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# **STAFF-RECOMMENDED ALTERNATIVE REPORT**

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**Lower Penitencia Creek Improvements Project**

*Project No. 40334005*

**WATERSHEDS DESIGN AND CONSTRUCTION  
DIVISION**

**September 2015**

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SANTA CLARA VALLEY WATER DISTRICT

LOWER PENITENCIA CREEK IMPROVEMENTS PROJECT

Project No. 40334005

## **STAFF RECOMMENDED ALTERNATIVE REPORT**

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# CHAPTER 1. INTRODUCTION AND BACKGROUND

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## 1.1 INTRODUCTION

This Staff-Recommended Alternative Report (Report) is for the proposed Lower Penitencia Creek Improvements Project (Project). This report is intended for internal Santa Clara Valley Water District (District) distribution, as required under District QMS procedure W73002— Planning Phase WBS Descriptions and Instructions. This Report presents and summarizes the Project's problem definition, and the studies and evaluations performed to develop and assess various project alternatives to identify a staff-recommended alternative.

## 1.2 BACKGROUND

Lower Penitencia Creek is situated in the northeasterly portion of Santa Clara County within the City of Milpitas in the Berryessa Creek watershed. Lower Penitencia Creek is an open trapezoidal channel with both earth- and concrete-lined sections. To increase channel capacity, improvements were constructed in 1955, 1962, 1965, and 1984. Lower Penitencia Creek's east levee located between California Circle and Berryessa Creek is FEMA (Federal Emergency Management Agency) certified. Two tributaries, Berryessa Creek and Penitencia East Channel, flow into Lower Penitencia Creek. Lower Penitencia Creek itself flows into Coyote Creek.

As shown in Figure 1, the District has two capital flood protection projects located immediately east of Lower Penitencia Creek, the Upper and Lower Berryessa Creek Projects. Completion of improvements along the Upper and Lower Berryessa Creek Projects will result in an increase to the Lower Penitencia Creek Improvement Project's 1-percent design flow. Lower Penitencia Creek, in its existing condition, lacks capacity to convey the increased 1-percent design flow.

The Upper Berryessa Creek Project (Calaveras Boulevard to I-680) is scheduled to complete construction in 2017. Construction of the Lower Berryessa Creek Project (Lower Penitencia Creek to Calaveras Boulevard) began in summer 2015 and is scheduled to be completed in 2017. Together, the Upper and Lower Berryessa Creek Projects will protect 3,400 homes, businesses, and public facilities from the 1-percent flood event. Lower Penitencia Creek construction must be completed within the same time frame as the Upper and Lower Berryessa Creek Projects to avoid inducing downstream flooding. Lower Penitencia Creek construction is also necessary to ensure its FEMA certified east levee does not become de-certified resulting in a portion of the community being placed back into FEMA's 1-percent floodplain.

## 1.3 PROJECT OBJECTIVES

The objectives of the Project are:

- a. Convey the Lower Berryessa Creek 1-percent design flow;
- b. Meet required water surface elevations at Coyote Creek and Berryessa Creek confluences;
- c. Minimize the need for seasonal removal of sediment and non-woody vegetation;
- d. Maintain existing Federal Emergency Management Agency (FEMA) accreditation along the east levee located between California Circle and Berryessa Creek; and
- e. Enable FEMA certification of the improvements.

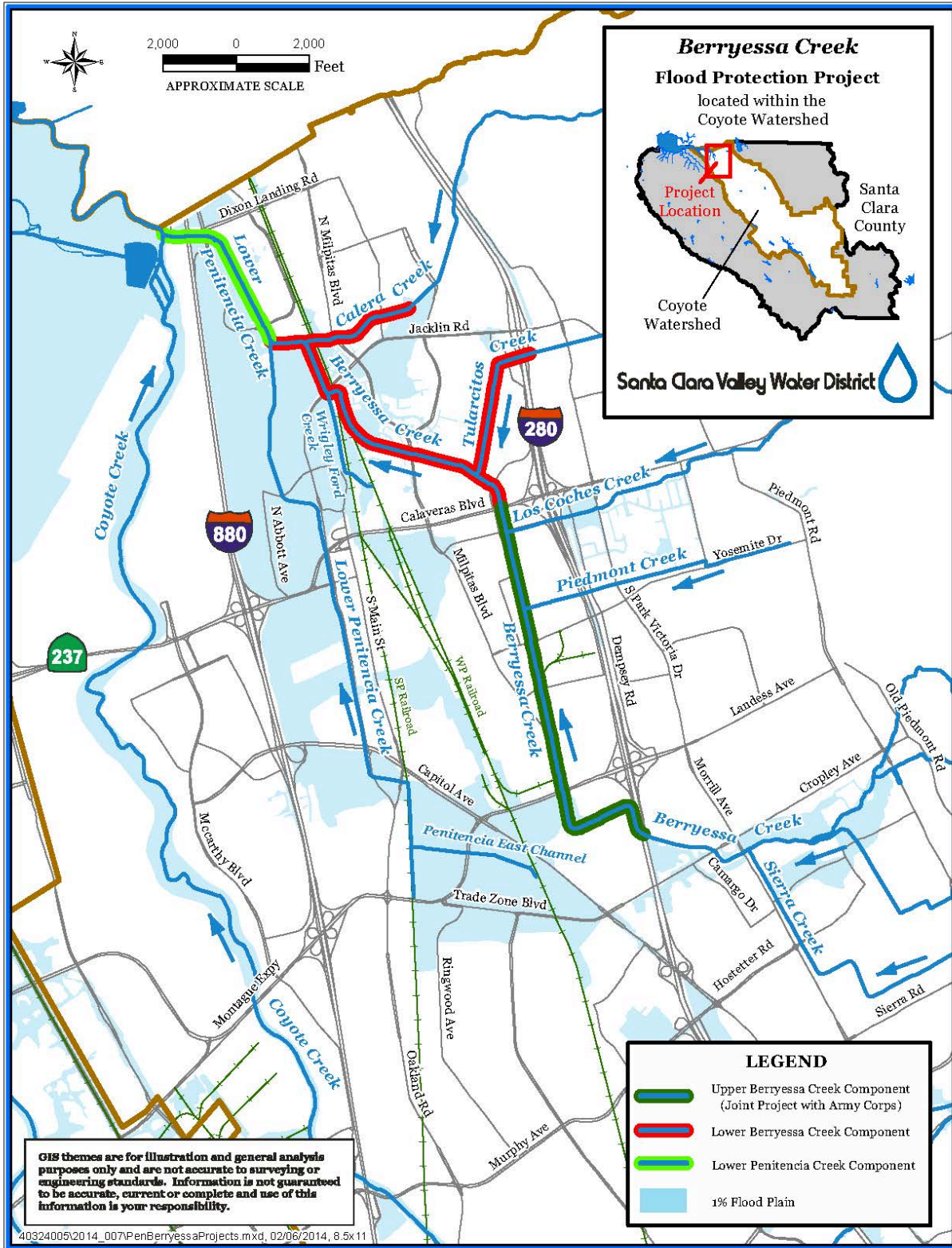


Figure 1. Map of Lower Penitencia Creek



## 1.4 PROJECT LIMITS

In its entirety, Lower Penitencia Creek is about four miles long and flows northerly from two large outfalls at Montague Expressway to its confluence with Coyote Creek near the intersection of Interstate 880 (I-880) and Dixon Landing Road. The creek is tidally influenced from Coyote Creek to approximately Marylinn Drive.

The Project extends from the Coyote Creek confluence upstream to San Andreas Drive, and the Project has been divided into four reaches as defined below:

- Reach 1—Coyote Creek confluence to I-880 (500 feet)
- Reach 2—I-880 to California Circle (600 feet)
- Reach 3—California Circle to Milmont Drive (3,000 feet)
- Reach 4—Milmont Drive to San Andreas Drive (900 feet)

## 1.5 LAND USE AND BIOLOGICAL RESOURCES

Lower Penitencia Creek flows northward through a mix of industrial and residential settings before reaching its confluence with Coyote Creek, which ultimately drains to San Francisco Bay. Introduced annual grass and ruderal (weedy) nonnative species dominate the levee banks. Aquatic and wetland vegetation grows along the water's edge.

The creek is considered longfin smelt habitat by the California Department of Fish and Wildlife<sup>1</sup>.

## 1.6 PROBLEM AND CONSTRAINTS

### 1.6.1. FREEBOARD DEFICIENCY

With completion of the Upper and Lower Berryessa Creek flood protection projects, the future 1-percent design flow will nearly double Lower Penitencia Creek's existing 1-percent flow condition. At the downstream end of the Project, the 1-percent design flow in the creek would increase from 4,830 cubic feet per second (cfs) under existing conditions to 8,720 cfs under future conditions.

With this increase in the 1-percent flow, Lower Penitencia Creek will no longer have 1-percent flood capacity. Without additional improvements, this section of the creek would become freeboard deficient.

### 1.6.2. BOUNDARY CONDITIONS AND SEA LEVEL RISE

Lower Penitencia Creek's 1-percent boundary water surface elevation must conform to the 1-percent water surface elevation of its confluence points with Coyote Creek and Berryessa Creek. The water surface elevation at the Berryessa Creek confluence point must not be exceeded. Lower Penitencia Creek would also be subject to future sea level changes. This has been taken into consideration in the project's design criteria for its starting water surface

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<sup>1</sup> The California Department of Fish and Wildlife (CDFW) considered the tidally-influenced reaches of Lower Berryessa Creek (Lower Penitencia Creek confluence to Abel Street) as potential longfin smelt habitat in the Streambed Alteration Agreement for the Lower Berryessa Creek Project. Since the Lower Penitencia Creek Improvements Project area is also tidally-influenced (and downstream of Lower Berryessa Creek), it is likely that CDFW will consider it to be potential longfin smelt habitat also.

boundary condition. Low, intermediate and high sea level changes were examined for a 50-year projection period.

### **1.6.3. TIDES**

Lower Penitencia Creek is a tidally influenced tributary to Coyote Creek located near South San Francisco Bay. As such, it receives incoming sediment with daily tidal episodes. It is a goal of this project to design flood protection improvements that allow for the tidally related sediment load to remain.

### **1.6.4. RIGHT OF WAY**

Lower Penitencia Creek exists in a completely urbanized area. Areas on either side of the creek are completely built up with either homes or businesses. The unavailable right of way and cost of real estate for the area make it challenging to expand Lower Penitencia Creek outside of its existing footprint and has constrained what flood protection improvements can be considered. More information about the property ownership along the creek can be found in the Problem Definition and Refined Objectives Report (SCVWD 2013).

## **1.7 DESIGN CRITERIA**

The following general design criteria were used in the development of the Project alternatives.

### **General**

- Project design life is 50 years.
- Flood protection improvements would be designed to convey the 1-percent design flow and meet FEMA freeboard requirements.
  - 1.0 feet of freeboard would be provided in sections of creek without levees or floodwalls.
  - 3.0 feet of freeboard would be provided in sections of creek with levees or floodwalls.
  - 4.0 feet of freeboard would be provided in sections of creek within 100 feet of structures (e.g., a bridge) or wherever flow is constricted.
- Maintenance roads would be a minimum width of 18 feet where possible.
- Lower Penitencia Creek's 1-percent water surface elevation at the Lower Berryessa Creek confluence point would not exceed 21.1 feet NAVD88.
- Lower Penitencia Creek's water surface elevation takes into consideration low, intermediate, and high future sea level rise projection for its 50-year design life.

## **Levees**

- Levees would have a side slope of 2:1 (horizontal:vertical or 2H:1V).
- Levees would be overbuilt as necessary to account for settlement as determined by future design geotechnical investigations.

## **Floodwalls**

- Floodwalls would be constructed on the outboard side of access roads or on tops of levees.

## CHAPTER 2. ALTERNATIVES DEVELOPMENT

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The District's alternatives evaluation has three stages: development of conceptual alternatives, development of feasible alternatives, and the development of a staff-recommended alternative.

### 2.1. CONCEPTUAL ALTERNATIVES

During the conceptual alternatives stage, numerous approaches to meet the project objectives were identified. Each of these approaches is referred to as a *Conceptual Project Element* (CPE). The following CPEs were developed during the conceptual alternative stage and then were refined during the feasible alternative stage.

#### 1. No Project

Under this CPE, the channels would remain in their existing conditions. Flood flows would overtop channel banks and inundate adjacent properties. Current maintenance activities to remove sediment and manage vegetation would continue.

#### 2. Levee

This CPE would provide flood protection by creating a new levee or raising an existing levee, thereby increasing the overall channel capacity. Levees would be designed with 2H:1V side slopes and a minimum top width of 18 feet.

#### 3. Vegetated Bench

This CPE would widen the channel area, adding a bench above the channel bottom that would be planted with wetland vegetation, providing more channel conveyance and also more habitat.

#### 4. Floodwall—Constructed on Existing Levee

This CPE would provide flood protection by creating a vertical concrete structure that would contain flow within the channel, thereby increasing overall channel capacity. Floodwalls would be constructed on the outboard side of the channel and where possible, would be placed at a minimum distance of 18 feet from the inboard top of bank to provide adequate access for maintenance activities.

#### 5. Floodwall—Remove Existing Levee

This CPE would provide flood protection by creating a vertical concrete structure that would contain flow within the channel, thereby increasing overall channel capacity. A portion of the existing levee would be removed, and a floodwall would be constructed in its place, on the outboard side of the channel and where possible, would be placed at a minimum distance of 18 feet from the inboard top of bank to provide adequate access for maintenance activities.

## **6. Bridge Raising**

This CPE would provide flood protection by increasing the available flow capacity at a bridge crossing by replacing the existing bridge with a new bridge that raises the bridge soffit.

## **7. Bridge Widening**

This CPE would provide flood protection by increasing the available flow capacity at a bridge crossing by replacing the existing bridge with a new bridge that has a wider open conveyance area below the bridge.

## **8. Concrete-Lined Channel**

This CPE would provide flood protection by excavating portions of the existing channel to create a trapezoidal concrete cross-section. The channel would be lined with concrete, which would reduce the channel roughness.

## **9. Off-Stream Detention Area**

This CPE would provide flood protection by temporarily diverting high flows during a flood event into an off-stream detention area. After the peak of the storm passed, the flows would be released to the creek. During a storm event, flows higher than the existing conveyance capacity (approximately 3,600 cfs) would spill over a weir and into a detention area.

## **10. Bypass Channel**

This CPE would provide flood protection by constructing an underground bypass culvert that would start at the confluence of Lower Penitencia and Lower Berryessa Creeks and flow westward to connect with Coyote Creek.

## **11. Annual Sediment Removal**

This CPE would provide flood protection by increasing the frequency of sediment removal activities in the channel to every year. Sediment removal would not be allowed to be delayed or deferred to future years but must occur on an annual basis.

Most of the conceptual alternatives were composed of several CPEs used in combination to meet the Project objectives.

Ten alternatives, including the No Project alternative, were developed and analyzed in the conceptual alternative stage of the Project (Table 1).

During the conceptual alternatives development stage, it was noted that the center maintenance access island in Reach 3 is currently not being used. Removal of the island was explored, however, this idea was not pursued further due to concerns about the impacts of removing trees, and the possibility of tules becoming overgrown in the island area. The tule growth would itself become a flow barrier that would become a new maintenance burden.

**TABLE 1**  
**Conceptual Alternatives**

Alternative Number	Alternative	CPE									
		Levee	Vegetated Bench	Floodwall – Constructed on Existing Levee	Floodwall – Remove Existing Levee	Bridge Raising	Bridge Widening	Concrete-Lined Channel	Off-Stream Detention Area	Bypass Channel	Annual Sediment Removal
	No Project										
1	Levees, Floodwalls, Raise and Widen One Bridge	X	X	X		X	X				X
2	Levees, Floodwalls, Widen Two Bridges	X	X	X			X				
3	Levees, Floodwalls, Raise and Widen One Bridge, Raise One Bridge	X	X	X		X	X				
4	Levees, Floodwalls, Widen One Bridge, Raise One Bridge	X	X	X		X	X				
5	Levees, Floodwalls, Setback Floodwalls, Raise and Widen One Bridge, Raise One Bridge	X	X	X	X	X	X				
6	Concrete-Lined Trapezoidal Channel	X		X			X	X			X
7	Off-Stream Detention Basin								X		
8	Bypass Channel to Coyote Creek									X	
9	Annual Sediment Removal										X

## 2.2 CONCEPTUAL ALTERNATIVE EVALUATION CRITERIA AND WEIGHTING FACTORS

Alternatives evaluation during the conceptual alternatives stage of the planning process is defined as level one screening, which focuses on the project objectives and cost. Conceptual alternatives must satisfy all of the following screening criteria to be carried forward to the feasible alternatives analysis phase of the planning process. The evaluation criteria collectively represent a common basis on which the alternatives were evaluated, and are shown with their weighting factors in TABLE 2.

**TABLE 2**

**Conceptual Alternative Evaluation Criteria and Weighting Factors**

<b>Criterion</b>	<b>Weighting Factor</b>	<b>Basis for Assigned Weighting Factor</b>
1. Convey the Lower Berryessa Creek 1-percent design flow	High	Providing flood protection is the primary driver for this Project.
2. Meet required water surface elevations at Coyote Creek and Berryessa Creek confluences	High	It is important for the design water surface elevation to be compatible with the design water surface elevations of Coyote and Berryessa Creeks.
3. Minimize the need for seasonal removal of sediment and non-woody vegetation	High	Sediment removal costs are quite high; with limited funds and challenges in obtaining permits to remove sediment, it is desirable to minimize sediment removal and vegetation management in the Project area.
4. Maintain existing Federal Emergency Management Agency (FEMA) accreditation along the east levee located between California Circle and Berryessa Creek	High	With the FEMA accreditation of the east levee, homes were removed from the regulatory floodplain. Placing these areas back into the regulatory floodplain and reinstating mandatory flood insurance would be unacceptable to the community and should be avoided.
5. Enables FEMA certification of improvements	High	Construction of this Project and Lower and Upper Berryessa Creek Projects would provide 1-percent flood risk reduction to approximately 3,400 parcels if the improvements can be FEMA certified.
6. Estimated construction cost does not exceed \$20 million	Medium	Funding in the Watershed Stream Stewardship Fund is limited.

## **Conceptual Alternative Evaluation Methodology**

The methodology used to develop and evaluate the conceptual alternatives was as follows:

- Identify and develop all conceptual alternatives that could meet the project objectives.
- Develop screening criteria to evaluate the conceptual alternatives.
- Evaluate the conceptual alternatives using screening criteria to identify which alternatives are to be considered for further detailed evaluation in the feasible alternatives analysis.
- Solicit public input.
- Solicit input from District subject matter experts.

## **2.3 CONCEPTUAL ALTERNATIVE EVALUATION RESULTS**



TABLE 3 shows how each conceptual alternative best met the screening criteria. A rating of 'High' means the alternative fully meets the criteria. A rating of 'Medium' means the alternative may meet the criteria. A rating of 'Low' means the alternative would likely not meet the criteria. And 'No' means the alternative does not meet the criteria.

Results of the screening analysis showed the following conceptual alternatives best met the screening criteria and would be carried forward for further analysis in the feasible analysis phase:

- Conceptual Alternative 1: Levees, Floodwalls, Raise and Widen One Bridge
- Conceptual Alternative 2: Levees, Floodwalls, Widen Two Bridges
- Conceptual Alternative 4: Levees, Floodwalls, Widen One Bridge, Raise One Bridge
- Conceptual Alternative 6: Concrete-Lined Trapezoidal Channel

Conceptual Alternatives 3, 4, and 5 are very similar with slight variations between each other. Conceptual Alternative 4 was the least costly of these 3 alternatives and therefore was selected to be carried forward.

Conceptual Alternative 7, the Off-Stream Detention Basin, was eliminated from further consideration because there is very little undeveloped area to construct a detention basin. Given a peak flow of 8,400 cfs on Lower Penitencia Creek at the Lower Berryessa Creek confluence and the current conveyance capacity of 3,600 cfs, approximately 800 acre-feet of flows would need to be detained. Assuming a 10–15-foot depth, 50–80 acres of land near the creek would need to be acquired for the detention basin. A weir would need to be constructed. The land near the creek is highly urbanized, and at current real estate prices of approximately \$2 million per acre, the cost just to acquire this land (without factoring in demolition and construction costs) would be approximately \$70–120 million<sup>2</sup>. A detention basin of the required size would require the demolition of structures and relocation of residents and/or businesses. The economic and social impacts would be considerable and likely unacceptable to the local community.

Conceptual Alternative 8, the Bypass Channel to Coyote Creek, would involve constructing an underground bypass culvert that connects Lower Penitencia Creek with Coyote Creek. The total length of the bypass would be about 2,500 feet. This alternative was eliminated because of the extensive impacts and costs that would result from constructing the bypass channel. The bypass would need to cross McCarthy Ranch Blvd, I-880, and Cadillac Court, and would cross four parcels (all privately owned), three of which are developed with commercial buildings and parking lots. This alternative would require easements to tunnel below existing residential and industrial developments, as well as I-880 and likely require extensive relocation of utility infrastructure. Additionally, the bypass would breach the Coyote Creek and Lower Penitencia Creek levees and there are anticipated impacts to fisheries because of increased water temperature resulting from diverting creek flows through a concrete bypass and discharging to a steelhead creek.

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<sup>2</sup> Prices based on SCVWD Real Estate Services Unit, August 2015, open market fair prices of \$40–50 per square foot for residential properties and \$17–20 per square foot for industrial/commercial properties. It was assumed that half of land acquired would be residential and half would be industrial/commercial based on City of Milpitas General Plan, 2010 Citywide Land Availability.

Conceptual Alternative 9 was eliminated from further consideration because ongoing annual sediment removal would not provide the needed channel capacity and is estimated to cost \$850,000 annually. In addition, with regular sediment removal, only poor-quality habitat would exist.

Lastly, the No Project alternative would also be carried forward into the feasible alternatives analysis phase as required by the California Environmental Quality Act (CEQA). However, it should be noted that the No Project alternative is really not considered an option since it does not address any of the Project objectives.

**TABLE 3**

**Conceptual Alternatives Screening Summary**

	Screening Criteria  Conceptual Alternative	Convey the Lower Berryessa Creek 1-percent design flow	Meet required water surface elevations at Coyote Creek and Berryessa Creek confluences	Minimize the need for seasonal removal of sediment and non-woody vegetation	Maintain existing FEMA accreditation along the east levee located between California Circle and Berryessa Creek	Enables FEMA certification of improvements	Estimated construction cost does not exceed \$20 million
1	Levees, Floodwalls, Raise and Widen One Bridge	High	High	Medium	High	High	High
2	Levees, Floodwalls, Widen Two Bridges	High	High	High	High	High	Medium
3	Levees, Floodwalls, Raise and Widen One Bridge, Raise One Bridge	High	High	High	High	High	Low
4	Levees, Floodwalls, Widen One Bridge, Raise One Bridge	High	High	High	High	High	Low
5	Levees, Floodwalls, Setback Floodwalls, Raise and Widen One Bridge, Raise One Bridge	High	High	High	High	High	Low
6	Concrete-Lined Trapezoidal Channel	High	High	Medium	High	High	Low
	No Project	No	No	Low	No	No	High

Descriptions of each of the alternatives to be carried forward for feasible analysis can be found in the next section of the report.

**Feasible Alternatives**

The purpose of this section is to provide descriptions of each of the feasible alternatives. Figures of these alternatives are contained in Appendix A.

### **2.3.1. NO PROJECT**

#### **Alternative Description**

Under the No Project alternative, no new elements would be implemented in the study area. Flood flows would overtop channel banks and inundate adjacent properties, resulting in flood-related damages to residences and businesses. Current maintenance activities such as sediment removal and vegetation maintenance would continue. Although this alternative does not meet the Project objectives, it is included here because the CEQA requires that the No Project alternative be analyzed.

### **2.3.2. ALTERNATIVE 1**

#### **Alternative Description**

This alternative combines raising and widening the California Circle bridge and constructing floodwalls, levees, and vegetation bench elements. This would increase the capacity of all project reaches to convey the design flow and provide channel stability.

#### **Operation and Maintenance**

New maintenance activity due to the construction of Alternative 1 would be annual sediment removal and vegetation management along the channel in Reaches 2 and 4; graffiti removal would also be anticipated due to the installation of new floodwalls. Other maintenance activities, such as trash and debris removal, would be the same as under existing condition.

#### **Land Ownership/Access**

Raising and widening the California Circle bridge on its east side would require coordination with Caltrans and permits from the City of Milpitas. All other improvements would occur within existing District easement or fee title.

#### **Cost Estimate**

Construction:	\$17,370,000
Land Acquisition:	—
<u>50-Year Maintenance:</u>	<u>\$ 9,600,000</u>
Total Lifetime Cost:	\$26,970,000

### **2.3.3. ALTERNATIVE 2**

#### **Alternative Description**

This alternative combines floodwalls, levees, vegetated benches, and widening the California Circle and Milmont Drive bridges. This would increase the capacity of all the project reaches to convey the design flow, provide channel stability, and improve water quality and channel habitat.

## Operation and Maintenance

New maintenance activity due to the construction of Alternative 2 would be limited to an anticipated increase in graffiti removal due to the installation of new floodwalls. Other maintenance activities under Alternative 2, such as trash and debris removal and mowing the channel banks would be the same as under the existing condition. Annual sediment removal would be required from California Circle to the upstream limit of the Project.

## Land Ownership/Access

Replacing the two bridges would require coordination with Caltrans and permits from the City of Milpitas. In this alternative, between the Coyote Creek confluence and I-880, reconstruction of the west levee by construction of a 50-foot-wide vegetated bench would require right-of-way acquisition from the City of Milpitas. All other works would occur within the District easement or fee title.

### Cost Estimate

Construction:	\$20,780,000
Land Acquisition:	\$ 70,000
<u>50-Year Maintenance:</u>	<u>\$ 2,220,000</u>
Total Lifetime Cost:	\$23,070,000

## 2.3.4. ALTERNATIVE 4

### Alternative Description

This alternative's elements are similar to Alternative 2A's, with the addition of a significantly taller floodwall and the vegetated bench on the west side of Reach 3. This alternative combines widening the California Circle bridge, raising the Milmont Drive bridge, and constructing floodwalls, levees, and vegetated bench elements. This would increase the capacity of all project reaches to convey the design flow, provide channel stability, and improve water quality and channel habitat.

### Operation & Maintenance

New maintenance activity due to the construction of Alternative 4 would be limited to an anticipated increase in graffiti removal due to the installation of new floodwalls. Under Alternative 4, maintenance activities such as trash and debris removal and mowing the channel banks would be the same as under the existing condition. This alternative would eliminate the need for regular sediment removal.

### Land Ownership/Access

Replacing the California Circle and Milmont Drive bridges would require coordination with Caltrans and permits from the City of Milpitas. In this alternative, between the Coyote Creek confluence and I-880, relocating the west levee by constructing a 50-foot-wide vegetated bench would require right-of-way acquisition from the City of Milpitas. All other works would occur within the District easement or fee title.

#### Cost Estimate

Construction:	\$29,380,000
Land Acquisition:	\$ 70,000
<u>50-Year Maintenance:</u>	<u>\$ 2,310,000</u>
Total Lifetime Cost:	\$31,760,000

### 2.3.5. ALTERNATIVE 6

#### Alternative Description

This alternative combines levees, floodwalls, widening the California Circle Bridge, island removal in Reach 3, and considerable concrete work along the entire channel (trapezoidal concrete channel with 1:1 side slopes), except for Reach 1, which remains earth. This would increase the capacity of all the project reaches to convey the design flow and provide channel stability.

#### Operation & Maintenance

New maintenance activity due to the construction of Alternative 6 would include an anticipated significant increase in graffiti removal due to the installation of new floodwalls and concrete channel lining. Annual sediment removal would be required in Reaches 2, 3, and 4. Under Alternative 6, maintenance activities such as trash and debris removal would be the same as under the existing condition.

#### Land Ownership/Access

Widening the California Circle bridge would require coordination with Caltrans and permits from the City of Milpitas. All other works would occur within the District easement or fee title.

#### Cost Estimate

Construction:	\$37,310,000
Land Acquisition:	--
<u>50-Year Maintenance:</u>	<u>\$11,990,000</u>
Total Lifetime Cost:	\$49,300,000

### 2.4. REFINED ALTERNATIVE ANALYSIS

After the feasible alternatives were selected, and prior to the Natural Flood Protection evaluation process, the bridge elements of the alternatives were modified. It was determined through an internal structural engineering evaluation that raising the entire structure of the bridges was not necessary. Additional clearance under the bridges could be accomplished by replacing the existing clear span bridges with bridges with thinner decks on piers. This would maintain the existing top of road elevations.

The cost estimates were updated to reflect the new bridge configurations. Also, more current construction unit costs were obtained and were used to update the cost estimates.

### 2.4.1. REFINED ALTERNATIVE 1

California Circle was modified from being raised and widened to being widened only by a bridge replacement that maintains the existing top of road elevation and raises the soffit. Additionally, a pier would be added below the midpoint of the bridge.

Along Lower Penitencia Creek, average floodwall/levee heights range from 3.5 to 6.0 feet; other proposed features are also described below:

- Reach 1
  - West bank: levee would be raised 3.5 feet
- Reach 2
  - West bank: floodwall (6 feet high)
  - East bank: 40-foot-wide vegetated bench
- California Circle bridge widened by 40 feet, existing soffit raised
- Reach 3
  - Both banks: floodwalls (4 feet high)
- Reach 4
  - Both banks: floodwalls (5 feet high)

Details and figures for this alternative are provided in Appendix A.

Revised cost estimate

Construction:	\$16,240,000
Land Acquisition:	--
<u>50-Year Maintenance:</u>	<u>\$ 9,600,000</u>
Total Lifetime Cost:	\$25,840,000

The detailed cost estimate can be found in Appendix B.

### 2.4.2. REFINED ALTERNATIVE 2A

During refined alternative analysis, Alternative 2 was renamed as Alternative 2A because Alternative 2 required annual sediment removal in Reaches 3 and 4, but further analysis determined that annual sediment removal was not required, so this lower-maintenance version of Alternative 2 was named Alternative 2A.

No change to elements.

Along Lower Penitencia Creek, average floodwall/levee heights range from 4 to 5.5 feet; other proposed features are also described below:

- Reach 1
  - West bank: levee would be relocated 50 feet westward and raised 4 feet, creating area for a vegetated bench
- Reach 2
  - West bank: floodwall (5.5 feet high)
  - East bank: 40-foot-wide vegetated bench
- California Circle bridge widened by 40 feet, existing soffit raised
- Reach 3
  - Both banks: floodwalls (4 feet high)
- Milmont Drive bridge widened, existing soffit raised
- Reach 4
  - Both banks: floodwalls (5 feet high)

Details for this alternative are provided in Appendix A.

Revised cost estimate

Construction:	\$20,520,000
Land Acquisition:	\$ 70,000
<u>50-Year Maintenance:</u>	<u>\$ 2,220,000</u>
Total Lifetime Cost:	\$22,810,000

The detailed cost estimate can be found in Appendix B.

### **2.4.3. REFINED ALTERNATIVE 4**

California Circle to be widened only (no change). Milmont Drive modified from being raised to being widened only by a bridge replacement that maintains the existing top of road elevation yet raises the soffit. Additionally, a pier would be added below the midpoint of the bridge.

Along Lower Penitencia Creek, average floodwall/levee heights range from 3 to 16 feet in the following locations:

- Reach 1
  - West bank: levee would be relocated 50 feet westward and raised 3 feet, creating area for a vegetated bench



- Reach 2
  - West bank: floodwall (5 feet high)
  - East bank: 40-foot-wide vegetated bench
- California Circle bridge widened by 40 feet, existing soffit raised
- Reach 3
  - West bank: floodwall (16 feet high) and vegetated bench (25–45 feet wide)
  - East bank: floodwall (3.5 feet high)
- Milmont Drive bridge widened, existing soffit raised
- Reach 4, both banks: floodwalls (5 feet high)

Details for this alternative are provided in Appendix A.

Revised cost estimate

Construction:	\$33,380,000
Land Acquisition:	\$ 70,000
<u>50-Year Maintenance:</u>	<u>\$ 2,310,000</u>
Total Lifetime Cost:	\$35,760,000

The detailed cost estimate can be found in Appendix B.

**2.4.4. REFINED ALTERNATIVE 6**

No change.

Reaches 2, 3, and 4 would be a trapezoidal concrete channel. Along Lower Penitencia Creek, average floodwall/levee heights range from 3 to 5.5 feet in the following locations:

- Reach 1
  - West bank: levee would be raised 4 feet
- Reach 2
  - West bank: floodwall (5.5 feet high)
- California Circle bridge widened by 40 feet, existing soffit raised
- Reach 3
  - Center island removed to form trapezoidal cross-section, channel lined with concrete

- Both banks: floodwall (4 feet high)
- Reach 4
  - Both banks: floodwalls (3 feet high)

Details for this alternative are provided in Appendix A.

Revised cost estimate

Construction:	\$53,760,000
Land Acquisition:	--
<u>50-Year Maintenance:</u>	<u>\$11,990,000</u>
Total Lifetime Cost:	\$65,750,000

The detailed cost estimate can be found in Appendix B.

**TABLE 4**

**Feasible Alternatives Summary**

		<b>Alt 1</b>	<b>Alt 2A</b>	<b>Alt 4</b>	<b>Alt 6</b>
Channel Type		Earth	Earth	Earth	R1: Earth R2, R3, & R4: Concrete
Floodwalls		4 - 6 ft high	4 - 5.5 ft high	3.5 - 16 ft high	4 - 5.5 ft high
Levees		3.5 ft high	4 ft high	3 ft high	4 ft high
Vegetated Bench		R2	R1 & R2	R1, R2, & R3	--
R3 Island		--	--	--	Remove Island
Bridges	California Circle	Raise existing soffit & widen bridge	Raise existing soffit & widen bridge	Raise existing soffit & widen bridge	Raise existing soffit & widen bridge
	Milmont Drive	No change, but U/S pressure flow	Raise existing soffit & widen bridge	Raise existing soffit & widen bridge	--
Water Surface Elevation at Lower Berryessa Creek confluence (ft. NAVD88)		21.01	20.46	20.28	18.7
Land Acquisition	Parcels	0	1	1	0
New Operations and Maintenance Activities		Annual sediment removal in Reaches 2 and 4	Reduced sediment removal in channel	Reduced sediment removal in channel	Annual sediment removal in Reaches 2, 3, and 4
		Additional graffiti removal	Additional graffiti removal	Additional graffiti removal	Reduced vegetation management in channel Additional graffiti removal
O&M	Annually	\$380,000	\$87,000	\$91,000	\$470,000
Cost	Over 50 yrs	\$9.6 million	\$2.2 million	\$2.3 million	\$12.0 million
Construction Cost		\$16.2 million	\$20.5 million	\$33.4 million	\$53.8 million
Land Acquisition			\$70,000	\$70,000	
Total Lifetime Cost		\$25.8 million	\$22.8 million	\$35.8 million	\$65.8 million

*Note:* Lower Penitencia Creek’s 1-percent water surface elevation at the Lower Berryessa Creek confluence point should not exceed 21.1 feet NAVD88.

**2.5. FEASIBLE ALTERNATIVES ANALYSIS**

The purpose of this section is to document the process used to evaluate the feasible alternatives.

**2.5.1. NATURAL FLOOD PROTECTION EVALUATION PROCESS**

The District Board of Directors (Board) has adopted an Ends Policy E-3 which states “There is a healthy and safe environment for residents, businesses and visitors, as well as for future generations.” As part of this policy, the Board has adopted a goal that states that “natural flood protection” is to be the method the District uses to provide flood protection. The CEO has interpreted the policy and goal as documented below.

The following objectives are balanced when selecting the preferred alternative to modify or maintain creeks to provide flood protection:

1. Homes, schools, businesses and transportation networks are protected from flooding and erosion.
2. Projects are integrated within the watershed as a whole.
3. Ecological functions and processes are supported.
4. Geomorphic stream functions and processes are integrated into project design.
5. Maintenance requirements are minimized.
6. The quality and availability of water are protected for ecological and water supply functions.
7. Cooperation with local agencies achieves mutually beneficial goals.
8. Community benefits beyond flood protection are realized.
9. Life-cycle costs are minimized.
10. Environmental impacts are avoided, minimized, or mitigated.

To comply with the ends policy and CEO interpretation, the Natural Flood Protection (NFP) evaluation process (QEMS work instruction WW75125 - Guidance on Alternative Evaluation and Selection for Natural Flood Protection Projects) was developed to rate and compare flood protection project alternatives. Various criteria were developed to help rate each objective. The objectives and corresponding criteria are listed below.

**Objective 1: Homes, Schools, Businesses and Transportation Networks Are Protected From Flooding and Erosion**

- |                 |   |
|-----------------|---|
| Criterion C1.1: | Safety—Protection of public safety if conditions exceed design assumptions  |
| Criterion C1.2: | Economic protection—Protection from damage due to floodwater, erosion or sediment for homes, schools, businesses, transportation systems and other infrastructure |
| Criterion C1.3: | Durability—Future District effort required to maintain design level of protection   |
| Criterion C1.4: | Resiliency—Adaptability to future changes external to District activities   |
| Criterion C1.5: | Local drainage—Support of local storm drain systems   |
| Criterion C1.6: | Time to implementation—Practicality of implementation accounting for logistical, negotiation and cost issues  |

## **Objective 2: Integrate Within the Context of the Watershed**

Criterion C2.1: Meets local watershed goals—Ability to meet watershed goals as defined in a process that examines the watershed as a whole and accounts for opportunities and constraints specific to the project area. Published documents such as the City of Milpitas General Plan and the San Francisco Bay Basin Plan are consulted for opportunities and constraints specific to the project area.

## **Objective 3: Support Ecological Functions and Processes**

Criterion C3.1: Meets local habitat goals—Ability to meet habitat goals as defined from examining the watershed as a whole and accounting for opportunities and constraints specific to the project area

Criterion C3.2: Quality of habitat—Quality and variety of habitat provided by the alternative

Criterion C3.3: Sustainability of habitat—Intensity of future human intervention required to maintain the target habitat quality; opportunity for habitat to self-adjust appropriately to future change

Criterion C3.4: Connectivity of habitat—Integration of habitat elements into surrounding habitat landscape and within project area

## **Objective 4: Integrate Physical Geomorphic Stream Functions and Processes**

Criterion C4.1: Floodplain—Inclusion of appropriately-sized overflow area within the flood conveyance corridor that effectively conveys high flows and dissipates erosive energy (“multi-stage” channel)

Criterion C4.2: Active channel—Appropriateness of size and configuration of the “active channel” relative to watershed inputs (water and sediment) and reach characteristics

Criterion C4.3: Stable side slopes—Stability of channel side slopes using geotechnical or biotechnical methods

Criterion C4.4: Upstream/downstream transitions—Stability of channel’s integration with upstream and downstream reaches

## **Objective 5: Minimize Maintenance Requirements**

Criterion C5.1: Structural features—Maintenance requirements associated with structural features within project corridor

Criterion C5.2: Natural processes—Maintenance requirements associated with vegetation growth, erosion and sediment processes

Criterion C5.3: Urban flows—Maintenance requirements resulting from smaller, more frequent storm events and outfall flows

Criterion C5.4: Access—Incorporation of adequate access for maintenance crews and equipment

**Objective 6: Protect the Quality and Availability of Water**

- Criterion C6.1: Water availability—Impact on ground-water recharge and on ability to maintain or improve the water supply functions in the project area
- Criterion C6.2: Groundwater quality—Groundwater quality protected from contamination and the threat of contamination by preventing contaminant entry into groundwater
- Criterion C6.3: Instream water quality—Water quality protection through vegetation and instream hydraulic complexity
- Criterion C6.4: Storm-water management—Ability to enhance water supply and quality and reduce peak flows through local retention of rainfall and pollution prevention programs
- Criterion C6.5: Flow regime—Ability to maintain geomorphically- and biologically-appropriate range of flows in terms of quantity and timing

**Objective 7: Cooperate with Other Local Agencies to Achieve Mutually Beneficial Goals**

- Criterion C7.1: Mutual local goals—Ability to achieve project-specific goals and objectives developed jointly by the District and local agencies/municipalities
- Criterion C7.2: Supports general plan—Ability to support goals and policies as stated in General Plan of partner agencies

**Objective 8: Maximize Community Benefits Beyond Flood Protection**

- Criterion C8.1: Community safety—Overall safety for appropriate access and recreation
- Criterion C8.2: Recreation—Quality of recreation experience provided by alternative
- Criterion C8.3: Aesthetics—Quality of aesthetic form provided by alternative
- Criterion C8.4: Open space—Incorporation of open space into alternative design
- Criterion C8.5: Community support—Alternative reflects community concerns or feedback

**Objective 9: Minimize Life-Cycle Costs**

- Criterion C9.1: Capital cost—Net present value of capital cost
- Criterion C9.2: Maintenance cost—Net present value of all maintenance costs over the life of the project
- Criterion C9.3: Grant or cost-sharing opportunities—Net present value of grant or cost-sharing opportunities for project or project components

## Objective 10: Impacts are Avoided, Minimized or Mitigated

- Criterion C10.1: Compliance with San Francisco Bay Basin Plan—  
Assesses potential effects of Alternative on water quality  
via regulatory standards (Basin Plan)
- Criterion C10.2: Identify the Least Environmentally Damaging Practicable  
Alternative (LEDPA) —Determines the preliminary LEDPA  
and ensures it is carried forward

### 2.5.2. NATURAL FLOOD PROTECTION EVALUATION RESULTS

The first step of the NFP evaluation process is to establish relative weights (high, medium, or low) for each of the objectives. This was done by obtaining input from the following stakeholders:

- City of Milpitas Planning and Public Works staff at a meeting held on February 21, 2014
- Members of the local community at a public information meeting held on June 14, 2014
- District subject matter experts (SMEs) at a meeting held on November 12, 2014

The assigned weights are shown in Appendix C.

The second step of the NFP evaluation process is to rate the feasible alternatives based on the individual criteria and overall objectives. The NFP evaluation methodology includes 10 objectives and 36 distinct criteria. SMEs rated each of the four feasible alternatives (Alternatives 1, 2A, 4, and 6) against all of the objectives and criteria. The Project team met with the SMEs on May 6, June 23, July 6, July 15, and July 23, 2015 to complete the rating process. The following SMEs participated:

- Brett Calhoun, Senior Water Quality Specialist
- Christy Chung, Associate Civil Engineer
- Pari Gharib, Assistant Engineer II
- Kurt Lueneburger, Senior Environmental Planner
- James Manidakos, Environmental Planner II
- Devin Mody, Engineering Unit Manager
- Zak Mousli, Senior Field Operations Administrator
- Matt Parsons, Biologist I
- Afshin Rouhani, Engineering Unit Manager
- Mark Wander, Vegetation Unit Manager
- Roy Weese, Associate Civil Engineer
- Liang Xu, Engineering Unit Manager
- Samuel Yung, Associate Civil Engineer

Some of the criteria required comparative ratings between the alternatives (for example, which alternative has the least or the most cost) while others were stand-alone ratings (for example, how well does the alternative meet community goals). Each feasible alternative was rated according to how well it accomplished each criterion. The ratings for the criteria under each objective were then compiled into a summary objective rating as defined by the NFP evaluation process. Table 4 shows the summary scores for all the alternatives. Completed NFP rating sheets are included in Appendix C. The result is a matrix (see Table 5) which shows a comparison of how well each alternative rated for each of the ten NFP objectives.

**TABLE 5**

**NFP Scores for Lower Penitencia Creek Improvements Alternatives**

<b>Alternative</b>	<b>NFP Score</b>
No Project	43.6
1	60.4
2A	76.1
4	71.3
6	28.2

The overall NFP scores varied greatly among the alternatives, ranging from 76.1 for Alternative 2A to 28.2 for Alternative 6. Alternative 6 was by far the lowest rated alternative because it is inconsistent with the watershed context, has poor ecological features including a reduction in both wetlands and riparian habit, is not geomorphically sound, will not maintain or improve water quality, fails to meet community goals, and has high construction costs. Among the four alternatives, Alternative 1 received the third highest rating at 60.4. Alternative 1 rated high in watershed context, mutual benefits with other agencies, and life-cycle cost. However, it rated poorly in ecological benefits, geomorphology, maintenance requirements, and environmental impacts.

Alternatives 2A and 4 were the two highest rated alternatives with scores of 76.1 and 71.3, respectively. There is no substantial difference between the two alternatives in terms of level of flood protection, geomorphology, maintenance requirements, protecting and enhancing water quality, or environmental impacts. Alternative 4 rated somewhat higher in ecological benefits; however Alternative 2A rated higher in watershed context, achieving mutually beneficial goals with the City of Milpitas, and life-cycle costs. Overall Alternative 2A best meets the District's Natural Flood Protection objectives.



TABLE 6

Natural Flood Protection Evaluation Feasible Alternatives Comparison Matrix

Objective	Objective Weight Rank	No Project	Alt 1	Alt 2A	Alt 4	Alt 6
1. Protection from Flood Damage	High	○	◐	◐	◐	◐
2. Watershed Context	High	○	◑	◑	◐	○
3. Ecology	Medium	○	◑	◑	●	○
4. Geomorphology	Medium	◑	◑	◑	●	○
5. Maintenance	High	◑	○	◑	◑	◑
6. Water Quality and Availability	Medium	◐	◐	◐	◑	○
7. Other Agency Support	Medium	◐	◑	◑	◐	○
8. Community Benefits	Low	◑	◑	◐	◐	○
9. Life-Cycle costs	Medium	●	◑	●	◐	○
10. LEDPA	Medium	◑	◐	◑	◑	○

Ratings Key:		
■	5	Outstanding
▣	4	Very Good
◐	3	Adequate
◑	2	Fair
○	1	Poor
X	0	Unacceptable

## **CHAPTER 3. STAFF- RECOMMENDED ALTERNATIVE DEVELOPMENT AND SELECTION**

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The purpose of this section is to document the evaluation of the feasible alternatives and provide a qualitative comparison of the alternatives used to determine the Staff-Recommended Alternative.

### **3.1. FEASIBLE ALTERNATIVES COMPARISON**

#### **Alternative 1**

Alternative 1 requires the replacement of only one bridge. It does not include additional planted area downstream of I-880 on the west overbank.

#### **Alternative 2A**

The locations of levees/floodwalls are similar to Alternative 1. However, for Alternative 2A, the western levee downstream of I-880 would be relocated 50 feet to the west and raised 4 feet. Alternative 2A requires the replacement of two bridges. This alternative reduces future maintenance requirements; it does not require future sediment removal. A parcel downstream of I-880 on the west bank would need to be acquired.

#### **Alternative 4**

The locations of levees/floodwalls are similar to Alternative 1. Like Alternative 2A, the western levee downstream of I-880 would be relocated 50 feet to the west and raised 4 feet. Alternative 4 has a significantly higher floodwall on the Reach 3 west bank than the other alternatives. Like Alternative 2A, Alternative 4 also requires the replacement of two bridges. Also like Alternative 2A, Alternative 4 reduces future maintenance requirements; it does not require future sediment removal. A parcel downstream of I-880 on the west bank would need to be acquired.

#### **Alternative 6**

Alternative 6 was driven by community input at the June 2014 public meeting. It significantly changes the channel by lining Reaches 2 through 4 with concrete. It only requires the replacement of one bridge, and would require annual sediment removal.

### **3.2. STAFF-RECOMMENDED ALTERNATIVE**

Upon completion of the Feasible Alternatives evaluation process, it has been determined that Alternative 2A, which combines floodwalls, levees, and bridge replacements, is the highest ranked alternative. For this reason, the project team is recommending Alternative 2A as the Staff-Recommended Alternative.

### 3.2.1. PRELIMINARY DESIGN ELEMENTS

This alternative combines floodwalls, levees, vegetated benches, and widening the California Circle and Milmont Drive bridges. This would increase the capacity of all the project reaches to the design flow, provide channel stability, and improve water quality and channel habitat.

Along Lower Penitencia Creek, average floodwall/levee heights range from 4 to 5.5 feet; other proposed features are also described below:

- Reach 1
  - West bank: levee would be relocated 50 feet westward and raised 4 feet, creating area for a vegetated bench
- Reach 2
  - West bank: floodwall (5.5 feet high)
  - East bank: 40-foot-wide vegetated bench
- California Circle bridge widened by 40 feet, existing soffit raised
- Reach 3
  - Both banks: floodwalls (4 feet high)
- Milmont Drive bridge widened, existing soffit raised
- Reach 4
  - Both banks: floodwalls (5 feet high)

Details for this alternative are provided in Appendix A.

#### Revised cost estimate

Construction:	\$20,520,000
Land Acquisition:	\$ 70,000
<u>50-Year Maintenance:</u>	<u>\$ 2,220,000</u>
Total Lifetime Cost:	\$22,810,000

The detailed cost estimate can be found in Appendix B.

### 3.2.2. RIGHTS-OF-WAY FOR CONSTRUCTION

Replacing the two bridges would require coordination with Caltrans and permits from the City of Milpitas. Between the Coyote Creek confluence and I-880, reconstruction of the west levee by construction of a 50-foot-wide vegetated bench would require right-of-way acquisition from the City of Milpitas. All other works would occur within the District easement or fee title.

### 3.2.3. AGENCY APPROVAL REQUIREMENTS

The Staff-Recommended Alternative would require approval by the following agencies:

- **U. S. Army Corps of Engineers (Corps)**—Federal Clean Water Act (CWA) Section 404 permit requires Corps authorization for work involving intentional or unintentional placement of fill or discharge of dredged materials into any “waters of the United States.” The Staff-Recommended Alternative would require construction within the Lower Penitencia Creek channel below the ordinary high water (OHW) mark in the “waters of the United States”; therefore, a Section 404 permit would be required from the Corps Regulatory Division.
- **San Francisco Bay Regional Water Quality Control Board (RWQCB)**—Federal Clean Water Act Section 401 Water Quality Certification (WQC) and California Porter-Cologne Act Waste Discharge Requirements (WDR). Federal CWA Section 401 requires that every applicant for a Corps CWA Section 404 permit or Rivers and Harbors Act Section 10 permit must receive certification from the RWQCB that the proposed activity would not violate State and/or Federal water quality standards. Since the Staff-Recommended Alternative would require a Section 404 permit, a Section 401 WQC would be required as well as a WDR permit. Typically, the RWQCB issues a combined permit covering both Section 401 WQC and WDR.
- **U. S. Fish and Wildlife Service (USFWS)**—Federal Endangered Species Act of 1973 (as amended) and Migratory Bird Treaty Act (16 U.S.C. 703 et seq). If a project may result in “incidental take” of a listed species, an incidental take permit is required. An incidental take permit allows a non-Federal landowner to proceed with an activity that is legal in all other respects, but that results in “incidental taking” of a listed species. USFWS also implements the Migratory Bird Treaty Act (MBTA) which prohibits harm to migratory birds. The Staff-Recommended Alternative may affect the federally endangered salt marsh harvest mouse (*Rheithrodontomys raviventris*) and a number of migratory birds. An incidental take permit from USFWS may be required, depending on the outcome of wildlife studies to be performed in support of the project. Impacts to migratory birds can usually be avoided through pre-construction surveys and establishment of buffers around active nests.
- **California Department of Fish and Wildlife (CDFW)**—California Fish and Game Code Section 1602 Streambed Alteration Agreement (SAA). CDFW Code section 1602 requires any person, State or local governmental agency, or public utility to notify CDFW before beginning any activity that would do one or more of the following: 1) substantially obstruct or divert the natural flow of a river, stream, or lake; 2) substantially change or use any material from the bed, channel, or bank of a river, stream, or lake; or 3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into a river, stream, or lake. The Staff-Recommended Alternative would require an SAA. The Staff-Recommended Alternative project area also likely contains habitat for the state protected longfin smelt (*Spirinchus thaleichthys*). Impacts to longfin smelt can usually be avoided by performing construction in summer and fall when longfin smelt are not found in the South San Francisco Bay and its tributaries. If avoidance of impacts is not possible, an incidental take permit from CDFW would be required under California Fish and Game Code section 2050.

- **Bay Conservation and Development Commission (BCDC)**—Under the McAteer-Petris Act, BCDC has regulatory authority over development of submerged lands, tidelands, and marshlands of Coyote Creek and its tributaries up to the eastern most point of Newby Island. The Staff-Recommended Alternative project area is located about 900 ft upstream of Newby Island. Because the project area would be wholly outside the jurisdictional area of BCDC, the Staff-Recommended Alternative would not require approval by BCDC.
- **State Water Resources Control Board (SWRCB)**—National Pollutant Discharge Elimination System (NPDES) Permit for discharge of storm water from construction and land-disturbing activities. A NPDES permit is required from SWRCB for any construction project disturbing over 1-acre in size. The Staff-Recommended Alternative would disturb far more than one acre and would require coverage under the General Construction Permit issued by SWRCB. To obtain coverage the District would prepare a Storm Water Pollution Prevention Plan (SWPPP) and submit a Notice of Intent to SWRCB.
- **National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS)**—Endangered Species Act compliance for marine mammals, saltwater fish, and anadromous fish. The Staff-Recommended Alternative would not be expected to affect habitat for species under authority of NMFS.
- **Other State and Local Agencies**—Other construction/building/grading permits required for earthwork, storm water pollution prevention plans, and encroachment on existing rights-of-way. The Staff-Recommended Alternative would require construction on bridges and roadways owned by the City of Milpitas. A construction permit and encroachment permit would be required from the City of Milpitas.

### 3.2.4. LONG-TERM OPERATIONS AND MAINTENANCE PROGRAM

New maintenance activity would be limited to an anticipated increase in graffiti removal due to the installation of new floodwalls. Other maintenance activities, such as trash and debris removal and mowing the channel banks would be the same as under the existing condition. The Staff-Recommended Alternative would eliminate the need for regular sediment removal.

### 3.2.5. PROJECT COST, FUNDING, AND SCHEDULE

The preliminary Staff-Recommended Alternative project cost is as follows:

Construction:	\$20,520,000
Land Acquisition:	\$ 70,000
<u>50-Year Maintenance:</u>	<u>\$ 2,220,000</u>
Total Lifetime Cost:	\$22,810,000

The detailed cost estimate can be found in Appendix B.

Funding for this project is anticipated to be allocated partially from California Department of Water Resources Proposition 1E, Round 2 Stormwater Flood Management Grant 4600010375. The total grant of \$30 million would be used to sponsor the Lower Berryessa, Lower Penitencia, and Upper Berryessa Improvements. The rest of the funding for this project would be from the District's Stream Stewardship funds.

The preliminary Project schedule is as follows:

<b>Major Milestones</b>	<b>End Date</b>
Final Planning Study Report	March 2016
Start of Design	March 2016
Certification of EIR	July 2016
100% Plans and Specifications Approval	December 2016
Construction Permits Acquired	March 2017
Start of Construction	June 2017

## REFERENCES

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Santa Clara Valley Water District. 2015. 100-Year Flow Distributions for Lower Penitencia and Berryessa Creeks: Existing, Interim, and Ultimate Conditions. San Jose, CA.

Santa Clara Valley Water District. 2001. Coyote Watershed Stream Stewardship Plan. San Jose, CA.

Santa Clara Valley Water District. 2015. Identifying Tidal Range in Lower Penitencia Creek. San Jose, CA.

Santa Clara Valley Water District. 2013. Problem Definition and Refined Objectives Report for the Lower Penitencia Creek Improvements Project. San Jose, CA.

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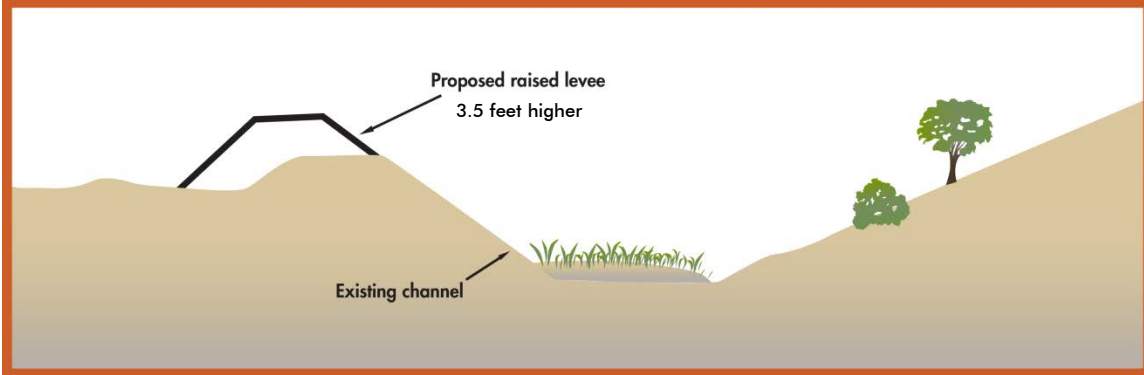


**APPENDIX A**  
**Alternative Details**

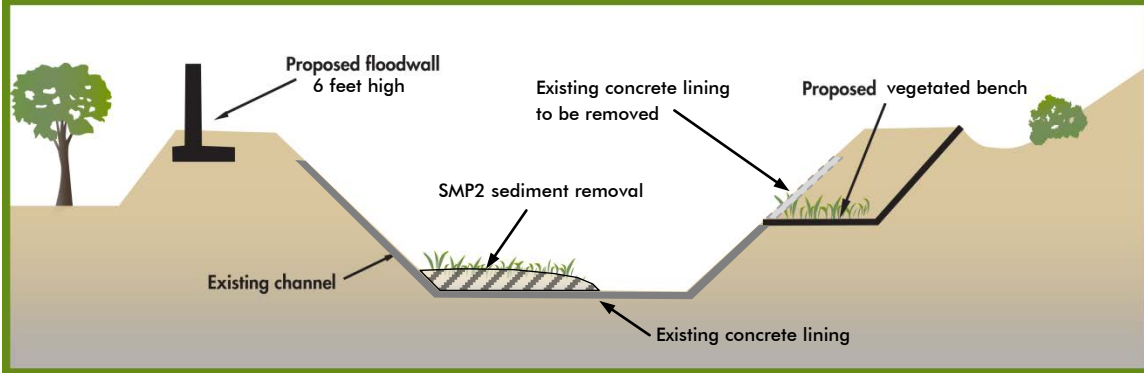
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**Alternative 1 – Widened California Circle Bridge with SMP2 Sediment Removal (R2 & R4)**  
Levee Raising (R1), Vegetated Bench (R2), Floodwalls, & Widen California Circle

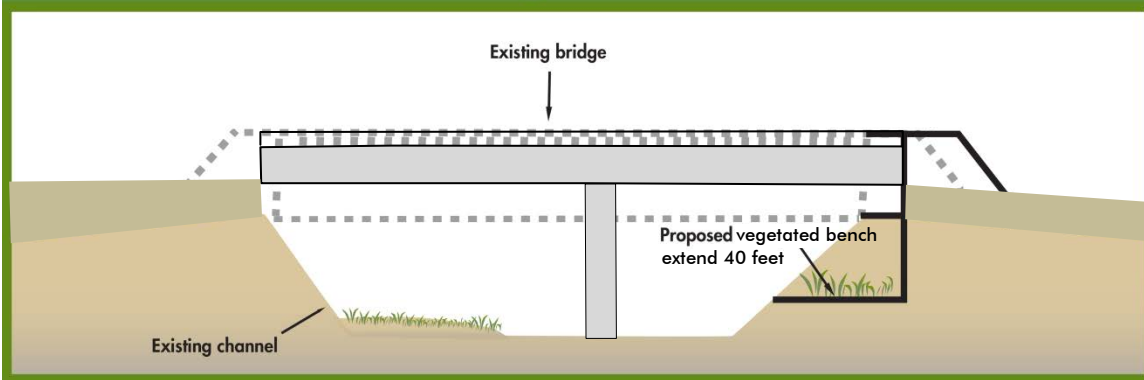
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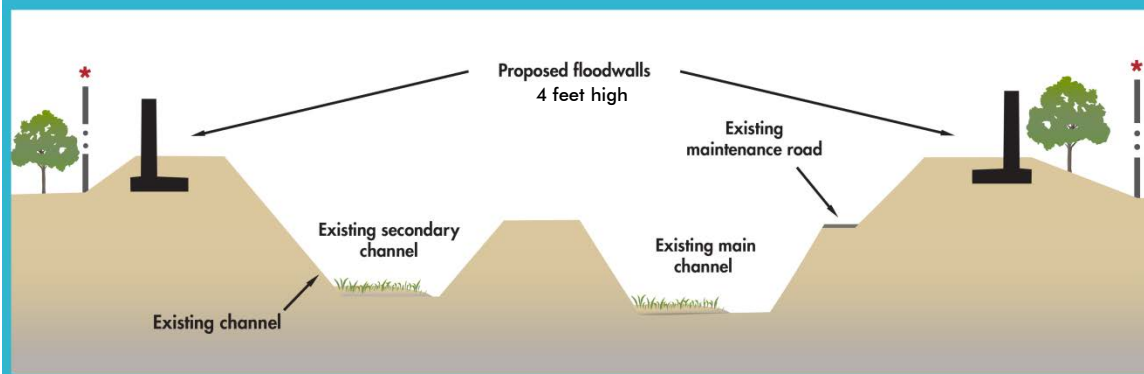
**Reach 2 – Highway 880 to California Circle**



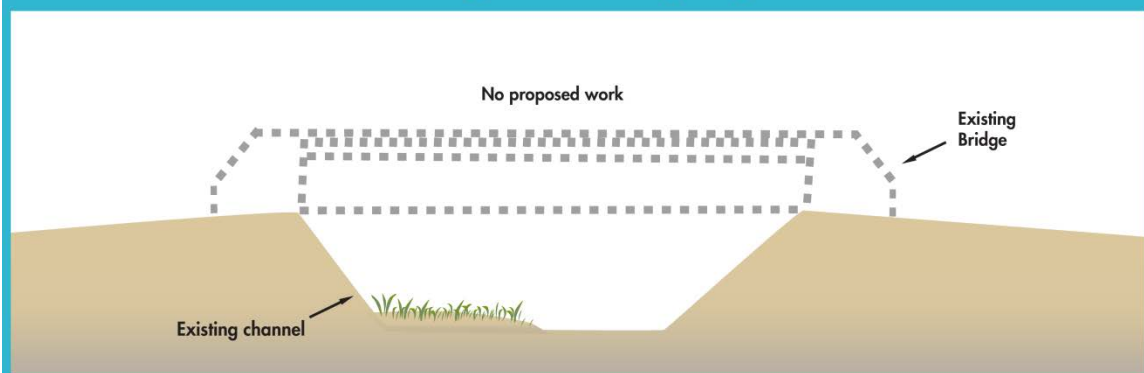
**At California Circle Bridge**



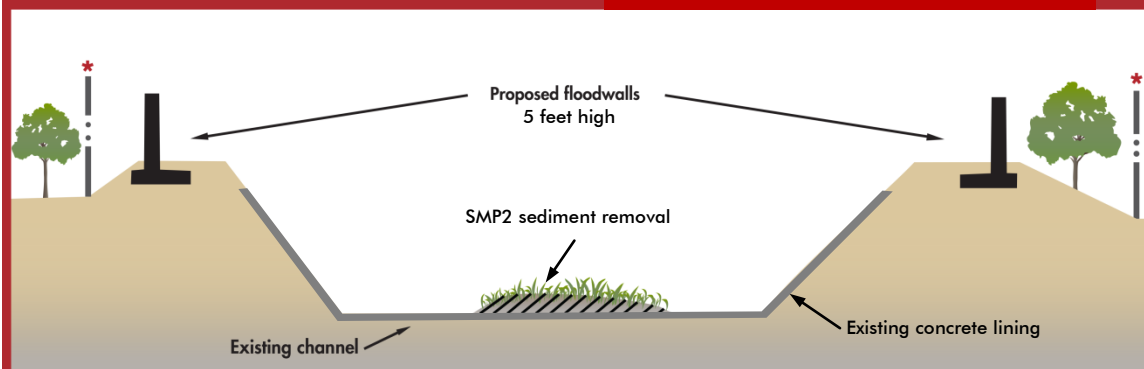
**Reach 3 – California Circle to Milmont Drive**



**At Milmont Drive Bridge – No proposed work**

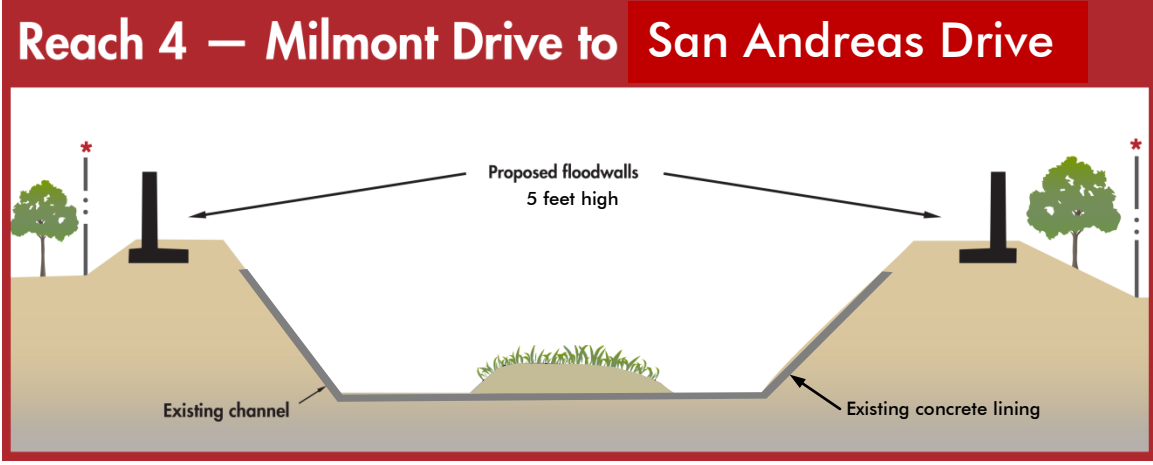
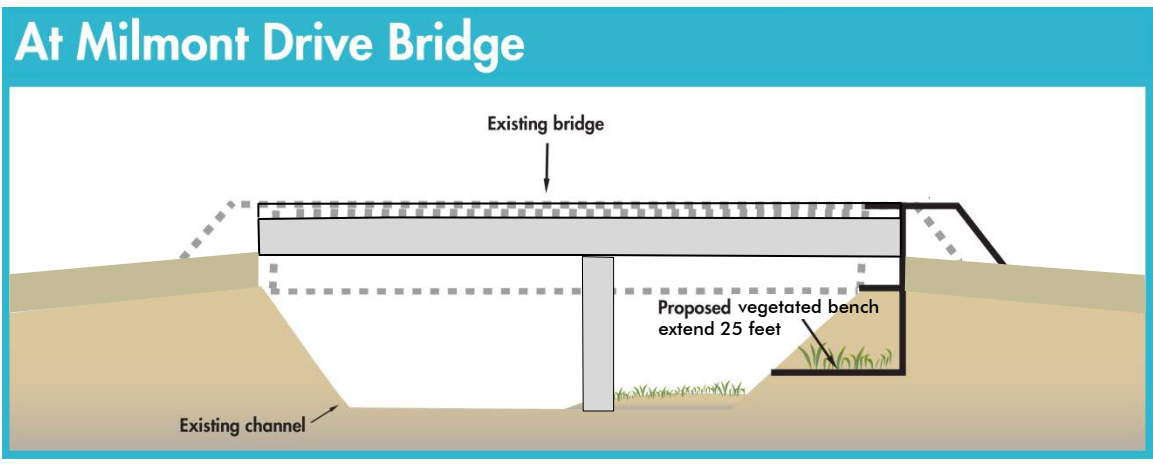
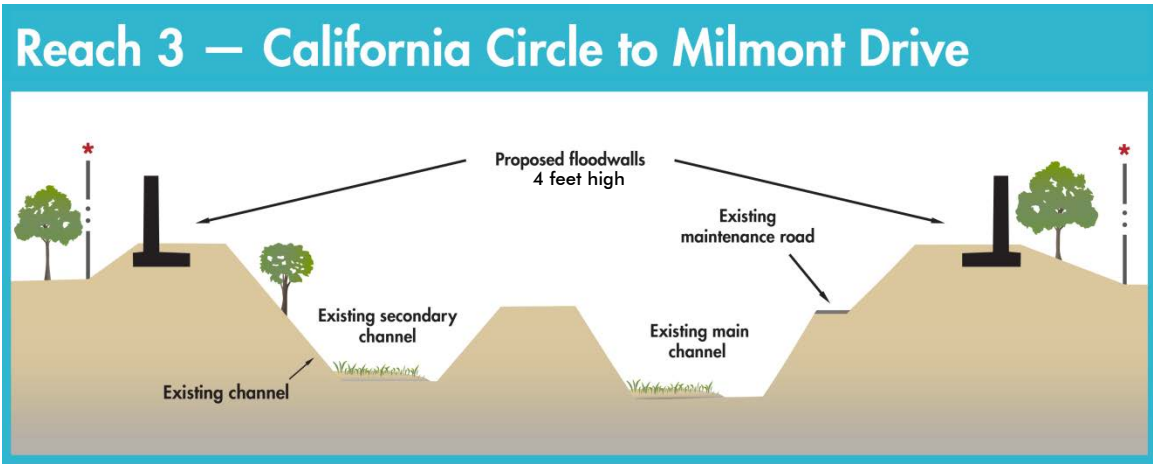
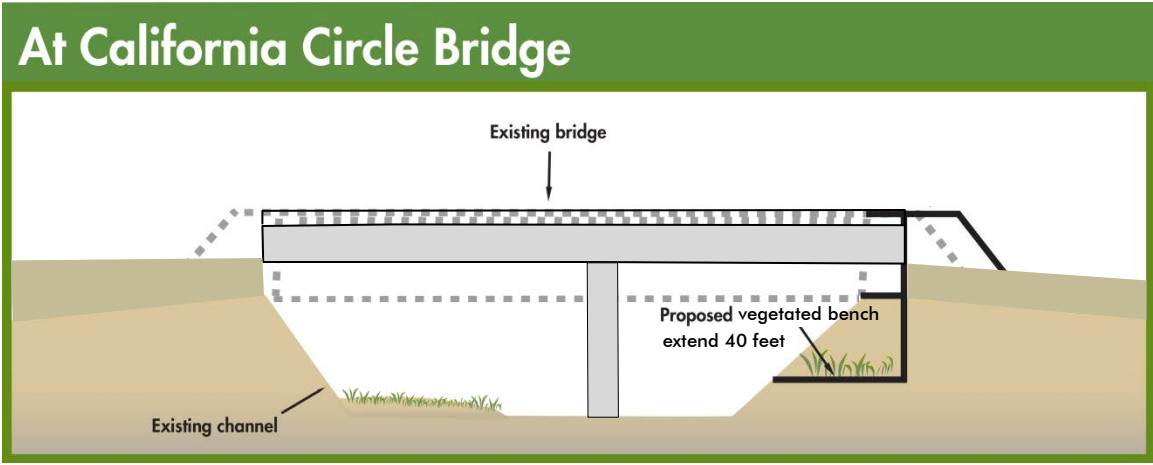
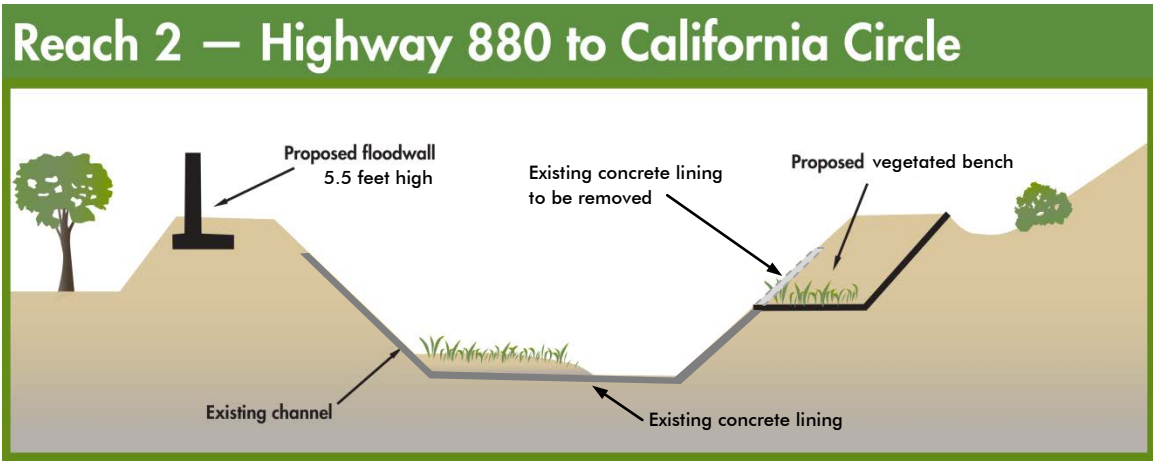
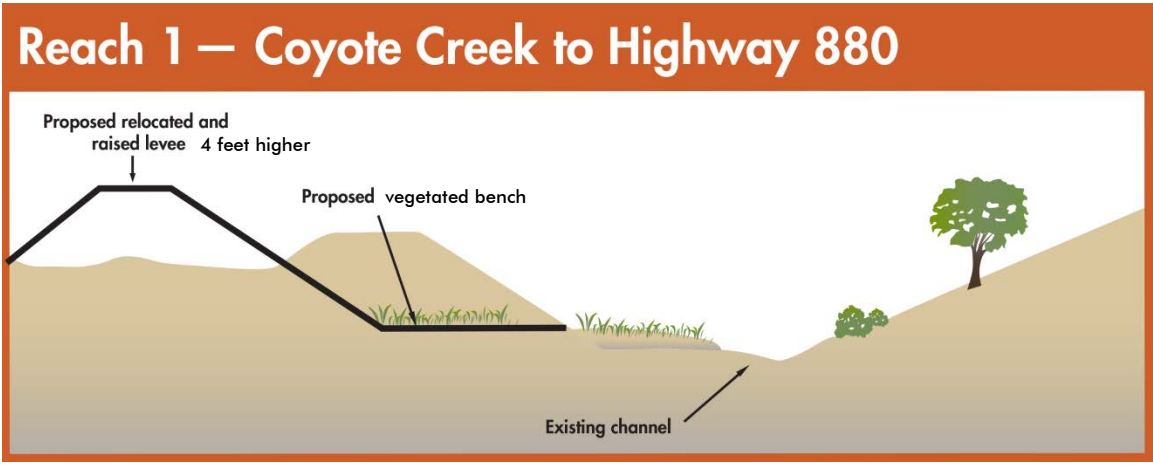


**Reach 4 – Milmont Drive to San Andreas Drive**

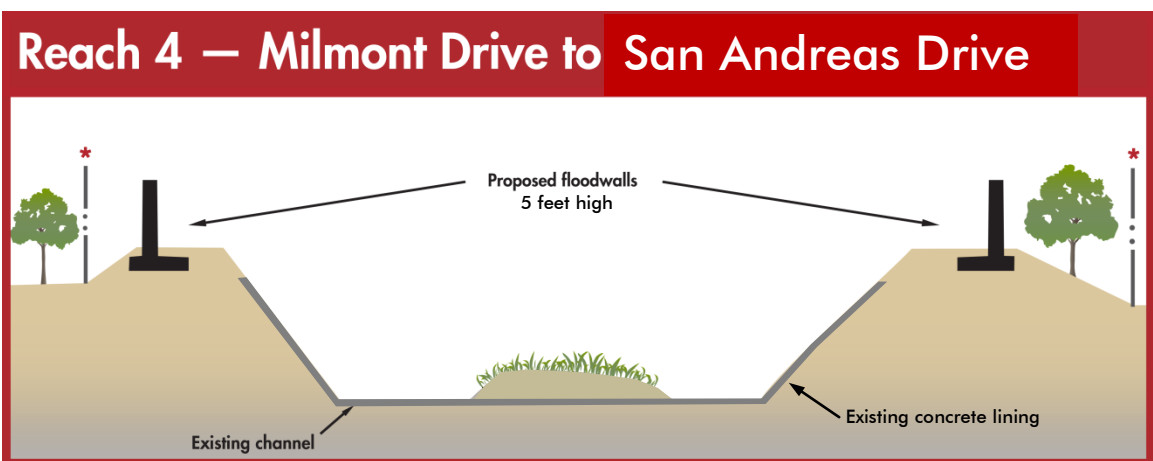
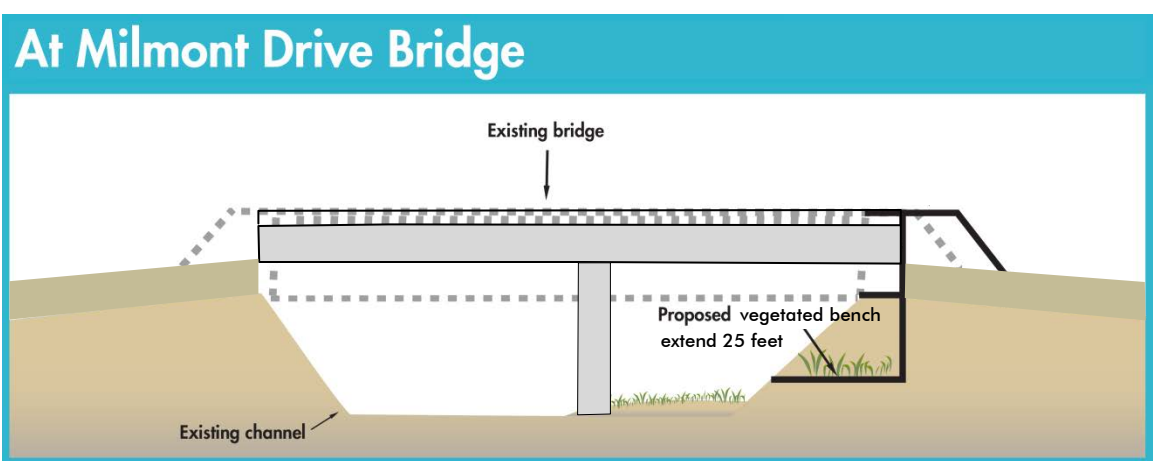
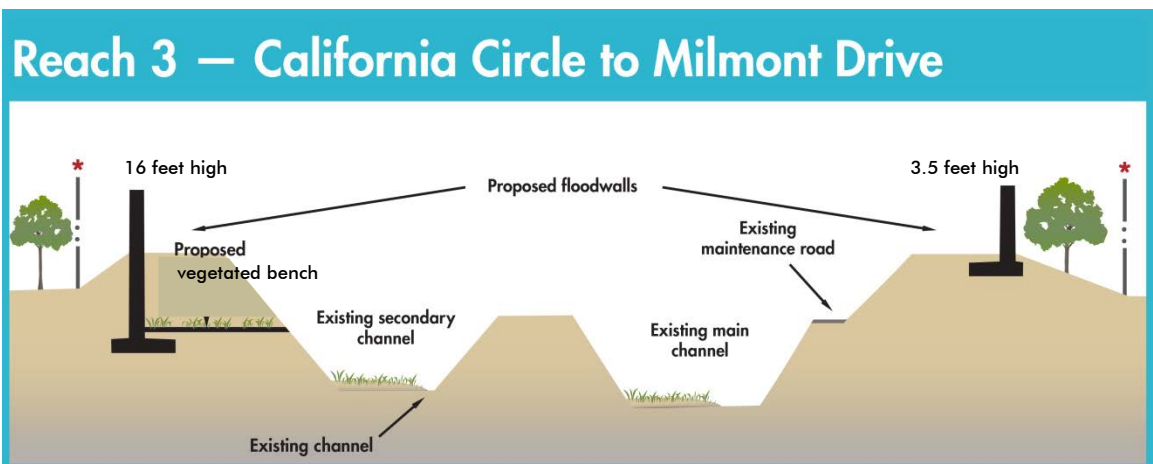
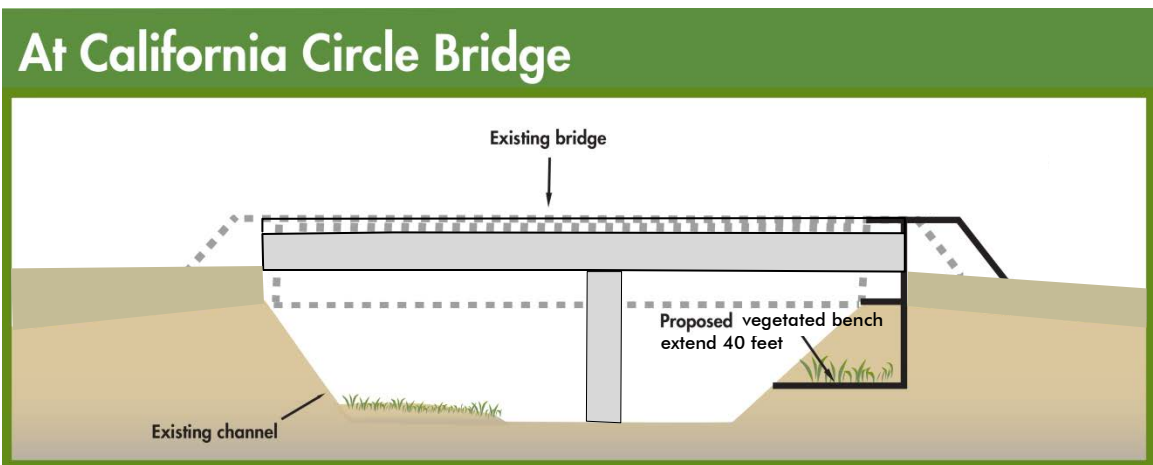
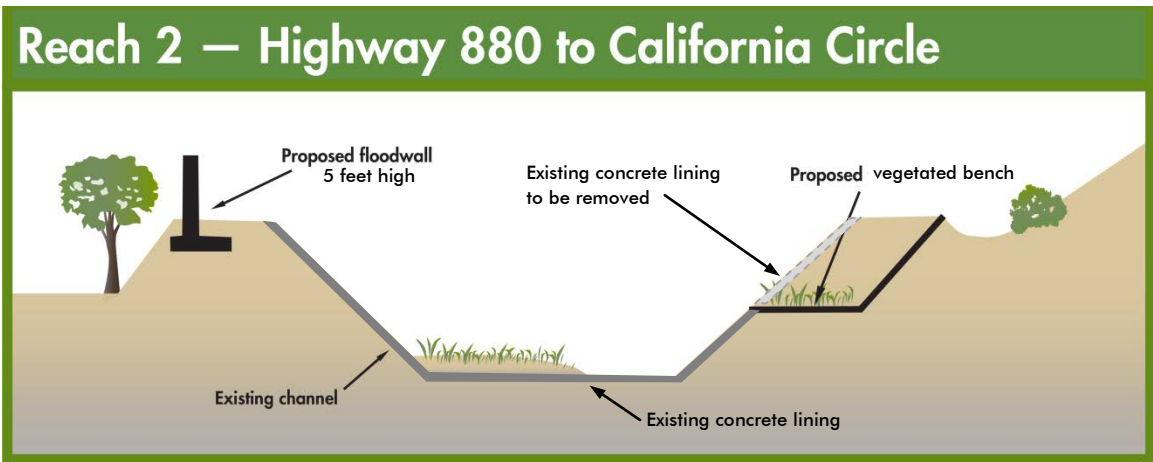
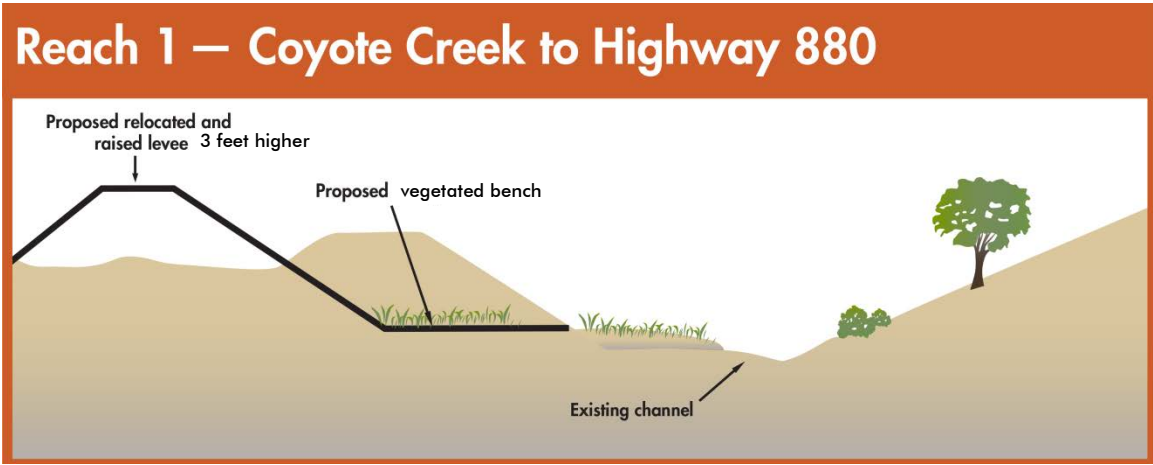


# Alternative 2A – Improvements with Bridge Widening (California Circle and Milmont Drive)

Levee Relocation (R1), Vegetated Benches (R1&2), Floodwalls, & Widen Both California Circle and Milmont Drive

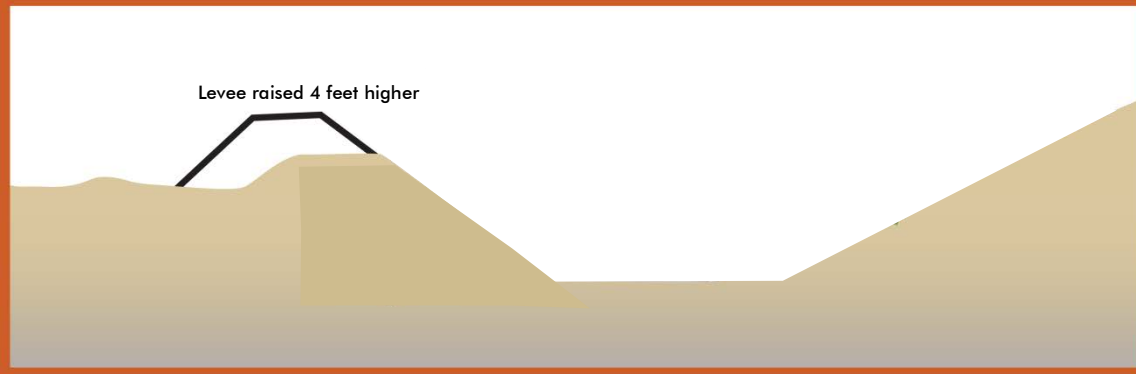


**Alternative 4 – West Bank Widening (R3) with Bridge Widening (California Circle and Milmont Drive)**  
 Levee Relocation (R1), Vegetated Benches (R1, 2, 3), Floodwalls, & Widen California Circle and Milmont Drive

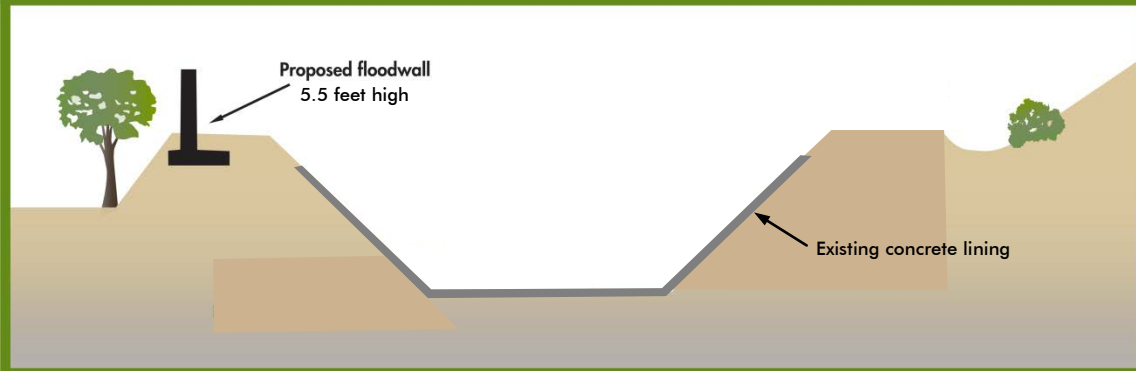


Alternative 6 – Concrete-Lined Channel (Reaches 2–4)  
(no sediment allowed)

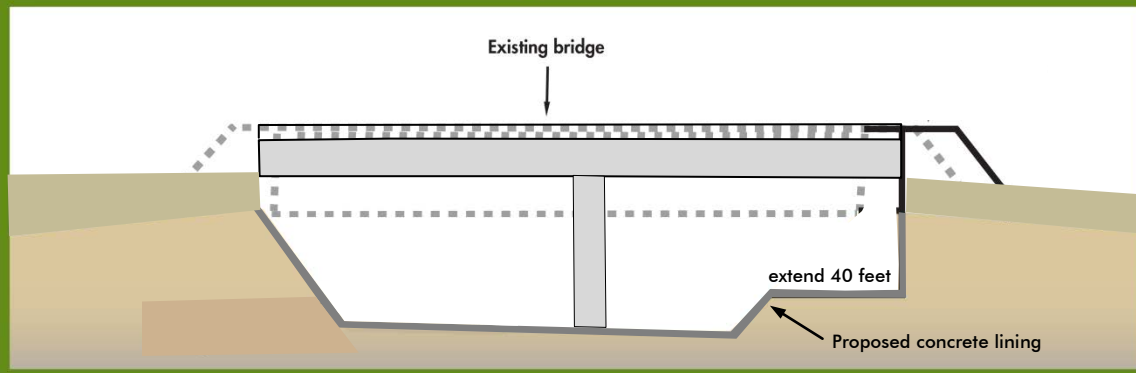
Reach 1 – Coyote Creek to Highway 880



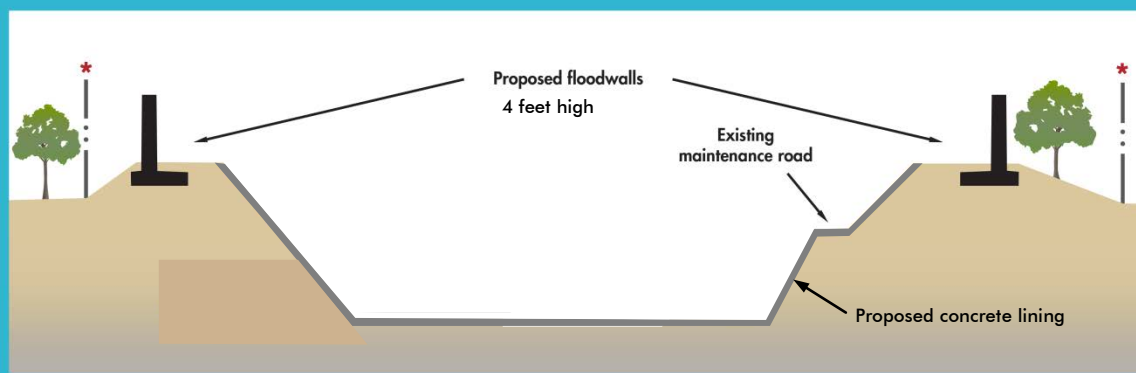
Reach 2 – Highway 880 to California Circle



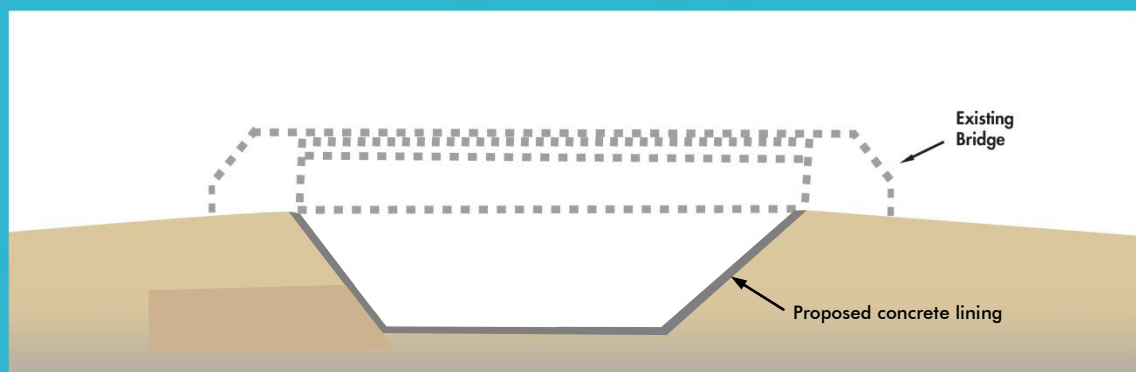
At California Circle Bridge



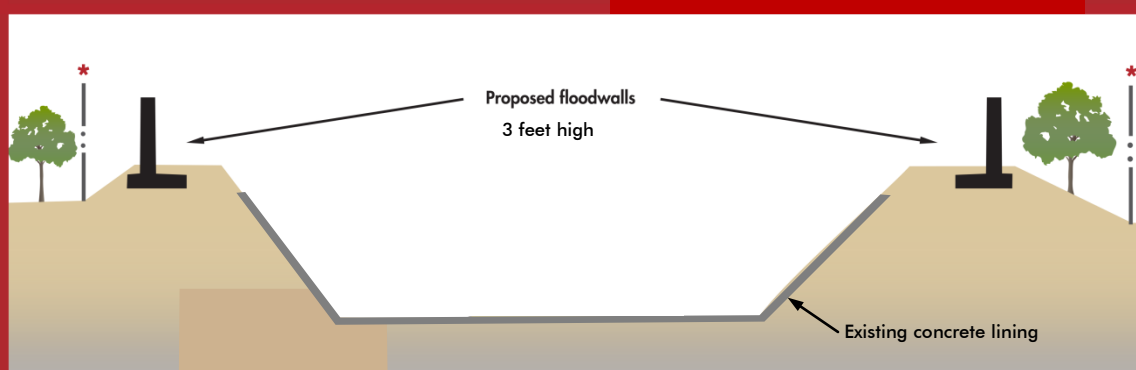
Reach 3 – California Circle to Milmont Drive



At Milmont Drive Bridge – No proposed work



Reach 4 – Milmont Drive to San Andreas Drive



**APPENDIX B**  
**Cost Estimate**

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**LOWER PENITENCIA CREEK PROJECT--ALTERNATIVE 1: RAISE AND WIDEN CALIFORNIA CIRCLE ONLY**

DESCRIPTION Alt #1	QUANTITY	UNIT	UNIT PRICE	AMOUNT
<b>PHASE I - LEVEE &amp; FLOODWALL WORK</b>			(Ref: L Berry)	
<b>CHANNEL EARTH WORK</b>				
<b>Reach 1 (raised ~ 3' existing west levee, L=180')</b>				
Levee embankment fill	940	CY	\$ 20.00	\$ 18,800.00
Offsite soil disposal (assumed clean soil)	0.00	CY	\$ 60.00	\$ -
Top Soil - Hydroseeding	32.27	CY	\$ 55.00	\$ 1,774.85
<b>Reach 2 (40' floodplain on E. side, L=403')</b>				
Channel excavation	3,821	CY	\$ 25.00	\$ 95,525.00
Clearing & Grubbing	0.30	AC	\$ 40,712.70	\$ 12,213.81
Offsite soil disposal (assumed clean soil)	3,351	CY	\$ 60.00	\$ 201,060.00
Top Soil - Hydroseeding	193.60	CY	\$ 55.00	\$ 10,648.00
<b>Reach 3 (40' flood plain E. side for ~176')</b>				
Channel excavation	1,669	CY	\$ 25.00	\$ 41,725.00
Offsite soil disposal (assumed clean soil)	1,199	CY	\$ 60.00	\$ 71,940.00
<b>Reach 4</b>				
N/A				\$ -
<b>FLOOD WALLS</b>				
<b>Reach 1</b>				
N/A				\$ -
<b>Reach 2 (5' floodwall on W. side)</b>				
Clearing & Grubbing	0.10	AC	\$ 40,712.70	\$ 4,071.27
Concrete	187	CY	\$ 1,600.00	\$ 299,200.00
Excavation	693	CY	\$ 25.00	\$ 17,325.00
Fill	573	CY	\$ 20.00	\$ 11,460.00
Offsite soil disposal (assumed clean soil)	120	CY	\$ 60.00	\$ 7,200.00
Top Soil - Hydroseeding	48.40	CY	\$ 55.00	\$ 2,662.00
<b>Reach 3 (4' floodwall on both sides (L=2881' &amp; L=2705'), w/13.5')</b>				
Clearing & Grubbing	1.36	AC	\$ 40,712.70	\$ 55,369.27
Concrete	2,722	CY	\$ 1,600.00	\$ 4,355,200.00
Excavation	10,492	CY	\$ 25.00	\$ 262,300.00
Fill	8,723	CY	\$ 20.00	\$ 174,460.00
Offsite soil disposal (assumed clean soil)	1,769	CY	\$ 60.00	\$ 106,140.00
Top Soil - Hydroseeding	806.67	CY	\$ 55.00	\$ 44,366.85
<b>Reach 4 (4.5' floodwall on both sides, L=464 each side)</b>				
Clearing & Grubbing	0.30	AC	\$ 40,712.70	\$ 12,213.81
Concrete	447	CY	\$ 1,600.00	\$ 715,200.00



**LOWER PENITENCIA CREEK PROJECT--ALTERNATIVE 2A: WIDEN BOTH CALIFORNIA CIRCLE AND MILMONT**

DESCRIPTION Alt #2A	QUANTITY	UNIT	UNIT PRICE	AMOUNT
<b>PHASE I - LEVEE &amp; FLOODWALL WORK</b>			(Ref: L Berry)	
<b>CHANNEL WIDENING</b>				
<b>Reach 1 (50' floodplain on W. side, L=180')</b>				
Channel excavation	2,089	CY	\$ 25.00	\$ 52,225.00
Levee & embankment fill	3,687	CY	\$ 20.00	\$ 73,740.00
Offsite soil disposal (assumed clean soil)	0.00	CY	\$ 60.00	\$ -
Top Soil - Hydroseeding	32.27	CY	\$ 55.00	\$ 1,774.85
<b>Reach 2 (40' floodplain on E. side, L=403')</b>				
Channel excavation	3,821	CY	\$ 25.00	\$ 95,525.00
Clearing & Grubbing	0.30	AC	\$ 40,712.70	\$ 12,213.81
Offsite soil disposal (assumed clean soil)	3,022	CY	\$ 60.00	\$ 181,320.00
Top Soil - Hydroseeding	193.60	CY	\$ 55.00	\$ 10,648.00
<b>Reach 3 (40' flood plain E. side for ~176')</b>				
Channel excavation	1,669	CY	\$ 25.00	\$ 41,725.00
Offsite soil disposal (assumed clean soil)	870	CY	\$ 60.00	\$ 52,200.00
<b>Reach 4</b>				
N/A				\$ -
<b>FLOOD WALLS</b>				
<b>Reach 1</b>				
N/A				\$ -
<b>Reach 2 (5' floodwall on W. side)</b>				
Clearing & Grubbing	0.10	AC	\$ 40,712.70	\$ 4,071.27
Concrete	187	CY	\$ 1,600.00	\$ 299,200.00
Excavation	693	CY	\$ 25.00	\$ 17,325.00
Fill	573	CY	\$ 20.00	\$ 11,460.00
Offsite soil disposal (assumed clean soil)	120	CY	\$ 60.00	\$ 7,200.00
Top Soil - Hydroseeding	48.40	CY	\$ 55.00	\$ 2,662.00
<b>Reach 3 (4' floodwall on both sides (L=2881' &amp; L=2705'), w/13.5'</b>				
Clearing & Grubbing	1.36	AC	\$ 40,712.70	\$ 55,369.27
Concrete	2,722	CY	\$ 1,600.00	\$ 4,355,200.00
Excavation	10,492	CY	\$ 25.00	\$ 262,300.00
Fill	8,723	CY	\$ 20.00	\$ 174,460.00
Offsite soil disposal (assumed clean soil)	1,769	CY	\$ 60.00	\$ 106,140.00
Top Soil - Hydroseeding	806.67	CY	\$ 55.00	\$ 44,366.85
<b>Reach 4 (4.5' floodwall on both sides, L=464 each side)</b>				
Clearing & Grubbing	0.30	AC	\$ 40,712.70	\$ 12,213.81



**LOWER PENITENCIA CREEK PROJECT--ALTERNATIVE 4: WIDEN CALIFORNIA CIRCLE AND RAISE MILMONT**

DESCRIPTION Alt #4	QUANTITY	UNIT	UNIT PRICE	AMOUNT
<b>PHASE I - LEVEE &amp; FLOODWALL WORK</b>			(Ref: L Berry)	
<b>CHANNEL WIDENING</b>				
<b>Reach 1 (50' floodplain on W. side, L=180')</b>				
Channel excavation	2,089	CY	\$ 25.00	\$ 52,225.00
Levee & embankment fill	3,687	CY	\$ 20.00	\$ 73,740.00
Offsite soil disposal (assumed clean soil)	0.00	CY	\$ 60.00	\$ -
Top Soil - Hydroseeding	32.27	CY	\$ 55.00	\$ 1,774.85
<b>Reach 2 (40' floodplain on E. side, L=403')</b>				
Channel excavation	3,821	CY	\$ 25.00	\$ 95,525.00
Clearing & Grubbing	0.30	AC	\$ 40,712.70	\$ 12,213.81
Offsite soil disposal (assumed clean soil)	3,022	CY	\$ 60.00	\$ 181,320.00
<b>Reach 3 (40' flood plain E. side for ~176', w.side 40' flood plain)</b>				
Channel excavation	32,600	CY	\$ 25.00	\$ 815,000.00
Offsite soil disposal (assumed clean soil)	31,801	CY	\$ 60.00	\$ 1,908,060.00
<b>Reach 4</b>				
N/A				\$ -
<b>FLOOD WALLS</b>				
<b>Reach 1</b>				
N/A				\$ -
<b>Reach 2 (5' floodwall on W. side)</b>				
Clearing & Grubbing	0.10	AC	\$ 40,712.70	\$ 4,071.27
Concrete	187	CY	\$ 1,600.00	\$ 299,200.00
Excavation	693	CY	\$ 25.00	\$ 17,325.00
Fill	573	CY	\$ 20.00	\$ 11,460.00
Offsite soil disposal (assumed clean soil)	120	CY	\$ 60.00	\$ 7,200.00
Top Soil - Hydroseeding	48.40	CY	\$ 55.00	\$ 2,662.00
<b>Reach 3 (4' floodwall on E. bank, 13.5' wall on the E. side for ~176')</b>				
Clearing & Grubbing	1.36	AC	\$ 40,712.70	\$ 55,369.27
Concrete	5,837	CY	\$ 1,600.00	\$ 9,339,200.00
Excavation	23,295	CY	\$ 25.00	\$ 582,375.00
Fill	19,926	CY	\$ 20.00	\$ 398,520.00
Offsite soil disposal (assumed clean soil)	3,369	CY	\$ 60.00	\$ 202,140.00
Top Soil - Hydroseeding	806.67	CY	\$ 55.00	\$ 44,366.85
<b>Reach 4 (4.5' floodwall on both sides, L=464 each side)</b>				
Clearing & Grubbing	0.30	AC	\$ 40,712.70	\$ 12,213.81
Concrete	447	CY	\$ 1,600.00	\$ 715,200.00



**LOWER PENITENCIA CREEK PROJECT--ALTERNATIVE 6: CONCRETE CHANNEL**

DESCRIPTION Alt #6	QUANTITY	UNIT	UNIT PRICE	AMOUNT
<b>PHASE I - LEVEE &amp; FLOODWALL WORK</b>			(Ref: L Berry)	
<b>CHANNEL EARTH WORK</b>				
<b>Reach 1 (raised ~ 3' existing west levee, L=180')</b>				
Levee embankment fill	940	CY	\$ 20.00	\$ 18,800.00
Offsite soil disposal (assumed clean soil)	0.00	CY	\$ 60.00	\$ -
Top Soil - Hydroseeding	32.27	CY	\$ 55.00	\$ 1,774.85
<b>Reach 2 (n/a besides R1, all reaches are concrete channel)</b>				
Channel excavation	0.00	CY	\$ 25.00	\$ -
Offsite soil disposal (assumed clean soil)	0.00	CY	\$ 60.00	\$ -
Top Soil - Hydroseeding	0.00	CY	\$ 55.00	\$ -
<b>Reach 3 (n/a besides R1, all reaches are concrete channel)</b>				
Channel excavation	0.00	CY	\$ 25.00	\$ -
Offsite soil disposal (assumed clean soil)	0.00	CY	\$ 60.00	\$ -
Top Soil - Hydroseeding	0.00	CY	\$ 55.00	\$ -
<b>Reach 4</b>				
N/A				\$ -
<b>TRAPEZOIDAL CONCRETE CHANNEL</b>				
<b>Reach 1</b>				
N/A				\$ -
<b>Reach 2 (18.5'H @ 1:1 slope both sides; 50' W; 18" thickness)</b>				
Concrete (21'+50'+21' x 18" x 403'L = 2060)	2,060	CY	\$ 1,600.00	\$ 3,296,000.00
<b>Reach 3</b>				
Concrete (21'+50'+21' x 18" x 2880'L = 14720)	14,720	CY	\$ 1,600.00	\$ 23,552,000.00
<b>Reach 4</b>				
Concrete (21'+50'+21' x 18" x 464'L = 2375)	2,375	CY	\$ 1,600.00	\$ 3,800,000.00
<b>Temporary Fencing</b>	9,280	LF	\$ 25.00	\$ 232,000.00
<b>Subtotal</b>				\$ 30,900,574.85
<b>Mobilization (10%)</b>				\$ 3,090,057.49
<b>Contingency (20%)</b>				\$ 6,180,114.97
<b>Total Construction</b>				\$ <b>40,170,747.31</b>
<b>Inspection (15%)</b>				\$ 6,025,612.10
<b>Mitigation (5%)</b>				\$ 2,008,537.37
<b>Phase I Levee &amp; Floodwall Total Costs</b>				\$ <b>48,204,896.77</b>





## **APPENDIX C**

### **Natural Flood Protection Evaluation**

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## Lower Penitencia Creek Improvements Project Natural Flood Protection (NFP) Evaluation

The criteria are scored as follows:

- 5 = Outstanding
- 4 = Very good
- 3 = Adequate
- 2 = Fair
- 1 = Poor
- 0 = Unacceptable

<b>TABLE 1: NFP Objectives and Subject Matter Experts</b>	
<b>NFP Objective</b>	<b>SME</b>
1. Homes, Schools, Businesses and Transportation Networks are Protected from Flooding and Erosion	Pari Gharib
2. Integrate Within the Context of the Watershed	James Manidakos
3. Support Ecological Functions and Processes	Matt Parsons
4. Integrate Physical Geomorphic Stream Functions and Processes	Liang Xu
5. Minimize Maintenance Requirements	Devin Mody, Mark Wander, Roy Weese
6. Protect the Quality and Availability of Water	Brett Calhoun
7. Cooperate with Other Local Agencies to Achieve Mutually Beneficial Goals	Sam Yung, James Manidakos
8. Maximize Community Benefits Beyond Flood Protection	James Manidakos
9. Minimize Life-Cycle Costs	Christy Chung
10. Impacts are Avoided, Minimized, or Mitigated	Kurt Lueneburger, James Manidakos

## Objective 1—Homes, Schools, Businesses and Transportation Networks are Protected from Flooding and Erosion (High Weight)

### Criterion C1.1: Safety (30)

**Rating Guidance:** Assesses protection of public safety if conditions exceed design assumptions.

**Outstanding:** Alternative continues to provide for public safety when flows exceed design flow or if design assumptions prove inaccurate.

**Adequate:** Alternative improves safety compared to existing conditions when flows exceed the design flow or if design assumptions prove inaccurate.

**Poor:** Alternative provides safety only up to design flow.

**Unacceptable:** Overall, flood hazard is increased.

Alternative	Rating	# Score	Comments
No project	Unacceptable	0	Future increase in flows from upstream not accommodated.
1	Fair	2	Milmont Drive bridge is under pressure flow
2A	Adequate	3	Capacity meets but does not significantly exceed design flow.
4	Adequate	3	Capacity meets but does not significantly exceed design flow.
6	Adequate	3	Capacity meets but does not significantly exceed design flow.

## Objective 1— Homes, Schools, Businesses and Transportation Networks are Protected from Flooding and Erosion (High Weight)

### Criterion C1.2: Economic Protection (30)

**Rating guidance:** Assesses protection from damage due to floodwater, erosion, or sediment.

**Outstanding:** Exceeds FEMA certification standards.

**Adequate:** Meets FEMA certification standards.

**Poor:** Design flows are not contained within project area, but would not cause substantial damage ('nuisance flows' of less than one foot).

**Unacceptable:** Flows less than the design flows would likely cause substantial damage to in-stream features, including bed and banks.

Alternative	Rating	# Score	Comments
No project	Unacceptable	0	Design flow exceeds existing flow conveyance capacity
1	Adequate	3	Meets required WSEL, Meets FEMA certification stds
2A	Adequate	3	Meets required WSEL, Meets FEMA certification stds
4	Adequate	3	Meets required WSEL, Meets FEMA certification stds
6	Very good	4	1% flow WSEL is over 1 ft below required WSEL, Meets FEMA certification stds

## Objective 1— Homes, Schools, Businesses and Transportation Networks are Protected from Flooding and Erosion (High Weight)

### Criterion C1.3: Durability (10)

**Rating guidance:** Assesses future District effort required to maintain design level of protection

**Outstanding:** Level of protection is virtually independent of future actions:

- a) Designed to be virtually maintenance-free.
- b) Has a viable, easily permittable, practical Operation and Maintenance Plan.
- c) Protection does not rely on real-time intervention during a flood event.

**Adequate:** Level of protection is dependent on future actions that can be realistically implemented:

- a) Periodic maintenance specified in a defined cycle of 3 or more years between major activities.
- b) Operation and Maintenance Plan preserves capacity, but may have some complexity in permitting or implementation.

**Poor:** Level of protection is dependent on future actions; they would be difficult or costly to apply and sustain:

- a) Frequent maintenance specified—less than 3 years between major activities.
- b) Operation and Maintenance Plan preserves capacity, but difficult to permit or implement.

**Unacceptable:** Level of protection is dependent on intense level of future actions requiring extensive knowledge and preparation, making them subject to potential failure.

Alternative	Rating	# Score	Comments
No Project	Poor	1	Requires future improvements to meet design flow
1	Adequate	3	Requires periodic sediment removal in Reaches 2 and 4
2A	Very good	4	Avoids need for future sediment removal
4	Very good	4	Avoids need for future sediment removal
6	Adequate	3	Requires periodic sediment removal in Reaches 2, 3 and 4

## Objective 1— Homes, Schools, Businesses and Transportation Networks are Protected from Flooding and Erosion (High Weight)

### Criterion C1.4: Resiliency (10)

**Rating guidance:** Assess adaptability to future changes external to District activities (e.g. future development, vegetation growth)

**Outstanding:** Channel design would accommodate design flows factoring in future sediment and vegetative conditions.

**Adequate:** Channel design conveys flows.

**Poor:** Channel design can convey flows with no sediment accumulation and minimal vegetation growth.

**Unacceptable:** Channel design does not convey flows.

Alternative	Rating	# Score	Comments
No project	Unacceptable	0	Design flow exceeds existing flow conveyance capacity
1	Fair	2	Channel conveys design flow but will require periodic sediment removal in Reaches 2 and 4
2A	Very Good	4	Channel flow capacity can be increased with periodic sediment removal
4	Very Good	4	Channel flow capacity can be increased with periodic sediment removal
6	Fair	2	Channel conveys design flow but will require periodic sediment removal in Reaches 2, 3 and 4

## Objective 1— Homes, Schools, Businesses and Transportation Networks are Protected from Flooding and Erosion (High Weight)

### Criterion C1.5: Local Drainage (10)

**Rating guidance:** Assesses support of local drainage systems

**Outstanding:** Alternative design improves local drainage in storm sewers.

**Adequate:** Alternative accommodates existing local drainage inputs without causing temporary street flooding. Alternative does not exacerbate any existing problems with storm-drains and localized street-flooding.

**Poor:** Alternative accommodates local drainage, but may retard flows to creeks during high flow events, causing temporary “nuisance flooding” in local streets.

**Unacceptable:** alternative does not accommodate local drainage systems.

Alternative	Rating	# Score	Comments
No Project	Poor	1	Overtopping of banks will retard local storm drainage
1	Adequate	3	Accommodates local storm drainage but no improvement
2A			
4			
6			



**Objective 1— Homes, Schools, Businesses and Transportation Networks are Protected from Flooding and Erosion (High Weight)**

**Criterion C1. 6: Time to Implementation (10)**

**Rating guidance:** Assess time to implement.

**Outstanding:** Least amount of time to implement compared to other alternatives.

**Adequate:** Time to implementation is approximately equal with most other alternatives.

**Poor:** Longest amount of time to implement compared to other alternatives.

**Unacceptable:** Indefinite time to implement due to funding, regulatory restrictions or other complications.

Alternative	Rating	# Score	Comments
No project	Outstanding	5	Already implemented
1	Very Good	4	Only one bridge modified
2A	Fair	2	Two bridges modified and low floodwalls
4	Poor	1	Two bridges modified and tall floodwall in Reach 3
6	Adequate	3	Only one bridge modified, but considerable concrete work

## Objective 2—Integrate Within the Context of the Watershed (High Weight)

### Criterion C2.1: Meets Local Watershed Goals (100)

**Rating guidance:** Assesses ability to meet watershed goals as defined in a process that examines the watershed as a whole and accounts for opportunities and constraints specific to the project area.

**Outstanding:** The alternative substantially advances watershed goals.

**Adequate:** The alternative advances some watershed goals, and is not in conflict with any watershed Goals.

**Poor:** The alternative conflicts with more than one major watershed goal.

**Unacceptable:** The project is in conflict with a number of watershed goals,

**OR**

**Watershed goals have not been created.**

NOTE: Watershed goals have not been created; therefore, relevant policies and goals from the City of Milpitas General Plan are used for this evaluation.

Alternative	Rating	# Score	Comments
No project	Poor	1	Thei alternative does not meet Policy 5.b.I-5.
1	Very Good	4	This alternative meets the following City of Milpitas Goals and Policies: <ul style="list-style-type: none"> <li>• 4.a G-2: Develop diversified trail system along streamsides and other public right of ways to provide recreational opportunities and link facilities</li> <li>• 4.d G-1: Assure reasonable protection of beneficial uses of creeks and protect environmentally sensitive areas</li> <li>• 5.b G-1: Minimize threat to life and property from flooding</li> </ul> 5.b I-5: Seek construction of flood control channel to withstand 100-year flood along Penitencia Creek. It supports east and west bank trails.
2A	Very Good	4	This meets City policies and goals 4a G-2, 5.b G-1, and 5.b I-5. It exceeds goal 4.d G-1 by increasing the amount of creekside vegetated area in Reaches 1 and 2. It supports east and west bank trails.
4	Adequate	3	This meets City policies and goals 4a G-2, 5.b G-1, and 5.b I-5. It greatly exceeds goal 4.d G-1 by greatly increasing the amount of creek-side vegetated area in Reaches 1, 2 and 3. The west bank trail would be of low quality due to its location on a depressed channel access road.
6	Poor	1	This alternative reduces wetlands and riparian habitat and does not meet City Goal 4.d. G-1. This alternative meets

			City Goal 4.d G-2 and Policy 5.b. I-5. City Goal 4.a G-2 is nominally met because the east bank trail would be retained, but the quality of the recreational experience would be adversely affected by a mostly concrete creek channel.
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## Objective 3—Support Ecologic Functions and Processes (Medium Weight)

### Criterion C3.1: Meets Local Habitat Goals (25)

**Rating guidance:** Assess ability to meet habitat goals as defined from examining the watershed as a whole and accounting for opportunities and constraints specific to the project area.

**Outstanding:** The alternative meets or exceeds local habitat goals.

**Adequate:** The alternative meets some local habitat goals, and is not in conflict with any habitat goals.

**Poor:** The alternative may conflict with one or more habitat goals.

**Unacceptable:** The alternative is in conflict with a number of habitat goals established as described above.  
OR

Habitat goals have not been created.

NOTE: Local habitat goals have not been created, however the Basin Plan adopted by the RWQCB lists warm freshwater habitat and wildlife habitat as beneficial uses of Lower Penitencia Creek.

Alternative	Rating	# Score	Comments
No project	Poor	1	No increase in vegetated area and requires future periodic sediment removal that would disrupt habitat
1	Fair	2	This alternative would result in only a minor increase in vegetated area and would require future periodic sediment removal that would disrupt habitat.
2A	Very Good	4	This alternative would preserve existing habitat and add new freshwater and wildlife habitat in Reaches 1 and 2. Future disruption of habitat during periodic sediment removal would be prevented.
4	Outstanding	5	This alternative would preserve existing habitat and add new freshwater and wildlife habitat in Reaches 1, 2 and 3. A large amount of freshwater and wildlife habitat would be added in Reach 3. Future disruption of habitat during periodic sediment removal would be prevented.
6	Unacceptable	0	Existing freshwater and wildlife habitat in Reach 3 would be permanently removed,

## Objective 3—Support Ecologic Functions and Processes (Medium Weight)

### Criterion C3.2: Quality of Habitat (30)

**Rating guidance:** Assesses quality of habitat provided by the project area.

**Outstanding:** The alternative would provide relatively undisturbed habitat composed of native plant species and features with a high potential to meet the needs (such as feeding, breeding, resting, movement, cover) for an appropriate and locally native assemblage of fish, amphibians, reptiles, birds, mammals and invertebrates in each phase of their life-cycle. Alternative addresses the special needs of endemic, endangered or special status species.

**Adequate:** The alternative would support the needs for a locally appropriate assemblage of fish, amphibians, reptiles, birds, mammals and invertebrates in each phase of their life-cycle. Alternative addresses the special needs of endemic, endangered or special status species.

**Poor:** Alternative focuses primarily on the special needs of threatened and endangered species as required by appropriate regulatory agencies.

**Unacceptable:** The alternative does not provide any habitat value, consists of paved areas or areas with no vegetation.

Alternative	Rating	# Score	Comments
No project	Poor	1	No improvement over current condition.
1	Fair	2	Marginal improvement over current condition due to creation of vegetated bench in Reach 2.
2A	Very Good	4	Substantial improvement over current condition due to creation of vegetated benches in Reaches 1 and 2.
4	Outstanding	5	Creation of vegetated benches in reaches 1, 2, and 3. Represent greatest improvement over existing conditions of any alternative. Reach 3 bench is very large.
6	Unacceptable	0	Removal of substantial vegetation in Reaches 2 and 3 with no replacement.

## Objective 3—Support Ecologic Functions and Processes (Medium Weight)

### Criterion C3.3: Sustainability of Habitat (25)

**Rating guidance:** Assesses intensity of future human intervention required to maintain the target habitat quality; opportunity for habitat to self-adjust appropriately to future change.

**Outstanding:** All of the following apply to alternative:

- a) Channel maintenance for capacity is projected to be minimal, allowing vegetation to develop, age and change naturally.
- b) Channel banks will be dynamically stable in the long-term.
- c) Vegetative maintenance / intervention has been minimized.
- d) Vegetation expected to be self-sustaining with appropriate successional changes.

**Adequate:** All of:

- a) Channel capacity maintenance would require periodic selective thinning of vegetation.
- b) Same as “b” above.
- c) Some short-term intervention (i.e. ‘landscaping’) necessary (up to five years) to establish vegetation.
- d) Same as “d” above.

**Poor:** All of:

- a) Regular maintenance for channel capacity is anticipated, compromising vegetation’s ability to develop, age and change naturally.
- b) Channel bank is expected to remain stable overall, with potential areas of instability that would require periodic rehabilitation.
- c) Intervention (i.e. ‘landscaping’) necessary to maintain vegetation over long-term.
- d) vegetation is self-perpetuating without appropriate successional changes

**Unacceptable:**

- a) Regular maintenance for channel capacity is anticipated, likely requiring major removal of vegetation.
- b) Unstable channel banks (erosion, deposition). Cross sectional instability expected over time.
- c) Frequent maintenance / irrigation of vegetation is necessary for vegetative survival (often indicating an inappropriate match of vegetation to soil/water conditions).
- d) Due to maintenance or instability, vegetation is not expected to be self-sustaining.

Alternative	Rating	# Score	Comments
No project	Poor	1	No change from existing condition. Frequent sediment removal in future.
1	Poor	1	Little change from existing condition. Frequent sediment removal in future.
2A	Adequate	3	Vegetated benches in Reaches 1 and 2 should be self-supporting. Minimal need for future sediment removal, but woody vegetation would be removed.
4	Very good	4	Vegetated benches in Reaches 1 , 2, and 3 should be self-supporting. Minimal need for future sediment removal, but woody vegetation would be removed.
6	Poor	1	Replaces vegetation with concrete in Reaches 2, 3, and 4. Frequent sediment removal in future.

### Objective 3—Support Ecologic Functions and Processes (Medium Weight)

#### Criterion C3.4: Connectivity of Habitat (20)

**Rating guidance:** Assesses integration of habitat elements into surrounding habitat landscape and within the project area.

**Outstanding:** Alternative provides a continuous riparian corridor along the length of the project and is appropriately integrated into the surrounding habitat mosaic.

**Adequate:** Alternative provides a contiguous, wildlife-accessible corridor connected to surrounding habitat mosaic, with much of the riparian corridor biologically intact.

**Poor:** Alternative does not provide contiguous riparian wildlife corridor and is not connected to surrounding habitat mosaic.

**Unacceptable:** Alternative not integrated into surrounding habitat.

Alternative	Rating	# Score	Comments
No project	Fair	2	Reach 1 vegetated area connect to downstream habitat, but little or no habitat connectivity in Reaches 2, 3 and 4.
1	Adequate	3	Reach 1 and 2 vegetated areas connect to downstream habitat, but little or no habitat connectivity to Reaches 3 and 4
2A	Very Good	4	Creation of vegetated benches in Reaches 1 and 2 and retention of existing vegetated island in Reach 3 result in connected habitat in the project area. Also connection to downstream habitat abutting coyote Creek.
4	Outstanding	5	Creation of vegetated benches in Reaches 1, 2, and 3 and retention of existing vegetated island in Reach 3 result in connected habitat in the project area. Reach 3 vegetated bench is large and connects to low-flow channel and downstream habitat. Also connection to downstream habitat abutting coyote Creek.
6	Poor	1	Mostly concrete with isolated patches of vegetation.

## Objective 4—Integrate Physical Geomorphic Stream Functions and Processes (Medium Weight)

### Criterion C4.1: Floodplain (30)

**Rating guidance:** Inclusion of an appropriately sized overflow area (adjacent floodplain) within the flood conveyance corridor that conveys high flows and dissipates erosive energy.

**Outstanding:** Active channel is hydraulically connected to a floodplain at properly sized bankfull level.

**Adequate:** Modified floodplain: Multi-stage channel (a smaller channel within a larger channel) allows expansion of flows higher than approximately  $\frac{1}{4}$  to  $\frac{1}{3}$  of the design flow by providing additional flow area (modified floodplain); but limited right-of-way requires that setback levees or other containment means are necessary.

**Poor:** Flow will not spread out laterally (overflow onto floodplain or second-phase channel) until at least  $\frac{1}{2}$  of design flow (e.g. 1%) is reached.

**Unacceptable:** Single-phase channel (no separate active channel, no floodplain of any size) sized to convey 1% flow.

Alternative	Rating	# Score	Comments
No project	Fair	2	No improvement from current condition.
1	Fair	2	No improvement from current condition.
2A	Very Good	4	Expands vegetated tidal bench in Reach 2 serves as floodplain and preserves existing bifurcated channel and island in Reach 3.
4	Outstanding	5	Expanded vegetated tidal benches in Reaches 2 and 3 serve as floodplain.
6	Poor	1	Concrete-lined channel lacks floodplain or benches.



## Objective 4— Integrate Physical Geomorphic Stream Functions and Processes (Medium Weight) (Medium Weight)

### Criterion C4.2: Active Channel (30)

**Rating guidance:** Assesses appropriateness of size and configuration of the active channel relative to watershed inputs and reach characteristics.

**Outstanding:** Tidal processes are fully accounted for, including range of tidal prism flows and tidal sedimentation processes.

**Adequate:** For extremely limited right-of-way, hardscaped near-vertical walls are used to maximize plan form space for flowage, active channel meander and near-stream vegetation. In highly confined creeks, large roughness elements (boulders, logs) used to force pool/bar development if appropriate (see Montgomery Buffington 1997)

**Poor:** Active channel is incorporated into the plan, but due to lack of data or significant site constraints, it is unknown whether it will be fully functioning in its ability to convey the dominant hydraulic and sediment discharge.

**Unacceptable:** No separate active channel is incorporated into alternative plan.

Alternative	Rating	# Score	Comments
No project	Fair	2	No improvement from current condition.
1	Fair	2	No improvement from current condition.
2A	Very Good	4	Expands vegetated tidal bench in Reach 2 and preserves existing bifurcated channel and island in Reach 3.
4	Outstanding	5	Expanded vegetated tidal benches in Reaches 2 and 3 define low-flow channel.
6	Poor	1	Concrete-lined channel is trapezoidal and lacks geomorphic elements.

**Objective 4— Integrate Physical Geomorphic Stream Functions and Processes (Medium Weight) (Medium Weight)**

**Criterion C4.3: Stable Side Slopes (20)**

**Rating guidance:** Assesses stability of side slopes using geotechnical or biotechnical methods.

**Outstanding:** All channel side slopes are stable through use of proper side slope ratios appropriate to the geologic materials and expected detrimental forces including hydraulic shear, gravity, overland flow, etc.

**Adequate:** Side slopes are protected from instability through biotechnical means (e.g. log crib walls with willows, root wads, willow wattles).

**Poor:** Side slopes are protected using hardscape (vegetated hardscape—e.g. planted rip-rap would earn a “fair” rating).

**Unacceptable:** Channel side slopes (either active channel or conveyance channel) are unstable and unprotected and subject to failure from anticipated adversary forces.

Alternative	Rating	# Score	Comments
No project	1	Poor	Minimal change from existing condition.
1	1	Poor	Minimal change from existing condition. Hardscape reduced in Reach 2.
2A	4	Very good	Slopes in most reaches are stabilized through combination of sloping and vegetation
4	3	Adequate	Slopes in most reaches are stabilized through combination of sloping and vegetation; however Reach 3 west bank slope is concrete floodwall
6	1	Poor	Hardscape used to protect slopes throughout

**Objective 4— Integrate Physical Geomorphic Stream Functions and Processes (Medium Weight) (Medium Weight)**

**Criterion C4.4: Upstream/Downstream Transitions (25)**

**Rating guidance:** Assesses stability of channel’s integration with upstream and downstream reaches.

**Outstanding:** Channel bottom is integrated so that it transitions seamlessly with stable upstream and downstream reaches. Transitions are achieved without abrupt changes in grade or direction of flow.

**Adequate:** Transition to upstream and/or downstream elevations require a stabilizing grade control. Grade control structures are limited to around 18 inch drop and minimally hardscaped (e.g. rock weirs).

**Poor:** Existing infrastructure at upstream and/or downstream ends require a hardscaped grade control structure with a drop greater than about 18 inch.

**Unacceptable:** Reaches upstream and/or downstream of the project are unstable and transitions between project reach and adjacent reach(es) are not designed for long-term stability.

Alternative	Rating	# Score	Comments
No project	3	Adequate	Transitions are primarily concrete lined beds and banks.
1	3	Adequate	Transitions are primarily concrete lined beds and banks.
2A	4	Very good	Vegetated tidal bench in Reach 2 provides improved transition.
4	4	Very good	Vegetated tidal benches in Reaches 2 and 3 provide improved transitions.
6	3	Adequate	Transitions are primarily concrete lined beds and banks.

## Objective 5—Minimize Maintenance Requirements (High Weight)

### Criterion C5.1: Structural Features (25)

**Rating guidance:** Assesses maintenance requirements associated with structural features within project corridor.

**Outstanding:** Need for structural features that require routine maintenance has been eliminated by design.

**Adequate:** Need for structural features that require routine maintenance has been reduced compared to existing conditions by design.

OR

Design of required structural features accounts for and minimizes projected routine maintenance.

**Poor:** Maintenance required for structural features is roughly equivalent to existing conditions.

**Unacceptable:** Significant numbers of structural features, requiring routine maintenance are incorporated into design.

AND/OR

More structural features than under existing conditions.

Alternative	Rating	# Score	Comments
No project	Poor	1	Maintenance unchanged from existing conditions.
1	Unacceptable	0	New structural features include: <ul style="list-style-type: none"> <li>widened California Circle Bridge,</li> <li>raised levee in Reach 1, and</li> <li>concrete floodwalls in reaches 2, 3, and 4.</li> </ul>
2A	Unacceptable	0	New structural features include: <ul style="list-style-type: none"> <li>widened California Circle and Milmont Drive bridges,</li> <li>raised levee in Reach 1, and</li> <li>concrete floodwalls in reaches 2, 3, and 4.</li> </ul>
4	Unacceptable	0	New structural features include: <ul style="list-style-type: none"> <li>widened California Circle and Milmont Drive bridges,</li> <li>raised levee in Reach 1, and</li> <li>concrete floodwalls in reaches 2, 3, and 4.</li> </ul>
6	Unacceptable	0	New structural features include: <ul style="list-style-type: none"> <li>widened California Circle Bridge,</li> <li>raised levee in Reach 1,</li> <li>concrete floodwalls in Reaches 2, 3, and 4, and</li> <li>concrete lining in Reaches 3.</li> </ul>

## Objective 5 – Minimize Maintenance Requirements (High Weight)

### Criterion C5.2: Natural Processes (25)

**Rating guidance:** Assesses maintenance requirements associated with vegetation growth, erosion and sediment processes

**Outstanding:** a) Expected (modeled) sediment deposition and vegetative growth for 100 plus years will not cause flows to exceed the design capacity including appropriate freeboard.

b) Stream bank erosion requiring repairs is not expected.

c) Conveyance channel incorporates floodplain area to minimize erosive velocities.

**Adequate:** a) Expected (modeled) sediment deposition and vegetative growth for 10 plus years will not cause flows to exceed the 1 percent capacity.

b) Some erosion is expected, but emergency erosion repairs will not be necessary.

c) Channel incorporates multi-phase channel design or bypass to alleviate high velocity, erosive flows in the main conveyance channel.

**Poor:** a) Expected (modeled or estimated) maintenance cycle for capacity restoration for sediment or vegetation in any one area is three or less years.

b) Maintenance guidelines provided so that locations of sediment maintenance are known, although frequency is not.

c) Alternative incorporates few if any areas where high flows are able to spread out and reduce velocities/erosive forces.

**Unacceptable:** a) Sediment, erosion potential and vegetation growth not modeled or otherwise accounted for.

b) Yearly maintenance expected or probable.

c) Channel is single-phase with no floodplain or secondary channel to relieve high flow pressure.

Alternative	Rating	# Score	Comments
No project	Poor	1	Future periodic sediment removal in Reaches 2 and 4.
1	Poor	1	Future periodic sediment removal in Reaches 2 and 4.
2A	Very Good	4	Minimizes needs for future sediment removal and Reach 2 bench will minimize flow velocities. Vegetated benches in Reaches 2 and 3 reduce flow velocities.
4	Outstanding	5	Vegetated benches in Reaches 2 and 3 reduce flow velocities.
6	Poor	1	Future periodic sediment removal in Reaches 2, 3 and 4.

## Objective 5—Minimize Maintenance Requirements (High Weight)

### Criterion C5.3: Urban Flows (25)

**Rating guidance:** Assesses maintenance requirements resulting from smaller, high-frequency storm events and outfall flows

**Outstanding:** Maintenance requirements from urban flows would be significantly reduced.

**Adequate:** Maintenance requirements from urban flows would be somewhat reduced.

**Poor:** Maintenance requirements from urban flows would be about the same or worse.

**Unacceptable:** Outfalls will contribute to excessive erosion and sedimentation in the channel. For example, high-output outfalls are placed at right angles to bank and flow directly into channel with no transition zone between outfall and creek flow.

Alternative	Rating	# Score	Comments
No project	Poor	1	No change from existing condition.
1	Poor	1	No change from existing condition.
2A	Poor	1	No change from existing condition.
4	Poor	1	No change from existing condition.
6	Poor	1	No change from existing condition.

## Objective 5—Minimize Maintenance Requirements (High Weight)

### Criterion C5.4: Access(25)

**Rating guidance:** Assesses incorporation of adequate access for maintenance crews and equipment.

**Outstanding:** Alternative provides multiple function access corridors and access points, optimized based on an analysis of projected maintenance activities and required maintenance equipment. For example, one extra-wide road might provide equipment access superior to two standard-width roads.

**Adequate:** Access corridors comply with District policy 3-410 of Engineering Policies & Procedures

**Poor:** Access corridors are provided, but do not comply with District policy 3-410 of Engineering Policies & Procedures,

**Unacceptable:** Alternative provides inadequate or no access for maintenance crews and equipment.

Alternative	Rating	# Score	Comments
No project	Adequate	3	Retains levee-crest roads in Reaches 1, 2, 3, and 4 and access ramps in Reaches 2, 3, and 4. Retains center island road in Reach 3.
1	Adequate	3	Provides levee-crest roads in Reaches 1, 2, 3, and 4 and access ramps in Reaches 2, 3, and 4. Retains center island road in Reach 3.
2A	Adequate	3	
4	Adequate	3	
6	Very Good	4	Provides levee-crest roads in Reaches 1, 2, 3, and 4 and access ramps in Reaches 2,3, and 4. Concrete-lined bed in Reaches 1, 2 and 3 facilitates vehicle movement.

## Objective 6—Protect the Quality and Availability of Water (Medium Weight)

### Criterion C6.1: Water Availability (10)

**Rating guidance:** Assesses impact on groundwater recharge.

**Outstanding:** Alternative would result in a net increase in recharge potential (i.e. increased perviousness in SCVWD-mapped recharge zones).

**Adequate:** No net change in potential recharge for the project area.

**Poor:** Alternative would reduce the potential for recharge in the project area (i.e. decrease perviousness in SCVWD-mapped recharge zones).

**Unacceptable:** Alternative substantially reduces or eliminates the existing potential for recharge in the project area.

Alternative	Rating	# Score	Comments
No project	Adequate	3	No change in recharge from existing condition.
1	Adequate	3	No change in recharge from existing condition.
2A	Adequate	3	No change in recharge from existing condition.
4	Adequate	3	No change in recharge from existing condition.
6	Unacceptable	0	Concrete bed lining will prevent creek water from infiltrating and recharging the shallow aquifer.



## Objective 6—Protect the Quality and Availability of Water (Medium Weight)

### Criterion C6.2 Groundwater Quality (10)

**Rating guidance:** Assesses groundwater quality protection from contamination and the threat of contamination by preventing contamination entry into groundwater.

**Outstanding:** Alternative maintains the minimum required separation for natural protection of groundwater and contains elements that provide structural features with ongoing maintenance to prevent contaminant entry into groundwater.

**Adequate:** Alternative maintains the minimum required separation for natural protection of groundwater. Alternative contains elements that provide structural features with ongoing maintenance to prevent contaminant entry into groundwater; and incorporate best management practices (e.g., vegetated swales) with ongoing maintenance

**Poor:** Alternative does not maintain the minimum required separation for natural protection of groundwater, however alternative includes best management practices with ongoing maintenance.

**Unacceptable:** Alternative does not maintain the minimum required separation for natural protection of groundwater and does not include measures or programs to protect groundwater quality.

Alternative	Rating	# Score	Comments
No project	Adequate	3	No change from existing condition.
1	Adequate	3	No change from existing condition.
2A	Adequate	3	No change from existing condition.
4	Adequate	3	No change from existing condition.
6	Adequate	3	No change from existing condition.

## Objective 6—Protect the Quality and Availability of Water (Medium Weight)

### Criterion C6.3: In-stream Water Quality (40)

**Rating guidance:** Assesses water quality protection through vegetation and in-stream hydraulic complexity.

**Outstanding:** a) Alternative would likely improve in-stream water quality by creating a hydraulically complex channel and including native riparian vegetation (reference SCVWD-approved list) in appropriate locations to achieve significant benefits to water quality:

- Filter pollutants—protective buffer strip of low, brushy, grassy vegetation on banks and/or in floodplain to slow and filter overland flows.
- Moderate temperatures—near-stream or canopy-forming vegetation (shaded riverine aquatic).
- Stabilize the stream banks with (live) root mass.
- Provide aeration, shade, filtering, mixing and stream bank erosion protection through large- or small-scale hydraulic roughness elements (Scale refers to discrete in-channel features (small-scale), vs. configuration of channel itself (large-scale))
- Concentrate low flows within a smaller, defined channel to reduce stagnant water and maintain temperature, dissolved oxygen and provide vector control.

b) Vegetation system provides above values short-term and long-term after construction.

**Adequate:** a) Alternative would likely maintain current water quality conditions through the use of appropriate vegetation and hydraulically complex in-stream elements.

b) Vegetation would likely take more than five years to re-establish and provide water quality benefits.

**Poor:** Alternative would reduce streamside vegetation and in-stream hydraulic complexity as compared to existing conditions, likely resulting in a reduction in water quality.

**Unacceptable:** Alternative would provide no vegetation or would result in significant loss of streamside and buffer vegetation. Alternative would provide little or no hydraulic complexity to enhance aeration, shade or other water quality parameters.

Alternative	Rating	# Score	Comments
No project	Adequate	3	No change from existing condition.
1	Adequate	3	No substantial change from existing condition.
2A	Very good	4	Vegetated benches in Reaches 1 and 2 would filter pollutants. Complex channel in Reach 3 combined with future reduction in sediment removal will enhance water quality.
4	Outstanding	5	Vegetated benches in Reaches 1, 2 and 3 would filter pollutants. Complex channel in Reach 3 combined with future reduction in sediment removal will enhance water quality.
6	Unacceptable	0	Reduction in vegetation reduces filtering of pollutants. Channel lacks complexity.

## Objective 6—Protect the Quality and Availability of Water (Medium Weight)

### Criterion C6.4: Storm-Water Management (20)

**Rating guidance:** Assesses ability to enhance water supply and quality and reduce peak flows through local retention of rainfall and pollution prevention programs.

**Outstanding:** Significantly increases retention and use of rainwater where it falls (thereby improving local water availability and reducing potential for non-point source runoff/ overland flow); significantly reduces peak flows to the creeks (thereby reducing the need for flood protection); and  
Incorporates programs or features that would result in a decrease of pollution potential.

**Adequate:** Alternative moderately or measurably increases retention and use of rainwater where it falls (thereby improving local water availability and reducing potential for non-point source runoff); and moderately or measurably reduces peak flows to the creeks (thereby reducing the need for flood protection).

**Poor:** Alternative does not contain any such elements.

**Unacceptable:** Alternative would discourage local capture of rainfall/runoff.

Alternative	Rating	# Score	Comments
No project	Poor	1	No elements to retain rainfall or prevent pollution.
1	Poor	1	No elements to retain rainfall or prevent pollution.
2A	Adequate	3	Vegetated benches in Reaches 1 and 2 would retain rainfall and filter pollutants.
4	Very Good	4	Vegetated benches in Reaches 1, 2 and 3 would retain rainfall and filter pollutants. Reach 3 bench is very large.
6	Unacceptable	0	Concrete lining inhibits capture of rainfall.

## Objective 6—Protect the Quality and Availability of Water (Medium Weight)

### Criterion C6.5: Flow Regime (20)

**Rating guidance:** Assesses ability to maintain geomorphologically and biologically appropriate range of flows – quantity and timing.

**Outstanding:** Alternative maintains locally appropriate seasonal variation in flows that will support an appropriate physical channel configuration and habitat.

**Adequate:** Alternative includes modification to the locally appropriate flow regime with no significant impact on channel stability or habitat.

**Poor:** Alternative includes significant modifications to natural flow regime which is likely to have an impact on channel stability or habitat.

**Unacceptable:** Modifications to flow regime are likely to have a significant impact on channel stability or habitat.

Alternative	Rating	# Score	Comments
No project	Poor	1	Periodic sediment removal in Reaches 2, 3 and 4 would disrupt habitat and affect flows.
1	Poor	1	Periodic sediment removal in Reaches 2 and 4 would disrupt habitat and affect flows.
2A	Very Good	4	Improved channel stability. Avoids periodic disruption from sediment removal. Channel physical configuration and habitat complexity are best possible given right of way limitations.
4	Very Good	4	Improved channel stability. Avoids periodic disruption from sediment removal. Channel physical configuration and habitat complexity are best possible given right of way limitations.
6	Unacceptable	0	Natural elements removed. Increase concrete bed and bank linings will result in unnaturally flashy flows.

## Objective 7—Cooperate with Other Local Agencies to Achieve Mutually Beneficial Goals (Medium Weight)

### Criterion C7.1: Mutual Local Goals (50)

**Rating guidance:** Assesses ability to achieve the project-specific goals and objectives developed by the District and local agencies.

**Outstanding:** All goals and objectives developed in a Memorandum of Consensus (MOC) are met.

**Adequate:** Some goals and objectives developed in the MOC of all agencies are met.

**Poor:** MOC is developed but only District goals and objectives are met.

**Unacceptable:** Few objectives met, or no MOC developed.

Alternative	Rating	# Score	Comments
No project	Outstanding	5	Retains east and west bank recreational trails and avoids bridge work.
1	Very good	4	Facilitates east and west bank recreational trails and minimizes bridge work.
2A	Adequate	3	Facilitates east and west bank recreational trails but modifies California Circle and Milmont Drive bridges.
4	Fair	2	West bank trail would be on depressed maintenance road and thus provides lower quality user experience. Modifies California Circle and Milmont Drive bridges
6	Poor	1	Concrete-lined channel is aesthetically and environmentally disfavored.

## Objective 7—Cooperate with Other Local Agencies to Achieve Mutually Beneficial Goals (Medium Weight)

### Objective C7.2—Supports General Plan (50)

**Rating guidance:** Assesses ability to support goals and policies as stated in general plan of partner agencies.

**Outstanding:** Supports all applicable City of Milpitas General Plan policies

**Adequate:** Supports some, but not all, applicable City of Milpitas General Plan policies

**Poor:** Does not support some City of Milpitas General Plan policies and conflicts with some General Plan policies.

**Unacceptable:** Significant conflicts with major policies in City of Milpitas General Plan.

### Criterion 2: Supports General Plan

Alternative	Rating	# Score	Comments
No project	Poor	1	Does not meet Policies 4.d G-1, 5.b G-1, or 5.b I-5.
1	Very Good	4	This alternative meets the following City of Milpitas Goals and Policies: <ul style="list-style-type: none"> <li>4.a G-2: Develop diversified trail system along streamsides and other public right of ways to provide recreational opportunities and link facilities</li> <li>4.d G-1: Assure reasonable protection of beneficial uses of creeks and protect environmentally sensitive areas</li> <li>5.b G-1: Minimize threat to life and property from flooding</li> </ul> 5.b I-5: Seek construction of flood control channel to withstand 100-year flood along Penitencia Creek. It supports east and west bank trails.
2A	Very Good	4	This meets City policies and goals 4a G-2, 5.b G-1, and 5.b I-5. It exceeds goal 4.d G-1 by increasing the amount of creekside vegetated area in Reaches 1 and 2. It supports east and west bank trails.
4	Adequate	3	This meets City policies and goals 4a G-2, 5.b G-1, and 5.b I-5. It greatly exceeds goal 4.d G-1 by greatly increasing the amount of creek-side vegetated area in Reaches 1, 2 and 3. The west bank trail would be of low quality due to its location on a depressed channel access road.
6	Poor	1	Although a small numbers of local residents expressed support for this alternative at the June 2014 public information meeting, this alternative reduces wetlands and

			<p>riparian habitat and does not meet City Goal 4.d. G-1. This alternative meets City Goal 4.d G-2 and Policy 5.b. I-5. City Goal 4.a G-2 is nominally met because the east bank trail would be retained, but the quality of the recreational experience would be adversely affected by a mostly concrete creek channel.</p>
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**Objective 8—Maximize Community Benefits beyond Flood Protection (Low Weight)**

**Criterion C8.1: Community Safety (20)**

**Rating guidance:** Assesses overall safety for appropriate access and recreation.

**Outstanding:** All safety issues identified by public safety officials during their review are addressed.

**Adequate:** Most safety issues identified addressed. Project team provides explanation for features deemed inappropriate or infeasible

**Poor:** Few if any recommendations incorporated into the proposed alternative

**Unacceptable:** alternative was not reviewed by public safety officials to evaluate safety concerns.

Alternative	Rating	# Score	Comments
No project	Unacceptable	0	Not reviewed by public safety officials
1			
2A			
4			
6			



## Objective 8— Maximize Community Benefits beyond Flood Protection (Low Weight)

### Criterion C8.2: Recreation (20)

**Rating guidance:** Assesses quality of recreation experience provided by alternative.

**Outstanding:** Area provides unique, quality recreational opportunities or a variety of opportunities including active and passive recreation in an area that is otherwise lacking in similar recreational opportunities. Area is highly accessible to the public and provides related amenities. Facilities are incorporated into existing recreational facilities and the surrounding community.

**Adequate:** Some recreational facilities incorporated into alternative. Access may be limited.

**Poor:** Few or no recreational facilities incorporated into alternative.

**Unacceptable:** Existing recreational activities are removed as a result of the alternative.

Alternative	Rating	# Score	Comments
No project	Fair	3	Retains east bank recreational trail and Reach 2 boat launch ramp. No increase in channel vegetation results in little or no aesthetic improvement.
1	Fair	3	Retains east bank recreational trail and Reach 2 boat launch ramp. Minimal increase in channel vegetation results in little or no aesthetic improvement.
2A	Adequate	3	Retains east bank recreational trail and Reach 2 boat launch ramp. Increased vegetation in Reaches 1 and 2 improves aesthetics. Retains potential for recreational trail on west bank in Reaches 3 and 4
4	Fair	2	Retains east bank recreational trail and Reach 2 boat launch ramp. Increased vegetated area in Reach 3 improves aesthetics but this is offset by tall floodwall and increased graffiti potential. Reach 3 floodwall separates possible west bank trail from creek.
6	Fair	2	Retains east bank recreational trail and Reach 2 boat launch ramp, but reduction in vegetation and increased potential for graffiti diminish recreation quality.

## Objective 8— Maximize Community Benefits beyond Flood Protection (Low Weight)

### Criterion C8.3: Aesthetics (20)

**Rating guidance:** Assesses quality of aesthetic form provided by the alternative.

**Outstanding:** This is a qualitative assessment. Some features to consider include:

- Harmonizes with the landscape
- Emulates / creates natural environment including sound (birds, water); meander; smell (natural earth, water)
- Unexpected large / small features
- Concrete may be colored or sculpted to look like natural rock
- Park-like, natural-like
- Art, informal art, locally appropriate art
- Amenities—benches
- Clever
- Follows “Coyote Watershed Aesthetic Guidelines” for project features, as applicable (SCVWD, Dec 2000)

**Unacceptable:** Hardscape significantly greater than greenscape, visual monotony, heavy use of plain concrete.

Alternative	Rating	# Score	Comments
No project	Very good	4	No new floodwalls or increase in hardscape.
1	Fair	2	New concrete floodwalls in Reaches 2, 3 and 4, marginally offset by small new vegetated bench in Reach 2.
2A	Adequate	3	New concrete floodwalls in Reaches 2, 3 and 4 offset by new vegetated benches in Reaches 1 and 2.
4	Adequate	3	New concrete floodwalls in Reaches 2, 3 and 4 offset by new vegetated benches 1, 2 and 3. Concrete floodwall in Reach 3 would be about 18 ft tall and graffiti target.
6	Unacceptable	0	Significant increase in concrete results in unnatural and unaesthetic channel. Frequent sediment removal in Reaches 2, 3, and 4 prevents vegetation establishment.

## Objective 8— Maximize Community Benefits beyond Flood Protection (Low Weight)

### Criterion C8.4: Open Space (20)

**Rating guidance:** Assesses incorporation of open space into alternative design.

**Outstanding:** The alternative ensures continued long-term protection of existing protected open space.

- Alternative creates new open space.
- Alternative protects existing open space that is/will be subject to development in the near future, taking advantage of opportunities to provide open space in anticipation of future development pressures or anticipated local growth

**Adequate:** The alternative preserves existing open space within the project area.

**Poor:** Existing open space would be degraded by the alternative.

**Unacceptable:** Significant amount of existing open space would be lost.

Alternative	Rating	# Score	Comments
No project	Adequate	3	Existing open space preserved but no increase.
1	Adequate	3	Existing open space preserved but no increase.
2A	Very Good	4	New open space connected to creek created in reach 1 by relocating west bank levee farther from creek. Higher quality open space created in Reach 2 by converting grass slope to vegetated creek-side bench.
4	Outstanding	5	New open space connected to creek created in reach 1 by relocating west bank levee farther from creek. Higher quality open space created in Reach 2 by converting grass slope to vegetated creek-side bench. New open space in Reach 3 created by replacing west bank levee with floodwall and vegetated creek-side bench.
6	Poor	1	Existing open space preserved but degraded by being covered in concrete.

## Objective 8— Maximize Community Benefits beyond Flood Protection (Low Weight)

### Criterion C8.5: Community Input (20)

**Rating guidance:** Alternative reflects community-developed objectives/ideas.

**Outstanding:** Relative to other alternatives, community indicates overwhelming support.

**Adequate:** Overall, community indicates acceptance of this alternative relative to the other alternatives.

**Poor:** Community clearly indicates a lack of support for this alternative.

**Unacceptable:** Community finds this alternative unacceptable.

Alternative	Rating	# Score	Comments
No project	Fair	2	At the June 14, 2014 public information meeting, the public neither supported nor opposed this alternative. They expressed support for reducing flood risks, which this alternative does not achieve. They all supported preserving and/or improving the City recreational trail and maintaining the creek for aesthetics and ecological protection, which this alternative achieves.
1	Adequate	3	At the June 14, 2014 public information meeting, the public neither supported nor opposed this alternative. They expressed support for reducing flood risks, preserving and/or improving the City recreational trail, and maintaining the creek for aesthetics and ecological protection. This alternative meets the City of Milpitas Goals and Policies with respect to recreational trails (4.a G-2), flood protection (4.d G-1 and 5.b I-5), and ecological protection (4.d G-1).
2A	Adequate	3	Same as Alternative 1.
4	Adequate	3	Same as Alternative 1.
6	Fair	2	Although a small numbers of local residents expressed support for a concrete-lined channel at the June 14, 2014 public information meeting, their support was based on achieving maximum flood protection. All of the alternatives would protect against the 100-yr flood event; concrete-lined channel is not required to achieve this objective. This alternative reduces wetlands and riparian habitat and does not meet City Goal 4.d. G-1.

**Objective 9—Minimize Life-Cycle Costs (Medium Weight)****Criterion C9.1: Capital Cost (50)**

Rating Guidance: Criteria are not weighted - costs are simply added together in net present value.

The funding available for capital cost for this project is \$20.0 million (2015 dollars)

<b>Alternative</b>	<b>\$NPV</b>	<b>Comments</b>
<b>No project</b>	\$0	
<b>1</b>	\$10.92 M	
<b>2A</b>	\$14.64 M	
<b>4</b>	\$21.97 M	
<b>6</b>	\$30.86 M	

**Objective 9—Minimize Life-Cycle Costs (Medium Weight)****Criterion C9.2: Maintenance Cost (30)**

Net Present Value of all maintenance costs over the life of the project (50 years)

<b>Alternative</b>	<b>\$NPV</b>	<b>Comments</b>
<b>No project</b>	\$12.74 M	
<b>1</b>	\$9.6 M	
<b>2A</b>	\$2.22 M	
<b>4</b>	\$2.31 M	
<b>6</b>	\$11.99	

**Objective 9—Minimize Life-Cycle Costs (Medium Weight)**

**Criterion C9.3: Grant or Cost-Sharing Opportunities (20)**

Net Present Value of grant or cost sharing opportunities for project or project components

<b>Alternative</b>	<b>\$NPV</b>	<b>Comments</b>
<b>No project</b>	0	
<b>1</b>		
<b>2A</b>		
<b>4</b>		
<b>6</b>		

## Objective 10—Impacts are Avoided , Minimized or Mitigated (Medium Weight)

### Criterion C10.1: Compliance with San Francisco Bay Basin Plan (50)

Rating guidance: Assesses potential effects of each project alternative on water quality via conformance with the Basin Plan adopted by the Regional Water Quality Control Board. The SF Bay Basin Plan designates the following beneficial uses for Lower Penitencia Creek:

- Warm freshwater habitat (Warm)
- Wildlife habitat (Wild)
- Water contact recreation (Rec-1)
- Noncontact water recreation (Rec-2)

**Outstanding:** Alternative will enhance or improve one or more existing or potential beneficial uses and will not impair or harm any beneficial uses designated by the SF RWQCB.

**Adequate:** Project Alternative will have only minor adverse effects on existing or potential beneficial uses for the water body designated by the RWQCB, and minor effects on existing or potential beneficial uses can be minimized and/or feasibly mitigated.

**Poor:** Alternative will have potentially significant adverse effects on two or more existing or potential beneficial uses for the water body designated by the RWQCB, and mitigation for adverse effects to beneficial use(s) will be technically difficult, excessively expensive, or will only partially compensate for harm.

**Inadequate:** Alternative will have potentially adverse effects on existing or potential beneficial uses for the water body designated by the RWQCB, and mitigation for the harm to beneficial use(s) is not feasible.

Alternative	Rating	# Score	Comments
No project	Adequate	3	No change from existing condition. Retains Reach 2 boat ramp and east bank recreational trail.
1	Adequate	3	No change from existing condition. Retains Reach 2 boat ramp and east bank recreational trail.
2A	Very good	4	Reach 1 and 2 vegetated benches improve wildlife habitat and water quality. Retains Reach 2 boat ramp and east bank recreational trail.
4	Very good	4	Reach 1, 2 and 3 vegetated benches improve wildlife habitat and water quality. Alternative has greatest amount of vegetated habitat. Retains Reach 2 boat ramp and east bank recreational trail.
6	Unacceptable	0	Concrete lined channel has no habitat value, increases water temperature, and adversely affects water quality. Retains Reach 2 boat ramp and east bank recreational trail but poor aesthetics detracts from quality of water-contact and non-contact recreation.

## Objective 10— Impacts Are Avoided , Minimized or Mitigated (Medium Weight)

### Criterion C10.2: Identify the Least Environmentally Damaging Practicable Alternative (LEDPA) (50)

**Rating guidance:** Determines the preliminary LEDPA and ensures it is carried forward. The Alternative with the highest C10.2 score is the preliminary LEDPA. The RWQCB and USACE will issue Clean Water section 401 and 404 approvals only to the Alternative that is the LEDPA. It is acceptable to carry forward to the planning phase alternatives that are not the preliminary LEDPA (future design revisions may change which alternative is the LEDPA), but the preliminary LEDPA must be one of the project alternatives carried forward to the next phase.

**Outstanding:** Alternative avoids all adverse effects on environmental resources.

**Very Good:** Alternative avoids and/or minimizes all effects on environmental resources, and alternative (without mitigation) will not result in significant adverse environmental effects.

**Adequate:** Project Alternative will result in potentially significant adverse effects to environmental resources, and feasible mitigation measures will reduce the significance of adverse environmental effects to less than significant levels.

**Poor:** Alternative will result in potentially significant adverse effects to environmental resources, and Mitigation for adverse effects to beneficial use(s) is infeasible or will be technically difficult or excessively expensive.

Alternative	Rating	# Score	Comments
No project	Poor	1	Future sediment removal will periodically disrupt creek bed habitat in Reaches 2, 3 and 4.
1	Fair	2	Future sediment removal will periodically disrupt creek bed habitat in Reaches 2 and 4. Vegetated bench in Reach 2 will somewhat increase wildlife habitat.
2A	Adequate	3	Minimizes need for future sediment removal. Vegetated benches in Reaches 1 and 2 provide increased habitat, which offsets adverse effect of new center pier for California Circle Bridge.
4	Adequate	3	Minimizes need for future sediment removal. Vegetated benches in Reaches 1, 2 and 3 increases habitat to greater extent than Alternative 2A. Tall floodwall and adjoining depressed maintenance road in Reach 3 increase in-channel hardscape compare to Alternative 2A. Milmont Drive widening results in construction-period disruption of channel. This alternative adds 2 bridge piers compared to 1 for alternative 2A.
6	Poor	1	Future sediment removal will periodically disrupt creek bed habitat in Reaches 2, 3 and 4. Concrete lining in Reaches 1, 2 and 3 will increase water temperature and decrease water quality. Permanently removes riparian habitat on center island in Reach 3.



Lower Penitencia Creek

Alternatives Workshop Natural Flood Protection (NFP) Summary Ratings

		(5) Outstanding	(4) Very Good	(3) Adequate	(2) Fair	(1) Poor	(0) Unacceptable				
Alternatives	<b>Objective</b>										
	Protection from flood damage (High weight)	Watershed Context (High Weight)	Ecology (Medium Weight)	Geomorphology (Medium Weight)	Maintenance (High Weight)	Water Quality & Availability (Medium Weight)	Other Agency Support (Medium Weight)	Community Benefits (Low Weight)	Life-Cycle Costs (Medium Weight)	LEDPA (Medium Weight)	Total NFP Points
Alternative 1	2.7	4.0	2	1.95	1.25	2.7	4	2.2	4	2.5	60.4
Alternative 2A	3.1	4.0	3.75	4.0	2.0	3.35	3.5	2.6	5	3.5	76.1
Alternative 4	3.0	3.0	4.75	4.45	2.25	3.75	2.5	2.6	3	3.5	71.3
Alternative 6	3.2	1.0	0.5	1.3	1.5	0.75	1	1	1	0.5	28.2

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Weights:**

High Weight=3, Medium Weight=2, Low Weight= 1

**Life-Cycle Cost**

Land acquisition for Alt 2A & Alt 4 has not been determined yet









**Lower Pen Creek  
Objective Rating Matrix**

<b>Objective 1: Provide protection from flood damage</b>									
			(4) Very Good						
Alternative	Criteria and Weights						Time to Implementation (10)	Summary Rating	
	Safety (30)	Economics Protection (30)	Durability (10)	Resiliency (10)	Local Drainage (10)				
Alternative 1								2.7	
Alternative 2A								3.1	
Alternative 4								3.0	
Alternative 6								3.2	

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3



























**Lowe Pen Creek  
Objective Rating Matrix**

<b>Objective 2: Integrate Within The Watershed</b>					
(5) Outstanding	(4) Very Good	(3) Adequate	(2) Fair	(1) Poor	(0) Unacceptable
Alternative	Criteria and Weights				Summary Rating
	Meets Local Watershed Goals (100)				
Alternative 1					 4
Alternative 2A					 4
Alternative 4					 3
Alternative 6					 1

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Lower Pen Creek  
Objective Rating Matrix**

<b>Objective 3: Support Ecologic Functions and Processes</b>						
<b>Alternative</b>	<b>Meets Local Habitat Goals (25)</b>	<b>Habitat Provided (25)</b>	<b>Sustainability of Habitat (25)</b>	<b>Connectivity of Habitat (25)</b>	<b>Criteria and Weights</b>	
					<b>(4) Very Good</b>	<b>(0) Unacceptable</b>
						
<b>Alternative 1</b>						
<b>Alternative 2A</b>						
<b>Alternative 4</b>						
<b>Alternative 6</b>						
						<b>Summary Rating</b>
						<b>2</b>
						<b>3.75</b>
						<b>4.75</b>
						<b>0.5</b>

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Numeric rating:**

If the numeric summary rating is between 2 rating (e.g. 3.5 which is between very good and adequate) the assigned rating will be the lowest rating

**Lower Pen Creek  
Objective Rating Matrix**

<b>Objective 4: Integrate Geomorphic Physical Stream Function and Processes</b>							
		 (5) Outstanding	 (4) Very Good	 (3) Adequate	 (2) Fair	 (1) Poor	 (0) Unacceptable
Alternative	Criteria and Weights					Summary Rating	
	Floodplain (35)	Active Channel (30)	Stable Side Slopes (20)	Transitions (15)			
Alternative 1						1.95	
Alternative 2A						4.0	
Alternative 4						4.45	
Alternative 6						1.3	

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Lower Pen Creek  
Objective Rating Matrix**

<b>Objective 5: Minimize Maintenance Requirement</b>							
		(5) Outstanding	(4) Very Good	(3) Adequate	(2) Fair	(1) Poor	(0) Unacceptable
Alternative	Criteria and Weights						Summary Rating
	Structural Features (25)	Natural Processes (25)	Urban Flows (25)	Access (25)			
Alternative 1	X						1.25
Alternative 2A	X						2.0
Alternative 4	X						2.25
Alternative 6	X						1.5

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Numeric rating:**

If the numeric summary rating is between 2 rating (e.g. 3.5 which is between very good and adequate) the assigned rating will be the lowest rating

**Lower Pen Creek  
Objective Rating Matrix**

<b>Objective 6: Protect the Quality and Availability of Water</b>							
	(5) Outstanding	(4) Very Good	(3) Adequate	(2) Fair	(1) Poor	(0) Unacceptable	
Alternative	Criteria and Weights						Summary Rating
	Water Availability (30)	Groundwater Quality (25)	Instream Water Quality (30)	Offstream Water Management (10)	Flow Regime (5)		
Alternative 1							2.7
Alternative 2A							3.35
Alternative 4							3.75
Alternative 6	X		X	X	X		0.75

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Lower Pen Creek  
Objective Rating Matrix**

<b>Objective 7: Cooperate With Other Local Agencies to Achieve Mutually Beneficial Goals</b>				
Alternative	Criteria and Weights			Summary Rating
	Mutual Local Goals (50)	Supports General Plan (50)		
Alternative 1				4.0
Alternative 2A				3.5
Alternative 4				2.5
Alternative 6				1.0

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Numeric rating:**

If the numeric summary rating is between 2 rating (e.g. 3.5 which is between very good and adequate) the assigned rating will be the lowest rating



**Lower Pen Creek  
Objective Rating Matrix**

<b>Objective 8: Community Benefits Beyond Flood Protection</b>						
						
Alternative	Criteria and Weights					Summary Rating
	Community Safety (20)	Recreation (20)	Aesthetics (20)	Open Space (20)	Community Support (20)	
Alternative 1	X					 2.2
Alternative 2A	X					 2.6
Alternative 4	X					 2.6
Alternative 6	X		X			 1.0

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Lower Pen Creek  
Objective Rating Matrix**

**Objective 9: Minimize Life-Cycle Costs**












Alternative	Criteria and Weights			Grant or Cost-sharing Opportunities	Summary Rating
	Capital Cost	Maintenance Cost			
Alternative 1	\$10.92	\$9.60		0	\$20.52
Alternative 2A	\$14.64	\$2.22		0	\$16.86
Alternative 4	\$21.97	\$2.31		0	\$24.28
Alternative 6	\$30.86	\$11.99		0	\$42.85



**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Lower Pen Creek  
Objective Rating Matrix**

<b>Objective 10: Impacts Are Avoided, Minimized or Mitigated</b>				
				
Alternative	Criteria and Weights			Summary Rating
	Water Quality Effect (50)	LEDPA (50)		
Alternative 1				 2.5
Alternative 2A				 3.5
Alternative 4				 3.5
Alternative 6	X			X 0.5

**Rating Guidance for each criteria:**

Refer to document ID: WW75125—Guidance on Alternative Selection & Evaluation for Natural Flood Protection Projects Revision R3

**Numeric rating:**

If the numeric summary rating is between 2 rating (e.g. 3.5 which is between very good and adequate) the assigned rating will be the lowest rating