present; however, these costs are not considered part of the recreational features as they would be required with or without a multi-use trail. It is assumed that access along Berryessa Creek would remain open as at present; supplemental safety fencing is not provided along the top of the sloping earthen channel banks as part of the project or recreational features.

Due to the limitations of the study area's obstruction-free zone for providing permanent facilities to trail users, existing regional staging areas (e.g., parks and public recreation facilities) should be utilized to provide potable and non-potable water and sanitary facilities. The 2-mile project reach allows these facilities to be located beyond the extents of the project while still meeting the Master Plan requirement of a 5-mile maximum spacing.

Several features that are typically recommended in conjunction with recreational trails in the Master Plan are not considered incidental recreational benefits. These non-incidental features are outside of the authorized project purpose. Adding this purpose to the authorized project would require additional authority from Congress, which would require a potentially lengthy process. However, these features could be added to the project as non-Federally funded betterments without additional Congressional authority.

The plan view in Figure 6-5 depicts the location of proposed incidental recreational features relative to the study area.

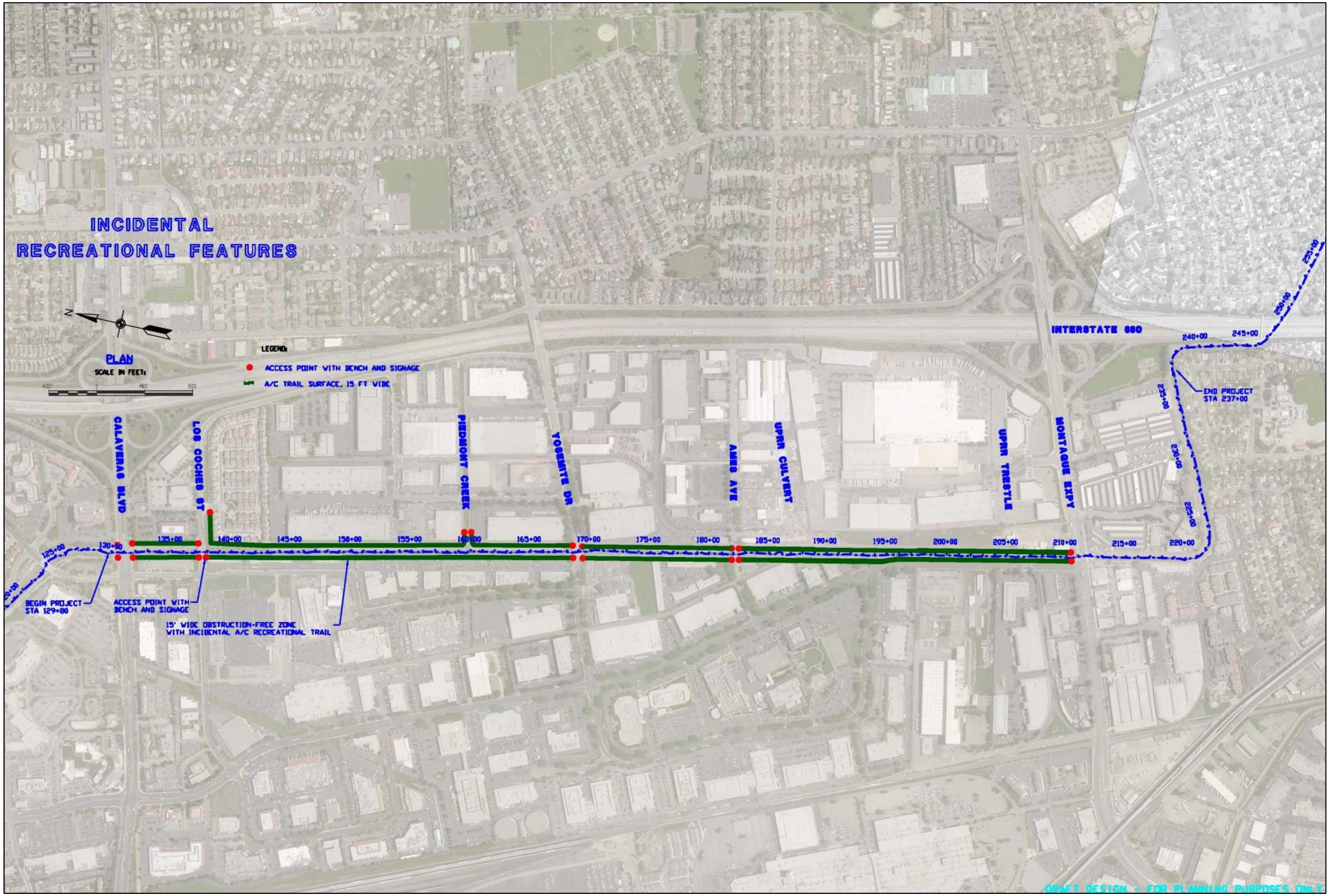


Figure 6-5 Incidental Recreational Features

6.2.5 Real Estate Costs

The general real estate requirements for the Project are the acquisition of channel improvement easements (CIE), flood protection levee easements (FPLE), and temporary work area easements (TWAE) and use of existing rights-of-way (ROW) owned and/or controlled by the SCVWD.. The preliminary alternative-comparison estimates for severance damages and contingencies (excluding utilities/facilities and administrative costs) are shown in Table 6-1.

Table 6-1 Real Estate Costs
November 2012 Prices[1]

	2A/d	2B/d	4/d	5
Preliminary Estimates	$9,828,000	$10,800,000	$14,965,000	$46,190,000[2]

[1] Source: 2012 Real Estate Plan
[2] Total estimated cost for the entire reach of Berryessa Creek upstream and downstream of I-680, as authorized. Costs for the downstream reach are estimated at $38,500,000.

The alternatives would also require relocations of publicly- and privately-owned utilities. The cost associated with alterations and relocations of bridges for non-navigation projects (other than railroad bridges) and utilities (e.g., municipal water and sanitary sewer lines, telephone lines, storm drains) determined by the Federal government to be necessary for construction of a project is considered LERRDs and included as part of the non-Federal sponsor contributions. The estimated relocation costs (including contingencies) are presented in Table 6-2. Additional information on the affected bridges and utilities for each alternative is presented in Appendix B, Design and Cost of Alternatives.

Table 6-2 Relocation Costs
October 2012 Prices[1]

	2A/d	2B/d	4/d	5
Utility/Facility Relocation Costs	$1,710,000[3]	$17,283,000	$17,283,000	$5,111,000[2]

[1] Source: Utilities-facilities survey developed October 2012.
[2] Total estimated cost for the entire reach of Berryessa Creek upstream and downstream of I-680, as authorized. Costs for the downstream reach are estimated at $2,398,000.
[3]Source: 2013 Real Estate Plan

6.2.6 Benefits

HEC-FDA was run simulating with-project conditions. Residual with-project damages were subtracted from the without-project damages to determine the flood risk management benefits. Table 6-3 presents the total annual benefits (from flood risk management) for the alternatives. Annual benefits represent the difference between the without- and with-project equivalent annual damage.

Table 6-3 Annual Benefits – Final Array of Alternative Plans Values in $1,000's, October 2012 Prices 3.75% Interest Rate, 50-Year Period of Analysis			
Alternative	**Equivalent Annual Damages**		**Annual Benefits[1]**
	Without Project	**With Project**	
Upstream of I-680 - Damage Areas A, B, C, & D			
Without	2,537	2,537	0
1) Alt. 5	2,537	454	2,083
2) Alt. 2A	2,537	2,537	0
3) Alt. 2B	2,537	2,537	0
4) Alt. 4	2,537	2,537	0
Downstream of I-680 - Damage Areas E & F			
Without	11,824	11,824	0
1) Alt. 5	11,824	319	11,505
2) Alt. 2A	11,824	887	10,937
3) Alt. 2B	11,824	0	11,824
4) Alt. 4	11,824	0	11,824
[1] Benefit values shown include average annual equivalent damages rather than expected annual damages.			

Any alternative that requires major reconstruction or replacement of any bridge crossing and extends the useful life of that bridge, advanced bridge replacement can be claimed (Table 6-4). In general, all of the bridges were constructed in the early 1970s, and replacement will extend their lives beyond the study's period of analysis. The life extension within the period of analysis is estimated at 24 years. Benefits from an operational and maintenance change are not expected to occur with bridge replacements.

Table 6-4 Advance Bridge Replacement Benefits October 2012 Prices 3.75% Interest Rate, 50-Year Period of Analysis						
Bridges	**2A/d**		**2B/d and 4/d**		**5**	
	Costs	**Benefits**	**Costs**	**Benefits**	**Costs**	**Benefits**
Old Piedmont Bridge	-	-	-	-	$708,589	$8,500
Montague Expressway	-	-	$3,041,550	$36,300	$1,040,751	$12,100
UPRR Trestle	$1,052,200	$12,600	$1,052,200	$12,600	$1,190,522	$14,200
Los Coches Street	-	-	$2,147,625	$25,600	-	-
Calaveras Road	-	-	$4,674,750	$55,800	-	-
TOTALS	**$1,052,200**	**$12,600**	**$10,916,125**	**$130,300**	**$2,939,862**	**$34,800**

Improvements for flood risk management may provide the opportunity for increased recreation uses in the study area. Improvements to the levees would allow for completion of locally proposed recreational trails. At this time, no recreation benefits have been computed as the recreation components have not yet been selected, and recreation has not been identified as a

Federal project purpose for the Berryessa Creek Element. Based on preliminary investigations, recreation measures could be added as a local project improvement to any of the alternatives without altering the formulation for flood risk management.

6.2.7 Costs

Project costs were developed for Alternatives 2A/d, 2B/d, and 4/d. Project costs for Alternative 5 (authorized project) have been updated to the 2012 price levels. For the purposes of comparing costs to benefits, the costs have been amortized over the projected 50-year period of analysis using the current Federal discount rate of 3.5 percent to yield an annual cost. Interest during construction was based on a two-year construction schedule assuming uniform expenditures over the period. Annual cost estimates are shown in Table 6-5.

Table 6-5 Total Project Cost Summary
October 2012 Prices
3.75% Interest Rate, 50-Year Period of Analysis

Item	2A/d	2B/d	4/d	5
Relocations	1,391,000	10,786,000	10,786,000	3,407,000
Channels and Canals	8,728,000	15,261,000	34.947,000	22,483,000
Total Construction Cost	10,228,000	26,047,000	45,733,000	25,890,000
Contingencies	2,558,000	10,178,000	17,638,000	8,991,000
Planning, Engineering, and Design	1,670,000	4,773,000	8,381,000	4,745,000
Construction Management	1,092,000	3,046,000	5,348,000	3,027,000
Lands and Damages (LERRD)	9,828,000	15,137,000	14,965,000	46,190,000
LERRD Administrative Costs	1,250,000	1,250,000	1,220,000	2,080,000
Total First Cost	**26,626,000**	**60,430,000**	**93,285,000**	**90,923,000**
Interest During Construction (IDC)	998,000	2,327,000	3,559,000	3,410,000
Total Project Economic Cost	27,624,000	62,757,000	96,844,000	94,333,000
Annualized Project Economic Cost	1,231,000	2,797,000	4,317,000	4,205,000
Annual OMRR&R	63,000	79,000	89,000	128,000
Total Annual Economic Cost	***1,294,000***	***2,876,000***	***4,406,000***	***4,333,000***

[1] IDC is based on a 2-year midlife full expenditure approach.

6.2.8 Net Benefits

Economic efficiency is based on the alternative with the greatest return on investment, as measured by annual net benefits. Annual net benefits are determined as the difference between the annual benefits and the annual costs of an alternative. The alternative that offers the greatest net benefits is known as the National Economic Development (NED) Plan. Table 6-6 shows equivalent damage reduction. Table 6-7 shows net benefits and the benefit-to-cost ratio for each alternative.

Table 6-6 Equivalent Annual Damage Reduced Values in $1000's, October 2012 Prices 3.75% Interest Rate, 50-Year Period of Analysis						
Alternatives	Equivalent Annual Damage			Probability Damage Reduced Exceeds Indicated Values		
	Without Project	With Project	Damage Reduced	75%	50%	25%
1	14,360	14,360	0	-	-	-
2A/d	11,824	887	10,937	2,731	3,337	8,068
2B/d	11,824	0	11,824	n/a	n/a	n/a
4/d	11,824	0	11,824	n/a	n/a	n/a
5	14,360	773	13,587	3,351	4,100	10,915

As shown in Table 6-7, the alternative that maximizes net annual benefits is Alternative 2A/d, and as such is the NED Plan.

Table 6-7 Annual Benefits and Costs Values in $1,000's, October 2012 Prices 3.75% Interest Rate, 50-Year Period of Analysis				
Item	2A/d	2B/d	4/d	5/d
Total Cost	26,626	64,383	98,470	94,333
Annual Benefits Flood Risk Reduction[1]	10,937	11,824	11,824	13,587
Advanced Bridge Replacement	13	130	130	35
Total Annual Benefits	10,950	11,954	11,954	13,622
Annual Costs	1,294	2,876	4,406	4,333
Net Benefits	**9,656**	**9,078**	**7,548**	**9,289**
B/C Ratio	*8.5*	*4.2*	*2.7*	*3.1*
[1] Including future development flood risk management benefits				

6.2.9 Verification of NED Plan

To confirm Alternative 2A/d's selection, an additional analysis on optimization was conducted to ensure increasing net benefits by analyzing a smaller alternative. This alternative, referred to as Alternative 2AA/d, was developed to pass the 0.02 exceedance probability event downstream of I-680, with a minimum of 50 percent CNP. The primary features of Alternative 2AA/d are similar to those of Alternative 2A/d. The analysis of Alternative 2AA/d followed the same procedures as with the other alternatives analyzed during this study. Engineering runs of hydrology and hydraulics were computed and were compiled with the economic data within HEC-FDA. The results of the HEC-FDA model are shown in Table 6-8. A preliminary construction cost estimate was prepared for Alternative 2AA/d and is displayed in Table 6-9. (It should be noted that the optimization was completed in an earlier draft of this GRR, and the outcome of the analysis (as presented in the following tables) will be unaffected with an update to 2012 price levels.)

Table 6-8 Equivalent Annual Damages – Alternatives 2A/d and 2AA/d Values in $1,000's, October 2011 Prices 4% Interest Rate, 50-Year Period of Analysis			
Alternative	**Equivalent Annual Damages**		**Annual Benefits**
	Without Project	**With Project**	
Upstream of I-680 - Damage Areas A, B, C, & D			
Without	2,537	2,537	0
Alt. 2A	2,537	2,537	0
Alt. 2Aa	2,537	2,537	0
Downstream of I-680 - Damage Areas E & F			
Without	11,823	11,823	0
Alt. 2A	11,823	887	10,936.
Alt. 2Aa	11,823	2,082	9,741

Table 6-9 Construction Costs – Alternatives 2A/d and 2AA/d October 2011 Prices 4% Interest Rate, 50-Year Period of Analysis		
Item	**Alt 2A/d**	**Alt 2AA/d**
Total Construction Cost	$9,215,695	$7,576,284
Contingency	$2,764,708	$2,272,885
Design Phase/PED	$1,382,354	$1,136,443
Construction Mgt-Inspection & Admin/SI/SA	$737,256	$606,103
LERRD Acquisition Costs	$9,825,000	$8,351,250
LERRD Investigations cost	$200,000	$200,000
Total First Cost	**$24,125,013**	**$20,142,964**
Interest During Construction	$984,301	$821,833
Total Project Economic Cost	$25,109,313	$20,964,797
Annualized Project Economic Cost	$1,168,844	$975,916
Annual OMRR&R	$63,071	$53,610
Total Annual Economic Cost	$1,231,914	$1,029,526

As shown in Table 6-10, the results of the above costs and benefits indicate that Alternative 2A/d produces greater net benefits than Alternatives 2AA/d.

Table 6-10 Annual Benefits and Costs – Alternatives 2A/d and 2AA/d Values in $1,000's, October 2011 Prices 4% Interest Rate, 50-Year Period of Analysis		
Item	**Alt 2A/d**	**Alt 2AA/d**
Total Cost	$25,109	$20,965
Annual Benefits Flood Damage Reduction	$10,937	$9,741
Savings in NFIP Administration Costs	$0	$0
Advanced Bridge Replacement	$13	$0
Total Annual Benefits	$10,950	$9,741
Annual Costs	$1,232	$1,030
Net Benefits	**$9,718**	**$8,711**
B/C Ratio	8.89	9.46

6.2.10 System of Accounts

The Principles and Guidelines specify that the alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment will be selected. The Assistant Secretary of the Army for Civil Works (ASA(CW)) may grant an exception when there are overriding reasons for selecting another plan based on other Federal, State, local, and international concerns. Because the purpose of this study is to reduce flood damages, the plan formulation and selection process for this reevaluation study is primarily driven by NED Plan selection criteria. Comparison of the alternative plans is summarized in Table 6-11.

Another means of evaluating the alternatives to assist in making a plan recommendation is to identify the non-monetary effects the alternative plans may have on significant environmental resources. This is included in the table under the Environmental Quality (EQ) account. A summary of environmental effects, levels of significance, and mitigation is also shown in Table 5-10. Also presented in the following table are the possible effects that the proposed plans may have on regional economic activity, specifically income and regional employment (illustrated under the Regional Economic Development [RED] account). Lastly, a comparison of the effects the proposed alternatives may have in the areas of public facilities and services, recreational opportunities, transportation and traffic and man-made and natural resources (included under the Other Social Effects [OSE] account) are also presented.

Recent Corps guidance on collaborative planning (EC 1105-2-409, dated 31 May 2005) provides that any alternative plan may be selected and recommended for implementation if it has, on balance, net beneficial effects after considering all plan effects, beneficial and adverse, in the four Principles and Guidelines evaluation accounts described above. Current policies on cost-sharing would apply, so that the Federal cost-share would be based on the NED Plan, or another plan approved by the ASA(CW).

Table 6-11 System of Accounts					
Criteria	**No Action Plan**	**Alternative 2A/d**	**Alternative 2B/d**	**Alternative 4/d**	**Alternative 5**
National Economic Development Account (without Recreation)					
Annual NED Benefits ($1,000s)	-	$10,950	$11,954	$11,954	$13,622
Annual Costs ($1,000s)	-	$1,266	$2,949	$4,478	$4,333
B/C Ratio		*8.6*	*4.1*	*2.7*	*3.1*
Net Benefits ($1,000s)	**-**	**$9,684**	**$9,005**	**$7,476**	**$9,289**
Environmental Quality Account					
Air Quality	Air quality conditions expected to remain the same or deteriorate with continuing development.	Temporary increase in ROG, NOx, CO, and PM emissions due to operation of construction equipment and vehicles.	Temporary increase in ROG, NOx, CO, and PM emissions due to operation of construction equipment and vehicles.	Same as Alternative 2B/d.	For both upstream and downstream reaches, ROG, NOx, CO, and PM emissions would temporarily increase due to operation of construction equipment and vehicles.
Water Resources and Quality	Water resources and water quality conditions expected to remain the same.	Potential increase in sediment load, suspended solids, and nutrients due to soil erosion. Possible accidental spills or leaks from equipment or vehicles. Slight temporary increase in water temperature.	Potential increase in sediment load, suspended solids, and nutrients due to soil erosion. Possible accidental spills or leaks from equipment or vehicles. Slight temporary increase in water temperature.	Same as Alternative 2B/d.	Same as Alternative 2B/d except loss of additional 2.42 acres of riparian habitat in the upstream study area (greenbelt reach upstream of I-680).
Biological Resources	Vegetation and wildlife expected to remain the same.	Temporary loss of grassland. Wildlife disturbed and displaced during construction, but return once construction completed.	Temporary loss of grassland. Wildlife disturbed and displaced during construction, but return once construction completed.	Same as Alternative 2B/d.	Temporary loss of grasslands and the loss of 2.42 acres of riparian habitat. Displaced wildlife during construction.
Special Status Species	Special status species expected to remain the same.	Potential temporary disturbance of western pond turtle, California yellow warbler, Cooper's hawk, loggerhead shrike, western burrowing owl, and white-tailed kite.	Potential temporary disturbance of western pond turtle, California yellow warbler, Cooper's hawk, loggerhead shrike, western burrowing owl, and white-tailed kite.	Same as Alternative 2B/d.	Same as Alternative 2B/d.
Cultural Resources	Sites CA-SCL-156 and P-43-001136 remain the same. Archeology sites CA-SCL-593 and C-167 continue to be at risk from erosion.	Disturbance of sites CA-SCL-593 and C-167. Changes to bridges, culverts, and trestle.	Disturbance of sites CA-SCL-593 and C-167. Changes to bridges, culverts, and trestle.	Same as Alternative 2B/d.	Same as Alternative 2B/d.
Noise	Noise sources and sensitive receptors expected to remain the same. Noise levels could increase due to increases in traffic volumes.	Increased noise levels during construction. Noise generated by construction equipment, haul trucks, and worker vehicles. Noise levels exceed local objectives.	Increased noise levels during construction. Noise generated by construction equipment, haul trucks, and worker vehicles. Noise levels exceed local objectives.	Same as Alternative 2B/d.	Same as Alternative 2B/d.
Aesthetics	Aesthetics and visual resources expected to remain the same.	Visual character of creek would change to include small floodwalls and earthen trapezoidal channel downstream of I-680.	Visual character of creek would change to include small floodwalls and earthen trapezoidal channel downstream of I-680.	Same as Alternative 2B/d except earthen low-flow channel with floodplain benches bounded by vertical concrete floodwalls downstream of I-680.	Visual character of the creek would change to include concrete-lined channel.
Regional Economic Development Account					
Employment	No impacts on employment.	Temporary increase in construction-related employment. The increased construction-related employment would have a corresponding short-term beneficial effect on the local economy. Increase would tend to be focused in lower specialization sector.	Temporary increase in construction-related employment. The increased construction-related employment would have a corresponding short-term beneficial effect on the local economy. Increase would tend to be focused in lower specialization sector.	Same as Alternative 2B/d.	Same as Alternative 2B/d.
Housing Supply and Business	No effect on housing supply or businesses.	Implementation of Alternative 2A/d would not require removal of residences or displacement of businesses.	Same as Alternative 2A/d	Same as Alternative 2A/d	Same as Alternative 2A/d
Local Government Finance	No direct impacts on local government	Non-Federal sponsor's initial investment of	Non-Federal sponsor's initial investment	Non-Federal sponsor's initial investment	Non-Federal sponsor's initial investment of

Table 6-11 System of Accounts					
Criteria	**No Action Plan**	**Alternative 2A/d**	**Alternative 2B/d**	**Alternative 4/d**	**Alternative 5**
	finance.	$13.4 for construction and $63,000 for maintenance annually.	of $31M for construction and $79,000for maintenance annually.	of $47.5M for construction and $89,000 for maintenance annually.	$45.5M for construction and $128,000 maintenance annually.
Growth Inducing Impacts	Growth within the study area will not be "induced" by a lack of project implementation.	Any potential growth in this area would be limited by market factors that are unrelated to elements of the proposed action.	Same as Alternative 2A/d	Same as Alternative 2A/d	Same as Alternative 2A/d
Other Social Effects Account					
Public Health and Safety	Safety threats associated with flood hazards would continue to exist for properties within the floodplain.	Reduced flood losses for existing properties within the floodplain.	Alternative has been designed to a FEMA certifiable level of protection.	Same as Alternative 2B/d.	Reduced flood losses for existing properties within the floodplain.
Recreation	Recreational facilities and access expected to remain the same.	Informal public access to the creek disrupted during construction; proposed maintenance roads would facilitate local plans for trails.	Same as Alternative 2A/d	Same as Alternative 2A/d	Informal public access to the creek disrupted during construction; proposed levees and maintenance roads would facilitate local plans for trails.
Transportation	Traffic is expected to remain the same or increase with continuing development.	Construction activities would contribute to an overall increase in traffic volumes on the roadway network on a localized and temporary basis.	Same as Alternative 2A/d.	Same as Alternative 2A/d.	Contribute to an overall increase in traffic volumes on the roadway network on a localized and temporary basis.

6.2.11 Risk-Based Analysis

Risk-based analysis is an approach to evaluation and decision making that explicitly and analytically incorporates considerations of risk and uncertainty in water resource planning. Values such as discharges, flood damages, and the parameters that determine these values are not known with absolute certainty. These parameters are better described by a probability distribution to account for the range of possible values. In the Berryessa Creek study, uncertainties in hydrology, hydraulics, and economics were all incorporated in determining both the probability and magnitude of the flood risk. Parameters that determine probable discharges, stages and damages for varying flood events were given probability distributions and standard errors to describe uncertainty in each value. Details of the uncertainties used in each relationship can be found in Appendix C, Economics.

Risk-based analysis provides results in terms of uncertainty and probability distribution. The computer model used for this analysis was the HEC-FDA program which uses Monte Carlo simulation to integrate the uncertainties in hydrology, hydraulics, and economics to determine expected annual damages and project performance. Detailed description can be found in Appendix C, Economics, with a graphical representation found in Figure 2 of the appendix.

Table 6-12 describes the risk-based results in terms of project performance, residual risk, and project accomplishment in terms of reduction in risk.

In addition to the monetary losses, flooding from Berryessa Creek could have other damage impacts and place many public services at risk, and if reduced would provide additional non-monetary benefit. Emergency costs (about 1 percent of total damages) evaluated in this study were limited to evacuation, relocation, and temporary assistance based on examples of similar flood risks found on other flood risk management studies in northern California. Administrative costs and increased public services such as police and fire were not included in these emergency cost estimates primarily due to lack of available data regarding any comparable historical flooding within the Bay Area. Nationwide, where depth of flooding and duration of event were much greater, some studies have estimated total emergency costs (including temporary relocation, evacuation, public administration, additional emergency healthcare, and increased labor) as high as 15 percent of the total without-project damages. While the emergency costs listed for Berryessa do not capture the total potential loss, these non-quantified losses are an incrementally-small portion of the overall losses and would not change the feasibility or formulation of any of the alternatives.

Potential traffic delays and temporary interruption in public services were also not quantified. Interstate 680 runs through the study area but would not be closed from flooding along Berryessa Creek. Minor roads within the floodplain may be closed for short durations due to flooding, but alternate routes would not add significant time loss or additional resource consumption to the NED account and would not change the feasibility or formulation of any of the alternatives.

Table 6-12 Project Accomplishments and Residual Flood Risk					
	No Action	**2A/d**	**2B/d**	**4/d**	**5**
Equivalent Annual Damages (in $1,000s, October 2011 Prices)					
Without-Project Damages	14,360	11,824	11,824	11,824	14,360
With-Project Residual Damage	14,360	887	0	0	773
Percent Reduction in Damage	0%	92%	100%	100%	95%%
Annual Exceedance Probability					
Without-Project	0.2461	.0696	.0696	.0696	.0696
With-Project Residual Risk	0.2461	.0089	.0000	.0000	.0062
Percent Reduction Flood Risk	0%	87%	100%	100%	91%
1 in X Chance of Flooding in any Year					
Without-Project	4	14	14	14	14
With-Project Residual Risk	4	112	NC	NC	161
Long-Term Risk – Chance of 1 or More Floods over 30 Years					
Without-Project	100%	84%	84%	84%	84%
With-Project Residual Risk	100%	20%	0%	0%	14%
Percent Reduction Flood Risk	0%	76%	100%	100%	83%
Conditional Non-Exceedance – Chance of No Damage from the 1 Percent Event					
Without Project	0%	22%	22%	22%	22%
With Project Residual Risk	0%	73%	100%	100%	70%
Statistics represent area of greatest risk. Other damage areas may have slightly different statistics. (See Appendix C for breakdown by damage area.)					

The area could suffer from significant business losses that could be included as RED damages in the analysis. However, most of these income losses could not be included in the NED analysis and therefore would not change the determination of the NED Plan, RED benefits were not explicitly quantified for this document.

Other non-monetary risks could also occur from a flood event but are not included in the NED evaluation. General reductions in risks to health, safety, and public welfare are typically associated with flood conditions and are further reasons why flood risk management serves the Federal interest and the public good. Within the Berryessa Creek floodplain, there are several elementary schools, two fire stations, a hospital, several medical clinics, police station, and Milpitas City Hall that could lose vital public services due to flooding of at least 1 foot above the first floor.

6.2.12 Fulfillment of Objectives

Early in the planning stages, objectives were identified to monitor the development of various social and environmental elements of alternatives. Implementation of the Recommended Plan is expected to achieve the following benefits, which are consistent with the study objectives. Table 6-13, at the end of this section, presents a comparison of the likely future attainment of project objectives among the alternatives considered in detail.

6.2.12.1 Flood Risk Management

Currently, Berryessa Creek poses the threat of causing millions of dollars in flood damage to thousands of homes and businesses within the cities of San Jose and Milpitas. Flooding within the watershed and vicinity has occurred often during the past decades. The primary objectives of the alternative plans are to control periodic flooding, preferably provide protection from the 0.01 exceedance probability flood event, and to avoid and/or minimize associated negative impacts and costs.

<u>FEMA Certification</u>

The guidance discussed in Section 3.2.3 under "Planning Criteria and Objectives" requires that the Berryessa Creek Element be formulated, selected, and constructed with a conveyance capacity corresponding to a 95-percent confidence level in order to qualify for levee certification under the NFIP program. This is based on (1) project outputs being determined with a risk-based analysis per current Corps of Engineers guidelines for economic analysis, and (2) the 95-percent confidence level (risk-based) for protection from the 0.01 exceedance probability flood event being less than the FEMA levee criteria (freeboard requirement of 3 feet). The alternatives in the current analysis generally follow typical project performance categories: for example, the 2 percent (previously called the 50-year event), 1 percent (100-year event), and 0.2 percent (500-year event) frequency levels. The discharges corresponding to these frequencies in the Corps' risk-based analysis are associated with a 50-percent (median) level of confidence. However, the guidance for FEMA levee certification requires a 95-percent level of confidence, as mentioned above. Only Alternatives 2B/d and 4/d have been designed to be NFIP-certifiable.

(Additionally, design and construction of the levee system leading to NFIP certification requires that a geotechnical and structural evaluation take place to determine if the levee meets Corps design, construction, operation, and maintenance standards. Data including the original design, surveys of levee top profile, levee cross-sections, embankment stability, underseepage, through seepage, and erosion protection is examined to determine "the water elevation at which the levee is not likely to fail.")

6.2.12.2 Fish and Wildlife Habitat

The alternative plans were formulated to avoid and minimize adverse effects to riparian and aquatic habitat. Where justified and feasible, the alternative plans were formulated to provide a more environmentally-sustainable channel design than currently exists. Under Alternative 5, the existing moderate quality habitat above Old Piedmont Road and in the greenbelt area would be protected to the maximum extent practicable. Any adverse effects would be mitigated by revegetation in the floodplain and riparian zone of the greenbelt.

6.2.12.3 Local Planning Criteria

- Flood Protection

As previously discussed, the primary objectives of the alternative plans are to control periodic flooding, to provide protection from the 0.01 exceedance probability flood event, and to avoid and/or minimize associated negative impacts and costs.

♦ Ecology

Alternative plans were designed to be environmentally-sustainable and to take advantage of opportunities for incidental restoration. This objective is mostly satisfied by Alternative 4/d that include terraces within the channel downstream of I-680 upon which vegetative plantings may take place, dependent on the further selection of vegetation for the benches and the upper bank. All alternatives, however, would have ecological improvements in this downstream area due to increased grassy vegetation cover on the banks of the channel.

♦ Geomorphology/Stable Channel

All alternative plans were formulated to provide stable bed and banks to reduce erosion and deposition. All of the alternatives consist of engineered slopes that include slope and toe protection. This would help limit future erosion and the associated sediment load.

♦ Maintenance

All alternatives seek to minimize the long-term obligation of operation and maintenance costs by protecting the channel banks from erosion, protecting the channel bed from deposition, and reducing the amount of sediment inflow into the project reach.

♦ Watershed Context

The manner in which flood risk management is being achieved is appropriate to the watershed and location of potential opportunities for alternatives. The downstream limits of the project alternatives is just upstream of the proposed Lower Berryessa Creek Project, a project of SCVWD that is currently designed to provide protection from the 0.01 exceedance probability flood event. Alternative plans were formulated to achieve mutually beneficial goals of the proposed Lower Berryessa Creek Project.

♦ Water Quality and Quantity

The Corps and SCVWD have coordinated with the San Francisco Bay Regional Water Quality Control Board, California Department of Fish and Game, and the U.S. Environmental Protection Agency (Region 9), regarding water quality, stream morphology, sediment production, and sediment transport in Berryessa Creek. Agency recommendations have been incorporated into the design of project features.

As previously mentioned, all of the alternatives consist of engineered slopes that include slope and toe protection, which help limit future erosion and the associated sediment load; thus, improving water quality.

♦ Local Partner Agencies

Throughout the history of the authorized project, the Corps and SCVWD have coordinated planning activities with other Federal, State, and local regulatory and planning agencies. In the 1980s, coordination with these agencies led to development of the authorized project. This coordination would continue through the reevaluation phase, leading to the design and construction of the authorized project as modified per the general reevaluation phase. The Corps and Water District plan to engage these agencies throughout the development and refinement of a range of alternatives for public consideration that would meet the objectives of the project.

- Community Benefits

All of the alternatives help meet this objective by improving the safety and health of citizens that would otherwise be subject to flooding and associated health risks. Alternatives also increase local community values to the extent that habitat remains or increases in vitality throughout the project reach. This would occur to a greater extent with Alternative 4/d, but is also true for Alternative 2B/d. Finally, community benefits are also increased by incorporation of community-based objectives and ideas.

- Life Cycle Costs

The alternatives satisfy this objective for viewing project costs over the long-term by considering both capital and operation/maintenance costs. The analysis of alternatives that is performed considers the net present value of first costs plus annual costs associated with the project to arrive at an annual cost that reflects the true life-cycle costs of the project. In addition, the alternatives include the opportunity for Federal cost-sharing to the project that helps reduce local funding investment requirements.

Table 6-13 Fulfillment of Objectives for Project Modification

Objective	No Action	Alt 2A	Alt 2B/d	Alt 4/d	Alt 5
Specific Planning Objectives					
Reduce flood damage from Berryessa Creek to upstream of Calaveras Boulevard	0	2	3	3	1
Provide protection from the 1% (0.01) flood event	0	2	3	3	1
Use environmentally sustainable design in addressing the flood damage reduction purpose	0	2	2	3	1
Other Planning Considerations					
Use the SCVWD's NFP objectives	0	1	3	3	1
Provide opportunities for local agency to incorporate recreational features	0	1	1	1	1
Reduce maintenance requirements	0	1	1	3	1
Improve water quality by reducing sedimentation within the creek	0	2	2	3	2
Cooperate with the mutually beneficial goals of related plans, projects, and agencies	0	3	3	3	1
Fully coordinate with other Federal, State, local agencies, and stakeholders	0	3	3	3	2
Legend: 3 = high; 2 = moderate; 1 = low; 0 = does not meet objective					

6.3 VALUE ENGINEERING

In April 2005, the Value Engineering Team (representatives from the Corps and SCVWD) performed a Value Engineering Study on the Berryessa Creek Element. The team executed the following:

- Identified, evaluated, and classified project features and functions
- Determined and evaluated values to each function
- Developed a FAST Diagram based on the classification and evaluation of each function
- Proposed remedial alternatives for each function
- Evaluated the plausibility of each proposal and selected the most viable proposals for submittal
- Provided documentation for alternatives on original design and VE proposals, costs comparison, savings, and justification for the selected proposal

The Value Engineering Team identified 15 proposals/alternatives. Of these, five were carried forward for further analysis and/or incorporation into the alternative plans. These proposals are listed below, followed by indented line items on how these proposals would be incorporated.

(1) <u>Investigate sediment storage in the project and upstream of the project (C-03)</u>: This proposal recommends that after computing new channel capacities based on setbacks, laybacks, raised levees, and excavations, determine what increased sediment volumes or management strategies could be implemented in the project. Conservation easements upstream may allow the local sponsor to significantly reduce sediment coming into the project.

   - Accurate modeling of sediment transport will require more detailed field data and design information than is currently available. Sediment transport modeling will therefore be conducted during pre-construction engineering and design along with other detailed project design. Based on the information currently available, the project alternatives include modifications to the existing sediment basin downstream from Piedmont Road.
   - Inspection of the upland watershed and information contained in past studies indicate that the majority of coarse sediment is generated in the lower steep canyon reaches of Berryessa Creek as a result of mass wasting and erosion of the steep hillsides immediately adjacent to the creek. Because of the scale of these sources and the fact that they are a result of natural process and conditions, including the presence of active fault zones and unstable geologic formation, controlling the coarse sediment supply at its source is not practical. Also, a large sediment basin upstream of Old Piedmont Road, for example, that would efficiently trap a majority of course sediment would likely cause downstream degradation, and is not compatible with the alluvial bed through the greenbelt reach. The conclusion of the sediment studies to-date is that installation of a debris fence or other permeable structure just upstream of the Old Piedmont Road culvert

would help prevent major debris flows containing large boulders from clogging the culvert.

- Upstream conservation easements are addressed in Item (4), below.

(2) Floodwalls/levees (C-06): This proposal recommends substituting floodwalls for levees, particularly in the greenbelt reach where mitigation is required for loss of riparian habitat in the levee footprint.

- Replacing the right-bank levee in the greenbelt reach, primarily along the 1,500-foot reach adjacent to Parkhaven Drive, was considered following this value engineering comment. A rough cost estimate for the floodwall that could replace this levee resulted in an additional cost of approximately $250,000, and would save approximately 0.3 acres of levee footprint. More detailed information regarding the impacts and costs of a floodwall in lieu of a levee are currently being developed. The decision on whether to include a floodwall in the Recommended Plan will be based on weighing the added cost against the impacts avoided and the cost of mitigation saved, as well as the aesthetic effect of a concrete structure rather than the earthen levee currently designed.

(3) Water detention (C-08): This proposal recommends constructing a detention reservoir in the City of San Jose property next to the Elementary School adjacent to the Greenbelt reach of the project. This property is approximately 6 acres in size, and would be excavated and sloped to drain toward the creek. Floodflows would be diverted into the upstream end of the detention basin and stored temporarily, and then would be released through a gated culvert at the downstream end of the detention basin. Levees would be constructed along the perimeter of this property to the height of the adjacent channel levee. The City of San Jose could construct soccer fields or other recreational fields in the detention basin that did not obstruct flows.

- During the refinement of measures, as discussed above, detention basins were eliminated due to their inability to reduce peak flooding in available locations due to limited basin volume. There were originally three potential sites: the elementary school and two additional sites that were vacant at the time. The study team decided they did not want to pursue detention basins on any of these sites during plan formulation, partially because of alternate plans for the open parcels, and partially due to the volume required to achieve a reduction in peak flow. For example, because of the additional tributaries and other inflows joining Berryessa Creek further downstream, a basin at the elementary school site would need to be prohibitively large in order to reduce the discharges in the downstream reach. It would need to be at least 8 feet deep even with a minimum recommended sideslope of 10:1.

(4) Vegetate the watershed (C-24): This proposal recommends the planting of native plants within the project watershed. A conservation easement in the same area would preclude the loss of vegetation by limiting or restricting grazing.

- A conservation easement and revegetation program could be pursued within the watershed. It would have to be coordinated with appropriate agencies, landowners, and the SCVWD. For the purposes of the GRR, a conservation easement will be recommended for implementation by watershed stakeholders, but not assumed to be part of the without- or with-project conditions. Relative impacts of limited or restricted upstream grazing, therefore, would not be assessed within the document.

(5) Eliminate bridges (C-26): This proposal recommends purchasing the existing UPRR bridges and UPRR spur right-of-way. These bridges would be removed and not replaced. The UPRR spur right-of-way would be used to increase the channel cross-section, or for recreational or restoration purposes.

- Coordination between the Valley Transportation Authority (VTA) and the SCVWD is taking place to identify the ability and desirability of purchasing the UPRR bridges and spur right-of-way. The SCVWD will continue coordination with the VTA, but the GRR will assume that the bridges will need to be replaced unless VTA determines that replacement of the bridges is not necessary.

6.4 IDENTIFICATION AND RATIONALE FOR SELECTION OF RECOMMENDED PLAN

As shown in Table 6-7 above, the analysis indicates that the NED Plan is Alternative 2A/d with annual net benefits of $9.68 million and a benefit-to-cost ratio of 8.6 to 1.

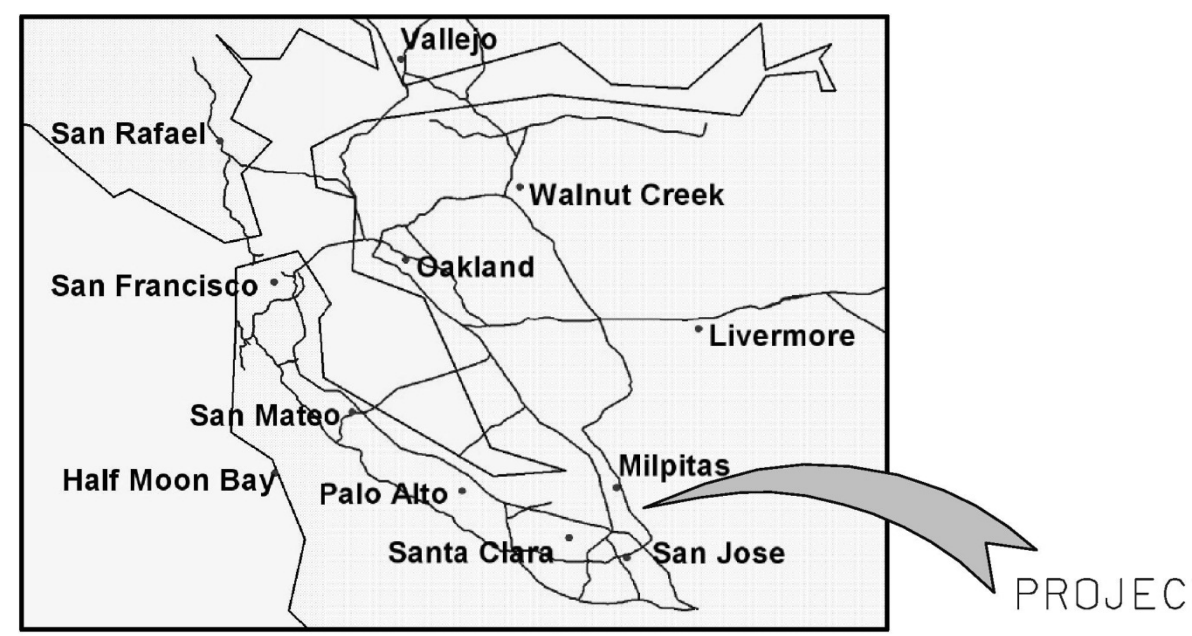
US Army Corps
of Engineers
Sacramento District

BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

SANTA CLARA COUNTY
CALIFORNIA

PLAN AND PROFILE VIEWS

FY_12



VICINITY MAP

DRAFT DESIGN - FOR PLANNING PURPOSES ONLY

US Army Corps
of Engineers
Sacramento District

Symbol	Description	Date	Approved

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

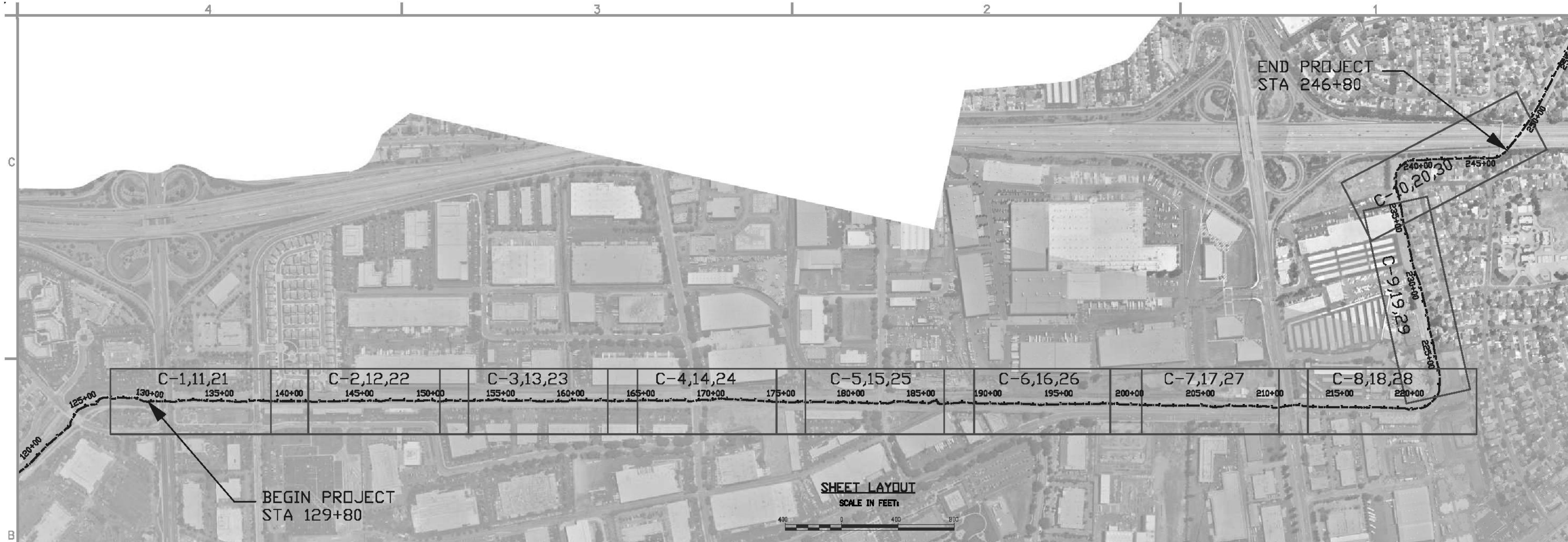
PREPARED BY:
TETRA TECH, INC.
17887 VON KARMAN AVE STE 500
IRVINE, CA 92614

Designed by: PRELIMINARY		Date: JAN 17, 2012	Rev. N/A
Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RM		Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

PROJECT ALTERNATIVES
PLAN AND PROFILE VIEW
TITLE SHEET

Sheet reference number:
G1
Sheet 1 of 35



ABBREVIATIONS

ACC	ACCORDING
APPROX	APPROXIMATE
BDY	BOUNDARY
BOB	BASIS OF BEARING
BM	BENCHMARK
CH	CHANNEL
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CY	CUBIC YARD
D/S	DOWNSTREAM
DIA	DIAMETER
EG	EXISTING GROUND
FG	FINISH GRADE
E	EAST, EASTING
EA	EACH
EL	ELEVATION
EXIST	EXISTING
FT	FOOT, FEET
IE	INVERT ELEVATION
INV	INVERT
LF	LINEAR FOOT
MAX	MAXIMUM
MIN	MINIMUM
N	NORTH, NORTHING
NAD	NORTH AMERICAN DATUM
N/A	NOT APPLICABLE
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NTS	NOT TO SCALE
PCL	PRIMARY CONTROL LINE
PROP	PROPOSED
PT	POINT
RCP	REINFORCED CONCRETE PIPE
ROW	RIGHT OF WAY
S	SOUTH
SCVWD	SANTA CLARA VALLEY WATER DISTRICT
SHT	SHEET
SS	SIDE SLOPE
SF	SQUARE FEET
STA	STATION
TOB	TOP OF BANK
TOW	TOP OF WALL
TYP	TYPICAL
U/S	UPSTREAM
UPRR	UNION PACIFIC RAILROAD
USACE	UNITED STATES ARMY CORPS OF ENGINEERS
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
W	WEST
WSEL	WATER SURFACE ELEVATION

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19	C-14	ALTERNATIVE 2B/d PLAN AND PROFILE STA 163+00 TO 177+00
20	C-15	ALTERNATIVE 2B/d PLAN AND PROFILE STA 175+00 TO 188+00
21	C-16	ALTERNATIVE 2B/d PLAN AND PROFILE STA 187+00 TO 200+00
22	C-17	ALTERNATIVE 2B/d PLAN AND PROFILE STA 199+00 TO 212+00
23	C-18	ALTERNATIVE 2B/d PLAN AND PROFILE STA 211+00 TO 224+00
24	C-19	ALTERNATIVE 2B/d PLAN AND PROFILE STA 223+00 TO 236+00
25	C-20	ALTERNATIVE 2B/d PLAN AND PROFILE STA 235+00 TO 248+00
		ALTERNATIVE 2B/d WALLED TRAPEZOIDAL CHANNEL, FEMA-CERTIFIABLE PROTECTION
26	C-21	ALTERNATIVE 4/d PLAN AND PROFILE STA 127+00 TO 140+00
27	C-22	ALTERNATIVE 4/d PLAN AND PROFILE STA 139+00 TO 152+00
28	C-23	ALTERNATIVE 4/d PLAN AND PROFILE STA 151+00 TO 164+00
29	C-24	ALTERNATIVE 4/d PLAN AND PROFILE STA 163+00 TO 176+00
30	C-25	ALTERNATIVE 4/d PLAN AND PROFILE STA 175+00 TO 188+00
31	C-26	ALTERNATIVE 4/d PLAN AND PROFILE STA 187+00 TO 200+00
32	C-27	ALTERNATIVE 4/d PLAN AND PROFILE STA 199+00 TO 212+00
33	C-28	ALTERNATIVE 4/d PLAN AND PROFILE STA 211+00 TO 224+00
34	C-29	ALTERNATIVE 4/d PLAN AND PROFILE STA 223+00 TO 236+00
35	C-30	ALTERNATIVE 4/d PLAN AND PROFILE STA 238+00 TO 248+00

NOTES

1. ALL PROJECT FEATURES SHOWN ARE PRELIMINARY IN NATURE AND ARE TO BE USED FOR PLANNING PURPOSES ONLY.
2. CONTROL LINE FROM HEC-GEORAS STATIONING, USACE 2004.
3. 2' CONTOUR INTERVAL TOPOGRAPHY AND DIGITAL ORTHOPHOTO USACE 2002.
4. PARCEL DATA FROM SCVWD 2009 BOUNDARY SURVEY.
5. ALL MAPPING IS PROJECTED TO NAD 83 STATE PLACE CALIFORNIA ZONE 3. VERTICAL DATUM IS NAVD 88. UNITS ARE SURVEY FEET.
6. WATER SURFACE ELEVATIONS ARE SHOWN FOR BASED ON HEC-RAS MODELING BY TETRA TECH USING UNSTEADY FLOWS WITHOUT UPSTREAM PROJECT IMPROVEMENTS IN PLACE.
7. DESIGN WATER SURFACE ELEVATION PROFILE FOR ALTERNATIVE 2A/d IS THE 0.01 WSEL AT 50% CERTAINTY ASSUMING NO FUTURE UPSTREAM IMPROVEMENTS BY SCVWD.
8. UPPER DESIGN WATER SURFACE ELEVATION PROFILE FOR ALTERNATIVES 2B/d AND 4/d IS THE 0.01 WSEL AT 50% CERTAINTY ASSUMING FUTURE UPSTREAM IMPROVEMENTS (SCVWD OBJECTIVE). DESIGN FLOODWALL HEIGHTS AND TOP OF BANK ELEVATIONS ARE BASED ON 95% CERTAINTY CRITERIA APPLIED TO THIS WSEL.
9. LOWER DESIGN WATER SURFACE ELEVATION PROFILE FOR ALTERNATIVES 2B/d AND 4/d IS THE 0.01 WSEL AT 50% CERTAINTY ASSUMING NO FUTURE UPSTREAM IMPROVEMENTS BY SCVWD.
10. CROSS SECTIONS ARE SHOWN LOOKING DOWNSTREAM AND ARE NOT TO SCALE.

LEGEND

EXISTING FEATURES (PLAN VIEW)

- 2' CONTOUR
- PARCEL LINE
- STRUCTURE
- WATER/SEWER/STORM UTILITY
- ELEC/TEL/CABLE UTILITY

PROPOSED FEATURES (PLAN VIEW)

- CONTROL LINE
- STRUCTURE
- TOP OF SLOPE
- TOE OF SLOPE
- LIMIT OF CONSTRUCTION
- TEMPORARY CONSTRUCTION EASEMENT
- TEMPORARY STAGING AREA

EXISTING FEATURES (PROFILE VIEW)

- TOP OF BANK
- THALWEG

PROPOSED FEATURES (PROFILE VIEW)

- TOP OF WALL/MAT
- WATER SURFACE ELEVATION
- VEGETATED BENCH
- THALWEG

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US Army Corps of Engineers
Sacramento District

Symbol	Description	Date	Approved

Designed by: PRELIMINARY	Date: JAN 17, 2012	Rev. N/A
Dwn by: KP / Spec No.: N/A	Design file no: N/A	
Reviewed by: RM	Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A	File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

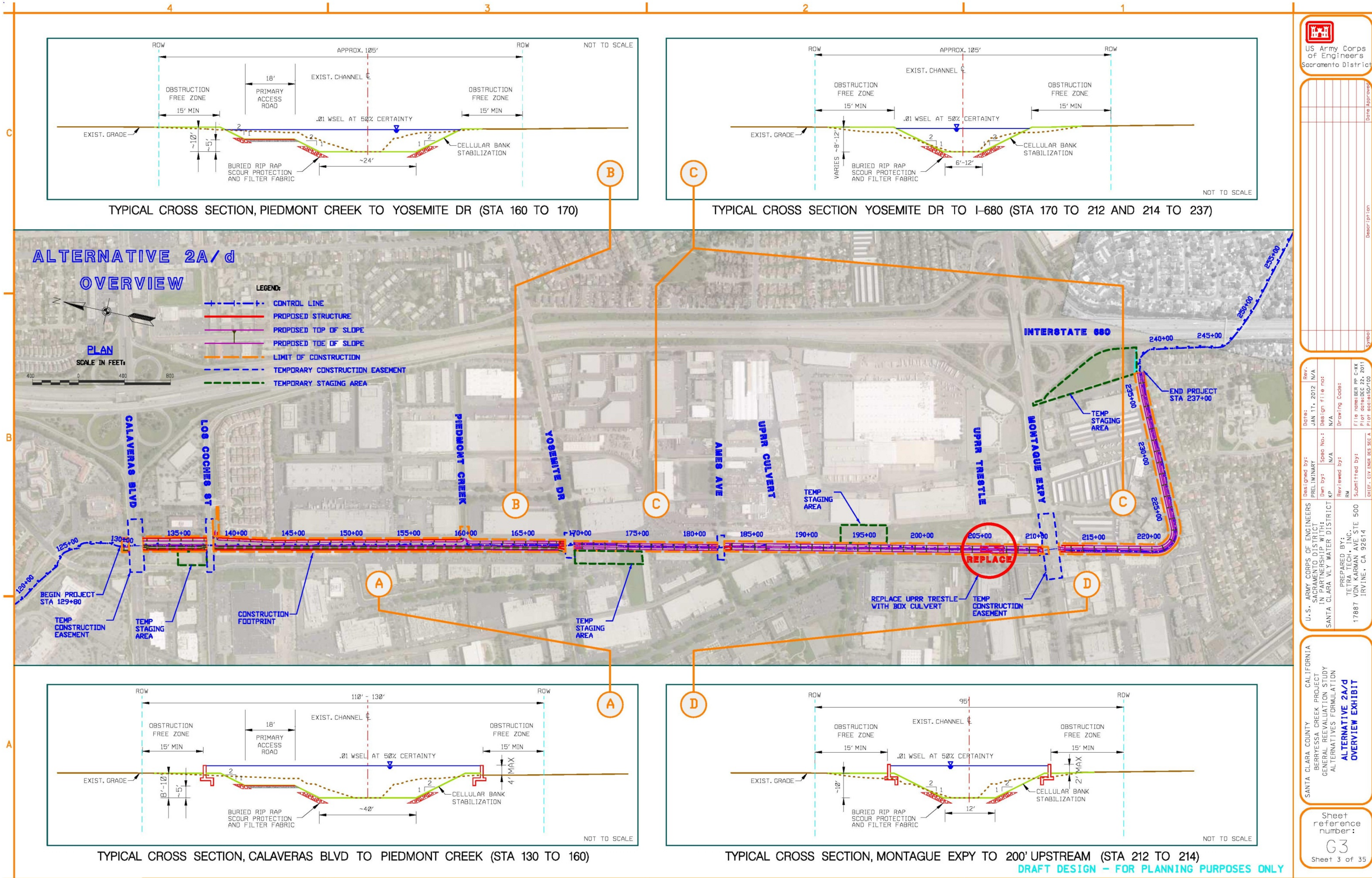
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

PREPARED BY:
TETRA TECH, INC.
17887 VON KARMAN AVE STE 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

PROJECT ALTERNATIVES
PLAN AND PROFILE VIEW
INDEX, LEGEND, AND ABBREVIATIONS

Sheet reference number:
G2
Sheet 2 of 35



ROW
APPROX. 105'
ROW
NOT TO SCALE
18'
PRIMARY ACCESS ROAD
EXIST. CHANNEL ℄
OBSTRUCTION FREE ZONE
15' MIN
.01 WSEL AT 50% CERTAINTY
EXIST. GRADE
~10'
~5'
~24'
BURIED RIP RAP SCOUR PROTECTION AND FILTER FABRIC
CELLULAR BANK STABILIZATION
TYPICAL CROSS SECTION, PIEDMONT CREEK TO YOSEMITE DR (STA 160 TO 170)
VARIES ~8'-12'
6'-12'
TYPICAL CROSS SECTION YOSEMITE DR TO I-680 (STA 170 TO 212 AND 214 TO 237)
ALTERNATIVE 2A/d
OVERVIEW
PLAN
SCALE IN FEET
LEGEND:
CONTROL LINE
PROPOSED STRUCTURE
PROPOSED TOP OF SLOPE
PROPOSED TOE OF SLOPE
LIMIT OF CONSTRUCTION
TEMPORARY CONSTRUCTION EASEMENT
TEMPORARY STAGING AREA
INTERSTATE 680
CALAVERAS BLVD
LOS COCHES ST
PIEDMONT CREEK
YOSEMITE DR
AMES AVE
UPRR CULVERT
UPRR TRESTLE
MONTAGUE EXPY
TEMP STAGING AREA
END PROJECT STA 237+00
BEGIN PROJECT STA 129+80
TEMP CONSTRUCTION EASEMENT
CONSTRUCTION FOOTPRINT
REPLACE
REPLACE UPRR TRESTLE WITH BOX CULVERT
120+00
125+00
130+00
135+00
140+00
145+00
150+00
155+00
160+00
165+00
170+00
175+00
180+00
185+00
190+00
195+00
200+00
205+00
210+00
215+00
220+00
225+00
230+00
235+00
240+00
245+00
250+00
255+00
A
B
C
D
110' - 130'
4' MAX
8'-10'
~40'
TYPICAL CROSS SECTION, CALAVERAS BLVD TO PIEDMONT CREEK (STA 130 TO 160)
95'
2' MAX
12'
TYPICAL CROSS SECTION, MONTAGUE EXPY TO 200' UPSTREAM (STA 212 TO 214)
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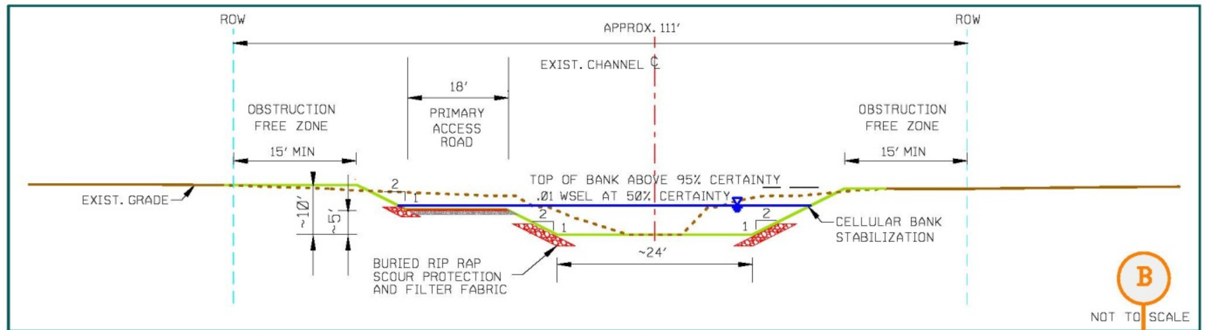
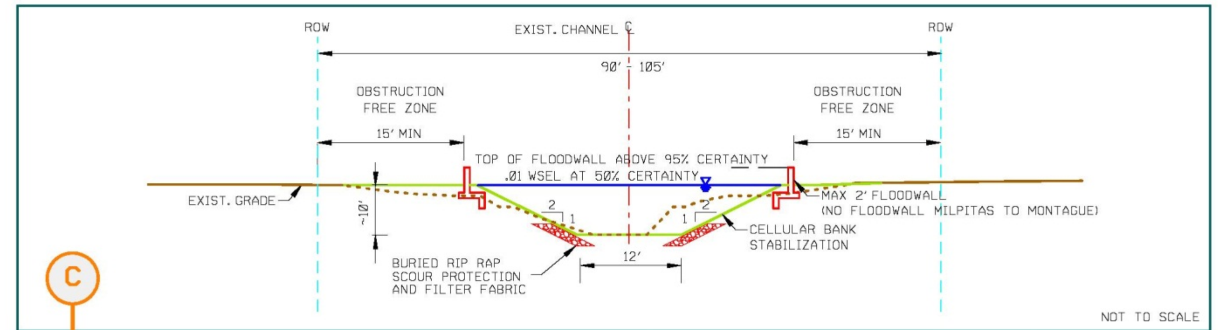
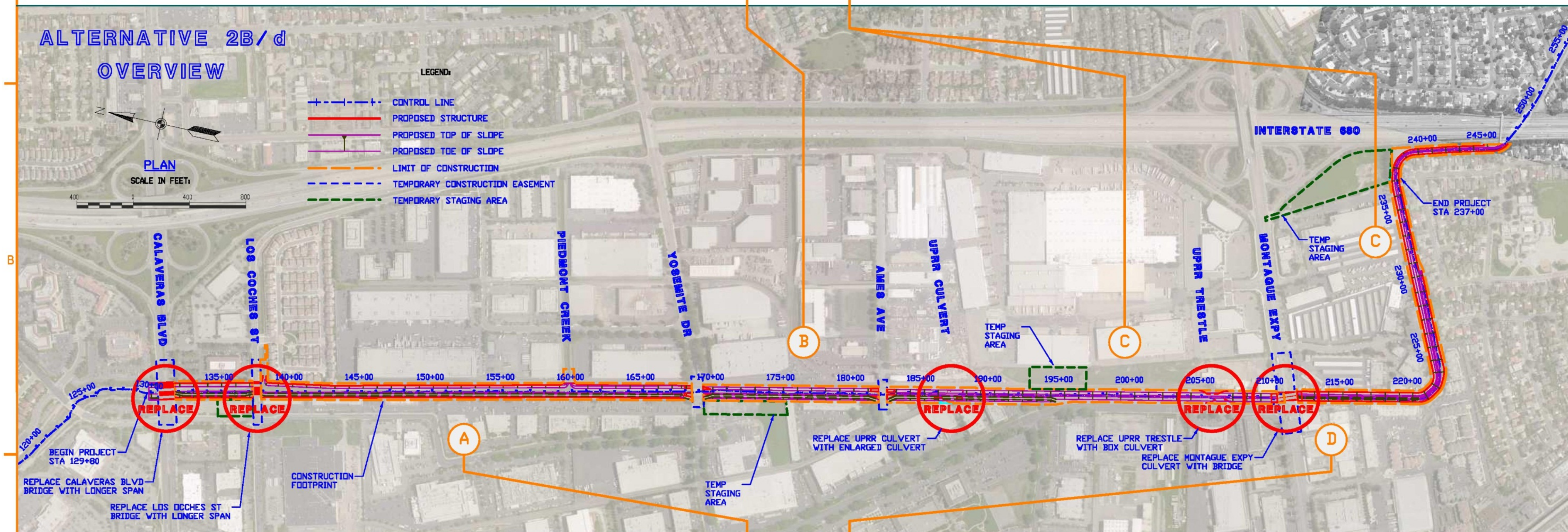
Sacramento District
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT
PREPARED BY:
TETRA TECH, INC.
17887 VON KARMAN AVE, STE 500
IRVINE, CA 92614
Date: JAN 17, 2012
SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION
ALTERNATIVE 2A/d
OVERVIEW EXHIBIT
Sheet reference number:
G3
Sheet 3 of 35

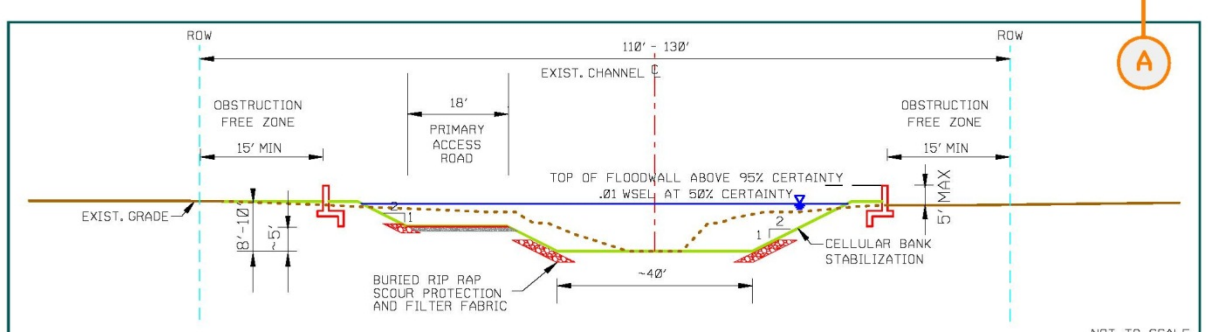


TYPICAL CROSS SECTION, YOSEMITE DR TO MILPITAS BLVD (STA 170 TO 195)



TYPICAL CROSS SECTION MILPITAS BLVD TO I-680 (STA 195 TO 212 AND 230 TO 248)





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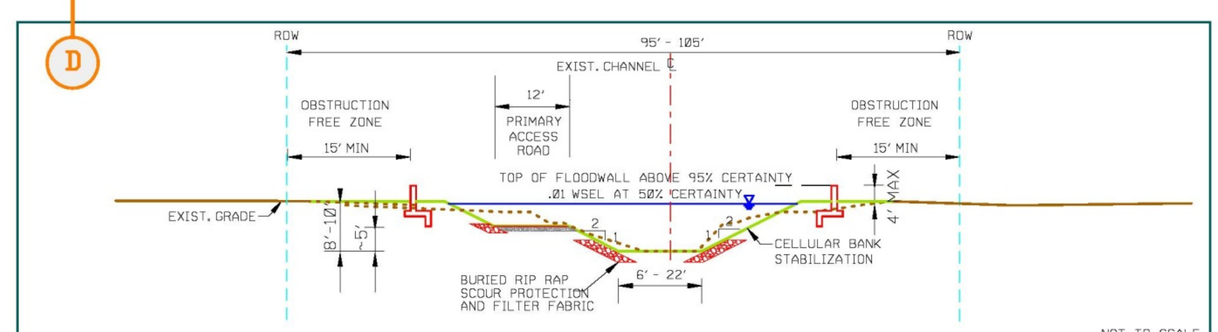

TYPICAL CROSS SECTION, MONTAGUE EXPY TO LAKEWOOD CT (STA 212 TO 230)

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US Army Corps of Engineers
Sacramento District

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U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
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PREPARED BY:
TETRA TECH, INC.
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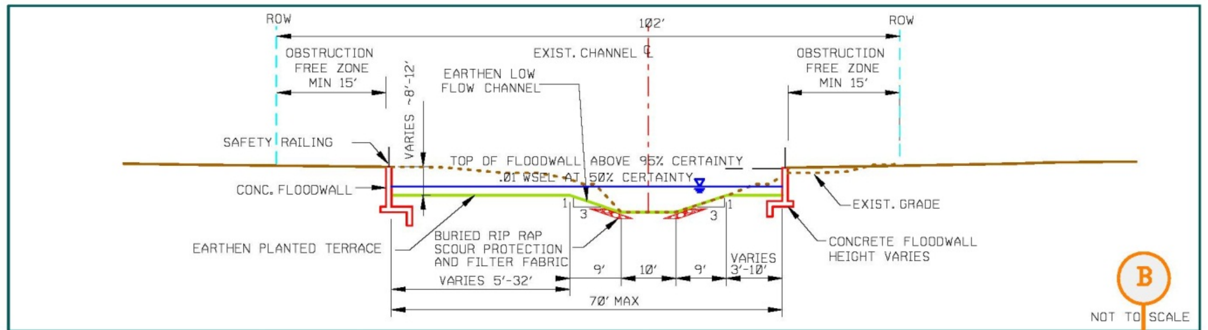
IRVINE, CA 92614

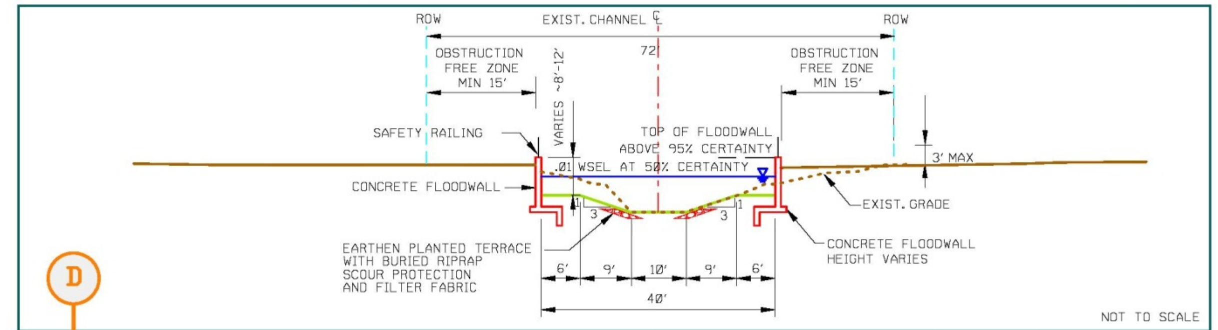
SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d OVERVIEW EXHIBIT

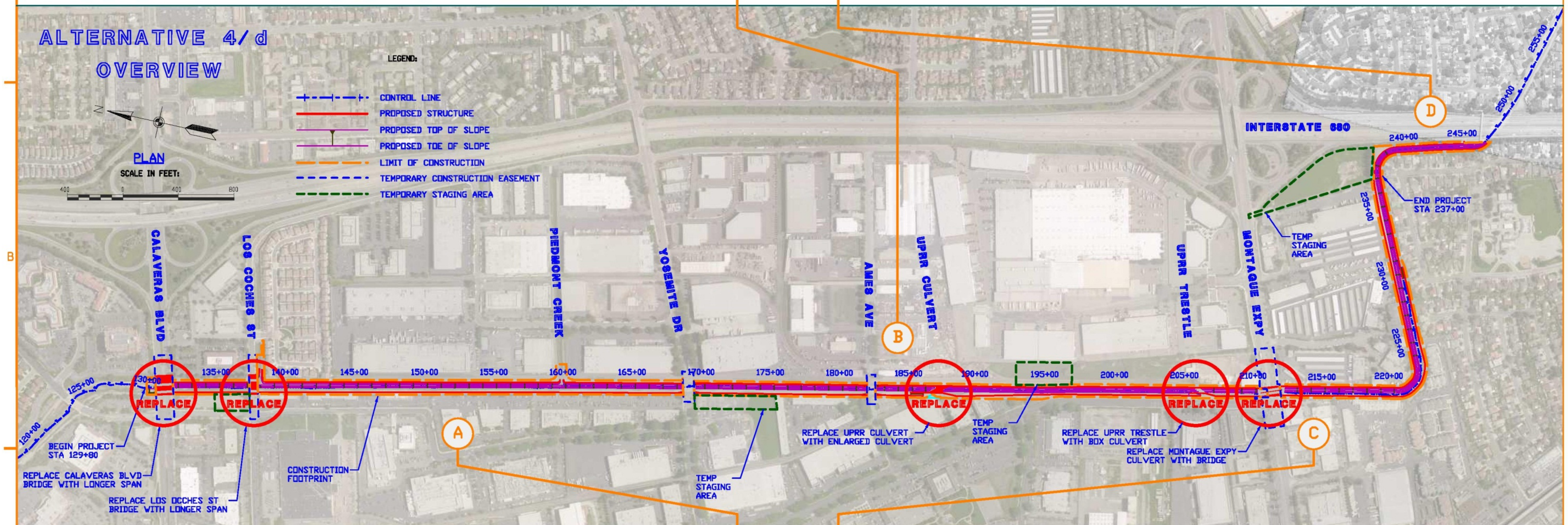
Sheet reference number:
G4
Sheet 4 of 35

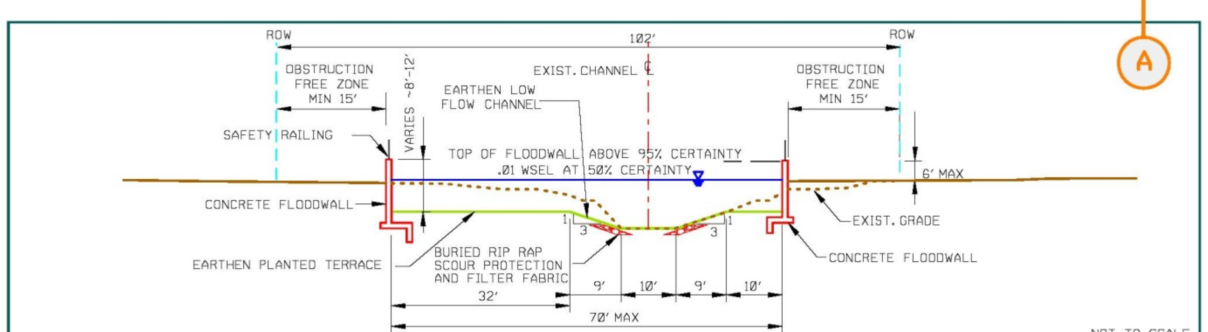


TYPICAL CROSS SECTION, AMES AVE TO MILPITAS BLVD (STA 182 TO 195)

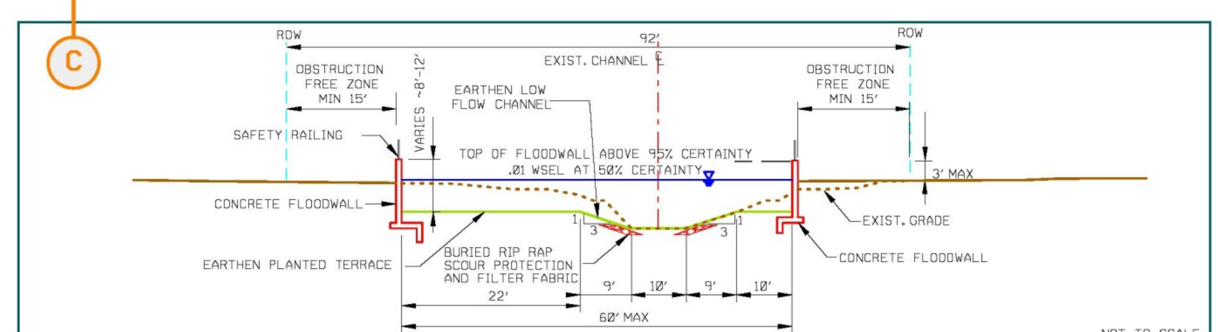


TYPICAL CROSS SECTION LAKEWOOD CT TO I-680 (STA 230 TO 248)





TYPICAL CROSS SECTION, CALAVERAS BLVD TO AMES AVE (STA 130 TO 182)



TYPICAL CROSS SECTION, MILPITAS BLVD TO LAKEWOOD CT (STA 195 TO 230)

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US Army Corps of Engineers
Sacramento District

Designed by: PRELIMINARY
Dwn by: KP
Reviewed by: RW
Submitted by:
Date: JAN 17, 2012
Rev. N/A
Spec No.: N/A
Design file no:
Drawing Code:
File name:
Plot date:
Plot scale:

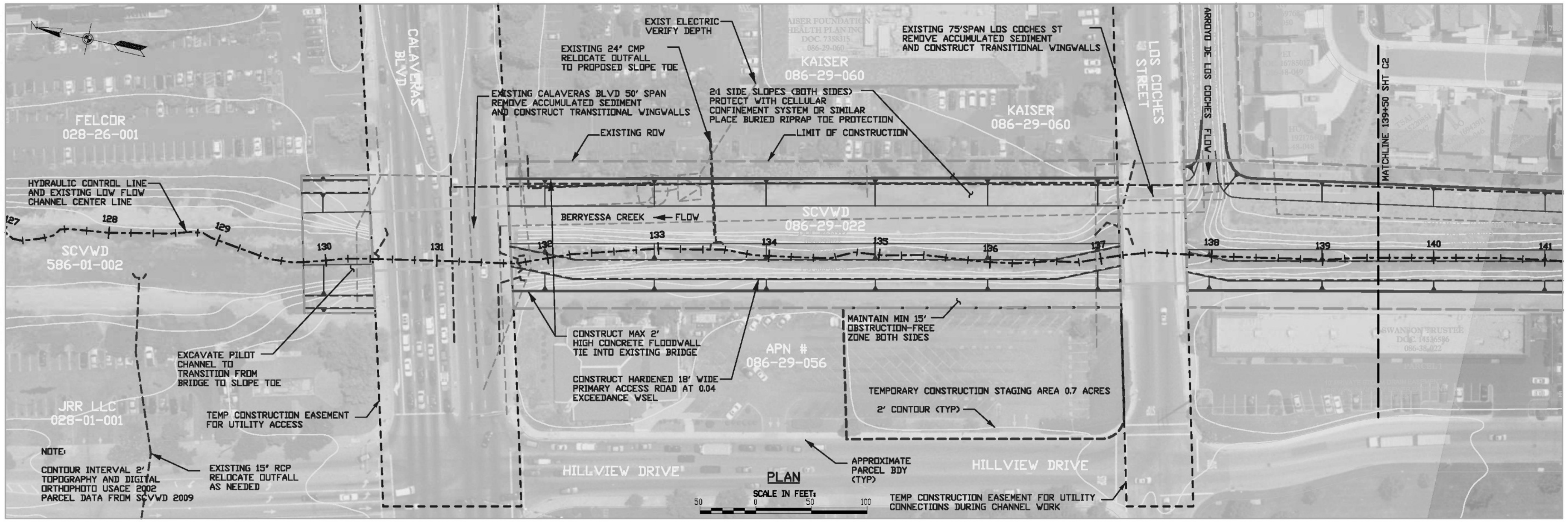
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

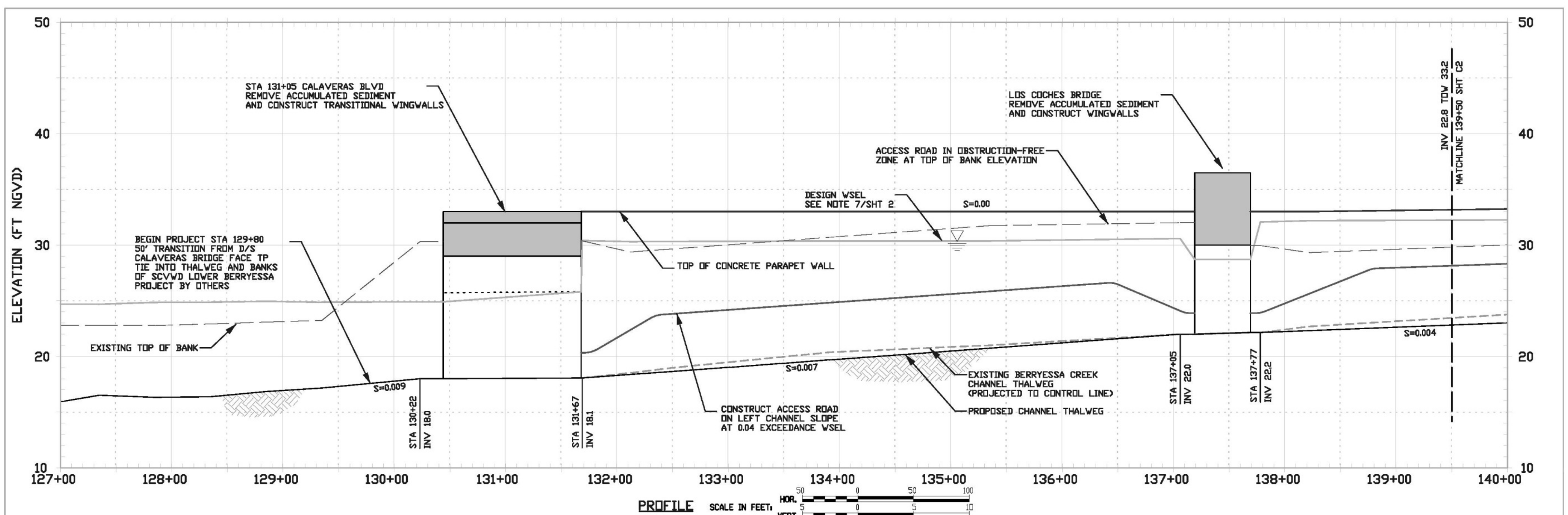
PREPARED BY:
TETRA TECH, INC.
17887 VON KARMAN AVE STE 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 4/d
OVERVIEW EXHIBIT

Sheet reference number:
G5
Sheet 5 of 35





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US Army Corps of Engineers
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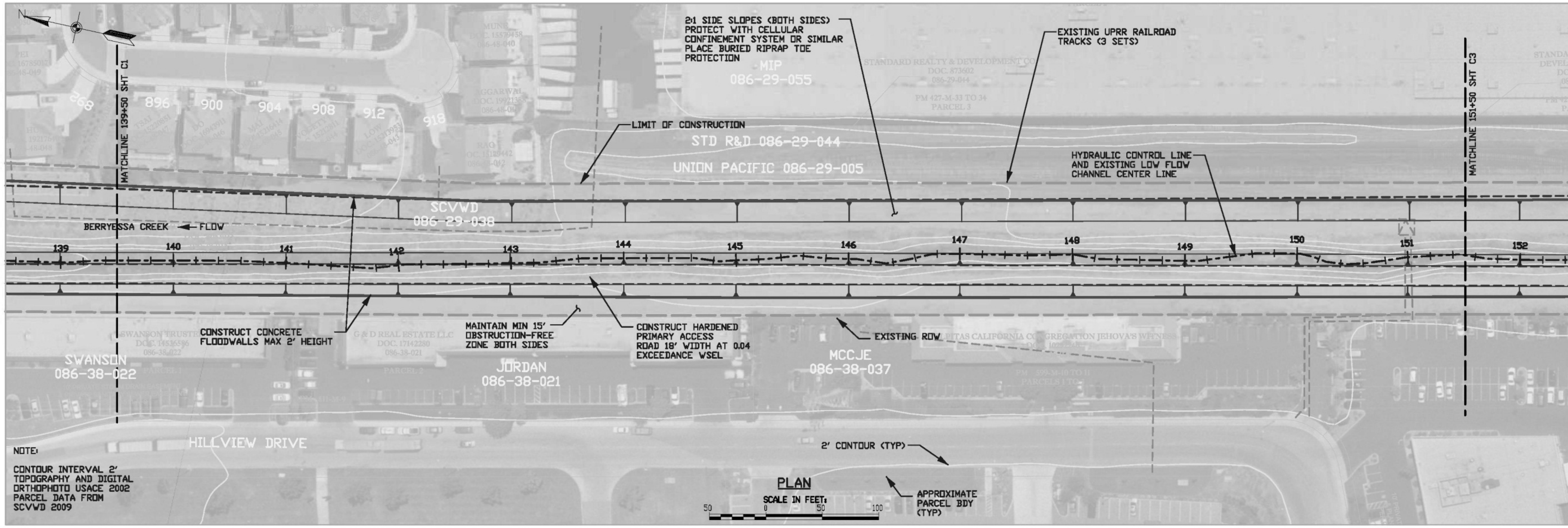
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

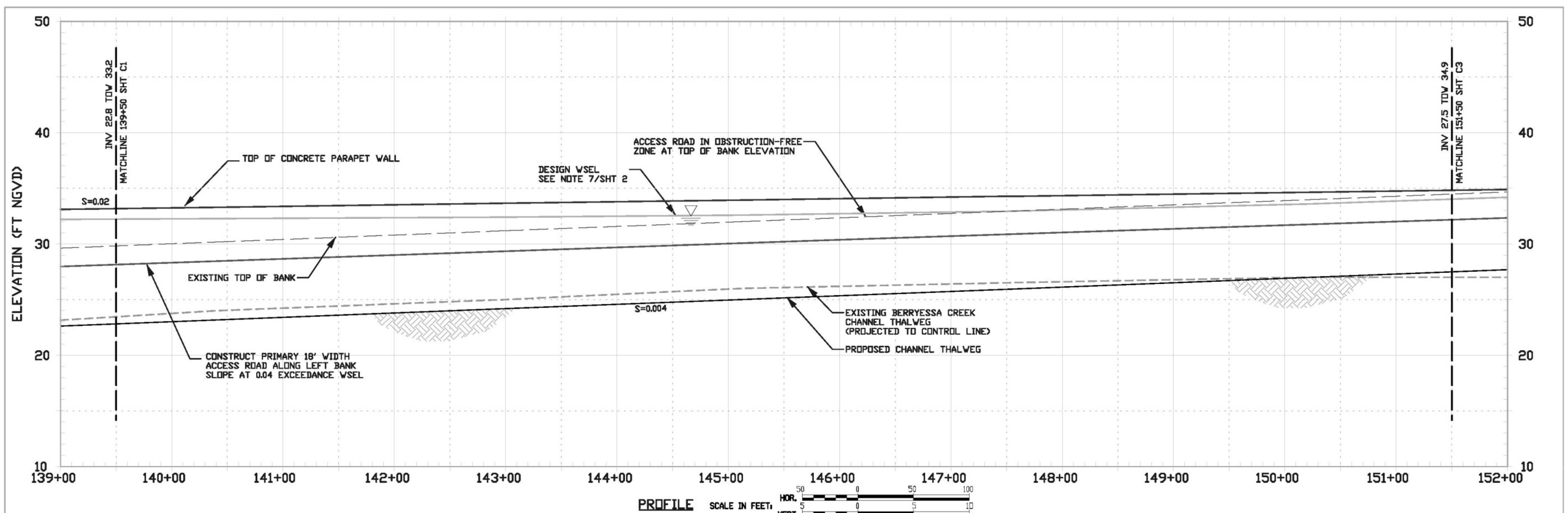
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 127+00 TO 140+00

Sheet reference number:
C1
Sheet 6 of 35





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US Army Corps of Engineers
Sacramento District

Designed by: PRELIMINARY		Date: JAN 17, 2012	Rev. N/A
Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RM		Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

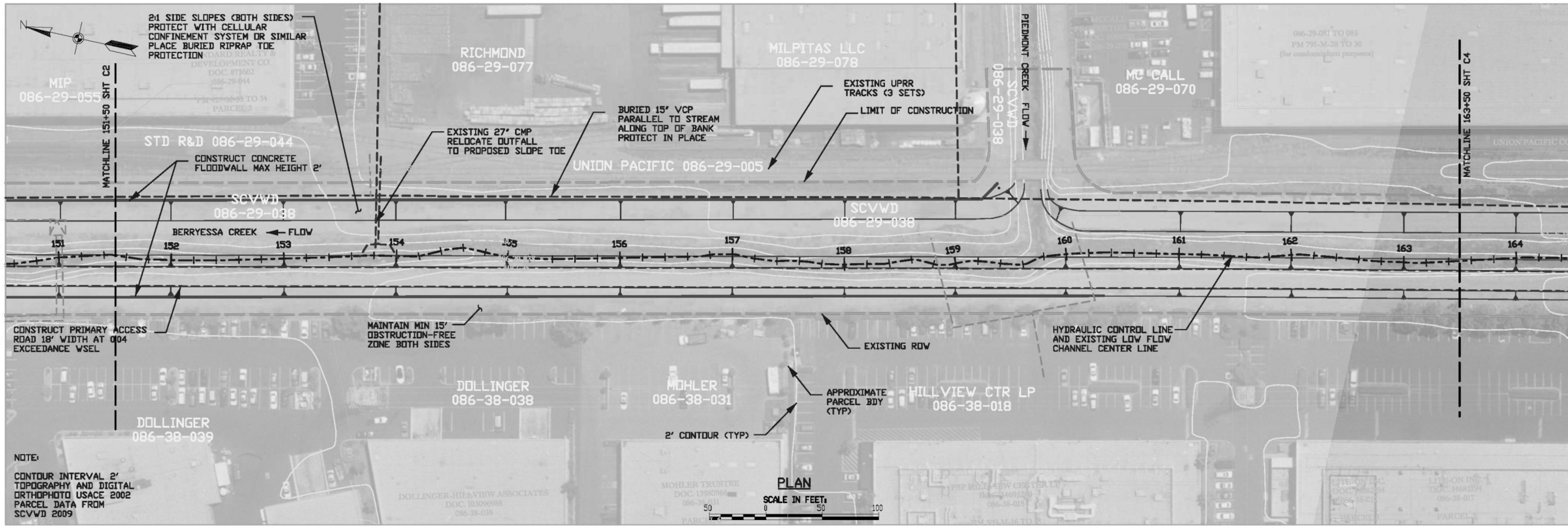
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

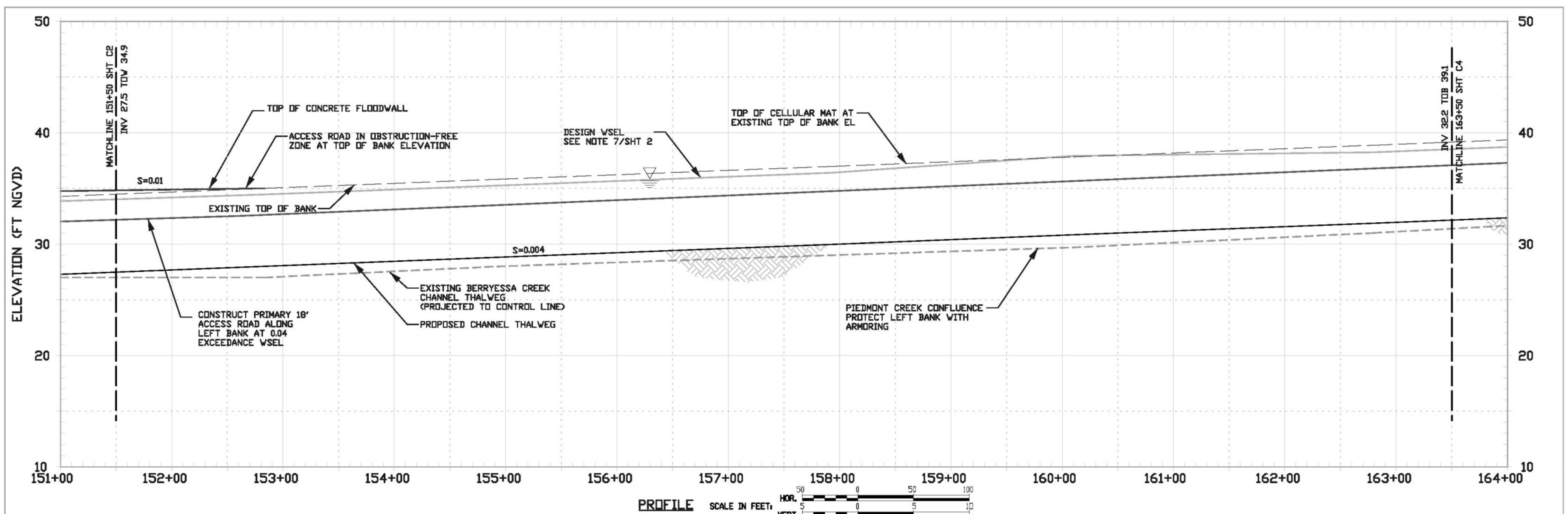
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 139+00 TO 152+00

Sheet reference number:
C2
Sheet 7 of 35





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US Army Corps of Engineers
Sacramento District

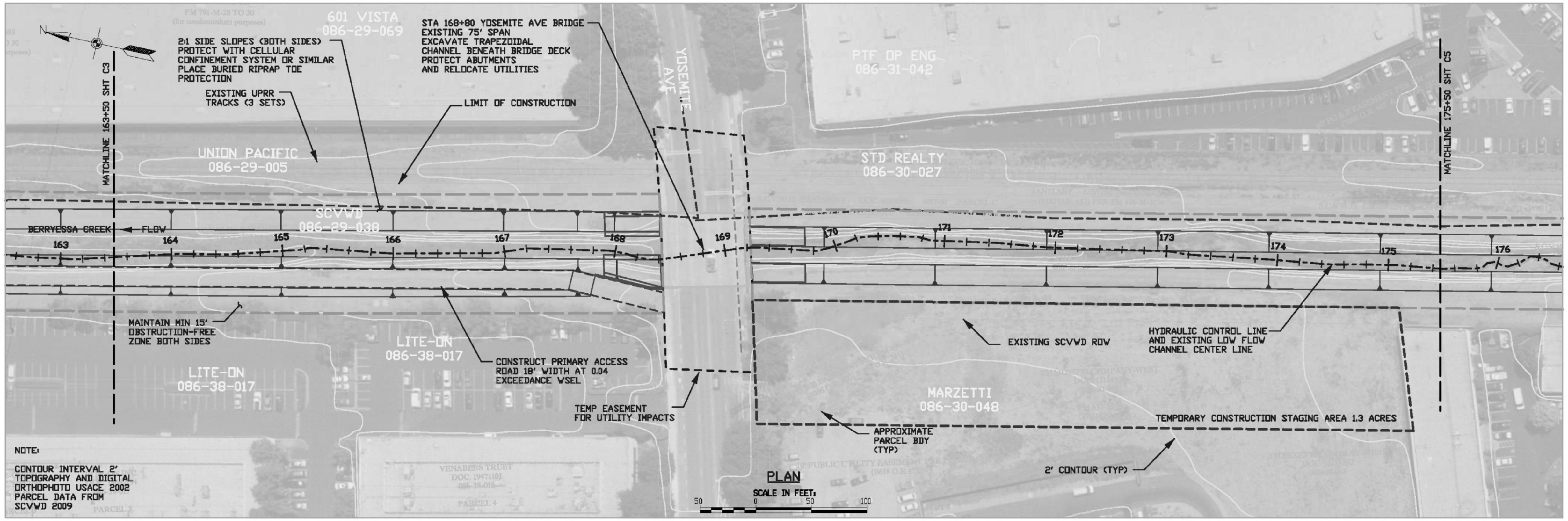
Symbol	Description	Date	Approved

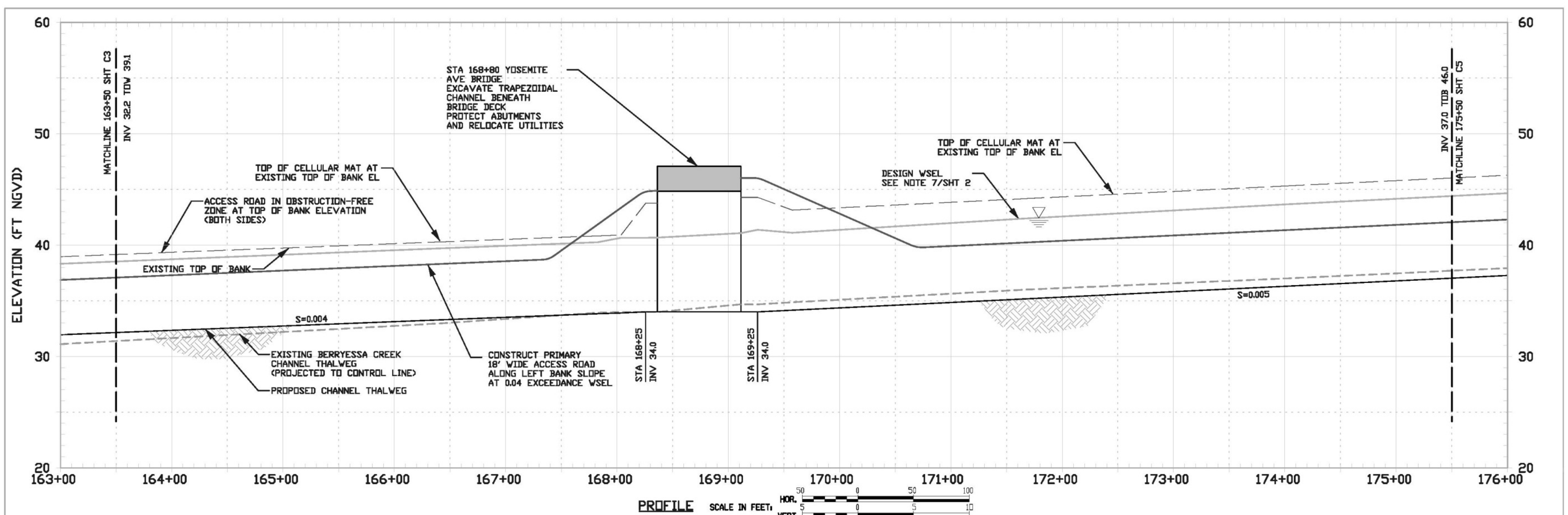
U.S. ARMY CORPS OF ENGINEERS SACRAMENTO DISTRICT IN PARTNERSHIP WITH: SANTA CLARA VLY WATER DISTRICT	Designed by: PRELIMINARY	Date: JAN 17, 2012 — Rev. N/A
	Dwn by: KP — Spec No.: N/A	Design file no: N/A
PREPARED BY: TETRA TECH, INC. 17770 CARTWRIGHT, STE. 500 IRVINE, CA 92614	Reviewed by: RM	Drawing Code:
	Submitted by: CHIEF, CIV ENGR DES SEC A	File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 151+00 TO 164+00

Sheet reference number:
C3
Sheet 8 of 35





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US Army Corps of Engineers
Sacramento District

Date: JAN 17, 2012
Rev.: N/A
Designed by: PRELIMINARY
Dwn by: KP
Spec No.: N/A
Design file no: N/A
Reviewed by: RW
Drawing Code:
Submitted by:

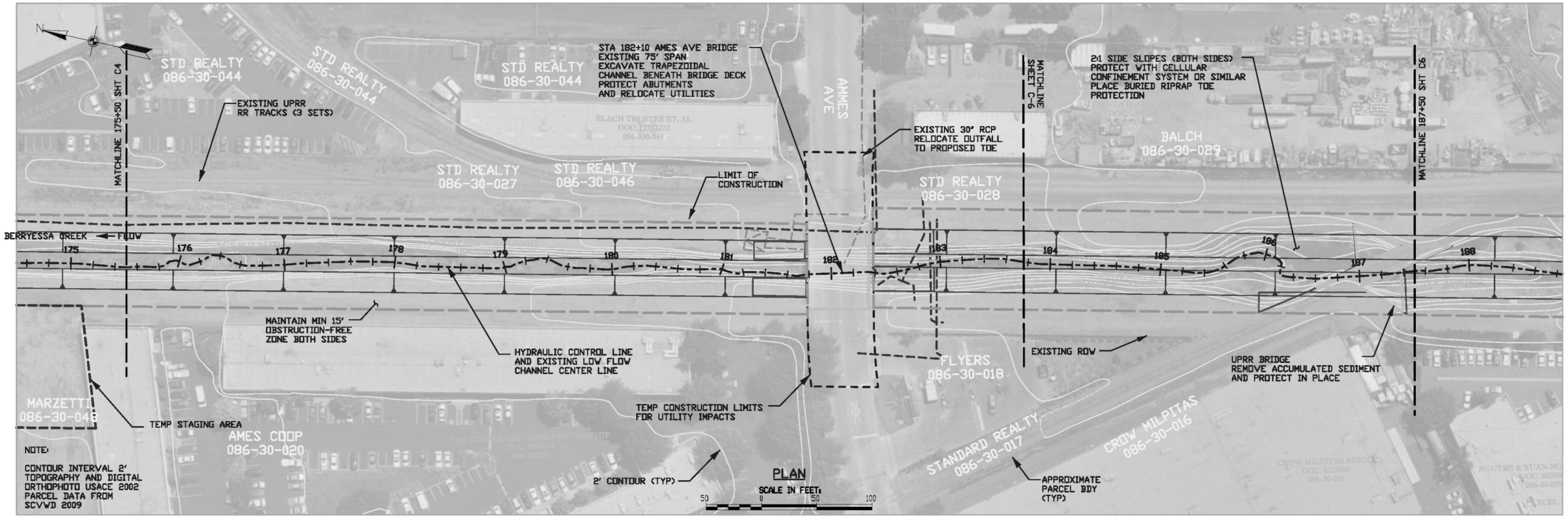
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

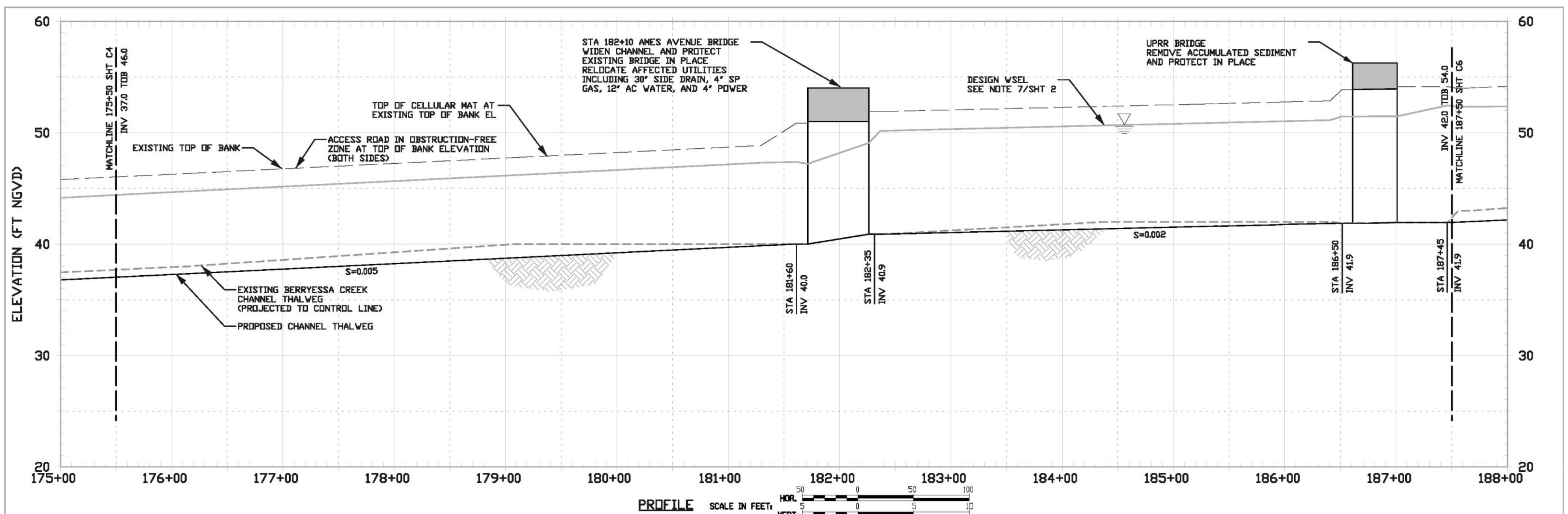
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 163+00 TO 176+00

Sheet reference number:
C4
Sheet 9 of 35





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US Army Corps of Engineers
Sacramento District

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Designed by: PRELIMINARY		Date: JAN 17, 2012	Rev. N/A
Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RM		Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

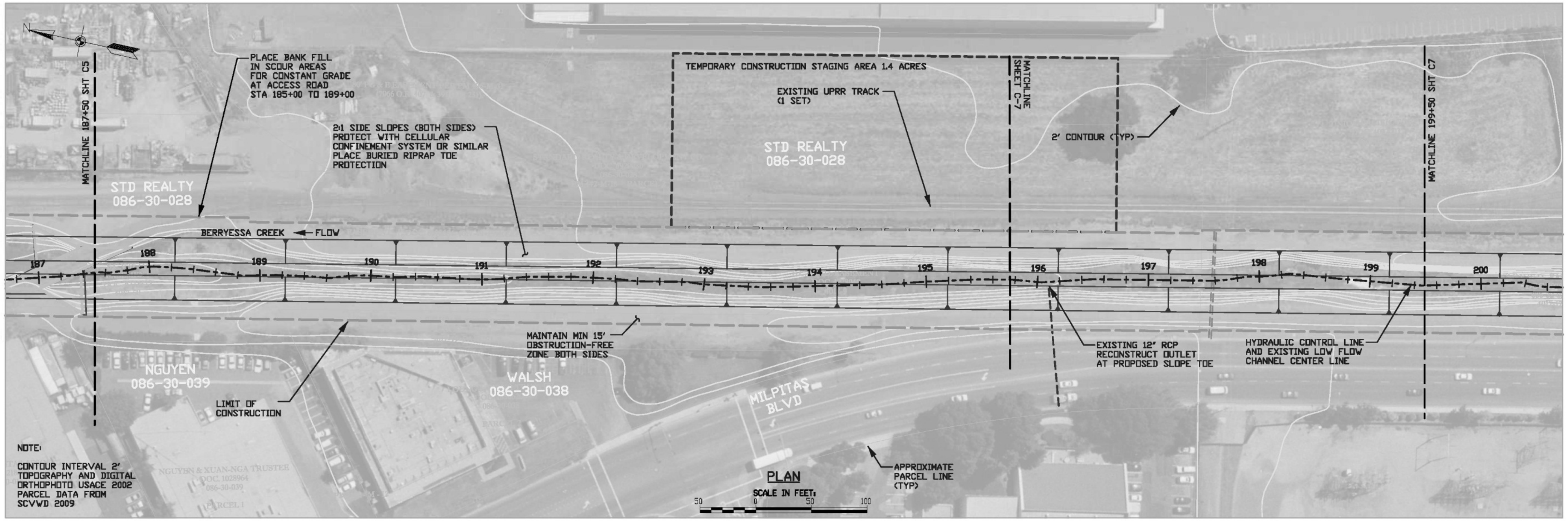
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

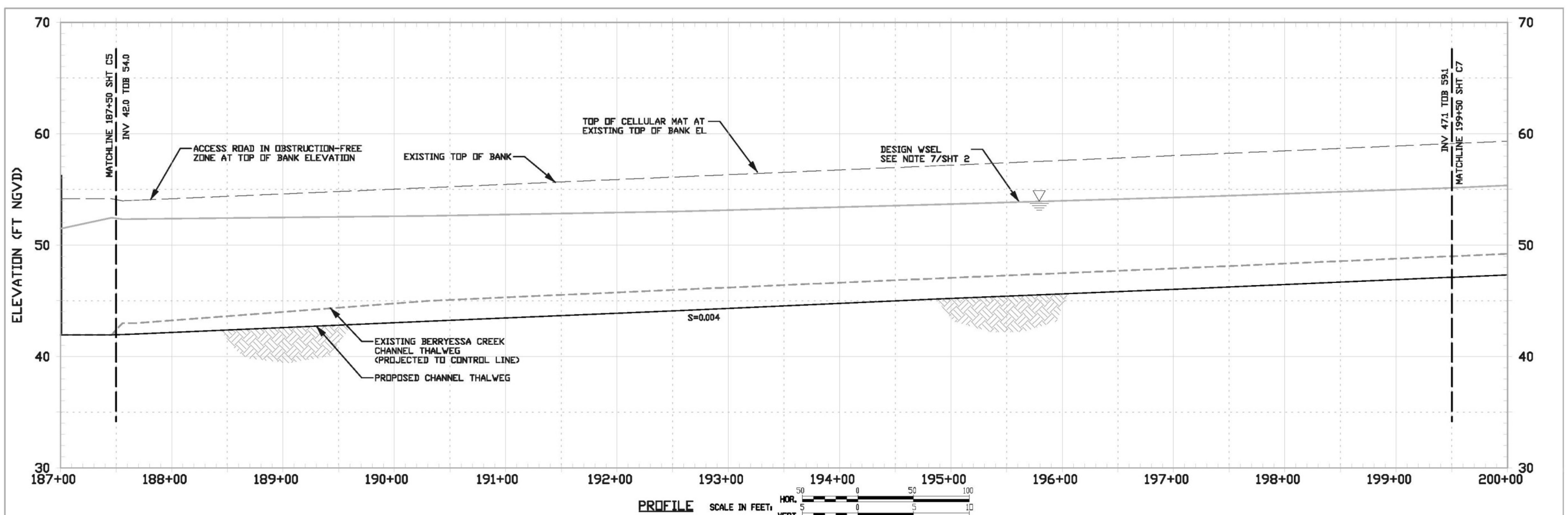
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 175+00 TO 188+00

Sheet reference number:
C5
Sheet 10 of 35





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Sacramento District

Symbol | Description | Date | Approved

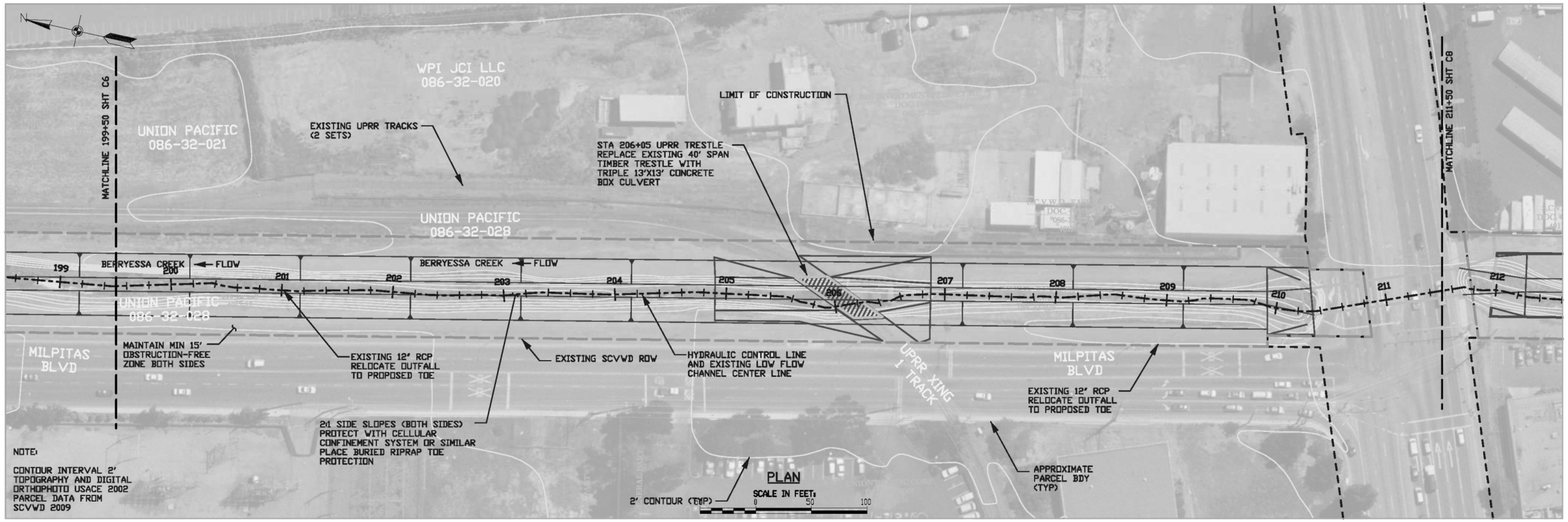
Designed by: PRELIMINARY
Dwn by: KP
Reviewed by:
Submitted by: RW
Spec No.: N/A
Date: JAN 17, 2012
Rev.: N/A
Design file no: N/A
Drawing Code:
File name: BER PP C-XX
Plot date: DEC 22, 2011
Plot scale: 1:50/100

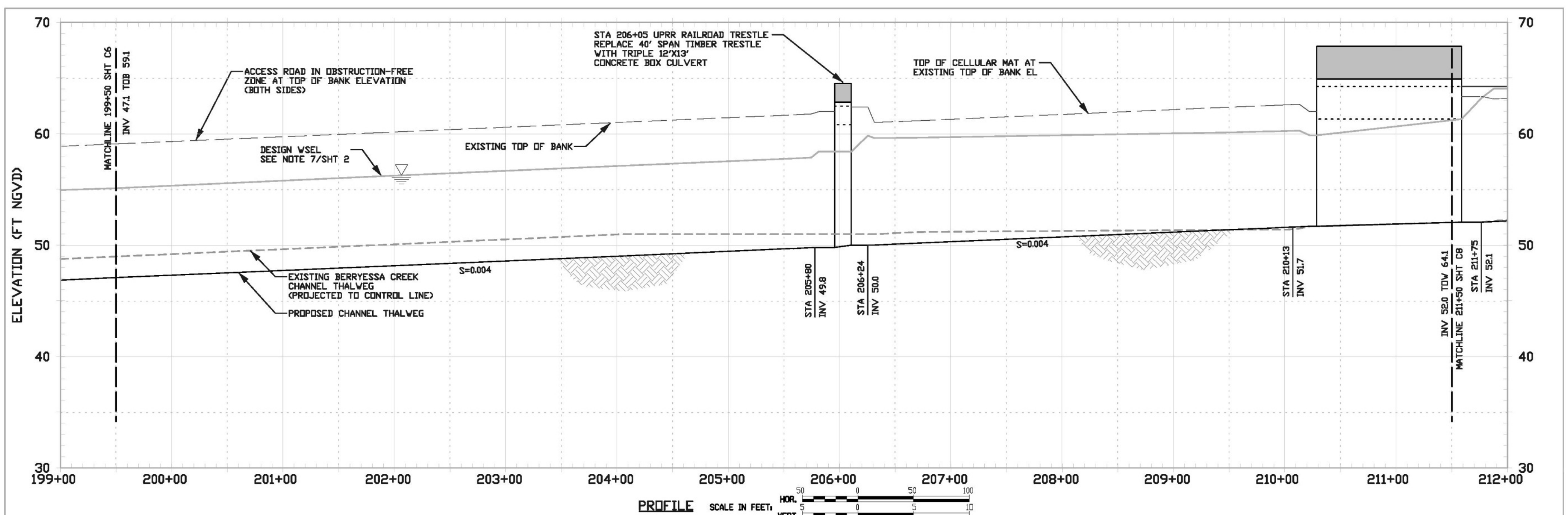
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION
ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 184+00 TO 197+00

Sheet reference number:
C6
Sheet 11 of 35





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US Army Corps of Engineers
Sacramento District

Symbol	Description	Date	Approved

Designed by: PRELIMINARY
Dwn by: KP
Reviewed by: RW
Submitted by:
Spec No.: N/A
Date: JAN 17, 2012
Rev.: N/A
Design file no.: N/A
Drawing Code:

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
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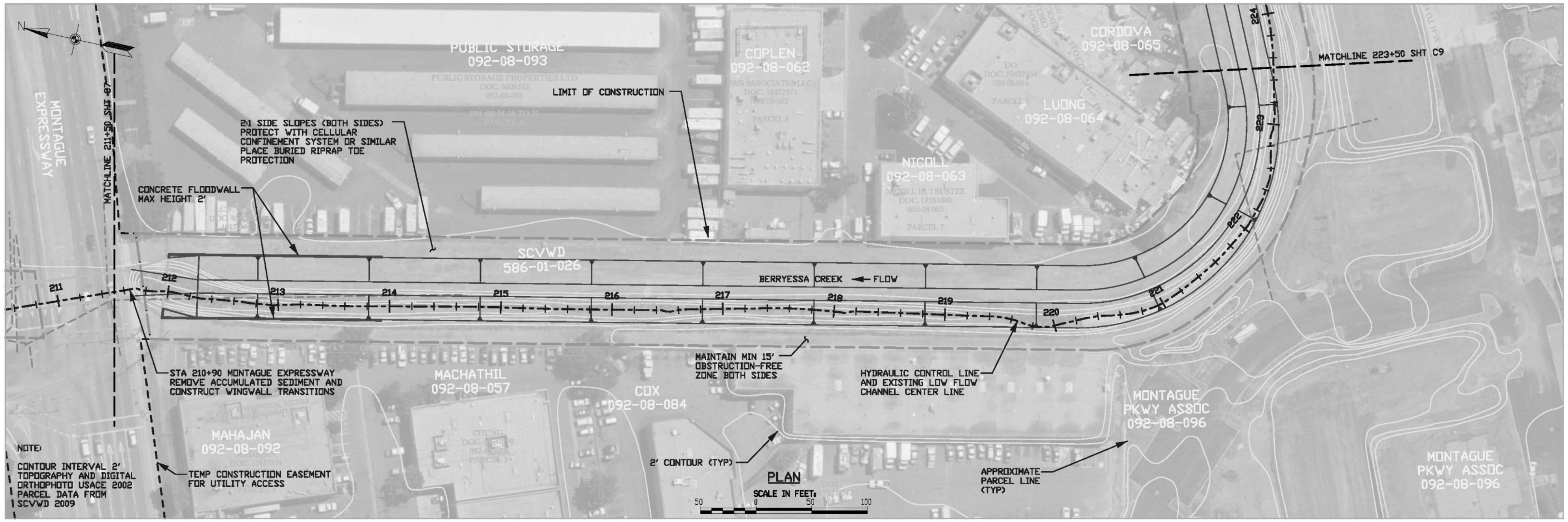
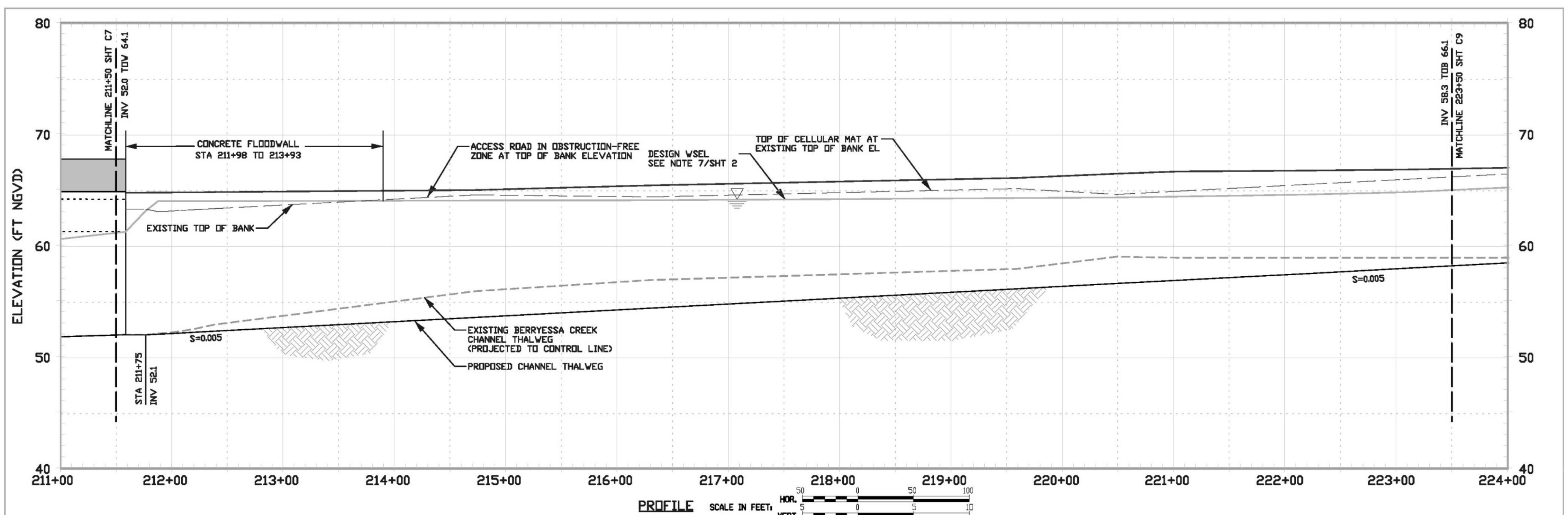
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 199+00 TO 212+00

Sheet reference number:
C7
Sheet 12 of 35





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US Army Corps of Engineers
Sacramento District

Designed by: PRELIMINARY
Dwn by: KP
Reviewed by: RW
Submitted by:
Date: JAN 17, 2012
Spec No.: N/A
Design file no: N/A
Drawing Code:

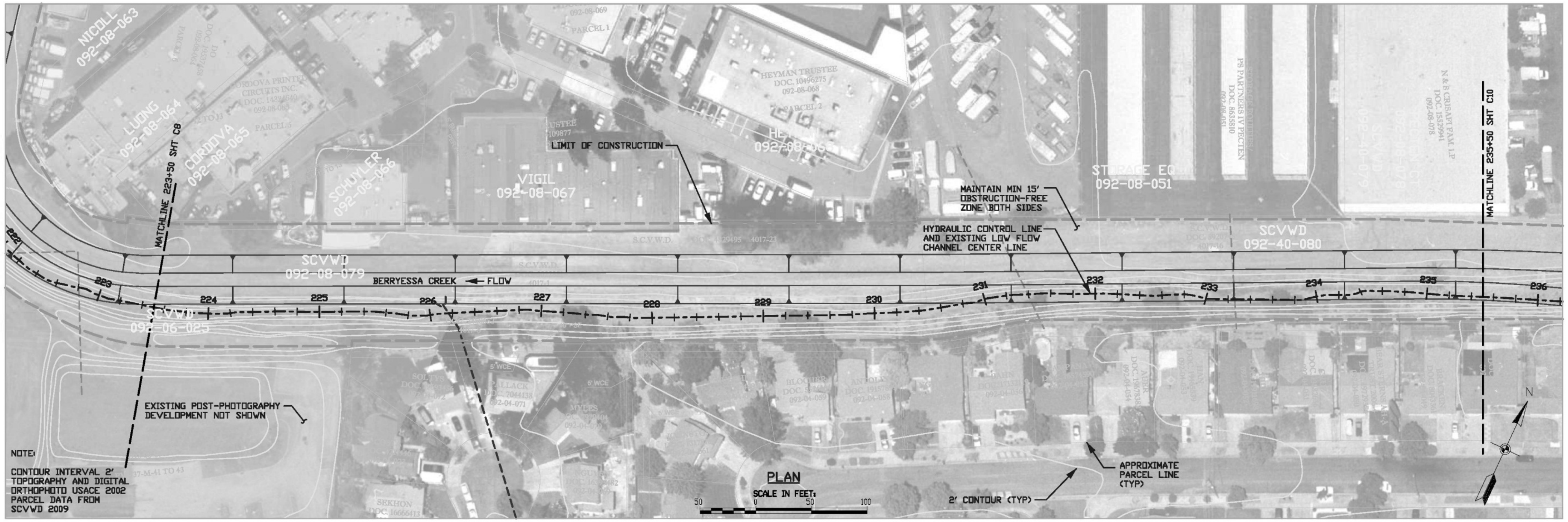
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

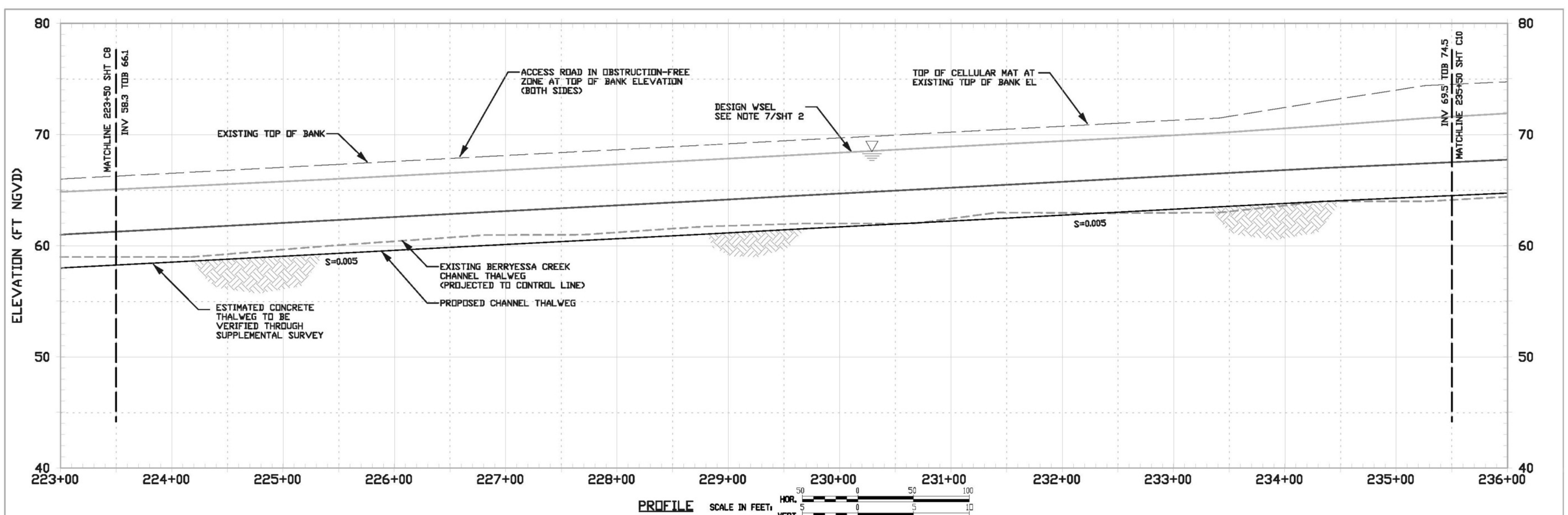
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 211+00 TO 224+00

Sheet reference number:
C8
Sheet 13 of 35





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US Army Corps of Engineers
Sacramento District

Symbol	Description	Date	Approved

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

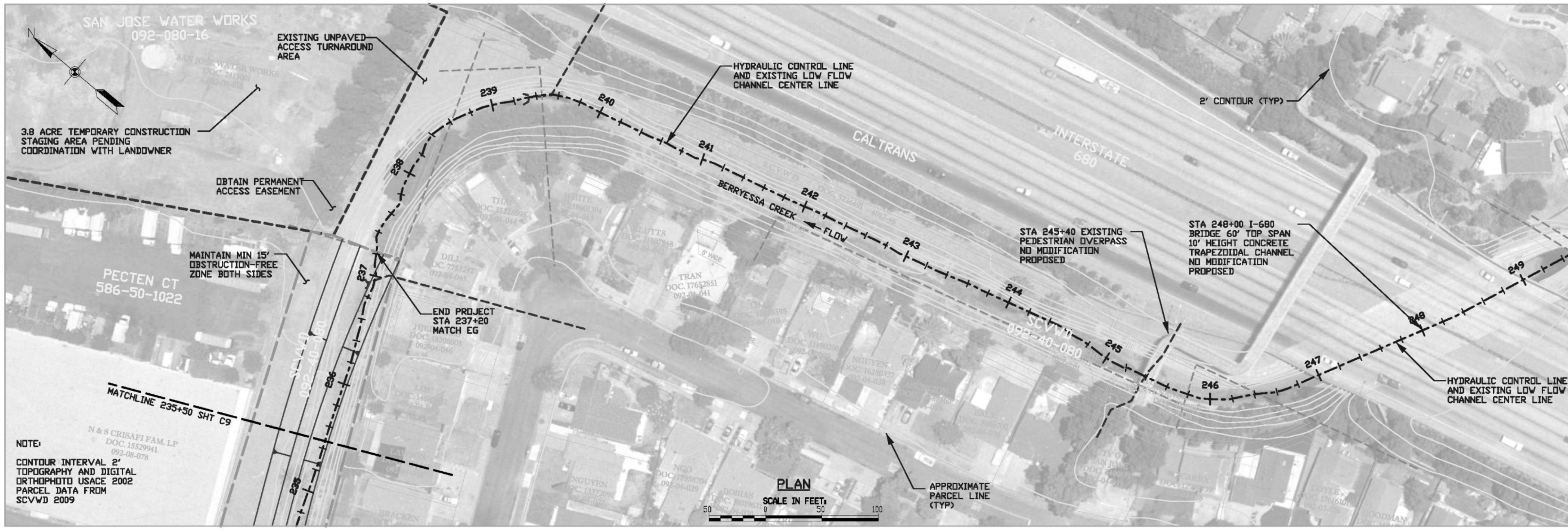
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

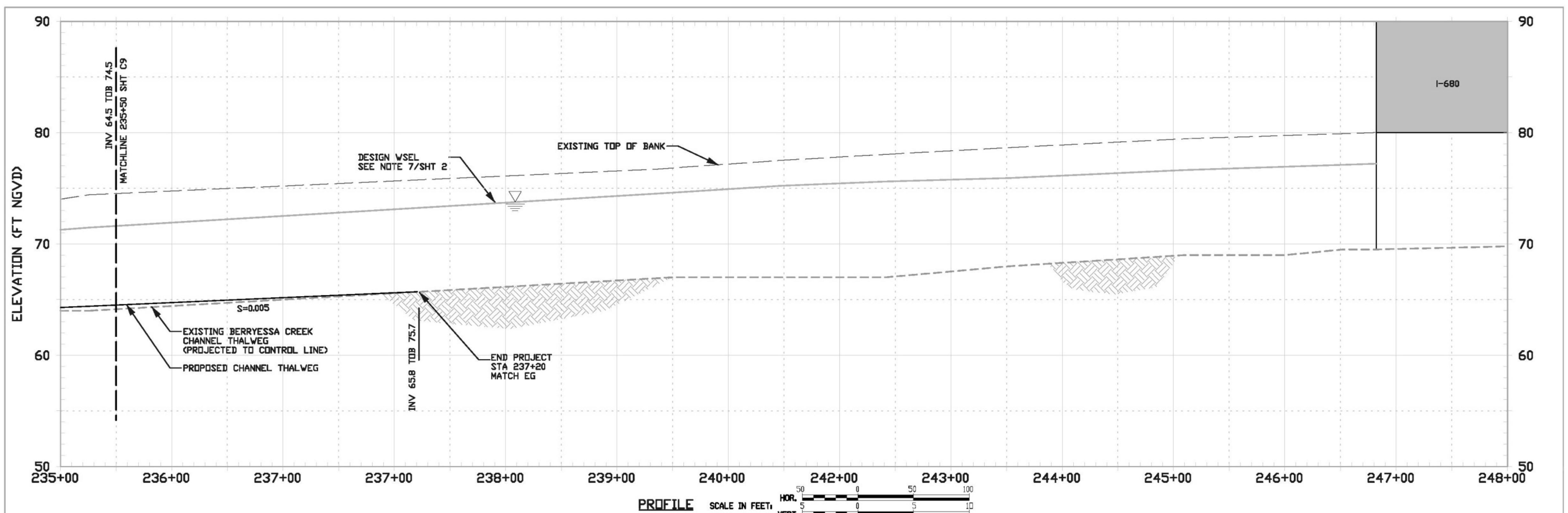
Designed by: PRELIMINARY		Date: JAN 17, 2012	Rev. N/A
Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RM		Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 220+00 TO 233+00

Sheet reference number:
C9
Sheet 14 of 35





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US Army Corps of Engineers
Sacramento District

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Dwn by: KP	Spec No.: N/A	Design file no: N/A	
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Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

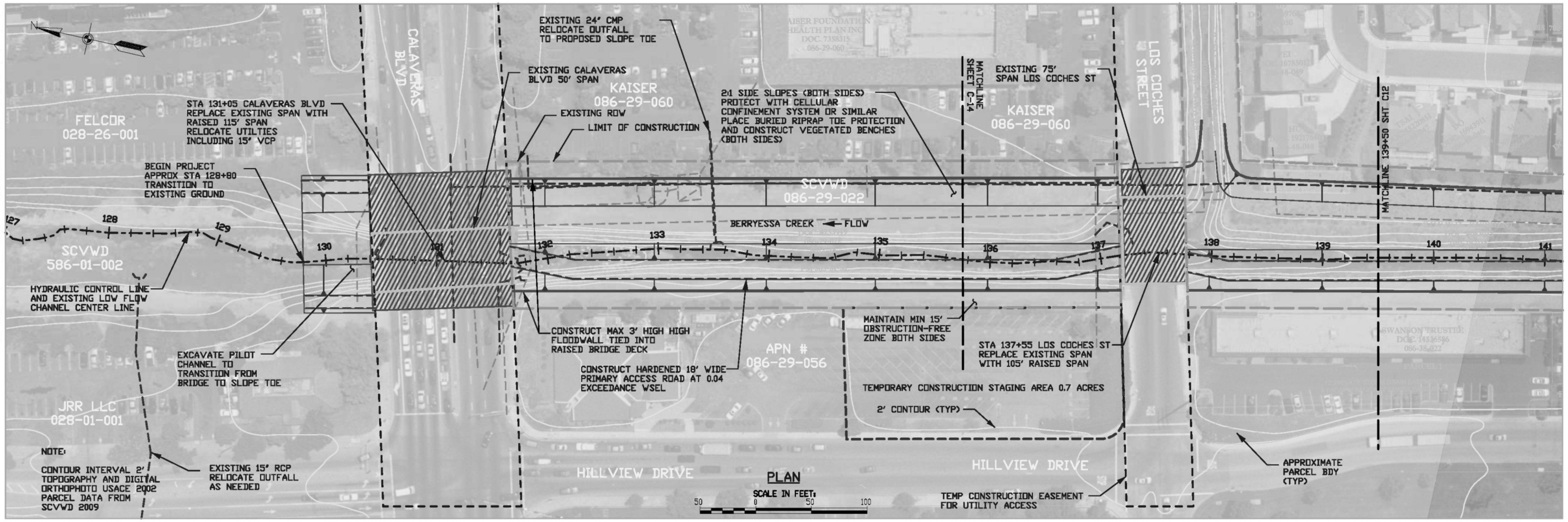
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

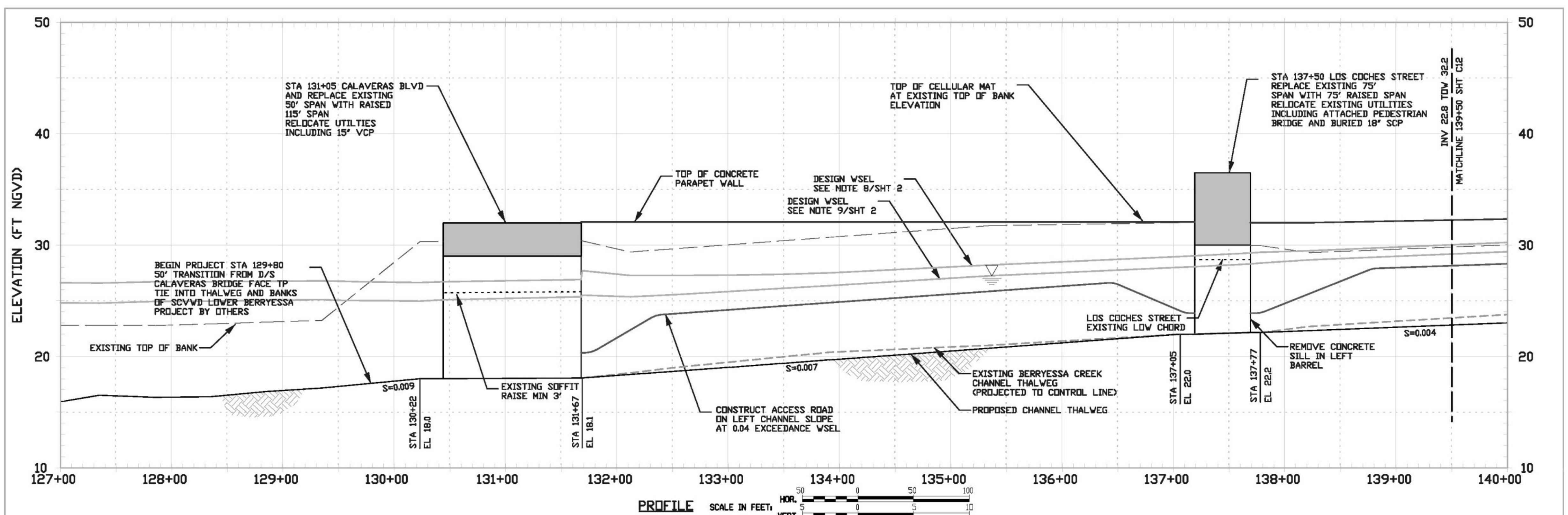
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2A/d
PLAN AND PROFILE VIEW
STA. 235+00 TO 248+00

Sheet reference number:
C10
Sheet 15 of 35





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US Army Corps of Engineers
Sacramento District

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

Designed by: PRELIMINARY	Date: JAN 17, 2012	Rev. N/A	
Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RW		Drawing Code:	
Submitted by:		File name:	

SANTA CLARA COUNTY — CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 127+00 TO 140+00

Sheet reference number:
C11
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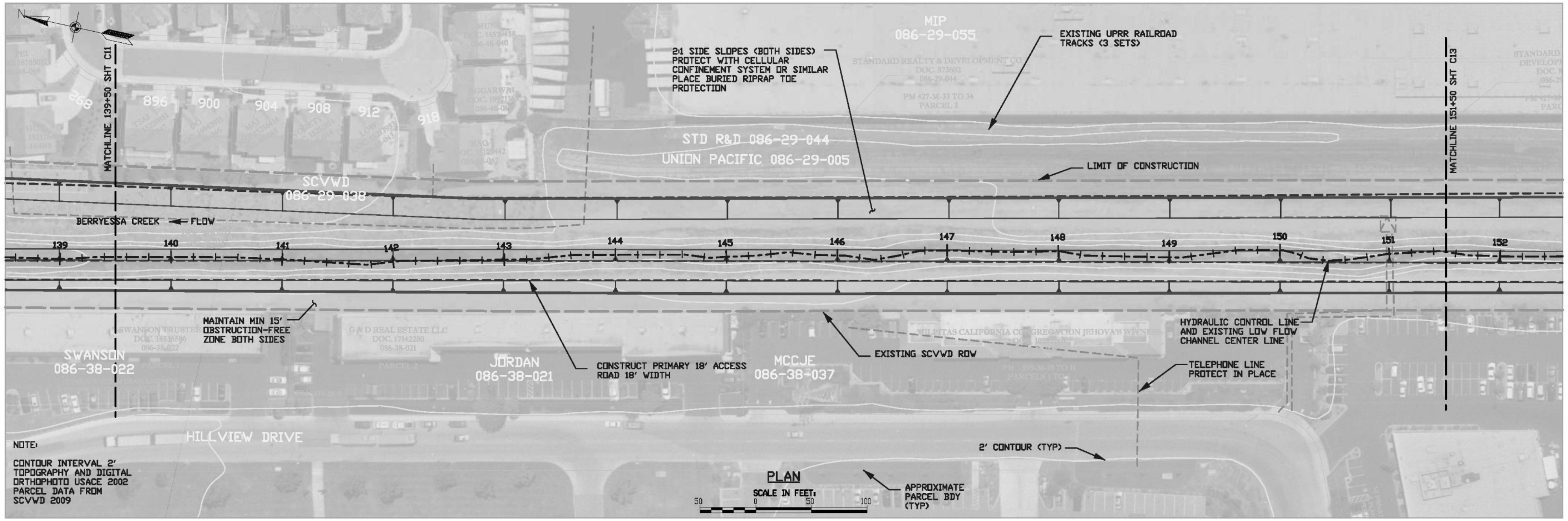

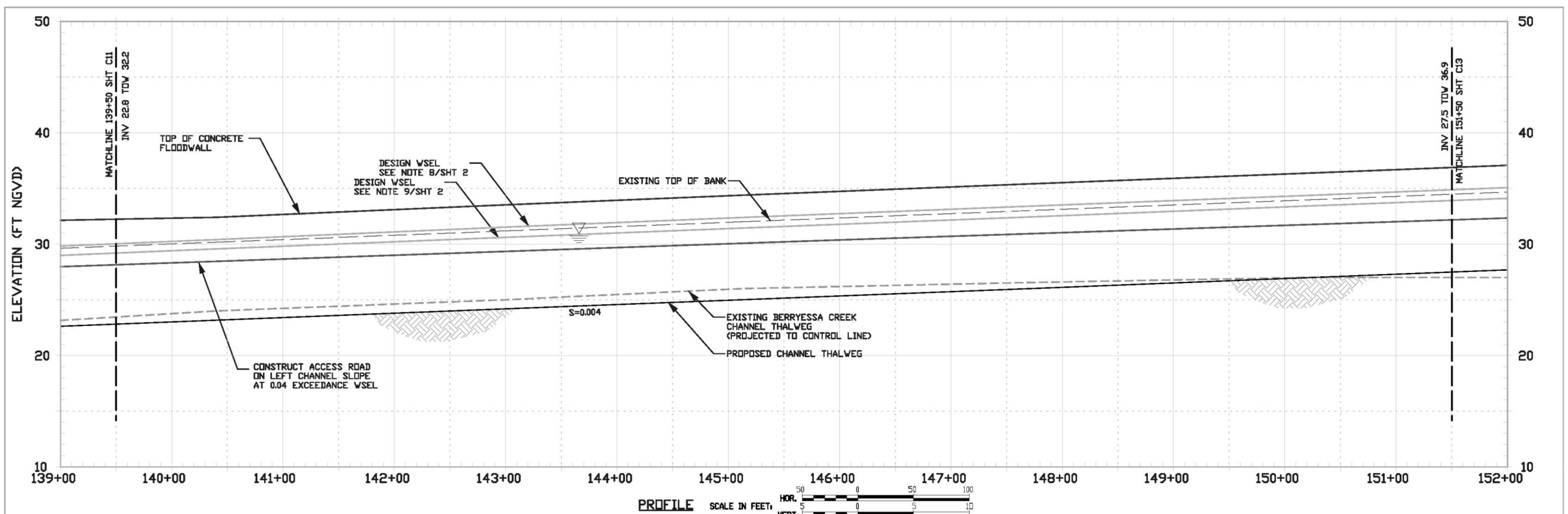

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US Army Corps of Engineers
Sacramento District

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

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Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RM		Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

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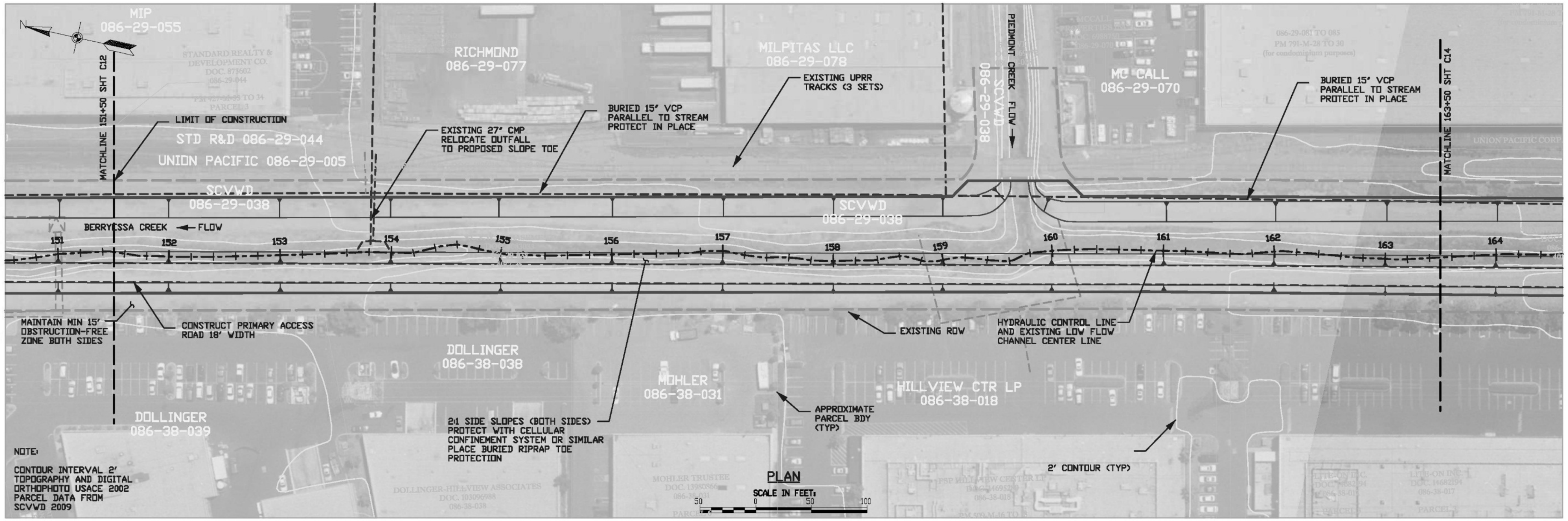
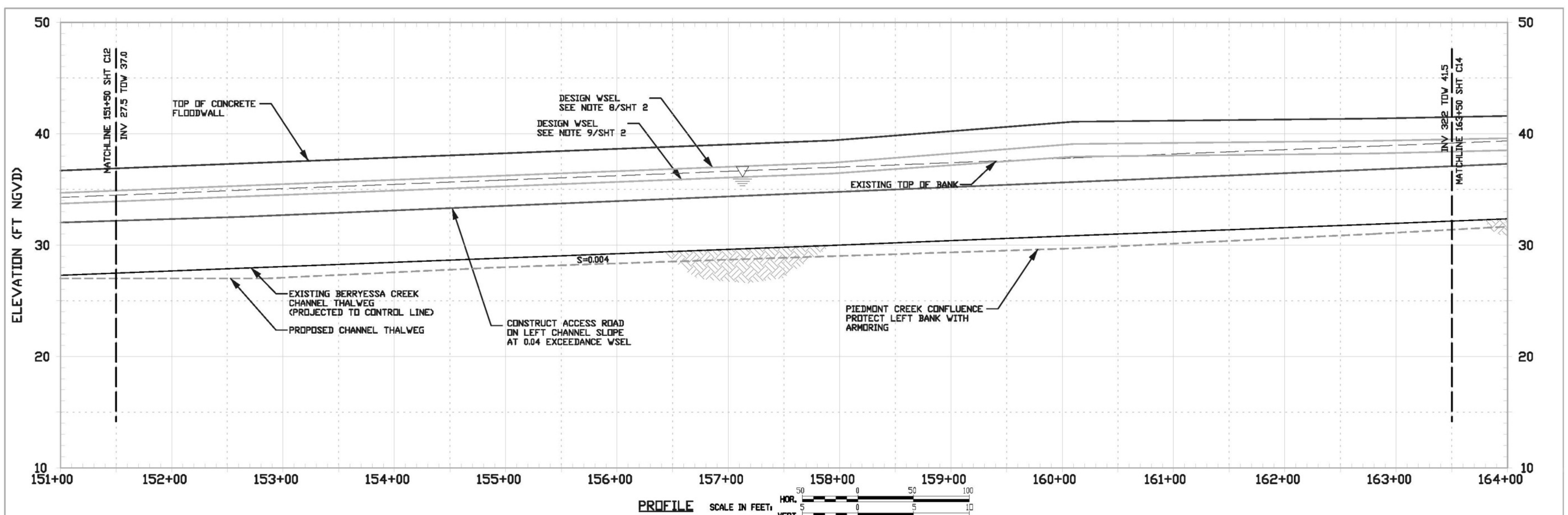
SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 139+00 TO 152+00

Sheet reference number:
C12





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US Army Corps of Engineers
Sacramento District

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

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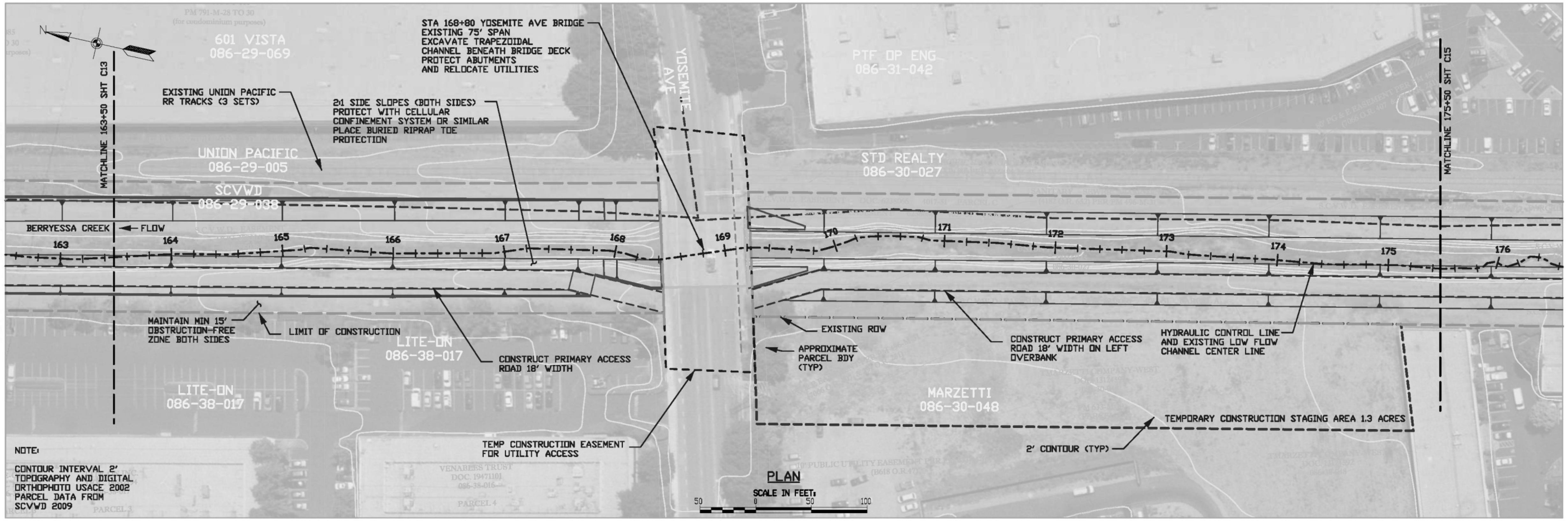
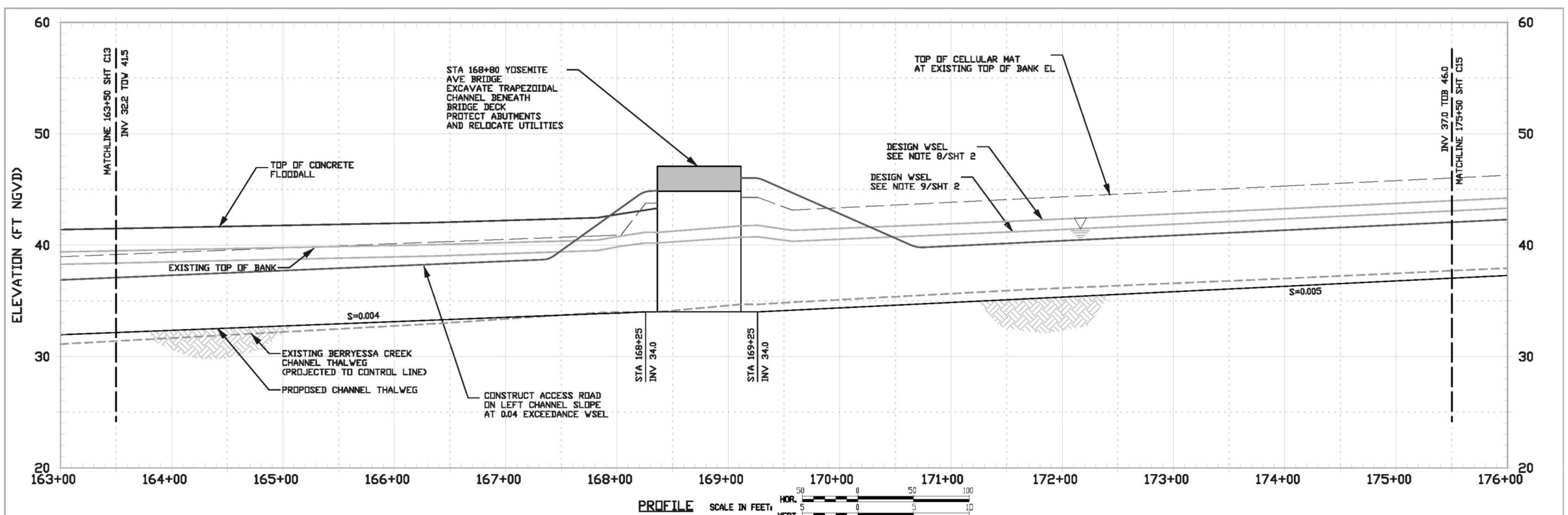
Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RM		Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 151+00 TO 164+00

Sheet reference number:
C13
Sheet 18 of 35





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US Army Corps of Engineers
Sacramento District

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Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

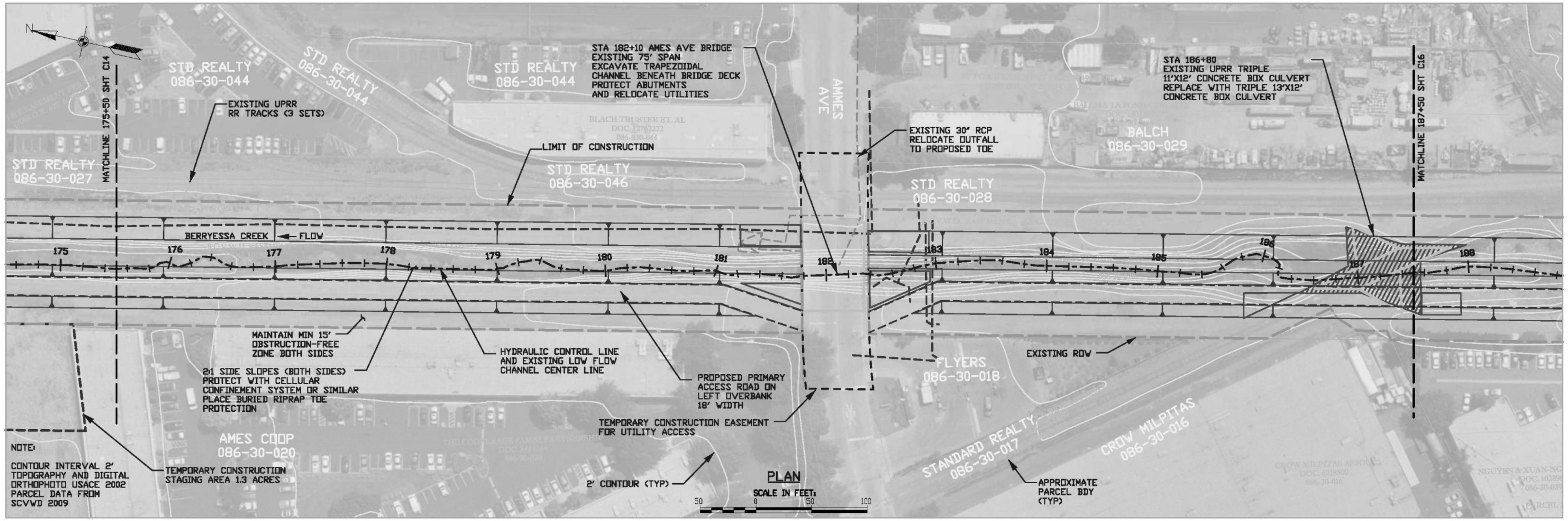
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

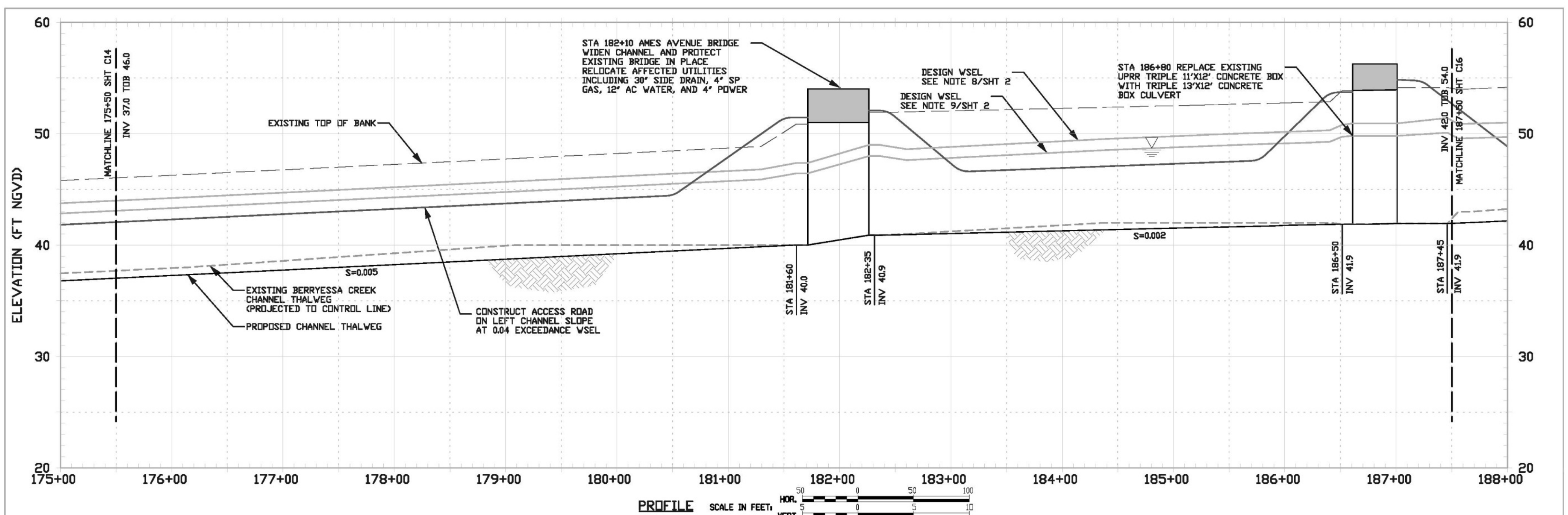
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 163+00 TO 176+00

Sheet reference number:
C14
Sheet 19 of 35





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US Army Corps of Engineers
Sacramento District

Symbol	Description	Date	Approved

Designed by: PRELIMINARY
Dwn by: KP
Reviewed by: RW
Submitted by:
Spec No.: N/A
Date: JAN 17, 2012
Rev.: N/A
Design file no: N/A
Drawing Code:

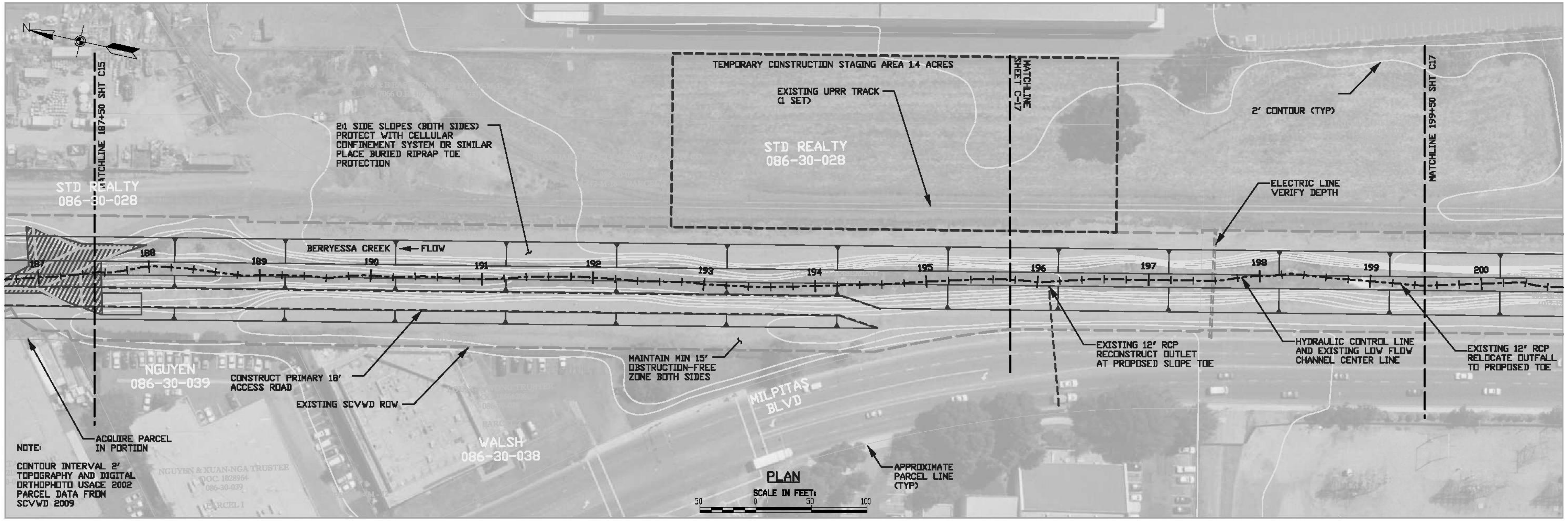
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

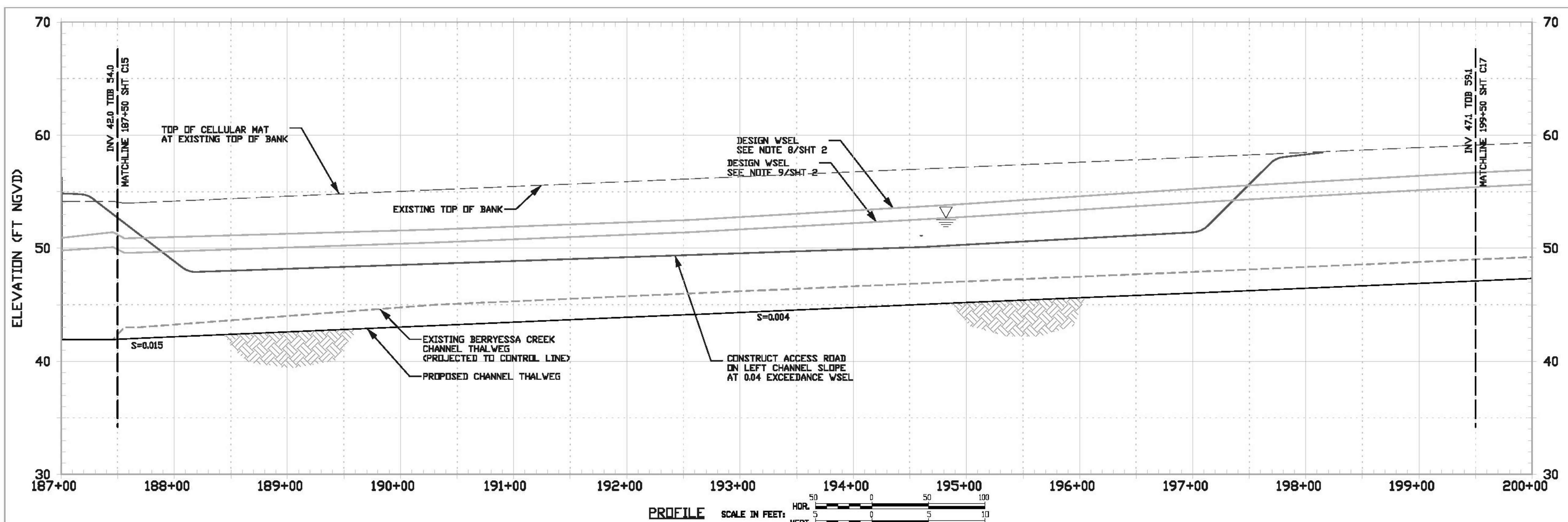
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 175+00 TO 188+00

Sheet reference number:
C15





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US Army Corps of Engineers
Sacramento District

Designed by: PRELIMINARY
Dwn by: KP
Spec No.: N/A
Reviewed by: RM
Submitted by: CHIEF, CIV ENGR DES SEC A
Date: JAN 17, 2012
Rev. N/A
Design file no: N/A
Drawing Code:
File name: BER PP C-XX
Plot date: DEC 22, 2011
Plot scale: 50/100

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION
ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 187+00 TO 200+00

Sheet reference number:
C16
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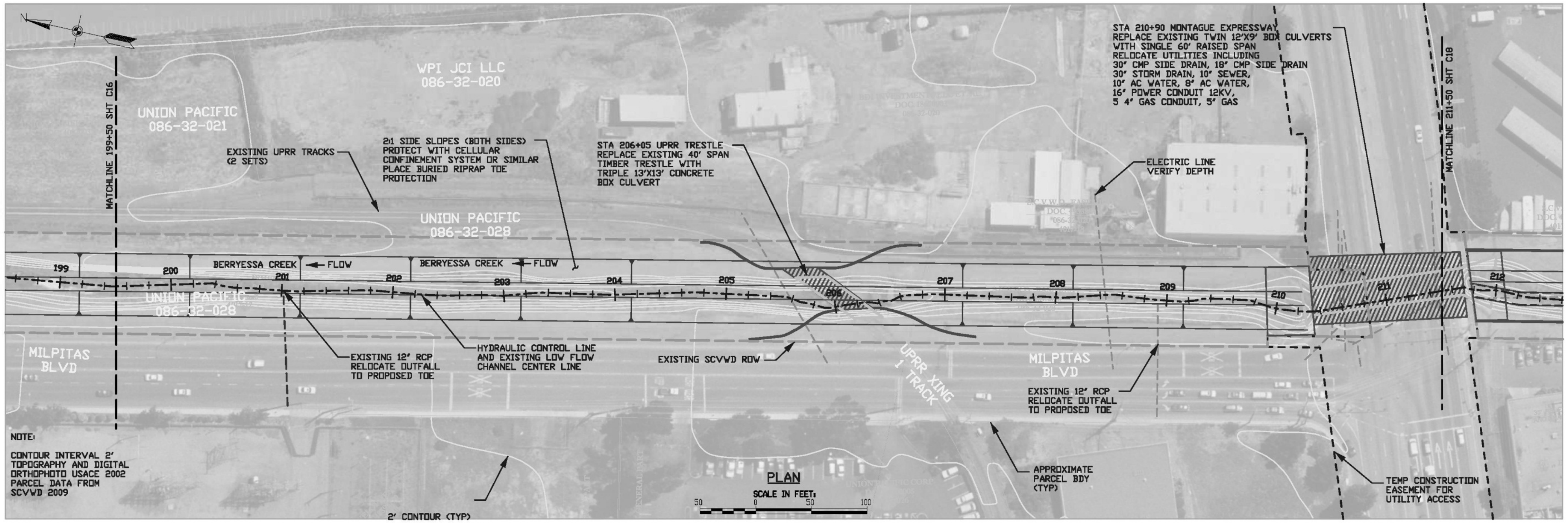

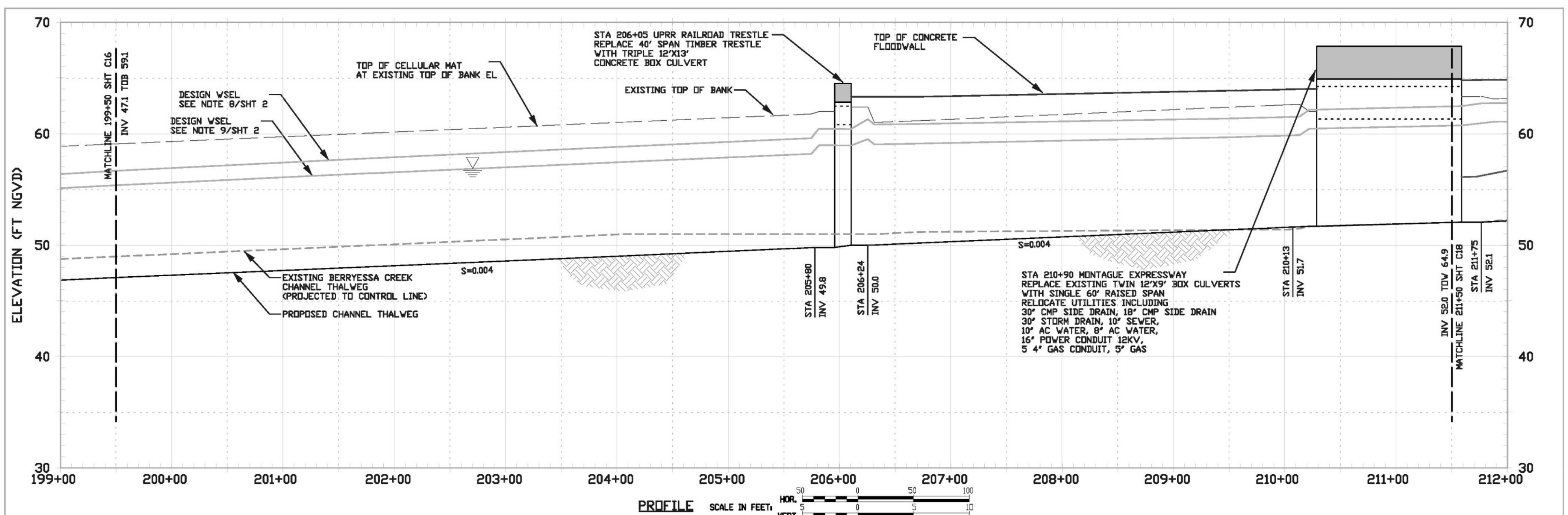

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US Army Corps of Engineers
Sacramento District

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

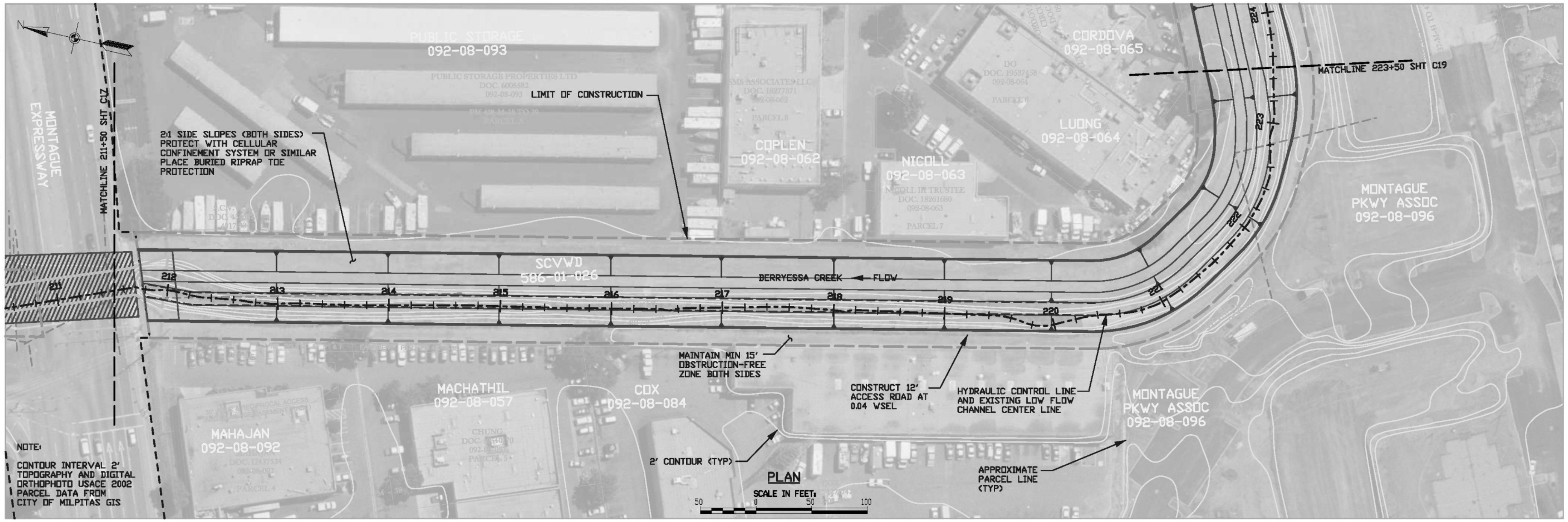
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

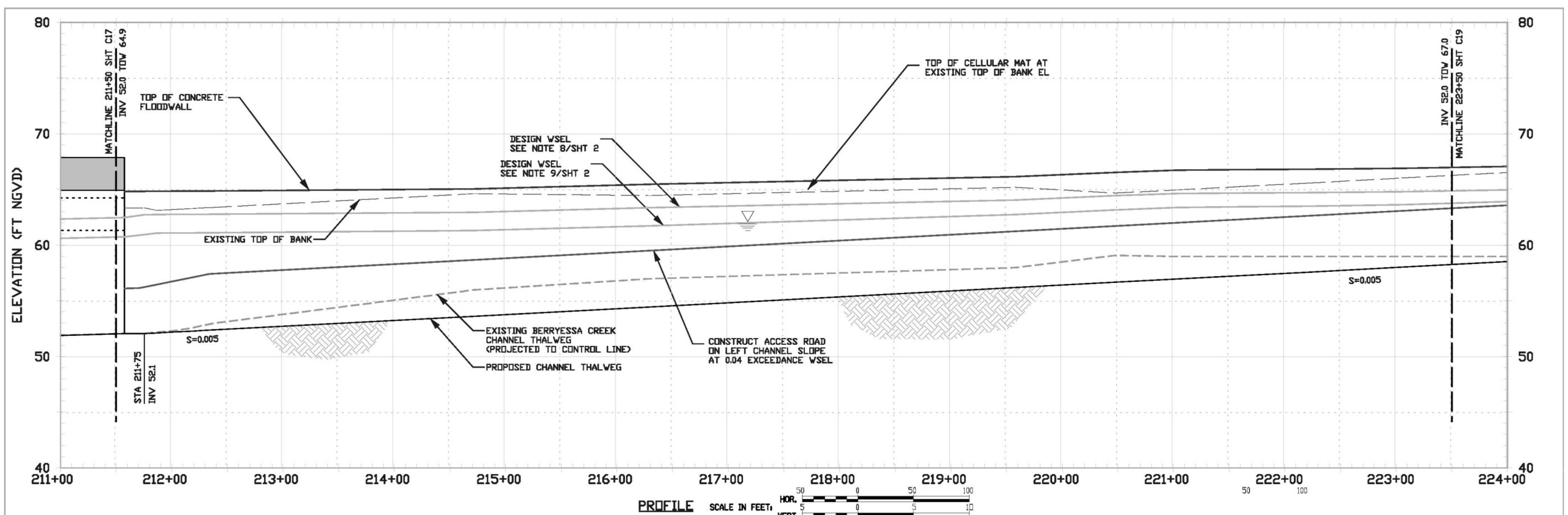
Designed by: PRELIMINARY		Date: JAN 17, 2012	Rev. N/A
Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RM		Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 199+00 TO 212+00

Sheet reference number:
C17
Sheet 22 of 35





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US Army Corps of Engineers
Sacramento District

Designed by: PRELIMINARY
Dwn by: KP
Reviewed by: RW
Date: JAN 17, 2012
Rev.: N/A

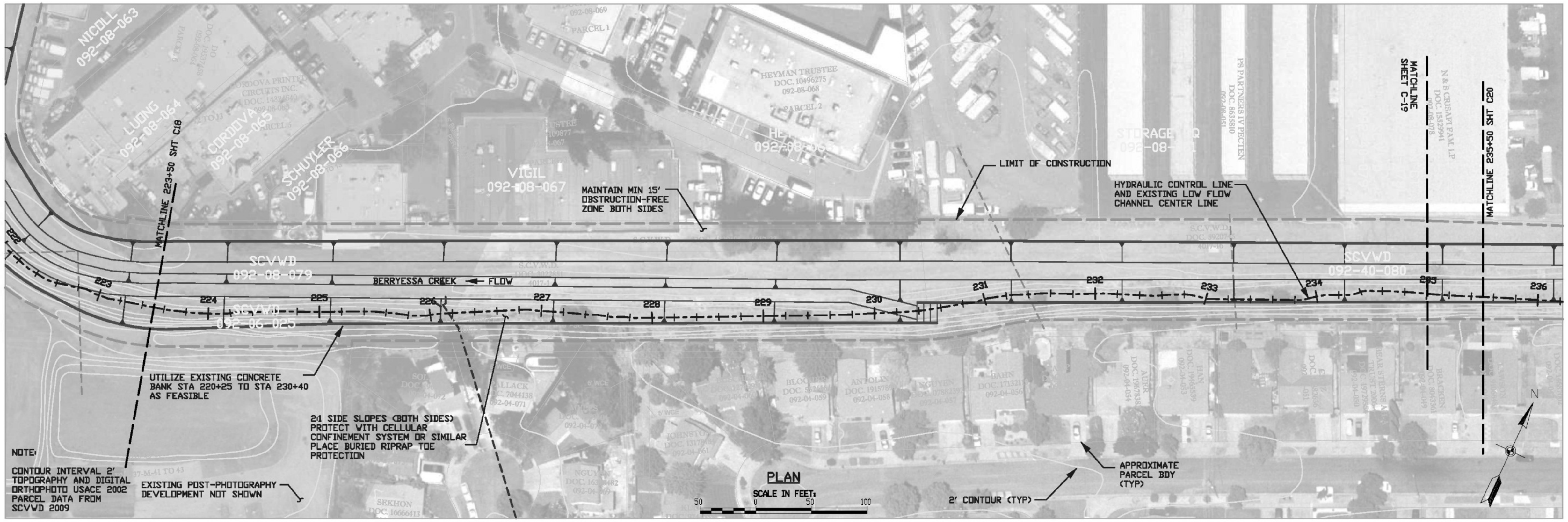
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

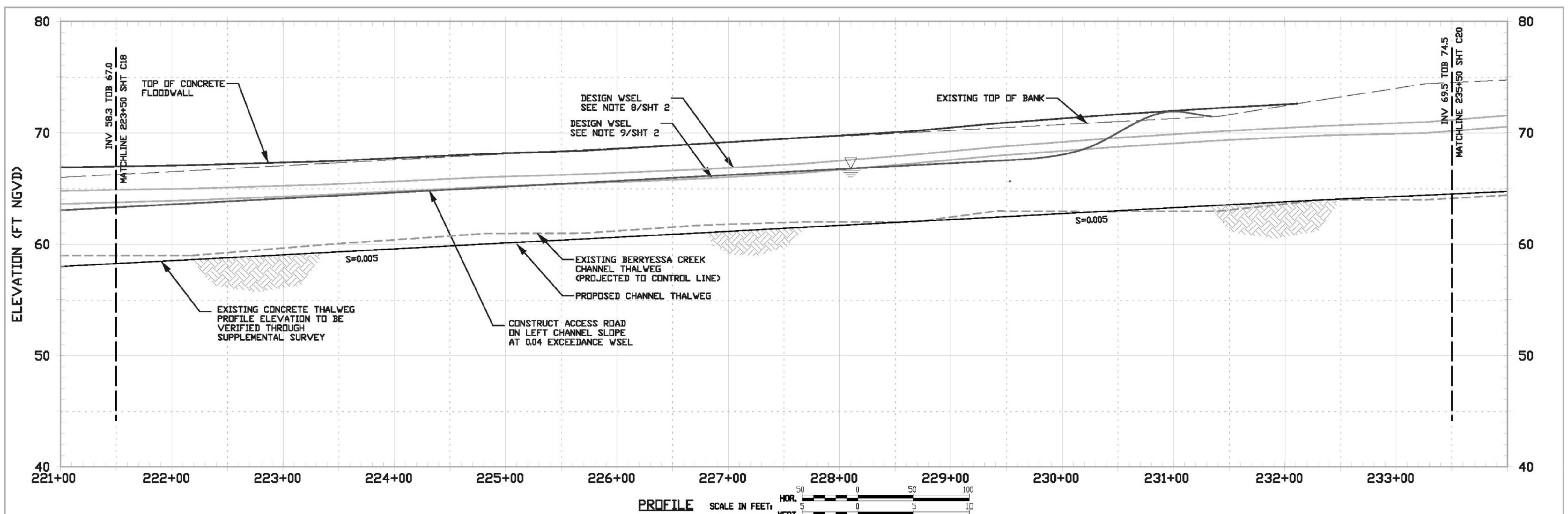
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 211+00 TO 224+00

Sheet reference number:
C18
Sheet 23 of 35





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US Army Corps of Engineers
Sacramento District

Symbol	Description	Date	Approved

Designed by: PRELIMINARY	Date: JAN 17, 2012
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Submitted by: CHIEF, CIV ENGR DES SEC A	File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100

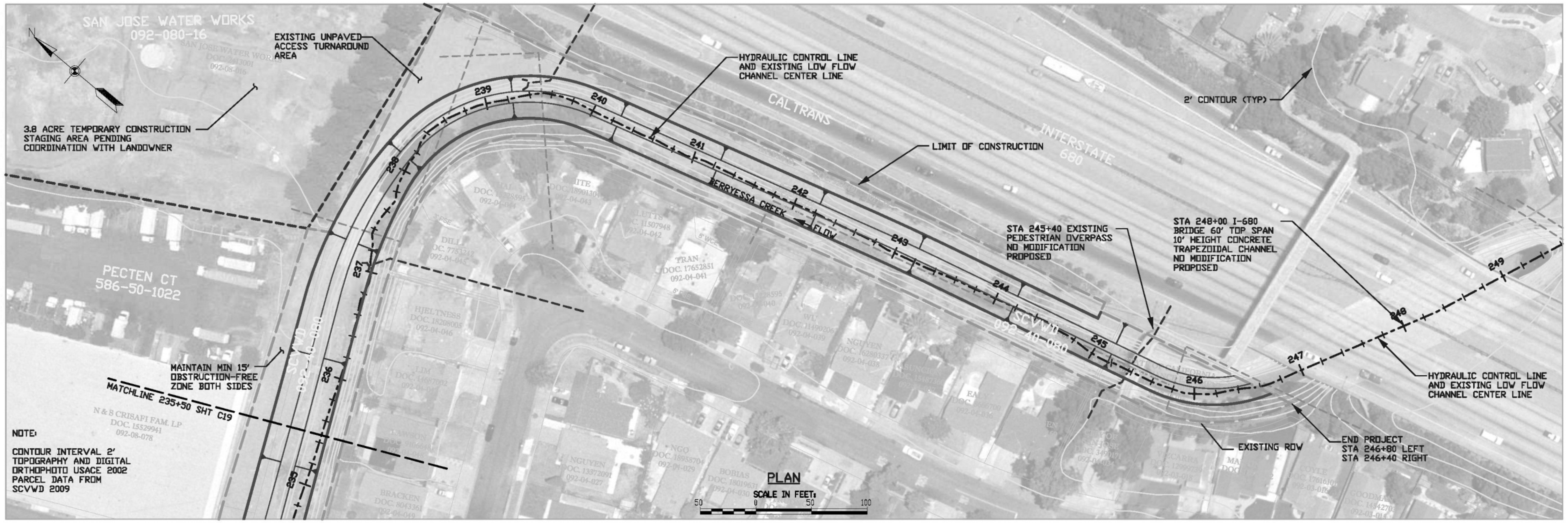
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

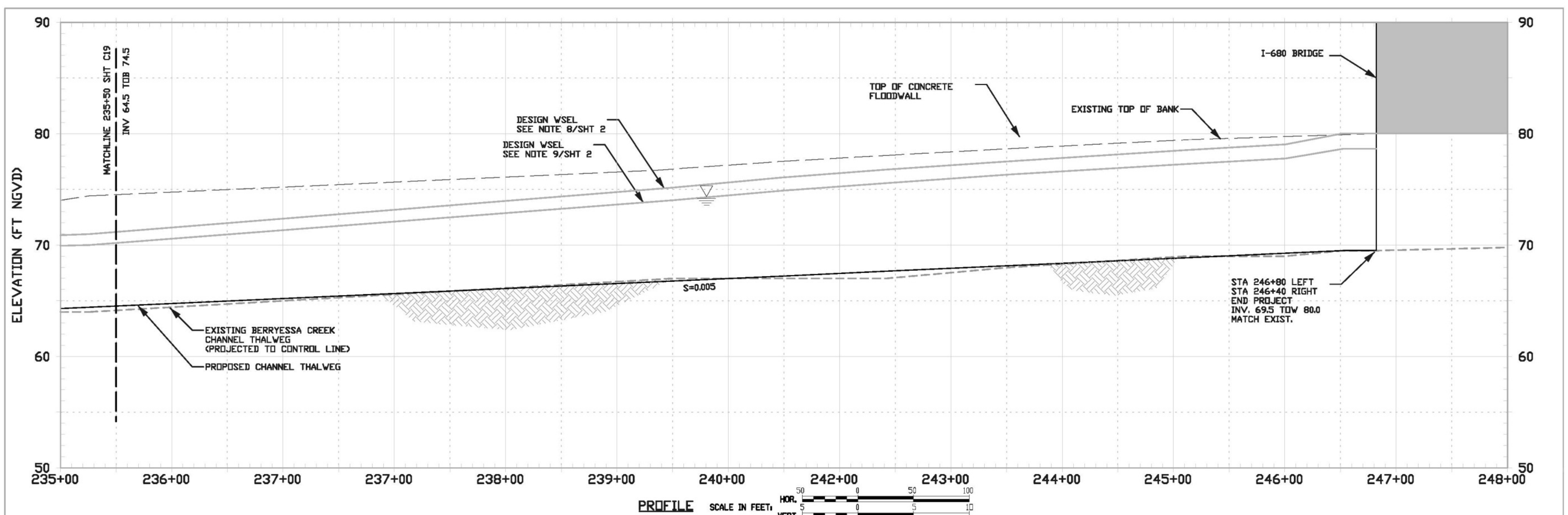
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 223+00 TO 236+00

Sheet reference number:
C19
Sheet 24 of 35





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US Army Corps of Engineers
Sacramento District

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

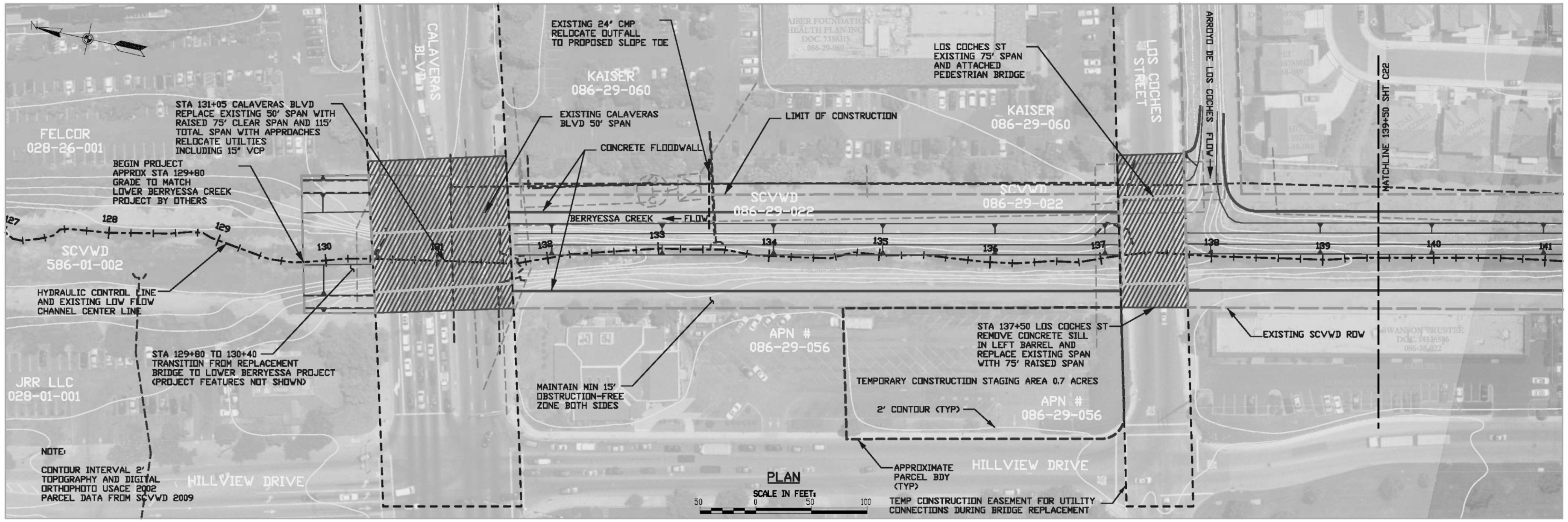
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

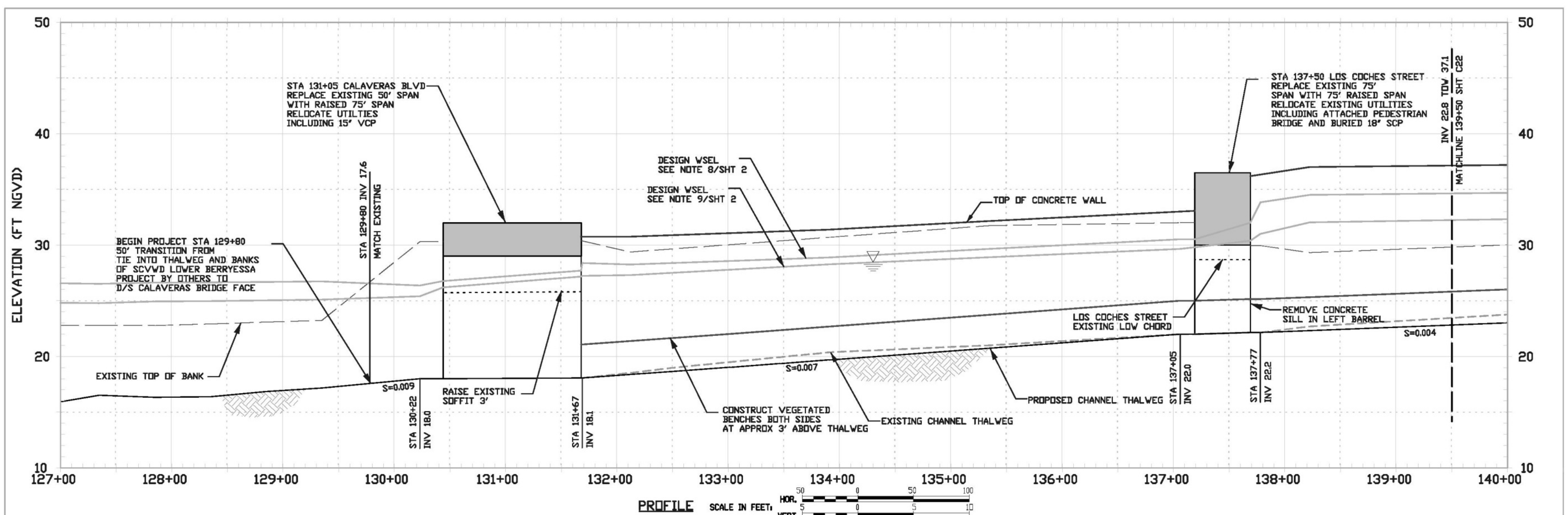
Designed by: PRELIMINARY		Date: JAN 17, 2012 — Rev. N/A
Dwn by: KP	Spec No.: N/A	Design file no: N/A
Reviewed by: RM		Drawing Code:
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX; Plot date: DEC 22, 2011; Plot scale: 50/100

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 232+00 TO 245+00

Sheet reference number:
C20
Sheet 25 of 35





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US Army Corps of Engineers
Sacramento District

Designed by: PRELIMINARY
Dwn by: KP
Reviewed by: RW
Submitted by:
Spec No.: N/A
Date: JAN 17, 2012
Rev. N/A
Design file no: N/A
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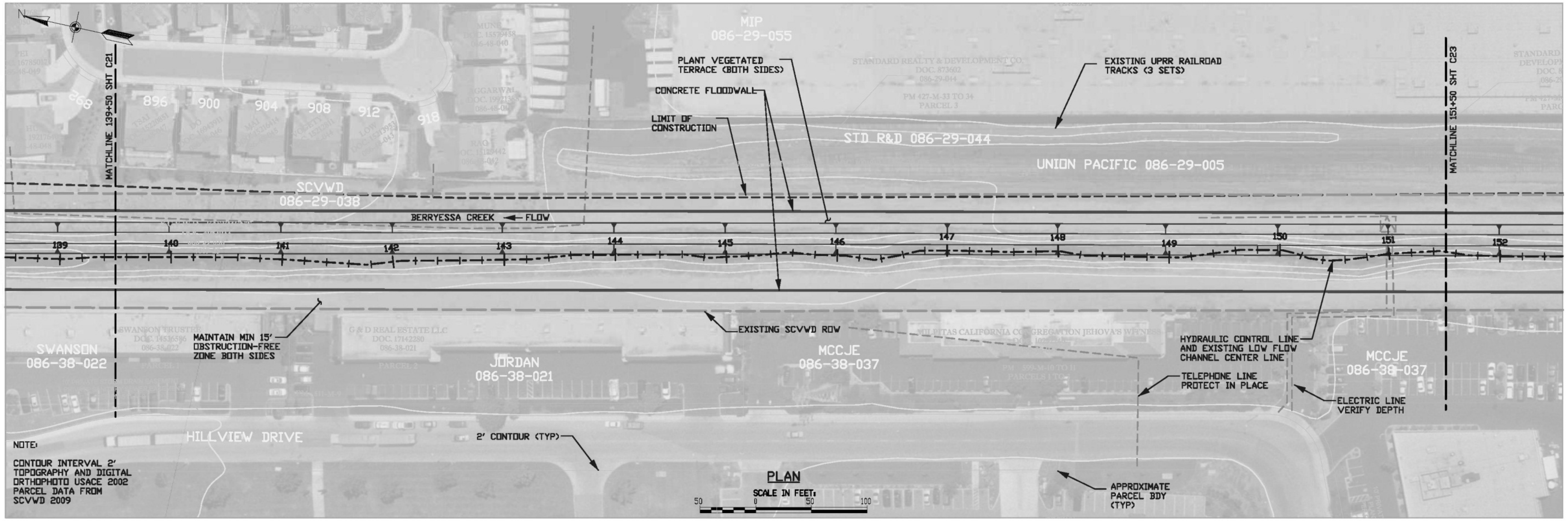
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

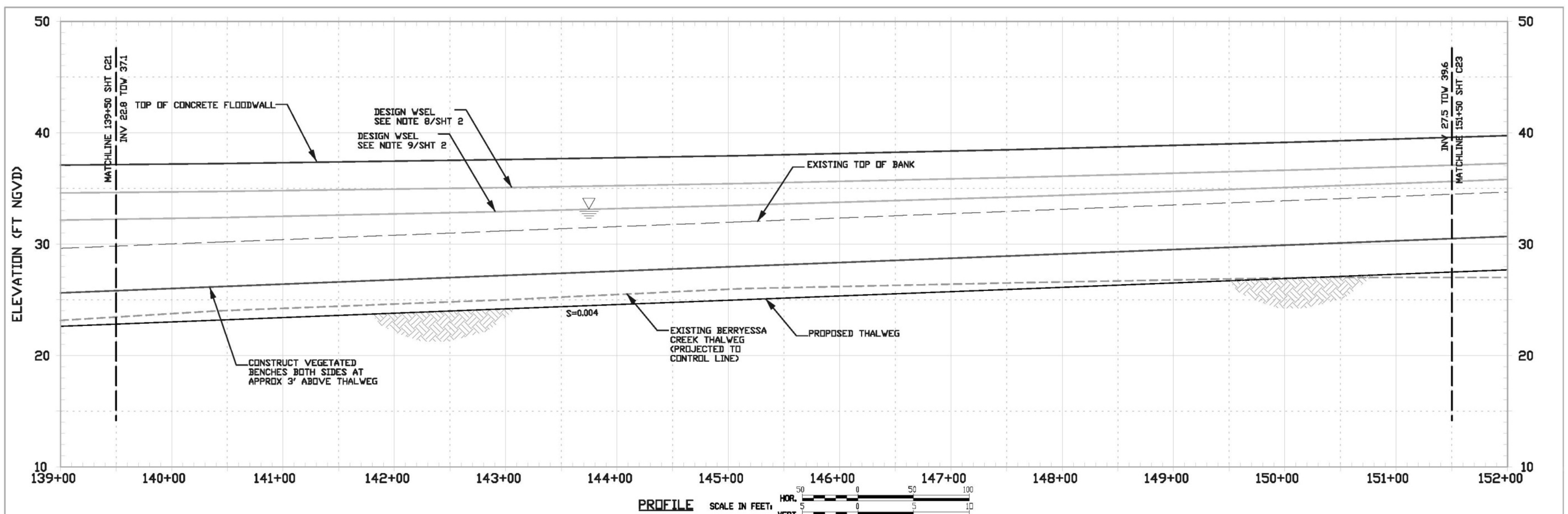
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 127+00 TO 140+00

Sheet reference number:
C21
Sheet 26 of 35





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US Army Corps of Engineers
Sacramento District

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Reviewed by: RW
Date: JAN 17, 2012
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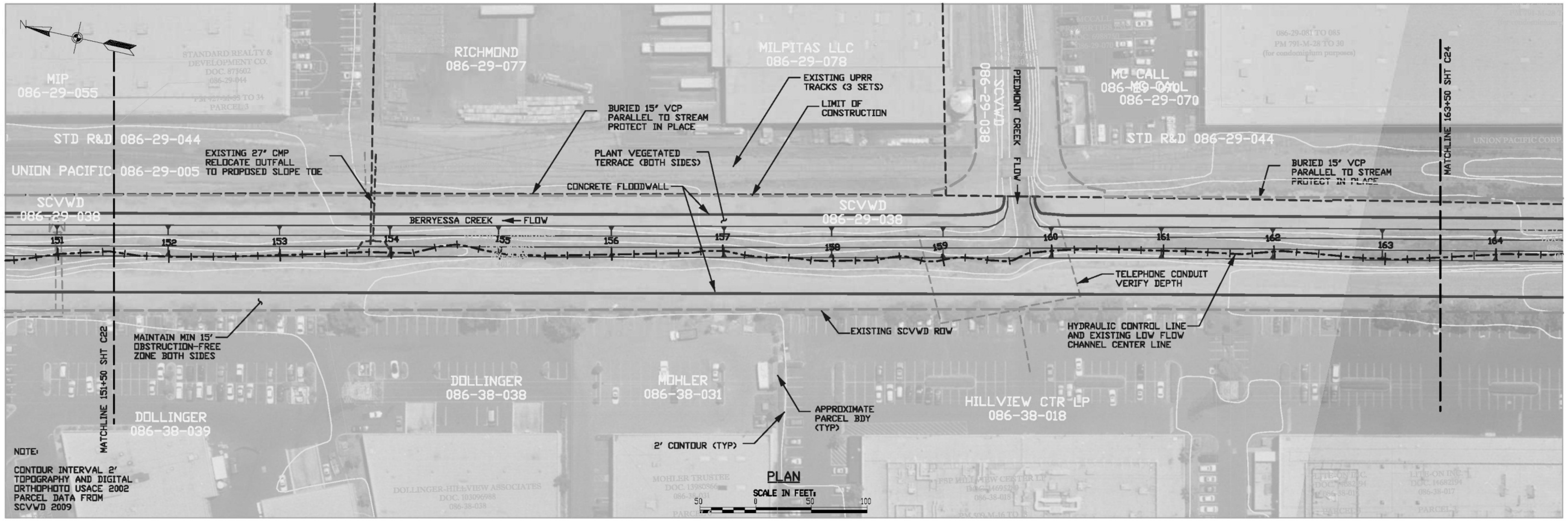
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

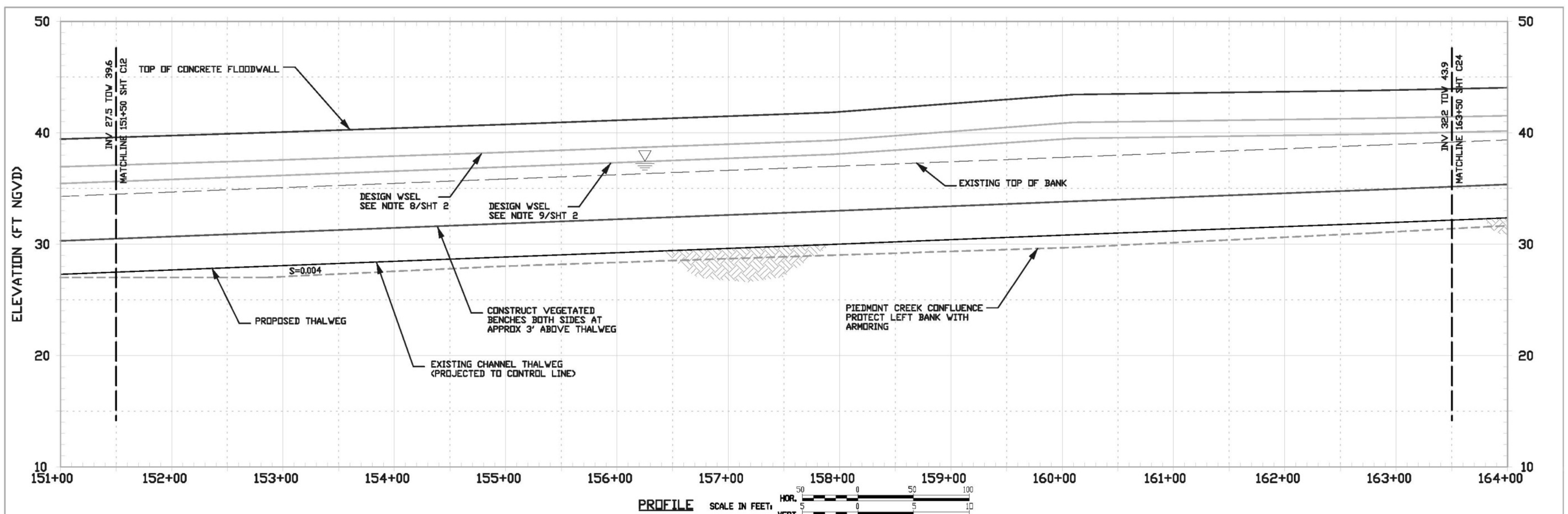
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 139+00 TO 151+00

Sheet reference number:
C22
Sheet 27 of 35





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US Army Corps of Engineers
Sacramento District

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 151+00 TO 164+00

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

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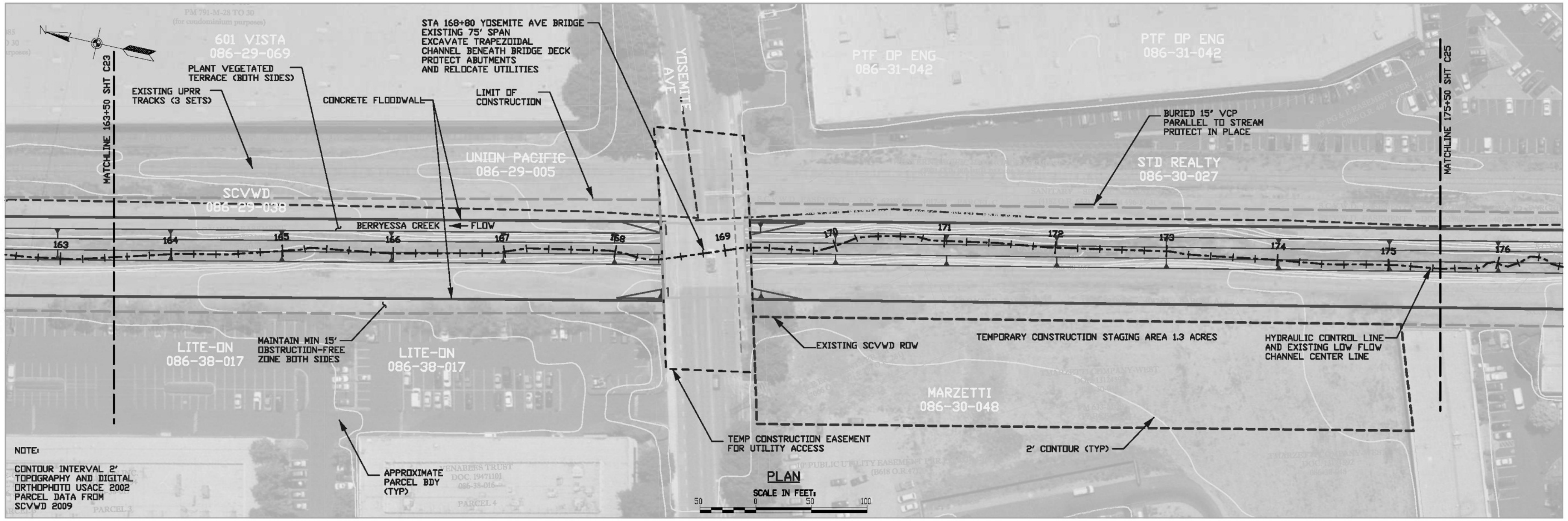
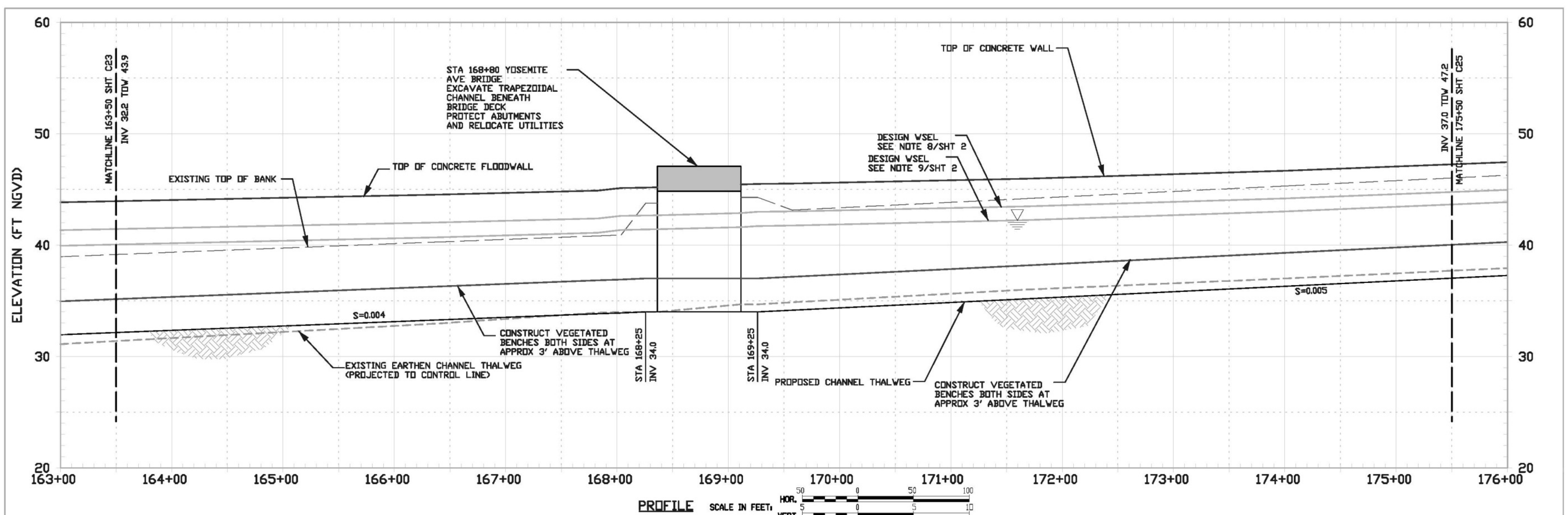
Dwn by: KP	Spec No.: N/A	Design file no: N/A	
Reviewed by: RM		Drawing Code:	
Submitted by: CHIEF, CIV ENGR DES SEC A		File name: BER PP C-XX Plot date: DEC 22, 2011 Plot scale: 50/100	

Symbol | Description | Date | Approved

Sheet reference number:
C23
Sheet 28 of 35





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US Army Corps of Engineers
Sacramento District

Date Approved | Description | Symbol

Date: JAN 17, 2012
Rev.: N/A
Design file no:
Drawing Code:
Designed by: PRELIMINARY
Dwn by: KP
Spec No.: N/A
Reviewed by: RW
Submitted by:

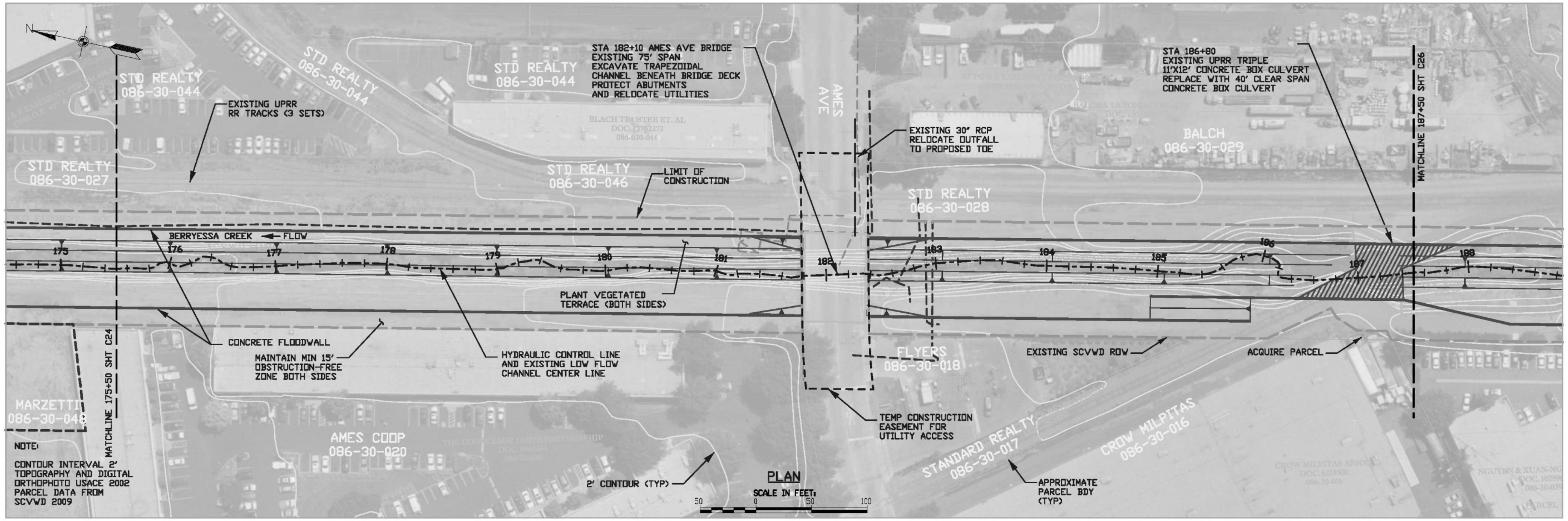
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
IN PARTNERSHIP WITH:
SANTA CLARA VLY WATER DISTRICT

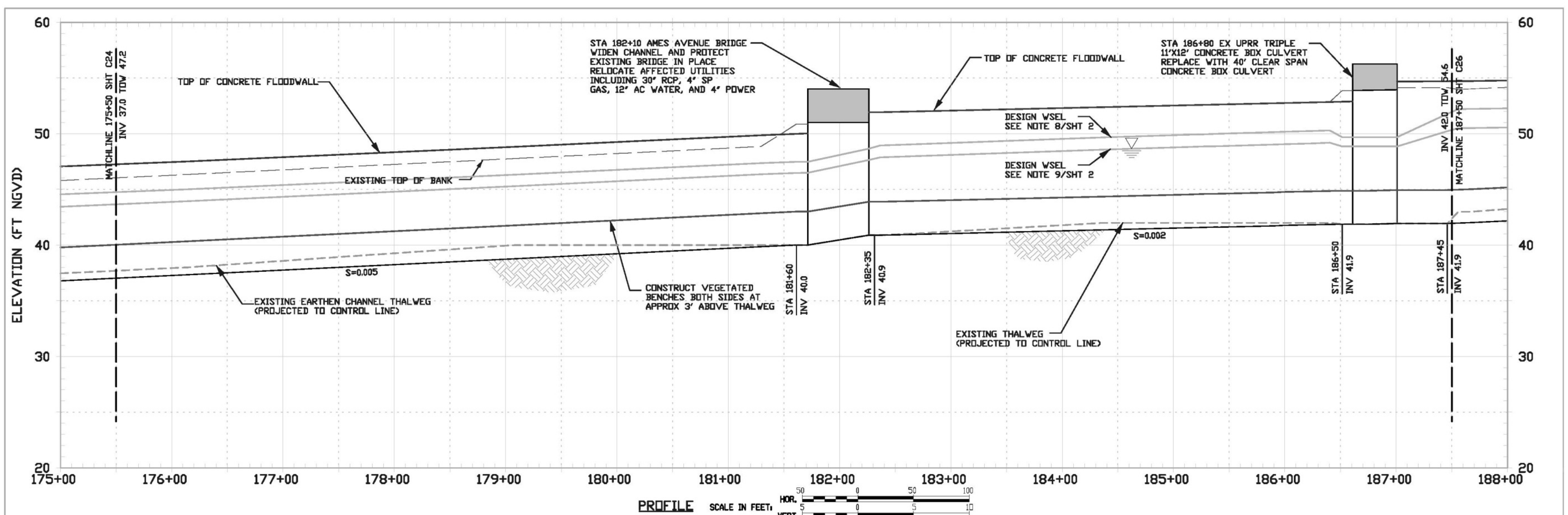
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 163+00 TO 176+00

Sheet reference number:
C24
Sheet 29 of 35





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Reviewed by: RW
Submitted by: CHIEF, CIV ENGR DES SEC A
Spec No.: N/A
Date: JAN 17, 2012
Rev.: N/A
Design file no: N/A
Drawing Code:
File name: BER PP C-XX
Plot date: DEC 22, 2011
Plot scale: 50:100

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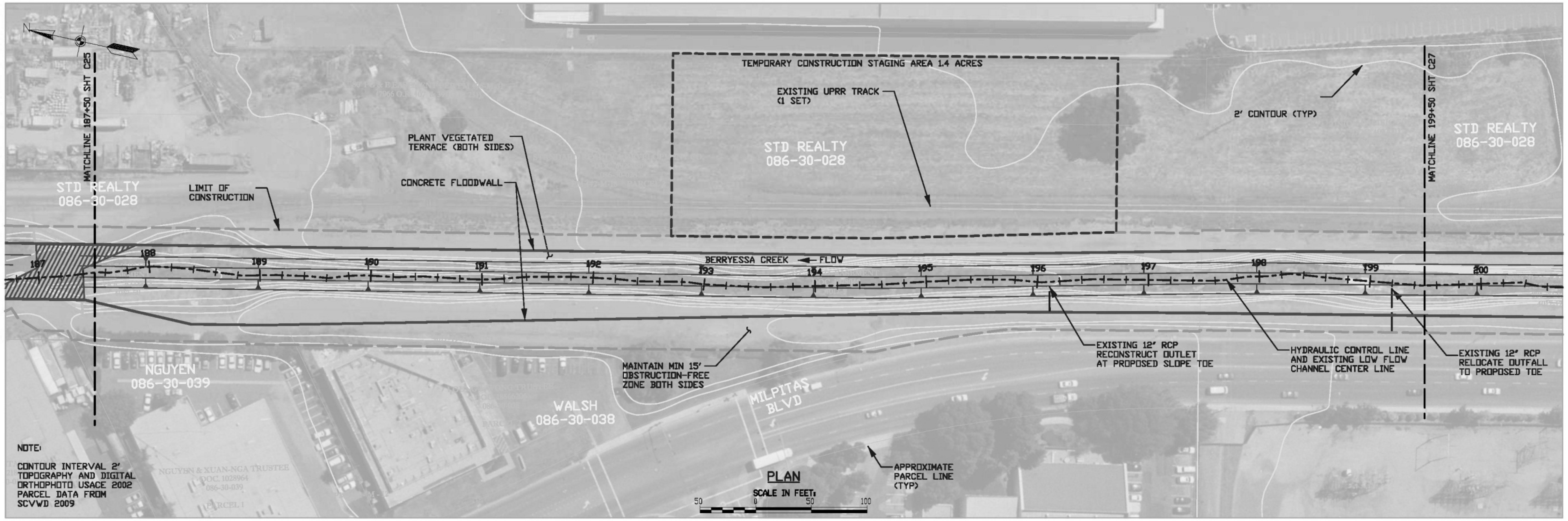
SANTA CLARA VLY WATER DISTRICT

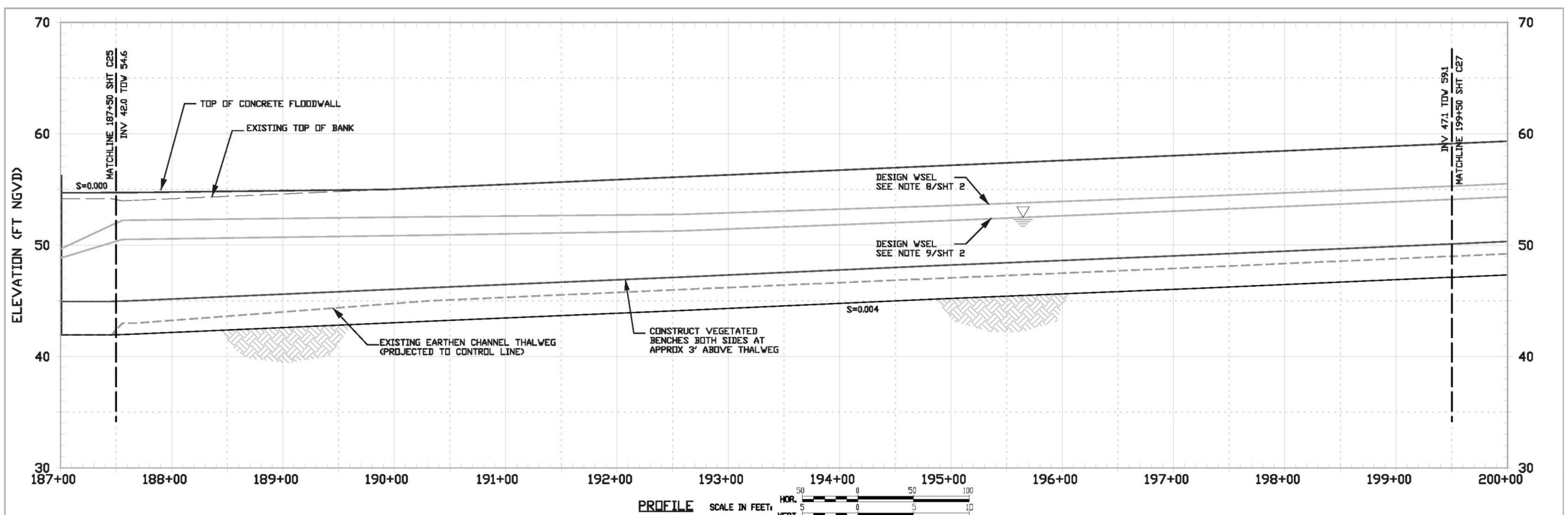
PREPARED BY:
TETRA TECH, INC.
17770 CARTWRIGHT, STE. 500
IRVINE, CA 92614

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 2B/d
PLAN AND PROFILE VIEW
STA. 175+00 TO 188+00

Sheet reference number:
C25
Sheet 30 of 35





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ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 187+00 TO 200+00

Sheet reference number:
C26
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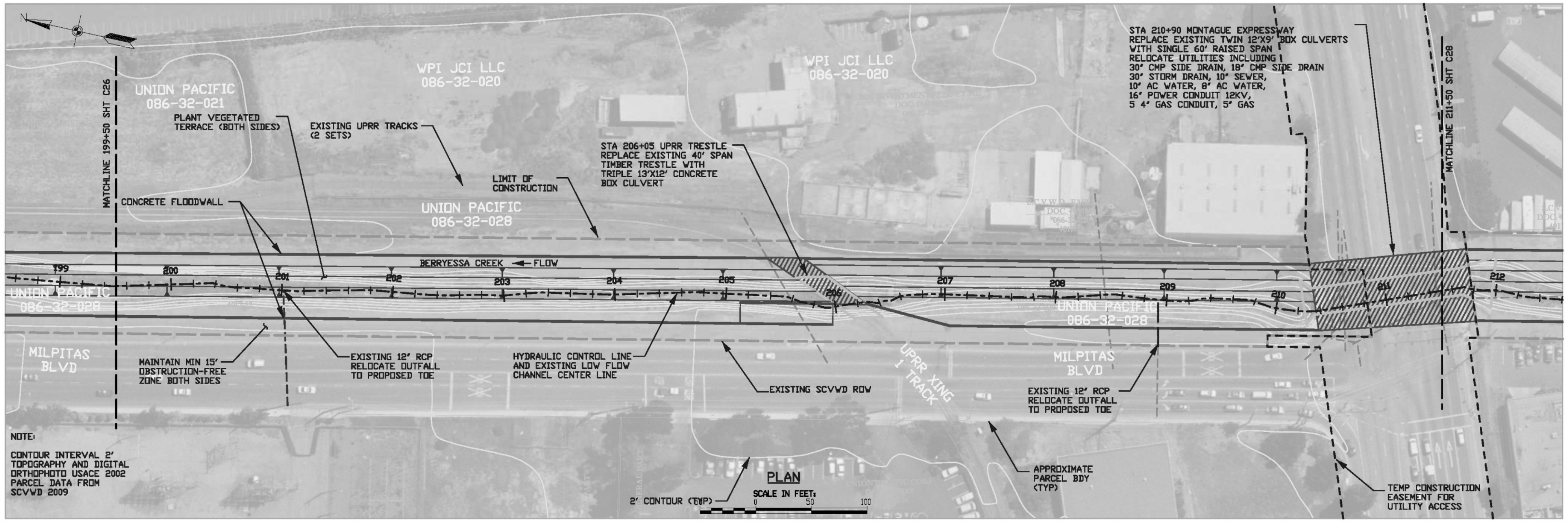

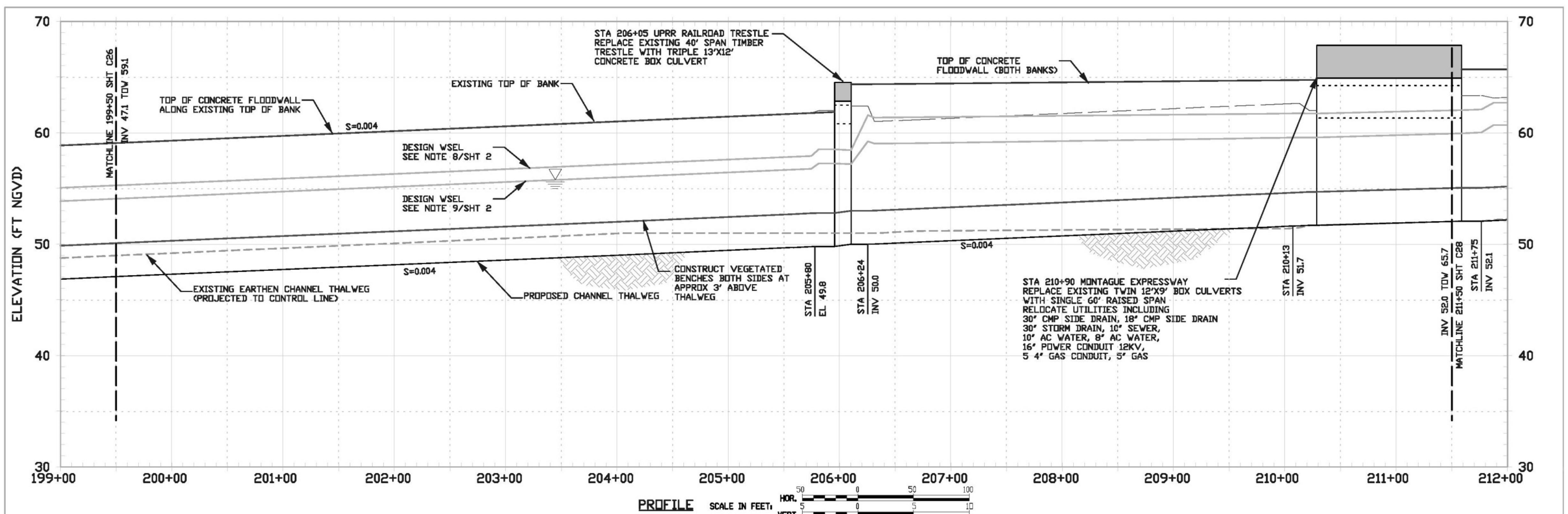

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ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 199+00 TO 212+00

Sheet reference number:
C27
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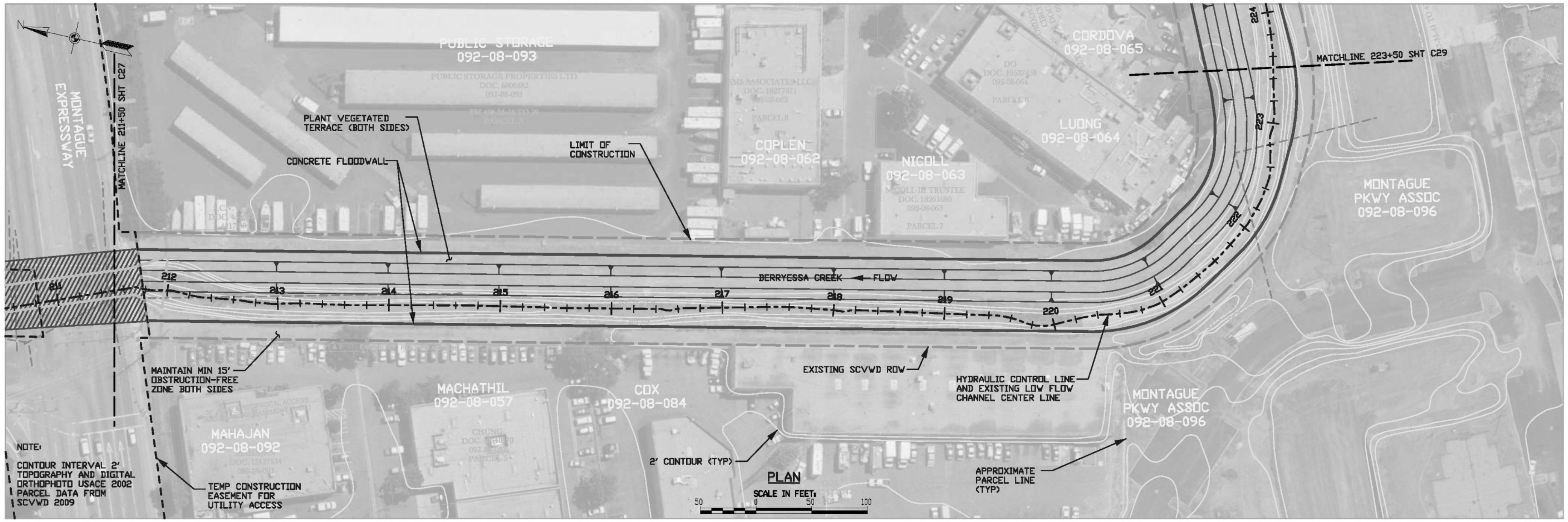

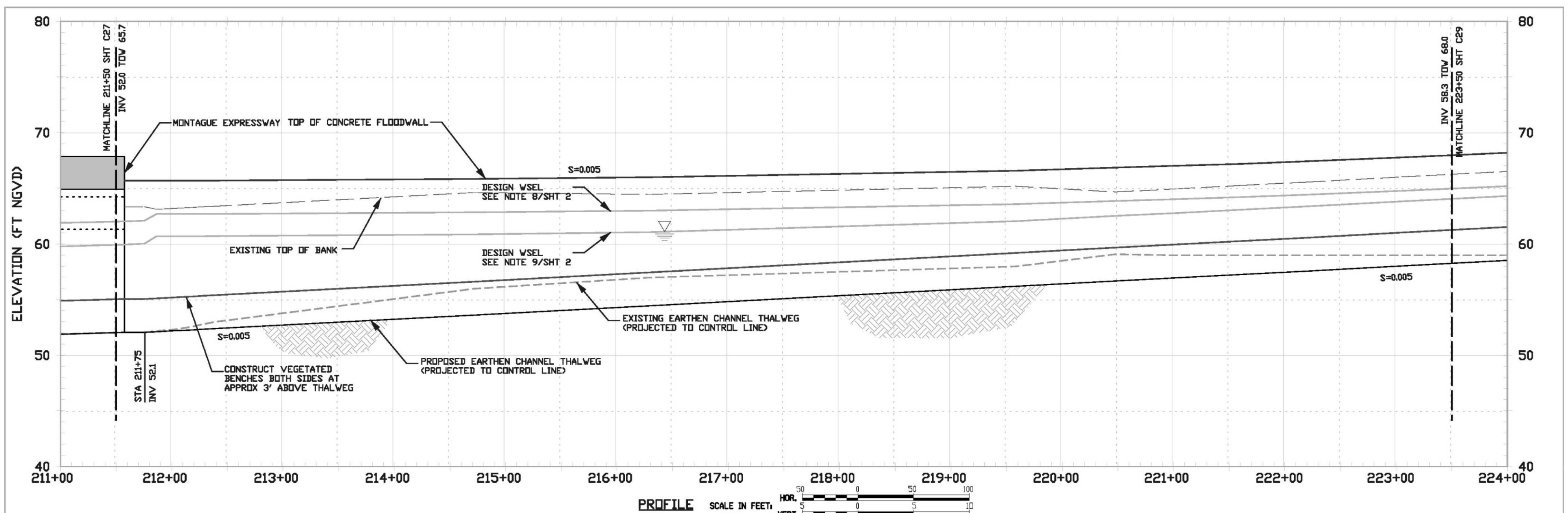

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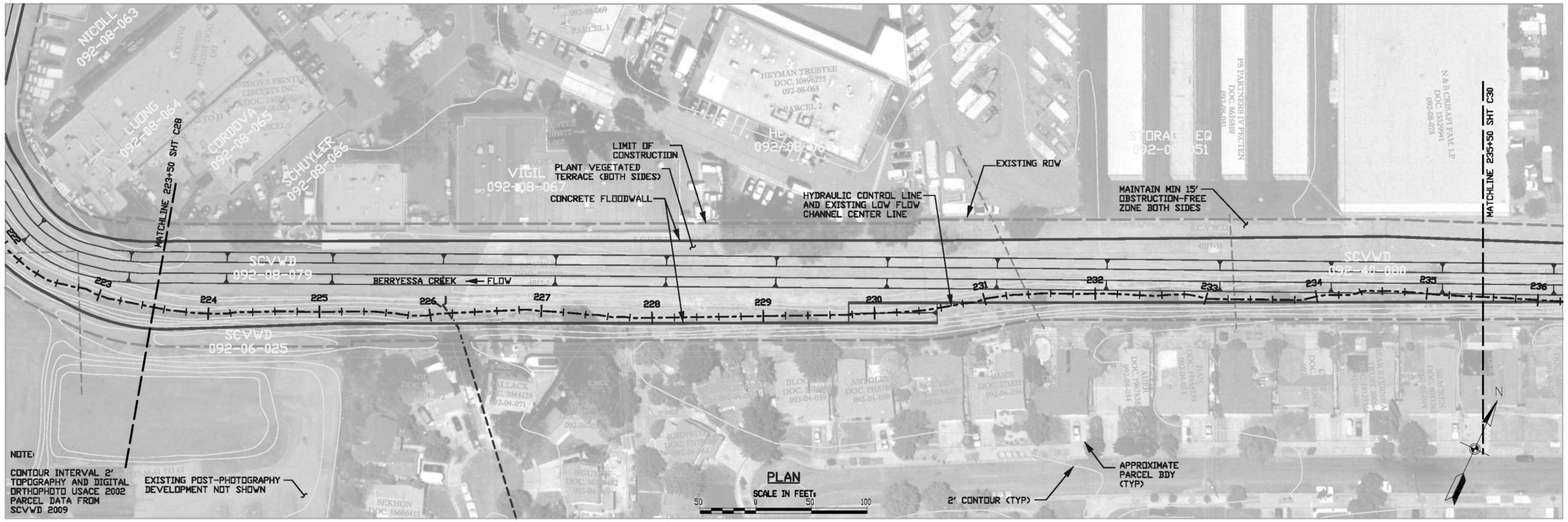
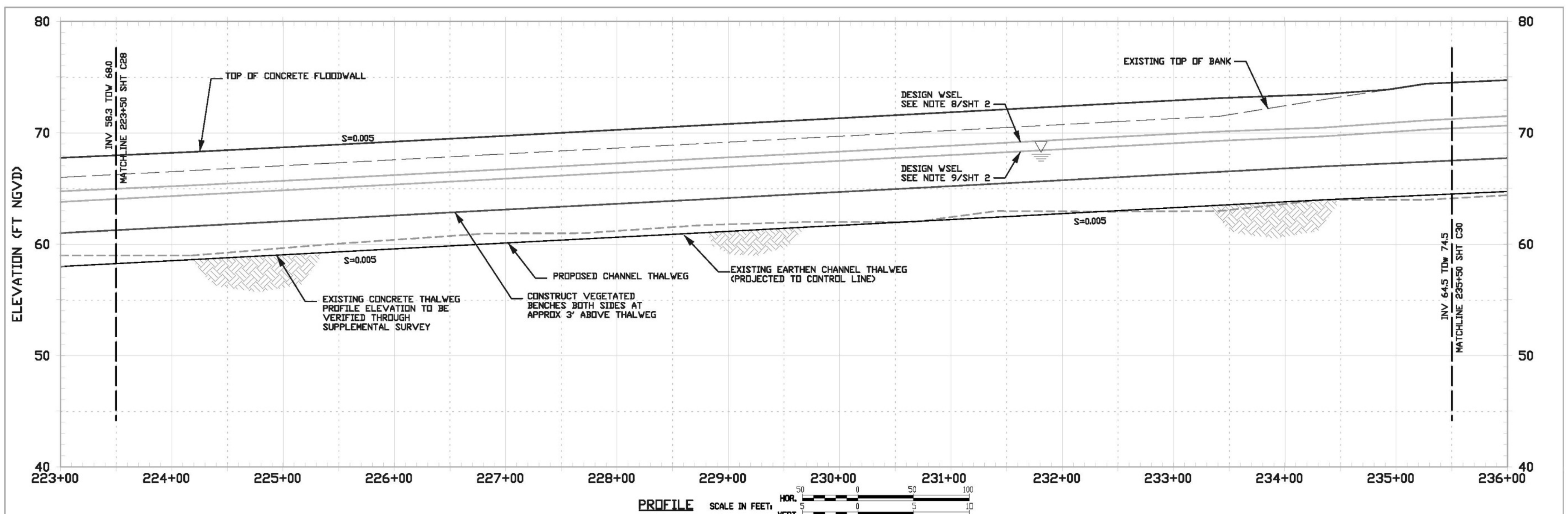
SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 211+00 TO 224+00

Sheet reference number:
C28
Sheet 33 of 35





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Design file no: N/A

SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 223+00 TO 236+00

Sheet reference number:
C29
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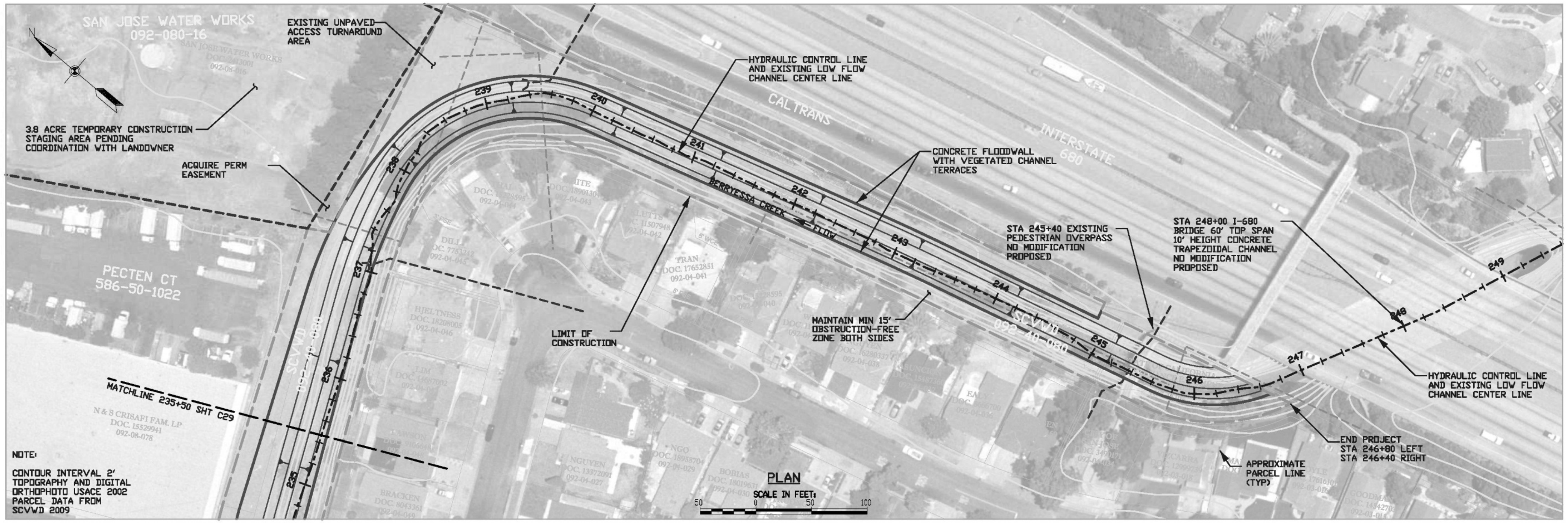

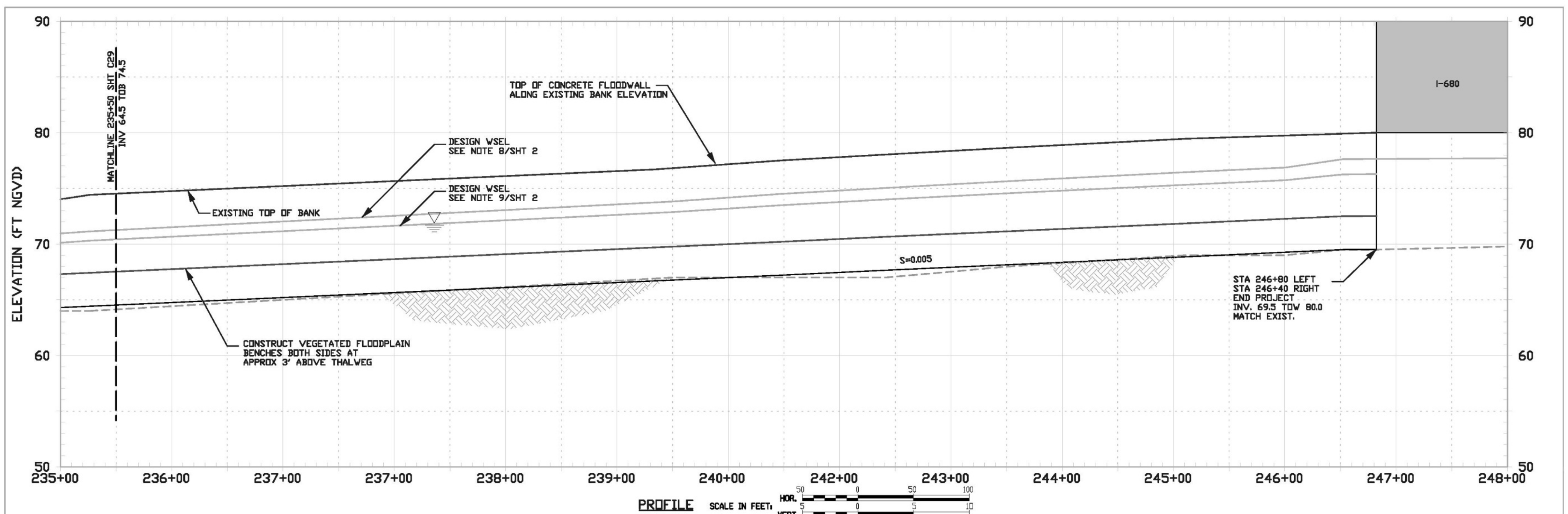

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Submitted by: CHIEF, CIV ENGR DES SEC A	File name: BER_PP_C-XX

U.S. ARMY CORPS OF ENGINEERS
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TETRA TECH, INC.
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SANTA CLARA COUNTY CALIFORNIA
BERRYESSA CREEK PROJECT
GENERAL REEVALUATION STUDY
ALTERNATIVES FORMULATION

ALTERNATIVE 4B/d
PLAN AND PROFILE VIEW
STA. 232+00 TO 245+00

Sheet reference number:
C30
Sheet 35 of 35

CHAPTER 7 – DETAILS OF RECOMMENDED PLAN

This chapter provides further details on the tentatively Recommended Plan, as determined in the preceding chapters of this report. Detailed cost estimates were developed using October 2012 price levels and the Federal interest rate of 3.75 percent, unless otherwise noted, and are presented as categorized in the various MCACES accounts. Federal and non-Federal cost apportionment responsibilities are also presented.

7.1 PLAN DESCRIPTION

7.1.1 Flood Risk Management

The NED Plan consists of a 0.01 exceedance probability event level of performance, with 50 percent assurance, downstream of the I-680 culvert. Alternatively, based on interpolation, at an assurance level of 90 percent, the NED Plan would be able to contain the equivalent of about a 0.03 exceedance probability event.

The plan would consist of an earthen trapezoidal channel section with varying bottom width and 2H:1V sideslopes. Due to real estate constraints, free-standing concrete floodwalls would be constructed instead of levees in the immediate vicinity of Montague Expressway as well as between the Piedmont Creek confluence and Calaveras Boulevard. Concrete floodwalls would include 42-inch safety railing for any wall heights above 2 feet. An access road would be located along the left bank channel slope downstream of Yosemite Avenue. Transition structures at Montague Expressway, UPRR culvert, Los Coches Street, and Calaveras Boulevard would be constructed. Transition structures (with variable sloping wingwalls) would extend for 50 to 75 feet upstream or downstream of the bridge face. The existing UPRR trestle would be replaced with a triple barrel concrete box culvert. Storm drains entering the channel, or running parallel to the channel, situated within the proposed channel excavation areas would be relocated. Individual channel and bridge/culvert modifications are shown in Table 7-1. A more detailed project footprint, including temporary construction easements, staging areas, and access routes, is presented in the overview exhibits at the end of Chapter 6.

Table 7-1 Summary of Features – NED Plan

Reach/Structure	Project Features
I-680 Bridge (Sta 248+00)	Remove accumulated sediment at downstream face
Channel Reach from I-680 to Montague Expressway (Sta 248+00 – 210+90)	Excavate 6- to 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope; construct 200 lineal feet of free-standing concrete floodwall to maximum height of 2 feet
Montague Expressway Culvert (Sta 210+90)	Tie floodwall into existing headwall at upstream face of structure; construct transitions to existing wingwalls
Channel Reach from Montague Expressway to UPRR Trestle (Sta 213+90 – 206+05)	Excavate 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope
UPRR Railroad Trestle Bridge (Sta 206+05)	Remove existing timber trestle; Construct triple 15-foot span by 12-foot rise concrete box culvert with wingwalls
Channel Reach from UPRR Trestle to UPRR Culvert	Excavate 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope

Table 7-1 Summary of Features – NED Plan	
Reach/Structure	**Project Features**
(Sta 206+05 - 186+80)	
UPRR Railroad Culvert (Sta 186+80)	Construct transition to existing wingwalls
Channel Reach from UPRR Culvert to Ames Avenue (Sta 186+80 – 182+10)	Excavate 12-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope
Ames Avenue Bridge (Sta. 182+10)	Excavate 12-foot bottom width channel beneath bridge; construct abutment and pier protection
Channel Reach from Ames Avenue to Yosemite Drive (Sta 182+10 – 168+80)	Excavate 15-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope
Yosemite Drive Bridge (Sta 168+80)	Excavate 15-foot bottom width channel beneath bridge transitioning to 24-foot bottom width; construct abutment and pier protection
Channel Reach from Yosemite Drive to Los Coches Street (Sta 168+80 – 137+50)	Excavate 26-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope
Los Coches Street Bridge (Sta 137+50)	Construct transition to existing structure
Channel Reach from Los Coches Street to Calaveras Boulevard (Sta 137+50-131+05)	Excavate 40-foot bottom width earthen channel with cellular bank protection at 2H:1V sideslope and access road along left bank slope; free-standing concrete floodwalls to maximum height of 4 feet
Calaveras Boulevard Bridge (Sta 131+05)	Construct transition to existing structure
Channel Reach Downstream of Calaveras Boulevard (Sta 131+05 – 129+80)	Construct transition to downstream project

7.1.1.1 Milpitas BART Station

As introduced in section 2.3.3.1, a new BART station will be constructed near the Berryessa Creek Element. BART stations are required to be protected from the 0.002 ACE ("500-year" flood) for sensitive facilities, while all other station features, such as walkways, are to be protected from the 0.01 ACE ("100-year" flood). Because the Corps' Berryessa Creek Element will not perform at the FEMA "100-year" level, the Milpitas BART Station will implement additional FRM measures, such as ensuring that raised walkways are constructed above the "100-year" regulatory flood plain.

7.1.2 Recreation Features

As previously discussed in Section 6.2.4, a 15-foot wide obstruction-free zone covers the entire project extent and is proposed outside of any excavation or floodwall on both side of the Berryessa Creek channel. A maintenance road would be constructed to allow access to the channel for flood-fighting and inspection purposes. The use of this maintenance road as a recreational trail is being investigated in coordination with the City of Milpitas and SCVWD. As determined in the preliminary analysis of the design criteria and specifications of the city's Trail Master Plan (Sokale/Landry Collaborative 1997), several elements required by the master plan are not considered incidental recreational features, rather project betterments. Non-incidental recreational features are outside of the authorized project purpose, and adding it to the authorized project would require additional Congressional authority, which would require a potentially lengthy process. However, these elements could be added to the project as non-Federally funded betterments without any additional authority from Congress.

7.1.3 Environmental Features/Mitigation Components

Ecosystem restoration is not included as a project purpose in the existing Coyote and Berryessa Creeks, California project authorization. Similar to recreation, as discussed above, adding this purpose to the authorized project would require a potentially lengthy process for re-authorization by Congress. However, the NED Plan provides an environmentally sensitive design and remains within the scope of the current flood risk management project.

Implementation of the NED Plan would disturb or eliminate 0.79 acres of wetlands dominated by cattails, a wetland obligate plant species. However, since stream hydrology would not be permanently affected, the cattails could reestablish naturally within a year to three years after construction, and the wetlands would re-emerge in the channel. Mitigation measures to address these short-term impacts are discussed in Chapter 5. In addition, Corps guidance would require removal of woody vegetation on the levee prism and within 15 feet of the toe of the levee. Approximately 15 trees, located between East Calaveras Boulevard and Los Coches Street, may need to be removed for construction access. Shrubs and grasses along the channel would be removed prior to construction. Vegetation communities included in this impact are located on the landside of the floodwall. Mitigation measures to address impacts are discussed in Chapter 5.

7.1.4 Health and Safety

The NED Plan would effectively reduce damages and provide additional protection to the residents currently living in flood prone areas downstream of I-680. The NED Plan would effectively provide approximately 92 percent of reduction in flood damages. Further, the plan decreases the risks for loss of life and increases safety during the 0.20 to the 0.01 exceedance probability flood event.

7.1.5 Induced Flooding Analysis

While a formal interior/induced flooding analysis was not completed for this feasibility effort, HEC-RAS and FLO-2D model results from the Existing Conditions and Selected Plan (Alt 2A/d) alternatives were reviewed by Hydraulic Analysis Section, Sacramento District, USACE (Hydraulic Analysis) to investigate the possibility of the selected plan inducing flooding elsewhere in the project area.

Hydraulic Analysis review suggests that the potential exists for new floodwall construction to impede local drainage to the creek; however measures such as flap-gated culverts will likely need to be incorporated to minimize and potentially eliminate this impact. Current modeling efforts do not include enough information to develop accurate depth data in potentially impacted areas, however, HEC-RAS hydrographic data suggests that the creek would only be high enough to potentially impede flow through culverts incorporating measures such as those identified above in instances of high tailwater for a duration that is on the order of 1 to 3 hours for large storm events (approximately equal to the 1% Annual Chance Exceedance event and less frequent events). More frequent events could still see interior drainage issues, but they would not be likely to be impacted by high creek tailwater.

A review of HEC-RAS maximum water surface profiles does not show direct potential for induced flooding. Maximum water surface elevations at the upstream end of the model are not impacted by the selected plan design and those downstream of the project, while they do increase, do not rise high enough to spill over the banks of the downstream channel.
A review of the floodplain data (Figures 3-14, 3-15, 6-1 and 6-2 as well as Tables 3-13, 3-14, 6-1 and 6-2 of the Floodplain Development Appendix) shows only a reduction in floodplain extent generated by the FLO-2D modeling and mapping.

In conclusion, implementation of the tentatively selected plan consistent with the suggested design refinements will likely reduce and possibly eliminate any induced flooding.
[Based on the foregoing, significant induced flooding is not presently anticipated as a consequence of implementation of the tentatively selected plan. In the event that detailed H&H modeling later yields contrary results (which appears unlikely), District Real Estate finds that any potential acquisitions would be covered by existing cost contingencies.

7.2 PROJECT BENEFITS

7.2.1 Flood Risk Management

As discussed in Chapter 6, the NED Plan provides approximately $10.95 million of annual benefits from flood risk management, resulting in approximately $9.65 million in net benefits and a benefit-to-cost ratio of 8.5. More detailed information on the benefits is also presented in Appendix C, Economics.

7.2.2 Recreation

Since recreation is not an authorized project purpose for Berryessa Creek, a recreation plan component was not included in the NED Plan. Thus, no project benefits were determined. However, opportunities exist for future recreation improvements within the scope of the currently authorized flood risk management project. A feasible option is the use of the proposed maintenance road to accommodate a multi-use recreational trail. Improvement of the Berryessa Creek Element levees would allow for the extension of a local recreational trail system. In less than one mile of the project improvements, over 60,000 people reside, according to tract data of the 2000 Census. The estimated cost of trail construction on the improvement is $1.63 million. The amortized value of this construction is less than $76,000 or nearly $1 per person in the immediate area. The FY12 unit day value for general recreation with a zero point value is $3.72. Less than 60 users per day would be necessary for economic justification at this unit day value.

7.3 REAL ESTATE REQUIREMENTS

The real estate interests required for and/or impacted by the Project are owned and or held by private owners, county governments and/or municipalities, public and private utilities, and the UPRC as shown in the tract register on page 8 of the Real Estate Plan (Appendix E).

Some properties required for and/or impacted by the project are located within, adjacent to or close to SCVWD's existing rROWs along Berryessa Creek, primarily downstream of I-680. Currently, SCVWD is fee owner of 15.88 acres of the required twenty-five (25) acres for permanent project acquisition needs. The remaining 9.12 acres required for CIEs are owned as identified above. Twenty-five (25) acres of land will be required for CIEs, 11.91 acres will be required for TWAEs, and 2.08 acres for FPLEs for the required floodwalls. Of the nine (9) parcels that will be encumbered by TWAEs, four (4) parcels will be required for staging areas consisting of 7.6 acres and five (5) parcels will be required to support construction consisting of 4.31 acres.

The baseline cost estimates include a cost estimate and the Federal and non-Federal costs associated with acquiring the lands for the project. There are no federally-owned lands or other Federal projects in or partially in the study area. The total cost estimate for real estate requirements for the NED Plan is shown in Table 7-2 and includes the value of non-Federal sponsor owned estates required for this project.

Table 7-2 Real Estate Costs
November 2012 Prices[1]

Land	Acres	Cost
Lands and Easements (26 parcels)	11.91 (TWAE)[1] 25.00 (CIE)[2] 2.08 (FPLE)[3]	$7,020,000
Incremental RE Costs (30% contingency)		$2,106,000
Preliminary Severance Estimate (10%)		$702,000
Subtotal (rounded)		$9,828,000
Non-Federal Administrative Costs		$930,000
Federal Administrative Costs (including crediting)		$320,000
TOTAL Lands and Damages		**$11,078,000**

[1] Source: 2012 Real Estate Plan
[2]TWAE – temporary work area easement (i.e. vegetation, staging, construction)
[3] CIE – (permanent) channel improvement easement
[4] FPLE – flood protection levee easement

The NED Plan would also require relocations of publicly- and privately-owned utilities. The total cost for utility/facility relocations (including a 23.82% contingency) is estimated at $1,710,000 (August 2013 Real Estate Plan). The affected utilities, locations, and ownership are shown in Table 7-3. Additional information is presented in Appendix B, Design and Cost of Alternatives. More detailed information on the real estate interests is presented in Appendix E, Real Estate Plan.

Table 7-3 Affected Utilities – NED Plan			
Berryessa Creek Reach	**Location**	**Type**	**Owner**
I-680 to Montague - Channel			
	Sta 226+00	Storm Drain System	City of San Jose
	Sta 222+00 to 222+60	Electrical	PG&E
	Sta 210+80 to 214+60	Electrical	PG&E
Montague to UPRR Trestle – Channel			
	Sta 208+40	Electrical	PG&E
UPRR Trestle to Culvert – Channel			
	Sta 205+80	Electrical	PG&E
	Sta 197+60	Electrical	PG&E
UPRR Culvert to Ames – Channel			
	Sta 183+00	Waterline	City of Milpitas
Ames to Yosemite – Channel			
	Sta 181+20 to 181+80	Electrical	PG&E
Yosemite to Los Coches – Channel			
	Sta 159+00 to 160+00	Telephone Conduit	AT&T
	Sta 154+00	Storm Drain Outlet	City of Milpitas
	Sta 153+80	Sanitary Sewer System	City of Milpitas
	Sta 151+00	Electrical	PG&E
	Sta 149+20 to 151+00	Electrical	PG&E
	Sta 142+40	Sanitary Sewer System	City of Milpitas
	Sta 138+60 to 143+70	Electrical	PG&E
Los Coches to Calaveras - Channel			
	Sta 137+20	Sanitary Sewer System	City of Milpitas
	Sta 137+00	Storm Drain Outlet	City of Milpitas
	Sta 137+00	Cable	Comcast
	Sta 134+80	Sanitary Sewer System	City of Milpitas
	Sta 133+50	Storm Drain Outlet	City of Milpitas
	Sta 132+00 to 138+00	Electrical	PG&E
	Sta 131+60 to 182+40	Sanitary Sewer System	City of Milpitas

Bridge Transitions.

The TSP/NED Plan proposes the construction of transitions from the proposed flood walls to the existing wingwalls at Montague Expressway, UPRC Culvert, Los Coches St, and Calaveras Blvd. The purpose of these wingwalls is to provide transitions between the proposed channel/flood walls and the existing bridge structures in order to provide for the continued structural integrity of the bridge foundations and abutments. Additionally, abutment and pier protection is planned for the bridges at Ames Avenue and Yosemite Drive in order to protect the piers/abutments from the increased flows and from potential undermining that may result from the planned deepening of the channel at these locations.

A review of the Authorized Project (The Coyote and Berryessa Creeks, California, Chiefs Report dated February 7, 1989 and the November 1987 Coyote Creek and Berryessa Creek Interim Feasibility Report) was conducted to determine if financial responsibility for the construction of these bridge transitions and related features, identified herein and in the GRR as project features, had previously been determined. While LERRDs costs are included in the cost estimate, no additional detail is provided in either the November 1987 Interim Feasibility Report, in the February 7, 1989 Chief's Report or in the corresponding project descriptions and construction costs breakdowns to suggest that these bridge transitions were authorized as LERRDs relocations rather than project features. Accordingly, based on the functions and purposes of the bridge transitions and features proposed for construction, and the provisions of ER 1105-2-100 (E-21)(c)(2) (22 Apr 2000) and EP 1165-2-1 (10-4)(a)(1) (30 July 1999), these features have been regarded as items of construction, included in the Engineering Cost Estimate attached to the GRR as Part IV of Appendix B, and are subject to standard cost-sharing rules.

Notwithstanding the foregoing, the construction, operation and maintenance of these project features must be supported by both temporary and permanent real estate acquisitions which are project LERRDs and the responsibility of the SCVWD. These acquisition costs are included in the 01 account of the MCACES, and any unanticipated acquisitions needs that may arise in this regard are covered within 30% 01 real estate acquisition cost contingency discussed in Section 12 of this REP and Exhibit B, attached hereto. The non-Federal sponsor will be responsible for operating and maintaining these features.

Railroad Bridge Trestle.

After the replacement of the existing railroad trestle at station 206.0+05, a triple box culvert would be installed. The concrete culvert will have openings of approximately 10-ft x 11-ft and will be cast-in-place with steel reinforcing. New railroad tracks will need to be re-built on top of the new triple box culvert. New ballast rock will be brought in along with new primary rails and wooden ties. These construction costs are included in the Engineering Cost Estimate attached to the GRR as Part IV of Appendix B.

To construct the triple box culvert, the SCVWD will be required to acquire a TWAE and a CIE from the property owner, Union Pacific Railroad Corporation (UPRC). The triple box culvert will require a CIE real estate right for maintenance and operation. The SCVWD will be responsible for maintaining the box culvert. Costs of acquiring the necessary real property interests required to support this project feature remains a non-Federal sponsor obligation and are included in the 01 account of the MCACES.

Structure	TSP/NED Proposed Work (2A/d)	Meets ER 1105-2-100 (E-21)(c)(2) criteria for consideration as a construction cost: "protection by reinforcement, underpinning, or construction to ensure the structural integrity of the bridge foundations, piers, or abutments" (Project Cost)	Cost Allocation
Montague Expressway Culvert (Sta 210+90)	Tie floodwall into existing headwall at upstream face of structure; Construct transitions to existing wingwalls	Yes	Project Cost
UPRC Railroad Trestle (Sta 206+05)	Remove existing timber trestle; Construction triple 15-foot span by 12-foot rise concrete box culvert with wingwalls	N/A (Railroad Bridge – 33 USC 701p)	Project Cost
UPRC Railroad Culvert (Sta 186+80)	Construct transition to existing wingwalls	N/A (Railroad Bridge – 33 USC 701p)	Project Cost
Los Coches Street Bridge (Sta 137+50)	Construct transition to existing structure	Yes	Project Cost
Calaveras Boulevard Bridge (Sta 131+05)	Construct transition to existing structure	Yes	Project Cost

7.4 OPERATION AND MAINTENANCE

A detailed operation, maintenance, repair, rehabilitation, and replacement (OMRR&R) plan will be developed during PED. Annual inspections of vegetation, bridges, culverts, and channel reaches will be conducted. Vegetation control, partial vegetation replacement, trash and debris removal, and periodic structural maintenance will be required. Other activities will include maintenance and repair of the channel bank protection, graffiti removal, encroachment removal to preserve clear zones and channel, and access road maintenance.

Key maintenance tasks will be sediment removal from the channel and scour hole repairs. Since 1977, an annual average of approximately 7,000 cubic yards of sediment and debris has been removed from Berryessa Creek upstream of Calaveras Blvd. Table 2-1 in the Geomorphic and Sediment Transport Appendix shows the estimated maintenance quantities for historical removal of existing debris and repair of local scour areas; results are presented for each year, and these approximate removal quantities are assumed to reflect with-project maintenance efforts.

Annual costs for OMRR&R are estimated at $63,000. The non-Federal sponsor will be responsible for these costs for as long as the project remains authorized.

7.5 COST ESTIMATE

A more detailed construction cost estimate was developed using the Corps' Micro-Computer Aided Cost Estimating System (MCACES) 2nd Generation (MII) estimating software in accordance with guidance contained in ER 1110-2-1302, Civil Works Cost Engineering. Part IV, Design and Cost, of Appendix B, contains the detailed MII cost estimate. Table 7-4 presents the total project cost summary for the NED Plan. As shown, the total economic first cost of the NED Plan is estimated at $26,763,000.

Table 7-4 MCACES Total Project Cost Summary – NED Plan
October 2014 Price Level

WBS Number	Civil Works Features	Estimated Cost[1] ($000)
01	Lands and Damages	11,552
02	Relocations	2,220
09	Channels & Canals	11,359
18	Cultural Resource Preservation	137
	SUBTOTAL	25,268
30	Planning, Engineering, and Design	1,511
31	Construction Management	984
	TOTAL FIRST COST	**26,763**
	Annual OMRR&R	*63*

[1] Estimated costs include contingencies.

It should be noted that the set of plan formulation cost estimates (shown in Table 6-5) used for plan selection rely on construction feature unit pricing. The MII cost estimate supporting the NED Plan is supported by the preferred labor, equipment, materials, and crew/production breakdown. In addition, project markups used in the MII cost estimate were lower than those used for the plan formulation cost estimates.

7.6 COST ALLOCATION AND COST APPORTIONMENT

The costs for the NED Plan were allocated to a single purpose of flood risk management. Cost allocation is shown in Table 7-5. The apportionment of costs between the Federal Government and the non-Federal sponsor is also presented in the table. Based on the cost-sharing requirements under WRDA 1986, the non-Federal sponsor's maximum cost-sharing cannot exceed 50 percent of the total project cost. The non-Federal cost-shared amount is estimated at $13,246,000.

Table 7-5 Cost Allocation and Cost Apportionment – NED Plan October 2014 Prices		
Item	**Federal**	**Non-Federal**
Construction[a] (Flood Risk Management)	$13,814,000	-
LERRD[b]	-	$13,772,000
Total First Cost (Flood Risk Management)	**$13,814,000**	**$13,812,000**
Mandatory 5% Cash	-$1,388,000	$1,388,000
Subtotals	$12,426,000	$15,200,000
% of Total Cost-Shared Amount	*45%*	*55%*
Adjustment to Meet Maximum Non-Federal Share of 50%	$1,387,000	-$1,387,000
Total Cost Shared Cost (Flood Risk Management)	**$13,813,000**	**$13,813,000**
% of Total Cost-Shared Amount	*50%*	*50%*
Cultural Resources Preservation[c]	137,000	
TOTAL FIRST COSTS	**$13,380,000**	**$13,246,000**
Annual OMRR&R[d]	-	$63,000
[a] Based on June 2013 MII. Does not include IDC or annual OMRR&R [b] Lands and damages and utility relocation (August 2013 REP) [c] 100% Federal Cost [d] October 2014 price level, 3.5% interest rate, 50-year period of analysis		

7.7 ENVIRONMENTAL REQUIREMENTS

Pre-construction surveys are required for nesting birds. Migratory birds and their habitats are protected under the Migratory Bird Treaty Act, as amended (16 U.S.C703 et seq.). The study area is of low habitat quality to migratory birds and lacks suitable nesting areas. However, to ensure that there would be no effect to migratory birds, preconstruction surveys by a Corps biologist would be conducted within the study area and for a radius of at least 0.25 miles around the study area if construction is to begin before August 15th of any year. If any migratory birds are found, a protective buffer would be delineated, and USFWS and CDFW would be consulted for further actions. In addition, focused bat surveys for *Myotis* or western big-eared bats should be completed prior to construction to see if these species are using the bridges for roosting.

Under the NED plan, a Mitigation and Monitoring Plan (MMP) is not required, since the project would not affect biological resources. However, a MMP would need to be developed under Alternative 5 if it was to be implemented.

7.8 ENVIRONMENTAL OPERATING PRINCIPLES

The Recommended Plan supports each of the seven USACE Environmental Operating Principles (EOPs). The re-energized Environmental Operating Principles are:

1. Foster sustainability as a way of life throughout the organization.

2. Proactively consider environmental consequences of all Corps activities and act accordingly.
3. Create mutually supporting economic and environmentally sustainable solutions.
4. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
5. Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
6. Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.
7. Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

The environmental operating principles are met in the following ways:

<u>Environmental balance and sustainability (EOP 1,2,3 &4)</u>
- Project avoids or minimizes environmental impacts while maximizing future safety and economic benefits to the community

<u>Planning with the environment (EOP 1,2 4, and 5)</u>
- Worked with local resource agencies during planning phase to minimize impacts to the environment

<u>Integrate scientific, economic and social knowledge base (EOP 6)</u>
- Updated report based on Public and Independent External Peer Reviews

<u>Seeks Public input and Comment (Win-win solutions) (EOP 7)</u>
- Held stakeholder meetings and public workshops throughout the process
- Worked with local groups to achieve a balance of project goals and public concerns

7.9 ENVIRONMENTAL COMMITMENTS

Environmental commitments are defined as the required measures, particularly mitigation measures, incorporated into projects as approved by the Corps. These commitments are related to the best management practices and mitigation measures described in this GRR-EIS.

Commitments related to direct environmental effects would be implemented during (1) pre-construction engineering and design, (2) project construction, or (3) O&M. Pre-construction engineering and design includes preparation of detailed mitigation plans and ongoing coordination with other agencies. During construction, the Corps is responsible for administering project construction contracts and for ensuring that the mitigation measures included in these contracts are carried out. After completion of the project, the non-Federal sponsor is required to maintain the improvements. The Corps prepares the O&M manual, which SCVWD is responsible for implementing.

The environmental commitments to mitigate the direct effects of the alternative plans are listed below.

7.9.1 Soils

- Best management practices will be instituted to reduce or prevent the erosion of soil during and after construction. Construction sites will be watered to prevent erosion of soil by the wind. Additionally, vegetation will be planted to curtail erosion due to water.
  - Since the channel will be wider with the project, and because of the cellular bank protection, sediment currently contributed from bank erosion in the project reach will be greatly minimized post-project. If timely sediment removal activities are performed in the project area (as will be prescribed in the OMRR&R plan), there should be minimal impact to the sediment transporting from the project to the downstream area.

7.9.2 Air Quality

- During project construction, the best management practices listed in Section 5.2 for combustion emissions and PM_{10} will be implemented to reduce any emissions to less than significant. Additionally, guidelines provided by the U.S. EPA to minimize emissions will be used during construction.
- To decrease the amount of dust and PM_{10}, unpaved roads, staging areas, and stockpile areas will be watered, as needed, to keep them moist.

7.9.3 Climate Change

- During project construction, the best management practices listed in Section 5.3 for reducing GHG emissions will be implemented to reduce any emissions to less than significant.

7.9.4 Water Resources and Quality

- Best management practices will consist of regular watering of construction surfaces with water trucks to prevent wind erosion of dust into water resources, refueling equipment in designated areas, monitoring and maintaining equipment for fuel leaks regularly, and reseeding soil areas with native or nonnative grass to prevent soil erosion from surface water runoff.

7.9.5 Traffic and Circulation

- Construction vehicles will not be permitted to block any travel lanes.
- Construction zones along roadways will be posted to notify approaching motorists of trucks entering and exiting, and to reduce speeds through the construction zone.

- If there are trucks or equipment which will need time to maneuver into or out of construction sites and could affect traffic, flaggers will be stationed to slow or stop approaching vehicles to avoid conflicts with construction vehicles or equipment.

7.9.6 Noise

- Ensure that construction machinery is properly equipped with mufflers.

- Limits haul truck or other vehicle speed on roads adjacent to residences and on unpaved roadways.

- Limit hours of construction in conformance with City noise ordinances.

- Notify residences about type and schedule of construction.

7.9.7 Cultural Resources

- Archeology site CA-SCL-593 may require two phases of investigation. The first phase will be used to determine if the site is an archeology site with multiple features, or a discrete burial location. If the site does turn out to be a full archeology site, then Phase 2 data recovery will be necessary. All work will be done pursuant to the MOA and approved HPTMP.

- An archeological monitor will be onsite for all ground-disturbing activities in the APE. If cultural deposits are encountered during monitoring activities, all work in the area will cease until the provisions of Stipulation IV. of the MOA, Discoveries and Unanticipated Effects are met.

7.9.8 HTRW

- Prepare a plan that identifies any necessary remediation activities including excavation and removal of on-site contaminated soils and redistribution of clean fill material within the project site, if necessary. The plan shall include measures that ensure the safe transport, use, and disposal of contaminated soil and building debris removed from the site. In the event that contaminated groundwater is encountered during site excavation activities, the contractor shall report the contamination to the appropriate regulatory agencies, dewater the excavated area, and treat the contaminated groundwater to remove contaminants before discharge into the sanitary sewer system. The contractors shall be required to comply with the plan and applicable Federal, State, and local laws. The plan shall outline measures for specific handling and reporting procedures for hazardous materials and disposal of hazardous materials removed from the site at an appropriate off-site disposal facility.

- Notify the appropriate Federal, State, and local agencies if evidence of previously undiscovered soil or groundwater contamination (e.g., stained soil, odorous groundwater) is encountered during construction activities. Any contaminated areas shall be remediated in accordance with recommendations made by the Central Valley Regional Water Quality Control Board, and/or other appropriate Federal, State, or local regulatory agencies.

7.10 COMPLIANCE WITH APPLICABLE LAWS, POLICIES, AND PLANS

The status of the approach channel project's compliance with applicable Federal, State, and local environmental requirements is summarized below. Prior to initiation of construction, the project would be in compliance with all applicable laws, regulations, and Executive Orders.

7.10.1 Federal Laws, Regulations, and Policies

Clean Air Act of 1972, as amended (42 U.S.C. 7401, et seq.)

Full compliance. Section 5.2 of this GRR-EIS discusses the effects of the project on local and regional air quality. The section discusses the issues relative to the project's compliance with the EPA's adopted *de minimus* thresholds in its general conformity rule. Since the project would have no significant adverse effects on air quality, a conformity determination would not be required.

Clean Water Act of 1972, as amended (33 U.S.C. 1251, et seq.)

Full Compliance. The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 5.4. Prior to construction, the Corps will prepare and implement a Stormwater Pollution Protection Plan (SWPPP). The SWPPP will help identify the sources of sediment and other pollutants, and establish BMPs for storm water and non-storm water source control and pollutant control. As part of the permits, contractors will be required to implement best management practices to avoid and minimize any adverse effects of construction on surface waters.

Section 404 of the CWA requires the EPA and Corps to issue individual and general permits for these activities. The Corps does not permit itself but conducts an internal assessment to ensure that all requirements of Section 404 are met. A 404(b)(1) analysis is included as Appendix A, Part V.

Endangered Species Act of 1973, as amended (16 U.S.C. 1531, et seq.)

Full Compliance. A list of threatened and endangered species that have the potential to occur in the study area was obtained from USFWS on April 29, 2012. Based on the analysis contained in this document, the Corps has determined that the project would have no effect on Federally-listed threatened or endangered species, and therefore no further consultation is required with USFWS or NMFS.

Executive Order 11988, Floodplain Management

Full Compliance. The objective of this Executive Order is the avoidance, to the extent possible, of long- and short-term adverse effects associated with the occupancy and modification of the base floodplain (1 in 100 annual event) and the avoidance of direct and indirect support of development in the base floodplain wherever there is a practicable alternative. The greater Milpitas area is highly developed with residential, commercial, public, and industrial land use. The proposed project is the only practicable way to reduce flood risk to the greater Milpitas area. The Berryessa Creek Element, in combination with other area flood risk management projects, protects the existing urban population while providing residual risk information to the appropriate agencies making land use decisions in the area. Therefore, the proposed project does not contribute to increased development in the floodplain and is in compliance with the executive order.

Executive Order 11990, Protection of Wetlands

Full Compliance. This Executive Order directs Federal agencies, in carrying out their responsibilities, to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. There is wetland vegetation within the study area. Wetland vegetation would be disturbed during construction but implementation of mitigation will reduce effects.

Executive Order 12989, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Full Compliance. This Executive Order states that Federal agencies are responsible for conducting their programs, policies, and activities that substantially affect human health of the environment in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination under such programs, policies, and activities because of their race, color, or national origin. The proposed construction project is not located near any minority or low income communities. The benefits of the project would extend to all residences in the area; therefore it would not provide disproportionate benefits or effects to any minority or low income populations and is in compliance with this Executive Order.

Farmland Protection Policy Act (7 U.S.C. 4201, et seq.)

Full Compliance. There are no designated prime or unique farmlands within the study area; therefore there would be no adverse effects to farmland and the project is in compliance with this Act.

Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661, et seq.)

Full Compliance. Federal agencies undertaking water projects are required to fully consider recommendations made by the USFWS in the provided Coordination Act Report (CAR) or Planning Aid Letter associated with the project. USFWS and CDFW have participated in evaluating the proposed project, and USFWS has prepared a CAR, dated April 26, 2013, which accompanies this document (Appendix A, Part VI).

Magnuson-Stevens Fishery Conservation and Management Act (16. U.S.C. 1801, et seq.)

Full Compliance. There is no essential fish habitat in the study area; therefore, the Corps has determined that the proposed action would have no effect on essential fish habitat. The project is in full compliance with this legislation.

Migratory Bird Treaty Act of 1936, as amended (16 U.S.C. 703, et seq.)

Full Compliance. The Migratory Bird Treaty Act implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russia, providing protection for migratory birds as defined in 16 U.S.C. 715j. The proposed action is located primarily in an industrial area. There is no suitable nesting habitat located within the study area; however, there are some potential nesting trees within a ½ mile of the study area. To ensure that the project does not affect migratory birds, preconstruction surveys would be conducted by a qualified biologist in areas adjacent to the project site. If breeding birds are found in the area, a protective buffer would be delineated and USFWS and CDFW would be consulted for further actions.

National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321, et seq.)

Full Compliance. NEPA applies to all Federal agencies and most of the activities they manage, regulate, or fund that affect the environment. This act requires full disclosure of the environmental effects, alternatives, potential mitigation, and environmental compliance procedures of proposed actions. NEPA requires the preparation of an appropriate document to ensure that Federal agencies accomplish the law's purposes. Full compliance will be achieved when the final GRR-EIS is filed with USEPA and the Corps issues a Record of Decision.

National Historic Preservation Act of 1966, as amended (16 U.S.C. 470)

Full Compliance. Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of a proposed undertaking on properties that have been determined to be eligible for, or included in, the National Register of Historic Places.

In a letter dated August 9, 2011, the Corps initiated consultation with the SHPO, informing the SHPO of the proposed project, and asked for comments on the determination of the APE and on the proposed efforts to identify historic properties within the APE. In a letter dated January 25, 2012, the SHPO concurred with the Corps' determination of the APE and concluded that the Corps' efforts to identify historic properties was reasonable and sufficient Additionally, SHPO re-confirmation that CA-SCL-593 is eligible for the National Register of Historic Places.

7.10.2 State of California Laws, Regulations, and Policies

California Clean Air Act

Full compliance. Section 5.2 of this document discusses the effects of the proposed project on the local and regional air quality. BAAQMD determines whether project emissions sources and emissions levels significantly affect air quality based on Federal Standards established by the U.S. EPA and State standards set by the California Air Resource Board. The project is in compliance with all provisions if the Federal and State Clean Air Acts.

California Endangered Species Act

Full Compliance. This GRR-EIS has considered the potential effects to State-listed species and has determined that due to lack of suitable habitat for these species, the project would have no effect on State-listed species. As a result, this project is in compliance with the California Endangered Species Act.

Porter-Cologne Water Quality Control Act

Full Compliance. The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 5.4. This project expects to achieve full compliance with the Water Quality Control Act by achieving compliance with RWQCB certification mandates for Section 401.

CHAPTER 8 – PUBLIC INVOLVEMENT*

8.1 PUBLIC INVOLVEMENT

The public and concerned planning and resource agencies have been invited to participate in all phases of the Berryessa Creek Element since its Feasibility Study/EIS phase in the mid-1980s. This has included opportunities to comment on the 1987 Berryessa Creek Interim Feasibility Report and Final EIS. A Notice of Intent (NOI) to prepare an EIS for the Berryessa Creek Element was filed with the Federal Register October 15, 2001. A Notice of Preparation (NOP) was also submitted to the Office of Planning and Research, State Clearing House by the SCVWD on October 29, 2001. In November 2001, a Public Scoping Meeting was conducted for the general reevaluation study. After the Corps and SCVWD committed to reevaluate the authorized flood control project, additional efforts were made to solicit public input and feedback on Berryessa Creek planning efforts, including:

- Disseminating information through SCVWD web site
- Providing background information through newspaper articles covering the project in the San Jose Mercury News and the Milpitas Post
- Creating opportunities for comment and discussion through public meetings and workshops at which the Corps, SCVWD, and other involved agencies have actively participated

The November 2001 Public Scoping Meeting was held to provide background information, discuss the purpose of the study, and discuss conceptual alternatives used in flood control projects. Concerns identified during public scoping typically fell into four categories: flood control, schedule, recreational, and environmental.

Environmental issues include public concerns about the biological effects of the project including effects on vegetation, wildlife, and fish. Concerns about the project's effects on recreation were also raised during the scoping meeting. Most of the comments received indicated concern about the provision of adequate trails along the creek, although several comments indicated concern about enhancing access to the creek. The City of Milpitas has a recreation trail project on Berryessa Creek in their Trails Master Plan; the City of San Jose has also identified an interim trail project from Morrill Avenue to Piedmont Avenue. The County of Santa Clara has not identified a trail project on Berryessa Creek.

Public concerns about flood control included various issues, such as the reduction of existing and potential flood damage to private and public properties and facilities, potential high maintenance costs for a flood control project along Berryessa Creek, the length of time required to complete the project, noise impacts on adjacent landowners during construction, and removing properties from the 100-year floodplain.

All pertinent scoping concerns have been duly considered in the preparation of this document. Comments on report scoping are on file at the SCVWD and Corps office as part of the project record.

Additional public meetings were held in November 2004 and March 2005, to update the community on the progress of the project and present conceptual alternatives developed for the project. Concerns generally included the following items.

- Concerns about safety related to accessibility and fencing between property owners and the creek, especially if there is a trail system. Most people wanted safety, security, and privacy but some did not want lighting shining into their homes. It was discussed that a trail may bring users more frequently, and that more people would actually preclude burglary and other security problems.

- Interested in what type of recreational trail there would be.

- Wanted to know how we calculated the flows for the 100-year flow? (Statistics, historical records, USGS information on rainfall and flow in the channel, using predictive equations in hydrology and frequency/probability of events occurring.)

- Concerns that in the past, flow patterns changed after flood events.

- Some thought that the trees in the greenbelt caused flooding, and did not want them or the debris falling in their yards; others wanted to make sure the trees are saved as much as possible. It was explained that the Water District has adopted natural flood control principles which encourages trees and natural streams.

- A recreational representative from the City of San Jose was at the meeting, and commented that the City is not sure they will build a trail project now because of funding. Further coordination would take place towards the end of the feasibility process, during design, or once the project is constructed. Milpitas has a trail master plan downstream of I-680.

- Concern over whether there will be walls built along the backyard fences was answered by citing that the City installed a supplemental fence (7 feet high) for the Guadalupe trail, but that homeowners still maintain their existing fence. This was handled by the community projects review unit, and now the Water District has a partnership with the City that the Water District maintains the creek and the City maintains the trails.

- In the past, the Water District did not want trails on their maintenance roads. "What is driver for the District to work with the City on trails?" Passage of Measure B supporting trails.

- Concern with riparian setbacks, and credit for rooftop gardens.

- Concern over motorbikes on the trails and who will patrol? (Police will respond to motorbikes.)

- Wanted to know where property would have to be acquired … where and how much.

- How will flood project address fast flood flows? Will the velocity increase with alternatives in the greenbelt area?

- Discussion over whether the community wants plants in the downstream area, where the creek mostly adjacent to commercial/industrial property. The community said it was hard to say without cost information, but it would generally be preferred.

8.1.1 Public Review and Comments on the Draft GRR-EIS

A Notice of Availability (NOA) on the Berryessa Creek Draft Integrated General Reevaluation Report/ Environmental Impact Statement (GRR-EIS) was published in the *Federal Register* on March 22, 2013. The 45-day public review period for the draft document began on March 22, 2013 and ended on May 5, 2013. A public workshop and hearing were held on April 18, 2013 at Milpitas Community Center to provide additional opportunities for comments on the Draft GRR-EIS. As required by environmental regulatory policies – National Environmental Policy Act (NEPA), the U.S. Army Corps of Engineers (Corps) as lead agency for the Final GRR-EIS, are required to respond to substantive environmental issues raised during the review and consultation process.

During the public review period, comments were received on the Draft GRR-EIS from Federal, State, and local agencies, and the general public. Comments were received in a variety of media, including letters, emails, telephone, and public meeting comments. Three comment letters were received on the Draft GRR-EIS from Federal, and local agencies and three letters from members of the public. Most comments were focused around air quality, water quality, traffic, biological resources, and flooding impacts.

Appendix G contains copies of all written and email comments received on the Draft GRR-EIS and all written comments received at the April 18 meeting. Comments received during the review period have been considered in preparing the Final GRR-EIS, as appropriate. A notice of availability of the Final GRR-EIS will be published in the Federal Register prior to distribution for public review.

8.1.2 Public Meeting

On April 18, 2013 the Corps, together with SCVWD held a public meeting to present the status of the project and obtain public input. The meeting was publicized in a Corps press release, the Corps' website, and by Corps/SCVWD's home mailings. The meeting was video recorded by SCVWD.

The purpose of the meeting was to continue the flow of information on the Berryessa Creek Element, while gathering additional information and community comments from citizens who live, work, and commute near the project area. In attendance were agency partners from SCVWD, and Tetra Tech. Interested parties from the City of Milpitas, City of San Jose, the State Assembly office, and ten community members attended the meeting.

At the meeting, the Corps and SCVWD had visual displays explaining the project location, and descriptions of the project alternatives. The Corps gave a short presentation on the history of the Berryessa Creek Element, the tentatively selected alternative, and the National Environment Policy Act. After the Corps presentation, questions were asked regarding channel maintenance and flooding in upper portion of Berryessa Creek. Concerns were raised about sediment accumulating at a bridge near Old Piedmont Road and the lack of maintenance which contributes to flooding. A question was asked as to who was responsible for maintenance. Dennis Cheong from SCVWD explained that the City of San Jose is responsible for channel maintenance in that area. Comments were also made on the need to have flood insurance. Concerns were expressed on potential flooding to the residents and a school in the upper Berryessa Creek area. Krey Price, Tetra Tech, explained the potential flooding patterns around the Berryessa Creek study area, the multiple scenarios that were investigated, and the rational for implementing flood control measures starting downstream and working upstream.

Questions were also raised about the need for floodwalls and the heights of the proposed floodwalls. Statements encouraged higher floodwalls along the creek to handle larger flows from possible increased runoff or climate change. Cameron Sessions explained that during investigation of alternatives a balance approached was used to consider cost, risk, level of protection and safety.

A member of the public asked if the creek would remain an earthen channel or if it would be converted into a concrete lined channel. Cameron Sessions explained that the channel would remain earthen. An additional question asked, was what environmental improvements to the creek result from the project. Jamie LeFevre explained that the project would stabilize the banks reducing erosion and sediment into the creek to improve water quality. The banks would also be reseeded with native vegetation which would result in an increase to plant diversity.

Another member of the public asked about additional recreational opportunities along the creek. Cameron Sessions explained although formal recreational components are not a part of this project; the required maintenance roads make incidental walking trails. Dennis Cheong went on to further explain SCVWD's and the City's plans to improve recreational opportunities in the future.

8.2 FEDERAL, STATE, AND LOCAL AGENCY INVOLVEMENT

Throughout the history of the authorized project and General Reevaluation Study, the Corps and SCVWD have coordinated planning activities with other Federal, State, and local regulatory and planning agencies. In the 1980s, coordination with these agencies led to development of the authorized project. This coordination would continue through the reevaluation phase, leading to the design and construction of the authorized project as modified per the general re-evaluation phase. The Corps and Water District plan to engage these agencies throughout the development and refinement of a range of alternatives for public consideration that would meet the flood risk management, recreational, and environmental objectives of the project. The primary conduit for technical feedback from other agencies and environmental groups include the Corps' interagency meetings and public outreach meetings, with members representing the following organizations:

- U.S. Army Corps of Engineers
- Santa Clara Valley Water District
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- U.S. Environmental Protection Agency
- California Water Resources Control Board
- California Department of Fish and Game
- San Francisco Bay Regional Water Quality Control Board
- City of Milpitas
- City of San Jose
- Coyote Watershed Integrated Working Group
- Santa Clara Valley Transportation Agency
- Union Pacific Railroad

The Corps and SCVWD are currently coordinating with the cities of Milpitas and San Jose to determine their interest in participating in the study, specifically in increasing and providing recreational uses/opportunities along Berryessa Creek.

8.2.1 Views of the Non-Federal Project Partner

The SCVWD has affirmed its intent to participate in the federally authorized Berryessa Creek Elementas the non-Federal sponsor. SCVWD staff will continue working with the Corps to comple the project on schedule and within the budget.

The SCVWD will continue to participate in the cost-sharing of the project in accordance with the terms of the reevaluation cost sharing agreement. The SCVWD is fully committed to providing flood control and stream stewardship for the communities of San Jose and Milpitas.

The SCVWD also understands their responsibility in furnishing all project lands, easements, rights-of-way, and relocations, excluding relocation of railroad bridges and approaches thereto. It should be noted that the voters of Santa Clara County approved the Clean Safe Creeks and Natural Flood Protection Act, a bond measure that specifically provides funding for the non-Federal share of the project.

8.2.2 Views of Concerned Resource Agencies

The Corps has continued its coordination of the Berryessa Creek Elementwith the various resource agencies. On September 14, 2004, Corps and SCWVD representatives met with the USFWS, USEPA, and RWQCB representatives at the project site to discuss and provide an overview and history of the project, including discussion of the preliminary alternative plans. Both the USEPA and RWQCB have provided comments and recommendation in their letter dated October 14, 2004. The agencies' concerns generally included the following.

- Having the maintenance road on one side of the channel
- Project should address sediment sources, both above and within the study area
- Stabilize upstream sediment sources to reduce the need for sediment removal and maintenance of sediment basin
- Maximize opportunities for restoring active floodplain and healthy riparian habitat within the greenbelt reach
- Link maintenance frequency to project objective of reducing sedimentation and maintenance needs
- Replace Old Piedmont Road Bridge to increase channel capacity
- Consider integrating vegetated flood bench and lowered maintenance road

CHAPTER 9 – REMAINING REVIEWS, APPROVALS, IMPLEMENTATION, AND SCHEDULE

9.1 PUBLIC REVIEW OF FINAL DOCUMENT

This GRR-EIS will be circulated for a 30-day review to Federal, State, and local agencies; organizations; and individuals who have an interest in the project. A notice of availability of the GRR-EIS will be published in the Federal Register following distribution for public review. All comments received during the public review period will be considered, as appropriate.

9.2 INTENDED USES OF THE GRR-EIS

This GRR-EIS is a public information document under NEPA. Its purpose is to inform public agency decision makers and the general public of the significant effects of the project. The document also identifies measures to avoid or minimize significant effects and describes reasonable alternatives to the project. The purpose or intent of an EIS is not to recommend either approval or disapproval of a project, but to disclose the potential effects of that project.

On the State level, the SCVWD, as the project's lead agency under CEQA, will prepare a separate EIR. Local agencies may use the final GRR-EIS when they consider permits or approvals that may be associated with the project. Coordination with agencies such as the BAAQMD will be necessary to obtain permits or approvals.

9.3 REPORT REVIEW AND APPROVAL

The final GRR-EIS will be submitted to the Chief of Engineers. Once the final report is approved and a Record of Decision (ROD) signed, construction funds must be appropriated by Congress before a Project Partnership Agreement can be signed by USACE and the sponsor in order to begin construction.

9.4 COST-SHARING REQUIREMENTS

The costs for the NED Plan will be shared in accordance with Section 103 of the WRDA 1986 and cost shared as a Flood Risk Management Feature. Cost sharing for the NED Plan is presented in **Error! Reference source not found.**.

9.5 FEDERAL AND NON-FEDERAL RESPONSIBILITIES

9.5.1 Federal Responsibilities

The Corps will accomplish preconstruction engineering and design studies. After the Recommended Plan is approved by the Corps and funded by Congress, and a cash contribution, lands, relocations, and assurances are provided by the SCVWD, the Corps will construct the project.

9.5.2 Non-Federal Responsibilities

The sponsoring agency, SCVWD, will be responsible to provide cash contribution of not less than 5 percent of the project cost; provide a minimum of 35 percent, but not to exceed 50 percent, of total project costs; provide all necessary lands, easements, rights-of-way, access routes, relocation of utilities necessary for project construction and subsequent operation maintenance of the project; and assume all responsibilities and costs for operation and maintenance of the project. Detailed non-Federal responsibilities are presented in Chapter 10.

9.6 PROJECT PARTNERSHIP AGREEMENT

A Design Agreement must be executed between the Corps and the SCVWD in order to cost-share the development of detailed plans and specifications. Before construction starts, the Federal Government and the non-Federal sponsor would execute a Project Partnership Agreement. This agreement would define responsibilities of the non-Federal sponsor for project construction as well as operation, maintenance, repair, replacement, and rehabilitation and other assurances.

9.7 PROJECT SCHEDULE

The following table indicates the schedule for the remaining milestones for the study, design, and anticipated construction.

Table 9-1 Schedule of Project Milestones

Milestone/Item	Date
Feasibility Scoping Meeting	April 2004
Alternative Review Conference	May 2005
GRR Conference and Tour	July 2006
Draft GRR-EIS Report for Public and HQUSACE Circulation	Mar-Apr 2013
Public Meeting/Hearing for Draft GRR-EIS	April 2013
Final GRR-EIS Public Review	September2013
Final GRR-EIS Submittal to South Pacific Division	August 2013
MSC/SPD Commander's Approval	September 2013

CHAPTER 10 –RECOMMENDATIONS

I recommend approval of a modified plan for the I-680 to Calaveras Boulevard, separable element, of the authorized Berryessa Creek Element of the Coyote and Berryessa Creeks, California flood control project, with deferral of the portion of the authorized project upstream from I-680 until further action is warranted. The total first cost of the project is currently estimated at $26,626,000 (under October 2012 prices). The Federal share is currently estimated at $13,380,000.

The scope of the proposed project modifications is substantially in accordance with the authorized project. Based on reevaluation of the project costs and the economic benefits, and consideration of the design refinements, the Berryessa FRM project is economically justified and considered sound economic investments for the Government.

I also recommend additional studies to investigate reduction of the residual flood risk in the vicinity of Berryessa Creek upstream of I-680, which may be undertaken as part of or coordinated with any future comprehensive investigation of the Berryessa and Coyote Creeks watershed, or a portion thereof.

It is recommended that this report be approved and that the project continue toward project implementation, subject to cost-sharing, financing, and other applicable requirements of Federal and State laws and policies, including Public Law 99-663, the Water Resources Development Act of 1986, as amended by Section 202 of Public Law 104-303, the Water Resources Development Act of 1996, and in accordance with the following requirements, which the non-Federal sponsor must agree to prior to project implementation.

1. Provide a minimum of 35 percent, but not to exceed 50 percent, of total project costs assigned to structural flood control, as specified below:

   a. Enter into an agreement which provides, prior to construction, 35 percent of preconstruction engineering and design (PED) costs.

   b. Provide, during construction, any additional funds needed to cover the non-Federal share of PED costs.

   c. Provide, during construction, a cash contribution equal to 5 percent of total project costs.

   d. Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations, except railroads, determined by the Government to be necessary for the construction, operation, and maintenance of the project.

   e. Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project.

f. Provide, during construction, any additional costs as necessary to make its total contribution equal to at least 35 percent of total project costs.

2. Give the Government a right to enter, at reasonable times and in a reasonable manner, upon land that the local partner owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

3. Assume responsibility for operating, maintaining, replacing, repairing, and rehabilitating the project or completed functional portions of the project, including mitigation features, without cost to the Government, in a manner compatible with the project's authorized purpose and in accordance with applicable Federal and State laws and specific directions prescribed by the Government in the OMRR&R manual and any subsequent amendments thereto.

4. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project, or separable element thereof until the non-Federal partner has entered into a written agreement to furnish its required cooperation for the project or separable element.

5. Hold and save the Government free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the Government or the Government's contractors.

6. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs.

7. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way necessary for the construction, operation, and maintenance of the project, except that the non-Federal partner shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government.

8. Assume complete financial responsibility for all necessary cleanup and response costs for any CERCLA-regulated materials located in, on, or under lands, easements, or rights-of-way that the Government determines necessary for the construction, operation, or maintenance of the project.

9. Agree that, as between the Federal Government and the Non-Federal Sponsor, the Non-Federal Sponsor shall be considered the operator of the project for the purpose of CERCLA

liability, and, to the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA.

10. Prevent obstructions or encroachments on project lands, easements, and rights-of-way (including prescribing and enforcing regulations to prevent such obstructions or encroachments) which might reduce the level of protection the project affords, hinder operation and maintenance of the project, or interfere with the proper functioning of the project.

11. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

12. Comply with all applicable Federal and State laws and regulations, including Section 601 of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled “Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army”: and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et. seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et. seq.) and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c)).

13. Comply with Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), which requires a non-Federal interest to prepare a floodplain management plan within one year after the date of signing a Project Cooperation Agreement. The plan shall be designed to reduce the impacts of future flood events in the study area, including but not limited to, addressing those measures to be undertaken by non-Federal interests to preserve the level of flood control provided by the project. As required by Section 402, implement the plan not later than one year after completion of the construction of the project. Provide an information copy of the plan to the Government upon its preparation.

14. Provide the non-Federal share of that portion of the costs of archeological data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with the cost sharing provisions of the agreement.

15. Participate in and comply with applicable Federal floodplain management and flood insurance programs.

16. Publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with protection levels provided by the project.

17. Do not use Federal funds to meet the Non-Federal Sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized.

18. Inform affected interests, at least annually, regarding the extent of protection afforded by the project.

The Corps, Sacramento District, has carefully reviewed the authorities for approving post-authorization changes presented in ER 1105-2-100, *Planning Guidance Notebook*, as amended. This review indicates that it is within the discretionary authority of the Commander, USACE, to approve the post-authorization changes to the Berryessa Creek Element. Under Section 2855 of the National Defense Authorization Act for Fiscal Year 1994 (P.L. 103-160), the project is exempt from the cost increase limitation in Section 902 of the Water Resources Development Act of 1986. There would be no changed features or conditions resulting from the project modifications that require Congressional authorization.

The Recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program or the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are approved. However, prior to approval, the partner, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Michael J. Farrell
Colonel, U.S. Army
District Commander

CHAPTER 11 – LIST OF PREPARERS*

The following individuals participated in the preparation of this GRR-EIS.

Table 11-1 List of Preparers	
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Sherman Fong	Sr. Cost Engineer
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Jane Bolton	Geotechnical Engineer
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George Heubeck	Real Estate Manager
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Merri Martz	Sr. Biologist
Richard McCallan	Sr. Water Resources Engineer
Krey Price	Sr. Civil Engineer/Designer
Michael Gorecki	Sr. Economist
Scott Vose	Cost Estimator
Jim Medlen	Environmental Planner
Kittelson & Associates	Subconsultant – Traffic Analysis

CHAPTER 12 – DOCUMENT RECIPIENTS*

The following Federal, State, and local agencies and organizations would either receive a copy of the GRR-EIS or a notification of document availability. Individuals who may be affected by the project or have expressed interest through the public involvement process would also be notified.

12.1 ELECTED OFFICIALS AND REPRESENTATIVES

Governor of California

- Honorable Edmund G. Brown, Jr.

United States Senate

- Honorable Barbara Boxer
- Honorable Dianne Feinstein

United States House of Representatives

- Honorable Mike Honda
- Honorable Zoe Lofgren

California Senate

- Honorable Ellen Corbett

California State Assembly

- Honorable Robert Wieckowski

12.2 U.S. GOVERNMENT DEPARTMENTS AND AGENCIES

- Council on Environmental Quality
- Federal Emergency Management Agency
- National Marine Fisheries Service
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey

12.3 STATE OF CALIFORNIA GOVERNMENT AGENCIES

- Senate Committee on Natural Resources
- Assembly Committee on Water, Parks, and Wildlife
- California Air Resources Board
- Central Valley Flood Protection Board
- San Fransisco Bay Regional Water Quality Control Board
- California Department of Conservation
- California Department of Fish and Game
- California Department of Parks and Recreation
- California Department of Transportation
- California Department of Water Resources
- Native American Heritage Commission
- State Office of Historic Preservation
- State Lands Commission
- State Water Resources Control Board
- Governor's Office of Emergency Services

12.4 LOCAL GOVERNMENT

- Bay Area Metropolitan Air Quality Management District
- City of Milpitas
- City of San Jose
- Santa Clara County Water District
- Santa Clara County

CHAPTER 13 – REFERENCES

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