PAJARO RIVER FLOOD RISK MANAGEMENT GENERAL REEVALUATION REPORT & INTEGRATED ENVIRONMENTAL ASSESSMENT

October 2017

Draft General Reevaluation Report and Integrated EA

Prepared by:

U.S. Army Corps of Engineers, San Francisco District

DRAFT FINDING OF NO SIGNIFICANT IMPACT
Pajaro River Flood Risk Management Project
Monterey and Santa Cruz Counties, California

The integrated General Reevaluation Report and Environmental Assessment (GRR/EA), dated [*add date of final GRR/EA*], for the Pajaro River Flood Risk Management Study (Pajaro Study), addresses flood risk in the City of Watsonville, the town of Pajaro, and surrounding agricultural lands in Monterey and Santa Cruz Counties, California. Based on this report, the reviews of other Federal, State, and local agencies, Native American Tribes, input from the public, and the review by my staff, I find the *Tentatively Selected Plan (TSP)* to be technically feasible, economically justified, cost effective, in accordance with environmental statutes, and in the public interest.

The original Pajaro River project was authorized by the Flood Control Act of 1944 (Public Law No. 534, 78th Congress, Ch. 665, 2nd Session). The existing Pajaro flood risk management project (Pajaro Project) was authorized by the Flood Control Act of 1966 (Section 203, Public Law 89-789, 80 Stat. 1421). Section 1001 of the Water Resources Development Act (WRDA) of 1986 states that every two years, the Secretary of the Army shall submit a list of projects to Congress for de-authorization. The list would include authorized projects that have not been constructed and have received no funding for the previous ten fiscal years. In order to avoid de-authorization, the Pajaro Study was re-authorized by the WRDA 1990, Section 107 Continuation of Authorization of Certain Projects (Public Law 101-640, November 28, 1990). Section 107 of WRDA 1990 provided that the Pajaro Project, as authorized by the Flood Control Act of 1966, remain authorized.

The GRR/EA, incorporated herein by reference, evaluated various non-structural and structural alternatives to reduce flood risk along the lower Pajaro River, Salsipuedes and Corralitos Creeks. In addition to a "no action" plan, nine alternative plans were evaluated in the environmental review. The Tentatively Selected Plan (TSP) includes measures to improve existing levees, measures to construct new levees (including setback levees and a ring levee), and measures to construct floodwalls. The plan recommended for implementation, the TSP, includes construction of:

Salsipuedes Creek and Corralitos Creek

- 1 mile of floodwall
- 0.6 mile of floodwall on existing levees
- 5 miles of new levees
- 3 miles of setback levees

- 37.2 acres of floodplain between the setback levee and the creek
- 1.7 miles of existing levee demolition
- Ring levee around the Orchard Park subdivision
- Raise 2 bridges

Pajaro River

- 1.3 miles of floodwalls on existing levees.
- 7.3 miles of new levees
- 5.2 miles of setback levees
- 52.4 acres of floodplain between setback levees and the river
- 5.2 miles of existing levee demolition

The proposed project could have a significant effect on the environment. However, implementation of the following mitigation features would reduce all significant impacts for a mitigated FONSI, thereby avoiding the need to prepare an EIS. Mitigation measures would be implemented, as described in the GRR/EA, to reduce effects to the following resources: aesthetics (Section 4.3.3), agriculture (Section 4.4.3), air quality (Section 4.5.3), aquatic resources (Section 4.6.3), cultural resources (Section 4.7.3), hydrology, hydraulics, geomorphology (Section 4.8.3), land use (Section 4.9.3), noise and vibration (Section 4.10.3), public health and environmental hazards (Section 4.11.3), recreation (Section 4.12.3), socioeconomics and environmental justice (4.13.3), special status federal species (4.14.3), traffic and circulation (4.15.3), utilities and public services (Section 4.16.3), vegetation and wildlife (Section 4.17.3), and water quality (Section 4.18.3). The project has been designed to be self-mitigating and additional compensatory habitat mitigation is not required.

The project is in compliance with the Endangered Species Act. We have requested concurrence from U.S. Fish and Wildlife Service and National Marine Fisheries Service with our determination that the project may affect, but is not likely to adversely affect federally listed species.

In accordance with the guidelines for specification of disposal sites for dredged or fill material under Section 404(b)(1) of the Clean Water Act, the Corps determined that the TSP is the least environmentally damaging practicable alternatives. A letter of support for the project has been requested from the RWQCB. A water quality certification pursuant to Section 401 of the Clean Water Act will be obtained from the Central Coast Regional Water Quality Control Board (RWQCB) prior to initiating construction.

In compliance with the Clean Air Act of 1963, as amended, the Corps will avoid and minimize impacts to air quality with the implementation of best management practices. The Corps will coordinate with Monterey County and Santa Cruz County Departments of Public Works, City of Watsonville Department of Public Works, and local recreation users, and will

implement best management practices for safety, such as flaggers, signage, detours, and fencing to notify and control recreation access and traffic around construction sites during construction.

The project is in compliance with Section 106 of the National Historic Preservation Act. A Programmatic Agreement between Corps and the California State Historic Preservation Officer is in development and will be executed before I sign this finding of no significant effect (FONSI). The PA will allow for phased implementation of Section 106 compliance.

Technical, environmental, and economic criteria used in the formulation of alternative plans were those specified in the Water Resource Council's 1983 *Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies*. All applicable laws, executive orders, regulations and local government plans were considered in the evaluation of alternatives.

Having reviewed the GRR/EA and information provided by all interested parties, I find that the Pajaro Project would not have a significant long-term effect on environmental, social, or cultural resources. Based on these considerations, there is no need to prepare an Environmental Impact Statement. Therefore, an Environmental Assessment and FONSI provide adequate environmental documentation to implement the project.

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Travis J. Rayfield
Lieutenant Colonel, U.S. Army
District Commander

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EXECUTIVE SUMMARY

This integrated General Reevaluation Report and Environmental Assessment (GRR/EA) describes the planning process followed to develop and evaluate an array of alternatives and identify the Tentatively Selected Plan (TSP; NEPA preferred alternative) to address flood risk management problems and opportunities in the Pajaro River Project Area. The U.S. Army Corps of Engineers (USACE), the Santa Cruz County Flood Control and Water Conservation Agency (Santa Cruz County) and the Monterey County Water Resources Agency (Monterey County) are sponsoring this study. This integrated report meets the environmental review and disclosure requirements of the National Environmental Policy Act (NEPA). USACE is the lead agency under NEPA.

This GRR/EA is being released for concurrent public review, internal policy review, and Agency Technical Review (ATR). All comments received during the 30-day public review period will be considered and incorporated into the final GRR/EA, as appropriate. The Final GRR/EA will present the recommended plan for implementation with approval obtained through a USACE Director of Civil Works Report (Director's Report) in accordance with the Chief of Engineers discretionary authority and Congressional project authorization provided by Section 203 of the 1966 Flood Control Act; or if warranted through with a new Chief of Engineers Report (Chief's Report) and a new Congressional project authorization.

STUDY AREA

The Pajaro River watershed is located on the central coast of California about 75 miles south of San Francisco and includes portions of Santa Clara, San Benito, Santa Cruz, and Monterey Counties (**Figure ES-1**). The watershed, which is approximately 88 miles long and 30 miles wide, drains an area of approximately 1,300 square miles of the southern section of the California Coastal Ranges, emptying into the Pacific Ocean six river miles southwest of the City of Watsonville.

The project area is located within the lower Pajaro River watershed. It encompasses an area of approximately 10,000 acres, which includes the stream channels, active floodplains, and terraces along the Pajaro River and Salsipuedes and Corralitos Creeks. The area is divided by the Pajaro River, which serves as a border for the two counties. Santa Cruz County lies to the north of the Pajaro River, and Monterey County lies to the south. Salsipuedes and Corralitos Creeks, which join just north of the Pajaro River in Santa Cruz County, are tributaries of the Pajaro River.

The City of Watsonville, north of the Pajaro River, and the unincorporated Town of Pajaro, south of the Pajaro River, are the two urban areas within the project area (Figure ES-1). The project area includes both widespread agricultural land devoted to high–value crops (e.g.,

strawberries, raspberries, and lettuce) and extensive residential, commercial, and industrial structures within the two urban areas.

BACKGROUND AND NEED

The purpose of the project is to reduce flood risk to the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands. The purpose of the study is to determine if there is a Federal interest in investing in additional flood risk management solutions in the study area. The Pajaro River Watershed has a long history of flooding that has resulted in substantial damages in the urban areas of the Town of Pajaro and City of Watsonville and surrounding agricultural areas. The study involved the formulation of alternative plans to reduce flood risk in the study area, evaluation of economic and environmental impacts of the alternatives, including the no action alternative, and identification of the plan that maximizes the net National Economic Development (NED) benefits and complies with applicable federal and state environmental regulations.

Since construction of the USACE levee system in 1949, there have been four major floods on the Pajaro River and its tributaries, 1955, 1958, 1995, and 1998, that have resulted in significant flooding caused by overtopping or breaching of the levees. Peak discharges for the four major post-construction floods exceeded the 19,000 cubic feet per second (cfs) design discharge upstream of the Salsipuedes Creek confluence.

The March 1995 storm resulted in the greatest flood damages. During that storm, the breach resulted in the Pajaro River completely inundating the Town of Pajaro and the surrounding agricultural areas. That flood caused damage estimated to be more than $95 million ($67 million in agricultural flood damages and $28 million in urban flood damages). One flood–related death occurred during the event (San Francisco Examiner 1995). The City of Watsonville was threatened, but it only sustained minor flood damage. Based on recent hydrologic analysis, the March 1995 flood was estimated to be the equivalent of a 6.5% (15.4-year) annual chance exceedance (ACE) flood event.

Floodwaters from the February 1998 storm, which is considered the flood of record, caused a major levee breach along the north bank of the Pajaro River approximately 1,500 feet downstream of Highway 1. Flooding was mainly limited to agricultural land. Scour and erosional damage to the project itself and the surrounding area was extensive. According to the counties, costs for emergency repair work alone totaled nearly $9 million. The ACE for the February 1998 flood event was estimated to be 3.5% (28.5-year). Although this was the flood of record, it does not approach the potential flooding of a 1% (100-year) ACE flood event if there were no project.

Since construction of levees along the Pajaro River and Salsipuedes Creek in 1949, documented flooding in the City of Watsonville area has been limited to overflow from Corralitos Creek (where no levee construction has been implemented), which occurred in 1955, 1982, and 1986.

The greatest economic damages resulting from flooding on Corralitos Creek occurred in 1955 when 29 city blocks were flooded to a maximum depth of 2 feet. Floodwaters overtopped the south bank of Corralitos Creek between Green Valley Road and Highway 152. No lives were lost in the storm, but 972 people were evacuated and over $1 million in damages were reported.

Flooding occurred along the southeastern perimeter of Watsonville on January 4, 1982, when the Corralitos Creek levee overtopped. Several homes were damaged, and there was shallow flooding along Bridge Street and Riverside Drive. According to stream gauge records for Corralitos Creek at Freedom, the January 1982 flood is the flood of record for Corralitos Creek. Flooding was also reported to have occurred in February 1986 along Corralitos Creek between the community of Freedom and Highway 152. Local estimates were that several million dollars of flood damage resulted.

The January 1997 flood exceeded the channel capacity on Corralitos Creek, which resulted in minor flooding upstream of the Highway 152 Bridge. During the high flows of February 1998, backwater from the Pajaro River caused overtopping of the east–bank levee in the lower reach of Salsipuedes Creek, just upstream of the Highway 129 Bridge. No flood damages were reported, but levee seepage was evident along the Salsipuedes Creek west–bank levee, just upstream of Highway 152. Emergency repairs by USACE prevented the possibility of severe flooding throughout Watsonville.

There is significant risk to public health, safety, and property in the project area associated with flooding. The existing levee system within the project area provides flood risk management benefits to over 10,000 acres of mixed-use land with a current population estimated at 12,600 residents located in the floodplain (approximately 3,000 residents in Pajaro and 9,600 in Watsonville) and an estimated $1.2 billion in damageable property. Further, as the floodplain habitat has been altered, native functional habitats have been lost causing impacts to endangered and threatened species.

The problems and opportunities in the Pajaro Project area include:

- PROBLEM: There is a risk to human life and safety in the City of Watsonville, Town of Pajaro, and surrounding unincorporated areas due to flooding from the Pajaro River, Salsipuedes Creek, and Corralitos Creek.

- PROBLEM: There is a high risk of economic flood damage to urban infrastructure within the City of Watsonville and Town of Pajaro from the Pajaro River, Salsipuedes Creek, and Corralitos Creek.

- PROBLEM: There is a high risk of economic flood damage to agricultural infrastructure and croplands within the project area from the Pajaro River, Salsipuedes Creek, and Corralitos Creek.

- PROBLEM: Aquatic and riparian habitat have been significantly compromised in the Pajaro River and Salsipuedes Creek tributary since the construction of the 1949 Federal project. The existing levee system and land uses have adversely modified geomorphic processes, ecological functions, and water quality associated with these ecosystems, which act as essential habitat for federally listed species. These ecosystems have been designated as critical habitat for steelhead trout.

Opportunities listed here are those positive conditions to be achieved by an alternative plan.

- OPPORTUNITY: There is an opportunity to coordinate with Pajaro River watershed flood and land management organizations, in the effort to deliver sustainable flood risk management within the watershed. Flood risk management includes public safety and flood damage reduction for urban and agricultural areas.

- OPPORTUNITY: To sustain and increase aquatic habitat, riparian habitat, and water quality for special status and other native species in conjunction with other flood risk management features in the project area.

- OPPORTUNITY: There is an opportunity to restore a more naturally functioning riverine system that would minimize future maintenance requirements and related impacts to riverine ESA species.

- OPPORTUNITY: Based on the subsurface geological setting, there is an opportunity to improve water recharge in the Corralitos reaches of this project in conjunction with other flood risk management features.

- OPPORTUNITY: There is an opportunity to increase recreational opportunities in conjunction with flood risk management features and existing land uses.

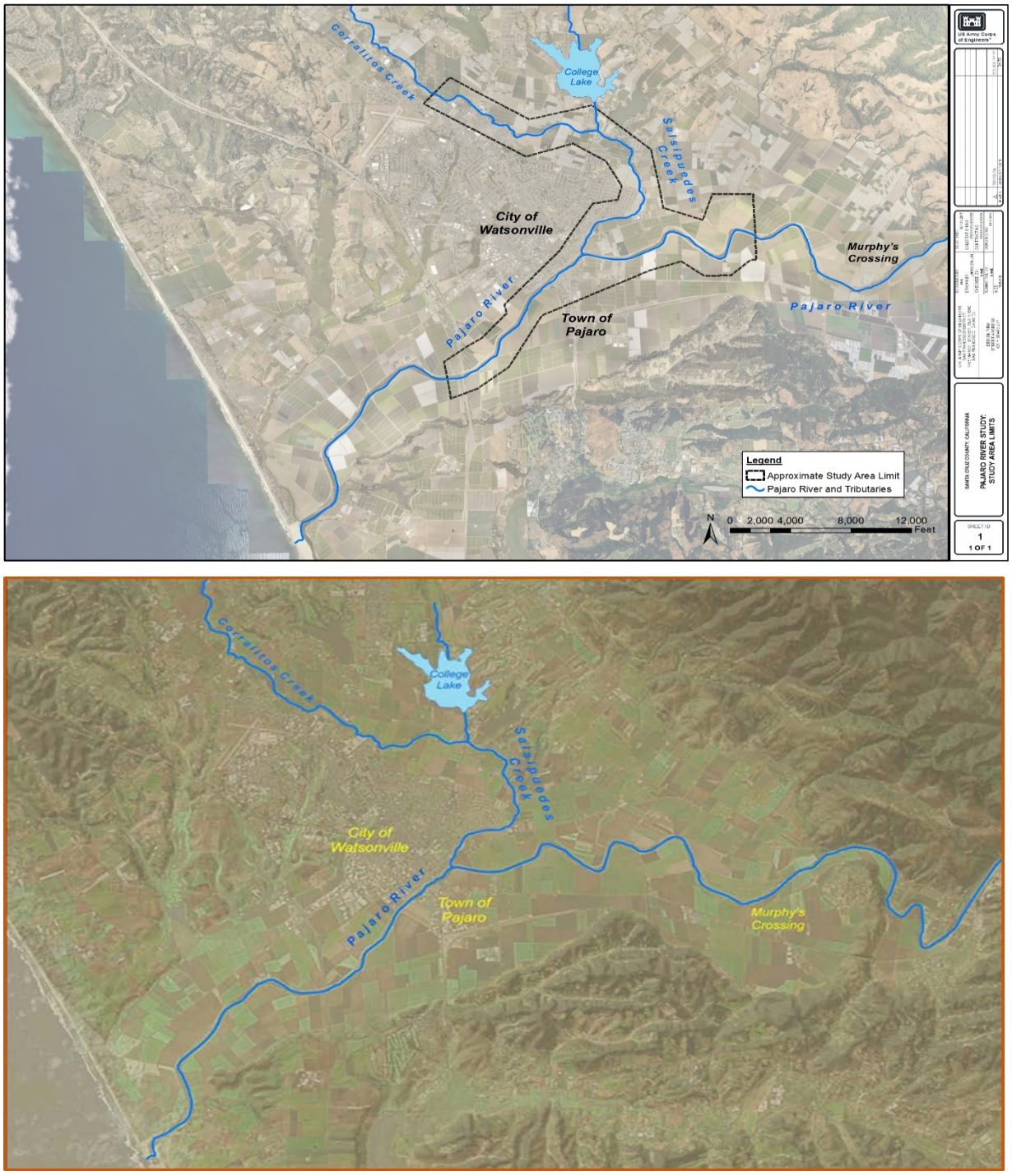

Figure ES-1: The Pajaro River Study Area

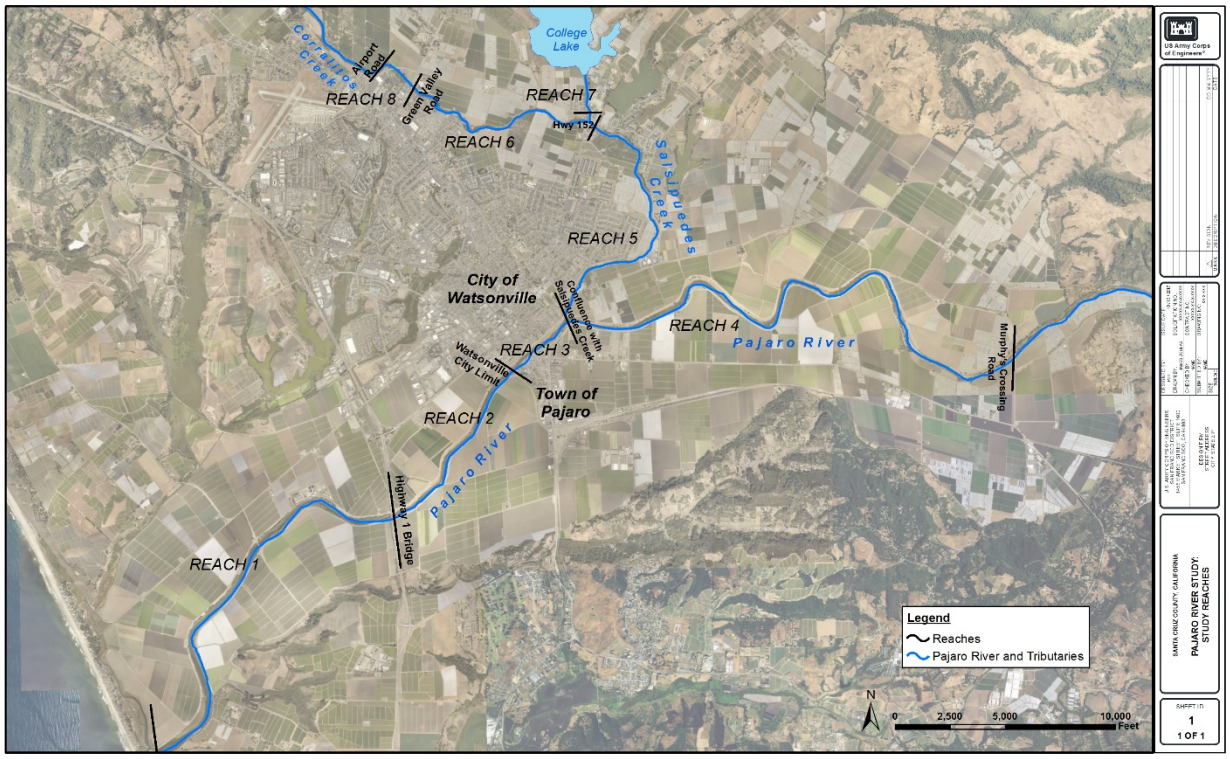

Figure ES-2: Study Reaches

CONSIDERATION OF ALTERNATIVE PLANS

During the study, the Federal planning process for development of water resource projects was followed to identify a Tentatively Selected Plan (TSP) for implementation under the discretionary authority of USACE Chief of Engineers in accordance with the project authorization provided by Section 203 of the 1966 Flood Control Act; or for a new Congressional authorization if warranted. Following definition of flood related problems and opportunities, specific planning objectives and planning constraints were identified. Various management measures were then identified to achieve the planning objectives and avoid the planning constraints. Management measures were combined to form an initial array of flood risk management alternative plans.

The strategy to move from the initial array to the final array of alternatives included the following steps: Apply metrics to the initial array of alternatives; select the best alternative for each separable area based on cost and benefit analysis; and combine the best alternatives to be carried forward to the final array. The final alternative plans were then compared to tentatively identify the plan that reasonably maximized net National Economic Development (NED) benefits, consistent with protecting the Nation's environment. The tentative NED plan is also the Tentatively Selected Plan (TSP).

The Final Array of Alternatives described in the draft GRR/EA are discussed below. Additional alternatives were originally proposed during the plan formulation process, but were screened from further analysis. More information about the alternatives eliminated from consideration can be found in the Plan Formulation Appendix (Appendix A).

No Action Alternative

Under the No Action Alternative, USACE would not conduct any additional work to address flooding concerns in the Pajaro Project area. As a result, the City of Watsonville and Town of Pajaro and surrounding agricultural area would remain at risk of a levee failure and flooding. There would be a continued high risk to human health and safety, property, and the adverse economic impact that serious flooding could cause would continue, and the risk of a catastrophic flood would remain high. Operation and maintenance of the levee system would continue as presently executed by the local maintaining entities.

Mainstem Alternatives

Alternative 1. This alternative includes improvements on both banks of Reaches 2, 3, and 4 (See **Figure ES-2**). Improvement on both banks of Reach 2 include demolition of the existing levee and construction of a new 100-foot setback levee. In Reach 3 on both banks the existing levee would be improved in place with a floodwall. In Reach 4 on the left bank the existing levee would be degraded and a new 100 foot setback levee would constructed. These levees would be constructed to contain the 1% Annual Chance Exceedance (ACE) event. On the right bank of Reach 4 the existing levee would be improved in place to contain the 4% ACE event.

Alternative 2. This alternative includes project features in Reach 2 and Reach 3. Alternative 2 limits the flood risk management areas to the City of Watsonville and the Town of Pajaro; protection provided to agricultural land is limited. In Reach 2, levees would be set back 100 feet on the north side of the Pajaro River. Reach 3 levees would be improved in place with a floodwall to the same level as those in Alternative 1. Levees on the south side of Pajaro River would be raised in their current locations starting at a point 100 feet downstream from the railroad bridge to a point 750 feet downstream of Salsipuedes Creek. Project levees would be constructed that encircle the Town of Pajaro. Existing project levees in Monterey County outside of the ring levee project area (Reaches 2 and 4) would remain in place and would not be raised. All bridges crossing the Pajaro River will remain in place.

Alternative 3. Alternative 3 includes features from Alternative 1 plus optimized Channel Migration Zone (CMZ) levees in Reach 4. The CMZ levees in Reach 4 are designed to consider larger setbacks where space is available at meander bends in order to provide for cost savings on levee construction and O&M as well as to provide for a more self-sustaining channel. In reaches 2 and 3 the levees would be improved the same as Alternative 1, new levees setback 100 feet on both banks of Reach 2 and the existing levees improved in place with a floodwall on Reach 3. In Reach 4, instead of a one-sided levee on the left-bank there would be optimized CMZ levees on both banks of lower Reach 4.

Alternative 4. This alternative is the same as Alternative 1 but the completion levee on the right bank of reach 4 would be designed to the non-Federal sponsor's preferred 2% ACE. This alternative includes improvements on both banks of Reaches 2, 3, and 4. Improvement on both banks of Reach 2 include demolition of the existing levee and construction of a new 100-foot setback levee. In Reach 3 on both banks the existing levee would be improved in place. In Reach 4 on the left bank the existing levee would be degraded and a new 100 foot setback levee would constructed. These levees would be constructed to contain the .01 Annual Chance Exceedance (ACE) event.

Tributary Alternatives

Alternative 5. In Reach 5, flood risk management would be achieved by raising existing levees in place with a setback levee on the opposite bank (the setback side switches between right and left–banks), and constructing floodwalls or a combination levee with a floodwall on top where urban development prevents raising existing levees. Salsipuedes Creek levees would be set back from 100 feet up to a maximum 225 feet in Reach 5. A floodwall would be constructed 2–5 feet tall on top of a new levee on the right–bank along the most downstream 2,450 feet of Reach 5 (starting at the confluence with the Pajaro River). Beginning approximately 8,800 feet upstream from the confluence with the Pajaro River, a floodwall would be constructed on the left–bank between Lakeview Road and College Road—a distance of approximately 1,460 feet—followed by a 2,584 foot length of floodwall about 4 feet tall on top of a new levee.

In Reach 6, new levees would be built on both sides of the Creek, set back from the existing natural streambanks approximately 50–75 feet (edge of channel to centerline of levee). A 490–foot length of floodwall would be constructed on the right–bank at Marigold Avenue. In Reach 7, an earthen detention levee structure that transitions into a floodwall on the right–bank of Salsipuedes Creek would be constructed aligned along the northern border of the Orchard Park subdivision. Approximately 1,700 feet of the Pinto Creek ditch would be relocated to accommodate construction of the detention levee because it is situated within the footprint of the proposed levee embankment. Pinto Creek would be realigned so that it empties into College Lake behind the containment levee. No levees or floodwalls would be constructed along the left–bank. New culverts, trapezoidal earth channel sections, and concrete U–walls would be constructed to connect the outflow channel from College Lake to the confluence of Corralitos and Salsipuedes Creeks. Channel improvements downstream of College Lake would be implemented to ensure improved regulation of College Lake during large storm events. In Reach 8, a new levee would be constructed on the left–bank only.

Alternative 6. This alternative would include the same measures as Alternative 5 but would exclude the levees along the left bank of Corralitos Creek. Instead, a ring levee would be constructed around the Orchard Park subdivision and the School district building along Corralitos Creek.

Alternative 7. The intent of this alternative is to construct optimize CMZ levee setbacks at meander bends in order to balance natural geomorphic conditions and sustainability with

existing land use. This alternative would have all the elements of Alternative 5; however, Channel Migration Zones (CMZ) levees would be incorporated into design of the proposed levee setbacks in Reaches 5, 6 and 8.

Alternative 8. This alternative would have all the elements of Alternative 5; however, Channel Migration Zones (CMZ) levees would be incorporated into design of the proposed levee setbacks in Reaches 5, 6 and 8 and there would be no levee on the left-bank of Corralitos Creek. Instead, a ring levee would be constructed around the Orchard Park subdivision in Reach 7 and the School district building along Corralitos Creek in Reach 8.

AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION

The environmental effects of implementing each of the action alternatives are described in Chapter 4. Initial evaluation of the effects of the project indicated that there would likely be little to no effect on geology, seismicity, timber and minerals. Sixteen other resources were analyzed in greater detail and compared to the No Action Alternative. The alternative formulation process focused considerable effort on developing a final array of alternatives that would avoid and minimize adverse effects. With the incorporation of the mitigation measures, including best practices, identified in Chapter 4, all of the action alternatives (Alternatives 1 through 8, and the TSP) would result in less than significant direct and indirect effects, and would not incrementally contribute to a significant cumulative effects on the resources considered. Therefore, a draft finding of no significant impact (FONSI) has been prepared and accompanies this GRR/EA.

COMPLIANCE WITH APPLICABLE LAWS, REGULATIONS, POLICIES AND PLANS

This document includes an integrated environmental assessment (EA) that complies with National Environmental Policy Act (NEPA) requirements. The project will comply with all Federal and State laws, regulations, Executive Orders, and permit requirements (see Chapter 5).

PUBLIC INVOLVEMENT

Public involvement activities associated with the project include public and agency meetings, consultation with Native American Tribes, and distribution of the draft GRR/EA for public review and comment. USACE published the notice of intent (NOI) to prepare a joint EIS/EIR for the Pajaro River Flood Risk Management Study in the Federal Register (June 8, 2001, 66 FR30894). One public scoping meeting was held on June 21, 2001 at the Watsonville Senior Center. The purpose of the meeting was to initiate scoping for the study and EIS/EIR while gathering additional information and community comments from citizens who live, work, and commute near the project area. The public was invited to submit written comments during and after the meeting.

Since publication of the NOI in 2001, the USACE and the study sponsors worked with stakeholders to identify and analyze a broad range of measures, alternatives, and mitigation. As part of this process, the study partners incorporated measures to avoid, minimize and compensate for adverse environmental effect. As a result, the environmental review conducted as part of this study has initially concluded that, with mitigation, the proposed alternatives would not result in any significant environmental effects. Therefore, an EA has been prepared instead of an EIS. Also, the Corps now requires water resources planning and National Environmental Policy Act (NEPA) documents to be integrated into a single document, in this case, an integrated GRR/EA. The California Environmental Quality Act (CEQA) document for the study is being prepared separately by Santa Cruz and Monterey Counties as the CEQA lead agencies.

This Draft GRR/EA will be circulated for a 30-day review to Federal, State, and local agencies; organizations; and individuals who have previously expressed an interest in the project. Public notification of the availability of the draft document for comment will be made by at least one of the following procedures: publication in the Federal Register; publication in a local newspaper of general circulation; and, direct mailings to agencies and individuals known to have an interest in the proposed action. A public workshop will be held on November 8, 2017, during the review period to provide additional opportunity for comments on the draft GRR/EA. The public workshop will be at the Watsonville Civic Plaza Community Room, 275 Main Street, 4th Floor, Watsonville, CA 95076, from 6:00 p.m. to 8:00 p.m. All comments received during the public review period will be considered and incorporated into the final GRR/EA, as appropriate. A comments and responses appendix will be included in the final GRR/EA.

COMMUNICATION WITH NATIVE AMERICANS

A list of potentially interested Native Americans was obtained from the Native American Heritage Commission. Consultation letters were sent to the Amah Mutsun Tribal Band, the Amah Mutsun Tribal Band of Mission San Juan Bautista, the Costanoan Rumsen Carmel Tribe, the Costanoan Ohlone Rumsen-Mutsen Tribe, the Esselen Tribe of Monterey County, the Indian Canvon Mutsun Band of Costanoan, the Muwekma Ohlone Indian Tribe of the San Francisco Bay Area, the Ohlone/Coastanoan-Esselen Nation, the Salinan Tribe of Monterey and San Luis Obispo Counties, and the Xolo-Salinan Tribe. Both the draft and final GRR/EA will be provided to these Tribes.

AREAS OF KNOWN OR EXPECTED CONTROVERSY

NEPA requires identification of issues of known controversy that have been raised in the scoping process and throughout the development of the project. The following issues were identified as a result of public scoping, stakeholder engagement, and conduct of the environmental review.

Property Acquisition

A specific issue of concern involves potential conflicts with private property within or near the construction area. In some cases, permanent property acquisition would be needed for project construction and O&M. Temporary construction easements will likely be needed for construction staging and equipment access, and temporary restrictions on access to private property may also be necessary.

Construction-Related Effects

Some portions of the levee system in the project area are adjacent to residential areas and other developed land uses. Construction activities are likely to result in construction-related effects including noise and traffic detours (car, bicycle, and pedestrian). These effects are described, together with mitigation measures to reduce adverse effects, in Chapter 4.

Levee Encroachment

The project would require removal, relocation or replacement of features in, on, or under the levee or adjacent O&M corridors such as structures, pipelines, walls, stairs, utilities and other elements such as vegetation.

Setback Levee Distance

A long-standing concern among some agencies and stakeholders is the appropriate and desirable distance from the waterway that levees should be setback. To provide the most ecological benefits some prefer a large setback distance. To preserve agricultural values and private property, others prefer a small setback distance, or no setback at all. A variety of distances were analyzed during development of the final alternatives.

TENTATIVELY SELECTED PLAN

The Tentatively Selected Plan (TSP) is the NED plan, which reasonably maximizes net benefits, is the combined Alternative 1 on the Mainstem of the Pajaro River and Alternative 6 on the Tributaries (**Figure ES-3**). An economic optimization analysis and further refinements to hydraulic and geotechnical engineering analysis was performed on the TSP (Alternative 1 [Main Stem] and Alternative 6 [Tributaries]). As a result the following modifications and refinements were made:

- 4% ACE improvement to the existing levee the right bank of Reach 4 (Alternative 1) on the mainstem was removed.
- 4% ACE levees/floodwalls in Reaches 5 and 6 of the tributaries (Alternative 6) were found to be economically optimal in lieu 1% ACE ring levee at Corralitos Creek.

- Project features and improvements associated with flood risk management at College Lake and Pinto Creek in Reach 7 (Alternative 6) were removed.

This plan meets the study objectives of reducing flood risk and flood damages. The TSP greatly reduces flood risk to people and property in the project area. The TSP provides benefits to 12,600 residents by improving existing levees and adding levees to reduce the chance of hazardous flooding in the area.

The structural features of the TSP on the mainstem include approximately 8 miles of new setback levee and 2 miles of improved levees with floodwalls. The levee improvements include new levee, levee geometry improvements, floodwalls and erosion protection, which provide for a 1% ACE level of protection for the City of Watsonville and the Town of Pajaro, and adjacent agricultural areas

The structural features of the TSP on the tributaries include approximately 5.5 miles of new setback levee and 2 miles of improved levees with floodwalls. The levee improvements include new levee, levee geometry improvements, and floodwalls, which provide 1% ACE level of protection for the City of Watsonville (including adjacent agricultural areas) and 4% ACE level of protection for the Orchard Park and Interlaken neighborhoods (including adjacent agricultural areas).

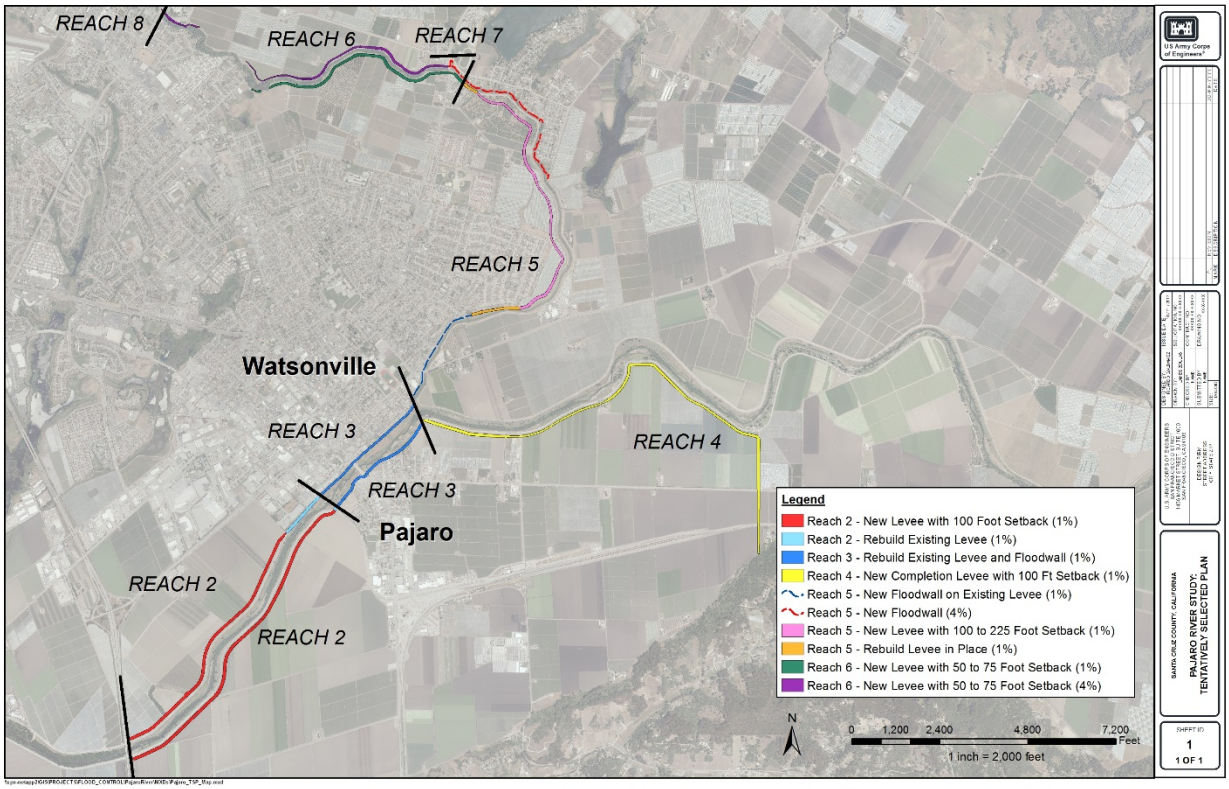

Figure ES-3: The Tentatively Selected Plan

ESTIMATED COST AND COST SHARING

Investment cost accounts from the draft Micro Computer-Aided Cost Engineering System (MCACES) cost estimate for the TSP are displayed in **Table ES-1** below.

Table ES-1. First Cost of Tentatively Selected Plan ($1,000)[1]

Cost Account	Construction Item	GRR Recommended Plan
01	Lands and Damages[2]	46
02	Relocations[2]	63,306
06	Fish & Wildlife Facilities[3]	0
11	Levees & Floodwalls	74
16	Bank Stabilization	3,
18	Cultural Resources Preservation	0
	Subtotal	**18**
30	Planning Engineering & Design	38
31	Construction Management	20,364
	Total First Cost	**24**
	Associated Costs	
	Total Costs	**24**

[1]Costs are in October 2016 price levels at 2.875 percent and 50 year period of analysis.
[2]LERRDs cost estimates have been updated and is currently estimated at a total of $84.3M per refinements to current project footprint as a result of the economic optimization analysis. The LERRDs cost estimate for the Final Integrated GRR/EA will be updated accordingly.
[3]The project has been designed to be self-mitigating through incorporation of setback levees and no additional compensatory mitigation costs are anticipated.

The estimated annual costs and benefits of the TSP are presented in **Table ES-2**. Refinement of the TSP to a recommended plan during the next milestone phase of work will further refine this information.

Table ES-2: Estimated Annual Costs for the Tentatively Selected Plan ($1,000)

Item	GRR Recommended Plan[1]
First Cost	245,556
Interest During Construction (IDC)	2,726
Total	**248,282**
Interest and Amortization	9,422
OMRR&R	200
Subtotal – Average Annual Costs	**9,622**
Monetary Benefits (FRM)	17,985
Net Annual FRM Benefits	**8,363**
FRM Benefit-Cost Ratio	**1.9**

[1]Costs are October 2016 price levels at 2.875%, for a 50-year period of analysis.

Table ES-3 below shows the preliminary cost apportionment for the TSP. The non-Federal sponsors are responsible for all Lands, Easements, Rights of Way, Relocations, and Disposal Sites (LERRDs) costs, and a minimum of 5% cash. The maximum non-Federal share is 50% of the total project cost.

Table ES-3. Preliminary Cost-Share Apportionment for Tentatively Selected Plan[1]

A				
ACT	**ITEM**	**FEDERAL**	**NON-FEDERAL**	**TOTAL**
1	Lands and Damages[2]		46,124	46,124
2	Relocations[3]	-	63,306	63,306
6	Fish and Wildlife Facilities	-	-	-
11	Levees and Floodwalls	74,018	-	74,018
16	Bank Stabilization	3,116		3,116
18	Cultural Resources	-		-
30	PED	38,628		38,628
31	Construction Management	20,364		20,364
	Subtotal First Cost	136,126	109,430	245,556
	Non-Federal 5% Cash Contribution[4]	-12,278	12,278	
	Total First Cost	123,848	121,708	245,556
	% of Total First Cost	50.4%	49.6%	

[1]Recommended plan summary of first cost from 2017 Pajaro River FRM Study
[2]Based on October 2016 price level, 2.875% interest rate, 50-year period of analysis, Costs in $1,000
[3]LERRDs cost estimates have been updated and is currently estimated at a total of $84.3M per refinements to current project footprint as a result of the economic optimization analysis. The LERRDs cost estimate for the Final Integrated GRR/EA will be updated accordingly.
[4]Non-Federal cash contribution reflects the 5% requirement for structural FRM features

MAJOR CONCLUSIONS

The preliminary recommendation of the District Engineer of the San Francisco District, U.S. Army Corps of Engineers is that the report be finalized based on results of public review, internal policy review, and ATR, of this draft GRR/EA, and if warranted, recommended for authorization for implementation as a Federal project. The estimated first cost of the tentatively selected plan is $245,556,000 and the estimated annual OMRR&R costs are $200,000. The Federal portion of the estimated first cost is $123,848,000. The non-Federal sponsor portion of the estimated first cost is $121,708,000.

District Quality Control (DQC) discovered an instability issue with the hydraulic model in the areas where setback levees are recommended. This hydraulic model instability caused a volume conservation error where a significant portion of the hydrograph was being lost in the transfer of flow from the 1D cross section to the newly created 2D setback area, which resulted in erroneous lower water surface elevations with the setback levees potentially undersized. This issue occurs wherever there are setback levees at all frequencies across all alternatives. As such, it is not expected to significantly impact the alternative formulation or comparison. All indications to date suggest that there is still Federal interest supporting a viable NED plan; however the sizing and scale of the NED plan with respect to project performance and level of protection provided is at risk of changing. There now exists the possibility that that the current design height of the setback levees may not be able to contain the current NED plan of 1% (1/100) ACE event as expected. Preliminary efforts were unable to sufficiently resolve the issue in time to meet the suspense date for public release of the Draft GRR/EA for concurrent review (Public/USACE Policy/USACE ATR/Regulatory Resource Agencies). The hydraulic model issue will be resolved during the concurrent review as the study advances into feasibility-level design.

ACRONYMS

AADT	Average Annual Daily Traffic
ACE	Annual Chance of Exceedence
AEP	Annual Exceedance Probability
AFB	Alternative Formulation Briefing
APV	Action Pajaro Valley
ATR	Agency Technical Review
BACT	Best Available Control Technology
BCR	Benefit-to-Cost-Ratio
BMP	Best Management Practices
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CalEPA	California Environmental Protection Agency
CalFire	California Department of Forestry and Fire Protection
CalTrans	California Department of Transportation
CARB	California Air Resources Board
CCC	California Coastal Commission
CCR	California Coad of Regulations
CDFG	California Department of Fish and Game (now California Department of Fish and Wildlife)
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cfs	Cubic Feet per Second
CFR	Code of Federal Regulations
CH_4	Methane
CMZ	Channel Migration Zone
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRLF	California Red-legged Frog
CRWQCB	California Regional Water Quality Control Board
db	Decibel
dbA	A-weighted decibel scale
DDD	Dichlorodiphenyldichloroethane

DPM	Diesel Exhaust Particulate Matter
DDT	Dichlorodiphenyltrichloroethane
DQC	District Quality Control
EA	Environmental Assessment
EAD	Expected Annual Damages
EDR	Environmental Data Resources
EIA	Economic Impact Area
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EOP	Environmental Operating Principles
EQ	Environmental Quality
ESA	Endangered Species Act (Federal)
ESU	Evolutionarily Significant Unit
ER	Engineering Regulation
FMMP	Farmland Mapping and Monitoring Program
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FRM	Flood Risk Management
FY	Fiscal Year
FYLF	Foothill Yellow-legged Frog
GC	California Government Code
GHG	Greenhouse Gas
GRR	General Reevaluation Report
GRR/EA	Integrated General Reevaluation Report and Environmental Assessment
HEC-FDA	Hydrologic Engineering Center-Flood Damage Analysis model
HQUSACE	Headquarters, USACE
HTRW	Hazardous, Toxic, and Radioactive Waste
IA	Initial Appraisal
IDC	Interest During Construction
KO	Contracting Officer
LAFCO	Local Agency Formation Commission
LERRD	Lands, Easements, Rights-of-Way and Disposal sites
LPP	Locally Preferred Plan
LUST	Leaking Underground Storage Tanks
MBUAPCD	Monterey Bay Unified Air Pollution Control District
MCE	Maximum Credible Earthquake
MCWRA	Monterey County Water Resources Agency
mi	Mile
MSAT	Mobile Source Air Toxics
MST	Monterey-Salinas Transit
N_2O	Nitrous Oxide

NAAQS	National Ambient Air Quality Standards
NAP	Normal Annual Precipitation
NCCAB	North Central Coast Air Basin
NED	National Economic Development
NEPA	National Environmental Policy Act
NFS	Non-federal Sponsor
NHPA	National Historic Preservation Act
NOI	Notice of Intent (NEPA)
NOP	Notice of Preparation (CEQA)
NMFS	National Marine Fisheries Service
NO_x	Nitrogen Oxides
NRHP	National Register of Historic Places
O_3	Ozone
OCMZ	Optimized Channel Migration Zone
NOAA Fisheries	National Oceanic and Atmospheric Administration Fisheries Service
O&M	Operation and Maintenance
OMB	Office of Management and Budget
OMRR&R	Operation, Maintenance Repair, Replacement and Rehabilitation
OSE	Other Social Effects
PA	Programmatic Agreement
PDT	Project Delivery Team
PED	Pre-Construction, Engineering and Design
PFP	Probable Failure Point
PGA	Peak Ground Acceleration
PL	Public Law
$PM_{2.5}$	Particulate Matter 2.5 micrometers or less in diameter
PM_{10}	Particulate Matter 10 micrometers or less in diameter
PNP	Probable Non-failure Point
PPA	Project Partnership Agreement
Ppmw	Parts Per Million Weight
PRB	Pajaro River Basin Project
PRWFPA	Pajaro River Watershed Flood Prevention Authority
PSDMD	Pajaro Storm Drain Maintenance District
RED	Regional Economic Development
RWQCB	Regional Water Quality Control Board
S-CCC	South Central California Coast
SC	Species of special Concern
SCCRTC	Santa Cruz County Regional Transportation Commission
SHPO	State Historic Preservation Officer
SO_2	Sulfur Dioxide
SPD	USACE, South Pacific Division

SPF	Standard Project Flood
SPN	San Francisco District, U.S. Army Corps of Engineers
SWPPP	Storm Water Pollution Prevention Plan
TAC	Toxic Air Contaminants
TMDL	Total Maximum Daily Load
TSP	Tentatively Selected Plan
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOCs	Volatile Organic Compounds
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act

CHAPTER 1 – STUDY INFORMATION

1.1 INTRODUCTION

This General Reevaluation Report (GRR) presents the draft findings of a feasibility-level investigation, conducted by the U.S. Army Corps of Engineers (USACE) San Francisco District (SPN) in collaboration with the non-federal sponsors (NFSs), Santa Cruz County Flood Control and Water Conservation District (Santa Cruz County) and Monterey County Water Resources Agency (Monterey County). The purpose of the study is to determine if there is a Federal interest in providing additional flood risk management (FRM) improvements along the Pajaro River and its tributaries The study involved the formulation of alternative plans to reduce flood risk in the study area, evaluation of economic and environmental impacts of the alternatives, including the no action alternative, and identification of the plan that maximizes the net National Economic Development (NED) benefits and complies with applicable federal and state environmental regulations. This document consists of a GRR with an integrated Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA).

1.2 PURPOSE AND NEED FOR THE PROJECT

The purpose of the project is to reduce flood risk to the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands. The project is needed to address the long history of flooding in the study area. This flooding has resulted in substantial damages in the Town of Pajaro and City of Watsonville and surrounding agricultural areas

1.3 PROJECT AUTHORIZATION HISTORY

The existing USACE Pajaro River flood risk management project was completed in 1949 and authorized by the Flood Control Act (FCA) of 1944 (Public Law No. 534, 78th Congress, Ch. 665, 2nd Session) which reads:

> *The plan of improvement for local flood protection on the Pajaro River and tributaries, California is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in session, at an estimated cost of $511,160.*

A new project authorization to modify the existing Pajaro River flood risk management project was provided by the Flood Control Act of 1966 (Section 203, Public Law 89–789, 80 Stat. 1421) stating:

The project for flood protection on the Pajaro River, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 491, Eighty–ninth Congress, at an estimated cost of $11,890,000.

Section 1001 of the Water Resources Development Act (WRDA) of 1986 states that every two years, the Secretary of the Army shall submit a list of projects to Congress for de-authorization. The list would include authorized projects that have not been constructed and have received no funding for the previous 10 fiscal years (FYs). In order to avoid de-authorization, the Pajaro River flood risk management feasibility study was re-authorized by the WRDA 1990, Section 107 Continuation of Authorization of Certain Projects (Public Law 101–640, November 28, 1990), which reads in part as follows:

(a) General Rule.—Notwithstanding section 1001(b)(1) of the Water Resources Development Act of 1986, the following projects shall remain authorized to be carried out by the Secretary: (1) Pajaro River, Santa Cruz, California. —The project for flood control, Pajaro River and tributaries, Santa Cruz, California, authorized by the Flood Control Act of 1966 (80 Stat. 1421).

Section 107 of WRDA 1990 provided that the Pajaro River FRM project as authorized by the FCA of 1966 remain authorized. SPN is currently reviewing the data from the feasibility investigation to confirm the proper authority for the construction of the Project.

1.4 STUDY AREA

The Pajaro River watershed is located on the central coast of California about 75 miles south of San Francisco and includes portions of Santa Clara, San Benito, Santa Cruz, and Monterey Counties ***(*Figure 1-1**). The watershed, which is approximately 88 miles long and 30 miles wide, drains an area of approximately 1,300 square miles of the southern section of the California Coastal Ranges, emptying into the Pacific Ocean six river miles southwest of the City of Watsonville.

The project area is located within the lower Pajaro River watershed. It encompasses an area of approximately 10,000 acres, which includes the stream channels, active floodplains, and terraces along the Pajaro River and Salsipuedes and Corralitos Creeks. The area is divided by the Pajaro River, which serves as the county boundary. Santa Cruz County lies to the north of the Pajaro River, and Monterey County lies to the south. Salsipuedes and Corralitos Creeks, which join just north of the Pajaro River in Santa Cruz County, are tributaries of the Pajaro River.

The City of Watsonville, north of the Pajaro River, and the unincorporated Town of Pajaro, south of the Pajaro River, are the two urban areas within the project area (**Figure 1-2**). The project area includes both widespread agricultural land devoted to high–value crops (e.g., strawberries, raspberries, and lettuce) and extensive residential, commercial, and industrial structures within the two urban areas.

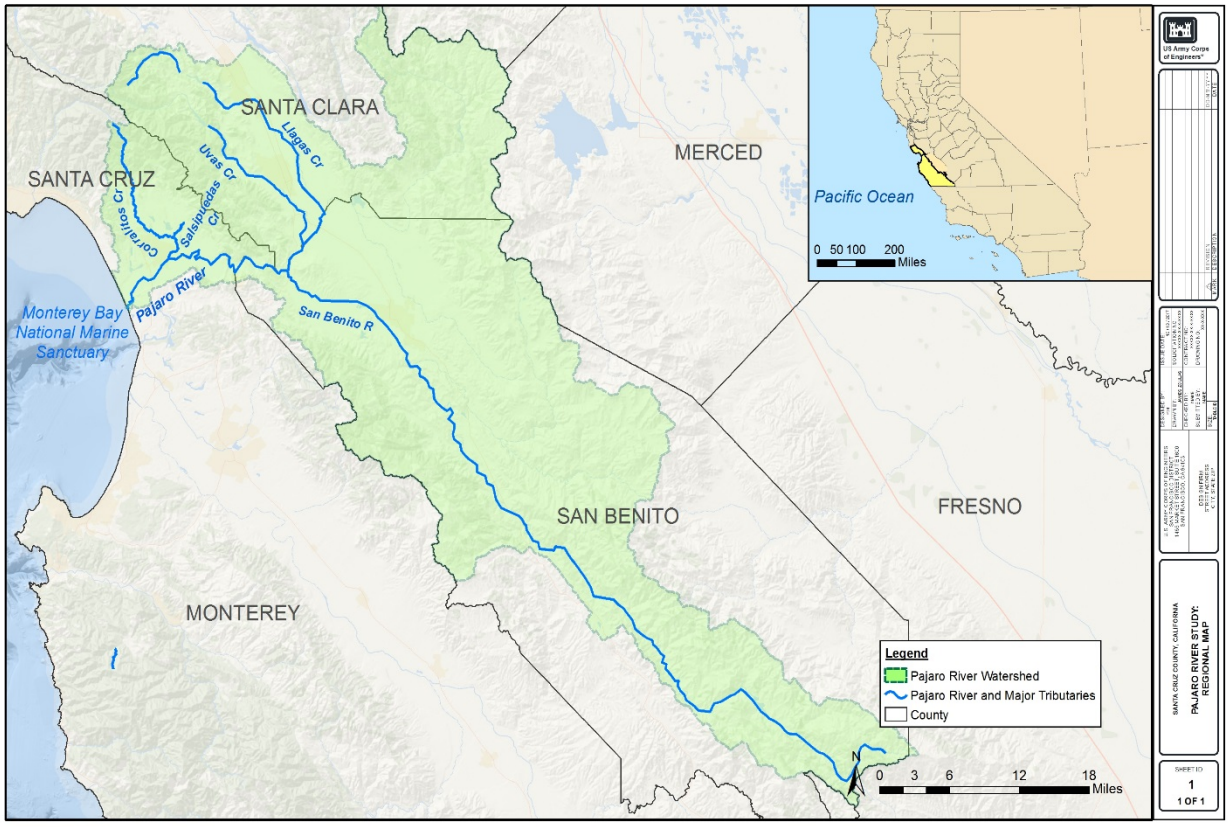

Figure 1-1: Regional Map of Study Area Setting

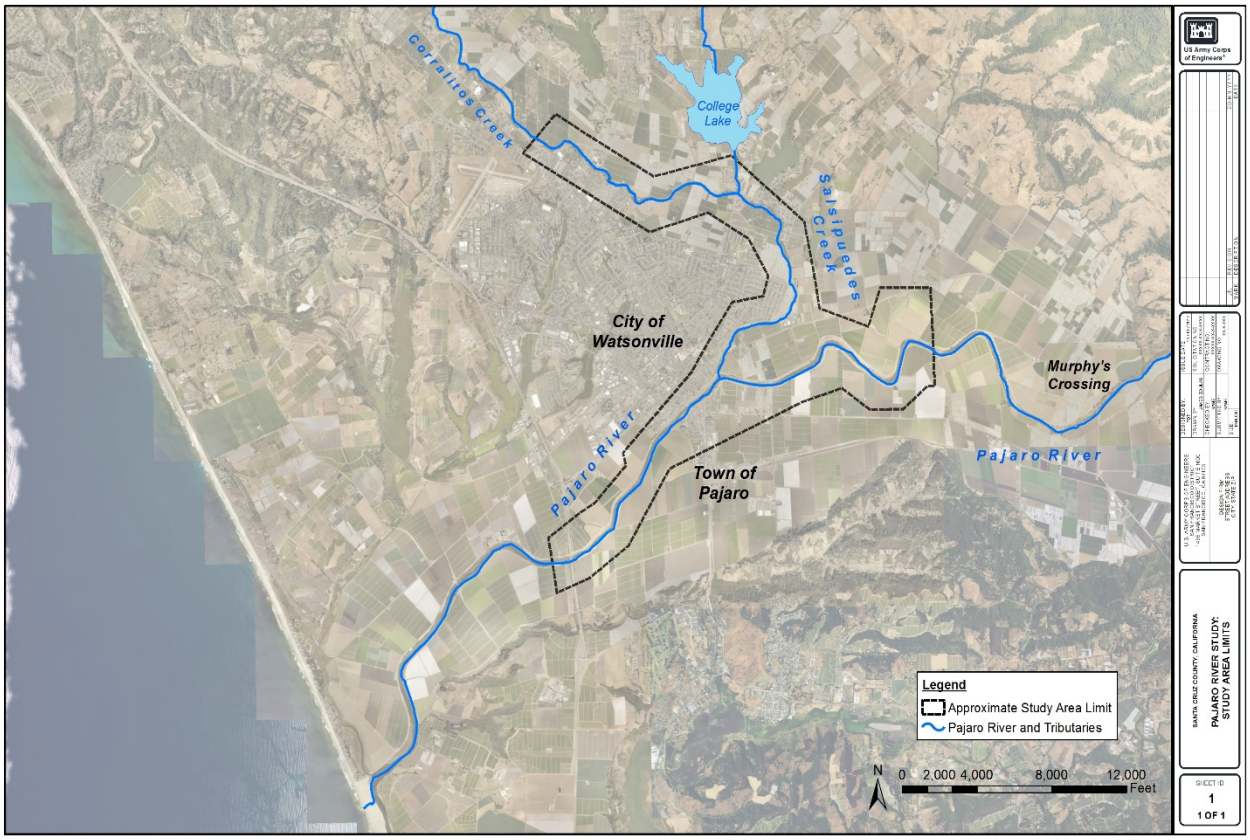

Figure 1-2: Study Area

The study area was divided into eight reaches based on land use practices, major confluences, and existing significant bridges (**Figure 1-3**):

- **Reach 1** is the most downstream reach of the Pajaro River mainstem, located between the Highway 1 Bridge and the Pacific Ocean. It is approximately 4.0 miles long.
- **Reach 2** is the stretch of the main stem of the Pajaro River extending from the Highway 1 Bridge to the west side of Watsonville's city limits. It is approximately 1.5 miles long.
- **Reach 3** is the stretch of the main stem of the Pajaro River extending from the west side of Watsonville's city limits to the confluence with Salsipuedes Creek. It is approximately 0.9 mile long.
- **Reach 4** is the stretch of the main stem of the Pajaro River extending from the confluence with Salsipuedes Creek to Murphy's Crossing Road. It is approximately 5.0 miles long.
- **Reach 5** is the stretch of Salsipuedes Creek from its confluence with Pajaro River main stem to Highway 152. It is approximately 2.6 miles long.
- **Reach 6** is the stretch of Corralitos Creek from Highway 152 to Green Valley Road. It is approximately 1.8 miles long.

- **Reach 7** is the stretch of Salsipuedes Creek from Highway 152 upstream, below College Lake and including the ring levee at the Orchard Park subdivision. It is approximately 0.3 miles long
- **Reach 8** is the stretch of Corralitos Creek from Green Valley Road to Airport Road. It is approximately 0.3 miles long.

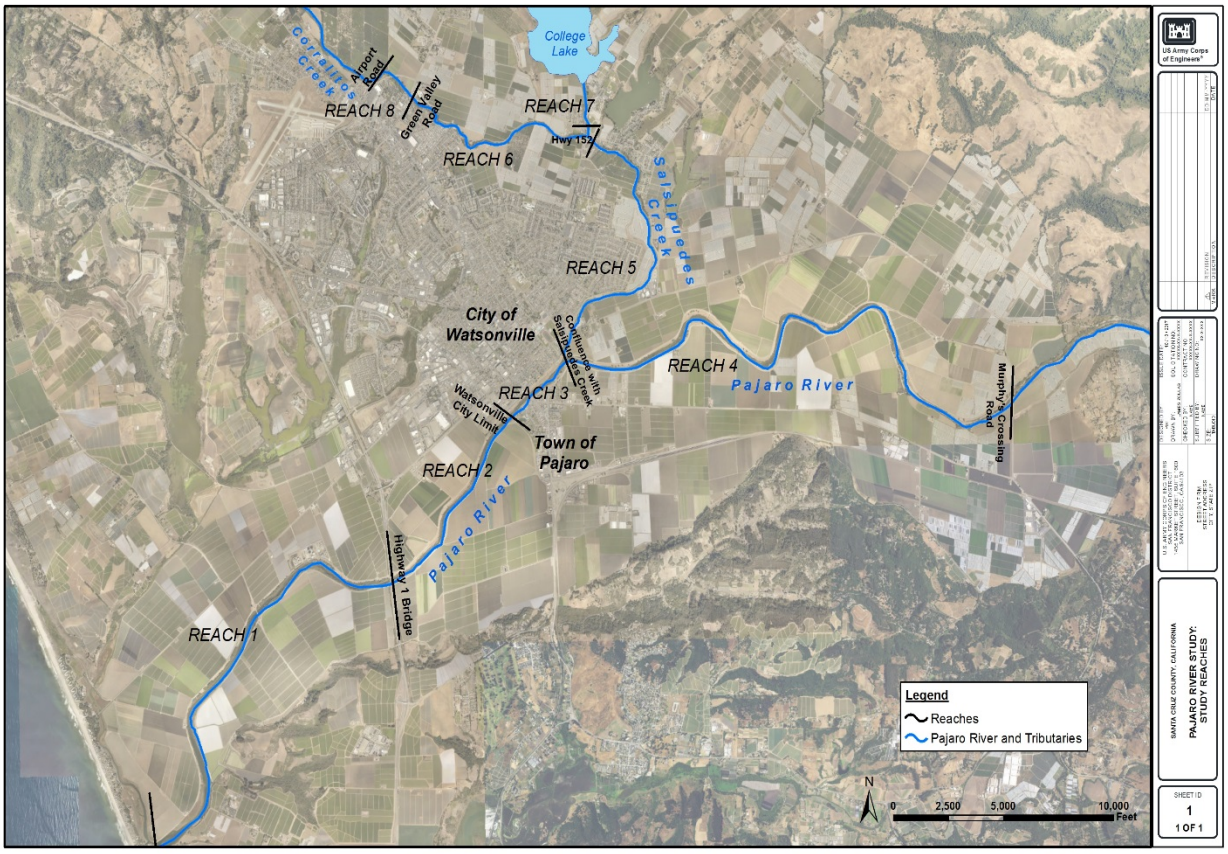

Figure 1-3: Study Reaches

1.5 PROJECT SPONSOR AND PARTICIPANTS

The project's NFSs are the Santa Cruz County Flood Control and Water Conservation District (Santa Cruz County) and the Monterey County Water Resources Agency (Monterey County). Both counties have submitted letters of support for the Pajaro FRM study, cost-shared in the study costs, and participated in the 2014 SMART Planning Charette, the Tentatively Selected Plan (TSP) Milestone Conference conducted on August 24, 2017, and other significant planning activities. The study area lies within the jurisdiction of the 20th Congressional District of California (Jimmy Panetta).

1.6 HISTORY OF INVESTIGATIONS IN THE STUDY AREA

In addition to previous reports prepared as required by Public Law 99, 84th Congress (PL84–99) for USACE Emergency Rehabilitation and Repairs of the existing 1949 USACE Federal FRM Project due to damage incurred from the multiple flood events over the life of the project, USACE has prepared the following studies and reports on the Pajaro River Basin:

1. **Survey Report, Pajaro River, California, House Document No. 505, 78th Congress, 2nd Session, October 1942**. This report recommended the authorization of a project for flood protection on the Pajaro River and its tributaries.
2. **Definite Project Report, Pajaro River and Tributaries, California, July 1946**. Authorized by Section 10 of the Flood Control Act of December 22, 1944 (Public Law 534, 78th Congress, 2nd Session) and in connection with the Survey Report, dated October 1942, this report provided detailed design for flood control improvements providing a 50–year level of protection with levees on the Pajaro River and Salsipuedes Creek. Construction was completed in 1949.
3. **Pajaro River Levee Project, Operation and Maintenance (O&M) Manual (c. 1949)**. This O&M manual was prepared and provided to Santa Cruz and Monterey Counties for implementation of their O&M responsibilities and obligations. The O&M manual describes the physical characteristics of the project, project history, and protection provided.
4. **Office Report on Standard Project Flood, Pajaro River Basin, California, December 1960**. The House Committee on Public Works authorized a review survey of the Pajaro River Basin on May 14, 1945. Headquarters approved the report on December 8, 1961.
5. **Interim Report for Flood Control, Pajaro River Basin, California and Appendices, June 1963, House Document No. 491, 89th Congress, 2nd Session**. This report, which was prepared in response to the 1955 and 1958 floods, recommended the modification and reconstruction of the existing levee system to provide a standard project flood (SPF) level of protection on Pajaro River and Corralitos and Salsipuedes Creeks. The estimated cost was $12,780,000 (approximately $99,000,000 at FY 2017 price levels). The Flood Control Act of 1966 authorized the recommended project; however, construction of the project was deferred because of withdrawn local support.
6. **Flood Control Alternatives for Pajaro Valley, Pajaro River, Salsipuedes & Corralitos Creek, July 1974**. This information pamphlet revisited the 1963 plan and presented a full range of alternatives that integrated water conservation and flood control. These alternatives included channel improvements and the use of dams and reservoirs.
7. **Reconnaissance Report, Pajaro River, California, March 1994**. This report presented the results of studies of the flooding problems in the communities of Watsonville and Pajaro as well as the adjacent farmlands. It identified the Federal interest in a plan for improvements primarily to the Pajaro River tributaries Corralitos and Salsipuedes Creeks, which would solve much of the frequent tributary flooding problem in Watsonville.
8. **Section 216 Initial Appraisal Report, 1998**. This initial appraisal report indicated that there was potential Federal interest with a floodwall project on the Pajaro River mainstem

and its tributaries with favorable economic justification. As such, further feasibility-level analysis was warranted.

1.7 EXISTING PROGRAMS, STUDIES, AND PROJECTS

The following are non–USACE relevant regional studies. This list is a subset of the information that has been developed for the past three decades and is not an inclusive list of all the investigations that have occurred in the Project area.

1. **Pajaro River Management and Restoration Plan (CH2M Hill et al. 1997)**: This report was developed in response to citizen concerns about massive vegetation removal initiated by Santa Cruz County along the Pajaro River mainstem as emergency actions in the wake of the 1995 flood event.
2. **Pajaro River Bank Erosion Assessment (Northwest Hydraulic Consultants 1998)**: This assessment evaluated damage to streambanks from the 1997 and 1998 flooding, and recommended numerous remediation actions.
3. **Proposed Long–term Maintenance Program for Salsipuedes and Corralitos Creeks (Santa Cruz County Public Works Department 1999)**: The report describes maintenance duties to be performed in Salsipuedes and Corralitos creeks by the Santa Cruz County Public Works Drainage Maintenance Division for the Pajaro Storm Drain Maintenance District.
4. **Pajaro River Watershed Water Quality Management Plan (AMBAG 1999)**: The Association of Monterey Bay Area Governments funded this study to identify, prioritize, and recommend management strategies to mitigate nonpoint sources of pollution in the Pajaro River watershed.
5. **Lower Pajaro River Enhancement Plan, Final Report (Fall Creek Engineering, Inc. 2002)**: The Santa Cruz County Resource Conservation District funded this study to assess erosion and sedimentation problems in several Pajaro tributary watersheds.
6. **An Environmental Alternative for the Pajaro River Flood Plan, Final Report (PWA 2003)**: This report assessed Pajaro channel designs to promote geomorphic sustainability, a dense riparian corridor, a more extensive range of ecologically useful channel–floodplain interactions while maintaining the project's desired flow capacity.
7. **Sediment Transport Characteristics of Reach 4 of the Pajaro River Flood Plan**: An assessment based on two–dimensional modeling (PWA 2005c) of sediment transport characteristics of Reach 4 of the Pajaro River.
8. **Total Maximum Daily Load for Sediment in the Pajaro River Watershed including Pajaro River, Llagas Creek, Rider Creek, and San Benito River – Phase 5: Regulatory Action Selection; Preliminary Project Report (RWQCB 2005)**: The Project Report presents a Sediment Total Maximum Daily Load (TMDL) for the Pajaro River including Llagas Creek, Rider Creek, and the San Benito River.
9. **Assessment of Streambank Riparian Habitat Potentially Impacted by Pajaro River Bench Excavation Project, Santa Cruz County Department of Public Works (Kittleson Environmental Consulting 2007)**: The report estimates the amount and

assesses the habitat value of streambank riparian/riparian scrub habitat likely to be impacted by the Pajaro River Bench Excavation Project.

10. **Salsipuedes Creek Conceptual Shade Canopy Development Program (James P. Allen and Associates 2008)**: James P. Allen and Associates produced a report recommending specific development, maintenance, and monitoring of a shade canopy program for Salsipuedes Creek.
11. **Breeding Season Bird Surveys and Special–Status Species Assessment Pajaro River Flood Control Project Santa Cruz and Monterey Counties, (Bryan Mori Biological Consulting Services 2012)**: The study focused on riparian habitats within the proposed flood control project areas. No surveys were conducted for agricultural or urbanized habitats within the project areas.
12. **Pajaro River Flood Risk Management Project Tree Survey Report Reaches 6, 7, and 8 (Biotic Resources Group, 2014)**. The survey identified 16 tree species in Reaches 6, 7, and 8, with 2,228 trees greater than six inches in diameter (2,040 trees in Reaches 6 and 8 and 188 trees in Reach 7).

1.8 INTENDED USES OF THE INTEGRATED REPORT

This report integrates two decision making and reporting requirements:

- A GRR, which satisfies the requirements of the USACE feasibility study planning process to arrive at the project implementation recommendation (USACE 2000).
- An EA, prepared in compliance with the NEPA (42 USC Section 4321 et seq.; 40 Code of Federal Regulations Section 1500.1).

The Final GRR/EA will present the recommended plan for implementation with approval obtained through a USACE Director of Civil Works Report (Director's Report) in accordance with the Chief of Engineers discretionary authority and Congressional project authorization provided by Section 203 of the 1966 Flood Control Act; or if warranted through with a new Chief of Engineers Report (Chief's Report) and a new Congressional project authorization.

1.9 TERMINOLOGY USED IN THIS INTEGRATED REPORT

The terms *environmental consequences*, *environmental impacts*, and *environmental effects* are synonymous in this analysis. *Action Alternatives* is used to refer to all of the alternative plans except the No Action Alternative, in other words, Action Alternative refers to Alternatives 1, 2, 3, 4, 5, 6, 7, 8, and the Tentatively Selected Plan (TSP). *Future without project conditions, No Action Alternative, and No Action Plan* are used interchangeably, as is *TSP* and *preferred alternative*.

1.10 REPORT ORGANIZATION

The description of the feasibility-level planning process performed for the GRR is integrated with an EA. **Table 1-1** describes where specific elements required by NEPA are located in this document.

Table 1-1: Locations of NEPA elements contained in this document

NEPA/CEQA Section	Location in this Document
Purpose and Need	Chapter 1, Sections 1.2; Chapter 2, Sections 2.1 and 2.1
Alternatives (development and description, including No Action Alternative)	Chapter 2, Sections 2.3 through 2.6, Chapter 3
Affected Environment	Chapter 4
Environmental Consequences	Chapter 4
Mitigation Measures	Chapter 4
Other NEPA requirements (including compliance with other environmental laws and regulations)	Chapter 5

CHAPTER 2 – PROBLEM DESCRIPTION AND PLANNING OBJECTIVES

This chapter presents the results of the first step of the planning process, the specification of water and related land resources problems and opportunities in the study area. The chapter concludes with the establishment of planning objectives and planning constraints, which are the basis for the formulation of alternative plans.

2.1 WATER RESOURCES PROBLEMS

The existing flood risk management project on the Pajaro River and its tributaries is not providing adequate protection from flooding, while habitat for a number of protected species is degraded and/or must be sustained.

2.1.1 Flooding in the Project Area

Since construction of the USACE levee system in 1949, there have been four major floods on the Pajaro River and its tributaries that have resulted in significant flooding caused by overtopping or breaching of the levees. Peak discharges for the four major post-construction floods exceeded the 19,000 cubic feet per second (cfs) design discharge upstream of the Salsipuedes Creek confluence (**Table 2-1**).

Table 2-1: Peak Discharges for Historical Floods on the Pajaro River

Date	Peak Discharge (cfs)
December 1955	24,000
April 1958	23,500
March 1995	21,600
*February 1998	28,800

*The largest flood on record at this location

The March 1995 storm resulted in the greatest flood damages. During that storm, the breach resulted in the Pajaro River completely inundating the Town of Pajaro and the surrounding agricultural areas (**Figures 2-1, 2-2, and 2-3**). That flood caused damage estimated

to be more than 95 million dollars[1] ($67 million in agricultural flood damages and $28 million in urban flood damages). One flood–related death occurred during the event (San Francisco Examiner 1995). The City of Watsonville was threatened, but it only sustained minor flood damage. Downstream from the urban centers, flood waters ponded behind the left–bank levee at the State Highway 1 Bridge, requiring it to be breached to drain the large amount of accumulated water. Ponding also occurred at the confluence of Salsipuedes Creek and the Pajaro River. Based on recent hydrologic analysis, the March 1995 flood was estimated to be the equivalent of a 6.5% (15.4-year) annual chance exceedance[2] (ACE) flood event.

Floodwaters from the February 1998 storm, which is now the flood of record, caused a major levee breach along the north bank of the Pajaro River at about river mile 3.35, approximately 1,500 feet downstream of Highway 1. Flooding was mainly limited to agricultural land. Scour and erosional damage to the project itself and the surrounding area was extensive. According to the counties, costs for emergency repair work alone totaled nearly $9 million. The ACE for the February 1998 flood event was estimated to be 3.5% (28.5-year).

[1] www.pajarowatershed.org
[2] The probability (as a percentage) that an event will be exceeded each year.

Figure 2-1: Flooding caused by a 1995 breach of the Pajaro River. Orange circle encompasses the Town of Pajaro. The mouth of the Pajaro River is in the foreground.

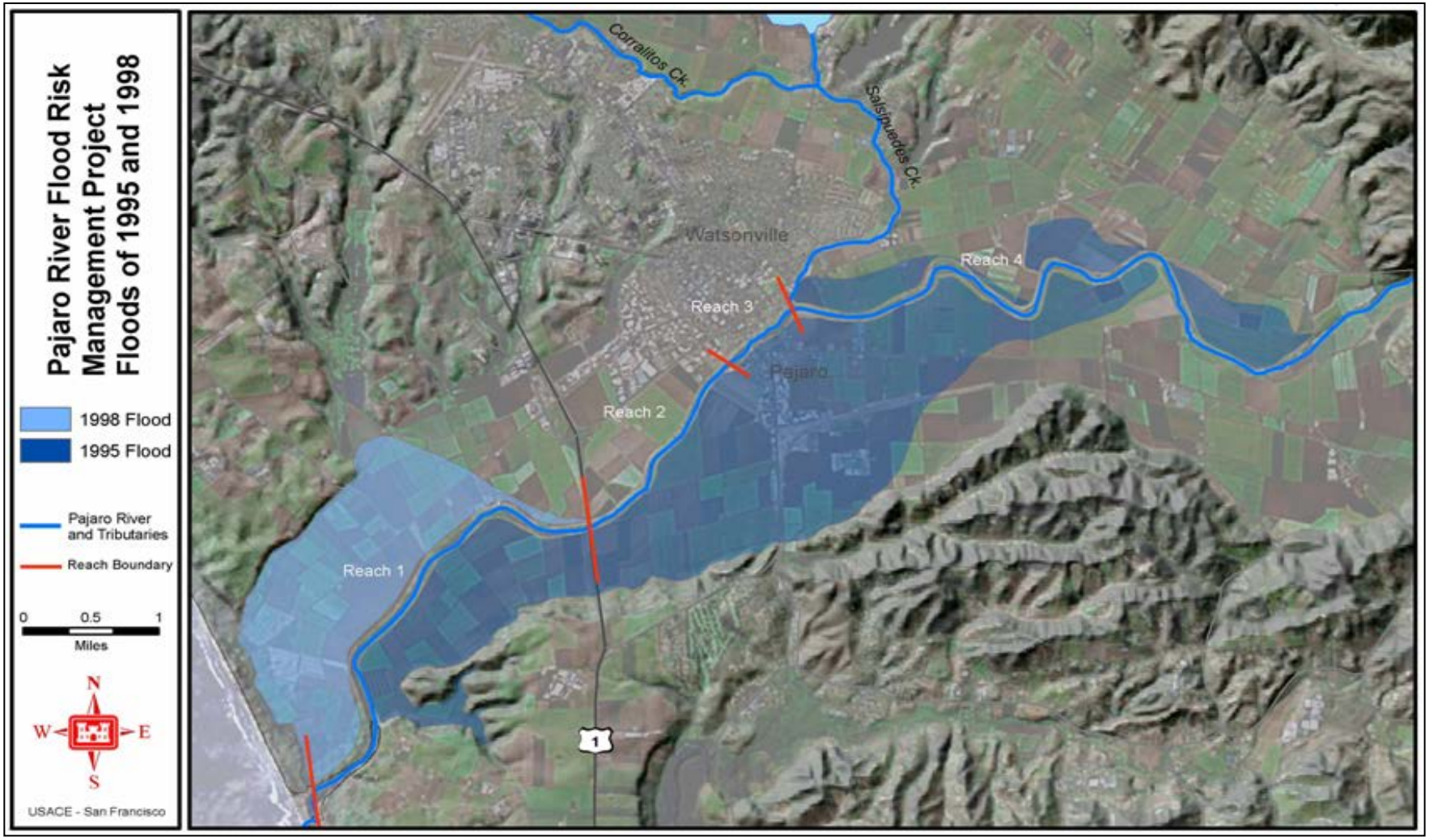

Figure 2-2: Extents of flooding in 1995 (dark blue) & 1998 (light blue) on the Pajaro River. The red lines indicate the reach boundaries for the river.

Figure 2-3: Flooding images from 1995 are as follows: (a) 1995 Flooding from Pajaro River (b) 1995 Pajaro River Breached Levee; (c) Aerial view of 1995 Pajaro River Flood; (d) 1995 Pajaro River Flooding.

Corralitos and Salsipuedes Creek Existing Flooding

Since construction of levees along the Pajaro River and Salsipuedes Creek in 1949, documented flooding in the City of Watsonville area has been limited to overflow from Corralitos Creek, which occurred in 1955, 1982, and 1986. Between 1955 and 1998, six floods on Corralitos Creek have produced peak discharges with a chance of occurrence of 20 years or less (Table 2-2).

Table 2-2: Major Peak Flows, Corralitos Creek at Freedom

Date	Peak Discharge (cfs)	Annual Chance of Exceedence (%)
*December 1955	4,700	4% (1/25)
April 1958	2,680	14% (1/7)
January 1982	5,610	2.5% (1/40)
February 1986	5,310	2.6% (1/38)
January 1997	2,900	12% (1/8)
February 1998	2,190	20% (1/5)

*Determined from unit hydrograph and rainfall analysis

The greatest economic damages resulting from flooding on Corralitos Creek occurred in 1955 when 29 city blocks were flooded to a maximum depth of 2 feet. Floodwaters overtopped the south bank of Corralitos Creek between Green Valley Road and Highway 152. No lives were lost in the storm, but 972 people were evacuated and over $1 million in damages were reported.

Flooding occurred along the southeastern perimeter of Watsonville on January 4, 1982, when the Corralitos Creek levee overtopped. Several homes were damaged, and there was shallow flooding in a 200–to–1,000–foot–wide strip along Bridge Street and Riverside Drive. According to stream gauge records for Corralitos Creek at Freedom, the January 1982 flood is the flood of record for Corralitos Creek, a 2.5% ACE (1/40) event.

Flooding was reported to have occurred in February 1986 along Corralitos Creek between the community of Freedom and Highway 152, as well as further upstream along Eureka Canyon Road. Local estimates were that several million dollars of flood damage resulted. It was also reported that overtopping of the USACE levees occurred along Salsipuedes Creek between Highway 152 and the Pajaro River during the same storm. While there were no documented damages from flooding from the Salsipuedes Creek, the levees along the creek had to be repaired at three locations because of overtopping or channel–bank erosion.

Figure 2-4: Flooding in the City of Watsonville from Salsipuedes Creek

The January 1997 flood exceeded the channel capacity on Corralitos Creek, which resulted in minor flooding upstream of the Highway 152 Bridge. During the high flows of February 1998, backwater from the Pajaro River caused overtopping of the east–bank levee in the lower reach of Salsipuedes Creek, just upstream of the Highway 129 Bridge. No flood damages were reported, but levee seepage was evident along the Salsipuedes Creek west–bank levee, just upstream of Highway 152. Emergency repairs by USACE through the P.L. 84-99 program prevented the possibility of severe flooding throughout Watsonville.

Continued High Risk of Levee Failure and Flooding

Based on recent analyses the Town of Pajaro and the City of Watsonville have about a 1 in 15 and about a 1 in 12 chance of flooding in any given year from the Pajaro River, respectively. In addition, the City of Watsonville has about a 1 in 5 chance of flooding in any given year from the Tributaries (Corralitos Creek). As several flood events in the past have proven, the chance of flooding in the area is relatively high.

It is also important to note that the chance of the Main Stem of the Pajaro River containing relatively frequent (smaller) ACE events, such as the 10% ACE (1/10)) and 4% ACE (1/25) events is low. The Pajaro River has about a 72% chance of passing the 10% ACE (1/10) and about a 28% chance of passing the 4% ACE (1/25) events, respectively.

The chance of Corralitos and Salsipuedes Creeks containing relatively frequent events is also low, with Corralitos Creek of having only a 4% chance of containing the 10% ACE (1/10) event and Salsipuedes Creek having about a 59% chance of containing the 10% ACE (1/10) event .

2.2 PROBLEM STATEMENT SUMMARY

The GRR for this study will present a list of public concerns relevant to this project. The problems and opportunities in this section describe these concerns in the context of problems and opportunities that can be addressed through water and related land resource management to reduce flood risk in the Pajaro Basin and to improve system performance. Problems are those undesirable conditions to be changed through the implementation of an alternative plan.

- PROBLEM: There is a risk to human life and safety in the City of Watsonville, Town of Pajaro, and surrounding unincorporated areas due to flooding from the Pajaro River, Salsipuedes Creek, and Corralitos Creek.
- PROBLEM: There is a high risk of economic flood damage to urban infrastructure within the City of Watsonville and Town of Pajaro from the Pajaro River, Salsipuedes Creek, and Corralitos Creek.
- PROBLEM: There is a high risk of economic flood damage to agricultural infrastructure and croplands within the project area from the Pajaro River, Salsipuedes Creek, and Corralitos Creek.
- PROBLEM: Aquatic and riparian habitat have been significantly compromised in the Pajaro River and Salsipuedes Creek tributary since the construction of the 1949 Federal project. The existing levee system and land uses have adversely modified geomorphic processes, ecological functions, and water quality associated with these ecosystems, which act as essential habitat for federally listed species. These ecosystems have been designated as critical habitat for steelhead trout.

2.3 OPPORTUNITIES

Opportunities listed here are those positive conditions to be achieved by an alternative plan.

- OPPORTUNITY: There is an opportunity to coordinate with Pajaro River watershed flood and land management organizations, in the effort to deliver sustainable flood risk management within the watershed. Flood risk management includes public safety and flood damage reduction for urban and agricultural areas.
- OPPORTUNITY: To sustain and increase aquatic habitat, riparian habitat, and water quality for special status and other native species in conjunction with other flood risk management features in the project area.
- OPPORTUNITY: There is an opportunity to restore a more naturally functioning riverine system that would minimize future maintenance requirements and related impacts to riverine ESA species.
- OPPORTUNITY: Based on the subsurface geological setting, there is an opportunity to improve water recharge in the Corralitos reaches of this project in conjunction with other flood risk management features.
- OPPORTUNITY: There is an opportunity to increase recreational opportunities in conjunction with flood risk management features and existing land uses.

2.4 PLANNING OBJECTIVES

National Objective

"In WRDA 2007, Congress passed statutory language (codified at 42 U.S.C. § 1962-3) that describes national water resources planning policy: "water resources projects should reflect national priorities, encourage economic development, and protect the environment by:

(1) seeking to maximize sustainable economic development;
(2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and
(3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems."

In consideration of the many competing demands for limited Federal resources, Federal investments in water resources should strive to maximize public benefits, with appropriate consideration of costs. Public benefits encompass environmental, economic, and social goals, include monetary and non-monetary effects and allow for the consideration of both quantified and non-quantified measures.

Congress directs the Corps of Engineers to study various water resource related issues in compliance with the specific planning and technical requirements defined by regulations and law. Compliance with those regulations and law provide the tools to prioritize economic development, the wise use of floodplains and the protection of the environment."

The national or Federal objective of water and related land resources planning is to contribute to NED. In addition, it must be consistent with protecting the nation's environment, pursuant to national environmental statutes, with applicable executive orders and with other Federal planning requirements. Contributions to the NED are increases in the net value of the national output of goods and services, expressed in monetary units. They are the direct net benefits that accrue in the planning area and in the rest of the nation.

The national objective is a general statement and is not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are refined and stated as specific planning objectives to provide focus for the formulation of alternatives. These planning objectives reflect the problems and opportunities and represent desired positive changes in the without project conditions. All objectives will be evaluated based on the USACE period of analysis, which is defined as 50 years, starting at the base year of project completion.

- OBJECTIVE: To reduce the risk of flooding on human life and safety in the City of Watsonville, Town of Pajaro, and surrounding unincorporated lands.
- OBJECTIVE: To reduce the risk of flood damages, including critical infrastructure, in the City of Watsonville, Town of Pajaro, and surrounding unincorporated lands in the project area.
- OBJECTIVE: To improve natural geomorphic processes and ecological functions in conjunction with other flood risk management features in the project area.
- OBJECTIVE: To include environmentally sustainable designs and construction methodologies and to minimize environmental impacts from future operation and maintenance for the recommended plan in conjunction with other flood risk management features in the project area.
- OBJECTIVE: To increase recreational opportunities in conjunction with flood risk management features and existing land uses.

2.5 PLANNING CONSTRAINTS

Planning constraints represent restrictions that limit the extent of the planning process. Constraints are designed to avoid undesirable changes between without and with-project future conditions. The planning constraints for the Pajaro River Project are:

- CONSTRAINT: Under Section 7 of the Endangered Species Act (ESA), all Federal agencies must ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its designated critical habitat. The Pajaro Watershed is critical to the long–term sustainability of the federally listed steelhead and tidewater goby. This project cannot jeopardize the continued existence of the federally listed steelhead trout, tidewater goby, or any of the other federally listed species identified in this report to be present in the lower Pajaro River, Salsipuedes Creek, or Corralitos Creek.
- CONSTRAINT: In accordance the Clean Water Act, the Pajaro River is a 303 (d) listed water body for sediment, nitrate and nutrients, among other pollutants. Section 303(d) of the Clean Water Act requires that the State of California establish priority rankings for waters on the 303(d) list and develop TMDLs. In accordance with Section 303(d), TMDLs have been developed for the Pajaro River, Salsipuedes Creek and Corralitos Creek. Currently, these TMDLs are currently not being met. Among the pollutants in these waterbodies are sediment, nutrients, pesticides, and fecal indicator bacteria. Levels of these pollutants are exacerbated by the degradation of aquatic and riparian habitat and changes in hydrogeomorphologic processes in these waterbodies. The project must not exacerbate levels of these pollutants.

2.6 OTHER PLANNING CONSIDERATIONS

The following issues and public concerns will inform, but not necessarily direct or constrain, the planning process:

- The NFS and stakeholders favor a final plan that reduces the frequency of inundation to 1% ACE in the City of Watsonville and Town of Pajaro and to 2% ACE in surrounding agricultural lands.
- Extensive collaboration between 2000 and 2004 led to a significant stakeholder compromise, between resource agencies and landowners, of 100-ft setback levees in those reaches not constrained by high urban development.
- It will be difficult to obtain additional lands within the City of Watsonville and Town of Pajaro for a flood projection project due to the high level of development within the urban areas.
- Avoid or minimize project encroachment on the recently constructed Main Street Bridge to avoid rerouting of traffic and the Railroad Bridge.
- Riparian vegetation protects water quality, endangered species, and species diversity, and provides bank stability.
- Current flood safety laws and regulations may conflict with local requests and preferences for recreational use along any future project levees outside the City of Watsonville and Town of Pajaro.
- There is heightened concern about the acceptability of the final plan to local citizens because the NFS's cost share will be based on funding through a Proposition 218 measure. Lack of community support could eliminate funding for implementation.
- Local citizens, including elderly citizens on fixed incomes, that live in the 100-year Federal Emergency Management Agency (FEMA) floodplain have seen their flood insurance rates increase dramatically. The NFS, in support of their constituents are supportive of alternatives that contain at least the 1% (100-year) ACE flood event in order to reduce the financial burden on the citizens in the project area.
- The NFS expressed concern about the likelihood that the benefit-cost ratio of the TSP (NED Plan) will not meet Office of Management and Budget (OMB) criteria for project funding.
- Development of an environmentally sustainable project that the NFS will effectively able to operate and maintain over the life of the project.
- Development of an environmentally sustainable project that will enable the NFS to effectively to acquire the necessary environmental regulatory permits in order to operate and maintain over the life of the project

2.7 INVENTORY OF EXISTING CONDITIONS

This section describes the existing flood control project on the Pajaro River and the emergency levee repair work done to date, as well as the economic and environmental conditions. The future without project condition is further described in Section 2.8.

2.7.1 Pajaro River Flood Control Project (1949)

In 1949, USACE constructed a flood control project on the Pajaro River and Salsipuedes Creek (**Figure 2-5**). The flood control project did not include Corralitos Creek. Project construction cost the federal government $748,000, which would be approximately $7,500,000 in FY16 (Consumer Price Index). The Pajaro levees were constructed from the river mouth up to mile 11.8 on the right (north) bank and to mile 10.6 on the left (south) bank. The levees on Salsipuedes Creek were constructed from its confluence at the Pajaro River up to mile 2.6 on the right (west) bank and to mile 1.7 on the left (east) bank.

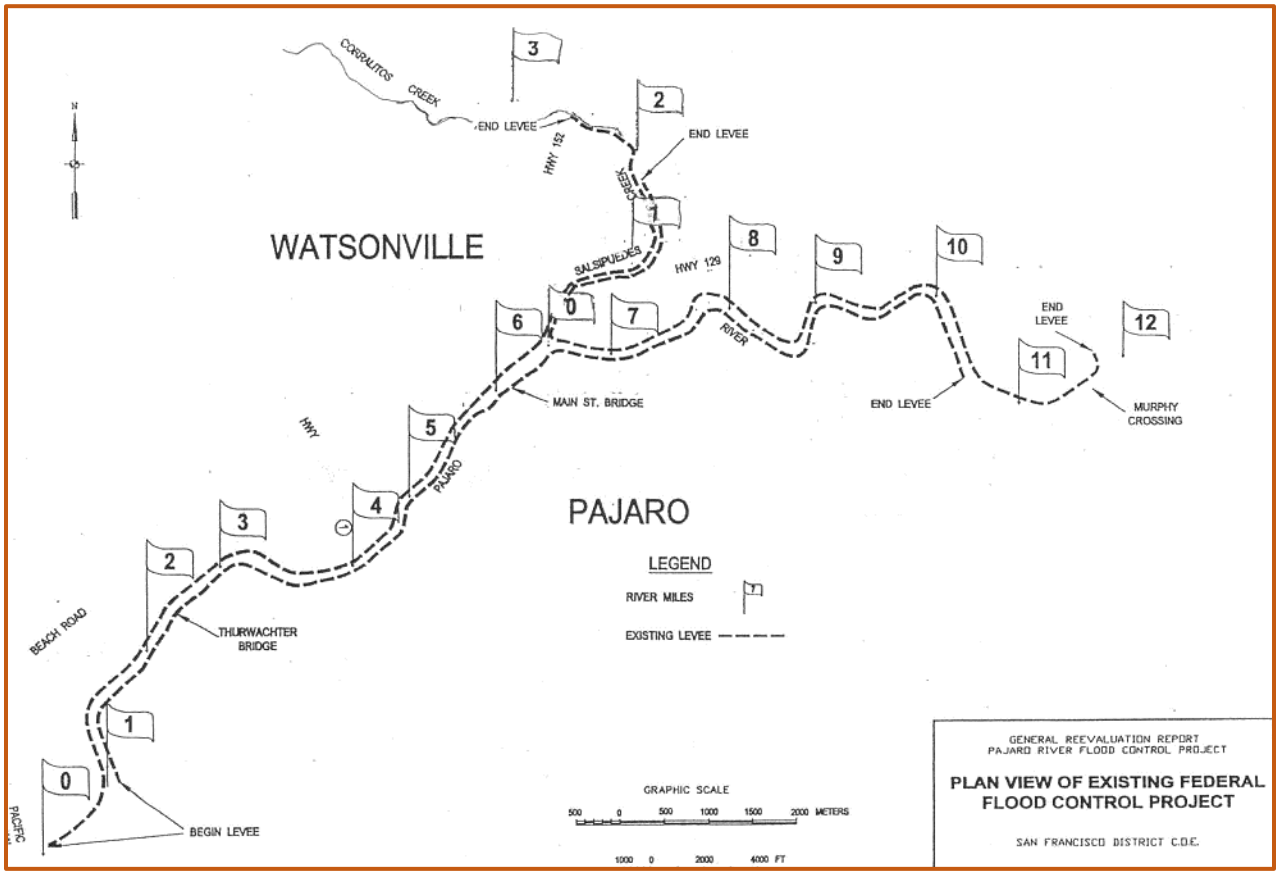

Figure 2-5: Existing Federal Flood Control Project

The design discharges for the Pajaro levees were 19,000 cfs in the Pajaro River upstream of the Salsipuedes Creek confluence and 22,000 cfs downstream of the confluence. The original design discharge for Salsipuedes Creek, which was based on peak flows in the Pajaro River, was 1,600 cfs, coincident with a peak flow of 19,000 cfs in the Pajaro River. Because it is a smaller watershed, the peak discharge in Salsipuedes Creek comes before the peak discharge in the Pajaro River.

At the time of construction, the levees were thought to be able to contain the 2% (50-year) ACE flood event (i.e., there was a 2% chance in any year that flood flows would overtop the project or 50-year flood). Hydrologic analysis of subsequent to floods in 1955 and 1958 and later, however, indicated that the design capacity of the project as constructed in 1949 was closer to the 8 % (12.5–year) ACE flood event on Pajaro River below the Salsipuedes Creek and the 10 % (10–year) ACE flood event on Salsipuedes Creek (USACE 2003).

2.7.2 USACE Emergency Levee Repair Under PL 84-99, Flood and Coastal Storm Emergencies

Under the provision of Public Law 99, 84th Congress, USACE has spent on the order of $30M for emergency levee repair (**Table 2-3**).

Table 2-3: Repair Costs for Pajaro River Flood Control Project (FY 17 Price Levels)

Year(s)	Amount Spent	Expenditure Activity
1956 and 1958	$7,600,000	Emergency levee repair and protective riprap
1982	$400,000	Rehabilitation of damaged levees on Salsipuedes Creek
1986	$650,000	Levee repair
1989	$2,900,000	Extensive repairs to entire Project after Loma Prieta Earthquake
1993	$69,000	Repairs on Salsipuedes Creek
1995	$3,250,000	Repair levee break from large storm, which exceeded design capacity
1997	$980,000	Multiple levee repairs following series of storms
1998	$9,800,000	Repairs to 13 sites
2017	$4,000,000[1]	Levee Repairs
Total	**$29,649,000**	

[1] NFS expended $6,325,000 on emergency repairs in 2017

2.7.3 Economic Conditions

Economic Impact Areas (EIA)

In FRM studies, economic impact areas (EIA) are used to describe the consequences (e.g., damages and benefits) of flooding in a smaller subarea of the larger study area. They are typically delineated by factoring in the source(s) of its flooding, land use within the area, physical barriers/borders (e.g., railroad tracks, roads, levees, etc.) that might cause one area to flood differently than another, and also political/legal boundaries that may require a separate reporting of the results. Economic impact areas help to facilitate data collection and enables a more detailed risk assessment of specific locations within the study area in terms of the chance and consequences of flooding. Finally, estimating damages and benefits by EIAs allows for a more complete incremental analysis, which aids in the identification of a plan that reasonably maximizes net economic benefits.

The Main Stem Pajaro River and Corralitos/Salsipuedes Creeks (Tributaries) are the major sources of flooding in this study. The EIAs were delineated based on flooding from these sources, physical barriers (levees), and land use, as described in **Table 2-4** and displayed in **Figure 2-6**.

Table 2-4. Description of Economic Impact Areas (EIA), Main Stem Pajaro River & Tributaries

Source of Flooding	Economic Impact Area (EIA)	Bank	Primary Land Use
Pajaro River	[A] Downstream of HWY 1	Left	Agricultural
Pajaro River or Tributaries	[B] Downstream of HWI 1	Right	Agricultural
Pajaro River	[C] Upstream of HWY 1	Left	Urban (Town of Pajaro); agricultural
Pajaro River or Tributaries	[D] Upstream of HWY 1	Right	Urban (City of Watsonville); agricultural
Pajaro River or Tributaries	[E] Area between Salsipuedes Creek and Pajaro River	Right	Agricultural
Tributaries	[F] North of Lakeview Road	Left	Urban (residential neighborhoods); agricultural

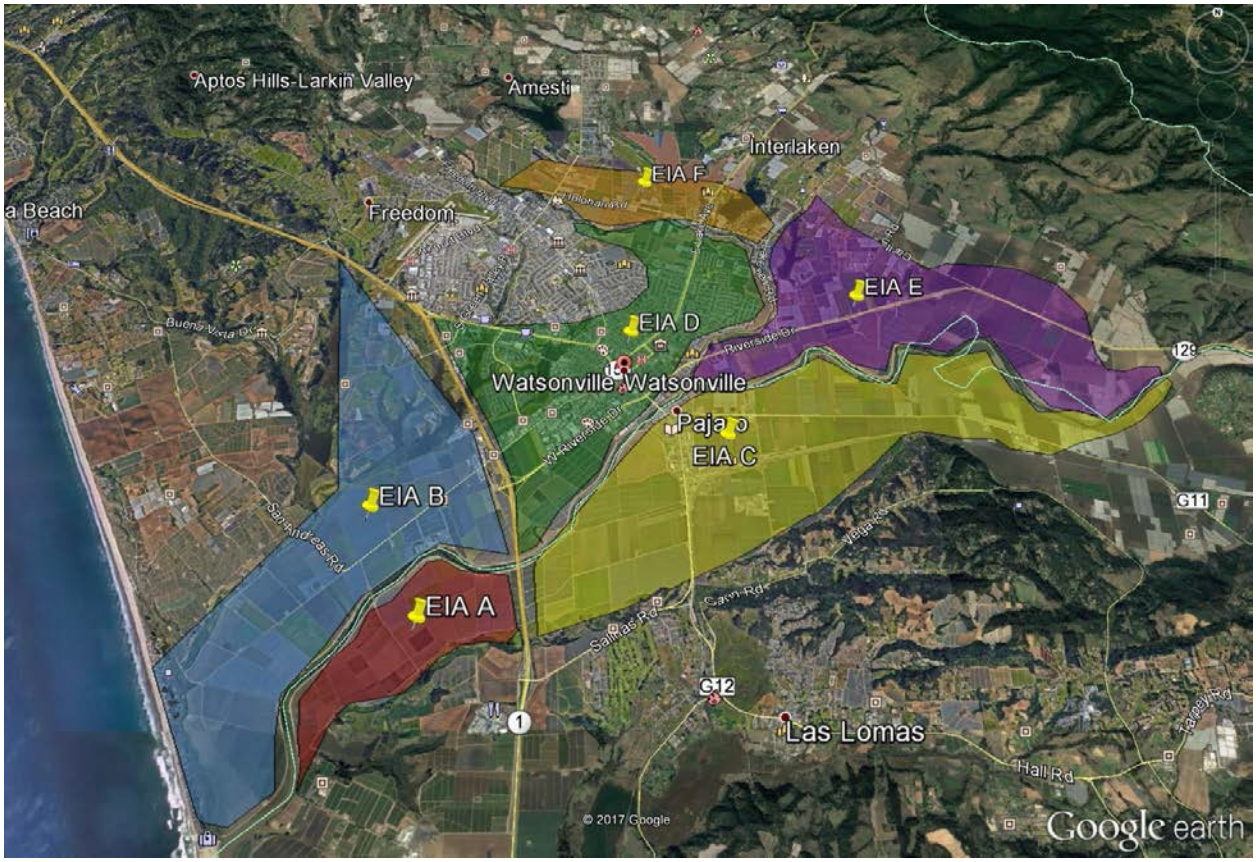

Figure 2-6: Economic Impact Areas (EIA)

Table 2-5 and Figure 2-6 indicate that EIA D, which is the City of Watsonville upstream of Highway 1 (shaded green in Figure 2-7), EIA B, which is the agricultural area downstream of Highway 1 on the right bank of the Pajaro River (shaded blue), and EIA E, which is the agricultural area between Salsipuedes Creek and the Pajaro River upstream of the confluence (shaded purple) have the potential to be flooded from either the Main Stem Pajaro or from the Tributaries . Since the Main Stem Pajaro River and Tributaries are considered hydrologically/ hydraulically independent (uncorrelated), separate economic analyses were performed for these areas based on the risk of flooding from each source. Hydrologic/hydraulic independence assumes that flooding from each source is mutually exclusive, and unlikely to occur at the same time (coincidently).

Damageable Property Value. The total value of damageable property, structures and contents, is $1.17B within the 0.2% ACE floodplain (500-year).

Table 2-5: Total Value of Damageable Property – Structures and Contents (October 2016 Price Levels) (Costs are in $1,000)

EIA	Residential	Commercial	Industrial	Public	Total
A	497	0	0	0	497
B	79,083	16,239	40,797	0	136,119
C	61,564	45,611	109,044	8,833	225,052
D	393,846	111,831	233,148	9,365	748,190
E	6,905	0	13,217	0	20,122
F	38,740	1,870	1,130	1,660	43,400
Total	580,635	175,551	397,336	19,858	1,173,380

Expected Annual Damages (EAD). EAD is the metric used to describe the consequences of flooding on an annual basis considering a full range of flood events – from high frequency/small events to low frequency/large events over a long time horizon. **Table 2-6** displays the EAD results by major damage category. As **Table 2-4** indicates approximately 39% of the total expected annual damages are in agriculture.

Table 2-6: Expected Annual Damage (2016 Price Levels)

Flooding Source	Urban[1]	Agricultural	Total
Mainstem	$7,407,000	$5,442,000	$12,849,000
Tributaries	$11,062,000	$6,403,000	$17,465,000
Total	**$18,469,000**	**$11,845,000**	**$30,314,000**

[1]Urban includes: Automobiles, Clean-Up Costs, Commercial, Housing Assistance, Industrial, Public, and Residential

Number of Structures. There are 3,187 within the 0.2% ACE floodplain (500-year). **Table 2-7** provides the Structure Count by Damage Category.

Table 2-7: Number of Structures by Category in 0.2% Exceedance Probability Floodplain

Structure Count By Damage Category	
Damage	**Structure Count**
Commercial	141
Industrial	194
Public	21
Residential	2,831
TOTAL	**3,187**

Population-At-Risk. An estimated population of 12,600 reside in the floodplain with approximately 3,000 in the Town of Pajaro and 9,600 in the City of Watsonville.

- Substantial percentages of the population are disabled, living in poverty, unemployed, and/or do not speak English well. These communities have a high vulnerability to flooding.
- Median household income in the Town of Pajaro ($33,200) is about 38% lower than the national average's ($53,900); the percentage of people living below the poverty level in the Town of Pajaro (31.9%) is about twice that of the national average's (15.5%).

Flooding Warning Times. Residents can expect an advanced warning one hour prior to a flood for Corralitos and Salsipuedes Creeks. Flood warning times for the Pajaro River at Chittenden range from 6 hours to 24 hours or more, but not more than 2-3 days in advance.

Critical Infrastructure at Risk. Critical infrastructure is a term used by governments to describe assets that are essential for the functioning of a society and economy. Most commonly associated with the term are facilities for:

- Electricity generation, transmission and distribution.
- Gas production, transport and distribution.
- Oil and oil products production, transport and distribution.
- Telecommunication.
- Water supply and wastewater.
- Agriculture, food production and distribution.
- Heating.
- Public health (hospitals, ambulances).
- Transportation systems (fuel supply, railway network, airports, harbors, inland

shipping).
- Financial services (banking, clearing).
- Security services (police, military).

The following lists include some of the critical infrastructure facilities in the study area:

Essential Services.

- Watsonville City Hall
- 6 Schools
- Police Stations (1)
- Fire Stations (2)
- Waste Water Treatment Facility

At Risk Population Facilities.

- Valley Convalescent and Rehabilitation
- Valley Heights
- Watsonville Residential Care

In addition to these facilities the following transportation systems are also located in the study area:

- Union Pacific Railroad Line
- US Highway 1
- Highway 152
- Highway 129
- San Juan Road

Damage to Agricultural Land and Crops. The study area's agricultural industry is an important part of the local and state economies. It is the central force in the economy of Pajaro and Watsonville, employing as much as one-third of the workforce in the Town of Pajaro, Furthermore, agriculture is a critical part of the local community's identity, and a temporary or permanent loss of farmland due to flooding could have significant adverse impacts on many families and businesses.

The study area contains approximately 8,500 acres of crops that are subject to flooding. The agricultural land use in the Pajaro River floodplain is characterized by very high intensity farming. A high percentage of the land is devoted to growing high value strawberry crops; and the study area is known for having some of the most –productive, high quality strawberry farming in the world. The strawberry crop is by far the most important in terms of both acreage planted and total value. Other major crops include lettuce as well as other vegetable and fruit crops such as broccoli and raspberries. Because

of both their characteristics and the stringent food safety standards, study–area agricultural lands and crops are extremely susceptible to damage from flooding.

In addition there are over 200 water wells within project area at risk for contamination during flooding.

2.8 FUTURE WITHOUT PROJECT CONDITIONS

The without-project condition is the most likely condition to exist in the future in the absence of a proposed water resource project. Proper definition and forecast of the future without project condition are critical to the success of the planning process. The future without-project condition constitutes the benchmark against which plans are evaluated. Other plans that have been adopted for the planning area and other current planning efforts with high potential for implementation or adoption shall be considered as part of the forecasted without project condition. The base year is 2025 and the period of analysis is 50 years.

The following general assumptions have been made in regard to the without-project condition for this study:

- Flooding will continue to cause economic damages, similar to historic conditions
- Flooding will continue to be a risk to human life and safety; the risks are likely to increase in the future
- Existing main stem and Salsipuedes levees protecting the City of Watsonville and Town of Pajaro are able to contain about a 4% annual chance exceedance (ACE) event but are subject to breaching prior to overtopping (geotechnical levee failure).
- Corralitos Creek has no existing levees and is able to contain about a 50% ACE event.
- Interest in recreation along the river corridor will increase in the future.
- Agriculture will continue to be the foundation of the Pajaro Valley's economy.
- Santa Cruz and Monterey Counties will remain committed to continued agricultural use and limits to urban development in agricultural zoned lands.
- O&MRRR and emergency repairs will continue.
- Poor habitat conditions and water quality would persist.

2.9 HISTORY OF PLAN FORMULATION

Originally authorized in 1966, the lengthy history of the Pajaro River Project includes numerous planning iterations. Plan Formulation summarizes alternative plans and concepts developed by USACE, NFS, and local stakeholder groups to meet the project's flood risk management goals. It presents a chronological history of the alternatives development process from 1993 to 2014, provides the rationale for elimination of many of these alternatives and describes the development and selection of the final array of alternatives that were carried forward for detailed analysis in the 2017 GRR. Where the Plan Formulation appendix provides context for the reader, Chapter 3 will present the most recent and relevant plan formulation information.

CHAPTER 3 – ALTERNATIVES

3.1 OVERVIEW OF PLANNING PROCESS

This chapter presents the most recent and relevant plan formulation information; the evaluation of the Final Array of Alternatives to determine the NED plan. The Plan Formulation Appendix (Appendix A) summarizes the plan formulation process over the history of the project and the selection of the final array of alternatives that are evaluated in this GRR/EA.

3.2 DESCRIPTION OF FINAL ARRAY OF ALTERNATIVES

The final array of alternatives demonstrate the trade-offs between the project objectives, constraints, and the planning criteria described in Chapter 2. The array includes the no action alternative as well as four mainstem and four tributary alternatives. Based on the Alternatives Milestone in December 2014 these alternatives were selected for evaluation and comparison for the final array. Note that the final array of alternatives does not include improvement to the levees in Reach 1 which provide FRM to agricultural areas.

The project delivery team (PDT) evaluated two sets of four alternatives –one set of alternatives for the Pajaro River mainstem and the other set for Corralitos and Salsipuedes Creeks tributaries (hereafter referred to as the "Tributary Alternatives"). For convenience and to minimize potential confusion, the alternatives were re-named to Mainstem Alternatives 1–4 and Tributary Alternatives 5-8. The following links the alternative names in this section with the alternatives described in the plan formulation appendix:

Mainstem Alternatives

- Alternative 1 (Alternative 9D Revised + Completion Levee with 4% Annual Chance Exceedance [ACE] Design Level in Reach 4 - Right Bank Agricultural Area)
- Alternative 2 (Pajaro Ring Levee + Protection to Urban Watsonville Area)
- Alternative 3 (9D Revised + Optimized Channel Migration Zone [CMZ] with 4% ACE Design Level in Reach 4 - Right Bank Agricultural Area)
- Alternative 4 (9D Revised + Local Preference of 2% ACE Design Level in Reach 4 - Right Bank Agricultural Area)

Tributary Alternatives

- Alternative 5 (T3/T4 – Variable 225-Foot Setback Levees and Orchard Park Ring Levee)
- Alternative 6 (T5 – Urban 100-Foot Setback and Orchard Park Ring Levee)
- Alternative 7 (Optimized CMZ with Corralitos Creek Left Bank Levee)

- Alternative 8 (Optimized CMZ with Orchard Park Ring Levee or Relocations along Corralitos Creek Left Bank)

3.2.1 No Action Alternative

Under the No Action Alternative, USACE would not conduct any additional work to address flooding concerns in the Pajaro Project area. As a result, the City of Watsonville and Town of Pajaro, including the surrounding agricultural areas would remain at risk of a possible levee failure and flooding. There would be a continued high risk to human health and safety, property, and the adverse economic impact that serious flooding could cause would continue, and the risk of a catastrophic flood would remain high. Regular operations and maintenance of the levee system would continue as presently executed by the local maintaining entities.

3.2.2 Mainstem Alternative 1

This alternative includes improvements on both banks of Reaches 2, 3, and 4 (**Figure 3-1**). Improvement on both banks of Reach 2 include demolition of the existing levee and construction of a new 100-foot setback levee. In Reach 3 on both banks the existing levee would be improved in place with a floodwall. In Reach 4 on the left bank the existing levee would be degraded and a new 100 foot setback levee would constructed. These levees would be constructed to contain the 1% ACE (100-year) event. On the right bank of Reach 4 the existing levee would be improved in place to contain the 4% ACE (25-year) event. A sliding gate will be required at the railroad bridge to close the levees during flood events at the bridge crossing.

Approximately 9,200 lineal feet of bank protection rip rap (rock revetment) will be placed on the right bank of Reach 4 and 4,300 lineal feet of bank protection rip rap will be placed on the left bank of Reach 4. The quantities of rip rap will be revised during PED.

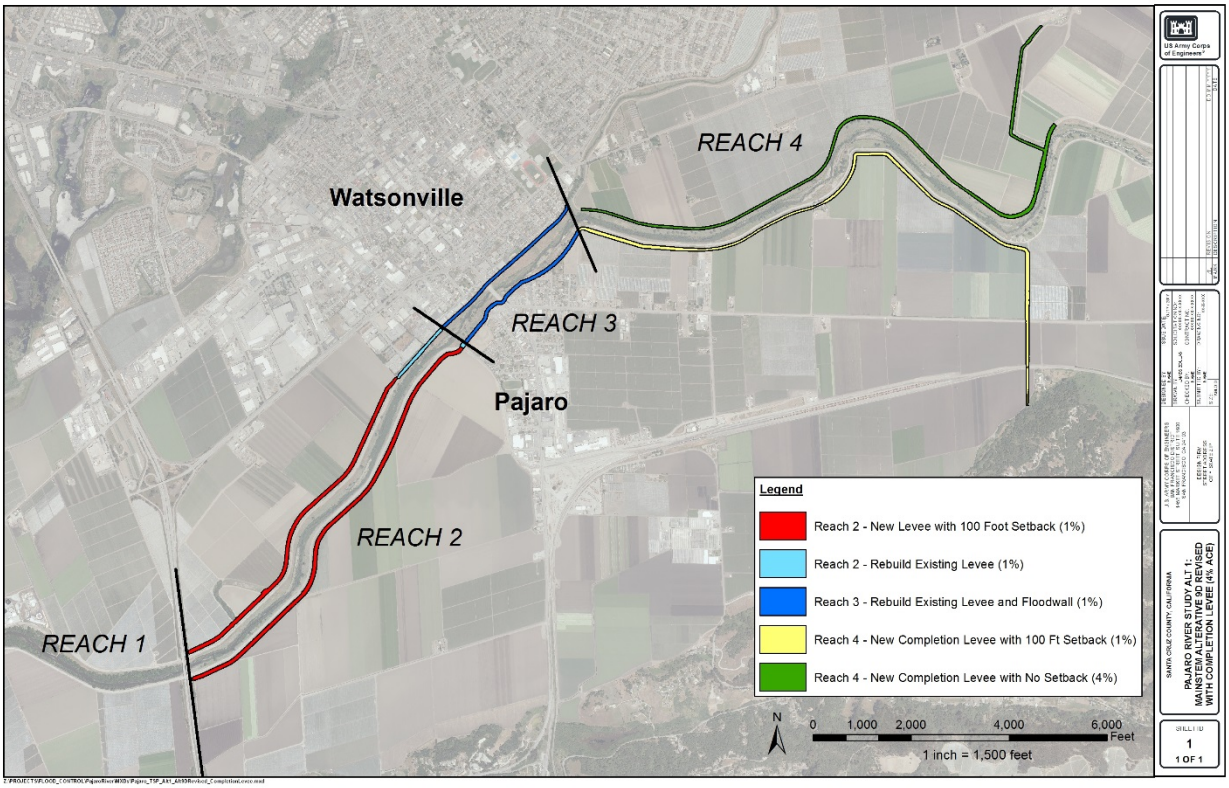

Figure 3-1: Mainstem Alternative 1

3.2.3 Mainstem Alternative 2

Alternative 2 includes project features in Reach 2 and Reach 3 (**Figure 3-2**). Alternative 2 limits the flood risk management areas to the City of Watsonville and the Town of Pajaro; protection provided to agricultural land is limited. In Reach 2, levees would be set back 100 feet on the north side of the Pajaro River. Reach 3 levees would be improved in place with a floodwall to the same level as those in Alternative 1. Levees on the south side of Pajaro River would be raised in their current locations starting at a point 100 feet downstream from the railroad bridge to a point 750 feet downstream of Salsipuedes Creek. Project levees would be constructed that encircle the Town of Pajaro. Existing project levees in Monterey County outside of the ring levee project area (Reaches 2 and 4) would remain in place and would not be raised. All bridges crossing the Pajaro River will remain in place. A sliding gate will be required at the railroad bridge to close the levees during flood events at the bridge crossing.

Approximately 1,200 lineal feet of bank protection rip rap (rock revetment) will be placed on the right bank of Reach 3 and 1,200 lineal feet of bank protection rip rap will be placed on the left bank of Reach 3. The quantities of rip rap will be revised during PED.

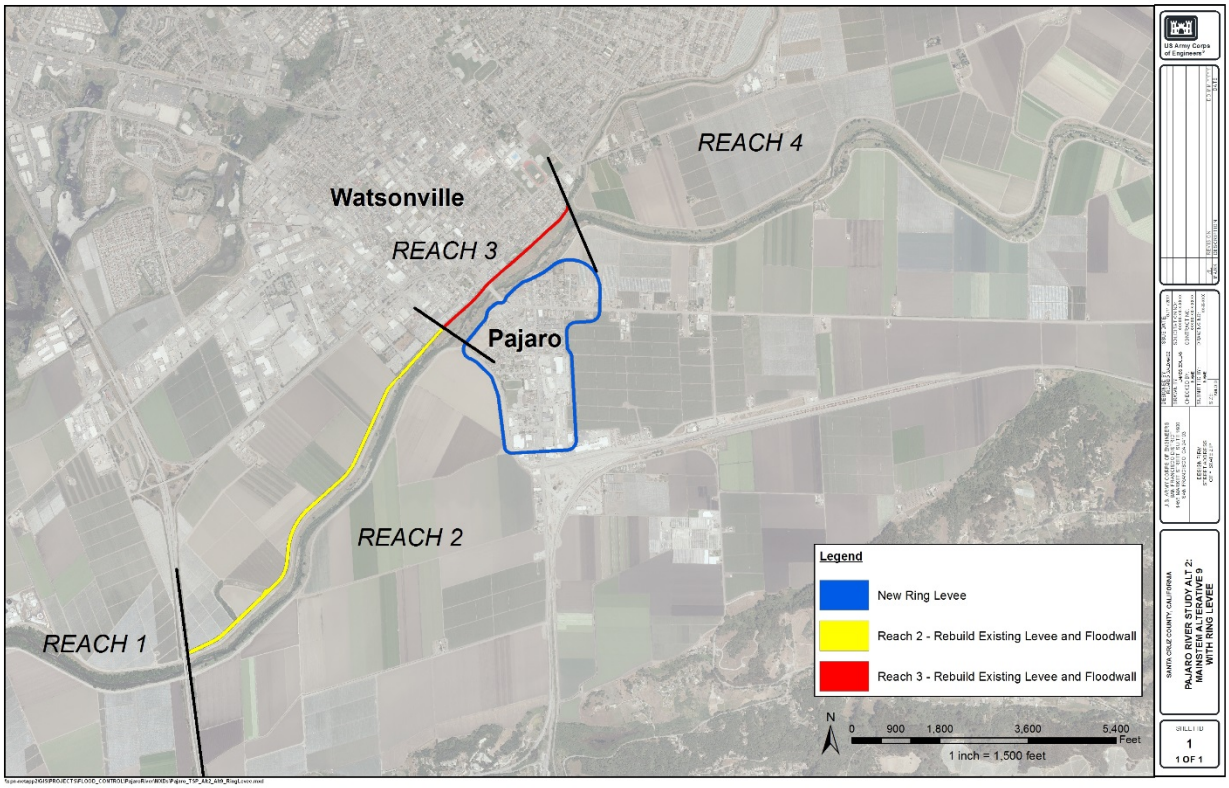

Figure 3-2: Mainstem Alternative 2

3.2.4 Mainstem Alternative 3

Alternative 3 includes features from Alternative 1 plus optimized CMZ levees in Reach 4 (**Figure 3-3**). The CMZ levees in Reach 4 are designed to consider larger setbacks where space is available at meander bends in order to provide for cost savings on levee construction and O&M as well as to provide for a more self-sustaining channel.

In reaches 2 and 3 the levees would be improved the same as Alternative 1, new levees setback 100 feet on both banks of Reach 2 and the existing levees improved in place with a floodwall on Reach 3. A sliding gate will be required at the railroad bridge to close the levees during flood events at the bridge crossing.

In Reach 4, instead of a one sided levee on the left bank there would be optimized CMZ levees on both banks of lower Reach 4 (e.g. levees cutting across meander bends). This would eliminate the risk transfer and associated induced flooding. It would also shorten the constructed levee length but would require additional real estate. Benefits would be reduction in O&M costs and construction costs.

Approximately 1,200 lineal feet of bank protection rip rap will be placed on the right bank of Reach 3 and 3,400 lineal feet of bank protection rip rap will be placed on the left bank of Reach 3. The quantities of rip rap will be revised during PED.

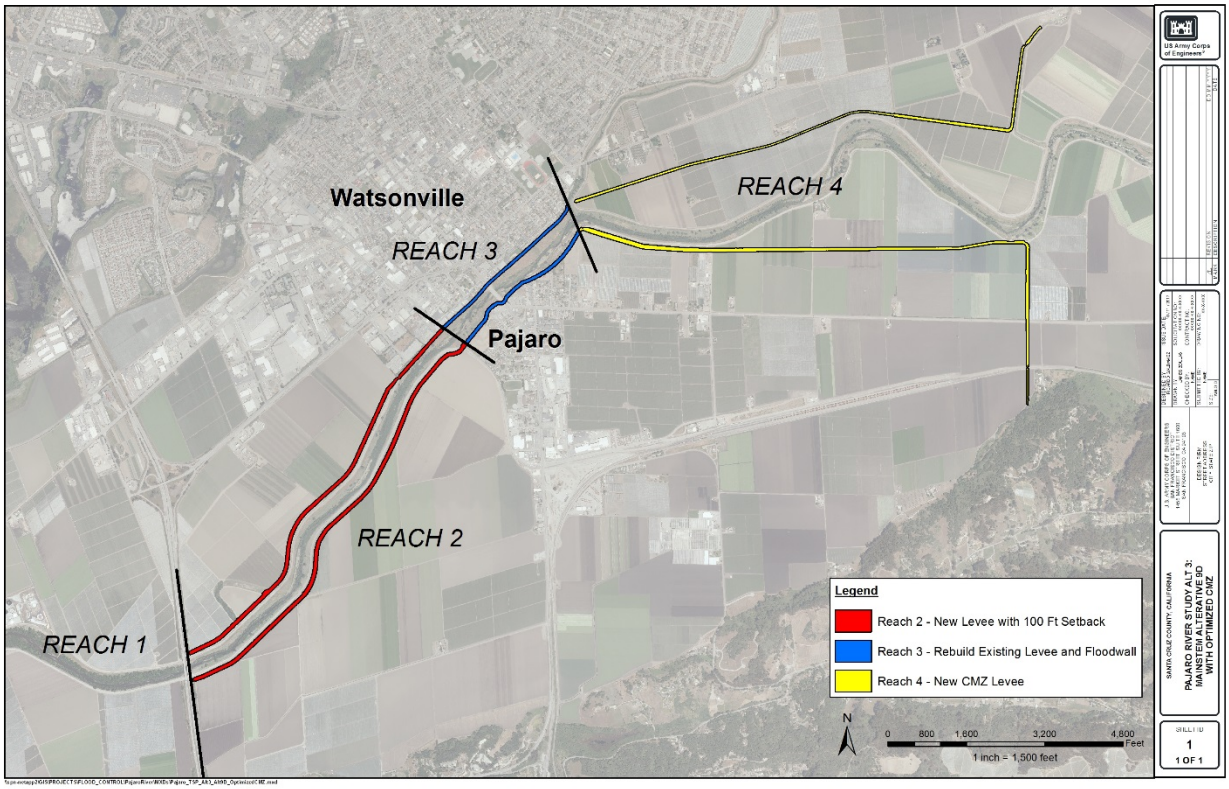

Figure 3-3: Mainstem Alternative 3

3.2.5 Mainstem Alternative 4

Alternative 4 is the same alternative as Alternative 1 but the completion levee on the right bank of reach 4 would be designed to the non-Federal sponsor's preferred 2% ACE (e.g. 2% instead of 4%; 50-year instead of 25-year, ACE flood event)

This alternative includes improvements on both banks of Reaches 2, 3, and 4 (**Figure 3-4**). Improvement on both banks of Reach 2 include demolition of the existing levee and construction of a new 100-foot setback levee. In Reach 3 on both banks the existing levee would be improved in place. A sliding gate will be required at the railroad bridge to close the levees during flood events at the bridge crossing.

In Reach 4 on the left bank the existing levee would be degraded and a new 100 foot setback levee would constructed. These levees would be constructed to contain the 0.01 ACE event.

Approximately 9,200 lineal feet of bank protection rip rap will be placed on the right bank and 4,300 lineal feet of bank protection rip rap will be placed on the left bank. The quantities of rip rap will be revised during PED.

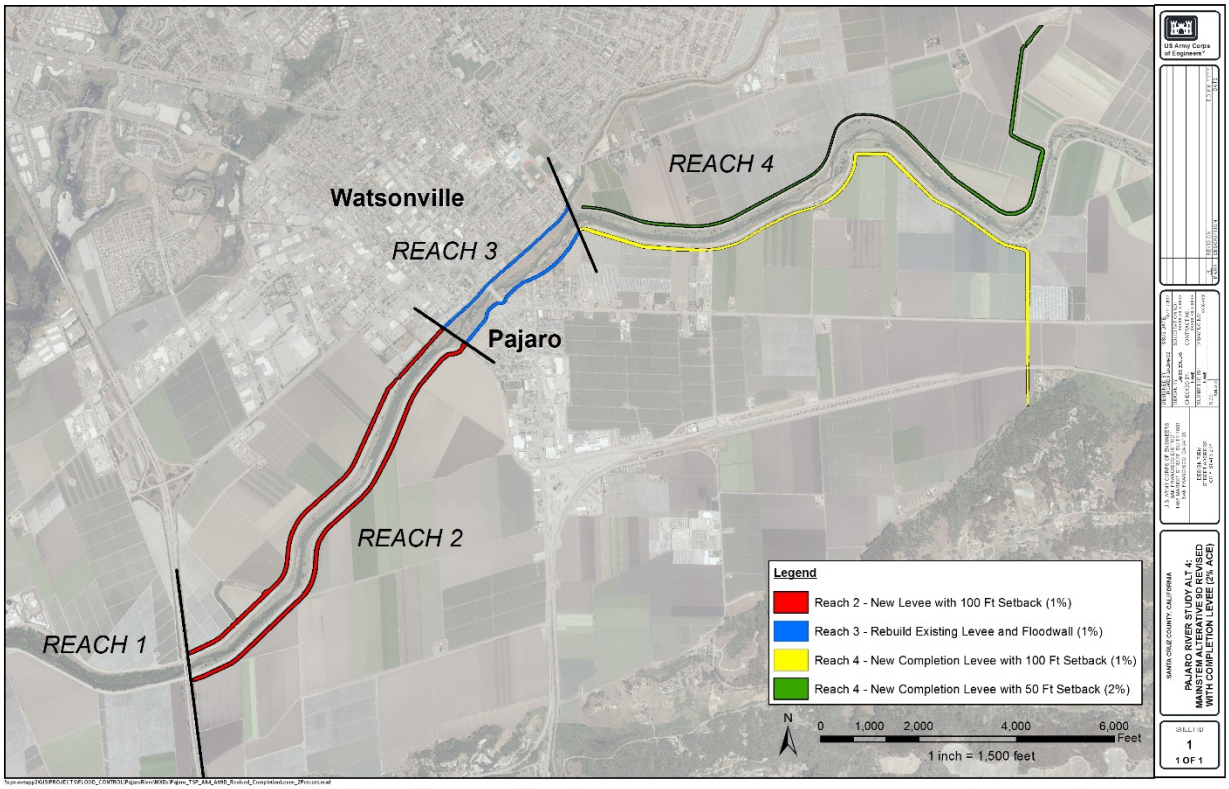

Figure 3-4: Mainstem Alternative 4

3.2.6 Tributary Alternative 5

In Reach 5, flood risk management would be achieved by raising existing levees in place with a setback levee on the opposite bank (the setback side switches between right and left–banks), and constructing floodwalls or a combination levee with a floodwall on top where urban development prevents raising existing levees (**Figure 3-5**). Salsipuedes Creek levees would be set back from 100 feet up to a maximum 225 feet in Reach 5. A floodwall would be constructed 2–5 feet tall on top of a new levee on the right–bank along the most downstream 2,450 feet of Reach 5 (starting at the confluence with the Pajaro River). Beginning approximately 8,800 feet upstream from the confluence with the Pajaro River, a floodwall would be constructed on the left–bank between Lakeview Road and College Road—a distance of approximately 1,460 feet—followed by a 2,584 foot length of floodwall about 4 feet tall on top of a new levee.

In Reach 6, new levees would be built on both sides of the Creek, set back from the existing natural streambanks approximately 50–75 feet (edge of channel to centerline of levee). A 490–foot length of floodwall would be constructed on the right–bank at Marigold Avenue, with an average height of approximately 6 feet.

In Reach 7, an earthen detention levee structure that transitions into a floodwall on the right–bank of Salsipuedes Creek would be constructed aligned along the northern border of the Orchard Park subdivision. Approximately 1,700 feet of the Pinto Creek ditch would be relocated to accommodate construction of the detention levee because it is situated within the footprint of the proposed levee embankment. Pinto Creek would be realigned so that it empties into College Lake behind the containment levee. No levees or floodwalls would be constructed along the left–bank. New culverts, trapezoidal earth channel sections, and concrete floodwall would be constructed to connect the outflow channel from College Lake to the confluence of Corralitos and Salsipuedes Creeks. Channel improvements downstream of College Lake would be implemented to ensure improved regulation of College Lake during large storm events.

In Reach 8, a new levee would be constructed on the left–bank only.

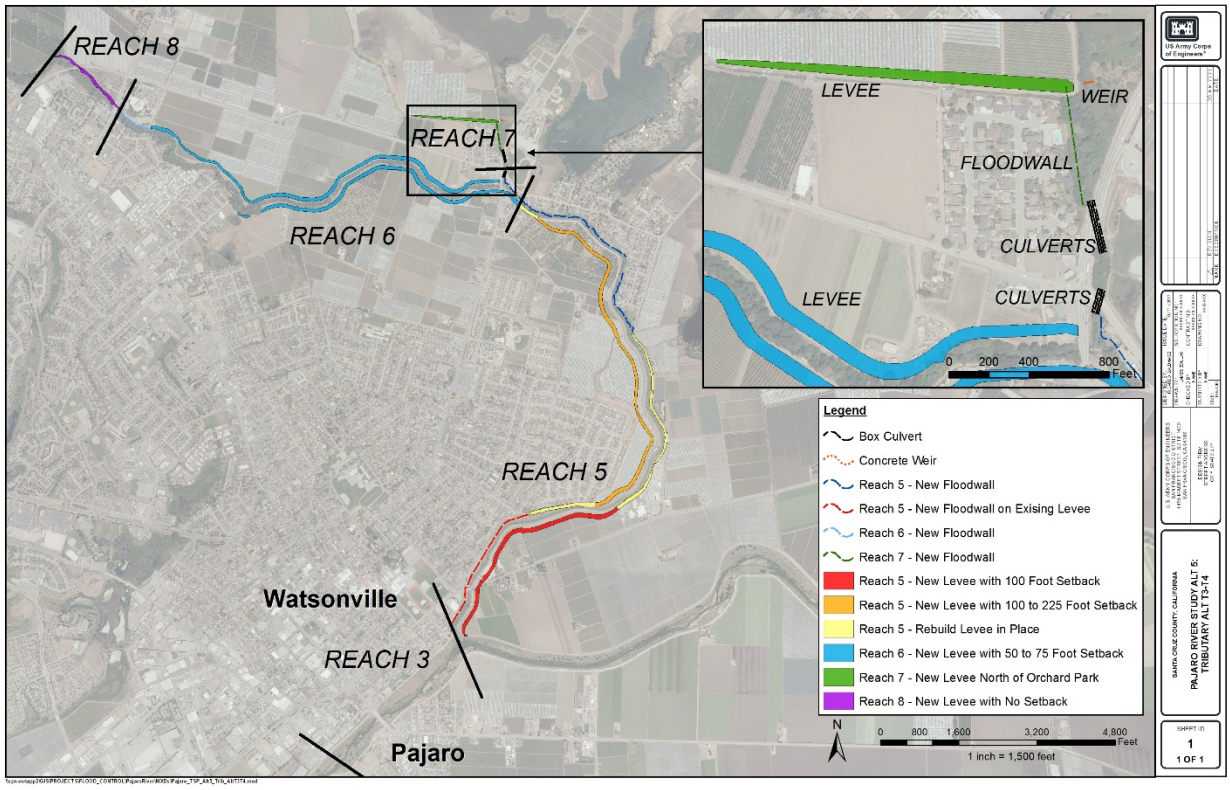

Figure 3-5: Tributary Alternative 5

3.2.7 Tributary Alternative 6

Alternative 6 would include the same measures as Alternative 5 but would exclude the levees along the left bank of Corralitos Creek (**Figure 3-6**). Instead, a ring levee would be constructed around the Orchard Park subdivision and the School district building along Corralitos Creek.

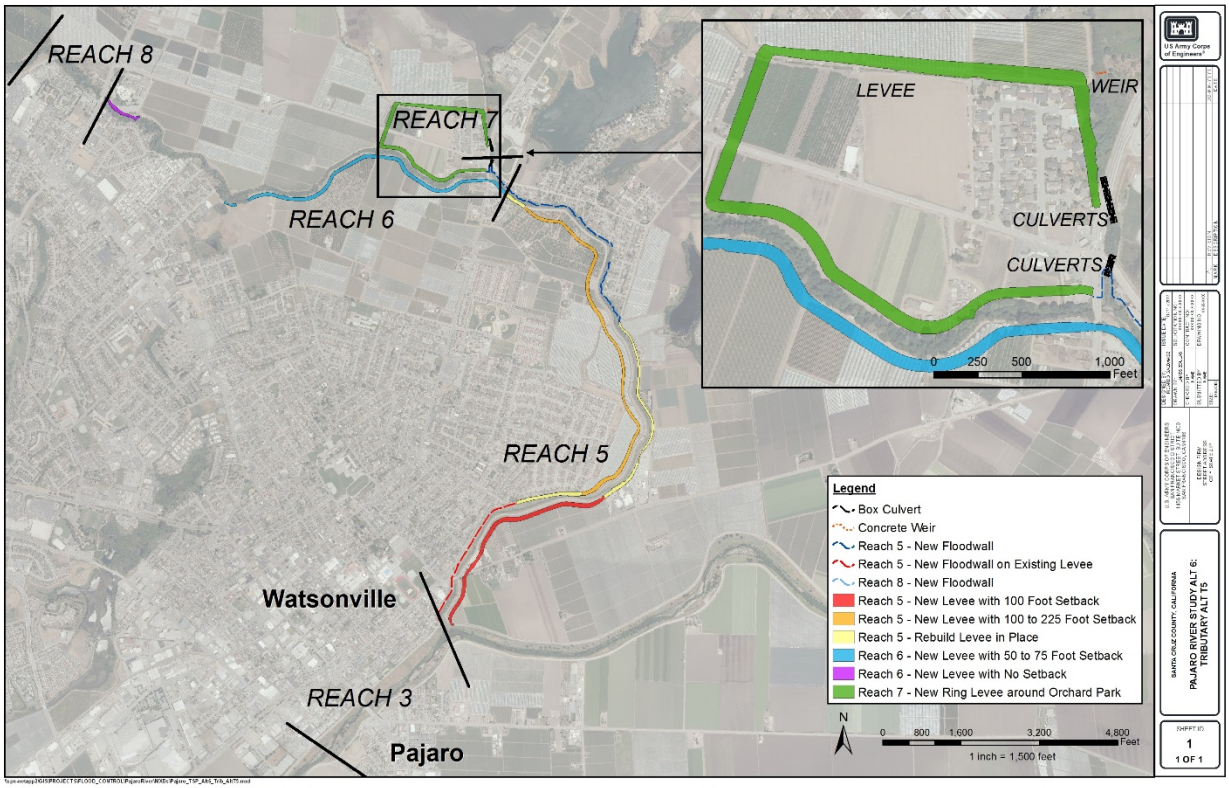

Figure 3-6: Tributary Alternative 6

3.2.8 Tributary Alternative 7

The intent of this alternative is to construct optimize CMZ levee setbacks at meander bends in order to balance natural geomorphic conditions and sustainability with existing land use.

This alternative would have all the elements of Alternative 5; however, CMZ levees would be incorporated into design of the proposed levee setbacks in Reaches 5, 6 and 8 (**Figure 3-7**). In addition to providing more sustainable channel characteristics, benefits would include reduction in O&M costs, reduced levee lengths, increased habitat value, increased channel capacity, and additional floodplain functions.

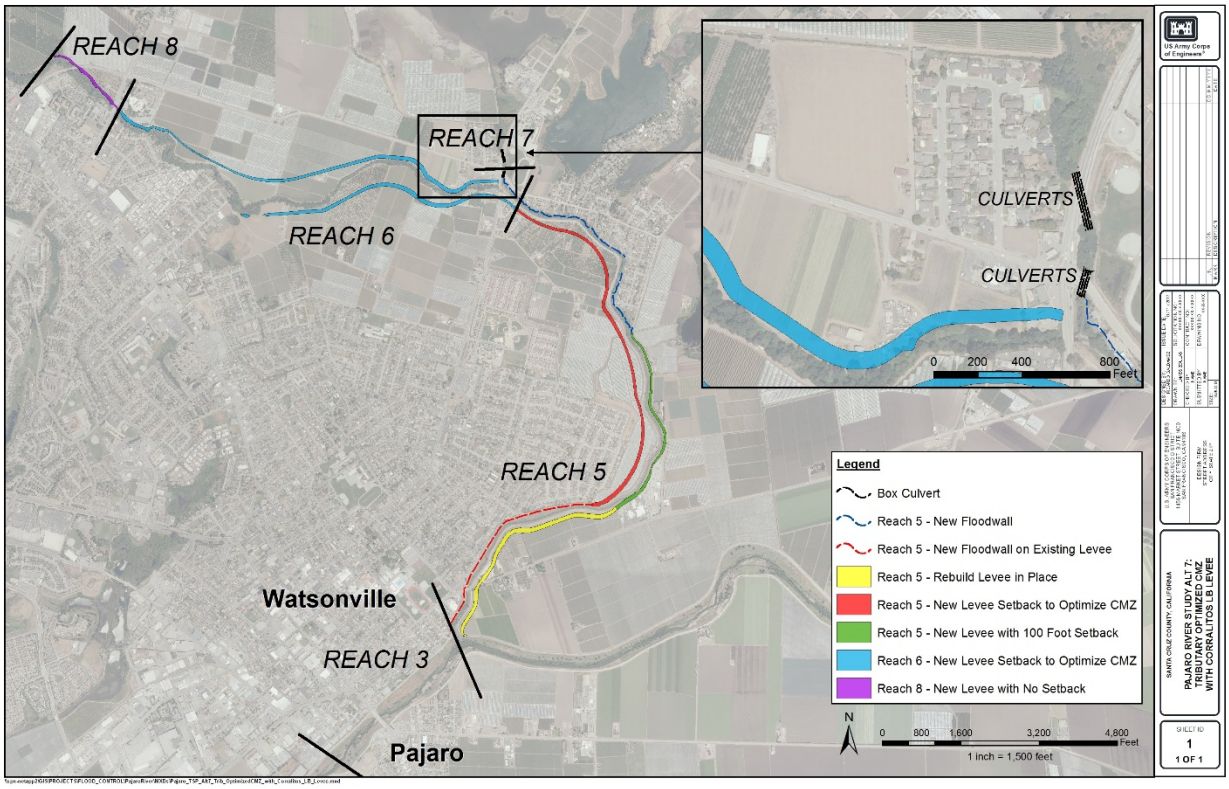

Figure 3-7: Tributary Alternative 7

3.2.9 Tributary Alternative 8

This alternative would have all the elements of Alternative 5; however, CMZ levees would be incorporated into design of the proposed levee setbacks in Reaches 5, 6 and 8 and there would be no levee on the left-bank of Corralitos Creek (**Figure 3-8**). Instead, a ring levee would be constructed around the Orchard Park subdivision in Reach 7 and the School district building along Corralitos Creek in Reach 8.

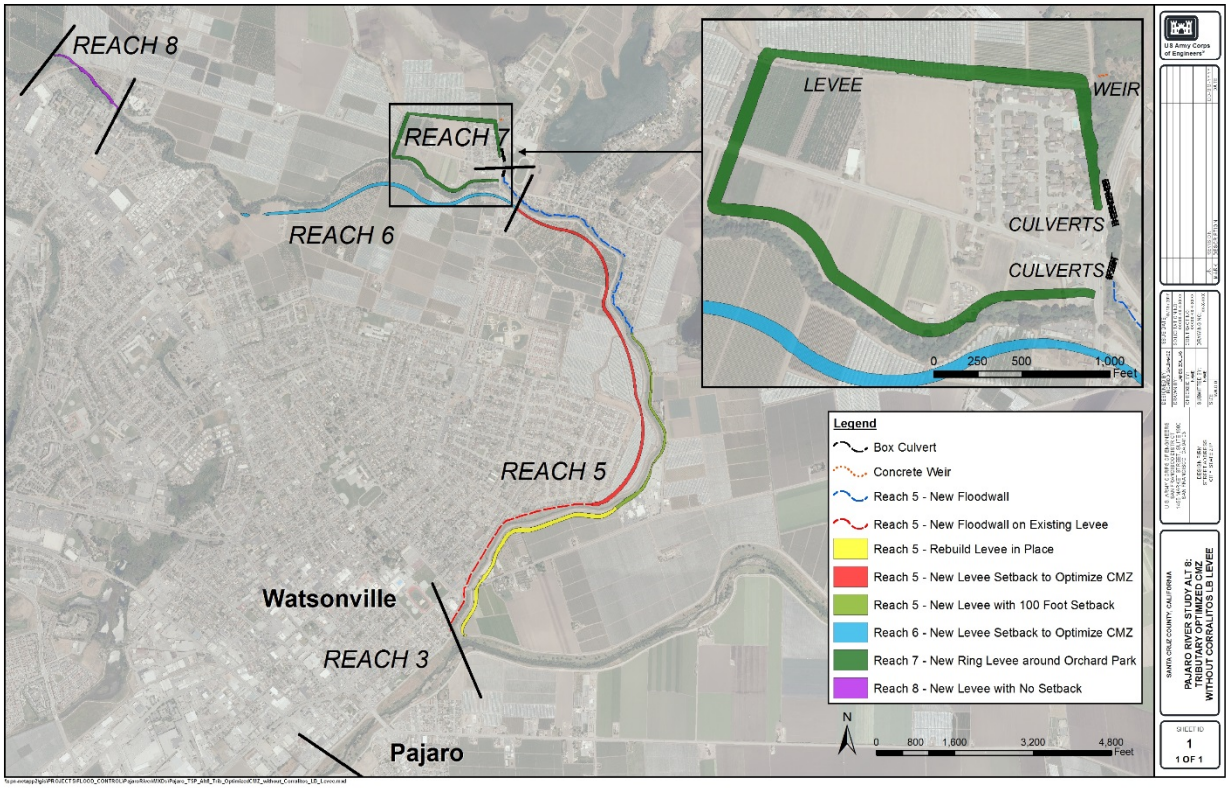

Figure 3-8: Tributary Alternative 8

3.3 EVALUATION OF THE FINAL ARRAY OF ALTERNATIVES

The final array of alternatives, Mainstem Alternatives 1- 4 and Tributary Alternatives 5-8 have been evaluated based on refined costs, refined benefits, contributions to the federal objectives and planning objectives. The mainstem and tributary alternatives were formulated and treated as separable elements. The benefits and costs of each mainstem and tributary array of alternatives were identified and the plan from each array that reasonably maximized net economic benefits was carried forward into a combined plan.

An economic optimization analysis and further refinements to hydraulic and geotechnical engineering analyses were performed on the combined plan to identify the National Economic Development (NED) Plan, which is the plan that reasonably maximizes net economic benefits. The NED Plan (Alternative 1 [Main Stem] and Alternative 6 [Tributaries]) is the Tentatively Selected Plan (TSP) for recommended for project implementation. As a result the economic optimization analysis and further engineering analysis, the following modifications and refinements were made which will be discussed in a greater level of detail later in Section 3.4 (Optimization and Incremental Analysis of Alternatives 1 and 6).
:

- 4% ACE improvement to the existing levee the right bank of Reach 4 (Alternative 1) on the mainstem was removed.
- 4% ACE levees/floodwalls in Reaches 5 and 6 of the tributaries (Alternative 6) were found to be economically optimal in lieu 1% ACE ring levee at Corralitos Creek.
- Project features and improvements associated with flood risk management at College Lake and Pinto Creek in Reach 7 (Alternative 6) were removed.

The TSP (NED Plan) meets the study objectives of reducing flood risk and flood damages. The TSP greatly reduces flood risk to people and property in the project area. The TSP provides flood damage reduction benefits and increased public safety to population at risk of 12,600 residents through improvements to the existing levee system that reduce the risk of hazardous flooding in the area.

All mainstem and tributary alternatives have been evaluated to determine their potential effects on the environment. In doing so, the environmental effects of any combination of the 8 plans have been addressed. The results of these analyses indicate mainstem Alternative 1 and tributary Alternative 6 combined is the NED Plan. These results are displayed in the comparison section below (**Table 3-1**, **Table 3-2**, **Table 3-3**, and **Table 3-4**).

Study Objectives

- OBJECTIVE: To reduce the risk of flooding on human life and safety in the City of Watsonville, Town of Pajaro, and surrounding unincorporated lands.
- OBJECTIVE: To reduce the risk of flood damages, including critical infrastructure, in the City of Watsonville, Town of Pajaro, and surrounding unincorporated lands in the project area.
- OBJECTIVE: To improve natural geomorphic processes and ecological functions in conjunction with other flood risk management features in the project area.
- OBJECTIVE: To include environmentally sustainable designs and construction methodologies and to minimize environmental impacts from future operation and maintenance for the recommended plan in conjunction with other flood risk management features in the project area.
- OBJECTIVE: To increase recreational opportunities in conjunction with flood risk management features and existing land uses.

Table 3-1 provides a comparison of the Final Array of Alternatives to the Study Objectives.

Table 3-1: Comparison of the Final Array of Alternatives to the Study Objectives.

Final Array of Alternatives	Project Objectives				
	To reduce the risk of flooding on human life and safety in the City of Watsonville, Town of Pajaro, and	To reduce the risk of flood damages, including critical infrastructure, in the City of Watsonville, Town of	To improve natural geomorphic processes and ecological functions in conjunction with other flood risk	To include environmentally sustainable designs and construction methodologies and to minimize environmental impacts from	To increase recreational opportunities in conjunction with flood risk management features and existing land uses.
Mainstem Alternative 1	Yes	Yes	Yes, setbacks levees in reaches 2 and 4 would	Yes, setback levee would provide environmentally	Yes
Mainstem Alternative 2	Yes	Yes	Yes, to some extent but only in Reach 2	Yes, setback levee in reach 2 would provide environmentally	Yes
Mainstem Alternative 3	Yes	Yes	Yes, Setback levees in Reach 2 and CMZ levees in Reach 4	Yes, Setback levees in Reach 2 and CMZ levees in Reach 4 would provide	Yes
Mainstem Alternative 4	Yes	Yes	Yes, setbacks levees in reaches 2 and 4 would	Yes, setback levee would provide environmentally	Yes
Tributary Alternative 5	Yes	Yes	Yes, setback levees in Reach 5 and 6 would	Yes, setback levees in reaches 5 and 6 would provide	Yes
Tributary Alternative 6	Yes	Yes	Yes, setback levees in Reach 5 and 6 would	Yes, setback levees in reaches 5 and 6 would provide	Yes

Tributary Alternative 7	Yes	Yes	Yes, setback levees in Reach 5 and 6 would	Yes, setback levees in reaches 5 and 6 would provide	Yes
Tributary Alternative 8	Yes	Yes	Yes, setback levees in Reach 5 and 6 and CMZ	Yes, setback levees in reaches 5 and 6 would provide	Yes

Cost estimates for the alternatives were provided. The costs were used for this economic analysis and are summarized in **Tables 3-2 and 3-3** below. In addition to project first costs, interest during construction (IDC) which is an economic cost, was also factored into the net economic benefit and benefit cost ratio (BCR) analyses. Interest during construction for each alternative was calculated. Information regarding the construction period for each alternative was prepared and used to compute IDC on an annual basis.

Table 3-2: Main Stem Pajaro River Alternatives - Project First Costs, IDC, and Average Annual Costs (October 2016 Price Level, 2.875% Discount Rate, 50-Year Period of Analysis, In $1,000s)

	Main Stem Pajaro River Alternative			
Cost Category	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Project First Costs	126,648	133,491	151,479	132,135
IDC	2,414	2,393	3,082	2,849
Total Economic Costs	129,062	135,884	154,561	134,984
Average Annual Costs	4,898	5,157	5,866	5,123
O&M Costs	100	100	100	100
Total Average Annual Costs	4,998	5,257	5,966	5,223

Table 3-3: Tributary Alternatives - Project First Costs, IDC, and Average Annual Costs (October 2016 Price Level, 2.875% Discount Rate, 50-Year Period of Analysis, In $1,000s)

Cost Category	Tributary Alternative			
	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Project First Costs	246,791	182,331	246,838	225,978
IDC	4,126	2,828	3,532	3,233
Total Economic Costs	250,917	185,159	250,370	299,211
Average Annual Costs	9,522	7,027	9,502	8,699
O&M Costs	100	100	100	100
Total Average Annual Costs	9,622	7,127	9,602	8,799

Net Benefits and Benefits-to-Cost Ratio

Total average annual benefits are compared to total average annual costs to calculate net economic benefits and BCRs as displayed in **Table 3-4**.

Table 3-4: Net Benefit Analysis (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Main Stem Pajaro River						
Alternative	Without-Project EAD	With-Project EAD	Average Annual Benefits	Average Annual Costs	Net Benefits	BCR
1	12,849	5,325	7,524	4,998	2,526	1.5
2		6,979	5,870	5,252	618	1.1
3		5,400	7,449	5,966	1,453	1.2
4		5,108	7,741	5,223	2,518	1.5
Tributaries						
Alternative	Without-Project EAD	With-Project EAD	Average Annual Benefits	Average Annual Costs	Net Benefits	BCR
5	17,465	5,579	11,886	9,622	2,264	1.2
6		6,698	10,767	7,127	3,640	1.5
7		5,579	11,886	9,602	2,284	1.2
8		6,511	10,954	8,799	2,155	1.2

The initial net economic benefit analysis summarized above concluded that Alternative 1 on the Pajaro River Mainstem and Alternative 6 on the Salsipuedes and Corralitos Creeks Tributaries reasonably maximized net economic benefits, respectively and were designated as the combined NED Plan and TSP. These plans were carried forward to the next stage of the analysis, which addressed refinements to the plans in terms of costs, optimization (scale), and incremental analysis (separate elements) of each plan.

3.4 OPTIMIZATION AND INCREMENTAL ANALYSIS OF ALTERNATIVES 1 AND 6

Refinements to Alternatives 1 and 6 were made based on optimization and incremental net benefit/BCR analyses. Optimization and incremental net benefit analyses ensure that the plans reasonably maximize net benefits in terms of scale and also ensure that separate elements of each plan are economically justified, respectively.

3.4.1 Optimization

Alternatives 1 and 6 are both designed to reduce flood risk for the urban areas of Pajaro and Watsonville from the 1% ACE flood event. A smaller scale design (ability to contain the 2% ACE event) and a larger scale design (ability to contain the 0.4% ACE event) to reduce flood risk to the urban areas were evaluated for Alternative 1 on the Main Stem Pajaro River; similarly, a smaller scale design (ability to contain the 2% ACE event) and a larger scale design (ability to contain the 0.2% ACE event) to reduce flood risk to the urban areas were evaluated for Alternative 6 on the Tributaries.

Cost Estimates

Cost estimates for the 2% ACE plan (Alternatives 1 and 6), 0.4% ACE plan (Alternative 1), and 0.2% ACE plan (Alternative 6) were developed parametrically. The cost estimates for the various plans are presented in **Table 3-5** and **Table 3-6.** The 1% ACE plans cost estimates for the Main Stem Pajaro River and the Tributaries are also included in the tables.

Table 3-5: Main Stem Pajaro River, Alternative 1 -Cost Estimates for 2%, 1% and 0.4% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Cost Category	Plan Scale – Alternative 1		
	Contains 2% ACE Event (Urban Areas)	Contains 1% ACE Event (Urban Areas)	Contains 0.4% ACE Event (Urban Areas)
Total Project First Costs	125,670	126,648	135,713
IDC	2,405	2,414	2,597
Total Economic Costs	128,075	129,062	138,310
Average Annual Costs	4,860	4,898	5,249
O&M Costs	100	100	100
Total Average Annual Costs	4,960	4,998	5,349

Table 3-6: Tributaries, Alternative 6 - Cost Estimates for 2%, 1% and 0.2% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Cost Category	Plan Scale – Alternative 6		
	Contains 2% ACE Event (Urban Areas)	Contains 1% ACE Event (Urban Areas)	Contains 0.2% ACE Event (Urban Areas)
Total Project First Costs	177,558	182,331	193,629
IDC	2,754	2,828	3,004
Total Economic Costs	180,312	185,159	196,633
Average Annual Costs	6,843	7,027	7,462
O&M Costs	100	100	100
Total Average Annual Costs	6,943	7,127	7,562

Average Annual Benefits

Average annual benefits for the 2% ACE and 0.4% ACE plan (Alternative 1) and the 2% ACE and 0.2% ACE plans (Alternative 6) were estimated using Hydrologic Engineering Center-Flood Damage Analysis model (HEC-FDA). The plans were modeled in HEC-FDA assuming a 90% assurance, the same approach utilized to estimate the 1% ACE plans for each alternative. **Tables 3-7 and 3-8** present the average annual benefits for each plan.

Table 3-7: Main Stem Pajaro River, Alternative 1 - Average Annual Benefits for 2%, 1%, and 0.4% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

Plan Scale	Without-Project EAD	With-Project EAD	Damages Reduced (Benefits)
Contains 2% ACE Event	12,849	6,280	6,569
Contains 1% ACE Event		5,325	7,524
Contains 0.4% ACE Event		4,540	8,309

Table 3-8: Tributaries, Alternative 6 - Average Annual Benefits for 2%, 1%, and 0.2% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, In $1,000s)

Plan Scale	Without-Project EAD	With-Project EAD	Damages Reduced (Benefits)
Contains 2% ACE Event	17,465	8,044	9,421
Contains 1% ACE Event		6,698	10,767
Contains 0.2% ACE Event		6,266	11,199

Net Benefit Analysis: Different Scales of Alternatives 1 & 6

For both Alternative 1 and Alternative 6, net benefits for the three scales were calculated and are presented in **Table 3-9** and **Table 3-10**. A curve was developed comparing the net benefits of each scale; this net benefit curve is displayed graphically in **Figure 3-9** and **Figure 3-10**. The graphical representation of the net benefit curves indicates that net benefits are reasonably maximized, for both alternatives, at around the 1% ACE event scale.

Table 3-9: Main Stem Pajaro River, Alternative 1 - Net Benefits and Benefit-to-Cost Analysis for 2%, 1%, and 0.4% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Plan Scale	Without-Project EAD	With-Project EAD	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
Contains 2% ACE Event	12,849	6,280	6,569	4,960	1,609
Contains 1% ACE Event		5,325	7,524	4,998	2,526
Contains 0.4% ACE Event		4,540	8,309	5,349	2,960

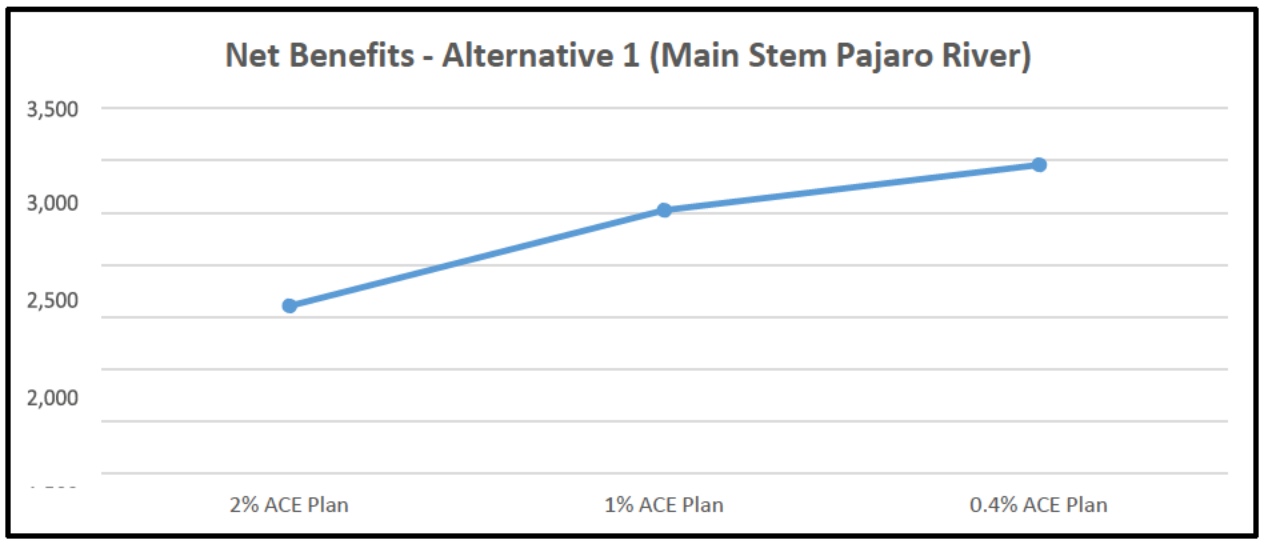

Figure 3-9: Net Benefit Curve for Alternative 1 (Main Stem Pajaro River). Note – Net Benefits in $1,000.

It should be noted that net benefits continue to increase above the 1% ACE Plan for Alternative 1; however, this increase in net benefits is happening at a decreasing rate – i.e., the curve begins to flatten out above the 1% ACE Plan. Additionally, net benefits for the larger plan on the curve (0.4% ACE plan) are based on a cost estimate that is indirectly derived from the 1% ACE plan cost estimate. For these reasons – a flattening net benefit curve and an indirectly derived cost

estimate for the 0.4% ACE plan, there is greater confidence (and less uncertainty) that the 1% ACE plan rather than larger plans maximizes net benefits. The 1% ACE plans for Alternative 1 and Alternative 6 were considered to be the plans that reasonably maximized net benefits and were the ones carried forward to the incremental analysis.

Table 3-10: Tributaries, Alternative 6 - Net Benefits and Benefit-to-Cost Analysis for 2%, 1%, and 0.2% ACE Plans (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Plan Scale	Without-Project EAD	With- Project EAD	Average Annual Benefits (AAB)	Average Annual Costs (AAC)	Net Benefits
Contains 2% ACE Event	17,465	8,044	9,421	6,943	2,478
Contains 1% ACE Event		6,698	10,767	7,127	3,640
Contains 0.2% ACE Event		6,266	11,199	7,562	3,637

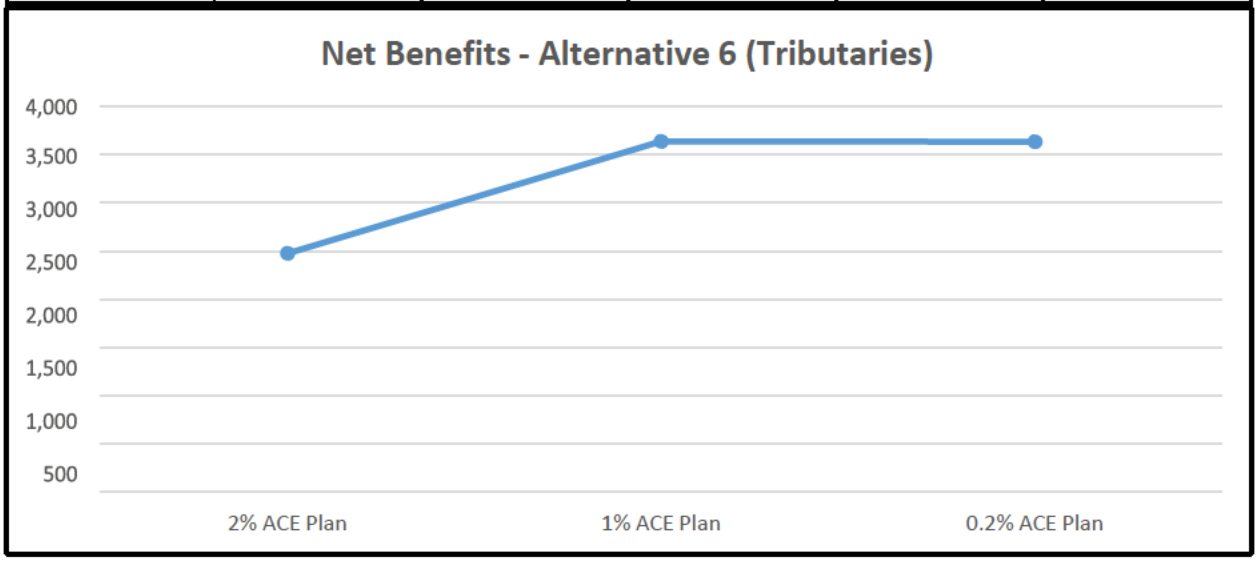

Figure 3-10: Net Benefit Curve for Alternative 6 (Tributaries) Note – Net Benefits in $1,000

3.4.2 Incremental Analysis of the Alternatives

An incremental analysis was conducted in order to assess the economic feasibility of each separable element. Aggregating net benefits without analyzing each element on its own may sometimes mask the subsidizing of net benefits by one element over another. This is especially common in locations where urban areas, with relatively high benefit areas, are mixed in with large swaths of agricultural areas, with relatively lower benefit areas vis-à-vis urban areas, such as in the Pajaro study area.

Table 3-13 and **Table 3-14** displays the results of the incremental analysis. **Figure 3-11** shows the Study Reaches.

Table 3-11: Main Stem Pajaro River, Alternative 1 - Incremental Net Benefit and BCR Analyses (October 2016 Price Level, 50-Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Hydraulic Reach	Protected EIA	AAB	AAC	Net Benefits	BCR
Left Bank Reaches 2, 3, and 4	Town of Pajaro and surrounding agricultural area (EIA C)	3,505	3,280	225	1.1
Right Bank Reaches 2 and 3	City of Watsonville and adjacent agricultural area east of HWY 1 (EIA D)	3,872	928	2,944	4.2
Right Bank Reach 4	Agricultural area upstream of confluence (EIA E)	147	690	(543)	0.2

Table 3-12: Tributaries, Alternative 6 - Incremental Net Benefit and BCR Analyses (October 2016 Price Level, 50- Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Hydraulic Reach	Protected EIA	AAB	AAC	Net Benefits	BCR
Right Bank Reaches 5 and 6	City of Watsonville and surrounding agricultural area (EIA D)	7,896	2,519	5,377	3.1
Left Bank Reaches 5, 6, and 7	Orchard Park neighborhood and agricultural area upstream of confluence (EIA F and EIA E)	2,872	4,508	(1,636)	0.6

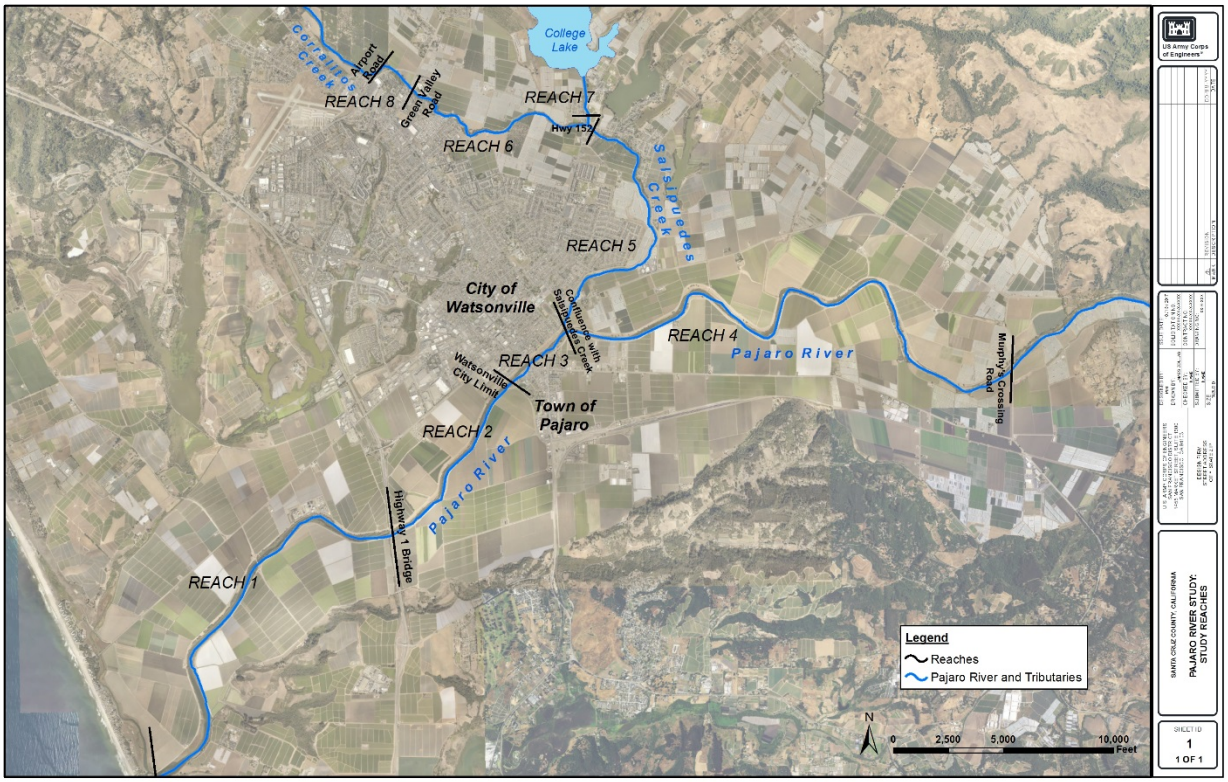

Figure 3-11 Study Reaches

For the Main Stem Pajaro River, the benefits are greater than the costs of the left bank levee improvements protecting the Town of Pajaro and the surrounding agricultural area. The net benefits are $225,000, resulting in a benefit-to-cost ratio (BCR) for these improvements of 1.1. Additionally, the net benefits of the improvements to the right bank levee improvements protecting the City of Watsonville and adjacent agricultural area are $2,944,000, resulting in a BCR of 4.2. Both the left and right bank improvements on the Main Stem are economically justified. However, the net benefits for the right bank levee improvements protecting the agricultural area east of the confluence are a negative $543,000, resulting in a BCR of 0.2, indicating that this feature is not economically justified for FRM up to the 1% ACE.

For the Tributaries, the net benefits for the for the right bank levee improvements protecting the City of Watsonville and the surrounding agricultural area are $5,377,000, resulting in a BCR of 3.1. However, the net benefits for the left bank levee improvements protecting the Orchard Park neighborhood and the agricultural area just upstream of the confluence between Salsipuedes Creek and the Pajaro River are negative $1,636,000, resulting in a BCR of 0.6, indicating that this element is not economically justified for FRM up to the 1% ACE.

3.4.3 Refinements to the Tentatively Selected Plan

Several changes to the NED plan and economic analysis took place following the TSP Milestone Conference held in August of 2017. These include changes to the scope of features proposed for the Tributaries, updated cost estimates, and an update to the damage/benefit analyses. These changes are described in more detail in the following sections.

Further refinement of the features in Reaches 5 and 6 led to the determination that providing FRM up to the 4% ACE event in the urbanized portion of reach 5 (upstream of Lakeview Road), and to Reach 6 had a positive BCR and was incrementally justified. FRM features that were originally proposed but ultimately screened out due to economic infeasibility were reintroduced at a smaller scale. The proposed FRM features include a levee, setback between 50 to 75 feet, along Corralitos Creek in Reach 6 and a floodwall in Reach 5 along Salsipuedes Creeks that extends down to Lakeview Road and will tie in to the existing levee downstream of Lakeview Road. Improvements that can provide flood risk reduction up to the 4% ACE flood event were selected because it is approximately the same level of flood risk reduction event of the existing levees constructed in 1949 on Salsipuedes Creek. **Table 3-13** presents the updated scope of the FRM project on the Tributaries.

Table 3-13: Tributaries, Revised Scope of Alternative 6

Hydraulic Reach	Protected EIA	AAB	AAC	Net	BCR
Right Bank Reaches 5 and 6	City of Watsonville and surrounding agricultural area (EIA D) with 4% ACE	8,127	4,167	3,960	2.0
Left Bank Reaches 5 and 6	Orchard Park neighborhood (EIA F) with 4% ACE	2,008	1,177	831	1.7

3.4.4 Updated Cost Estimate

The updated cost estimate for the TSP (NED Plan), Mainstem Alternatives 1 and Tributary Alternative 6, is displayed in **Table 3-14.**

Table 3-14: Costs and Benefits of the TSP-NED Plan (October 2016 Price Level, 50- Year Period of Analysis, 2.875% Discount Rate, In $1,000s)

Item	TSP Plan ($1,000s)
First Cost	245,556
Interest During Construction (IDC)	2,726
Total	248,282
Interest and Amortization	9,422
OMRR&R	200
Subtotal	9,622
Monetary Benefits (FRM)	17,985
Net Annual FRM Benefits	8,363
FRM Benefit-Cost Ratio	1.9

3.5 ENGINEERING PERFORMANCE OF THE TSP

The TSP (NED Plan) provides FRM up to the 1% ACE flood event for the urban Pajaro and Watsonville areas (EIA C and EIA D, respectively) and from the 4% ACE flood event for the Orchard Park neighborhood along the left bank of Corralitos and Salsipuedes Creeks. The TSP also provides flood protection for the agricultural areas located in EIAs C and D. The TSP does not provide flood protection for the primarily agricultural areas of EIA A and EIA E; in EIA B, the TSP does reduce flood risk from the Tributaries but does not reduce the risk from Pajaro River flooding.

Table 3-15 displays the with-project engineering performance statistics by EIA.

Table 3-15: Tentatively Selected Plan (TSP) - Engineering Performance Statistics

System	EIA[1]	Engineering Performance Statistics								
		AEP	Long-Term Risk			Assurance				
			10	30	50	10%	4%	2%	1%	0.2%
PAJARO RIVER	A	8.5%	59%	93%	99%	72%	31%	11%	3%	1%
	B	7.3%	53%	90%	98%	78%	37%	14%	4%	1%
	C	0.4%	4%	12%	20%	99%	99%	97%	87%	43%
	D	0.5%	5%	13%	21%	99%	99%	97%	86%	40%
	E	5.9%	45%	84%	95%	87%	39%	12%	3%	1%
	F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRIBUTARIES	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	B[2]	7.3%	53%	90%	98%	78%	37%	14%	4%	1%
	C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	D	0.3%	3%	9%	15%	99%	99%	99%	89%	61%
	E	25%	94%	99%	99%	58%	28%	14%	6%	1%
	F	2%	18%	45%	63%	99%	90%	63%	30%	4%

[1]Economic impact areas (EIA) receiving flood protection from the TSP are shaded grey.
[2]The risk from tributary flooding is reduced; however, with the TSP in place, the greatest risk to EIA B comes from potential Pajaro River flooding, and is reflected in the engineering performance statistics reported in this table.

3.6 THE TENTATIVELY SELECTED PLAN

The recommendation of the District Engineer of the San Francisco District, U.S. Army Corps of Engineers is that the NED Plan, the Combined Alternative 1 for the Mainstem of the Pajaro River and Alternative 6 on the Tributaries, be considered the Tentatively Selected Plan (TSP). The estimated first cost of the NED plan is $245,556,000.

CHAPTER 4 – AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION MEASURES

4.1 INTRODUCTION

This chapter describes the affected environment, reports the environmental consequences that would result from implementing the alternatives in the final array, and identifies mitigation measures to address potential adverse effects. The alternatives evaluated in this chapter are described in Chapter 3 and are summarized in comparative form in Section 4.1.6.

4.1.1 Determining Significance Under NEPA

NEPA requires that the environmental effects of a project be analyzed for significance. Under NEPA, potential project effects are assessed in relation to the conditions described in the No Action Alternative. Impacts are considered significant because of their context (location sensitivity) and intensity (severity of impact) (40 Code of Federal Regulations [CFR] Section 1508.27). USACE has integrated NEPA requirements into its regulations, policies, and guidance. Engineer Regulation 1105-2-100, "Planning Guidance Notebook," April 2000, establishes the following significance criteria, which apply to all resources considered in this environmental review and are not repeated for each resource:

- *Significance based on institutional recognition means that the importance of the effects is acknowledged in the laws, adopted plans, and other policy statements of public agencies and private groups. Institutional recognition is often in the form of specific criteria.*
- *Significance based on public recognition means that some segment of the general public recognized the importance of the effect. Public recognition may take the form of controversy, support, conflict, or opposition expressed formally or informally.*
- *Significance based on the technical or scientific criteria related to critical resource characteristics.*

4.1.2 Effect Determinations Used in this Report

An overall effect determination is identified, by alternative, for each resource. For the purposes of the analyses, the effect determinations are defined as described below.

- **Beneficial.** Would provide benefit to the environment as defined for that resource.

- **No Effect.** Would cause no discernible change in the environment.

- **Less Than Significant.** Would cause no substantial adverse change in the environment. Incorporation of mitigation measures may be considered in making this determination.

- **Significant.** Would cause a substantial adverse change in the physical conditions of the environment.

4.1.3 Chapter Structure

The section covering each resources includes the following elements:

- **Affected Environment.** This section briefly describes the environmental setting relevant to the resources that could be affected by the alternatives being analyzed.

- **Environmental Consequences.** The effects are considered and evaluated as to whether they are direct, indirect or cumulative (40 CFR Section 1508.8). Direct effects are caused by the action and occur at the same time and place. Indirect effects are reasonably foreseeable consequences the physical environmental that may occur at a later time or at a distance from the project area. Short-term and long-term effects are also considered. Short-term effects are primarily associated with construction activities. Cumulative effects for all resource areas are discussed in Section 4.19, Cumulative Effects.

- **Mitigation.** Measures to mitigate (i.e., avoid, minimize, rectify, reduce, or compensate for) accompany each effect discussion. NEPA regulations require identification of mitigation for any adverse impact but does not require implementation of specific measures. In this GRR/EA, the mitigation measures identified are proposed for implementation.

4.1.4 Scope of this Environmental Analysis

The Pajaro GRR/EA documents the General Reevaluation Study's consideration of Federal participation in additional flood risk management solutions for the overall defined study area, and specifically the City of Watsonville and the town of Pajaro. This environmental review analyzed the environmental effects of the proposed alternatives using a conservative approach that looks at typical cross sections and footprints for levee reaches.

During quality control review an instability issue was identified with the hydraulic model. This does not affect the description of the No Action Alternative/Without Project Future Condition or the comparison of alternatives (since the modeling issue affects each of the Action Alternatives). It may, however, change the dimensions of each of the Action Alternatives, and could affect the sizing and scale of the NED plan with respect to project performance and level of protection provided. There now exists the possibility that the current proposed design height of the setback levees may not be able to contain the current NED plan of 1% (1/100) ACE event as expected. Preliminary efforts were unable to sufficiently resolve the issue in time to meet the

suspense date for public release of the Draft GRR/EA for concurrent review (Public/USACE Policy/USACE ATR/Regulatory Resource Agencies). The hydraulic model issue will be resolved during the concurrent review as the study advances into feasibility-level design. As planning proceeds, USACE, and the non-Federal study sponsors will continue to refine project elements. Any refinements to the project would be reviewed and compared to what was evaluated in this Draft GRR/EA to determine if supplemental NEPA documentation would be required. CEQ regulations specify that supplements are required if: (i) USACE makes substantial changes in the proposed action that are relevant to environmental concerns; or (ii) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.

If the project is approved and funded, during the Pre-construction Engineering and Design (PED) phase USACE would then do a site-specific analysis to support detailed design and construction. This work would include appropriate biological and cultural resources site surveys and site-specific engineering. As descried above, design refinements and survey information would be reviewed to determine if supplemental NEPA documentation would be required.

4.1.5 NEPA No Action Alternative

Section 2.8 describes key conditions and trends assumed to exist in the study area in the future if the proposed flood risk management project is not undertaken. Section 4.1.5 focuses additional attention on future conditions for those resources evaluated in this environmental review.

Summary

The historical record together with results of the current study demonstrate that the project area is at high risk of flooding from the lower Pajaro River, Salsipuedes Creek and Corralitos Creek. The effects of a specific flooding event would vary depending upon the location, extent, depth, and duration of the flooding. The consequences could be modest and confined to a small portion of agricultural lands or they could be grave and extensive if a large portion of the urbanized floodplain is inundated, placing lives and property at risk. This study has identified sufficient likelihood of adverse effects from flooding to tentatively recommend a plan for Federal investment to address that flood risk. **Figure 4.8-1** shows the extent and depth of inundation during a 100-year flood under the No Action Alternative.

Flooding would negatively affect the physical environment, primarily through effects on water quality. During a flood event, floodwaters move across the floodplain, including urban areas, and can pick up and transport contaminants, eventually drawing them into rivers and creeks as floodwaters recede. High water leaving a waterway and spreading out on its floodplain is a natural ecosystem process and may provide ecological benefits by activating the floodplain and providing habitat for species like waterfowl and wading birds. However, exposure to

contaminants and other hazards could off-set these benefits. In an urban or otherwise developed landscape, these flood waters can result in serious hazards to humans, developed lands, and the environment.

At a minimum, continued flood fighting and subsequent levee rehabilitation would occur. If damage were extensive, the clean-up and rehabilitation would require use of heavy construction equipment, disposal of debris including hazardous materials, and use of a large quantity of materials to rebuild houses, businesses, and infrastructure. People would be displaced from homes and jobs. This type of reconstruction would significantly disrupt the physical, biological, and socioeconomic environment.

Levee maintenance under the No Action Alternative would continue under current requirements as described in the Project Operation and Maintenance Manual and other regulatory permits. One of these regulatory permits is the annual 1602 Streambed Alternation Agreement with California Department of Fish and Wildlife prepared jointly by both the County of Santa Cruz and the Monterey County Water Resources Agency. Maintenance activities in the Agreement include selective removal of vegetation from the channels, banks, and benches of the Pajaro River and Salsipuedes Creek. There are no maintenance activities currently implemented on Corralitos Creek and no sediment removal activities are currently permitted.

Agriculture. The No Action Alternative would directly affect agriculture during periods of flooding, when impacts would include damage to agricultural infrastructure, erosion and loss of soils, and at least temporary production losses. No changes would occur that could indirectly convert farmland to nonagricultural use. Operation and maintenance activities would continue on, and adjacent, to the existing levees, many of which are immediately adjacent to agricultural lands.

Air Quality. Recovery from extensive flooding would likely require a robust clean up and construction response, as described in the introductory paragraphs to this chapter. To the extent feasible in light of the emergency, best management practices and other mitigation measures would be applied to address potential effects from construction equipment.

Aquatic Resources. Conditions would remain generally as described in Section 4.6.1, however flooding could introduce additional contaminants to the waterways and uncontrolled flooding could strand aquatic organisms on the floodplain as the waters recede.

Cultural Resources. Conditions would remain generally as described in Section 4.7.1 except that emergency flood fighting and levee rehabilitation could affect both known and currently unidentified archeological resources and flooding could affect historic buildings in the City of Watsonville and the town of Pajaro.

Hydrology, Hydraulics, Geomorphology. Conditions would remain generally as described in Section 4.8.1.

Land Use. Land use would remain generally as described in Section 4.9.1. Some agricultural lands around the periphery of the City of Watsonville and the town of Pajaro could be converted to urban uses as populations of these communities increase.

Noise and Vibration. The current level of risk for a major levee failure and flooding within the project area would remain. In the event of a levee breach, repair-related construction activities would occur. The location and extent of repair-related activities could be minor to extensive depending on the location and severity of the levee failure and duration of flooding. Repair-related activities would likely involve repairing damaged homes, utility infrastructure, roads, and highways. Noise-sensitive land uses (i.e., residential uses) are concentrated in Watsonville and Pajaro in the vicinity of likely levee repairs.

Public Health and Environmental Hazards. Generally, the condition of public health and environmental hazards would remain as described in Section 4.11.1. Hazardous materials would continue to migrate down-gradient in groundwater and from contaminated soils into groundwater. Clean up of these materials is also anticipated to continue. The existing flood risk remain high, which would be expected to result in significant future flooding, flood fighting, and rehabilitation, all of which have a high potential to bring exposure to Hazardous, Toxic, and Radioactive Waste (HTRW) as a result of both the flooding itself and the flood fighting and rehabilitation construction work. Flood damage to homes and other structures can render them dangerous due to structural damage and contamination. Electrical systems could be damaged by flooding, posing potential fires and natural gas leaks that could result in poisoning through inhalation of fumes or could cause a sudden explosion if sparked. The likelihood of a significant amount of mold production is high after a flood event. Mold not only threatens the physical integrity of structures, but also poses its own health risks. Mold can cause lung infections, skin irritations and other health dangers, especially for those with asthma, allergies or suppressed immune systems. Additionally, the floodwaters themselves and ponds left behind, could provide a wide breeding ground for mosquitos and the incidence of vector born disease would likely increase.

Recreation. Direct and indirect effects on recreational facilities and opportunities from flooding could be temporary and minor or could result in long-term damage and facilities closures, including damage to pedestrian and bicycle facilities.

Socioeconomics and Environmental Justice. The current level of risk would remain for a major levee failure and flooding of areas in the City of Watsonville, town of Pajaro, and surrounding agricultural lands. Damage and impacts on existing residential, commercial, agricultural structures behind the existing levees could be from minor to significant depending on the location and severity of the levee failure and the duration of flooding. Levee failure and subsequent inundation would have the potential to cut off access to certain portions of the affected communities and inundation would require temporary or permanent relocation of residents and businesses to nearby communities. Large-scale flooding could temporarily reduce the local housing supply and leave many residents without shelter in the short-term. To the extent

that local housing were reconstructed, the housing stock would likely recover over the long run. Large-scale flooding could induce some local residents to move out of the area permanently, which would result in decreased population levels and a reduction in housing resources.

A flood event could have important consequences for agriculture in the study area, thereby affecting economic productivity. Flooding could result in substantial damage to private and public property and loss of personal income.

Based on their proximity to the flood inundation area, it is likely that flood damages would occur within the town of Pajaro and/or the City of Watsonville, which could affect minority and low-income populations. Such impacts would include loss of personal property and potential loss of life from large-scale flood events. In addition, damages to the agricultural sector could affect the long-term viability of agricultural operations in the region. In the case where agricultural operations are displaced (either short or long term), households that are dependent on the agricultural sector, which include farmworkers, would be most affected. Impacts on these communities could include loss of employment and income.

Special Status Federal Species. Conditions would remain generally as described in Section 4.14.1, except that flooding could introduce contaminates to the waterways and some species could be transported to different locations or stranded on the floodplain as floodwaters move across the land.

Traffic and Circulation. Existing public transit, bikeways, and pedestrian facilities would be unchanged and would continue to be flooded during heavy storm events. Railways adjacent to the Project area would be inundated during a 100-year flood. Flooding could cause roads to be closed and subsequent repairs could require detours that could re-route traffic. Emergency access could be limited by impassible roadways during floods.

Utilities and Public Services. Conditions under the No Action Alternative would generally remain as described in Section 4.16.1, Affected Environment, except that the area would remain at elevated risk of flooding. Flooding would be expected to damage utility and service infrastructure and strain services.

Vegetation and Wildlife. Conditions would generally remain as describe in Section 4.17.1, except that a levee failure or emergency levee repairs could result in removal of vegetation and habitat. Some wildlife, like waterfowl, could temporarily benefit from flooded floodplains where the flooding occurs on agricultural lands and contaminates are not present. Extensive, deep flooding, can displace or kill some wildlife that cannot move out of the way.

Water Quality. Under the No Action Alternative water quality conditions would generally remain as described in Section 4.18.1; however, the risk of flooding along the Lower Pajaro River, Salsipuedes and Corralitos Creeks would remain high and flooding in the future is highly likely to occur. Flooding of urban and agricultural lands would be likely to result in pollution of

the Corralitos Creek, Salsipuedes Creek and/or lower Pajaro River and contribute to temporary and long-term water quality degradation and nonattainment of designated uses. Flooding could release contaminates from buildings and other infrastructure (e.g., lead paint and asbestos), stored chemicals, septic systems, and flooded vehicles, all of which could contaminate the Pajaro River, Salsipuedes Creek and/or Corralitos Creek. These contaminants, including petroleum products, solvents, pesticides, and nutrients would likely exceed acceptable established water quality standards and, at least temporarily impair beneficial uses of the river, its tributaries and in, and downstream of, the project area.

4.1.6 Comparative Summary of the Action Alternatives

Chapter 3 describes the alternatives development process and provides a narrative description of each of the Action Alternatives evaluated in Chapter 4. Alternatives are composed of different types of improvements, and different types of features comprise those improvements. Some types of improvement are included in all of the Action Alternatives; some are included in just one alternative. This is also true of specific features. **Table 4.1-1** and **Table 4.1-2** show, in comparative form, the proposed improvements for each action alternative. Similarly, **Table 4.1-3** shows key features included in each Action Alternatives.

Construction would occur outside of the flood season which is from 1 November to 15 April and would be consistent with all regulatory requirements. **Table 4.1-4** compares construction durations for each of the Action Alternatives. Construction staging and access for equipment would be on the landside of the existing levees. **Table 4.1-4** compares the estimated borrow material required to construct each alternative. Sufficient quantities of appropriate borrow materials are available within 25 miles of the project from licensed permitted facilities that meet all Federal and State standards and requirements. In reaches where a setback levee is proposed, much of the required material would come from existing levees demolished and replaced with setback levees. Up to 75% of the existing levee material would be reused to construct the new setback levee. The remaining removed material would be hauled offsite and disposed of at an approved site in the vicinity of the project. For exiting levees that would be fixed in place, suitable materials removed from the levees would temporarily be stockpiled adjacent to the levee landside and returned to the levee as the remediation is completed. Alternatively, materials would be moved to another levee segment for use in constructing that segment. Materials unsuitable for reuse would be removed to commercial and local disposal sites.

Once project construction is complete, it would be turned over to the local non-Federal project partners together with an operation and maintenance manual in accordance with the executed Project Partnership Agreement (PPA) for construction. The PPA is signed before construction begins. Following construction, the non-Federal partners would be responsible for continued operation and maintenance of the project consistent with the new and/or amended

operation and maintenance (O&M) manuals, also referred to as Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) Manuals, which specify requirements for operating and maintain the project.

Table 4.1-1: Comparison of Proposed Improvements for Each Action Alternative

Reach	Left Bank (L)/ Right Bank (R)	Features[1]	Action Alternatives – Mainstem Pajaro				
			1	2	3	4	TSP[2]
Reach 2	L	100 ft. setback levee. Demolish existing levees	X	--	X	X	X
	R	100 ft. setback levee. Demolish existing levees	X	X	X	X	X
Reach 3	L	Floodwall on levee	X	--	X	X	X
	L	Pajaro Ring Levee	--	X	--	--	--
	R	Floodwall on levee	X	X	X	X	X
Reach 4	L	100 ft. setback levee Completion levee Demolish existing levee	X	--	--	X	X
	L	OCMZ[3]	--	--	X	--	--
	R	Completion levee (4% ACE)	X	X	--	X	--
	R	50 ft. setback levee (2% ACE) Completion levee	--	--	--	X	--
	R	OCMZ[3] (4% ACE)	--	--	X	--	--

[1] Unless indicated, the design level of all features is 1% ACE (1.100).
[2] TSP in includes improvements on the mainstem of the Pajaro river and on the tributaries (Salsipuedes and Corralitos Creeks)
[3] OCMZ is optimized channel meander zone.

Table 4.1-2: Comparison of Proposed Improvements for Each Action Alternative

			Alternatives - Tributaries				
Reach	**Left Bank (L)/ Right Bank (R)**	**Features**[1]	**5**	**6**	**7**	**8**	**TSP**[2]
Salsipuedes	L	New floodwall Rebuild levee in place New levee with setback	X	X	X	X	--
	L	New floodwall (4% ACE)	--	--	--	--	X
	R	Rebuild levee in place New levee with setback New floodwall on existing levee	X	X	--	--	X
	R	New levee with CMZ New floodwall on existing levee	--	--	X	X	--
Corralitos	L	New levee with no setback Orchard Park: Levee and floodwall Reach 8 levee	X	--	--	--	--
	L	New levee with no setback Orchard Park: Ring levee	--	X	--	--	--
	L	New levee with no setback New levee with CMZ Reach 8 levee	--	--	X	--	--
	L	New levee with no setback Orchard Park: Ring levee Reach 8 levee	--	--	--	X	--
	L	New levee with no setback (4% ACE)	--	--	--	--	X
	R	New levee with no setback	X	X	--	--	X
	R	New levee with CMZ	--	--	X	X	--

[1] Unless indicated, the design level of all features is 1% ACE (1/100).
[2] TSP in includes improvements on the mainstem of the Pajaro river and on the tributaries (Salsipuedes and Corralitos Creeks).

Table 4.1-3: Comparison of Key Features For Each Action Alternative

	Action Alternatives								
Structural Measure[1]	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**TSP**
Floodwall (no levee) (mi)	--	--	--	--	1.1	1.1	1.0	1.0	1.0
Floodwall on levee (mi)	0.8	0.8	0.8	0.8	0.6	0.6	0.6	0.6	0.8
New Levee (mi)	10.2	5.9	9.3	10.2	7.1	5.9	7.0	6.5	11.9
Levee Setback (mi)	5.2	1.4	3.1	7.5	4.6	2.9	0.9	0.9	8.6
Levee Setback CMZ (mi)	--	--	4.6	--	--	--	4.2	4.2	--
Existing levee removed (mi)	5.2	1.4	7.7	7.5	1.7	1.7	2.4	2.4	6.0
Completion levee	Yes	No	No	Yes	No	No	No	No	Yes
Ring Levee (mi)	--	3.6[2]	--	--	--	1.6[3]	--	--	--
Levee Along Pinto Creek and Realignment	--	--	--	--	Yes	--	--	--	--
Erosion Protection, Left Bank (mi)	1.7	0.2	1.7	1.7	--	--	--	--	1.7
Erosion Protection, Right Bank (mi)	0.8	0.2	0.8	0.8	--	--	--	--	0.8
Sliding Floodgate at Railroad crossing	Yes	No	Yes	Yes	No	No	No	No	Yes
Setback Floodplain (acres)	52.4	15.1	405.5	52.4	42.8	38.2	89.6	60.0	89.6
Bridge Raise (#)	--	--	--	--	2	2	2	2	2

Table 4.1-4: Comparison of Construction Durations and Borrow Material Required for the Action Alternatives

	Action Alternatives								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**TSP**
Construction Duration (months)	11	10	12	13	9	8	7	7	19
Construction Seasons (years)	7	7	7	7	9	8	7	7	7[1]
Amount of borrow material needed (cy)	327,362	336,159	336,251	362,742	413,607	343,328	319,538	324,375	447,172

[1] Based upon simultaneous construction on both mainstem Pajaro (Pajaro River) and the tributaries (Salsipuedes and Corralitos Creeks).

4.1.7 Summary of Significance Determinations Made in this Report

All of the Action Alternatives analyzed would result in less than significant direct, indirect, and cumulative effects on each resources considered. The alternative formulation process focused considerable effort on developing a final array of alternatives that would avoid and minimize adverse effects. For some resources mitigation measures are incorporated to reduce all potential adverse effects to less than significant levels. Mitigation measures described in this chapter are incorporated into the Action Alternatives.

4.2 RESOURCES DISMISSED FROM DETAILED EVALUATION

Resources considered and determined not to warrant detailed evaluation because the proposed project would not affect them are **geology**, **soils, seismicity, timber, and minerals.** Best management practices would be implemented during construction, operation and maintenance to ensure that soil remains in place or topsoil is removed and stored during construction and placed appropriately following construction. The project resides in a high seismic hazard zone. The existing project levees have experienced damage from seismically induced liquefaction (USACE, 1989) and the project area is likely to experience peak ground accelerations (PGA) up to 0.76 g for the maximum credible earthquake (MCE). However, the likelihood of experiencing ground shaking capable of producing damages to flood risk management structures coincident with a high water event is remote. Construction and operation of flood risk management features, like those proposed for this project, would have no effect on the occurrence of seismic events.

4.3 AESTHETICS

Visual resources are the physical characteristics of a landscape that determine its scenic quality. These characteristics are both natural and human-made features that make up a specific landscape scene.

4.3.1 Affected Environment

The project area landscape is a mixture of urban communities surrounded by a mosaic of agricultural fields. Bisecting this plain is the Pajaro River and Salsipuedes and Corralitos creeks, which undulate within shallow riverbanks across the expanse. Currently, much of the project vicinity is urbanized or is farmed in row crops. The riparian corridors associated with the Pajaro River and Salsipuedes and Corralitos creeks provide contrast among the urban and agricultural landscape.

Critical public views with high sensitivity within the project area include views from state and regional scenic highways, residential neighborhoods, recreational parks, and walkways. Viewers of the project area include motorists traveling on roads that intersect area streams, those who use the levees along the Pajaro River and Salsipuedes Creek for recreation, visitors to local parks, and residents of the area with views of the river from their private residences. Motorists typically view the streams only for short periods, but recreational users and residents would experience the views for longer periods.

Agricultural areas are sparsely populated and do not have much public traffic through the area. The sparse population and limited public travel denote that views from this area have a low sensitivity. The commercial areas are situated so that they are not oriented to any public views and, therefore, would also have a low sensitivity. Homeowners often choose their residences based on their location and surrounding visual landscape. Outdoor activities are closely tied to surrounding environment, such as hiking and sightseeing and parks.

Residential communities and parks, particularly along the Pajaro River and Corralitos and Salsipuedes creeks, can be sensitive to visual changes in the landscape because these views are intricately related to the surrounding environment. The project area can be viewed from several public parks and facilities. River Park at East Front Street and River Mini Park off Riverside Drive in the City of Watsonville provide views of the lower Pajaro River. Palm Beach State Park provides access to and views of the mouth of the Pajaro River on the Santa Cruz County side; Zmudowski State Beach provides views and access from the Monterey County side. Salsipuedes Creek is visible from a smaller park near Delta Way in the City of Watsonville. Corralitos Creek can be viewed at road crossings. Additional critical public views to the project area include statewide and regional travel routes, residential subdivisions, parks, and schools.

Land use along Reaches 2, 4, 7 and the left bank of Reaches 5, 6, and 8 is primarily agricultural with a few residential and industrial sites. Land use along Reach 3 and the right bank of Reaches 5, 6, and 8 is primarily residential and commercial. A description by reach follows:

Reach 2. Levees parallel the Pajaro River is banked on both sides in this reach. Flat agricultural fields extend from the river to the north and south. Reach 2 also includes the City of Watsonville's western-most edge in an industrialized portion of the city. Thick native vegetation is found along the banks of the river as well as within a remnant of an oxbow currently disconnected from the river. The northeastern portion of this reach is surrounded on three sides by commercial and industrial development. The dominant landscape attributes within Reach 2 are the mosaic of agricultural fields and the industrial development within the City of Watsonville and Town of Pajaro. Primary public views of this reach are from Highway 1. Although levee access is restricted as a public view site, the levees are used as pedestrian access routes and recreational trails. In addition, residences along the southern edge of the Town of Pajaro have a clear view of the project area. All other views are from rural access roads and sporadic residences.

Reach 3. Both sides of the river in this reach is are dominated by urban infrastructure. The City of Watsonville extends along the entire right bank of the river and the town of Pajaro extends along most of the left bank. The landform differs from the previous two reaches with the wide bench between the river and the levee. Thick native vegetation grows along the banks of the Pajaro River and large trees grow intermittently along the exterior bank of the levee. Vegetation within the communities varies from large trees to manicured grasses and bushes. Human uses along the levee and within the communities include residential, commercial and industrial structures, fencing, transmission lines, signs, roads and bridges. The dominant landscape attributes within Reach 3 are residential, commercial and industrial development within the City of Watsonville and Town of Pajaro. Primary public views of this reach are from Porter Drive Bridge, residential communities on the left and right banks of the river, and River Park. Although levee access is restricted from public viewing, the levees have become popular pedestrian access routes and recreational trails within this reach. With the implementation of an approximately 8 foot high floodwall, construction in Reach 3 has the potential to affect residences on the right bank of the Pajaro River. People that reside in the homes immediately adjacent to the Pajaro River in Reach 3 would have an obscured view to the river when the new floodwall is implemented depending on how accessible their current view is now.

Reach 4. Reach 4 extends from just east of Pajaro River's intersection with Salsipuedes Creek to the base of the Santa Cruz Mountain foothills, approximately 5 river miles (see Photo 7). Reach 4 is very similar to Reach 1 in that the existing levees hug the banks of the Pajaro River and are bordered on both sides by large agricultural fields. Thick, native vegetation along the banks of the Pajaro River form a meandering line of green through the agricultural fields. Effects to visual character in Reach 4 are similar to effects in Reach 2 due to both reaches being surrounded by agricultural land. This alternative would not affect agricultural views or residences located on East Front Street and West Front Street. Primary public views of this reach

are from rural access roads and sporadic residences. Travelers utilizing the Main Street Bridge and the road immediately adjacent to the left side of the Pajaro River would have the highest level of potential visual disturbance, but the commute would be minimal and temporary for both modes of transportation.

Reach 5. Low-lying levees hug both banks of Salsipuedes Creek (with a few smaller benches between the river and the levees) until the northern intersection with Lakewood Drive. At that point, the left bank levee tapers off and a residential community begins. The dominant landscape attributes within Reach 5 are the mixture of agricultural fields interspaced with residential developments. Land uses on both sides interchange between residential neighborhoods and agricultural fields. Thick, native vegetation grows within the banks of Salsipuedes Creek similarly to the Pajaro River. Development in this area includes community houses and structures, transmission lines, commercial development and roads. The access road along the right bank levee also serves as a popular community hiking and biking trail. Primary public views of this reach are from residential communities on the left and right banks of the river, the pedestrian path along the right bank levee, and Atri Park. In addition, the reach can be viewed from Lakeside Drive with parallels the left bank levee to the south.

Reach 6. No levees exist along this reach of Corralitos Creek. The creek is primarily bordered by agricultural fields on both sides until Atkinson Lane on the right bank. From Atkinson Lane to Green Valley Road extends a residential community directly bordering the creek. Thick, native vegetation grows within the banks of Corralitos Creek, similarly to the Pajaro River and Salsipuedes Creek. The dominant landscape attributes within Reach 6 are the mosaic of agricultural fields and residential developments to the north. Primary public views of this reach are from residential communities, Highway 152 and Green Valley Road bridges.

Reach 7. Existing levees for Reach 7 extend from the confluence at the Pajaro River to mile 2.6 on the west bank and to mile 1.7 on the eastern bank. Land uses include a residential neighborhood, Lakeview Middle School and agricultural fields. Thick, native vegetation grows within the banks of a few portions of Salsipuedes Creek. Other vegetation includes a few sparse trees and agricultural crops. The landscape attributes within Reach 7 include the mixture of agricultural fields interspaced with residential and educational developments. Primary public views of this reach are from residential communities, Lakeview Middle School, Highway 152, Holohan Road, College Road, and from the Pajaro River Levee Trail Park. All other views are from rural access roads. Current public access on the Pajaro River levee system is along the Watsonville City Limits, consisting of 1 mile of the levee on the mainstem of the river and a half mile on the tributary Salsipuedes Creek. The City of Watsonville operates this 1.5-mile stretch of levee as The Pajaro River Levee Trail Park. While this is the only area of legal access, the entire 12 mile length of the levee road of the River's main stem is also openly used on both sides of the river from the river mouth to Murphy's Road Crossing by runners, bicyclists, equestrians, and walkers because the levee maintenance road is maintained as a 13-foot wide path of paved asphalt that is easily traversed by pedestrian users (Santa Cruz County 2010).

Reach 8. The creek is primarily bordered on the left bank by agricultural fields and on the right bank by residences. Thick, native vegetation grows within the banks of Corralitos Creek, similarly to the Pajaro River and Salsipuedes Creek. Human disturbances along this reach include roads, residences, agricultural structures, and transmission lines. Reach 8 primarily traverses between riparian, residential, and agricultural lands. Primary public views of this reach are from residential communities, Highway 152 and Green Valley Road bridges. All other views are from rural access roads and sporadic residences.

4.3.2 Environmental Consequences – Action Alternatives

Implementing Alternatives 1, 2, 3, and 4 would affect the same geographic area and have similar effects on aesthetics in the vicinity of Pajaro River and immediately adjacent lands. Similarly, implementing Alternatives 5, 6, 7, and 8 would have similar effects along and adjacent to Salsipuedes and Corralitos Creeks. The TSP would have effects similar to both of these sets of alternatives since it proposes similar flood risk management features along all three of these waterways. For all alternatives in all reaches, erosion protection, likely riprap, would line up to three quarters of the waterside levee slopes and woody vegetation would be removed from the levees and from within 15 feet of both the landside and waterside of the levees and floodwalls. These features would be maintained free of woody vegetation.

Generally, the visual quality of the project area would change slightly under each of the Action Alternatives, but the changes would not greatly alter the visual landscape. In most areas, levees would be replaced by new levees located at a greater distance from the waterway or existing levees would be reshaped and raised and, in some cases, a floodwall would be added to the top of the levee, and in some areas a stand-alone floodwall would be constructed. Under some alternatives, though, a new flood risk management feature would be added to the landscape where none currently exists.

During construction visual resources may temporarily be impaired. Visual quality could decrease due to the amount of equipment, material, and barren land in view throughout the duration of construction. However, improved existing levees, new levees, and new floodwalls would be approximately the same height as the existing levees and would perform the function. In addition, the proposed project would not create permanent new sources of substantial light or glare. Following construction, the disturbed areas, including levee slopes and easements would be reseeded with native grasses and forbs.

Improved Levees

Residential communities may experience a decrease in visual quality due to the obstruction that improved levees. Depending on the height, the improved feature could act as a barrier between the homes and riparian habitat located along the Pajaro River (Alternatives 1, 2, 3, 4, and TSP) or along Salsipuedes and Corralitos Creeks (Alternatives 5, 6, 7, 8, and TSP).

New Ring Levees

Alternative 2 would introduce a ring levee around the town of Pajaro. Alternative 6 would introduce a ring levee around the Orchard Park subdivision. The ring levee would be a new landscape feature and would cause a permanent and distinguishable change for residents living adjacent to the new levee. Construction related aesthetic changes would only prohibit the residents from having a clear view of the surrounding agricultural land, therefore, visual quality would not be significantly decreased.

New Levees and Floodwalls

The construction of new levees and the floodwall would create a slight blockage for public views depending on the height of the new levee features in relation to the elevation at ground level. However, many of the views in the project area are restricted to public access and are on agricultural land. The change of view in the restricted areas would not be considered a hindrance to aesthetic quality.

Effects to visual character in Reaches 5, 6, 7, and 8 (Alternatives 5, 6, 7, 8 and TSP) would all be generally similar. The height of the setback levees and floodwalls would not cause a large discrepancy in the current visual quality. Because much of the footprint is surrounded by agricultural fields, residential communities, and miscellaneous buildings, most of the land is already developed and disturbed.

In consideration of the information presented above, construction related effects on aesthetics are considered **less than significant** because construction-related effects would be temporary. The new levees and floodwalls would not be a significant aesthetic change from current flood risk management features and would, therefore, result in **less than significant** effects on aesthetics.

4.3.1 Mitigation

The following mitigation measures would be implemented to reduce the adverse effects associated with the proposed project to ensure they remain less-than-significant

Mitigation Measure VIS-1: Preserve existing native trees to the extent practicable.

Mitigation Measure VIS-2: Locate staging areas on previously disturbed lands where feasible.

Mitigation Measure VIS-3: Restore staging areas following construction by restoring pre-construction topography to the degree practicable and hydroseeding the areas with native grasses and forbs.

4.4 AGRICULTURE

4.4.1 Affected Environment

Important Farmlands Inventory

The Farmland Mapping and Monitoring Program (FMMP) is a state program that produces maps and statistical data used for analyzing impacts on California's agricultural resources. Agricultural land is rated according to soil quality and irrigation status. The highest quality land, called Prime Farmland, has the best combination of physical and chemical features able to sustain long-term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store moisture, is rated as Farmland of Statewide Importance. Farmland of lower quality soils used for the production of the state's leading agricultural crops is rated as Unique Farmland. This land is usually irrigated, but may include non-irrigated orchards or vineyards, as found in some climate zones in California. Land of importance to the local agricultural economy as determined by each county's Board of Supervisors and a local advisory committee is considered to be Farmland of Local Importance. Grazing land is land with existing vegetation suited to the grazing of livestock (California Department of Conservation 2010a). **Figure 4.4-1** illustrates the FMMP designates for the adjacent lands within 200 feet of the Project site.

Santa Cruz County

Due the fertile soil and climate that allows for year-round production, agriculture is one of the most valuable industries in Santa Cruz County. Based on gross value, the number one crop in the county is strawberries, followed by raspberries. Other important crops include lettuce, Brussels sprouts, cut flowers, apples, miscellaneous berries, and miscellaneous vegetables, such as artichokes, beans, beets, cabbage, cucumbers, mushrooms, peas, spinach, and squash. In 2008, Santa Cruz County generated over $485 million from agriculture, with berries ($287 million) and nursery crops ($107 million) as the top grossing crops (Santa Cruz County Agricultural Commissioner 2009). See Section 4.13 for more details on socioeconomic impacts on agriculture. Between 1984 and 2014, Santa Cruz County lost 3,077 acres of Prime Farmland, 401 acres of Farmland of Statewide Importance, 524 acres of Unique Farmland, and gained 70 acres of Farmland of Local Importance. During that time the county also gained 1,742 acres of grazing lands.

Monterey County

Agriculture is the largest, most valuable industry in Monterey County. In 2008, the county produced over $3.8 billion of agriculture productions. By gross value, lettuce is the county's biggest crop, followed by strawberries, nursery crops (e.g., potted plants, bulbs, poinsettias, etc.), broccoli, and wine grapes. In fact, almost half of the County's vegetable crop

land (about 153,000 acres out of 320,000 acres) is dedicated to growing lettuce (Monterey County Agricultural Commissioner 2009). See Section 4.13 for more details on socioeconomic impacts on agriculture. Between 1984 and 2014, Monterey County lost 10,591 acres of Prime Farmland, gained 6, 232 acres of Farmland of Statewide Importance, gained 15,226 acres of Unique Farmland. During this time the county lost 18,811 acres of grazing land. No Farmland of Local Importance has been identified.

Williamson Act Contracts

Agricultural lands in California may be protected under the California Land Conservation Act, commonly called the Williamson Act. Local governments can enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open-space use. Landowners receive substantially reduced property tax assessments in return for enrollment under Williamson Act contracts. Property tax assessments of Williamson Act-contracted lands are based on generated income of land as opposed to the potential market value of the property (California Department of Conservation 2010b).

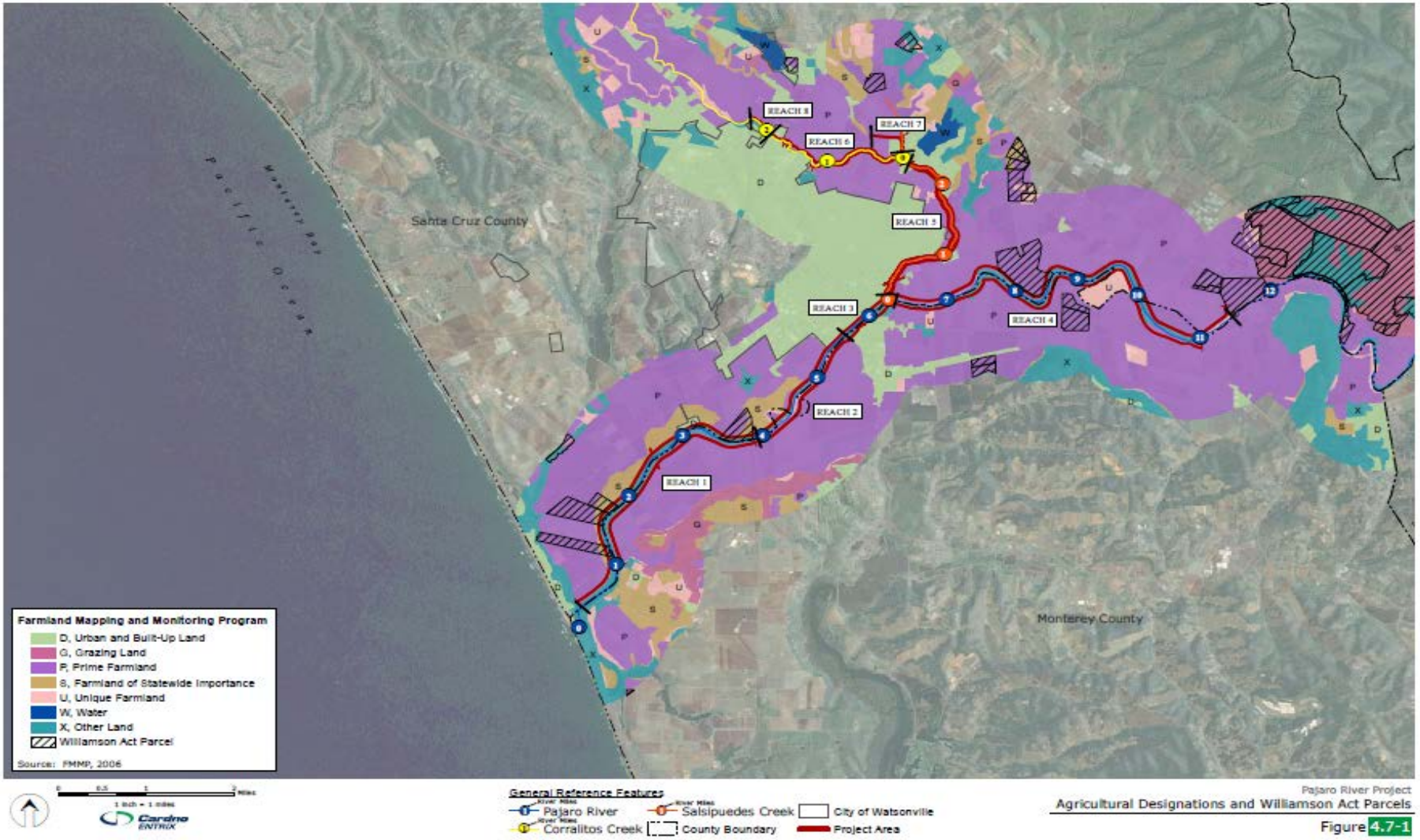

Figure 4.4-1: Farmland Mapping and Monitoring Program Land Designations in Project Area.

4.4.2 Environmental Consequences – Action Alternatives

Table 4.4-1 shows the acreage of important farmland effected by each of the Action Alternatives. Farmland in this region is high value and important, however the conversion event the largest Pajaro project alternative (the TSP) would result in loss of just 0.4 % of important farmland in Santa Cruz County and 0.05 % of important farmland in Monterey County. The proposed project would not indirectly result in conversion of other farmland in the area to non-farm uses. County and local General Plans and zoning strongly support the maintenance of these farmland. Changing these requirements would require official modification to county and local requirement to significant conversion of farmland to other uses. O&M practices would be similar to current practices.

Table 4.4-1: Total Farmland Within the Construction Footprint of Each of the Action Alternatives

	Alternative (acres)									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**TSP**	**Staging**
Santa Cruz County										
Prime Farmland (acres)	38.6	18.0	50.9	53.8	84.8	72.7	77.6	71.3	60.6	7.0
Unique Farmland (acres)	0.5	0.5	0.5	0.5	0.0	0.0	0.0	0.0	0.5	0.0
Farmland of Statewide Importance (acres)	2.3	2.3	2.3	2.3	0.0	0.0	0.0	0.0	2.3	0.0
Sub-total	**41.5**	**20.8**	**53.6**	**56.5**	**84.8**	**72.7**	**77.6**	**71.3**	**63.4**	**7.0**
Monterey Cruz County										
Prime Farmland (acres)	57.6	14.9	56.3	57.6	--	--	--	--	57.5	2.0
Unique Farmland (acres)	0.5	0.0	0.7	0.5	--	--	--	--	0.5	0.0
Farmland of Statewide Importance (acres)	0.1	0.0	0.1	0.1	--	--	--	--	0.1	0.0
Sub-Total	58.2	14.9	57.1	58.2	--	--	--	--	58.2	2.0
TOTAL	**99.5**	**35.6**	**110.7**	**114.7**	--	--	--	--	**119.6**	**8.0**

Lands under Williamson Act contracts are located within the footprints of just two of the alternatives (see **Figure 4.4-1**). Alternatives 3 and 4 would affect swaths of land in Reach 4 where new levees would be constructed set back from the river, of Williamson Act lands in Reach 5. Alternative 3 would affect the most Williamson Act Lands and would affect lands on both the right and left banks. Alternative 4 would affect lands on the right bank. The non-Federal project partners are responsible for providing all lands, easements, and rights of way required for project implementation. For lands under Williamson Act contracts, would be accomplished consistent with the requirements of California Government Code (GC) §51280 et seq. including coordination with the California Department of Conservation.

Based upon the information presented above, the proposed project, including conversion of some farmland to flood risk management project features, would constitute a **less than significant** direct and indirect effect on agriculture. **Beneficial** effects would result from reducing flood risk and the associated adverse effects that flooding may have on agricultural infrastructure, soils, and production.

4.4.3 Mitigation

The following mitigation measure would further reduce adverse effects on Agriculture.

Mitigation Measure AG-1: Compensate Landowners. Property acquisition would be consistent will all applicable laws and regulations, including compensating at fair market value landowners whose lands become part of the project.

4.5 AIR QUALITY

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

State and federal law defines criteria emissions to include the following: Reactive or volatile organic compounds (VOCs), nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), respirable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$). Greenhouse gases (GHGs) include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (Health and Safety Code Section 38505[g]). The most common GHG that results from human activity (combustion) is CO_2, followed by CH_4 and N_2O (OPR 2008).

4.5.1 Affected Environment

Sources of Pollutants

The most significant regional sources of ozone (O_3), NO_2, and CO in ambient air are automobiles, trucks, and other on-road vehicles, along with trains, vessels, and aircraft. Ozone is not directly emitted; rather, photochemical O_3 is formed by the atmospheric reaction of VOCs and NO_X in sunlight. Gasoline and diesel engines emit VOCs and NO_X as combustion products, as does natural gas-fired equipment (stationary sources) such as irrigation pump engines, gas turbine generators, process heaters, and steam boilers. Due to the Project's proximity to the City of Watsonville, Highway 1 (Pacific Coast Highway), Highway 129 (Riverside Drive), and Highway 152 (Lake Avenue), along with U.S. 101 to the east, vehicle emissions are the greatest contributor to local pollutants.

Local emissions of PM_{10} are primarily the result of fugitive dust from travel on unpaved roads, as well as construction and agricultural activities. Coarser particles also may be emitted from activities that disturb the topsoil. Other sources include wind-blown dust, pollen, salts, brake dust, and tire wear. Although $PM_{2.5}$ is a subset of PM_{10}, it differs from the rest of PM_{10}. While most ambient PM_{10} results from direct emissions of the pollutant, a significant amount of the ambient $PM_{2.5}$ results from transformation of precursors and condensing of gaseous pollutants in the atmosphere. Other than direct $PM_{2.5}$ emissions, the key pollutants contributing to $PM_{2.5}$ concentrations in the atmosphere are SO_2, NO_X, VOCs, and ammonia (CARB 2005).

Ambient Air Quality

Air quality is affected by a variety of sources in the vicinity of the Project. Large stationary sources such as oil refineries and power plants emit substantial amounts of nitrogen oxides and reactive organic compounds, along with PM_{10} and $PM_{2.5}$. Light motor vehicles, diesel powered construction equipment, and commercial trucks used in the Project area are another source of these pollutants. Non-combustion sources of PM_{10} and $PM_{2.5}$ include fugitive dust from roads, construction, demolition, and earthmoving. Finally, commercial and general aviation aircraft generate emissions that affect air quality.

The Monterey Bay Unified Air Pollution Control District (MBUAPCD) collects and validates data from a regional air monitoring network comprised of six active monitoring stations (Carmel Valley, Hollister, King City, Pinnacles National Monument, Salinas, and Santa Cruz) that collectively measure the ambient concentrations of six criteria air pollutants: CO; $PM_{2.5}$; NO_2; O_3; PM_{10}; and, SO_2.

Sensitive Receptors

Certain population groups are considered more sensitive to air pollution and odors than others; in particular, children, elderly, and acutely ill and chronically ill persons, especially those with cardio-respiratory diseases such as asthma and bronchitis. Sensitive receptors (land uses) indicate locations where such individuals are typically found, namely schools, daycare centers,

hospitals, convalescent homes, residences of sensitive persons, and parks with active recreational uses, such as youth sports.

Persons engaged in strenuous work or physical exercise also have increased sensitivity to poor air quality. Residential areas are considered more sensitive to air quality conditions than commercial and industrial areas, because people generally spend longer periods of time at their residences, resulting in greater exposure to ambient air quality conditions. Recreational uses such as parks are also considered sensitive, due to the greater exposure to ambient air quality conditions and because the presence of pollution detracts from the recreational experience.

Due to proximity to the City of Watsonville, sensitive receptors are likely near the Project sites (i.e., within 1,000 feet or 305 meters), therefore, the Project corridor on the perimeter of the city should be considered a sensitive receptor zone.

Standards and Attainment Status for Federal Criteria Pollutants

The Clean Air Act of 1970 (CAA, amended 1977 and 1990, 42 USC 7401 et seq.) established national ambient air quality standards (NAAQS), and individual states retained the option to adopt more stringent standards and to include other pollution sources. California had already established its own air quality standards when federal standards were established, and because of the unique meteorological problems in the state, there are notable differences between the federal and the state standards currently in effect in California, as shown in **Table 4.5-1**. California ambient air quality standards (CAAQS) tend to be at least as protective as national standards and are often more stringent.

The ambient air quality standards shown in **Table 4.5-1** are intended to protect the public health and welfare and specify the concentration of pollutants (with an adequate margin of safety) to which the public may be exposed without adverse health effects. The standards are designed to protect those segments of the public most susceptible to respiratory distress (known as sensitive receptors), including asthmatics, the very young, the elderly, people weak from other illness or disease, or persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels somewhat above the ambient air quality standards before adverse health effects are observed.

Air districts in California are required to monitor air pollutant levels to assure that NAAQS and CAAQS are met and, in the event that they are not, to develop strategies to meet these standards. Depending on whether the standards are met or exceeded, the local air basin is classified as being in “attainment” or “nonattainment,” respectively. Where insufficient data exist to make a determination, an area is deemed “unclassified.” Where a nonattainment area has achieved attainment or where an attainment area is at risk of becoming nonattainment, it can be classified as a “maintenance” area to implement preventive measures.

California Air Resources Board (CARB) has established the State Implementation Plan (SIP), which describes how the state would comply with the federal CAA. All local attainment plans must be approved by the state and incorporated into the SIP.

Table 4.5-1 Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards		Federal Standards	
		ppmv	µg/m³	ppmv	µg/m³
Ozone (O_3)	1-hour	0.09	177	—	—
	8-hour	0.07	137	0.075	147
Nitrogen Dioxide (NO_2)	1-hour	0.18	338	0.100	188
	Annual	0.03	56	0.053	100
Sulfur Dioxide (SO_2)	1-hour	0.25	655	0.075	196
	3-hour (secondary)	—	—	0.50	1,309
	24-hour	0.04	105	0.14	367
	Annual	—	—	0.03	79
Carbon Monoxide (CO)	1-hour	20	22,898	35	40,071
	8-hour	9	10,304	9	10,304
	Lake Tahoe (8-hr)	6	6,869	—	—
Respirable Particulates (as PM_{10})	24-hour	—	50	—	150
	Annual	—	20	—	—
Fine Particulates (as $PM_{2.5}$)	24-hour	—	—	—	35
	Annual	—	12	—	15
Lead (Pb)[4]	30-day	—	1.5	—	—
	Rolling 90-day	—	—	—	0.15
	Quarterly	—	—	—	1.5
Sulfates (as SO_4)	24-hour	—	25	—	—
Hydrogen Sulfide (H_2S)	1-hour	0.03	42	—	—
Vinyl Chloride (C_2H_3Cl)	24-hour	0.01	26	—	—
Visibility Reducing Particles	8-hour	Extinction coefficient of 0.23 per kilometer; visibility of 10 miles or more (0.07 to 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent.		—	—

Notes for Table 4.5-1:

ppmv – part(s) per million by volume
µg/m^3 – microgram(s) per cubic meter
[4] The 1.5 µg/m^3 Federal quarterly standard applied until 2008; 0.15 µg/m^3 rolling 90-day average thereafter
For gases, µg/m^3 calculated from ppmv based on molecular weight and standard conditions
Standard Temperature 25 deg C
Standard Molar Volume 24.465 liter/g-mole
Sources: CARB 2012, USEPA 2011a

In general, the North Central Coast Air Basin (NCCAB) experiences low concentrations of most pollutants when compared to state and federal standards, except for ozone and particulate matter, for which standards are exceeded periodically. The attainment status of the region is shown in **Table 4.5-2**.

Table 4.5-2: Attainment Status - North Central Coast Air Basin (2006-2008 data)

Criteria Pollutants	Status	
	Federal Standards	**State Standards**
Ozone (O_3)	Attainment	Moderate Nonattainment
Carbon Monoxide (CO)	Attainment	Unclassified/Attainment
Nitrogen Dioxide (NO_2)	Attainment	Attainment
Sulfur Dioxide (SO_2)	Attainment	Attainment
respirable Particulates (PM_{10})	Attainment	Nonattainment
Fine Particulates ($PM_{2.5}$)	Unclassified/Attainment	Attainment
Lead (Pb)	Unclassified/Attainment	Attainment

Sources: MBUAPCD 2009a; CARB 2011

Notes:
North Central Coast Air Basin (NCCAB) - Santa Cruz, San Benito, and Monterey counties
Santa Cruz and Monterey counties are "Moderate" nonattainment for state 1-hour ozone standard
Santa Cruz and San Benito counties are unclassified for CO; Monterey County is attainment for CO (state standards)
Effective July 26, 2007, the CARB designated the NCCAB a nonattainment area for the California ozone standard, which was revised in 2006 to include an 8-hour standard of 0.070 ppm.
On March 12, 2008, USEPA adopted a new 8-hour ozone standard of 0.075 ppm, while temporarily retaining the existing 8-hour standard of 0.08 ppm.
In 2006, the Federal 24-hour standard for $PM_{2.5}$ was revised from 65 to 35 µg/m^3.
On October 15, 2008, USEPA substantially strengthened the national ambient air quality standard for lead by lowering the level of the primary standard from 1.5 µg/m^3 to 0.15 µg/m^3.

Basin Significance Thresholds

The MBUAPCD has established significance thresholds for nonattainment and maintenance pollutants, and U.S. Environmental Protection Agency (USEPA) for attainment pollutants, which are listed in **Table 4.5-3**. The greatest potential for impacts would occur during the construction activities that result in ground disturbances (earthmoving), which causes fugitive dust to be entrained in the wind.

Table 4.5-3: Emissions Significance Thresholds - North Central Coast Air Basin

Criteria Emissions	Significance Thresholds	
	Pounds per Day	Tons per Year
Volatile Organic Compounds (VOCs as CH_4)	137	25
Carbon Monoxide (CO)	550	100
Oxides of Nitrogen (NO_X as NO_2)	137	25
Sulfur Dioxide (SO_X as SO_2)	150	27
Respirable Particulates (PM_{10})	82	15
Fine Particulates ($PM_{2.5}$)	—	—
Lead (Pb)	—	0.6

Sources: MBUAPCD 2008a, 40 CFR 51.166
Notes:
MBUAPCD thresholds expressed in pounds per day only; applies to construction
— No applicable threshold
Federal Prevention of Significant Deterioration (PSD) thresholds apply for CO and lead
For comparison, VOCs, NO_X, SO_X, and PM_{10}, equivalent tons per year is calculated from pounds per day
For ozone nonattainment areas, thresholds apply to precursors VOCs and NO_X

General Conformity

Santa Cruz, Monterey, and San Benito counties (NCCAB) are presently in NAAQS attainment or unclassified for all pollutants, thus, General Conformity does not apply to the proposed Pajaro Project and no General Conformity determination is required. A General Conformity determination is required for federally sponsored or funded actions in NAAQS nonattainment areas or in certain maintenance areas when the total direct and indirect net emissions of nonattainment pollutants (or their precursors) exceed specified thresholds (CAA Amendments of 1990 Section 176(c). This regulation ensures that federal actions conform to the SIP and agency (i.e., MBUAPCD) NAAQS attainment plans.

4.5.2 Environmental Consequences – Action Alternatives

The TSP has the largest construction footprint of all of the Action Alternatives. Analysis of this Alternative discloses the largest reasonably foreseeable contribution to air quality for the proposed project. Conservative assumptions were made regarding construction of the TSP to ensure all potential effects are disclosed. To understand the differences among the alternatives, the overall length of each alternative is a good indicator of potential contribution to air quality degradation. The TSP would have the largest contribution; followed by Alternatives 1, 2, 3, and 4 which are similar; and finally Alternatives 5, 6, 7, and 8. Direct effects to specific geographic areas would vary somewhat based upon the location and extent of the construction footprint, with Alternatives 1, 2, 3, and 4 having the greatest effect on sensitive receptors along Pajaro River, Alternatives 5, 6, 7, and 8 have the greatest effect on receptors along Salsipuedes and Corralitos Creeks, and the TSP potentially affecting sensitive receptors in both areas. The length of exposure each year would be similar for each alternative, about 7 months of the year, but the number of years of exposure would be different (see **Table 4.1-4** for construction timeframes).

Table 4.5-4: Preliminary Estimated Construction Criteria Emissions for the TSP (mitigated)

	Daily		Annual and Cumulative	
Criteria Emissions	**lbs/day**	**Sig**	**tons/yr**	**tons**
Volatile Organic Compounds (VOCs as CH_4)	40	No	1.5	10.3
Carbon Monoxide (CO)	163	No	5.9	41.4
Oxides of Nitrogen (NO_X as NO_2)	304	Yes	11.2	78.2
Sulfur Dioxide (SO_X as SO_2)	0.5	No	0.0	0.1
Combustion Particulates (C-PM_{10})	14	No	0.5	3.4
Combustion Particulates (C-$PM_{2.5}$)	12	—	0.4	3.1
Fugitive Dust (F-PM_{10})	169	Yes	10.2	71.3
Fugitive Dust (F-$PM_{2.5}$)	26	—	1.2	8.5

Sources: South Coast Air Quality Management District 2008; USEPA 2012, 2011b

Notes:

Sig - Significant per daily thresholds for construction

Fugitive dust and combustion particulates are determined separately

Table 4.5-5: Preliminary Estimated Annual and Cumulative Construction GHG Emissions for the TSP

Greenhouse Gas Emissions	TSP	
	MT/yr	MT
Carbon Dioxide (GHG - CO_2)	1,659	11,611
Methane (GHG - CH_4)	0.1	0.8
Nitrous Oxide (GHG - N_2O)	0.1	0.4
Carbon Dioxide Equivalents (CO_2 eqv)	1,678	11,745
Percent of State Inventory (CO_2 eqv)	0.0004%	
Percent of National Inventory (CO_2 eqv)	0.00003%	

Sources: South Coast Air Quality Management District 2008; USEPA 2012
Notes:
MT - metric tonne (1,000 kg or 2,204.6 lbs)
Seven-year cumulative totals (MT), contiguous or noncontiguous years
Global Warming Potentials - carbon dioxide 1, methane 21, nitrous oxide 310

Preliminary estimated (mitigated) emissions of criteria pollutants, fugitive dusts, and GHGs for the TSP are shown in **Table 4.5-4** and **Table 4.5-5**. Construction activity emissions would be temporary and intermittent, over the years of construction with inactive periods between some years, and would permanently cease upon completion of work.

As shown in **Table 4.5-4**, preliminary estimated peak daily NO_x and fugitive PM10 emissions would exceed applicable MBUAPCD daily significance thresholds, with mitigation measures applied, due to the scale of the TSP and intensive earthmoving work to be performed using heavy equipment. No other daily or annual thresholds would be exceeded, neither MBUAPCD nor USEPA. No applicable GHG thresholds exist for this type of construction-only project (MBUAPCD 2008a).

During each year (dry season) of construction, the TSP would temporarily cause criteria and GHG emissions from the combustion of fossil fuels (i.e., diesel and gasoline) used to run construction equipment and vehicles, both on site and off site. Construction activities would also cause emissions of fugitive dust, primarily as PM_{10}. For the purposes of this preliminary assessment of the TSP, it was assumed the dry season comprises the months April through October during any given year (31 weeks).

Construction of the Project would have a limited and temporary potential to contribute to existing violations of state air quality standards in the NCCAB for ozone and PM_{10}, primarily through diesel engine exhaust (VOCs, NO_X and PM_{10}) and fugitive dust emissions (PM_{10}) during construction activities. However, since the immediate vicinity, i.e., City of Watsonville, has not had any recent violations of federal or state air quality standards, it is not expected that the Project would be the sole cause of any new violations mainly due to the dispersed nature of

construction-related emission sources. The construction impact has the potential to be significant, however, implementation of the mitigation measures identified in Section 4.5.3 would ensure that any adverse effects on air quality would be **less than significant**.

Diesel exhaust contains substances, including Diesel Exhaust Particulate Matter (DPM), Toxic Air Contaminants (TACs), and Mobile Source Air Toxics (MSAT), that are suspected carcinogens, along with pulmonary irritants and hazardous compounds, which may affect sensitive receptors such as young children, senior citizens, or those susceptible to respiratory disease. Where construction activity occurs in proximity to long-term sensitive receptors, a potential could exist for unhealthful exposure of those receptors to diesel exhaust, including residential receptors.

All of the Action Alternatives include construction on the perimeter of the City of Watsonville and sensitive receptors are likely nearby (i.e., within 1,000 feet or 305 meters), therefore, the corridor on the perimeter of the city should be considered a sensitive receptor zone during the annual 7-month dry season (April through October) construction period.

Due to the intermittent and short-term temporary nature of construction activities during a period of up to 20 nonconsecutive years, emissions of DPM, TACs, or MSATs would not be sufficient to pose a significant risk to sensitive receptors from construction equipment operations dispersed over a wide area and at different locations during the course of the project. MBUAPCD control measures for diesel exhaust would be implemented as described in Mitigation Measures AQ-1. The Project would not be expected to expose sensitive receptors to substantial pollutant concentrations. The impact would be **less than significant** with mitigation.

California ultralow sulfur diesel fuel with a maximum sulfur content of 15 ppm by weight would be used in all diesel-powered equipment, which minimizes emissions of sulfurous gases (sulfur dioxide, hydrogen sulfide, carbon disulfide, and carbonyl sulfide). Therefore, no objectionable odors are anticipated from construction activities or normal operation of the Project, and no mitigation measures would be required. The Project would not create objectionable odors affecting a substantial number of people; therefore, no impact would occur.

Greenhouse Gases. As shown in **Table 4.5-5**, mitigated TSP Alternative construction emissions would be approximately 1,700 MT CO_2 equivalents occurring over the course of each year. These emissions would be temporary and, one project construction is complete, would permanently cease. Compared to national and statewide GHG inventories for fuel combustion, mitigated annual construction emissions would comprise about 0.00003 percent of the national inventory and about 0.0004 percent of the state inventory. Such small percentage contributions are well within the estimation error of emissions inventories, generally plus or minus 10 percent (CARB 2007). Therefore, the impact of the Project's GHG emissions on the nationwide and statewide environments is **less than significant**. However, at the local level (Santa Cruz and Monterey counties), the Project could have the potential to temporarily increase mobile source GHG emissions by up to 50 percent on an annual basis, depending on actual levels of construction activity (Santa Cruz County Public Works Department 2008).

Operations

No new operational emissions would occur, only emissions from periodic inspection and maintenance activities (i.e., vehicle travel), which are presently performed on the levees, walls, roads, and bridges. However, the rebuilding and reinforcement of levees, walls, roads, and bridges may reduce the need for frequent inspections and maintenance, thus resulting in a net decrease of existing operational emissions, a long-term air quality benefit. Due to its small temporary scale and GHG mitigations, the Project would not individually affect the environment or impede the state's ability to meet its 2020 GHG emission reduction goal. Therefore, the individual impact would be **less than significant** with mitigation.

4.5.3 Mitigation

Implementing the mitigation measures below would ensure that each of the Action Alternatives (Alternatives 1 to 8 and the TSP) would have less than significant effects on air quality and greenhouse gases.

Mitigation Measure AQ-1: Contracted Diesel Control Measures. In addition to the use of Tiered engines and California ultralow sulfur diesel fuel, the following requirements would be incorporated into contract specifications:

- Properly tune construction equipment to minimize potential diesel odor impacts on nearby receptors (pursuant to MBUAPCD Rule 402, Nuisances). Develop a maintenance schedule and perform scheduled maintenance on all equipment operating within the Project area. Maintain a written log of required equipment tune-ups and submit a copy of the log to the Contracting Officer (KO) or their representative for review every 2,000 service hours.
- Use electrical power for fixed temporary sources of air emissions (such as portable pumps, compressors, generators, etc.) unless the contractor submits documentation and receives written approval from the KO that the use of such equipment is not practical, feasible, or available (generally contingent upon power line proximity, capacity, and accessibility). Use California ultralow sulfur diesel fuel with maximum sulfur content of 15 ppm by weight, or an approved alternative fuel, for onsite fixed equipment not using line power.
- To minimize diesel emission impacts, construction contracts would require off road compression ignition equipment operators to reduce unnecessary idling with a 2-minute time limit, subject to monitoring and written documentation.
- On road material hauling vehicles would shut off engines while queuing for loading and unloading for time periods longer than 2 minutes, subject to monitoring and written documentation.
- Off road diesel equipment would be fitted with verified diesel emission control systems (e.g., diesel oxidation catalysts) to the extent reasonably and economically feasible.
- Utilize alternative fuel equipment (i.e., compressed or liquefied natural gas, biodiesel, electric) to the extent reasonably and economically feasible. Feasibility would be

determined consistent with Best Available Control Technology (BACT) general criteria: 1) achieved in practice; 2) contained in adopted control measures; 3) technologically feasible; and 4) cost-effective.

Mitigation Measure AQ-2: Diesel Particulate Matter Emissions Control Measures. The Project would implement the following measures to reduce particulate matter emissions from diesel exhaust:

- Use grid power instead of diesel generators where it is feasible to connect to grid power (generally contingent upon power line proximity, capacity, and accessibility).
- Include in the Project specifications a requirement to use 13 California Code of Regulations (CCR) Sections 2480 and 2485, which limit the idling of all diesel-fueled commercial vehicles (weighing over 10,000 pounds, both California- or non-California-based trucks) to 30 seconds at a school or 5 minutes at any location. In addition, limit the use of diesel auxiliary power systems and main engines to 5 minutes when within 100 feet of homes or schools while the driver is resting.
- Include in the project specifications 17 CCR Section 93115, Airborne Toxic Control Measure for Stationary Compression Ignition Engines, which specifies fuel and fuel additive requirements; emission standards for operation of any stationary, diesel-fueled, compression-ignition engines; and operation restrictions within 500 feet of school grounds when school is in session.
- Develop a schedule of low-emissions tune-ups and perform scheduled tune ups on all equipment, particularly for haul and delivery trucks.
- Use low-sulfur (≤ 15 ppmw S) fuels in all stationary and mobile equipment.

Mitigation Measure AQ-3: Basic Dust Control Measures. The following controls would be implemented at the construction and staging sites as applicable.

- Water all active construction areas at least twice daily as necessary and indicated by soil and air conditions.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least 2 feet of freeboard.
- Pave, apply water three times daily, or apply (nontoxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.
- Stabilize all disturbed areas, including storage piles, which are not being actively utilized for construction purposes, use water, chemical stabilizer/suppressant, covered with a tarp or other suitable cover or vegetative ground cover to avoid and minimize dust emissions.
- Stabilize all onsite unpaved roads and offsite unpaved access roads using water or chemical stabilizer/suppressant to avoid and minimize dust emissions.

- Control fugitive dust emissions associated with land clearing, grubbing, scraping, excavation, land leveling, grading, cut & fill, and demolition activities using application of water or by presoaking.
- Where applicable, for demolition of buildings up to six stories in height, apply water to all exterior building surfaces during demolition.
- Cover, or effectively wet, all materials when transporting them off site, to limit visible dust emissions, and maintain at least 6 inches of freeboard space from the top of the container.
- All operations would limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at the end of each workday. (The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions. Use of blower devices is expressly forbidden.)
- Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles would be effectively stabilized of fugitive dust emissions utilizing sufficient water or chemical stabilizer/suppressant.
- Within urban areas, track outs would be immediately removed when it extends 50 or more feet from the site and at the end of each workday.
- Any site with 150 or more vehicle trips per day would prevent carryout and track outs.

Mitigation Measure AQ-4: Enhanced Dust Control Measures. The following measures would be implemented at construction sites that are greater than 4.0 acres in area:

- All Basic Control Measures listed above.
- Hydroseed or apply (nontoxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily, or apply (nontoxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 miles per hour.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways from sites with a slope greater than 1 percent.
- Replant vegetation in disturbed areas as quickly as possible.

Mitigation Measure AQ-5: Optional Dust Control Measures. The following control measures are strongly encouraged at construction sites that are large in area, located near sensitive receptors, or which for any other reason may warrant additional emissions reductions at the discretion of the lead agency:

- Install wheel washers for all exiting trucks, or wash off all trucks and equipment leaving the site.
- Install wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 20 miles per hour.
- Limit the area subject to excavation, grading, and other construction activity at any one time.

Mitigation Measure AQ-6: Greenhouse Gas Control Measures. During construction, contractors would be required to implement the following measures to reduce GHG emissions from fuel combustion and construction activities:

- Maintain on road and off road vehicle tire pressures to manufacturer specifications. Check tires and reinflate at regular intervals.
- Use lower-carbon fuels such as biodiesel blends where feasible.
- Use engine retrofits to remove emissions such as diesel particulate matter filters with diesel oxidation catalysts where feasible.
- Maintain construction equipment engines to manufacturer's specifications.
- Use locally made materials for construction to the extent feasible.
- Recycle construction debris for reuse to the extent feasible.
- Feasibility would be determined consistent with Best Available Control Technology (BACT) general criteria: 1) achieved in practice; 2) contained in adopted control measures; 3) technologically feasible; and 4) cost-effective.

4.6 AQUATIC RESOURCES

4.6.1 Affected Environment

Physical Environment

The mainstem Pajaro River within the Project area is primarily confined within the existing levees. The channel has been greatly straightened and simplified for flood management purposes. Substrates are almost entirely sand or other fine material. Riparian vegetation is very limited and generally consists of smaller plants, although a few mature trees are present. Much of the riparian forest that provided cover along the Pajaro River has been scoured from the channel during recent flood events or cleared to maintain flood capacity and repair eroding banks. A dense growth of riparian forest remains along the Pajaro River downstream of the Project area from the Highway 1 crossing to the upper end of the Central Coast arroyo willow riparian forest community. Only intermittent patches of riparian forest are present upstream of Highway 1 to the Murphy's Crossing Road.

The Salsipuedes Creek channel below the confluence of Corralitos Creek is also highly confined by existing levees. The lower section has abundant emergent vegetation and near the southern end of Lake Tynan, a narrow band of riparian canopy is present. This section continues up to Highway 152. Substrate is sand and fines near the mouth and coarsens as it approaches Highway 152. North of Highway 152, Salsipuedes Creek is essentially a drainage ditch with silt or concrete lined bed. Corralitos Creek joins Salsipuedes Creek just south of Highway 152. Corralitos Creek is relatively incised, has a rocky bottom, and a substantive riparian corridor along both banks. The mainstem Pajaro River and tributaries support anadromous and resident fish species typical of coastal central California rivers and streams. Downstream of the project area, the Pajaro estuary supports saltwater fish with broad salinity tolerances and freshwater fish that tolerate brackish water.

Aquatic Species

The Project area supports a range of aquatic fish both resident and anadromous. Resident species are fish that spend their entire lives in fresh water. Native resident species present in the Pajaro River downstream of Murphy's Crossing Road include Sacramento sucker (*Catostomus occidentalis*), hitch (*Lavinia exilicauda*), Sacramento blackfish (*Orthodon microlepidotus*), Sacramento pikeminnow (*Ptychocheilus grandis*), prickly sculpin (*Cottus asper*), and threespine stickleback (*Gasterosteus aculeatus*) (Smith 1982). Several species including the hitch and Sacramento blackfish can tolerate brackish water and are found in the upper Pajaro estuary (Mitchell Swanson & Associates and The Habitat Restoration Group 1993).

Anadromous species are fish that spawn and spend a portion of their life in freshwater before migrating to the marine environment. Anadromous species found in the Pajaro River include steelhead (*Oncorhynchus mykiss*) and Pacific lamprey (*Lampetra tridentata*).

Historically, Coho salmon (*O. kisutch*) may have been present in the Pajaro River watershed, but successful spawning populations have not been present for over 30 years (Smith 1982). Steelhead (*Oncorhynchus mykiss*) in the Pajaro River are considered part of the South Central California Coast (S-CCC) Evolutionarily Significant Unit (ESU) for steelhead.

A large number of marine fish species use the Pajaro River estuary. In 1991 and 1992, sampling indicated that 25 marine species were found in the Pajaro estuary. The most commonly collected species included Pacific herring (*Clupea pallasi*), topsmelt (*Atherinops affinis*), shiner surfperch (*Cymatogaster aggregata*), staghorn sculpin (*Leptocottus armatus*), and starry flounder (*Platichthys stellatus*) (Mitchell Swanson & Associates and The Habitat Restoration Group 1993). In late summer, striped bass (*Morone saxatilis*), a nonnative anadromous species, was common in fish collections in the most upstream portions of the estuary. Striped bass are not known to spawn in the Pajaro River system. Only three species of resident estuarine species were collected: threespine stickleback, arrow goby (*Clevlandia ios*), and the federally listed tidewater goby (*Eucyclogobius newberryi*) (Mitchell Swanson & Associates and The Habitat Restoration Group 1993).

Several wildlife species dependent on standing or flowing water for breeding also use the Pajaro River. Reptiles known to use the Pajaro River include the southwestern pond turtle (*Emys marmorata*) and western aquatic garter snake (*Thamnophis couchii*). Amphibians such as bullfrog (*Rana catesbeiana*), Pacific tree frog (*Hyla pseudacris*), California slender salamander (*Batrachoseps attenuatus*) and California red-legged frog (*Rana draytonii*) are also known to use the Pajaro River corridor (Kittleson Environmental Consulting 2012, Harding ESE 2001).

Four species found in the Pajaro River have special-status based on federal or state endangered species laws. They are S-CCC steelhead (*Oncorhynchus mykiss*), tidewater goby (*Eucyclogobius newberryi*), California red-legged frog ([*Rana draytonii*] CRLF), and foothill yellow-legged frog ([*Rana boylii*] FYLF). These species are discussed in Section 4.14, Special Status Federal Species.

Existing Threats/Key Factors Affecting Aquatic Resources

Habitat within riverine systems is created by geomorphic processes. These processes include the topography and geology of the area and of upstream areas, runoff patterns, sediment transport, and riparian dynamics. These factors interact to create areas of sediment scour and deposition along the river channel, which govern its local hydraulics, channel size, and cover and complexity. These areas form the underlying structure of habitats (riffles, runs, glides, pools) that influence invertebrate and fish production and distribution. These factors have been profoundly affected within the Project area and in the surrounding watershed by human alterations. Key factors that affect fish and fish habitat in the Pajaro River include hydrologic and hydraulic conditions, channel erosion and deposition, river geomorphology, water temperature, suspended solids and toxic constituents, and cover.

Hydrologic and Hydraulic Conditions

Habitat components that are affected by hydrologic and hydraulic conditions include water temperature, water depth and velocity, substrate, and riparian and emergent vegetation. These components are discussed below. The Pajaro River is a "flashy" system, meaning that flow increases dramatically in response to rain. Typically, flows peak in winter or early spring in response to peak watershed runoff. Low flow occurs in late summer and early fall, before the onset of seasonal rains. Flows during winter and early spring are usually less than 100 cfs. Flows during May through October are usually less than 5 cfs. During the dry summer and fall months, low flow might restrict fish to pools and other areas of the stream where surface water remains. Prolonged periods of low surface flow in the Pajaro River reduce fish survival and growth because of increased competition for living space and food and because of elevated water temperatures and low levels of dissolved oxygen. Modifications to the levee system may alter channel hydraulics under high-flow conditions. These high-flow conditions are those that cause channel modifications that alter habitat.

Channel Erosion and Deposition

Erosion and deposition of channel bottom sediment can alter fish habitat conditions that are critical to migration, spawning, feeding, resting, and refuge from predators. Habitat conditions affected by erosion and deposition include the depth of riffles and pools and the occurrence of cover and spawning gravel. Movement of sediments maintains habitat conditions by flushing sand and silt from spawning gravel. A comparison of the river's cross section from the Project design in 1946, the as-constructed plans from 1949, cross sections completed for the USACE in 1994, and 1998 field reconnaissance indicates that the channel bed elevation appears to be stable (Northwest Hydraulic Consultants 1998, as referenced in Harding ESE 2001). Although recent mapping shows a slight degree of degradation, it might be related more to the resolution of the information from the 1949 plans than any slight reduction in bed elevation. The exception is the lower portion of Salsipuedes Creek and the Salsipuedes Creek/Pajaro River confluence, which has a tendency toward deposition. Modifications to the levee system may alter areas of erosion and deposition, which would affect habitat conditions in the Project area.

Substrate

River geomorphology includes substrate and channel form. Substrate refers to the composition of the channel bottom, including clay, silt, organic detritus, sand, gravel, cobble, and rock. Substrate is an important component of fish spawning and rearing habitat. In general, streams with gravel-cobble substrates support greater diversity and abundance of invertebrates. Aquatic invertebrates are an important source of food for fish, including steelhead. In addition, gravel substrates are needed to support spawning steelhead, Pacific lamprey, and other species. Adult steelhead require relatively clean gravel in which to deposit their eggs. The filling of the smaller spaces between gravel particles with silt and sand reduces the flow of water and oxygen to eggs and larvae in the gravel. Fine sediments can also reduce or prevent young fish from redd emergence after they hatch. The geomorphology of the lower mainstem Pajaro River within the Project area has been highly modified by flood management, creating a straightened, simplified channel that provides little habitat for fish.

The Pajaro River serves as a migration corridor for steelhead. However, because of low summer flow, warm summer temperatures, and substrate dominated by sand or silt, it provides almost no potential rearing or spawning habitat[3]. The mainstem Pajaro River is the migration pathway to and from spawning and rearing habitat in Pescadero, Uvas, Llagas, and Pacheco creeks. A major migration bottleneck in the Pajaro River is the downstream migration of smolts through the Murphy's Crossing Road area, where the wide channel and early streambed drying can block all or some migrating fish in the spring of many years. It is unlikely that either Project alternative would have any effect on channel morphology, or substrate composition of the lower Pajaro River, Corralitos Creek, or Salsipuedes Creek.

Water Temperature

Water temperature is dependent on flow and the availability of riparian shade. During the summer and fall months, low-flow conditions on the Pajaro River and its tributaries and lack of riparian cover throughout most of the Project area lead to relatively warm water conditions above the optimum rearing temperatures for steelhead (Smith 2002). Maintenance practices within the riparian zone may affect water temperatures.

Contaminants

In general, the toxic effects of insecticides, metals, nutrients, and herbicides might reduce growth and survival of fish and other aquatic organisms. Toxic materials enter the Pajaro River from various sources, including agricultural and urban. Toxic materials can cause fish mortality within a short period (a few days) or adversely affect growth and development, thereby limiting chances for fish survival. Toxic materials can affect all fish life stages and food web organisms.

[3] One redd was observed in the mainstem just upstream of Highway 101 in 2009 (G. Kittleson, pers. comm. to L. Wise). Given the conditions here, it is suspected that the steelhead used this location because they could not access more suitable habitat upstream.

Agricultural and urban runoff are the primary factors affecting the level of sediment and toxic constituents entering the Pajaro River and Salsipuedes and Corralitos creeks. Although adverse effects of urban runoff on fish and aquatic organisms are not apparent in the Pajaro River, toxic constituents have been identified. The Central Coast Water Board is implementing programs to address pollutant input and protect the biological resources of the Pajaro River. The Project is unlikely to affect the input of contaminants into the Pajaro River or its tributaries.

4.6.2 Environmental Consequences - Action Alternatives

The effects of constructing and operating these elements would be similar but would occur in different locations. Alternatives 1, 2, 3, and 4 would be implemented along the Lower Pajaro River in Reaches 2, 3, and 4. Alternatives 5, 6, 7, and 8 would be implemented along Salsipuedes and Corralitos Creeks in Reaches 5, 6, 7, and 8. The TSP would be implemented along all three waterways. Alternative 5, 6, 7, and 8 include in-water or in-channel work.

Construction activities that occur outside of the active channel (levee improvements, levee demolition, and floodwall construction) are not expected to directly impact aquatic species, but could indirectly impact them through runoff of sediments or pollutants. Construction activity in the active channel could directly affect individual organisms by crushing, disturbance of organisms, release of sediment, and release of pollutants associated with equipment.

O&M would include use of herbicides to manage vegetation on the levees and within 15 feet of the levees and floodwalls. This could result in runoff of herbicides and sediment during maintenance activities could impact sensitive aquatic species. O&M activities for levees and floodwalls would be conducted outside of the water. O&M of the in-channel features of Alternatives 5, 6, 7, and 8, have the potential to affect aquatic organisms in a similar manner to in-channel construction.

Measures Included In All Action Alternatives

Levee Setbacks. Levee setbacks would modify the hydraulics of the channel and would affect the processes that create aquatic habitat while additionally allowing the expansion of riparian zones which could affect habitat availability and quality. As the levee setbacks would reduce hydraulic pressure on the channel, and provide more space for habitat and wider riparian zones, more natural channel processes would occur within the levees. This would provide more natural channel processes, riparian cover, habitat complexity and potentially more stream shading within the levees than currently exists or would exist under the No Action Alternative. This impact would be beneficial to aquatic resources.

Exiting Levee Demolition. Where new setback levees are constructed, the existing levees would be removed. All construction work would be accomplished from the top and landside of the existing levee. With implementation of BMPs there would be no effect on aquatic species.

Alternatives 5, 6, 7, and 8

Bridge Raise. Raising bridges would require construction activities in the active channel.

Floodwall Construction. The construction of a concrete floodwall channel could reduce aquatic habitat and would require the removal of in-channel vegetation, which could increase water temperatures. The floodwall channel would be oversized to allow sediment deposition, creating a native material stream bottom with a low-flow channel. Given that College Lake acts as a sediment trap and the short length of channel between College Lake and this feature, it is unknown how long it would take for sediment to accumulate enough to establish a natural channel bottom. This would cause a short-term loss of habitat and could cause short-term fish passage impediment.

Over the long-term, sediment deposition would occur naturally in the floodwall channel and any loss of habitat, as compared to existing conditions, resulting from this feature would be allowed to reestablish and no fish passage impediments would be expected. Given that the floodwall would not increase water residence time and the small amount of vegetation to be removed would not substantially decrease shading relative to existing conditions, it is unlikely that this aspect of the project would increase water temperatures.

Culvert Construction. The construction of culverts downstream of College Lake and beneath Highway 152 on Salsipuedes Creek could create passage barriers for migrating steelhead. Salsipuedes Creek and Casserly Creek upstream of these features and College Lake are identified as critical habitat for coastal steelhead (NMFS 2005). Culverts would be designed to allow passage of migrating steelhead following NMFS guidelines to mitigate for potential passage impediment.

Weir Construction. The construction of a concrete weir designed to limit outflow from College Lake could create a passage barrier for migrating steelhead. Salsipuedes Creek and Casserly Creek upstream of College Lake are designated as critical habitat for coastal steelhead (NMFS 2005). The new concrete feature would replace a preexisting concrete weir that is listed as a potential barrier to migrating steelhead.

Implementing the mitigation measures outlined in Sections 4.11.3, 4.14.3, 4.17.3, and 4.18.3 would reduce direct and indirect adverse construction and O&M effects to aquatic species to **less than significant**.

4.6.3 Mitigation

Implementation of the mitigation measures for environmental hazards (Section 4.11.3) water quality (Section 4.18.3), vegetation and wildlife (Section 4.17.3), and special status species (Section 4.14.3) would ensure that construction and O&M effects on aquatic resources would be less than significant.

4.7 CULTURAL RESOURCES

4.7.1 Affected Environment

Environmental and Cultural Background

The proposed project lies within the Pajaro River Basin. The environment in this basin has changed considerably in the last 10,000 years, both through natural processes such as climatic and sea level changes, and due to relatively recent human impacts such as draining and filling of wetlands. These changes have, in turn, affected both prehistoric and historic patterns of human land use and settlement in the area. It is a former embayment that has filled with sediments over time. Once a series of low marine terraces today the Valley is represented by a small series of lakes, Tynan, Drew, Kelley, College, and Pinto. It is drained from the north principally by Corralitos and Salsipuedes Creeks.

Prior to European colonization, the Pajaro Valley had extensive marshes and riparian forests which provided habitat for an abundance of fish and wildlife. Spanish and Mexican colonization brought about advanced ecological changes by the introduction of cattle and non-native plants. Subsequent Anglo-American settlement in the Pajaro Valley filled and converted marshlands and riparian areas for agricultural use. Today most of the Valley is used for agricultural purposes or has been modified by urban development with residential and commercial buildings, schools, and roadways (Pajaro EIS, 1996).

Cultural Context

Prehistoric Archaeological Background. The rich riverine habitat of the Pajaro River Basin appears to have supported significant levels of pre-Contact (pre-European contact at A.D. 1540) Native American occupation. This is clear from the presence of complex multi-component settlement sites and burial sites on coastal bluffs and on terraces along the Pajaro River and its tributaries. A previous literature search identified a multitude of archaeological resources within the vicinity of the project area. Some, are among the oldest sites in the central California coastal region with Holocene components dating to more than 7,000 years old.

Pre-Contact cultural history of the Central California coast and inland region has been poorly documented and archeological sites dating prior to the Spanish Entrada in A.D. 1540, are rare. Only within the last two decades, with work conducted under the auspices of NEPA or CEQA compliance, has this began to change. The majority of archaeological investigations conducted to comply with these Federal and State regulations are mainly associated with the

development of urban areas and transportation corridors. This has limited the development of regional chronologies regarding Prehistoric settlement and cultural development. The Pajaro Valley is relatively limited in regards to locally specific archaeological data and interpretations of cultural resources within the Pajaro Valley has, therefore, had to rely upon models developed from regions where more research has occurred. This includes the Southern Santa Clara Valley and Monterey Bay. For more detailed information beyond what is summarized below, the reader is directed to the Pacific Legacy, Inc., *Cultural Resources Survey for the Pajaro Valley Water Management Agency Distribution Pipeline Draft Final Report*, (1999) and Bergthold (1982), Cartier et al. (1980), Dietz (1977), Hall and Leach-Palm (1988), Hildebrandt (1983), Hildebrand and Mikkelson (1993), King and Hickman (1973), and Stickel (1981) regarding the southern Santa Clara Valley. For the Monterey Bay area, see Breschini and Haversat (1980a), Breschini (1983), Breschini et al. (1983), Breschini and Haversat (1992), Cartier (1993), Dietz (1985), Dietz et al. (1988), Dietz and Jackson (1981), Hildebrandt and Mikkelson (1993), Jones and Hylkema (1988), Jones (1993), Jones et al. (1992), Jones and Jones (1992), and Patch and Jones (1984).

The Prehistoric cultural chronologies developed for the Southern Santa Clara Valley and Monterey Bay Regions suggest earliest settlement of the area surrounding the project area occurred as early as 13,000–10,000 years ago during the Paleoindian period as local expressions of the Paleo-Coastal Tradition (Jones et al. 1996). Subsequent periods proposed for these region include the Millingstone Period (10000–4000/3500 B.P.), and Early (5500–2600 B.P.), Middle (4000–1500 B.P.), and Late (800–200 B.P.) periods or horizons used to characterize cultural evolution between initial settlement during the Paleoindian or Millingstone periods and European Contact. Generally, early period occupation can be characterized by a high degree of mobility and utilization of a broad spectrum of resources including both marine and riverine species. Sites dating to Middle and Late periods indicate an increase in more permanent residence patterns, substantial increases in population, and increased social complexity.

Ethnographic Overviews. At the time of Euroamerican contact (ca. 1769), Native American groups of the Costanoan language family occupied the area from San Francisco Bay to southern Monterey Bay and the lower Salinas River. The Costanoan language family consists of eight separate and distinct languages, and approximately 50 tribelets comprising approximately 200 individuals (Levy 1978). The Pajaro River drainage was occupied by Mutsun speakers (Jones et al. 1996). Unfortunately, Costanoan culture was dramatically affected by missionization and pupulations of Costanoan speakers significantly declined from the late 1800s through the early 1900s (Heizer 1925; Levy 1978). In 1971 the remaining Costanoan descendants united as a corporate entity identified as the Ohlone Indian Tribe (Levy 1978).

Each tribelet was grouped into clans and moieties, usually controlled by a headman (Harrington 1933, 1942; Levy 1978). This position was passed patrilineally, usually from father to son and was subject to approval by the community (Levy 1978). Costanoans seasonally moved between semi-permanent camps and villages to take full advantage of available resources. Dwellings were dome-shaped, with pole frameworks, thatched roofs, and walls. Other Costanoan structures types included: acorn granaries; sweathouses; menstrual houses; and dance and/or assembly houses, generally located in the center of a village (Broadbent 1972).

Interaction between Costanoan tribelets was friendly or hostile, involving marriage, trade, and warfare. Intermarriage usually occurred between adjacent tribes, and was rare between tribes at greater distances (Milliken et al. 1993). Shell, piñon, and obsidian was a regularly traded between coastal and inland groups. Warfare is a common theme in historical accounts of Costanoans, and was usually associated with territorial disputes and over control of particular resources (Broadbent 1972; Langsdorff 1968).

Foothills, valleys, sloughs, and coastal areas, were exploited by Costanoans to obtain subsistence resources. These resources included: various seeds; nuts (e.g., acorn, buckeye, laurel, and hazelnuts); berries; grasses; corms; roots; insects; birds (e.g., geese, mallard, and coot); fish (e.g., steelhead, salmon, and sturgeon); shellfish (e.g., abalone, mussel and clam); and both marine and terrestrial mammals (e.g., sea otter, sea lion, harbor seal, deer, elk, grizzly bear, rabbits, antelope, raccoon, and squirrels) (Levy 1978).

Costanoan technology highlights exploitation of both marine and terrestrial resources. Tule balsas were used for transportation, fishing, and hunting (Levy 1978). Hunting weaponry included bows with wooden arrows tipped with chert and obsidian projectile points (Levy 1978). A wide array of utilitarian tools and materials were utilized. Baskets were made to collect and store food and water. Portable and bedrock mortars, pestles, and mutatesto grind acorns and other materials. Bone was also used to make to make awls and other tools (Levy 1978). Clothing, robes, and blankets were made of various animal skins (Levy 1978). Personal ornaments were made from steatite, serpentine, bone, and various types of shell such as abalone or Olivella that were cut and ground into beads (Levy 1978).

Colonization. Sebastian Vizcaino's landing at present day Monterey in 1602 is the earliest documented contact with Native Americans in the area. Contact intensified with subsequent overland explorations of the area. These included Gaspar de Portolá in 1769 (Hoover et al. 1990) who followed the coast and Pedro Fages in 1770 and 1772, Fernando Javier de Rivera in 1774, and Juan Bautista de Anza in 1776. These later expeditions followed a route along the eastern side of the Santa Cruz Mountains that eventually became the El Camino Real (Beck and Haase 1974).

Gaspar de Portolá founded Monterey in 1769, and in 1770 Padre Junipero Serra founded Mission San Carlos de Borromeo, which was later relocated to Carmel (Jones et al. 1996). These, as well as other missions had a dramatic effect. Costanoan traditional cultural practices were disrupted as the Spanish converted Native Americans to Catholicism and incorporated them into the "mission system." By 1810 most Native Americans in the area were either incorporated or relocated into local missions. This, coupled with exposure to European diseases, virtually whipped out Native American culture in and around Monterey Bay.

The Mexican period (ca. 1821-1848) in California is an outgrowth of the Mexican Revolution. During this period missions were secularized and their lands divided among the Californios as land grants or Ranchos. This facilitated the growth of a semi-aristocratic group that exploited Native Americans as forced labor. Ranchos in the general Project area include

Bolsa del Potrero y Moro Cojo; Monterey Tract (Castro); El Tucho; Las Salinas; Monterey, City Lands; Monterey Tract (Cocks); Nacional; Rincon de las Salinas; and Two Suertes (Beck and Haase 1974).

At the end of the Mexican-American War the Treaty of Guadalupe Hidalgo was signed in 1848. This marked the beginning of the American period (ca. 1848-Present) in California history. In 1862–1864, a drought forced many landowners to sell off or subdivide their ranchos. Open range was fenced off and the economy shifted from cattle ranching to dairy farming and agriculture. Regardless of these changes, the plight of Native American remained unchanged. The U.S. Senate rejected treaties with Native Americans in 1851 and 1852, and military reserves were established to maintain various groups (Heizer 1974).

The latter half of the 19th century Anglo-Americans immigration into the area caused major cultural and economic changes. Hispanic culture was largely eclipsed and dispersed farmsteads slowly replaced the immense Mexican ranchos and farming slowly replaced cattle ranching. The advent of the railroad in the mid to late 1800s and the mechanization of farming with steam-driven machinery further altered the economy of the region. These agricultural developments sparked an influx of immigrant labor. Groups of Chinese were the first new immigrants in the area, and were followed by Japanese, Filipino, and Mexican laborers. The history of agriculture and especially immigrant labor, beginning with the Chinese in the mid-19th century, is perhaps the greatest contributing element to the identity of the people and communities of the Pajaro River Valley.

Methods Used to Identify Cultural Resources

As the lead federal agency it is USACE's responsibility to identify historic properties within the project area and to assess the potential adverse effects. This inventory and evaluation was conducted to comply with Section 106 of the National Historic Preservation Act (NHPA). These initial inventory efforts were conducted by the USACE, San Francisco District archaeologist. Inventory evaluation tasks comprised background research utilizing in-house resources including maps and records, research at Bancroft Library, a records search conducted at the Northwest Information Center, Sonoma State University, and archival research that included historic maps and aerial photographs, and archaeological field surveys.

Archival Records Search. In 1996 USACE of Engineers, San Francisco District began investigating the project area for cultural resources and potential adverse effects (potential impacts) resulting from the proposed project. USACE conducted a records search in January 1996 at the Northwest Information Center and an additional records review of in-house maps, documents and aerial photographs. Background research was also conducted at the U.C. Berkeley Anthropology Library, the Bancroft Library, and the Monterey County Historical Research Library. The National Register of Historic Places, California Inventory of Historic Resources, California Historical Landmarks, California Points of Historical Interest were also reviewed for information pertinent to the project area. Informal interviews with long-time project engineers and with local citizens were also conducted to supplement background research.

The Assessment of the Cultural Resources of the Lower Pajaro River Basin, California, with Selected Preliminary Field Studies by Rob Edwards and Mary Ellen Farley (1974), includes an evaluation of both prehistoric and historic period cultural resources for the area. Edwards and Farley identified 44 cultural resource sites, 18 of them prehistoric archaeological sites, and 26 historic period sites. More recent studies show that both prehistoric and historic archaeological sites exist within and adjacent to the project area.

Pacific Legacy Incorporated conducted an extensive study, published in the *Cultural Resources Survey for the Pajaro Valley Water Management Agency Distribution Pipeline Draft Final Report* (ESA 1999). In 1999, the Pajaro River Flood Protection Project was included in Pacific Legacy's study area.

In 2012 a records search and archival research were conducted. This work identified five sites within or near the boundaries of current Alternatives 2–8 of the project area and two sites within or near the current boundaries of the NED Alternative of the project area.

Site Surveys. USACE archaeologists performed a site visit of the proposed project area on January 26, 1996. At that time the, project area included the river channel and a 200-foot corridor (100 feet out from the center channel along each bank). Since 1996 the project area has changed significantly, and is now defined as a 1,000-foot corridor (500 feet from the center of the Pajaro River out along both banks).

During the 1996 site visit, existing access roads were used to travel along the project area. No surface indicators of prehistoric sites were observed. A few fragments of historic trash such as clay pigeons, glass and rusted metal were noted, but were probably the result of dumping.

A second, more extensive site survey was made in March, 1999 by Pacific Legacy, Incorporated for the Pajaro Valley Water Management Agency (PVWMA) Distribution Pipeline. Most of the Pajaro River Flood Protection Project area was included in their study area. Pacific Legacy, Incorporated approved USACE use of their 1999 report for this cultural resources report.

Pacific Legacy's pedestrian survey covered approximately 33 miles of pipeline and associated facilities corridor. Two previously recorded sites could no longer be found and two new cultural resource sites as well as three sensitive areas were recorded. They discovered a high density of cultural resources on terraces overlooking the Pajaro Basin at the western edge of the project area in the Coastal Distribution System.

Most of the project area is subsumed by agricultural fields and not always accessible for purposes of systematic archaeological field surveys. Previous surveys, such as the Pajaro Valley Water Management Agency (PVWMA) Distribution Pipeline, Final Draft, 1999, were utilized.

Cultural Resources Expectations. Based on a review of cultural resources investigations in the project vicinity, the types of archaeological sites that are likely to be found within the project area are summarized in **Table 4.7-**1 (after Eidsness and Jackson 1994).

Table 4.7-1: Historic Contexts and Related Land Use

Historic Context	Land Use
Prehistoric Period: Prehistoric Cultural Adaptions in Interior South Coast Ranges (before A.D. 1769)	Complex archaeological deposits (e.g. villages); Low density, low variability flaked stone artifact scatters (e.g. camps, tool production sites); Milling sites; Chert quarries; Burial sites; Rock art sites
Historic Period: Exploration and Mission (A.D. 1769-1835)	Exploration sites; Native American sites; Centralized residential, production, and religious facilities; Mission Ranchos; Water systems; Industrial sites
Land Grants and Ranchos	Ranch headquarters; Agricultural sites
Small-scale Settlement	Native American sites; Early immigrant sites ; Small-parcel owner sites; Schools; Religious sites
Transportation and Commerce	Railroads; Roads; Commercial services
Mining	Extraction sites (i.e. granite quarry, tar); Processing sites
Large Scale Agriculture	Food processing facilities; Land improvements; Water transportation facilities

The majority of the project area corridor is located along existing waterways, roadways, or farm roads. Some historic period structures predating 1947 are located adjacent to the corridor.

Several areas are considered sensitive for prehistoric resources. These are areas that would have been terraces, and therefore high places adjacent to water resources such as the historic course of the Pajaro River or the seasonal College Lake bed and its shores. Such areas include the bluff along Trafton Road on the Springfield Lateral that overlooks the Pajaro River, the terraces and knolls representing higher ground along Salsipuedes and Corralitos Creeks, the terraces and knolls representing higher ground around the perimeter of College Lake and the historic shoreline around College Lake.

Prehistoric and Historic Archaeological Sites. In accordance with Advisory Council Regulations 36 CFR Part 800: Protection of Historic Properties, USACE sought to identify properties within the project area during two previous iterations of the Pajaro River Project EIS/EIR. Based on existing data from a 2012 records search conducted by Cardno ENTRIX, five previously known sites may be within or *adjacent* to the project area. Of these, two have been assessed as eligible for the National Register of Historic Places. The remaining three sites appear to be NRHP eligible but have not been assessed. Sites included Prehistoric and historic resources, within one Prehistoric habitation site containing burial features potentially located in the proposed Reach 7. Historic site are more numerous and included segments of Highway 1,

two historic structures, and the Watsonville Historic District that extends into Reaches 3, 5, and 6 (**Tables 4.7-2** and **4.7-3**).

Background research and the records search conducted in 1996 and work conducted in 1999 identified as many as fourteen archaeological sites within or near previous iterations Pajaro River Flood Protection Project corridors. This indicates the potential for the presence of additional resources within the current project area. Considering this potential for the presence additional resources, more inventory surveys may be required to more adequately assess the effects of the project on cultural resources within the project area.

Table 4.7-2: Known Cultural Resources Within TSP Alternative

Site #	Site Type	Reach	NRHP/CRHP Eligibility
Site P-44-000406	Segments of the old and modern Highway 1 and is located throughout Monterey, San Luis Obispo, Santa Barbara, and Santa Cruz counties.	2	NRHP and CRHP
Site P-44-000395	City of Watsonville historic district.	3, 5, 6, 7	n/a

Table 4.7-3. Known Cultural Resources Within Alternatives 1–8. In this table, Alternatives 1, 2, 3 and 4 include Reaches 2 and 3. Alternatives 5, 6, 7, and 8 include Reaches 5, 6, and 7)**.** The TSP, shown in Table 4.7-2, includes Reaches 2, 3, 5, 6, and 7.

Site #	Site Type	Reach	NRHP/CRHP Eligibility
Site P-44-000406	Segments of old and modern Highway 1 and is located throughout Monterey, San Luis Obispo, Santa Barbara, and Santa Cruz counties.	2	NRHP and CRHP
Site P-44-000410	Two-story vernacular house.	7	n/a
Site P-44-000395	City of Watsonville historic district.	3, 5, 6	NRHP and CRHP
Site P-44-000049	Habitation site containing multiple burials and pit features.	7	n/a
Site P-44-000400	Flat-roofed, wood=frame building with stucco walls that appears to be a remnant of a motel or series of small apartments.	7	n/a

4.7.2 Environmental Consequences – Action Alternatives

The environmental review for cultural resources focused on compliance with Section 106 of the National Historic Preservation Act (NHPA), as amended. Section 106 requires Federal agencies to take into consider the effects of their undertakings on historic properties, and affords the Advisory Council a reasonable opportunity to comment on such undertakings. The NHPA and its implementing regulations [CFR 800.1(a)] requires federal agencies to conclude the Section 106 process prior to the approval of the expenditure of any Federal funds on the undertaking and prior to the issuance of any permit. This does not prohibit authorizing nondestructive project planning activities, provided that such actions do not restrict the subsequent consideration of alternatives to avoid, minimize, or mitigate the undertaking's adverse effects on historic properties.

Some of the project related measures, such as the construction of floodwalls and new levees have the potential to result in the alteration or destruction of recorded prehistoric and historic archaeological resources. These activities could also reveal buried or otherwise obscured archaeological deposits. Mitigation to ensure that effects are less than significant would be accomplished through consultation with the State Historic Preservation Officer (SHPO) and Native American Tribes, and execution and implementation of a Section 106 Programmatic Agreement (PA). The draft PA is included in Appendix E-3.

Potential indirect impacts to cultural resources, primarily vandalism, could result from increased access to, and use of, the general area during construction. Such disturbance could result in significant effects, including disturbance of cultural deposits, the loss of information, and the alteration of a site’s overall integrity. These effects would be mitigated to a less than significant level through development, execution and implementation of the Section 106 PA.

It appears that most of the known sites described above have not yet been assessed for eligibility for listing on the National Register of Historic Places NRHP. Also, the proposed project area has not been adequately surveyed and there is potential for the presence of additional NRHP eligible resources. Therefore, the project may result in significant effects on cultural resources in the project area. To address this and ensure that effects are less than significant, a PA will be developed for this undertaking. Development of this PA will be coordinated with the State Historic Preservation Officer, tribes, and other interested parties, and will contain stipulations regarding the identification of cultural resources, assessing resources for significance and NRHP eligibility, determining the effects of the undertaking upon NRHP eligible resources, and mitigating the effects to these resources. The PA will also contain stipulations on post Section 106 review discoveries and the treatment of human remains.

4.7.3 Mitigation

Mitigation to ensure that effects are less than significant would be accomplished through consultation with the SHPO and Native American Tribes, and execution and implementation of a Section 106 PA. The draft PA is included in Appendix E-3.

4.8 HYDROLOGY, HYDRAULICS, GEOMORPHOLOGY

4.8.1 Affected Environment

Regional Climate

The Project area is located along the western margin of the Coast Range and the climate is dominated by the Pacific Ocean. Warm winters, cool summers, small daily and seasonal temperature ranges, and high relative humidity are characteristic of this area. With increasing distance from the ocean, the maritime influence decreases. The Mediterranean climate is characterized by moderate coastal climate with mild, wet winters and generally dry summer days, which are often overcast or have coastal fog and cool temperatures.

Average annual precipitation in the Pajaro River watershed varies greatly, from around 13 inches in the coastal valleys to 44 inches in the upper watershed. At the Watsonville Waterworks climate station, near the center of the Project area, the average annual precipitation is 21.5 inches. More than half of the annual precipitation falls in the winter months (Western Regional Climate Center 2010). The upper portions of the watersheds in the Santa Cruz Mountains, particularly Corralitos and Salsipuedes creeks, can experience heavy rainfall in the winter months (October through April). Within the watershed, snowfall is a rare occurrence, and snowmelt is not generally a significant factor in storm flows.

Watershed Context

The Project is located within the lower (downstream) portion of the Pajaro River watershed. The watershed of the Pajaro River is comprised of about 1,275 square miles of variable topographic conditions within the California Coast Ranges and interior coastal valleys of central California. Major tributaries to the Pajaro River are the San Benito River, which drains the southern end of the watershed; Uvas, Carnadero, Pescadero, Llagas, and Pacheco creeks, which flow into the Pajaro River in the southern Santa Clara Valley; and Salsipuedes and Corralitos creeks, which flow into the Pajaro Valley from the Santa Cruz Mountains. At its northern end, the watershed is oriented east-west and flows westward to Monterey Bay. The southern portion of the watershed trends northwest-southeast (conforming to the topographic fabric of the Coast Ranges) and extends about 70 miles inland to San Benito Peak.

The upper portion of the watershed is drained by the San Benito River, which flows northwestward through the southern Santa Clara River. The river collects flow from its tributaries including the Llagas, Pacheco, Uvas, Carnadero, and other creeks that drain the urbanized areas of Gilroy, Morgan Hill, and San Martin. The San Benito joins the Pajaro River near San Juan Bautista. The Pajaro River then flows westward in a narrow valley through the southern Santa Cruz Mountains. The valley forms a constriction, known as “Pajaro Gap” near Chittenden before opening into the broader coastal lower Pajaro Valley near the Monterey/San Benito County line. The major tributaries within the lower valley are Corralitos and Salsipuedes creeks. Green Valley and Casserly creeks contribute significant flows from the western Santa Cruz Mountains into the Pajaro River via College Lake and Salsipuedes Creek. The near-coastal

areas are drained by sloughs, including Watsonville and Harkins Sloughs. These sloughs flow into the Pajaro Lagoon, a tidally influenced estuary at the mouth of the Pajaro River, where it flows into the Pacific Ocean.

Geomorphology

Channel. Currently, the Pajaro River within the Pajaro Valley is a managed floodway. A continuous levee system along the Pajaro River from the mouth to the Murphy Road Crossing and along the lower reach of Salsipuedes Creek was constructed by the USACE in 1949. The channel within the levees consists of the low-flow channel and banks, and the broad, relatively level channel benches. The channel benches are parts of the original valley lake bed and may represent the modern river "floodplain"[4] which are now contained within the levees and roughly level with the ground surface outside the levees. The benches vary in width from 0 to over 100 feet and are generally wider on the Santa Cruz County side of the river than on the Monterey County side. During construction of the levee system, several reaches of the river were channelized into linear segments with over-steepened streambanks (Harding ESE).

The flow of Salsipuedes is contained on the west (right) bank by an earthen levee built by USACE in 1949. The east (left) bank is a natural channel from the Corralitos confluence to Lakeview Road, downstream of which the engineered levee contains both sides of the river and extends along the remaining reach of Salsipuedes Creek. The total length of Salsipuedes Creek from its lake outlet to its confluence with the Pajaro River at the Highway 129 Bridge is approximately 3 miles. Corralitos Creek has not been leveed. There have been relatively recent changes associated with urbanization, particularly road crossings on both Corralitos and Salsipuedes Creek, and the Pajaro River.

Sinuosity. In the project area, the Pajaro River has a moderately high sinuosity ratio (river length/valley length) about 1.3 in Reach 4, which is indicative of a meandering channel planform. Over the 6 mile length encompassed by Reaches 1-3 the Pajaro mainstem channel has a relatively low sinuosity ratio 1.06, which is considered a straight channel type. The low sinuosity ratio in Reaches 1-3 is unusual in that a greater degree of meandering is typically associated with lower channel gradients. This may be an indication of a history of channel straightening in the lower reaches. Aerial photography available from the 1930s suggest that the lower Pajaro river exhibited a greater degree of meandering (Curry, 2003, and USACE, 2000), but even by the 1930s the valley floor was converted to agricultural uses and the channel was likely to have been subjected to channelization. The sinuosity ratio for Salsipuedes Creek (reach 5) is 1.05, and for Corralitos Creek (Reach 6 and 8) is 1.09; both are within the range of a relatively straight channel planform.

[4] The floodplain in alluvial rivers are usually constructed by the river over geologic time when they deposit sediments during overbanking flows. In the case of the Pajaro River, the valley flat was constructed by the Pleistocene Lake Pajaro and more recently by the catastrophic spilling and sediment delivery from the ancient upstream lake San Benito rather than the long-term process of river floodplain building. However, the Pajaro River still has had a period of tens-of-thousands of years to transport and re-work sediments, including likely over-banking flows (as still occurs today even with channelization) to develop a floodplain. The relationship of the benches to the Pajaro River is unclear, but may in fact be the modern floodplain surface.

Sediment Transport. The pattern of sediment deposition and erosion that occurs along river channels during flood events varies because of flow magnitude and velocity, sediment supply from upstream sources, river planform, roughness (i.e., vegetation) and many other interrelated factors. The tributary San Benito River is likely the most significant source of sediment to the lower Pajaro River.

To develop a better understanding of sediment issues and possible solutions in the watershed, the Pajaro River Watershed Flood Prevention Authority commissioned three studies associated with sediment transport. One of these studies developed a sediment transport model for the lower San Benito River and the Pajaro River at the confluence with the San Benito River (PWA, 2005b). The model simulations compared sediment outflow from the San Benito with the sediment inflow to the Pajaro River. The results suggested that during high flows two thirds of the Lower Pajaro River sediment load comes from the San Benito River with about one-third coming from the Pajaro River watershed upstream. At low flows the proportion of sediment contribution from the San Benito is even greater, but the excess sediment may be stored in the Pajaro River between the San Benito confluence and Chittenden, mobilizing only during larger events. An average total sediment load of 410,482 tons per day was delivered by the San Benito River to the Pajaro River at the peak of the 100-year flood, and 3,602 tons was delivered during bankfull events. The study determined that several reaches of the lower San Benito River are likely to erode in the future and concluded that sediment delivery to the Pajaro River can be reduced by addressing San Benito River erosion issues.

Bank Erosion. The 1949 USACE levees along the Pajaro River were considered to be an environmentally compatible design at the time of construction. Using setback levees allowed vegetation to grow, and existing benches were allowed to remain to provide a buffer against erosion damage. The locations and types of bank protection features that have been implemented along the Pajaro River during the past decades have not been fully documented, and some bank protection has been buried by deposition of sediment, some were exposed following the record 1998 flood. Types of protection along the Pajaro River include rock, broken concrete, or wire mesh placed along the banks, and jacks (rail fastened together in a radial pattern).

Following the flood events of 1995 and 1998, 70 specific sites in need of erosion repair along the Pajaro River on both the Santa Cruz and Monterey County sides were identified (NHC 1998). The counties have performed the needed erosion control repairs for past flood events, and continue to monitor the river banks and take appropriate actions to repair erosion sites as they may occur.

Project Vicinity Hydrology and Surface Waters

Pajaro River. The lower Pajaro River valley forms a coastal watershed of about 160 square miles in the southern part of Santa Cruz County and the northern part of Monterey County; and forms the boundary between the counties (Hanson 2003). The valley is the coastal part of the larger Pajaro River Basin. The major tributaries to the lower Pajaro River are Corralitos and Salsipuedes creeks, which merge and flow into the Pajaro River at Watsonville. Within the Project area, the lower Pajaro River flows in a broad alluvial valley at the margin of the Pacific Ocean. Much of the surrounding land use within and adjacent to the Project area

consists of extensive row-crop farming. However, two significant urban areas are located near the river. The City of Watsonville lies on the Santa Cruz side of the Pajaro River Valley and the unincorporated town of Pajaro lies on the opposite side in Monterey County.

The mouth of the Pajaro River discharges to Monterey Bay. The lower portion of the river is tidally influenced when the river mouth is open to the bay. The tidal influence extends to just upstream of the Highway 1 Bridge. Seasonally, the migration of sand along the coast results in formation of a sand spit, which builds during lower flow conditions in the river and, in most years, the spit closes the mouth. When the mouth is closed, the Pajaro River lagoon forms in the general area of the tidal influence. The County of Santa Cruz is permitted to artificially breach the spit and allow the lagoon to drain directly into the bay.

Daily streamflows for the mainstem Pajaro River at Chittenden have been recorded by the USGS since 1939. The USGS gage at Chittenden is the most representative of flows through the Project area from Murphy's Crossing (approximately 3 miles downstream of gage) to the Salsipuedes Creek confluence. The most useful streamflow data are for the period since 1956, when the existing upstream reservoirs (Uvas and Chesbro) began operating. Mean monthly flows since 1957 are presented in **Table 4.8-1**. On a yearly basis, flow in the Pajaro River is greatest from January through April and lowest from June through October. The average annual runoff past the Chittenden Gage for the 1957 to 1999 period is about 127,500 acre-feet. The median annual runoff for this period is about 63,000 acre-feet. The range of annual runoff is approximately 850-fold, ranging from 768-acre-feet in water year 1977 to 655,000 acre-feet in water year 1983. Only rarely has annual runoff exceeded 300,000 acre-feet.

Table 4.8-1: Mean Monthly Streamflows (cfs) in the Pajaro River at Chittenden, California

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
431	729	496	274	59	19	9	7	7	5	20	99

Note:
cfs = cubic feet per second
Source data from USGS Gage 11159000; 1956 through 2000

Corralitos and Salsipuedes Creeks. The annual streamflow for Corralitos Creek (measured at a gage at Freedom) is about 1,400 acre-feet/per year. Streamflow on Corralitos Creek is subject to diversions on the order of about 1,000 acre-feet/per year for water supply (Hanson 2003). Summer streamflows are about 40 acre-feet/season on while winter flows are almost 3,700 acre-feet/season. Mean daily flows exceed or equal 0.4 cfs on 50 percent of the days and equal or exceed 79 cfs on 5 percent of the time. The annual streamflow for during wet-year periods is about 2.4 times larger than in dry-year periods (Hanson 2003).

College Lake. College Lake is a natural reservoir situated immediately upstream of the junction of Corralitos and Salsipuedes creeks, near the Highway 152/College Drive intersection. The surface area of the lake is approximately 500 acres and intercepts runoff from about 19.6 square miles of the Salsipuedes Creek watershed. The bottom of College Lake is 5 feet lower

than the channel bottom at the junction, which means that reverse flow can occur from Corralitos Creek into the lake. College Lake is also capable of significantly reducing the flow entering Salsipuedes Creek during storm events.

Flooding – Lower Pajaro River and Tributaries

Flood management has been a primary concern for the lower Pajaro River and its tributaries, Salsipuedes and Corralitos creeks, since the settlement of area. The USACE initiated a flood control study for the Pajaro River in 1936. In 1949, the current earthen levee system was constructed along the lower 12.5-mile segment of the river from the Murphy's Crossing Road to the river mouth and the first 4.5 miles of Salsipuedes Creek. The Pajaro River and its tributaries have a long history of flooding, as evidenced by the occurrence of three major flood events and several smaller events since 1936. The flood of 1955 was the most extensive in recorded history, breaching and overtopping the 1949 levees and causing severe flooding in the Monterey Bay area. Other Pajaro River flooding in the recent past occurred in 1982, 1986, 1995, 1997, and 1998. The 1995 flood event inundated significant areas of the unincorporated town of Pajaro and adjacent farmland acreage in Santa Cruz and Monterey counties. The existing and future without project floodplain for the 1% ACE flood is shown in **Figure 4.8-1**.

The entire Project area is located within a Federal Emergency Management Agency (FEMA) Zone, flood hazard zone that includes areas within the 1 percent floodplain. The area within the flood hazard zone has been determined to be subject to inundation during a flood stage that has a 1 percent probability to occur in any given year. Since 1949, four major floods have caused levee breaching and/or overtopping on the Pajaro. During these events, the primary levee failure mode has been overtopping. The 1995 flood was the most damaging of the flood events because the levee became saturated and sand boils occurred in the area of levee failure. Although flows during the 1998 flood event were higher than during the 1995 event, this event was less damaging. Capacity increases from levee resurfacing in 1997, and vegetation clearance following the 1995 flood were likely responsible for the reduced severity of the 1998 flood; however the removal of vegetation during 1995 did increase bank erosion in some locations during the 1998 flood.

Flooding in Corralitos and Salsipuedes creeks has caused damage on several occasions. Serious damage occurred in 1955 when floodwaters escaped from Corralitos Creek. Damage also occurred during 1982 and 1986. Although the 1998 flood produced the highest flows on the Pajaro River, this storm was less intense and longer in duration than other events that produced higher flows on the smaller Salsipuedes and Corralitos creeks. However, backwater from the Pajaro River almost resulted in overtopping of the lower Salsipuedes Creek levees in 1998 (Harding ESE 2001).

Climate Change and Hydrologic Response

Several effects on water resources infrastructure may occur in response to global warming. Potential impacts throughout California could include changes in snowpack accumulation and melting, alteration of precipitation and runoff patterns, increasing sea level,

changes in flood frequency and timing, increased droughts, increased potential for wild fires, and increased demand for groundwater (and related decreases in groundwater levels).

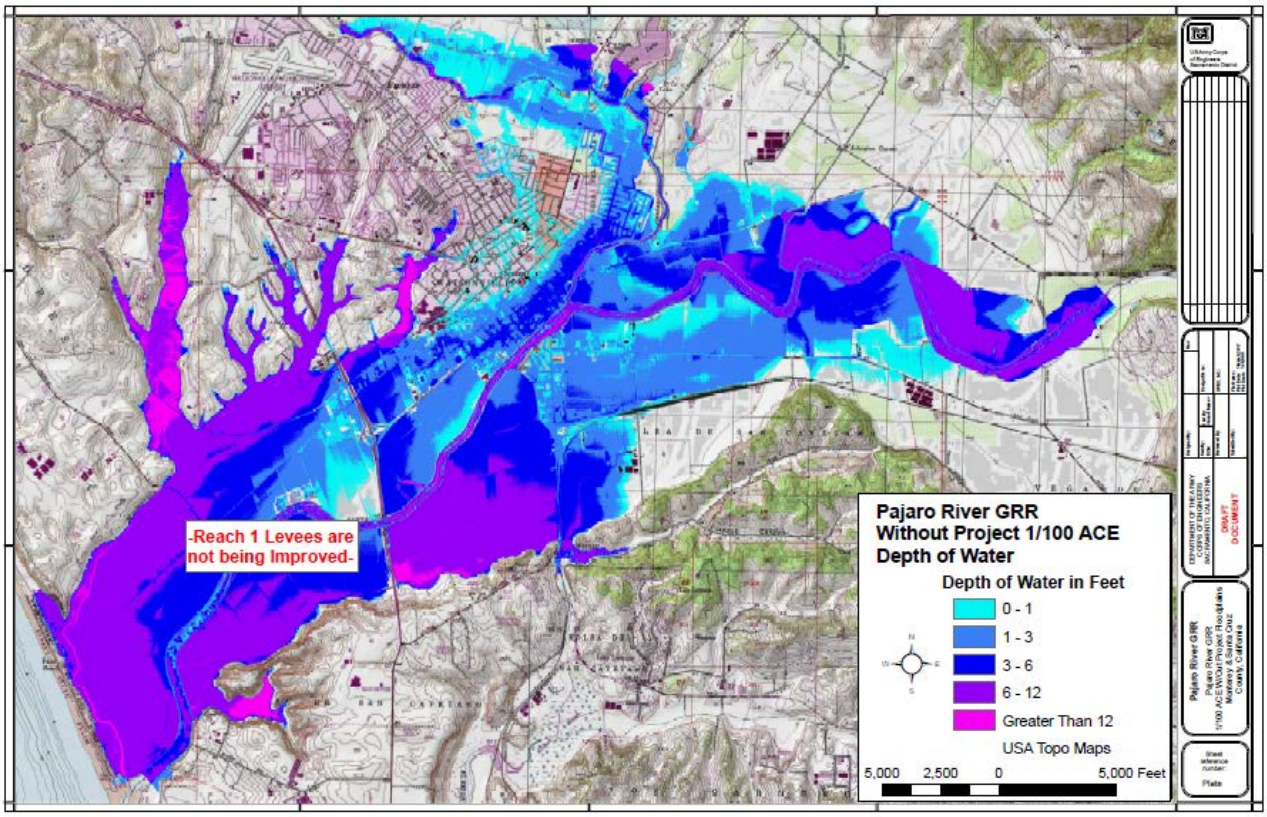

Figure 1.8-1: Existing and Future Without Project 1% ACE Floodplain.

Groundwater Hydrology

The Pajaro Valley Groundwater Basin is comprised of three sedimentary geologic units (Quaternary, Aromas Sands, and Purisima Formation) that contain four recognizable groundwater zones. The sedimentary units comprising the groundwater basin are tilted gently to the west, and deepen from north to south towards the Pajaro River (Hanson 2003). This entire sedimentary sequence extends to a depth of about 2,000 feet, and overlies Cretaceous age granitic rock at depths of between 2,000 to 4,000 feet below the ground surface (Hanson 2003).

Based upon differences in water chemistry as well as age, different groundwater zones have been recognized in the basin (no formally recognized differences in aquifers). These groundwater zones are divided roughly by formation; the uppermost groundwater zone is found in the overlying alluvium, two zones of groundwater with differing quality are found in the Aromas Sand, and a fourth zone of lower quality groundwater is found in the Purisima Formation. A fifth groundwater zone is comprised of seawater that represents recent intrusion along the coastal plain, and is located within the alluvial layer between 100 to 200 feet in depth.

Additionally, some indication exists that seawater may be intruding within the Aromas Sands lower groundwater zone (between 300 to 600 feet) near the coastal plain (Hanson 2003). This groundwater zone is currently considered the source of the highest quality groundwater within the Pajaro Valley, as it is under confining layers and is, therefore, isolated from nitrate loading from surface runoff. The primary water quality impairment in the basin is presence of high total dissolved solids, which markedly differ between the five groundwater zones (DWR 2006).

Extraction of local ground-water is currently the source of virtually all irrigation water used in the Pajaro Valley, and is primarily extracted from shallow alluvial and underlying Aromas aquifers (Hanson 2003). Agricultural uses comprise approximately 84 percent of groundwater withdrawal, and municipal/domestic use accounts for the remaining 16 percent of water use (Hanson 2003). In total, groundwater extraction yields 54,000 acre-feet per year. Total recharge in the basin is estimated to be 61,000 acre-feet per year. The calculated sustainable yield is estimated at less than half the current volume of extraction (24,000 acre-feet per year), but extraction is projected to potentially increase to 48,000 acre-feet per year should pumping along the coastal boundary be reduced. Total storage in the basin is estimated to be 2,000,000 acre-feet within the Aromas Sand and overlying alluvium. Additional storage in the Purisima Formation is estimated at 5,770,000-acre-feet for a total storage of 7,770,000 acre-feet (DWR 2006).

4.8.2 Environmental Consequences – Action Alternatives

Geomorphology

The most significant changes from existing and future without project conditions in terms of geomorphology would be establishing new setback levees and removing the existing levees in those reaches, thereby incorporating a broader floodplain into the flood risk management system. These broader areas would expand the meander belt and reduce the potential risk of levee erosion. During high flow events in the Pajaro River, however, the sheer stress would still be great enough to erode channel banks anywhere that there is no protective cover (like riprap) on levee slopes and banks. Therefore, Alternatives 1, 2, 3, 4, and the TSP propose placement of erosion protection, as shown in **Table 4.1-3**.

The setbacks also widen the waterway cross section and create areas of low velocity floodplain where sediments being transported in floodwater would be expected to settle out onto the floodplain. This would remove sediment that would otherwise have been transported to the downstream reaches, and would reduce aggradation potential in the low-flow channel area. **Table 4.1-3** described the area of floodplain offset area created by new setback levees. Alternative 3 creates the largest floodplain offset area followed by Alternatives 7 and TSP. Alternative 2 would create the smallest offset area.

Surface Waters – Flood Risk

Each of the nine Action Alternatives have been developed to achieve the same level of performance in terms of reducing flood risk; however, each reduces flood risk (in comparison

with the No Action Alternative) to somewhat different geographic areas. The greatest difference is between; alternatives on the tributaries (Alternatives 5, 6, 7, 8), which reduce flood risk to all portions of the City of Watsonville; the alternatives on the mainstem of the Pajaro River (Alternatives 1, 2, 3, 4), which reduce flood risk to central and western portions of the City of Watsonville and the town of Pajaro; and, the TSP which reduces flood risk to all portions of the City of Watsonville and town of Pajaro. **Table 4.8-2** generally identifies geographic areas that would experience reduced flood risk under each action alternative in comparison with the No Action Alternative. The specific flood risk reduction that would be realized, expressed as a specific percent chance of being exceeded in any given year (i.e., X% annual chance exceedance flood), is currently being refined and will be presented in the final GRR/EA. None of the Action Alternatives would transfer flood risk or induce flooding in areas not currently flooded, nor would they exacerbate existing flooding; therefore, project effects on hydrology and hydraulics would be **beneficial** to areas receiving reduced flood risk, and there would be **no effect to less than significant** effects to areas not receiving reduced flood risk from the proposed project.

Table 4.8-2: Reduced Flood Risk Provided by Each Action Alternative in Comparison with the No Action Alternative. An "X" indicates that the specified alternative reduces flood risk to the area identified in the first column in comparison with the No Action Alternative.[1]

	Alternative								
Reduced Flood Risk to:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**TSP**
City of Watsonville – Central and Western Portion (from about the Confluence of Salsipuedes Creek and Pajaro River westward	X	X	X	X	X	X	X	X	X
City of Watsonville – Eastern Portion (from about the confluence of Salsipuedes Creek and Pajaro River north and east)	--	--	--	--	X	X	X	X	X
Orchard Park Subdivision (in Reach 7)	--	--	--	--	X	X	X	X	X
Town of Pajaro	X	X	X	X	--	--	--	--	X
Agricultural Lands Northwest of Reach 2	X	X	X	X	--	--	--	--	--
Agricultural Lands Southeast of Reach 2	X	--	X	X	--	--	--	--	X
Agricultural Lands North of Reach 4	X	--	X	X	X	X	X	X	--
Agricultural Lands South of Reach 4	X	--	X	X		--	--	--	X
Agricultural Lands East of Reach 5	--	--	--	--	X	X	X	X	--
Agricultural Lands East of Reach 6	--	--	--	--	X	--	X	--	X
Agricultural Lands in the vicinity of Reach 7	--	--	--	--	X	X	--	X	X
Agricultural Lands Northeast of Reach 8	--	--	--	--	X	--	X	X	--

[1] Where the alternative includes a setback area, reference to reduced flood risk refers to lands landward of the new setback levee.

Groundwater

In general, the construction of the levees and floodwalls proposed by the any of the Action Alternatives would not significantly impact the groundwater supplies or conditions within the Project area. None of these alternatives would require sustained pumping or use of groundwater. Levee construction would not generally result in excavation or construction below the groundwater table of the unconfined aquifer that underlies the Project area. The shallow groundwater within the Project area is generally at or below sea level (Hanson 2003). The depths to groundwater in most areas of construction would be greater than 10 feet. Therefore, the potential for adversely affecting groundwater flow patterns or rates of flow are unlikely. Consolidation or compression of sediments below newly constructed levees may result in minor and localized changes in the hydraulic conductivity of the sediments. Given the expected relatively high hydraulic conductivity and extensive area and volume of the alluvial sediments, local changes would be equilibrated over relatively short distances and no significant changes in recharge or discharge of groundwater flow would be expected.

The alignment for the levees proposed by the Action Alternatives would cover domestic and agricultural wells. Alternatives 5, 6, 7, and TSP would place levees over one domestic well and four agricultural wells. Alternative 8 would place levees over one domestic well and two agricultural wells. Locating the levees over the wells would essentially preclude the continued use of these water supply wells. The loss of use would potentially present a significant project effect on the well users. Mitigation would include replacing these wells in kind or compensating owners. Each of the Action Alternatives would remove some land from agricultural production which would reduce groundwater demand on the subject properties.

Each of the Action Alternatives would reduce flood risk to large areas of the lower Pajaro River valley. Relative to existing and future without project conditions, the flood risk management would improve from a 4-5 percent flood risk level to up to a 1 percent flood risk level for approximately 4,588 acres of land. Under existing conditions, these areas are flooded during low frequency events. The shallow groundwater in the lower Pajaro River valley is recharged by two primary sources: deep percolation of local runoff and streamflow infiltration of Pajaro River (and its tributaries) water. For a nominal stream width of 33 feet, the rate of streambed seepage per unit stream length in the lower Pajaro River valley is estimated to be about 1 to 4 x 10^{-5} square meters per second or a seepage velocity of about 0.3 to 3.3 feet per day (Ruehl et al. 2007). Very little vertical flow goes through the layered aquifer system (Hanson 2003). Under each of the Action Alternatives, the floodplain landward of the proposed levees and floodwalls would be inundated less frequently than is the current and future without project condition. The Action Alternatives do include setback levees which create an area between the existing and proposed levees that would be inundated more frequently and provide some potential for contributing to groundwater supply, with Alternative 3 providing the largest floodplain followed by Alternatives 7 and TSP (see **Table 4.1-3**). Following an inundation event some of the floodwaters would potentially infiltrate but much of the water would flow back to the river.

Given the low frequency of major flooding events and the relatively short duration (on the order of days) and shallow depths of inundation, the amount of reduced recharge under any of the Action Alternatives would not be significant relative to the recharge from other sources (runoff and stream channel flow); therefore, the project would have a **less than significant** effect on groundwater supplies and quality. Effects on water supply wells, which would be less than significant with mitigation, are discussed in Section 4.16.2.

4.8.3 Mitigation

Implementing Mitigation measure UT-2: Replace water supply wells removed from service (See Section 4.16.3) would reduce effects related to water supply wells to a less-than-significant level.

4.9 LAND USE

4.9.1 Affected Environment

In the Project area, the Pajaro River generally forms the boundary between Santa Cruz County on the north and Monterey County to the south and is adjacent to the City of Watsonville. Commercial agriculture is the primary land use in the vicinity. Urban development is centered in the City of Watsonville and the unincorporated town of Pajaro.

Table 4.9-1 delineates land use types within 1,000 feet of the Project reaches in Santa Cruz County. **Table 4.9-2** delineates land use types within 1,000 feet of the Project reaches in Monterey County. **Table 4.9-3** delineates land use types and acreages within 1,000 feet of the Project reaches in the City of Watsonville. **Figure 4.9-1** shows existing land use designations.

Table 4.9-1: Existing Land Use Types Within Study Area (Santa Cruz County)

Project Reach	Agriculture	Residential	Commercial	Industrial	Open Space	Other[1]
Reach 1	407.3	n/a	n/a	n/a	n/a	21.7
Reach 2	154.2	n/a	n/a	n/a	n/a	n/a
Reach 3	2.4	n/a	n/a	n/a	n/a	n/a
Reach 4	449.5	n/a	n/a	n/a	n/a	n/a
Reach 5	357.8	62.2	n/a	n/a	9.9	3.6
Reach 6	315.9	22.4	5.4	n/a	2.9	3.7
Reach 7	56.9	12.7	1.6	n/a	0.5	32.2
Reach 8	47.3	10.2	5.2	n/a	2.3	n/a

[1] Public parks, resource conservation, public facilities, etc.
n/a – No acres of that land use type within 1,000 feet of river/creek.
Source: Santa Cruz County 1994

Table 4.9-2: Existing Land Use Types Within Study Area (Monterey County)

Project Reach	Agriculture	Residential	Commercial	Industrial	Open Space	Other[1]
Reach 1	319.9	n/a	n/a	n/a	n/a	14.2
Reach 2	149.9	n/a	n/a	n/a	n/a	23.6
Reach 3	8.1	21.3	13.2	n/a	n/a	18.0
Reach 4	564.1	n/a	<0.1	n/a	n/a	74.6
Reach 5	n/a	n/a	n/a	n/a	n/a	N/A
Reach 6	n/a	n/a	n/a	n/a	n/a	N/A
Reach 7	n/a	n/a	n/a	n/a	n/a	N/A
Reach 8	n/a	n/a	n/a	n/a	n/a	N/A

[1] Public parks, resource conservation, public facilities, etc.
n/a – No acres of that land use type within 1,000 feet of river/creek.
Source: Monterey County 2010

Table 4.9.3: Existing Land Use Types within Study Area (City of Watsonville)

Project Reach	Agriculture	Residential	Commercial	Industrial	Open Space[1]	Other[2]
Reach 1	n/a	n/a	n/a	n/a	n/a	n/a
Reach 2	10.0	n/a	n/a	23.8	12.5	n/a
Reach 3	n/a	24.2	9.6	8.4	32.6	1.4
Reach 4	n/a	n/a	n/a	n/a	n/a	n/a
Reach 5	<0.1	82.4	n/a	1.8	24.7	13.8
Reach 6	<0.1	40.1	14.2	n/a	5.2	19.3
Reach 7	n/a	n/a	n/a	n/a	n/a	n/a
Reach 8	n/a	7.2	1.6	n/a	0.1	n/a

[1] Includes EM-OS-designated land
[2] Public parks, resource conservation, public facilities, etc.
n/a – No acres of that land use type within 1,000 feet of river/creek.
Source: City of Watsonville 1994 (land use data for the 2030 General Plan was not available for publication at the time of this writing)

4.9.3 Environmental Consequences – Action Alternatives

Construction. Project implementation would permanently change some land uses from their current use to permanent features of the flood risk management system. Each of the Action Alternatives would have similar types of effects but these effects would vary in magnitude and

by location. **Table 4.9-4**, **Table 4.9-5**, and **Table 4.9-6** show the amount of land by land use required to construct each of the alternatives.

Table 4.9-4: Santa Cruz County Acreage Required to Construct the Action Alternatives

	Alternative (acres)									
Designation	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**TSP**	**Staging**
Agriculture	49.1	26.6	60.0	57.8	92.8	78.2	85.1	78.4	26.0	1.0
Residential					1.9	2.9	2.3	3.3		
Commercial					1.1	1.2	1.3	1.3		
Industrial										
Open Space					2.9	2.9	2.6	2.6		
Public Space and Public Facilities					0.4	0.4	0.4	0.4		
Other[1]										
Undesignated[2]										
TOTAL	**49.1**	**26.6**	**60.0**	**57.8**	**99.2**	**85.6**	**91.6**	**86.1**	**26.0**	**1.0**

[1] Public parks, resource conservation, public facilities, etc.
[2] Land undesignated by municipality; mostly agricultural land considered by California Department of Conservation to be farmland of Prime, Unique or Statewide Importance.
n/a – No acres of that land use type within the permanent easement

Table 4.9-5: Monterey County Acreage Required to Construct the Action Alternatives

	Alternative (acres)									
Designation	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**TSP**	**Staging**
Agriculture	33.8	14.4	31.9	33.8					**31.9**	**2.0**
Residential	0.6	0.8	0.6	0.6					**0.6**	**0**
Commercial	0.6	1.0	0.6	0.6					**0.6**	**0**
Industrial	0.0	3.2							**0**	
Resource Conservation	10.2	5.4	10.1	10.2					**10.1**	**0**
Rivers and Water Bodies	39.8	0.0	40.2	39.8					**39.8**	**0**
Open Space										
Other										
Undesignated										
TOTAL	**85.0**	**24.8**	**83.5**	**85.0**					**117.6**	**3.0**

[1] Public parks, resource conservation, public facilities, etc.
[2] Land undesignated by municipality; mostly agricultural land considered by California Department of Conservation to be farmland of Prime, Unique or Statewide Importance.
n/a – No acres of that land use type within the permanent easement

Table 4.9-6: City of Watsonville Acreage Required to Construct the Action Alternatives

	Alternative (acres)									
Designation	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**TSP**	**Staging**
Agriculture					5.7	5.7	5.6	5.6	4.4	0
Residential					0.8	0.8	0.8	0.5	0.7	
Commercial						0.2			0	
Industrial									0	
Open Space	8.8	8.6	9.0	8.8	5.5	5.5	5.5	5.5	13	
Public Space and Public Facilities					0.7	0.7	0.7	0.7	0.7	
Other					1.6	1.4	1.5		1.2	
TOTAL	**8.8**	**8.6**	**9.0**	**8.8**	**14.4**	**14.3**	**14.0**	**12.3**	**20.1**	**0**

[1] Public parks, resource conservation, public facilities, etc.
[2] Land undesignated by municipality; mostly agricultural land considered by California Department of Conservation to be farmland of Prime, Unique or Statewide Importance.
n/a – No acres of that land use type within the permanent easement

Implementation of the Pajaro Project would convert some existing land uses to flood risk management features, however, the overall land use types and the land use pattern in the project area would remain generally the same as described for the No Action Alternative. Therefore, the proposed Pajaro Project would have a **less than significant** direct and indirect effect on land use.

O&M. O&M activities would have **no effect** on land use.

4.9.3 Mitigation

Property acquisition would be consistent will all applicable laws and regulations. Relocation of people, homes or businesses would be minimized to the extent feasible and consistent with the project purpose and would be compensated under the Uniform Relocation Assistance and Real Property Acquisition policies Act. Implementing this mitigation measure would ensure that effects on land use would be less than significant.

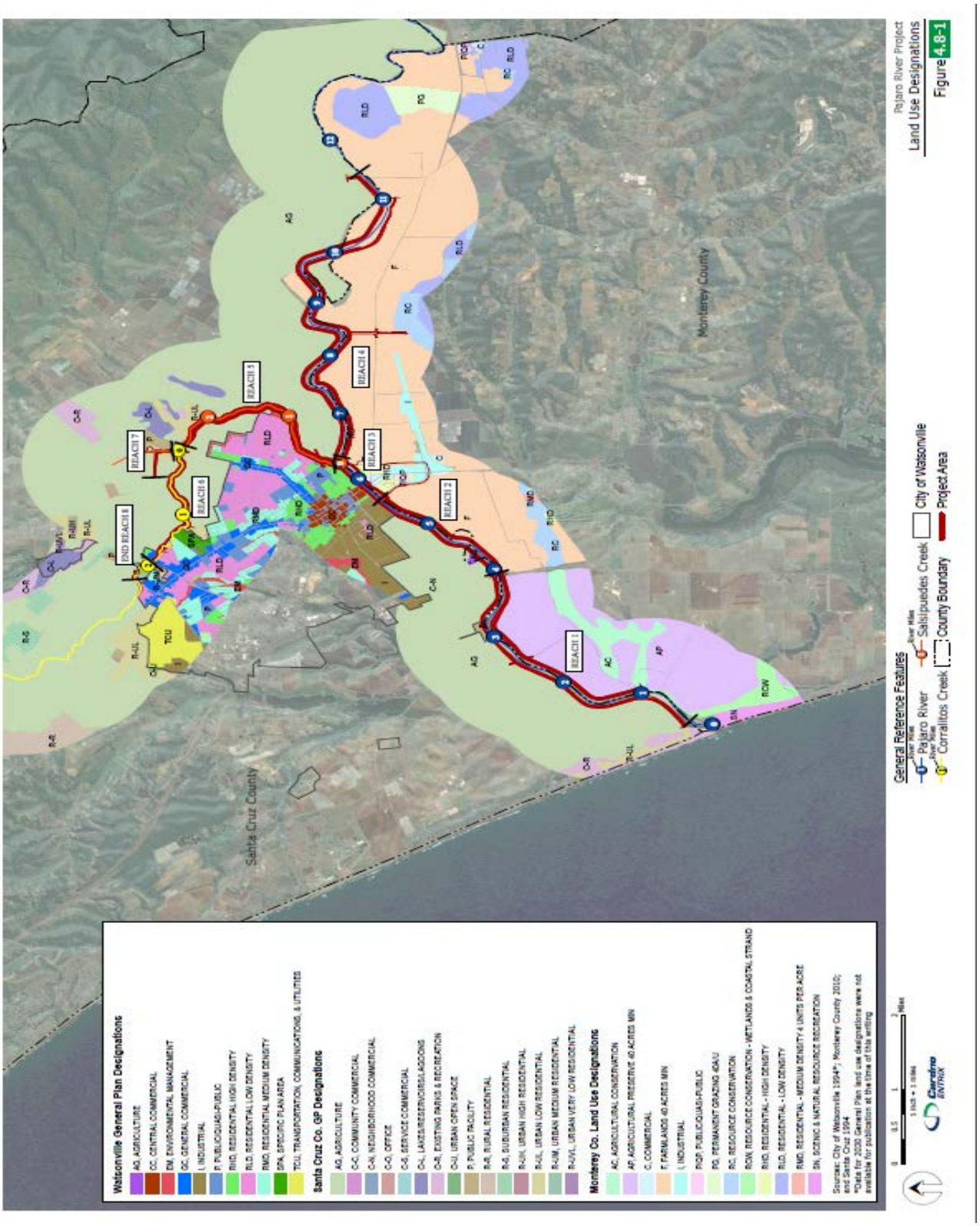

Figure 4.9-1: Land Use in the Project Area.

4.10 NOISE AND VIBRATION

Using the A-weighted decibel scale (dbA), typical sounds range from 40 decibels dBA (very quiet) to 100 dBA (very loud). Conversation is roughly 60 dBA at three to five feet. As background noise levels exceed 60 dBA, speech intelligibility becomes increasingly difficult. Noise becomes physically discomforting at 110 dBA. In general, human sound perception is such that a change in sound level of 3 decibels (dB) is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceive as doubling or halving the sound level.

Potential annoyance and physical damage to buildings from vibration are the primary issues associated with groundborne vibration. **Table 4.10-1** shows the human response to continuous vibration (Whiffen, 1971). **Table 4.10-2** shows damage potential thresholds for vibration generated by construction activities (AASHTO, 1990).

Table 4.10-1: Human Response to Continuous Vibration From Traffic.

PPV (in/sec)	Human Response
0.4 – 0.6	Unpleasant
0.2	Annoying
0.1	Begins to annoy
0.08	Readily perceptible
0.006 – 0.019	Threshold of perception

PPV = Peak Particle Velocity
Source: Whiffen 1971

Table 4.10-2: Maximum Vibration Levels for Preventing Damage.

Type of Situation	Limiting Velocity (in/sec)
Historic sites or other critical locations	0.1
Residential buildings with plastered walls	0.2 – 0.3
Residential buildings in good repair with gypsum board walls	0.4 – 0.5
Engineered structures without plaster	1 – 1.5

Source: AASHTO 1990

4.10.1 Affected Environment

In many portions of the Project area, the existing noise environment is characterized primarily by natural sounds (wind, birds, insects, etc.) and by transportation-related uses, including airplanes flying overhead from the public Watsonville Municipal Airport (located approximately 0.5 mile west of Reach 8), vehicles traveling on local and regional roadways, and public transit. **Table 4.102-3** summarizes typical ambient noise levels based on population density.

Table 4.10-3: Population Density and Associated Ambient Noise Levels.

	dBA, L_{dn}
Rural	40–50
Suburban	
Quiet suburban residential or small town	45–50
Normal suburban residential	50–55
Urban	
Normal urban residential	60
Noisy urban residential	65
Very noisy urban residential	70
Downtown, major metropolis	75–80
Under flight path at major airport, 0.5 to 1 mile from runway	78–85
Adjoining freeway or near a major airport	80–90

Sources: Cowan 1984; Hoover and Keith 1996.

Sensitive Receptors

Some land uses are generally regarded as being more sensitive to noise than others due to the types of population groups or activities involved. Sensitive population groups generally include children and the elderly. Noise sensitive land uses typically include all residential uses (single- and multi-family, mobile homes, dormitories, and similar uses), hospitals, nursing homes, schools, and parks.

The closest hospital and nursing homes to the Project area are located in the City of Watsonville. The Watsonville Community Hospital is located approximately 1.5 miles west of Reach 6 and the closest nursing home is located 1.25 miles north of Reach 3. The following describes other sensitive receptors located around each reach. **Table 4.10-4** summarizes the distance between the sensitive receptors closest to each reach along the Pajaro River and Salsipuedes and Corralitos creeks.

Table 4.10-4: Apparent Closest Sensitive Receptors to Project Area

Reach	Receptor Type	Distance from Bank (feet)	Jurisdiction
Reach 1	Residence	275 north	Santa Cruz County
Reach 2	Residence	1,700 north	Santa Cruz County
Reach 3	Residence	175 south	Monterey County
Reach 4	Residence	275 south	Monterey County
Reach 5	Residence	40 east	City of Watsonville (Sphere of Influence)
Reach 6	Residence	50 west	City of Watsonville
Reach 7	Residence	40 west	Santa Cruz County
Reach 8	Residence	100 west	City of Watsonville's (25-year Urban Limit Area)

4.10.2 Environmental Consequences - Action Alternatives

Project implementation under each of the Action Alternatives would be similar in magnitude and type but would vary by location and duration. Construction effects would be direct and short term. O&M effects would be direct and periodic over the long term.

Construction

Noise. Construction activity noise levels within the project area would fluctuate depending on the particular type, number, and duration of uses of various pieces of construction equipment. Construction related material haul trips would raise ambient noise levels along haul routes, depending on the number of haul trips made and types of vehicles used. In addition, certain types of construction equipment generate impulsive noises (such as pile driving). **Table 4.10-5** shows typical noise levels during different construction stages. **Table 4.10-6** shows typical noise levels produced by various types of construction equipment.

Table 4.10-5. Typical Construction Noise Levels.

Construction Phase	Noise Level (dBA, Leq)[1]
Ground Clearing	84
Excavation	89
Foundations	78
Erection	85
Finishing	89

[1]Average noise levels correspond to a distance of 50 feet from the noisiest piece of equipment associated with a given phase of construction and 200 feet from the rest of the equipment associated with that phase.
Source: USEPA, 1971

Based on their distance from the project site, sensitive receptors in the project area are anticipated to experience noise levels similar to those described in **Table 4.10-5** and **Table 4.10-6**. Construction noise at these levels would be substantially greater than existing noise levels at nearby sensitive receptor location. Construction activities associated with the project would be temporary in nature and related noise impacts would be short-term. Construction activities could substantially increase ambient noise levels at noise-sensitive locations, especially if they occurred during nighttime hours, noise from construction.

Table 4.10-6: Typical Noise Levels for Common Construction Equipment (at 50 feet)

Equipment	L_{max} (dBA)
Air Compressor	78
Backhoe	78
Cement Mixer Truck	79
Cement Pump Truck	81
Chain Saw	84
Compactor	83
Crane	81
Concrete Saw	90
Dozer	82
Excavator	81
Dump Truck	76
Flat Bed Truck	74
Front End Loader	79
Fork Lift	75
Generator	81
Grader	85
Paver	77
Pick-up Truck	40
Roller	80
Tractor	40
Tree Chipper	87

Source: Federal Highway Administration 2006

The alternatives would affect different sensitive receptors. Alternatives 1, 2, 3, 4, and the TSP could affect:

- **Reach 2**. The closest sensitive receptor to Reach 2 is a residence located about 1,700 feet north of the Pajaro River. The closest school is approximately 1 mile south of the river.
- **Reach 3**. Reach 3 borders the City of Watsonville and the town of Pajaro, and as such, is in close proximity to many sensitive receptors, including residences, schools, and parks. The

closest residence is about 175 feet south, the next closest residence is 200 feet north, the closest school is 500 feet north, and the closest park is 300 feet north of the river.

- **Reach 4.** The nearest sensitive receptors to Reach 4 are residences dispersed north and south of the Pajaro River. The closest of these residences is located approximately 275 feet south and the nearest school is approximately 1 mile south of the river.

Alternatives 5, 6, 7, 8, and the TSP could affect:

- **Reach 5**. Around Reach 5, there are numerous residences that line Salsipuedes Creek on the right and left banks. The closest residences are located approximately 40 feet east of the left bank. In addition, there is a park located about 175 feet from the right bank.
- **Reach 6**. There are also numerous residences bordering Corralitos Creek around Reach 6. The closest residences are located approximately 50 feet west of the creek. There is also a school located 300 feet east of the creek.
- **Reach 7**. Around Reach 7, the closest residence is about 40 feet west of the right bank The nearest school is 1,400 feet east of the left bank of Salsipuedes Creek.
- **Reach 8**. As with many of the other reaches, there are numerous residences bordering Corralitos Creek around Reach 8. The nearest residences are approximately 100 feet west of the right bank. There is also a school located about 400 feet east of the left bank.

Vibration. Some of the construction equipment listed in **Table 4.10-5** would also produce groundborne vibration. The pieces of equipment proposed for the Project that would produce the highest vibration levels are listed in **Table 4.12-6**.

Table 4.10-6: Typical Vibration Levels for Common Construction Equipment (at 25 feet)

Equipment	Inches/second PPV
Dozer	0.089
Flat Bed Truck	0.076
Roller	0.210

Source: Federal Transit Administration 2006

In comparison with the effects of the No Action Alternative, implementation of any of the Action Alternatives would have a **less than significant** effect related to noise and vibration. The mitigation measures identified in Section 4.10.3 would minimize these effects.

Operation

Operational activities associated with the Action Alternatives would be limited to required maintenance and repair of the newly constructed or improved flood risk management features. Operational activity proposed for the Project would be considered long-term but would be periodic because some activities would occur annually (like levee vegetation management) others would occur as occasionally as needed (like post high water erosion repair). Project

maintenance activities would result in a **less than significant** effect on noise and vibration in the Project area.

4.10.3 Mitigation

Implementing the following mitigation measures would reduce the impact of noise and vibration to **less than significant** levels for all of the Action Alternatives (Alternatives 1, 2, 3, 4, 5, 6, 7, 8, TSP).

Mitigation Measure NOI-1 NED: Reduce noise from construction and operational activity.

- Prepare a construction noise plan prior to construction.
- Limit construction and maintenance activity (not including emergency maintenance activity) to avoid noise during more sensitive nighttime hours and restrict activities on Sundays.
- Locate stationary noise sources as far from sensitive receptors as possible. If they must be located near receptors, use adequate muffling (with enclosures) and face the enclosure opening or venting away from sensitive receptors. A registered engineer regularly involved in noise control, analysis and design will design enclosures.
- All construction and maintenance equipment powered by gasoline or diesel engines will have sound-control devices that are at least as effective as those originally provided by the manufacturer and that all equipment be operated and maintained to minimize noise generation.
- Use noise-reducing enclosures around stationary noise-generating equipment capable of 6-dB attenuation.
- Construct barriers between noise sources and noise-sensitive land uses or take advantage of existing barrier features, including material stockpiles, to block sound transmission.
- Limit truck trips through residential areas to or from Project area to the hours of 9:00 a.m. until 4:00 p.m., Monday through Saturday, to minimize the associated noise impacts to less sensitive time periods. Use best available noise control techniques (including mufflers, intake silencers, ducts, engine closures, and acoustically attenuating shields or shrouds) for all equipment and trucks as necessary.
- Turn off all equipment, haul trucks, and worker vehicles when not in use for more than 30 minutes.
- Bells, whistles, alarms, and horns would be restricted to safety warning purposes only.
- As practicable, material stockpiles, maintenance/equipment staging, and parking areas shall be located as far as possible from residential receptors.

Mitigation Measure NOI-2: Reduce vibration construction and operational activity. To help reduce any vibration-related impacts to structures and sensitive receptors, the following Best Management Practices (BMPs) would be used:

- The construction contractor would be required to prepare a vibration plan prior to construction.
- The construction contractor would be required to employ vibration-reducing construction practices.
- Conduct pre-construction surveys for potential buildings and structures that could be affected by vibrations.
- Reduce vehicle and truck speeds to 10 miles per hour.

Mitigation Measure NOI-3: Coordinate with Potentially Affected Community. To help reduce any vibration-related affects to local residents, business, and organizations, the following BMPs would be used:

- Prior to each construction season, the project partners would provide written notification to potentially affected residents, workers, and the general public identifying the type, duration, and frequency of construction activities. Before haul truck trips are initiate during a construction season on roads within 90 feet of residences located along haul routes, written notification would be provided to the potentially affected residents identifying the hours and frequency of haul truck trips. A noise disturbance coordinator would be designated and contact information would be provided in the notices and posted near the project area in a conspicuous location that is clearly visible to nearby receptors most likely to be disturbed. The coordinator would manage complaints and concerns resulting from noise-generating activities. The severity of the noise concern would be assessed by the coordinator, and if necessary, evaluated by a qualified noise control engineer. The project partners would take corrective action.

4.11 PUBLIC HEALTH AND ENVIRONMENTAL HAZARDS

4.11.1 Affected Environment

A Phase I Environmental Site Assessment (Weston Solutions, Inc., 2005; see Appendix E-6) identified a total of 28 sites of potential concern along Reaches 1 through 8 from records of potential sewage, hydrocarbon, and pesticide sources. Three areas of known groundwater impacts and one area of soils impact were identified (**Table 4.11-1**). Of the four sites identified, two are open cases of Leaking Underground Storage Tanks that are relatively close to the alignments of the Tributary Alternatives (Alternatives 5, 6, 7 and 8) and the TSP.

The Environmental Data Resources (EDR) database did not identify any portion of the proposed levee alignment or any sites within one mile of the proposed levee alignment as a National Priority List or state-equivalent site. There were no Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites present within one half-mile radius of the Pajaro River Project or equivalent California Environmental Protection Agency (CalEPA) sites within the same radius. If the project is approved and funded, the Phase I

analysis would be updated to cover the specific elements of the approved alternative and to identify any new relevant information.

Table 4.11-1. Table of Locations, Current Use, Past Use and Potential Environmental Concerns

Assessor's Parcel Number (APN)	Current Use	Past Use	Potential Environmental Concerns
017-241-04	Electrical substation	Power plant, manufactured gas plant	Former CERCLIS - residual contamination from petroleum, PAH and metals
n/a	Gas station #77	Gas station	Open LUST case-groundwater and soil impacted with gasoline constituents including MTBE
051-121-59	Gas station #63	not available	Open LUST case-groundwater and soil impacted with gasoline constituents including MTBE
051-101-48	Residence	not available	Open LUST case-groundwater and soil impacted with gasoline constituents including MTBE

4.11.2 Environmental Consequences - Action Alternatives

HTRW and Hazardous Materials Release

Four sites are identified in the Phase I Environmental Site Assessment. Three of these sites are open cases of Leaking Underground Storage Tanks (LUST). Two of the sites, including one LUST, occur in Reach three, outside the construction footprints but nearby Alternatives 1, 2, 3, 4 and TSP. The other two sites, both LUST sites, occur in Reach 5 on the north/northeast side of Salsipuedes and Corralitos Creeks. These sites are outside the construction footprints but nearby Alternatives 5, 6, 7 8, and TSP). These sites are up-gradient of the levee or floodwall alignments and thus there is an increased likelihood of encountering transported hydrocarbon constituents down-gradient (towards drainages). Should excavation occur to shallow groundwater near any of the four above-mentioned sites with known pollution of soils and groundwater, the potential exists for intercepting contaminated groundwater and/or soils. These potential impacts would be mitigated to less than significant by implementing the mitigation measures identified in Section 4.11.3, Mitigation.

Implementation of each of the Action Alternatives would involve the use of small quantities of fuels (e.g., diesel and gasoline), oils, lubricants, paints and solvents necessary for the routine operation of earthwork equipment. Spills or leaks of these compounds could potentially result in releases of contaminants to the Pajaro River, Salsipuedes Creek or Corralitos Creek or to groundwater. This impact would be similar for all Action Alternatives. The impact would be relatively higher for alternatives which have larger construction footprints and greater areas of construction (rebuild) of levees in their current locations (i.e., closer to the streams). The mitigation measures identified in Section 4.11.3 would reduce potential impacts to **less than significant**.

Public Health, Safety, and Emergency Planning and Response

Schools. The Project area is within 0.10 mile of Watsonville High School (250 East Beach Street) and 0.23 mile of the Pajaro Valley Middle School (250 Salinas Road). The schools are not adjacent to work proposed under any of the Action Alternatives but Alternative 2, which proposes a ring levee around the town of Pajaro. The western portion of this ring levee would boarder the Pajaro Middle School along the track and ball fields. No hazardous materials storage is proposed within 0.25 mile of these schools. However, operation of heavy equipment during construction would possibly require fueling and maintenance of the equipment, activities which would involve the use and handling of hazardous materials. Implementation of standard best management practices for these activities would reduce the potential for exposure of the public to the accidental release of hazardous materials to a **less than significant level**.

Public Safety. None of the Action Alternatives are located with an adopted airport land use plan or within two miles of a public or public use airport. The closest airport to the Project area is the Watsonville Airport, which is located about 2.7 miles north of the closest Project area boundary. **No effect** on public safety hazard for people residing or working in the project area would result from Project implementation.

Emergency Planning and Response. None of the alternatives would interfere with implementation of any emergency plan or emergency response activities. The Project would not present any interruption or interference with provisions of the Monterey County Multijurisdictional Hazard Mitigation Plan (MCOES 2007) or the Santa Cruz County Draft Local Hazard Mitigation Plan (SCCOES 2010). The Project would not result in any permanent change to existing activities or functions within the Project area that would cause interference with these plans; therefore, **no effect** would occur and no mitigation is required.

Wildfire. The predominant land use within and adjacent to the construction areas for all alternatives is row crop agriculture. The potential for the development and spread of wildfire is low in agricultural areas due to the lack of fire fuel and the numerous firebreaks formed by public and private access roadways and irrigation canals and ditches. Most of the Project Area is classified by the Monterey County Office of Emergency Services (MCOES 2007a) as “Non Fuel” areas, indicating a low potential for wildfire. The area within and adjacent to the town of Pajaro and isolated, discontinuous areas are designated as a “moderate” rank due to the availability of building and other flammable materials as fire fuel. The structures proposed by the

alternatives would have a low fire risk. None of the alternatives would expose permanent residents to additional wildfire hazards; therefore, the project would have **no effects** related to wildfires.

Incorporation of mitigation measures would ensure that all effects of project implementation would result in **less than significant** direct and indirect effects related to public health and environmental hazards and reduction in flood risk would be a **beneficial** effect.

4.11.3 Mitigation

Mitigation Measure HAZ-1: Implement Best Management Practices. Some standard BMPs for construction projects include:

- Use a covered, paved area dedicated to vehicle maintenance and washing;
- Ensure that the areas are properly connected to a storm drain system;
- Develop a spill prevention and cleanup plan;
- Prevent hazardous chemical leaks by properly maintaining vehicles and equipment;
- Properly cover and provide secondary containment for fuel drums and toxic materials;
- Properly handle and dispose of vehicle wastes and wash water.
- Develop a Storm Water Pollution Prevention Plan (SWPPP). The transport of non-visible pollutants by surface runoff from the construction site would be regulated by a site-specific SWPPP. The SWPPP would identify any location where fuels or other hydrocarbons would be stored on-site, as well as any other construction materials that could result in non-visible surface water pollution, such as cement, tackifier, or other materials. The SWPPP would also identify BMPs such that any spills or leakage would be adequately contained.
- Standard construction procedures and BMPs will be implemented to reduce the emissions of dust and pollutants during construction. See Section 4.5.3, Air Quality.

Mitigation Measure HAZ-2: Immediately contain spills, excavate spill-contaminated soil and dispose of contaminated soils at an approved facility. In the event of a spill of hazardous materials over soil the contractor would immediately control the source of the leak and contain the spill. Contaminated soils would be excavated, tested and disposed of off-site at a facility approved to accept such soils. The likelihood of spills from vehicles would be lessened by use of designated parking areas, maintenance of construction equipment, and other preventive measures outlined in the project SWPPP.

Mitigation Measure HAZ-3: Environmental specialist retained to characterize excavations. Personnel responsible for construction oversight would be adequately trained to recognize and evaluate the potential presence of soil and groundwater contamination. During excavation down-gradient of existing commercial properties, field screening would take place as necessary to evaluate excavated soils for the presence of pollutants and would include systematic random sampling of agricultural soils and testing for agricultural chemicals (including but not limited to Dichlorodiphenyldichloroethane (DDD), Dichlorodiphenyltrichloroethane (DDT), and toxaphane). If evidence of a past spill is identified, all work within 100 feet of the evidence would be halted until a Professional Geologist, Professional Engineer, or Registered

Environmental Assessor evaluates the area. If hazardous materials are identified, the Construction Contractor would notify the USACE within two days and ensure that all other required release reporting is performed. Alternatively, a pre-construction soil investigation involving trenching or soil borings with analysis for constituents of concern would be conducted to determine whether shallow soils near existing or historical commercial properties are impacted by hazardous materials. Any further action would be dependent upon the result of the investigation

Mitigation Measure HAZ-4: Notification provision within body of SWPPP. The SWPPP prepared for the Project would include provisions for notification to schools prior to the initiation of grading activities within 0.25 miles of any school or school grounds. The notification would include information on the expected duration of construction activities and project security to minimize the potential for exposure of children to the active work environment. Additionally, the SWPPP would provide specific best management practices for preventing fueling of vehicles within 0.25 mile of schools.

4.12 RECREATION

4.12.1 Affected Environment

Within the City of Watsonville there are 26 recreational parks covering 143 acres. River Park (Pajaro River, Reach 3) and Atri Park (Salsipuedes Creek, Reach 5) are adjacent to levees where improvements are planned under one or more of the Pajaro Project alternatives. Within the town of Pajaro there are two pocket parks and one full park with numerous amenities (Pajaro Park). Pajaro Park is just outside the footprint of levee improvements proposed under Alternatives 1, 2, 3, 4 and the TSP. None of these parks provide direct access to the Pajaro River or Corralitos and Salsipuedes creeks.

Although direct public access to most of the lower Pajaro River is limited, the river (Reaches 1 through 4) offers surrounding residents an open-space corridor of riparian vegetation and a system of informal pathways and informal neighborhood open-space areas. The river accommodates activities that depend on water, such as fishing and recreational boating, as well as activities that are enhanced by water, such as walking and nature viewing. Although no boat launch ramps exist, limited recreational boating occurs on the Pajaro River. During moderate to high flows, the river is navigable by small watercraft, such as canoes and kayaks. Boating opportunities are limited during low-flow conditions from May to November. Other recreational opportunities along the river include hiking, jogging, bicycling, and nature viewing. Recreational access to Pajaro River is along Reaches 1 through 4 is via the maintenance roads on top of the levees. The public can access the river at its mouth through Zmudowski State Beach. The estuary and adjacent Watsonville Slough area provide opportunities for kayaking. Most recreation on Salsipuedes Creek occurs on levee maintenance roads. That portion of Corralitos Creek within the Project area (Reach 6) is not accessible by road or trail.

In the City of Watsonville, the Santa Cruz County bicycle path is located along the levee in Reaches 2, 3, 5, and 6, and along a portion of Reach 8. In addition, the City of Watsonville

identifies levee trails along the Pajaro River in Reach 5 which allows for walking, hiking, jogging, and nature viewing. The City of Watsonville has proposed trails along Corralitos Creek in Reaches 7 and 8. No other formally established trails currently border or cross the Pajaro River, Salsipuedes Creek, or Corralitos Creek, although trails may be developed in the future. Recreational activities along levee maintenance roads are not allowed along the other reaches of Salsipuedes or Corralitos creeks.

4.12.2 Environmental Consequences – Action Alternatives

Construction of Alternatives 1, 2, 3, 4 and the TSP would temporarily disrupt river-related recreational activities along the Pajaro River. Construction of Alternatives 5, 6, 7, 8 and the TSP would temporarily disrupt river-related recreational activities along Salsipuedes and Corralitos Creeks. The public would not have access to levee roads during construction periods. Construction would affect use of the levee roads and informal pathways in the short term. Over the long term, access to these river reaches would remain because levee roads would be constructed on the new levee sections. Construction of Alternatives 5, 6, 7, 8 and the TSP could provide additional recreational opportunities along Corralitos Creek as new levees are constructed. Maintenance of the levees and floodwalls may also periodically reduce access to levee roads while.

In the City of Watsonville, River Park is in Reach 3 adjacent to the Lower Pajaro River and Atri Park is in Reach 5 adjacent to Salsipuedes Creek. River Park is adjacent to levees where improvement are planned under Alternatives 1, 2, 3, 4, and the TSP. Atri Park is adjacent to levees where improvements are planned under Alternatives 5,6,7,8, and the TSP. In Pajaro, Pajaro Park is adjacent to the footprint of new levees proposed under Alternatives 1, 2, 3, 4 and the TSP. During construction access may be restricted to all or parts of these parks.

Implementation of the any of the Action Alternatives would not substantially alter boating opportunities on the Pajaro River. At very low flows, the river would continue to be unnavigable, as it is under existing conditions. Maintenance of the levees, floodwalls and the required 15 feet each side of these structures would occur during very low-flow periods, when boating on the river is not possible.The impact on public access and recreational activities during construction and maintenance would be **less than significant** because the construction and maintenance activities would not cause a substantial long-term disruption of public access and recreational activities
Short-term construction-related impacts on bikeways and pedestrian facilities would be less than significant with mitigation and are discussed in Section 4.15, Traffic and Circulation.

4.12.3 Mitigation

Mitigation Measure REC-1: Provide Advance Notice, Safety Signs, and Detours. Construction of all of the Action Alternatives (1, 2, 3, 4, 5, 6, 7, 8, and TSP) would include advance notice to recreation users in the vicinity, on site safety signs, and appropriate detours for bicycle and pedestrian recreationists. These measures together with the availability of other recreation locations in the area would provide sufficient recreation opportunities in the project vicinity, resulting in **less than significant** effects on recreation for Action Alternatives.

4.13 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

4.13.1 Affected Environment

Historic and projected population levels for the study area are summarized in **Table 4.13-1**. In those areas susceptible to flooding, the data show that from 1990 to 2000, population increased the greatest in the City of Watsonville (3.6 percent), which far outpaced growth observed in town of Pajaro (0.2 percent) and the State of California as a whole (1.4 percent). However, from 2000 to 2020, the highest rate of population growth is expected in the town of Pajaro, approximately 2.0 percent per year, which is slightly higher than projected population growth in the City of Watsonville at 1.7 percent (State of California, Department of Finance 2007; U.S. Census Bureau 1990 and 2000). **Table 4.13-2** shows the racial and ethnic breakdown of the population in the study area, as well as that of the State of California to provide context. **Table 4.13-3a** summarizes existing housing and household data for the study area.

Table 4.13-1: Historic and Projected Population Levels

	Population		Population Projections		Annual Change		
Area	**1990**	**2000**	**2020**	**2030[1]**	**1990-2000**	**2000-2020**	**2020-2030**
Monterey County	355,660	403,887	476,642	529,145	1.3%	0.8%	1.1%
Town of Pajaro	3,332	3,384	5,065	N/A	0.2%	2.0%	N/A
Santa Cruz County	229,734	256,447	287,480	304,465	1.1%	0.6%	0.6%
City of Watsonville	31,099	44,265	62,060	N/A	3.6%	1.7%	N/A
California	29,760,021	34,095,209	44,135,923	49,240,891	1.4%	1.3%	1.1%

Source: State of California, Department of Finance (2007), U.S. Census Bureau (1990 and 2000)
Notes: Population projections for the town of Pajaro and the City of Watsonville were provided by USACE and did not extend beyond 2020.
N/A Not available

Table 4.13-2: Race and Ethnicity in the Project Area by Percentage of Population (2010)

Area	**Total Population**	**White**	**African American / Black**	**Alaskan / American Native**	**Asian**	**Native Hawaiian / Pacific Islander**	**Other Race**	**Multi-Race**	**Hispanic**
Monterey County	**415,057**	55.6%	3.1%	1.3%	6.1%	0.5%	28.3 %	5.1%	55.4 %

Table 4.13-3a: Historic and Projected Population Levels

Area		Population		Population Projections		Annual Change			
		1990	2000	2020	2030[1]	1990-2000	2000-2020		2020-2030
Town of Pajaro	**3,070**	47.3%	0.5%	2.5%	1.7%	0.0%	41.7 %	6.3%	94.1 %
Santa Cruz County	**262,382**	72.5%	1.1%	0.9%	4.2%	0.1%	16.5 %	4.7%	32.0 %
City of Watsonville	**51,199**	43.7%	0.7%	1.2%	3.3%	0.1%	46.6 %	4.4%	81.4 %
State of California	**37,253, 956**	57.6%	6.2%	1.0%	13.0 %	0.4%	17.0 %	4.9%	37.6 %

Source: U.S. Census Bureau (2010)

Table 4.13-3b: Estimated Occupied and Vacant Housing

Area	Total Housing Units	Occupied Housing	Vacant Units	Percent Vacant
Monterey County	139,048	125,946	13,102	9.4%
Town of Pajaro	655	621	34	5.2%
Santa Cruz County	104,476	94,355	10,121	9.7%
City of Watsonville	14,089	13,528	561	4.0%
California	13,680,081	12,577,498	1,102,583	8.1%

Source: U.S. Census Bureau (2010)

Economic Base

The labor force, employed, and unemployed population in the study area is shown in **Table 4.13-4**. Employment by industry data in Monterey County and town of Pajaro are summarized in **Table 4.13-5**. **Table 4.13-6** summarizes the employment by industry in Santa Cruz County and City of Watsonville. Income and earnings data are indicators on the quality of jobs in an area. Earnings by industry at the county level are displayed in **Table 4.13-7**.

Table 4.13-4: Labor Force and Unemployment (2009)[1]

Area	Labor Force	Employed	Unemployed	Unemployment Rate
Monterey County	206,600	172,200	34,400	16.7%
Town of Pajaro	1,700	1,400	300	16.2%
Santa Cruz County	150,800	130,400	20,400	13.5%
City of Watsonville	24,300	17,700	6,700	27.4%

Table 4.13-4: Labor Force and Unemployment (2009)[1]

Area	Labor Force	Employed	Unemployed	Unemployment Rate
California	18,195,800	15,989,300	2,206,600	12.1%

Source: State of California, Employment Development Department (2010)

Notes

[1] Preliminary data. Not seasonally adjusted

Table 4.13-5: Employment by Industry in Monterey County and Town of Pajaro

Industry Sector	Monterey County	Percent of County Total	Town of Pajaro	Percent of Town Total
Agriculture, Forestry, Mining, Fishing, Hunting	25,332	14.4%	227	25.2%
Construction	11,098	6.3%	32	3.5%
Manufacturing	9,986	5.7%	106	11.8%
Wholesale Trade	5,564	3.2%	19	2.1%
Retail Trade	19,630	11.1%	146	16.2%
Transportation and Utilities	6,084	3.5%	10	1.1%
Information	3,168	1.8%	0	0.0%
FIRE	8,592	4.9%	23	2.5%
All Other Services[1]	86,682	49.3%	339	37.6%

Sources: U.S. Census Bureau (2010)

Notes

[1] All Other Services includes professional, scientific, and management, administrative and waste services, educational services, healthcare and social assistance, arts, entertainment, and recreation, accommodation and food services, other services, and public administration.

Table 4.13-6: Employment by Industry in Santa Cruz County and City of Watsonville

Industry Sector	Santa Cruz County	Percent of County Total	City of Watsonville	Percent of City Total
Agriculture	7,234	5.7%	4,468	20.9%
Construction	9,858	7.8%	1,607	7.5%
Manufacturing	11,642	9.2%	1,767	8.3%
Wholesale Trade	3,981	3.2%	984	4.6%
Retail Trade	13,021	10.3%	2,101	9.8%
Transportation and Utilities	3,239	2.6%	654	3.1%
Information	2,890	2.3%	119	0.6%
FIRE	6,079	4.8%	916	4.3%
All Other Services[1]	68,436	54.2%	8,784	41%

Sources: U.S. Census Bureau (2010)

Notes

Table 4.13-6: Employment by Industry in Santa Cruz County and City of Watsonville

Industry Sector	Santa Cruz County	Percent of County Total	City of Watsonville	Percent of City Total

[1] All Other Services includes professional, scientific, and technical services, management of companies, administrative and waste services, educational services, healthcare and social assistance, arts, entertainment, and recreation, accommodation and food services, and other services. Table will be updated in Final document.

Table 4.13-7: Earnings by Industry in Monterey and Santa Cruz County ($1,000)

Industry Sector	Monterey County (2007)	Percent of County Total	Santa Cruz County (2007)	Percent of County Total
Agriculture	$ 1,166,440	9.8%	$ 27,078	0.4%
Mining	$ 34,295	0.3%	(D)	0.0%
Construction	$ 612,846	5.2%	$ 630,566	9.7%
Manufacturing	$ 576,323	4.9%	$ 474,049	7.3%
Wholesale Trade	$ 545,247	4.6%	$ 407,916	6.3%
Retail Trade	$ 785,467	6.6%	$ 590,980	9.1%
Transportation and Utilities	$ 297,906	2.5%	(D)	0.0%
Information	$ 190,595	1.6%	$ 83,317	1.3%
Fire	$ 631,242	5.3%	$ 366,371	5.7%
All Other Services[1]	$ 4,197,956	35.4%	$ 2,724,234	42.1%
Government	$ 2,807,905	23.7%	$ 1,173,545	18.1%
State	$ 268,501	2.3%	$ 354,116	5.5%
Local	$ 1,419,961	12.0%	$ 754,297	11.6%
Total	**$ 11,846,222**	**100.0%**	**$ 6,478,056**	**100.0%**

Source: U.S. Department of Commerce, Bureau of Economic Analysis (2009)
1 All Other Services includes professional, scientific, and technical services, management of companies, administrative and waste services, educational services, healthcare and social assistance, arts, entertainment, and recreation, accommodation and food services, and other services.
(D) Not shown to avoid disclosure of confidential information, but estimates for this item are included in the totals

Income and Poverty. Low-income populations in the study area were identified by several socioeconomic characteristics, including per capita income, median household income, and poverty status. **Table 4.13-8** displays these economic characteristics for the Project area based on 2010 U.S. Census Bureau data. Per capita income was $29,188 for the State of California. Although income levels for Santa Cruz and Monterey counties, as a whole, were comparable to the state, the town of Pajaro and City of Watsonville both had per capita incomes

significantly below the statewide average at $10,294 and $16,227, respectively. Similarly, median household income levels in the town of Pajaro and City of Watsonville are lower than in the state, and poverty rates are substantially higher.

Table 4.13-8: Income and Poverty

Area	Per Capita Income	Median Household Income	Percent in Poverty Status
Monterey County	$ 25,776	$ 59,271	13.9%
Town of Pajaro	$ 10,294	$ 36,094	27.6%
Santa Cruz County	$ 32,862	$ 65,253	12.7%
City of Watsonville	$ 16,227	$ 46,675	18.7%
California	**$ 29,188**	**$60,883**	**13.7%**

Source: U.S. Census Bureau (2010)

Key Industry – Agriculture. Agriculture plays an important role in the economies of Monterey and Santa Cruz County. The gross value of agricultural production was approximately $3.8 billion in Monterey County in 2008 (Monterey County Agricultural Commissioner 2009). The top crop category produced in Monterey County was vegetables with a gross value of $2.5 billion. In Santa Cruz County, agricultural production was valued at $485.3 million in 2008, and the leading crop was berries, valued at $287.2 million (Santa Cruz County Agricultural Commissioner 2009).

Environmental Justice

Based on the social and demographic characteristics of the communities in the Project area described in Section 4.13.1, the City of Watsonville and the town of Pajaro are both considered low-income communities because the percent of people in poverty is at least 5 percent higher than the state as a whole and is considered a minority community because the City of Watsonville's minority communities comprise 55.3 percent of the population and Pajaro's minority community comprises 52.7 percent of the population. Also, due to increased farm worker presence within the study area, disproportionate impacts on farm workers were assessed.

4.13.2 Environmental Consequences – Action Alternatives

USACE has completed an economic analysis of all of the Action Alternatives as part of this study (see Appendix B and Chapter 3). The TSP is the alternative that maximizes NED. The Action Alternatives provide the greatest to least NED benefits in the following order: Alternative 6; Alternative 1; Alternatives 4, 5, 7, and 8 (same benefits); and the least national economic benefits accrue from Alternative 2 (see Chapter 3). In comparison with the No Action Alternative, each of the Action Alternatives would reduce flood to all or a portion of the project vicinity. Alternatives 5, 6, 7, and 8 would reduce flood risk to Watsonville, Alternatives 1, 2, 3, and 4 would reduce flood risk to both the City of Watsonville and the town of Pajaro, and the TSP would reduce flood risk to both Pajaro and to Watsonville (from both the tributaries and the mainstem Pajaro).

To improve the existing levees and maintain required O&M easements at the base of the levees would affect properties immediately adjacent to the existing levees. Implementing Alternatives 1, 2, 3, 4, and the TSP would affect properties, including residential properties along the Pajaro River in Reaches 2 and 3 in the City of Watsonville and the town of Pajaro. Alternatives 5, 6, 7, 8 and the TPS would affect property owners including residential properties along Salsipuedes and Corralitos Creeks in Reaches 5, 6, 7, and 8. Additional information is available in the Real Estate Appendix (**Appendix C**). In some cases it may be necessary to temporarily or permanently relocate some residents or businesses. The alignments of each of the alternatives is shown in Chapter 3.

Environmental Justice. All of the Action Alternatives would reduce flood risk and flood damages to minority and low-income communities in comparison with the No Action Alternative and none of them would increase flood risk to these communities. This includes reducing property damages, loss of life, and reductions in agricultural income and employment that would likely occur with large-scale flood events. Project construction would generate jobs in the project vicinity. Some construction workers would likely be hired locally during peak construction period. Alternatives 5, 6, 7 and 8 would neither reduce nor increase flood risk to the town of Pajaro. The cultivated acres that would be removed from production as a result of each of the alternatives is shown in **Tables 4.9-1**. Removing agricultural land from product could disproportionately affect minority and low-income populations. The long-term loss of agricultural production could reduce agricultural employment and income for farm workers. In addition, a decrease in agricultural production could reduce regional economic activity in the town of Pajaro and City of Watsonville.

As described above, implementing the project has the potential to adversely affect socioeconomics. Implementing the mitigation measures described in 4.13.4 would ensure that direct and indirect construction related effects on socioeconomics are **less than significant**. O&M would have no direct or indirect effect on socioeconomics.

4.13.3 Mitigation

Mitigation Measures Socio-1: Provide Compensation. Development of all of the Action Alternatives included attention to avoiding and minimizing potential impacts on adjacent

properties to the extent feasible in consideration of the FRM goals of the study. Effects on properties would be mitigated through appropriate compensation. If relocation of people or their homes is required, they would be compensated under the Uniform Relocation Assistance and Real Property Acquisition Act. With mitigation, the potentially significant impacts to adjacent property owners of implementing Alternatives 1, 2, 3, 4, 5, 6, 7, 8, and the TSP would be reduced to **less than significant** on socioeconomics.

4.14 SPECIAL STATUS SPECIES

4.14.1 Affected Environment

For the purpose of this section, special-status species are wildlife and fish species that meet one or more of the following definitions: species listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (ESA) (50 CFR 17.11); species that are Candidates for possible future listing as threatened or endangered under the federal ESA (61 FR 7591).

Animals

A list of 20 special-status wildlife and fish species that are known to occur or potentially occur in the vicinity of the Project area was compiled and evaluated for their potential to occur within the Project area. The list was compiled from databases, literature resources, and a habitat assessment conducted for the Project. The California Natural Diversity Database (CNDDB) (CDFW 2017) was reviewed for special-status species that occur in the Watsonville East and Watsonville West 7.5-minute United States Geological Survey (USGS) quadrangles. A list of federally listed wildlife and fish species that potentially occur in the Watsonville East and Watsonville West 7.5 minute quadrangles was compiled from the Sacramento U.S. Fish and Wildlife Service (USFWS) online database list (Appendix D; USFWS 2017).

Onsite field assessments were conducted in the Project area during the 2012 breeding bird surveys to determine the potential for habitats in the Project area to support special-status wildlife species (Bryan Mori Biological Consulting Services 2012). Limited focused protocol level surveys for special-status wildlife species were conducted in the Project area (Kittleson Environmental Consulting 2012).

Based on these onsite habitat assessments, an analysis of distribution, known occurrences, and habitat requirements, 3 of the 20 special-status species evaluated may occur in the Project area (**Table 4.14**-1). Several wildlife species dependent on standing or flowing water for breeding use the Pajaro River. There is one (1) special-status amphibian species, California red-legged frog, which may potentially occur within the Project area. Fish species use the Pajaro River in the project area as a migration corridor, but spawning is not known to occur in the project vicinity.

Table 4.14-1: Federal Special-Status Wildlife, Fish, and Plant Species that May Occur in the Project Vicinity

Common Name	Scientific Name	Status
Amphibians		
California Red-legged Frog	*Rana draytonii*	Threatened
Fishes		
Tidewater Goby	*Eucyclogobius newberryi*	Endangered
Steelhead	*Oncorhynchus* (=*Salmo*) *mykiss* (S-CCC)	Threatened
Plants		
Santa Cruz Tarplant	*Holocarpha macradenia*	Threatened

Plants

Nine (9) special-status plant species were identified as potentially occurring near the Project. A combination of literature investigation, examination of previous field surveys, and surveys conducted on Reaches 5, 7, and 8 in 2012 was used to evaluate the potential presence of these species along the Pajaro River and Salsipuedes and Corralitos creeks. Information about habitat requirements, range, and nearest occurrence was drawn from The Jepson Manual of Higher Plants of California (Hickman 1993), A California Flora and Supplement (Munz and Keck 1968), the California Native Plant Society (CNPS) inventory, and the CNDDB. Using a review of habitat requirements, observed conditions within the Project area, and survey results, 8 of the 9 species identified on the original list were determined to have little potential for occurrence in the Project area and are not discussed further. Further evaluation of the remaining plant, Santa Cruz Tarplant (*Holocarpha macradenia*), which is federally listed as threatened (March 20, 2000 [65 FR 14898 14909]) and is an RPR 1B.1 species (CNDDB 2017) determined that it is not likely to occur within the action area because the area lacks suitable grassland habitat for this species.

4.14.2 Environmental Consequences

Table 4.17-1 shows the direct effects on general vegetation/habitat of each of the alternatives. In this table "grass," "shrub," "forest," and "palustrine emergent" acreages pertain to any vegetation that is encompassed within the riparian, coastal scrub, and marsh habitat types. The shrub and forest impacts occur in areas that directly serve as habitat to the special stats species that might potentially occur within the project area, and may affect cover and shading for CRLF and juvenile steelhead, with the exception of the Pinto Creek ditch, which is a previously altered waterway and does not serve as habitat for any of the special status species.

Effects to special status species in Reaches 2 through 6 from all of the Action Alternatives is relatively similar due to the reaches primarily being surrounded by agricultural, residential, and developed land. The construction activities taking place on each of the reaches is not likely to adversely affect any existing Special status species habitat within the immediate

area of impact. Indirect effects of the project could potentially include physical vibration and an increase in site disturbance during operation of equipment and trucks during construction activities. The levees and within 15 feet of both the waterside and landside levee toes would be maintained free of trees and shrubs. After construction, all levee slopes would be hydroseeded with native grasses to assist in erosion control. Any displaced wildlife would be expected to return to the area after the project is completed. With the implementation of mitigation measures, construction impacts to special status species resources would be **less than significant**.

California red-legged frog. Construction of the Pajaro project could potentially result in indirect and direct effects to California red-legged frog. No suitable breeding habitat exists for this species within the action area. California red-legged frogs spend most of their lives in and near sheltered backwaters of ponds, marshes, springs, streams, and reservoirs. Deep pools with dense stands of overhanging willows and an intermixed fringe of cattails are considered optimal habitat. Several occurrences of the California red-legged frog are documented in the Watsonville Sloughs System and other locations within 0.6 to 1.5 miles of the Pajaro River. However, CNDDB's last and single reported occurrence of CLRF in the proposed project footprint occurred in 2009, and was located within Reach 2. The proposed project could have temporary, indirect effects on habitat for the California red-legged frog, including erosion and resultant turbidity.

Steelhead. When considering the constituent elements for steelhead habitat, the action area does not contain spawning or rearing sites; however, it does provide a freshwater migration corridor to an estuarine area that is both free of obstructions and excessive predation. The proposed project has been designed to minimize to the extent possible any impacts to migrating adult as well as juvenile steelhead. All of the river and tributary habitats under this project are primarily migratory routes for both adults and juveniles.

The alternatives would have little impact, if any, direct or indirect, on the stream habitat utilized by the steelhead. The river in these reaches is primarily utilized as a migration corridor and any minor loss of shading effects are likely not significant. The additional setback distance would allow increased riparian vegetation, an increase in the length of stream meander, a wider floodplain, and lower flow velocities. The new off-set floodplain areas may be beneficial for juveniles during out-migration. Alternatives 1, 2, 3, 4, and TSP would not include in stream work; however Alternatives 5, 6, 7, and 8 do proposed some in stream work, work, but Pinto creek is not suitable habitat for utilization by steelhead.

Santa Cruz Tarplant. No effects on this plant from any of the Action Alternatives are expected because the proposed action would not result directly or indirectly in any increased risk of harm to individuals or existing populations of this species.

Tidewater Goby. No effects on this fish from any of the Action Alternatives are expected because the proposed action would not result directly or indirectly in any increased risk of harm to individuals or existing populations of this species.

4.14.3 Mitigation

With the incorporation of the mitigation measures in Section 4.11, Public Health and Environmental Hazards, and Section 4.18, Water Quality, most potential adverse effects would avoided or minimized for all of the Action Alternatives except Alternative 5, which involves more extensive in channel work. Additional conservation measures are being developed in consultation with USFWS and National Marine Fisheries Service (NMFS). Incorporation of these measures and successful conclusion of ESA consultation with these agencies will ensure that the project would have less than significant effects on Federal special status species, and specifically the California Red-legged frog and steelhead.

Mitigation Measure SSS-1 (Alternatives 5, 6, 7, 8): Short-term loss of habitat prevention. To mitigate the short-term loss of habitat and potential short-term passage impediment created through the new concrete floodwall channel the bottom of this feature will be filled with sediments similar to the natural stream bottom within reach 7 as part of construction.

Mitigation Measure SSS-2 (Alternatives 5, 6, 7, 8): Anadromous Salmonid passage facility design. To mitigate the potential passage impediment, the new concrete weir at College Lake would be designed following Anadromous Salmonid Passage Facility Design (NMFS 2008). Preliminary design would be subject to review by NMFS.

Mitigation Measure SSS-3: Limit work in or near channel until after May. During cool, wet years when steelhead may be present in the Project area due to a shift in the run timing of adult fish (Shapovalov and Taft 1954), avoid any work in or immediately adjacent to the channel until after May. Construction work before June will be limited to areas away from the channel to ensure no impacts occur to steelhead adults.

Mitigation Measure SSS-4 (Alternatives 5, 6, 7, 8): Preconstruction Surveys prior to in-water Construction. Perform preconstruction surveys in areas where in-water construction would be required. Preconstruction surveys will be performed by a qualified biologist to determine if steelhead, CRLF, or FYLF are present in the construction area. Protocol surveys would be performed for CRLF and FYLF. Steelhead surveys would consist of visual and seine surveys. If either species is present, these organisms would be captured and relocated to areas of suitable habitat that would not be affected by the construction activity.

Mitigation Measure SSS-5 (Alternatives 5, 6, 7, 8): Biological Monitor for Dewatering Activities. During the isolation of the work area after preconstruction surveys have been conducted, an on-site biological monitor would present during all working hours from prior to the time activities to isolate the site begin, until the site is dewatered and completely isolated. The monitor will inspect the work area to determine if any steelhead or CRLF are present during the dewatering. If either species is detected, all construction activity will cease, except as directed by the monitor, until these species can be captured and relocated.

Mitigation Measure SSS-6: Delay application of herbicide during cool, wet years. During cool, wet years when steelhead may be present in the Project area due to a shift in the run timing of adult fish (Shapovalov and Taft 1954), delay application of herbicide until after May to ensure no adult migrants are present in Project area.

Mitigation Measure SSS-7: Manage Herbicide Use During O&M. Runoff of herbicides and sediment during maintenance activities could impact sensitive aquatic species. Some herbicides could be applied directly within or immediately adjacent to the active channel. These activities would be conducted during the season when steelhead are unlikely to be present (April 15 to October 15) and when little precipitation occurs in the Project area; therefore, runoff would be negligible. The herbicides that would be applied near the water are approved for use in aquatic environments and, therefore, should not impact aquatic organisms. Water approved herbicides could negatively affect adult steelhead that are present later in the season due to cool wet years. This impact could be significant.

4.15 TRAFFIC AND CIRCULATION

4.15.1 Affected Environment

Regional Roadway and Highway Network

The regional transportation system consists of roadways, regional transit systems, bikeways, air service, and rail service. Roadways include freeways, which are part of the state and federal highway system. Regional freeways include Highways 1, 9, 17, 68, 129, 152, 156, and U.S. 101.

The five major state highways that connect Santa Cruz with adjacent counties are Highways 1, 9, 17, 129, and 152 (Santa Cruz County 1994). Highways 1, 68, 156, and U.S. 101 carry the highest highway traffic loads in Monterey County (TAMC 2010). North Monterey County contains three major highways (principal arterials) of statewide significance: Highways 1, 156, and U.S. 101, which traverse the planning area on the east, south, and west. Highway 183 has a minor arterial function similar to major county roads. Highway 1 is a two-lane highway, except for a mile-long, four-lane section between its intersection with Salinas Road and the Pajaro River/County line; and the four lanes south of Castroville. Also known as the Cabrillo Highway, it is the county's and the state's primary coastal route.

Monterey County has no direct access to I-5. U.S. 101 provides access to and from the north and south and is the most significant truck travel thoroughfare in Monterey County. U.S. 101 is a four-lane divided highway with many crossovers and intersections, entering the northeastern corner of Monterey County. It connects the communities of Prunedale and Salinas with other communities in the Salinas Valley, eventually exiting into San Luis Obispo County at Camp Roberts. U.S. 101 is the county’s most prominent trucking corridor (TAMC 2010). It runs through the states of California, Oregon, and Washington, merging at some points with Highway 1. U.S. 101 provides the major internal circulation for Monterey County primarily between the southern Salinas Valley and commercial and agricultural processing centers in Salinas, North

Monterey County, and Watsonville. Highways 129 and 156 are major connectors to U.S. 101 and Highway 1 corridors and handle a large percentage of truck traffic volume. Highway 156 is also a major coastal access route from U.S. 101 (TAMC 2010).

Local Roadway Network

Local roadways that intersect the Project area footprint are Thurwachter-McGowan Road, Highway 1 (Cabrillo Highway), Main Street–Porter Drive, Highway 129 (Riverside Road), Highway 152 (East Lake Avenue), Green Valley Road, College Road, Lakeview Road, and San Juan Road.

Air Traffic

Santa Cruz County is served by one small public-use airport located in the City of Watsonville (Santa Cruz County 1994). The two-runway Watsonville Municipal Airport is owned by the City of Watsonville and is open to the public, but accommodates only corporate and private aircraft. On average, this airport has 347 aircraft operations per day (Air Nav 2010). This airport is located approximately 0.5 mile from Reach 8. Santa Cruz County also has two private-use airports. Bonny Doon Airport is located in Bonny Doon, about 21 miles northwest of Reach 8, and Las Trancas Airport is located in Davenport, approximately 23 miles northwest of Reach 8.

Monterey County is served by four public air facilities, Monterey Peninsula Airport, Salinas Municipal Airport, Marina Municipal Airport, and Mesa Del Rey Airport (King City). The three latter airports are owned and operated by their respective cities while Monterey Airport is owned and operated by Monterey Peninsula Airport District, a separate jurisdiction. The closest of the public airports to the Project area is Salinas Municipal Airport, located approximately 15 miles south of Reach 2. Monterey County also contains over 30 private airstrips and agricultural landing fields, as well as three military airfields (Monterey County 2010). The closest private airstrip is Clark Ranch Airport, located 38 miles south of Reach 4.

Transit Service

Santa Cruz Metropolitan Transit District (METRO) operates transit services within Santa Cruz County. METRO operates a total of 39 fixed-route bus services and a Highway 17 Express service in conjunction with the Santa Clara Valley Transportation Authority, Amtrak®, California Department of Transportation (Caltrans), and Capitol Corridor Joint Powers Authority. In addition, METRO operates paratransit services for any persons unable to use fixed route service due to a disability (METRO 2010). METRO operates six fixed-route services within and around the City of Watsonville. Route 79 runs through the eastern portion of Watsonville, and crosses the Corralitos and Salsipuedes creeks in Reaches 6 and 7. In addition, Route 71, which provides service from Santa Cruz to Watsonville, runs along Green Valley Road and crosses Corralitos Creek in Reach 8.

Bus services are provided by Monterey-Salinas Transit (MST) to the greater Monterey and Salinas areas, including the City of Watsonville in Santa Cruz County. Services originate from Monterey Transit Plaza in central Monterey and Salinas Transit Center in downtown Salinas. MST operates a total of 12 fixed-route bus services and provides paratransit services. The three lines that run to Watsonville connect with METRO at Watsonville Transit Center in downtown Watsonville (MST 2010). These bus routes run along Main Street and cross the Pajaro River in Reach 3.

Railway Service

The Southern Pacific Railroad presently provides freight service to the Pajaro Valley along the coast of Santa Cruz County and extends into the San Lorenzo Valley (Santa Cruz County 1994). In Santa Cruz County, Sierra Northern Railway also currently operates and maintains an active freight line that runs limited operations between the City of Watsonville and Davenport. Sierra Northern Railway leased this 31.8-mile Santa Cruz County line from Union Pacific Railroad (UPRR) in 2009 (Sierra Northern Railway 2009). In February 2010, Santa Cruz County Regional Transportation Commission (SCCRTC) approved a recreational dinner train service to run between Santa Cruz and Davenport on this line (Santa Cruz Sentinel 2010). In January 2011, the California Transportation Commission approved funding for SCCRTC purchase of the Santa Cruz Branch Rail Line from UPRR. Sierra Northern Railway will continue as freight operator and will implement recreational rail service from Santa Cruz to Davenport. The line crosses Reach 3 of the Pajaro River at Walker Street. The rail right-of-way parallels Highway 1 and extends almost 32 miles from the town of Pajaro in Monterey County to Davenport in north Santa Cruz County. The right-of-way is generally 50 to 60 feet wide. A total of 37 bridges and trestles are along the right-of-way, including major crossings of the Pajaro River, Highway 1, Soquel Creek, Santa Cruz Yacht Harbor, and the San Lorenzo River (SCCRTC 2011).

Rail passenger service is provided to Monterey County by two Amtrak® trains. One is the Coast Starlight, a daily train in each direction between Los Angeles and Seattle. Salinas is the train's only stop in Monterey County, allowing connections to Los Angeles or San Jose and Oakland. The other train, called the Spirit of California, stops in Salinas en route between Sacramento and Los Angeles. All rail freight service in Monterey County is provided by Southern Pacific. Freight stations are located at Castroville, Gonzales, Salinas, and Watsonville Junction in Pajaro (Monterey County 2010).

Bikeways

Currently, Monterey County has approximately 240 miles of Caltrans' Standard classification bikeways on state, county, and local roads and Santa Cruz County has approximately 215 miles of bikeway. Caltrans maintains the largest segment of bikeways, Pacific Coast Bicycle Route, which includes 120 straight road miles of Class III bicycle routes along the coastline. Monterey County's cities maintain roughly 40 miles of bikeways. Santa Cruz County bikeways include both on-road and off-road facilities that are operated and maintained by the SCCRTC. The City of Watsonville has jurisdiction over approximately 27 miles of the 215 miles

of Caltrans' Standard Classification bikeways in Santa Cruz County (Monterey County 2008; SCCRTC 2009).

The Pacific Coast Bicycle Route extends 1,853.5 miles from Vancouver, British Columbia, to Imperial Beach, California (Adventure Cycling Association 2010). The route intersects the Project area as a Class III Bikeway at Reach 1, where the route crosses the Pajaro River on Thurwachter-McGowan Road (SCCRTC 2010). A Santa Cruz County Bicycle Path is within the Project footprint in Reaches 2, 3, 5, 6, and a portion of 8. The bikeway is located on the levee on the right bank of the Pajaro River from Thurwachter Road to the confluence of Salsipuedes Creek and continues on the levee of the right bank of Salsipuedes Creek and terminates at East Lake Avenue in Watsonville (SCCRTC 2010).

Pedestrian Facilities

In the City of Watsonville, the Santa Cruz County bicycle path located along the levee in Reaches 2, 3, 5, and 6, and along a portion of Reach 8 also allows for walking, hiking, jogging, and nature viewing. Four miles of trails provide public access to the Watsonville wetlands system north of the Project footprint (City of Watsonville 2010). No other formal trails border or cross the Pajaro River, Salsipuedes Creek, or Corralitos Creek.

In addition to formal trails, sidewalks located along the local roadways serve the residential areas surrounding portions of Reaches 3, 5, 6, and 8. Sidewalks along several of the bridges allow for pedestrian travel across the river and creeks. In particular, sidewalks are located along the Main Street–Porter Drive Bridge that crosses Reach 3, the Highway 129 Bridge that crosses Reach 5, the East Lake Avenue (Highway 152) Bridge that crosses Reach 6, and the Green Valley Road Bridge that crosses Reach 8. Other bridges that cross the Pajaro River, Salsipuedes Creek, and Corralitos Creek do not contain sidewalks or other pedestrian facilities.

4.15.2 Environmental Consequences – Action Alternatives

Truck Haul Traffic

It is anticipated that truck hauls of borrow material would generate most of the construction-related truck traffic. The largest reasonably foreseeable effect would result from the TSP, which requires the most construction, almost double, that of the other Action Alternatives. We estimate that about 16 truck trips per day would occur on work days during the construction season. Potential truck haul routes from the supplier locations to construction sites include U.S. 101 and Highway 156 as well as county roads. San Benito Supply, at 42.5 miles, is the furthest material supplier from the Project area. In 2008, the highest average annual daily traffic (AADT) on the U.S. 101 segment of the haul route was 86,000 vehicles at San Miguel Canyon Road; the lowest AADT on this segment was 27,000 vehicles at the Walnut Avenue Interchange in Greenfield. On Highway 156, the highest AADT on the haul route was 29,500 vehicles at Union/Mitchell roads; the lowest AADT was 11,600 at Route 25 at Hollister (Caltrans 2008). During the construction period, the TSP Alternative would add approximately 16 trucks per day

(8 trucks round-trip) to these volumes. Materials to be disposed of from construction would be hauled to a landfill, or other area to be identified during the Project's design phase.

Railroad

Under Alternatives 1, 2, 3, 4, and the TSP, the UPRR Bridge in Reach 3 may be partially modified to reduce resistance to high flow, but elevation would not be raised. A gap would occur in the Reach 3 levee raise where the UPRR passes through and crosses the Pajaro River. To provide improved flood capacity at the railroad crossing, a sliding floodgate would be installed. The floodgate would close during high flows. Details of the floodgate design and operation would be prepared during the Project's engineering design phase if the project is approved and funded.

In Reach 4, Alternatives 1, 3, 4, and the TSP would require a tieback levee which would attach to either side of the UPRR right-of-way, but would not actually cross the tracks. A sliding floodgate would instead be installed across the track, connecting to either side of the levee to provide flood protection, similar to the railroad crossing of the Pajaro River.

Roadway Bridges

Where levees would be raised either in their original location or at new setback locations, existing roads, and access ramps may be affected. For minor roads and access points, grading and/or realignment would be necessary to maintain egress and ingress along affected roadways. Under Alternative 5, College Road would need to be raised and resurfaced just downstream from College Lake to accommodate a new culvert, and Lakeview Road (Reach 5) would require relocation, realignment, or raising, as the left bank levee overlies approximately a 3,000-foot section of the roadway. Under the TSP Alternative and Alternatives 1, 2, 3, and 4, the tieback levee proposed for Reach 4 would require a road raise at San Juan Road and a crossing of the UPRR. The levee height would be approximately 7 feet at the San Juan Road crossing. A design for the road crossing at the levee has not yet been prepared, but would be developed for the Project's final engineering phase.

Roadways and Roadway Bridges

Under Alternatives 5, 6, 7, 8 and the TSP, two roadway bridges would be replaced to raise their elevations along Salsipuedes and Corralitos creeks: the Highway 152 Bridge (Lake Avenue) and the Highway 129 Bridge (Riverside Road). Additionally, Thurwachter McGowan Bridge may be raised to accommodate the right bank levee or it may remain in place. In addition, existing roads and access ramps may be affected where levees would be raised either in their original location or at new setback locations. Replacement or modification of the Highway 152 Bridge (East Lake Avenue), the Highway 129 Bridge (Lakeview Road), the Green Valley Road Bridge, San Juan Road, and College Road would accommodate levee improvements without modifying existing roadway capacity. Roadway bridges would be closed during construction, causing an impact on traffic circulation by providing for detours in the Project area while the bridges are under construction. The bridge projects would increase normal travel times for a

period of time that could last several months. Traffic diversion could increase traffic and adversely affect traffic operations on the detour routes.

Under Alternatives 1, 3, 4, 5 and TSP, the tieback levee at Reach 4 would require a road raise at San Juan Road and a crossing of the UPRR. The levee height would be approximately 7 feet at the San Juan Road crossing. A design for the road crossing at the levee would be developed for the Project's final engineering phase.

Under Alternative 5, College Road would be raised and resurfaced just downstream from College Lake to accommodate a new culvert and Lakeview Road (Reach 5) would require relocation, realignment, or raising, due to the left bank levee that overlies approximately a 3,000-foot section of the roadway.

Under all of the Action Alternatives, minor roads and access points may require grading and/or realignment to maintain egress and ingress along affected roadways. Changes to vertical and/or horizontal roadway geometry could introduce design changes such as sharp curves or shortened sight distances, which in turn would affect the speed at which a driver could safely react or maneuver a vehicle. Also, raising the grade of roadways and approaches to bridges has the potential to adversely affect access to homes and businesses.

The Action Alternatives do include roadway improvements intended to increase capacity or improve effectiveness of the circulation system. The Project would not decrease roadway capacity; however, modifications to the vertical or horizontal alignment of these roads could alter sight distances or cause other changes to roadway geometry that would affect traffic flow.

Construction of the Action Alternatives has the potential to result in significant effects on traffic and circulation. Implementing the Mitigation measures identified in Section 4.15.3, would reduce potential effects on traffic and circulation to **less than significant**.

Bikeways and Pedestrian Trails

During construction all bicycle and pedestrian traffic would be excluded from construction zones. Detours would be established in coordination with local responsible agencies. Trails affected by construction would be restored to their preconstruction conditions to the extent permitted by USACE policy. The greatest effects may result during construction of the two bridges under Alternatives 5, 6, 7, 8, and the TSP. Incorporation of mitigation measures would ensure that the effects on bikeways and pedestrian trails are **less than significant**.

4.15.3 Mitigation

Mitigation Measure TRAF-1: Coordinate Roadway and Bridge Designs. USACE, Santa Cruz County, and Monterey County will submit design drawings and engineering specifications for roadways and bridges to the appropriate jurisdictional agency so that the agency may ensure that the roadway and/or bridge design will not decrease performance of the circulation system in such a way that the modifications would conflict with agency plans, ordinances, or policies. Drawings and specifications will be submitted as follows:

- Design drawings and specifications for state roadways and bridges will be submitted to Caltrans for review and approval.
- Design drawings and specifications for Santa Cruz County roadways and bridges will be submitted to Santa Cruz County Department of Public Works for review and approval.
- Design drawings and specifications for Monterey County roadways and bridges will be submitted to Monterey County Department of Public Works for review and approval.
- Design drawings and specifications for roadways and bridges in the City of Watsonville will be submitted to City of Watsonville Department of Public Works for review and approval.

Mitigation Measure TRAF-2: Coordinate and Provide Advance Notification.

- USACE, Santa Cruz County, and Monterey County will notify tenants and owners of property within 300 feet of the edge of the construction footprint at least 2 weeks before roadway or bridge construction. Additionally, schools, businesses, and the Santa Cruz Metro will be contacted in advance to coordinate the development of alternate routes.
- Construction notifications will summarize the purpose of construction and modifications at the specific site and include names and phone numbers of Project contacts at Santa Cruz County and Monterey County who will be available to address questions and concerns from the public during the construction period.
- USACE, Santa Cruz County, and Monterey County will notify emergency providers at least 2 weeks before roadway or bridge construction of anticipated lane or full road closures and work to coordinate the development of alternate routes. USACE will immediately notify emergency providers of unanticipated lane or full road closures.
- USACE, Santa Cruz County, and Monterey County will coordinate with the residents and business owners to ensure that access to private driveways and walkways is maintained.
- USACE, Santa Cruz County, and Monterey County will restrict truck operators to truck haul routes identified in **Figure 4.10-3**. Access routes within the City of Watsonville will be restricted to truck routes defined by city ordinance.
- USACE, Santa Cruz County, and Monterey County will notify and coordinate alternate routes with Santa Cruz METRO and MST of construction activities on their transit routes 60 days before the start of construction on that route.

Mitigation Measure TRAF-3: Prepare a Traffic Control Plan. USACE, Santa Cruz County, and Monterey County will prepare a Traffic Control Plan and submit the plan to Caltrans, Santa Cruz County, Monterey County, and the City of Watsonville for approval. The plan will include the following measures:

- Site-specific traffic circulation and detour plans for each roadway construction site

- Site-specific traffic control measures such as changing signal timing, installation of new temporary traffic signals, traffic calming devices, restriping lanes and public outreach for each roadway construction site.

Mitigation Measure TRAF-4: Coordinate with Railroad Companies and Minimize Service Interruptions.

- USACE, Santa Cruz County, and Monterey County will coordinate construction on the UPRR line with UPRR and Sierra Northern Railway to minimize interruptions in service.
- USACE, Santa Cruz County, and Monterey County will submit design drawings and specifications for modifications to railway bridges and construction within railroad right-of-way to FRA and UPRR for review and approval.

Mitigation Measure TRAF-5: Provide Advance Notice and Detours for Bicycle Riders and Pedestrians.

- Prior to beginning construction notice will be posted near pedestrian and bicycle trails.
- During construction, closure and/or detour signs will be posted during construction on bikeways.

Mitigation Measure TRAF-6: Maintain Bicycle Connectivity During Bridge Raising. USACE, Santa Cruz County, and Monterey County would coordinate with the City of Watsonville, County of Santa Cruz and the Watsonville community regarding pedestrian and bicycle connectivity on Green Valley Road during the bridge closure. It may be possible to maintain pedestrian and bicycle connectivity by maintaining transit stops for Metro Route 71 on each side of the bridge on Green Valley Road. An alternative would be to establish a temporary pedestrian/bicycle route between Green Valley Road and Airport Boulevard using Pajaro Lane and Thicket Lane.

Mitigation Measure TRAF-7: Restore Bikeways and Pedestrian Trails.

- USACE, Santa Cruz County, and Monterey County will restore or replace pedestrian trails directly affected by construction to equal or better than the existing preconstruction condition.
- USACE, Santa Cruz County, and Monterey County will restore or replace walkways on affected streets directly affected by the project to equal or better than the existing preconstruction condition.

4.16 UTILITIES AND PUBLIC SERVICES

4.16.1 Affected Environment

Waste Water, Water Supply, Solid Waste

Waste Water. The City of Watsonville Public Works and Utility Department provides wastewater conveyance, treatment, and disposal services to the City of Watsonville, Pajaro, Freedom, and Salsipuedes sanitary districts (City of Watsonville Public Works and Utilities Department 2011a). The Department's wastewater treatment facility treats an average of 6 million gallons of wastewater per day (City of Watsonville Public Works and Utilities Department 2011a). Within the Project study area, unincorporated portions of Santa Cruz and Monterey counties likely rely on septic systems for wastewater storage and treatment.

Water Supply. The City of Watsonville Public Works and Utilities Department provides potable water portions of the Project study area located within the City of Watsonville limits and adjacent portions of unincorporated Santa Cruz County (City of Watsonville Public Works and Utilities Department 2005). The Pajaro/Sunny Mesa Community Services District provides potable water to the town of Pajaro and the residential areas of Monterey County known as the Sunny Mesa and Hillcrest subdivisions (Pajaro/Sunny Mesa Community Services District 2011). Other unincorporated areas of Santa Cruz and Monterey counties within the Project study area likely obtain water from groundwater wells.

Solid Waste. State-mandated solid waste diversion goals are established in the California Integrated Waste Management Act (AB 939). SB 1016, approved in 2008, builds on AB 939 by implementing a simplified and timelier indicator of jurisdiction performance that focuses on reporting disposal at Board-permitted disposal facilities (CalRecycle 2011b). Under SB 1016, the objective is to be below the jurisdiction 50 percent equivalent per capita disposal target (CalRecycle 2011b). In 2008 (the last year for which data are available), the unincorporated portions of Santa Cruz and Monterey counties and the City of Watsonville all met both the population and employment disposal rate targets (CalRecycle 2011c).

Fire Protection and Police Services

Fire Protection. The City of Watsonville Fire Department provides fire and emergency services within the city limits to unincorporated areas north of the City of Watsonville (City of Watsonville Fire Department 2011). The Pajaro Valley Fire Protection District provides fire protection services to the unincorporated portions of south Santa Cruz County, including areas surrounding the City of Watsonville. Santa Cruz County contracts with the Department of Forestry and Fire Protection (CalFIRE) to provide fire protection services in the portion of the county along reaches 1, 2, and 4 (Santa Cruz LAFCO 2007). The portion of the Project area within Monterey County is located within the North County Fire Protection District, which responds to structure, wildland, vehicle, and other fires and emergency medical situations in the District, including in the community of Pajaro. The Santa Cruz County Fire Marshal's Office and

the Pajaro Valley Fire Marshal's Office are responsible for the enforcement of fire related state and local laws and ordinances in the area.

The predominant land use within and adjacent to the Project area is row crop agriculture and the potential for the development. The spread of wildfire is low in agricultural areas due to the lack of fire fuel and the numerous firebreaks formed by public and private access roadways and irrigation canals and ditches.

Police Services. The City of Watsonville Police Department provides police protection services to land within the city limit. The Police Department operates one station within the City along with two satellite stations, one at the Freedom Library and the other at the East Lake Village Shopping Center (City of Watsonville Police Department 2011). The Santa Cruz County Sheriff's Office provides police protection services to the portions of southern Santa Cruz County located within the Project study area through the Aptos (Beat 9) and South County (Beat 11) Service Centers (Santa Cruz County Sheriff's Office 2011). The Monterey County Office of the Sheriff provides law enforcement and other police protection services to unincorporated Monterey County out of three stations. The Central Station, located in Salinas, patrols the northern portion of the County, including the Project study area, and operates three community field offices, including one in the town of Pajaro (County of Monterey Office of the Sheriff 2011).

Schools

The closest school to the Project area is Pacific Coast Charter School at 294 Green Valley Road, which is located at the upstream end of Reach 8. Two other schools are located in the project vicinity: Watsonville High School at 250 East Beach Street (0.10 mile); and, the Pajaro Valley Middle School at 250 Salinas Road (0.23 mile).

4.16.2 Environmental Consequences – Action Alternatives

All of the Action Alternatives would result in similar direct and indirect effects on utilities and public services. The specific locations where the effects would occur and the duration of exposure to the effects would vary based upon location and construction duration for each of the alternatives.

Waste Water, Water Supply, Solid Waste

Waste Water. During construction, the Project would generate in a minimal amount of additional wastewater. The Project would not result in the construction of new residential units or any other uses that would permanently increase wastewater generation in the long-term. Therefore, the Project would not exceed wastewater treatment capacity in the area and project effects on wastewater would **be less than significant.**

Storm Water. Every storm drain located within the levee easements and boundaries would be replaced within the existing location, outside of the permanent easement, extended 50,

100 or 225 feet. As such, no existing storm drains would be permanently removed from within the Project study area and the project would have a **less than significant** effect on stormwater and facilities to manage these waters.

Water Supply. During construction, the Project would marginally increase demand for water over current levels during the construction period for construction activities, such as watering loose soil, and for workers to drink. In addition, initial alignments for Alternatives 5, 6, 7, 8, and TSP would place levees over two agricultural wells and one domestic well in Reach 5. Alternatives 5, 6, 7, and TSP would place levees over two additional agricultural wells in Reach 6. This would be mitigated by implementing Mitigation Measure UT-2.

The Project would not result in construction of new housing units or any other uses that would permanently increase water demand in the Santa Cruz County, Monterey County, or the City of Watsonville. Additionally, the Project would take some agricultural land out of production which would incrementally decrease the demand for water throughout the Project area.

Because the project would not substantially increase demand for water supplies or wastewater treatment services, it would not exceed wastewater treatment requirements, require the construction of new water and wastewater treatment facilities, or result in a determination by the wastewater treatment provider that it does not have adequate capacity to serve the Project's projected demand, and would mitigate for closure of any agricultural or domestic well affected by the project, the project would have a **less than significant effect** on these resources and public services.

Solid Waste. The Project would generate additional solid waste during the construction period. As previously stated, materials requiring disposal would be hauled to a landfill or other area to be identified during the Project's design phase. The Construction Contractor would select landfills that could accommodate the solid waste and would recycle materials, where feasible. The Project would not result in any permanent uses that would generate solid waste. As such, it would not hinder the counties and the City from reaching their SB 1016 disposal rate targets. As a result, the project would have **less than significant effects** on solid waste.

Fire Protection and Police Services

Fire Protection. The Project would marginally increase demand for additional fire protection services in the unincorporated portions of Santa Cruz and Monterey counties and the City of Watsonville during the construction period. Additional construction workers and use of construction equipment would introduce additional fire hazards into the Project study area and could result in an increase in emergency calls. The predominant land use within and adjacent to the Project area is row crop agriculture and the potential for the development. The spread of wildfire is low in agricultural areas due to the lack of fire fuel and the numerous firebreaks formed by public and private access roadways and irrigation canals and ditches. As such, construction work in these areas would not substantially increase the risk of wildfires. The Project does not include any components that would result in an increased demand for fire

protection or emergency medical services in the long-term. The Project's short-term increase in demand would not require new fire department facilities to maintain acceptable service ratios or response times and the impact would **be less than significant.**

Police Services. During construction, the Project would result in a marginal increase in demand for police services due to an increase in people in the Project area. However, the Project does not include any components that would substantially increase demand for police protection services in the long-term. Therefore, the Project would not require new police facilities to maintain acceptable service ratios or response times and the impact to police services would be **less than significant**.

Schools

Since the Project would not result in any new residential units, it would not directly increase the student population at these or any other schools in the City of Watsonville or in Santa Cruz or Monterey counties. Therefore, the Project would have **no effect** on school services and would not require the construction of new school facilities.

With implementation of the mitigation measures described in Section 4.16.3, project implementation would have a **less than significant** direct and indirect effect on utilities and public services.

4.16.3 Mitigation

Implementation of this mitigation measure would reduce impacts caused by disruption of utility services under Alternatives 1 through 8 and the TSP to a **less than significant** level because the construction contractor would coordinate with service providers and consumers to minimize interruptions to the maximum extent feasible. A response plan to address service interruptions would be prepared and implemented.

Mitigation Measure UT-1: Prior to Initiating Constructing the Construction Contractor will Coordinate with the Public and with Public Service Providers. Mitigation would be the same for all of the Action Alternatives. Before beginning construction, coordination with utility providers to implement orderly relocation of utilities that need to be removed or relocated would occur. Coordination would include the following:

- Notification of any potential interruptions in service shall be provided to the appropriate agencies and affected landowners.

- Before the start of construction, utility locations shall be verified through field surveys and the use of Underground Service Alert services. Any buried utility lines shall be clearly marked where construction activities would take place and on the construction specifications before of any earthmoving activities begin.

- Before the start of construction, the contractor would be required to coordinate with the local municipality and acquire any applicable permits prior to use of municipal water for construction.
- Before the start of construction, a response plan shall be prepared to address potential accidental damage to a utility line. The plan shall identify chain of command rules for notification of authorities and appropriate actions and responsibilities to ensure the public and worker safety. Worker education training in response to such situations shall be conducted by the contractor. The response plan shall be implemented by the contractor during construction activities.
- Utility relocations shall be staged to minimize interruptions in service.

Mitigation Measure UT-2: Replace water supply for wells removed from service. Agricultural and Domestic Wells removed to construct the project would be replaced in kind or fair market value would be paid to the owner.

Mitigation Measure UT-3: Coordinate with Schools and School Districts. Coordinate construction work schedule and safety measures with schools adjacent to planned construction and along construction haul routes.

4.17 VEGETATION AND WILDLIFE

4.17.1 Affected Environment

Vegetation

Oak Woodland. A small area of oak woodland is present near the south end of the proposed tieback levee. Oak woodland occurs near the terminus of the proposed tie-back levee. Oak woodland is dominated by coast live oak (*Quercus agrifolia*), with an understory consisting of native shrubs and herbs including coyote brush, poison oak, California blackberry, California coffee berry, and other species found in adjacent coastal scrub and disturbed habitats. Oak woodland conforms to coast live oak woodland (Holland 1986) and the *Quercus agrifolia* woodland alliance in Sawyer et al. (2009).

Riparian Forests. Riparian forest communities occur along perennial streams and are subject to periodic flooding. Dominant species generally require moist, bare mineral soils for germination and establishment. Riparian forest in the project area is an intergrade (blend) between Holland's descriptions of Central Coast cottonwood-sycamore riparian forest, southern cottonwood-willow riparian forest, and north coast black cottonwood riparian forest (Holland 1986). Dominant canopy species include black cottonwood (*Populus balsamifera* var. *trichocarpa*), Fremont's poplar (*Populus fremontii*), western sycamore (*Platanus racemosa*), box elder (*Acer negundo* var. *californicum*), white alder (*Alnus rhombifolia*), and oaks (*Quercus* spp.). Understory species include red willow, arroyo willow, shining willow (*Salix lucida* var. *lasiandra*), mulefat (*Baccharis salicifolia*), western poison oak (*Toxicodendron diversilobum*), and western blackberry (*Rubus ursinus).* Herbaceous species commonly observed include

mugwort (*Artemisia douglasii*), western goldenrod (*Euthamia occidentalis*), western verbena (*Verbena lasiostachys*), Hooker's evening primrose (*Oenothera elata* var. *hookeri*), smartweed (*Polygonum* spp.), Kikuyu grass, and stinging nettle (*Urtica dioica holosericea*) (Harding ESE 2001).

Marsh & Coastal Scrub. Coastal and valley freshwater marsh communities are typically dominated by perennial, emergent, monocots that grow to several feet tall. This community is generally found in areas of slow-flowing fresh water or in areas with prolonged saturation. Freshwater marshes occur in suitable conditions throughout the project area upstream of the tidally influenced portion of the Pajaro River. This community is present along the majority of the channel bottom in Salsipuedes Creek, and sporadically in the main channel of Corralitos Creek in areas that contain perennial flows or pond water during the summer (Harding ESE 2001). Characteristic species include narrow-leaved cattail (*Typha augustifolia*), broad-leaved cattail (*T. latifolia*), broad-fruited bur-reed (*Sparganium eurycarpum*), panicled bulrush (*Scirpus microcarpus*), and various rushes (*Juncus* spp.) and spikerushes (*Eleocharis* spp.). Other commonly observed species include young willows (*Salix* spp.), yellow water weed (*Ludwigia peploides*), cocklebur, and various grasses such as rabbit-foot grass, meadow barley (*Hordeum brachyantherum*), velvet grass (*Holcus lanatus*), and water bent grass (*Agrostis viridis*) (Harding ESE 2001).

Salt marsh communities are characterized by a predominance of salt-adapted plant species dominated by herbaceous and suffrutescent (woody at the base only) perennials. In the project area, this community is found at the mouth of the Pajaro River and at the confluence of Watsonville Slough. Dominant plant species include pickleweed (*Salicornia virginica*), saltgrass (*Distichlis spicata*), bulrush (*Scirpus maritimus*), alkali heath (*Frankenia salina*), fleshy jaumea (*Jaumea carnosa*), small-pod peppergrass (*Lepidium latifolium*), and coastal gumplant (*Grindelia latifolia*) (Biotic Resources Group 2012, Harding ESE 2001).

Wetlands. Wetlands were observed in areas outside of the river/creek channels, including agricultural drainage ditches and other man-made basins. Dominant species are similar to those found in coastal and valley freshwater marsh, along with other herbaceous wetland species such as smartweed (*Polygonum* sp.). Wetlands contain elements of coastal and valley freshwater marsh (Holland 1986) and correspond to a mix of vegetation alliances described in Sawyer et al. (2009).

A seasonally wet depression was mapped near College Lake. This depression provides marginal habitat for special status plant species adapted to this habitat type, but no special status plant species were observed during the survey (Biotic Resources Group 2012).

Agricultural. Agricultural habitat includes areas of row crop agriculture, as well as occasional orchards, greenhouses, and other agricultural facilities. Agricultural habitat is prevalent outside of river levees throughout the Project area. It is not recognized in any formal vegetation classification system (Holland [1986] or Sawyer et al. [2009]).

Disturbed. Ruderal vegetation typically consists of non-native plants that thrive in areas of disturbance. Soil in these areas is often highly compacted, and frequent disturbance prevents the establishment of native trees and shrubs. Plant species in ruderal communities are generally annuals capable of growing rapidly and producing large quantities of seed when conditions are favorable. Also found are perennial species adapted to frequent disturbance by reproducing from fragments of rhizomes or root and stem cuttings.

Ruderal vegetation along the Pajaro River and tributaries occurs in areas subject to vegetation control for flood management purposes, such as the tops and sides of levees, channel benches, and channel banks. This community is the dominant vegetation type on the levees and channel benches along the Pajaro River and Salsipuedes Creek. Dominant species observed include grasses such as wild oat (*Avena barbata, A. fatua*), ripgut grass (*Bromus diandrus*), Italian ryegrass (*Lolium multiflorum*), soft chess (*Bromus hordeaceus*), Bermuda grass (*Cynodon dactylon*), and dicot herbs such as wild radish (*Raphanus sativus*), poison hemlock (*Conium maculatum*), Russian knapweed (*Acroptilon repens*), cheeseweed (*Malva parviflora*), common knotweed (*Polygonum arenastrum*), and black mustard (*Brassica nigra*) (Biotic Resources Group 2012, Harding ESE 2001).

The project area includes developed areas with landscape trees and plantings (e.g., City parks and street medians). This habitat is not recognized in any formal vegetation classification system (Holland [1986] or Sawyer et al. [2009]). The Monterey pines reported in plant surveys conducted in 2012 (Biotic Resources Group 2012) are planted specimens; these planted trees have no special status.

Wildlife Habitat

The wildlife habitats identified in the project area are associated with the vegetation communities listed above in Section 4.17.1. The five habitats include riparian, coastal scrub and marsh, wetlands, agricultural, and developed. A discussion of wildlife that has been documented or that typically occurs in these habitats within the project vicinity is presented below. Descriptions of birds and observed and potential special-status species in the Project area are also based on 2012 breeding season bird surveys and 2012 special-status species habitat assessments conducted in the project area (Bryan Mori Biological Consulting Services 2012), as well as special-status species surveys conducted in portions of the project area in 2012 (Kittleson Environmental Consulting 2012). These surveys were completed for a previous EIS produced by the Kittleson Environmental Consulting firm.

Riparian Forest. Riparian areas are one of the most important habitats in California for many wildlife species. Central Coast arroyo willow riparian forests provide food, water, cover, and migration and dispersal corridors for a diversity of amphibians and reptiles, bird, and mammals. Several wildlife species dependent on standing or flowing water for breeding are found in the Pajaro River. Amphibians such as the federally threatened California red-legged frog (*Rana draytonii*), bullfrog (*Rana catesbeiana*), Pacific tree frog (*Pseudacris regilla*), and California slender salamander (*Batrachoseps attenuatus*) have been reported from the Pajaro River corridor (Harding ESE 2001). Reptiles known to use the Pajaro River include the western

pond turtle (*Actinemys marmorata*), a state species of special concern, and western aquatic garter snake (*Thamnophis couchii*).

Eighteen (18) waterbird species were observed in the 2012 surveys (Bryan Mori Biological Consulting Services 2012), and four of these species are known or potential breeders at this study site, including mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), killdeer (*Charadrius vociferus*), and American avocet (*Recurvirostra americana*). The three largest populations of waterbirds were western gull (*Larus occidentalis*), mallard, and double-crested cormorant (*Phalacrocorax auritus*). Waterbirds at this study site were primarily non-breeding residents and over-summering migrants that use the lagoon for roosting, foraging, and bathing. The composition of landbird species observed within the Pajaro River project area is diverse, and all but one of these 49 species are known or potential breeders.

The ten most abundant landbird species were song sparrow (*Melospiza melodia*), house finch (*Carpodacus mexicana*), chestnut-backed chickadee (*Poecile rufescens*), spotted towhee (*Pipilo maculatus*), Swainson's thrush (*Catharus guttatus*), Wilson's warbler (*Cardenilla pusilla*), American robin (*Turdus migratorius*), cliff swallow (*Petrochelidon pyrrhonota*), bushtit (*Psaltriparus minimus*), and Bewick's wren (*Thryomanes bewickii*). Several fly-over special-status birds were recorded, including: yellow warbler (*Dendroica petechia brewsteri*), white-tailed kite (*Elanus leucurus*), and tri-colored blackbird (*Agelaius tricolor*).

Mammals that inhabit the project area generally do not require a continuous riparian corridor, have relatively small home ranges, and are tolerant of ongoing human activity and disturbance associated with agriculture and urbanization. Mammals that were observed in the project area in 2007 during a riparian habitat assessment for the bench excavation project include black-tailed deer (*Odocoileus hemionus*), bobcat (*Felis rufus*), coyote (*Canis latrans*), opossum (*Didelphis virginiana*), and raccoon (*Procyon lotor*) (Kittleson Environmental Consulting 2007). Other mammals known to use riparian communities within the Project area include brush rabbit (*Sylvilagus bachmani*), black-tailed hare (*Lepus californicus*), muskrat (*Ondatra zibethicus*), dusky-footed woodrat (*Neotoma fuscipes*), broad-footed mole (*Scapanus latimanus*), deer mouse (*Peromyscus maniculatus*), western harvest mouse (*Reithrodontomys megalotis*), red bat (*Lasiurus borealis*), and hoary bat (*Lasiurus cinereus*) (Harding ESE 2001).

The 2012 breeding season bird surveys conducted for this study focused on riparian habitats that were primarily mixed riparian forests. Riparian areas along Corralitos Creek (Reach 8) and the College Lake tributary (Reach 7) are also mixed riparian forest (refer to **Figure 4.6-1**). Twenty-seven species of landbirds were observed along Reach 8 in 2012 (Bryan Mori Biological Consulting Services 2012). Three waterbird species and 28 landbird species were recorded along Reach 7 (Bryan Mori Biological Consulting Services 2012).

Marsh & Coastal Scrub. Coastal and valley freshwater marsh with emergent vegetation provides a high quality seasonal resource for red-winged blackbirds (*Agelaius phoeniceus*), egrets and herons (family *Ardeidae*), garter snakes (*Thamnophis* spp.), ranid frogs (family *Ranidae*) and waterfowl—such as American coots (*Fulica americana*) and mallard ducks (*Anas platyrhynchos*)—and many others. Agricultural ditches and man-made basins that are included in

this habitat type in the project area provide lower quality habitat then emergent marshes, but support similar wildlife species.

Birds that may utilize the marsh for either food or roosting include great blue heron (*Ardea herodias*), great egret (*Ardea alba*), American coot (*Fulica americana*), northern harrier (*circus cyaneus*), and many shorebirds. Northern coastal salt marsh provides food and refuge for many mammals including vagrant shrews (*Sorex vagrans*) and raccoons. The 2012 breeding season bird surveys (Bryan Mori Biological Consulting Services 2012) conducted for this EIS/EIR included a point count station study site off San Juan Road, near the southern end of the NED Alternative tie-back levee (**Figure 3.1-1**). This station was in the vicinity of oak woodland, coastal scrub, and a ranch with landscape trees. Twenty-one (21) bird species were recorded, all of which are known or potential breeders at this study site. Bird species observed at this station that potentially breed in coastal scrub in the project area include: wrentit (*Chamaea fasciata*), orange-crowned warbler (*Oreothlypis celata*), Anna's hummingbird (*Calypte anna*), and California towhee. Red-tailed hawk, which were recorded at the Pajaro River study site during 2012 surveys, potentially breed in riparian woodlands and forage in coastal scrub in the project area. Song sparrow, spotted towhee, and California quail (*Callipepla californica*) are other birds that were observed during the 2012 surveys potentially breed in coastal scrub in the project area.

Western fence lizard, black-tailed jackrabbit (*Lepus californicus*), deer mouse, and gopher snake are other wildlife species that potentially utilize coastal scrub in the project area. Adult Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*), a federal and state endangered species, could also utilize coastal scrub in the project area.

Wetlands. Wetlands in the project area include one seasonally wet depression near College Lake (refer to **Figure 4.6-1**). Wildlife species that potentially utilize this wetland are similar to wildlife described under the developed section below.

Agricultural. Many species of rodents and birds are adapted to agricultural croplands (Mayer and Laudenslayer 1988). Rodents and mammals that forage in agricultural areas include California vole (*Microtus californicus*), deer mouse, California ground squirrels, black-tailed jackrabbit, raccoon, and black-tailed deer. Raptors, such as red-tailed hawks, forage in agricultural areas for rodents and other small mammals. Birds adapted to agricultural areas include many common species that are adapted to disturbance and human activities such as American crow (*Corvus brachyrhynchos*), western scrub-jay (*Aphelocoma californica*), house finch (*Carpodacus mexicanus*), and American robin.

Disturbed. Ruderal areas are dominated by nonnative annual grasses and forbs that are adapted to disturbances. This habitat is present in the project area on levees, benches, and other disturbed areas. Ruderal habitats provide limited wildlife habitat and generally support only generalist, and sometimes nonnative wildlife species that are tolerant of human presence and activities. Terrestrial wildlife species commonly associated with ruderal habitats in the project area include western fence lizard (*Sceloporus occidentalis*), California kingsnake (*Lampropeltis zonata*), gopher snake (*Pituophis melanoleucus*), western harvest mouse (*Reithrodontomys*

megalotis), deer mouse (*Peromyscus maniculatus*), California ground squirrel (*Spermophilus beecheyi*), and Botta's pocket gopher (*Thomomys bottae*).

Avian species commonly associated with annual grasslands in the project area include white-crowned sparrow (*Zonotrichia leucophrys*), Brewer's blackbird (*Euphagus cyanocephalus*), and dark-eyed junco (*Junco hyemalis*). These species were documented at the riparian forest study sites in the project area during the 2012 breeding season bird transect surveys (Bryan Mori Biological Consulting Services 2012). In addition, annual grassland provides foraging habitat for predatory birds that nest in the adjacent woodlands such as red-tailed hawk (*Buteo jamaicensis*) and American kestrel (*Falco sparverius*).

Urban areas provide limited wildlife habitat and generally support wildlife species that are tolerant of human presence and activities. Black-tailed deer, raccoon, opossum, striped skunk (*Mephitis mephitis*), black-tailed jackrabbit, California slender salamander (*Batrachoseps attenuatus*), and western fence lizard are common urban wildlife. Birds adapted to urban environments include western scrub-jay, northern mockingbird (*Mimus polyglottos*), house finch, mourning dove (*Zenaida macroura*), and house sparrows (*Passer domesticus*).

4.17.2 Environmental Consequences – Action Alternatives

Alternatives 1, 2, 3, and 4 would have similar types of effects on vegetation and wildlife along the mainsteam Pajaro in Reaches 1, 2, 3, and 4. Alternatives 5, 6, 7, and 8 would have similar types of effects on vegetation and wildlife along Salsipuedes and Corralitos Creeks. The TSP would have similar types of effects to both the mainstem Pajaro and the tributary alternatives. The extent of the direct and indirect effects vary with the footprint and construction duration of each of the alternatives. The direct effects of each alternative on broad habitat types is provided in **Table 4.17-1**. A crosswalk between the vegetation/habitat types described in Section 4.17.1 is provided in **Table 4.17-2**. The construction duration is described in in **Table 4.1-4**.

Construction activities taking place on each of the reaches would remove any existing vegetation and wildlife habitat within the immediate area of impact and temporarily displace wildlife from the construction area. O&M activities would maintain levees and 15 feet either side of the levees permanently free of trees and shrubs. All levee slopes would be hydroseeded with native grasses to assist in erosion control. In addition, any wildlife present would not be able to inhabit the immediate area. Wildlife temporarily displaced by construction r O&M activities would be expected to return to the area or to the newly established off-set areas created by construction of setback levees and regeneration with native plants. With the implementation of mitigation measures, construction and O&M impacts to vegetation and wildlife resources for this project would be **less than significant**.

Table 4.17-1: Acres of Vegetation and Habitat Affected by Each Alternative

Land Type	Alternatives								
	1	2	3	4	5	6	7	8	TSP
Existing Levees	5.56	2.45	8.15	8314	1.99	1.99	1.99	1.99	7.55
Bare	14.72	3.21	19.16	20.03	6.91	5.59	9.1	8.69	20.31
Agricultural	75.58	30.16	82.72	89.97	60.54	52.77	55.72	52.08	128.33
Grassland	18.03	7.1	20.71	20.56	5.74	5.31	8.75	7.85	23.34
Riparian Shrub Scrub	0.65	1.25	0.75	0.71	4.78	4.42	7.03	6.41	7.06
Riparian Forest/ Woodland	-	-	-	-	7.16	4.5	4.73	6.48	4.5

Table 4.17-2: Crosswalk Between General Habitat Types Analyzed in this GRR/EA and the Vegetation and Habitat Types discussed in Section 4.17.1.

General Habitat Types	Vegetation/Habitat Types[1]
Riparian Forest/Woodland	Riparian forest and woodland, Oak woodland
Riparian Shrub Scrub	Marsh & Coastal Scrub,
Grassland	Disturbed
Agriculture	Agriculture
Bare Ground	--
Existing Levees	--

[1] Wetlands are not well captured with the GIS tools used in this analysis. Where present they may be included within water or grassland.

4.17.3 Mitigation

The following mitigation measures would be implemented to reduce the potentially significant effects to less-than-significant.

Mitigation Measure WILD-1: Implement General Construction and O&M Best Management Practices.

- The construction contractor and O&M personnel would be required to place food-related wastes in self-closing trash containers, in an effort to keep wildlife away from construction areas where they might be harmed.
- To minimize dust impacts to vegetation, wetlands, and wildlife, dust control measures consistent with the appropriate air quality control board measures would be implemented by the construction contractor and personnel conducting O&M

- Minimize impacts to fish and wildlife resources and their habitat by confining travel to established roads/paths in the project area and confining parking to established areas (parking lots and staging areas).
- Minimize project impacts by reseeding all disturbed areas at the completion of construction with forbs and grasses.
- Avoid future impacts to the site by ensuring all fill material is free of contaminants.
- For each phase of the project, USACE would prepare final construction plans that would include drawings identifying habitat areas, including wetlands, that must be protected and specifying the methods of protection (e.g. installation of fencing or similar physical barriers, posting of signs, etc.). These plans would also illustrate and/or describe those areas/lands near the project features that are outside the limits of construction (and thus are protected from direct construction impacts). The final construction plans would be accompanied by written project specifications further detailing the habitat protection requirements, as well as general requirements concerning the protection of vegetation and wildlife.
- To help prevent importation of invasive plants and animals, the construction contractor would be required to thoroughly clean vehicles and equipment before first entering the project site.

Mitigation Measure WILD-2: Implement Worker Awareness Training for Construction Personnel. USACE would ensure that all construction and O&M personnel undergo environmental protection training to be aware of all required environmental protections (birds, wildlife, and vegetation/habitat protection) per the final construction plans and specifications and approved O&M Manual, as well as those required by applicable federal and state laws.

Mitigation Measure WILD-3: Implement Migratory Bird Surveys and Best Management Practices. Where work would occur in or adjacent to migratory bird habitat:

- Schedule work outside of nesting season to the extent feasible.
- Conduct pre-construction surveys for active nests in the areas scheduled for construction that year.
- Avoid work activity around active nests until the young have fledged. If this is not feasible, coordinate with USFWS, to develop an acceptable solution.

Mitigation Measure WILD-4: Implement Swainson's Hawk Conservation Measures. The following protocol from the California Department of Fish and Wildlife (CDFW) for Swainson's hawk would suffice for the pre-construction survey for raptors: A focused survey for Swainson 's hawk nests will be conducted by a qualified biologist during the nesting season (February 1 to August 31) to identify active nests within 0.25 mile of the project area. The survey will be conducted no less than 14 days and no more than 30 days prior to the beginning of construction. If nesting Swainson 's hawks are found within 0.25 mile of the project area, no construction will occur during the active nesting season of February 1 to August 31, or until the young have fledged (as determined by a qualified biologist), unless otherwise negotiated with the California Department of Fish and Wildlife. If work is begun and completed between September 1 and February 28, a survey is not required.

Mitigation Measures WILD-5: Complete Pre-Construction Survey and Delineate Wetlands and Other Waters of the U.S. Prior to initiating construction of a given project phase, USACE staff would conduct an assessment of drainage depressions, channels, and ditches present at the project site to determine whether any such features provide water to wetlands. USACE staff would also delineate the approximate limits of jurisdictional wetlands located within or immediately adjacent to the project's limits of construction. The construction contractor would be required to maintain flows in those drainage features that are found to provide water to wetlands. Direct construction impacts to wetlands would be prohibited.

Mitigation Measure WILD-6: Avoid Affecting Native Plants Outside the Designated Construction and O&M Footprints.

- Avoid impacts to any oak woodlands and riparian areas outside, but in close proximity to, the construction easement and staging areas by fencing their boundaries with orange construction fencing or cyclone fencing just outside of the drip line of the woody vegetation.
- Avoid impacts to native trees, shrubs, and aquatic vegetation. Any native trees or shrubs removed with a diameter at breast height of 2 inches or greater should be replaced onsite, in-kind with container plantings so that the combined diameter of the container plantings is equal to the combined diameter of the trees removed. These replacement plantings should be monitored for 5 years or until they are determined to be established and self-sustaining. The planting site(s) should be protected in perpetuity.
- Minimize the impact of removal and trimming of all trees and shrubs by having these activities supervised and/or completed by a certified arborist.

4.18 WATER QUALITY

4.18.1 Affected Environment

Pajaro River, Salsipuedes and Corralitos Creeks are recognized as impaired waters under the Clean Water Act due to compromised water quality. About 32 miles of Pajaro River, 13 miles of Corralitos Creek, and 2.6 miles of Salsipuedes Creek are on State Water Resources Control Board and USEPA approved Section 303(d) List (see **Table 4.18-1**). TMDL's are required for all of the pollutants listed in **Table 4.18-1**. TMDL's have been approved for the following pollutants in the Pajaro River Watershed, including Pajaro River: chlorpyrifos and diazinon, fecal coliform, sediment and nutrients A TMDL has also been approved for pathogen in Corralitos Creek. The Central Coast Ambient Monitoring Program (CCAMP) is the Central Coast RWQCB's regionally scaled water quality monitoring and assessment program.

Table 4.18-1: Clean Water Act Section 303(d) Listed Waters and Pollutants in the Project Area.

Constituent	USEPA-Approved TMDL in Place (Y/N)	303(d) Listed		
		Pajaro River	Salsipuedes Creek	Corralitos Creek
Boron	N	X		
Chlordane	N	X		
Choride	N	X		
Chlorpyrifos and Diazinon	Y	X		
DDD [1]	N	X		
Dieldrin	N	X		
Escherichia coli (E. Coli)	Y[3]	X	X	X
Fecal Coliform	Y	X	X	X
Low Dissolved Oxygen	Y[4]	X	X	
Nitrate	Y[2]	X		
Nutrients	Y	X		
PCBs[2]	N	X		
Sedimentation/Siltation	Y[6]	X		
Sodium	N	X		
Sediment/Turbidity	Y	X	X	X
pH	N	X	X	X

[1] Dichlorodiphenyldichloroethane)
[2] Polychlorinated biphenyls)
[3] Addressed within "Fecal Coliform**."**
[4] Addressed within Nutrients TMDL.
[5] Addressed within Nutrients TMDL.
[6] Addressed within Sediment TMDL.

Pajaro River

Nutrients. Nutrients include various forms of nitrogen and phosphorus typically originating from fertilizer, pesticides, and detergents. Nutrient contamination in the Pajaro River stems from a variety of sources, including irrigated crop production; storm runoff, subsurface drainage, irrigation tailwater, and return flows from agriculture; urban runoff/storm sewers; wastewater/ land disposal; channelization; removal of riparian vegetation; and nonpoint sources (Central Coast RWQCB 2005). Sedimentation/siltation sources include agriculture, resource extraction, surface mining, channelization, hydromodification, channel erosion, habitat modification, removal of riparian vegetation, streambank modification, channel erosion, and natural sources.

Available data on nutrient and chlorophyll levels in the Pajaro River and Llagas Creek watersheds indicate both waterbodies contain adequate levels of nutrients and chlorophyll to cause violations of the nitrate water quality objective (10 mg/L nitrate-N) (RWQCB 2006) for the municipal and domestic water supply use. Ammonia and phosphate levels either do not exceed a standard or no standard exists with which to compare. Numeric standards for total dissolved solids have also been exceeded at various times during CCAMP monitoring at several locations in the Pajaro River. Concentrations of nutrients are highest during the winter months when rainfall provided the majority of runoff.

Turbidity. USGS measurements in the Pajaro River at Chittenden show that turbidity has ranged from 2.0 to 600 nepholometric turbidity units (NTU) with an average of 195 NTU. San Jose State University and Merritt Smith Consulting (1994) compiled and collected turbidity data at various locations in the watershed from the early 1950s through 1993. Individual turbidity measurements were collected in 1992 and 1993 at seven stations in the watershed. Three of the stations were located along the Pajaro River and four along Llagas Creek. Pajaro River turbidity ranged from 0.4 to 240 NTU. Concentrations of turbidity and nutrients are highest during the winter months when rainfall provides the majority of runoff. Like nutrients, concentrations of turbidity nutrients are highest during the winter months when rainfall provided the majority of runoff.

Temperature. A long-term, continuous record of water temperatures in the Pajaro River and tributaries is not available. Water temperature data were, however, collected monthly during CCAMP monitoring and intermittently by the USGS during water quality monitoring. Water temperatures in the mainstem Pajaro River from this data set ranged from approximately 5°C to 24.5°C (41°F to 76°F). This short-term record indicates water temperatures in the mainstem Pajaro River are suitable for steelhead and other coolwater fish for at least part of the year.

Dissolved Oxygen. Dissolved oxygen levels measured in the Pajaro River at Chittenden by USGS suggest that concentrations of dissolved oxygen generally have been greater than 6 mg/L and suitable for aquatic life at all temperature conditions. More recent sampling through CCAMP shows that dissolved oxygen levels in the mainstem Pajaro River and Corralitos Creek occasionally drop to levels below the water quality objective specified in the Basin Plan (7.0 mg/L).

Salsipuedes and Corralitos

Water quality data for Salsipuedes and Corralitos creeks are very limited. Agricultural and urban uses within the City of Watsonville and the communities of Pajaro and Freedom are likely sources of potential water quality pollutants. Agricultural uses typically contribute runoff containing contaminant nutrients from fertilizers and pesticides, as well as sediment. Urban uses typically contribute runoff containing elevated levels of oil, grease, nutrients, sediments and heavy metals. In addition to these sources, College Lake drains to the Salsipuedes and Corralitos tributaries eventually reaching the Pajaro River. The lake has been tested for selected water parameters. Results have found nitrate levels averaging 7.6 mg/L, which is below the drinking water standard of 45 mg/L but above groundwater quality, which is about 1.5 mg/L. Herbicides

and pesticides were not detected. Electroconductivity ranged from 407 to 752 microsiemens per centimeter, and water was recorded as turbid due to high sediment load from contributing streams (Harding ESE 2001).

4.18.2 Environmental Consequences – Action Alternatives

Construction

The construction effects for each of the Action Alternatives would be similar in type but would vary in the location, extent, and duration of exposure. Alternatives 5, 6, 7, 8 and TSP could directly affect Corralitos Creek and Salsipuedes Creek with effects potentially extending downstream to the Lower Pajaro River. Alternatives 1, 2, 3, 4, and TSP could directly affect the Pajaro River downstream to the ocean. All of the Action Alternatives include measures to reconstruct existing levees, construct new levees, and construct floodwalls. Alternative 5 also includes realignment of Pinto Creek and associated in-channel construction in Reach 7. Alternatives 1, 2, 3, 4, and TSP include a sliding floodgate in Reach 4 where the railroad must pass through a gap in the levee.

Construction activities have the potential to temporarily impair water quality if disturbed and eroded soil, petroleum products or construction-related wastes (e.g., cement and solvents) are discharged into receiving waters or onto the ground where they can be carried into receiving waters. Soil and associated contaminants that enter receiving waters can increase turbidity, stimulate algae growth, increase sedimentation of aquatic habitat and introduce compounds that are toxic to aquatic organisms. Accidental spills of construction-related substances such as oils and fuels can contaminate both surface water and groundwater. The extent of potential impacts on water quality would depend on the tendency for erosion of soil types encountered, types of construction practices, extent of the disturbed area, duration of construction activities, timing of particular construction activities relative to rain events, proximity to receiving water bodies and sensitivity of those water bodies to contaminants. Implementation of the mitigation measures identified in Section 4.18.3, including BMPs, would ensure that these effects are avoided and minimized resulting in **less than significant** effects on water quality.

O&M (Operations and Maintenance)

If constructed, the proposed project (regardless of the Action Alternative selected) would inundate floodplains in areas where setback levees are constructed. Floodplain inundation could mobilize nutrients and pesticides used during previous agricultural activities and could draw these constituents into the waterway as floodwaters recede. Some sediment could also be introduced to the waterway from the floodplain; however, it is anticipated that due to the larger channel cross section in setback areas and the resultant lower water velocities, sediment would most likely drop out of the water onto the floodplain rather than be picked up and transported into the waterway by floodwaters (see Section 4.8.2). The risk of exposure to these potential contaminants is related to the amount of new floodplain offset added to the flood risk management system. **Table 4.1-3** shows the new floodplain area that would be created by each of the Action Alternatives, with Alternative 3 creating the largest area, followed by Alternatives

7 and the TSP. Alternative 2 would add the least amount of floodplain to the flood management system. The No Action Alternative would expose expansive areas of urban and agricultural lands to uncontrolled flooding and would be expected to return large quantities of contaminants to the waterways. In consideration of this, the relatively small, managed exposure of the floodplain newly incorporated into flood management system by each of the Action Alternatives would be **less than significant**.

All of the Action Alternatives would include O&M necessary to maintain the flood risk management facilities to design and operational standards. O&M would be similar to current practices. O&M has the potential to affect water quality directly and indirectly since it would involve use of herbicides and possibly rodenticides. It would also include vegetation management on and within 15 feet of the levees and floodwalls and within the new offset areas. The location and extent of these O&M activities would vary with the alternative similar to what is described above for construction. With incorporation of mitigation measures, including BMPs, O&M would result in **less than significant** effects on water quality.

4.18.3 Mitigation

Implementing the mitigation measures identified below would ensure that construction and associated O&M of the proposed Action Alternatives (Alternatives 1, 2, 3, 4, 5, 6, 7, 8, and TSP) for the Pajaro Project would ensure that effects on water quality are **less than significant**. In addition to the mitigation measures described below, if the project is approved and funded, the detailed designs and operational criteria developed during PED would be coordinated with the RWQCB, NMFS, USFWS and CDFW to ensure that potential effects on water quality are avoided or minimized.

Mitigation Measure WQ-1: Implement Best Management Practices for Construction.

- The contractor would prepare a spill control plan and a SWPPP prior to initiating construction in accordance with guidance from the Central Coast RWQCB. These plans would be reviewed and approved by USACE before construction begins.
- Implement appropriate measures to prevent debris, soil, rock or other material from entering the water. Use a water truck or other appropriate measures to control dust on haul roads, construction areas and stockpiles.
- Properly dispose of oil or other liquids.
- Fuel and maintain vehicles in a specified area that is designed to capture spills. This area cannot be near any ditch, stream or other body of water or feature that may convey water.
- Fuels and hazardous materials would not be stored on site.
- Inspect and maintain vehicles and equipment to prevent dripping oil and other fluids.
- Schedule construction to avoid the rainy season as much as possible. If rains are forecasted during construction, erosion control measures would be implemented as described in the RWQCB Erosion and Sediment Control Field Manual.
- Maintain sediment and erosion control measures during construction. Inspect the control measures before, during and after a rain event.

- Train construction workers in SWPPP and how to respond to, control, contain and clean up spills.
- Revegetate disturbed areas in a timely manner to control erosion.
- Cover and protect materials from wind, rain and runoff to avoid unwarranted dispersal.

Mitigation Measure WQ-2: Prepare and implement an approved Construction Dewatering Plan. The construction specifications for the implementation of the project would include the requirement that the contractor prepare and implement a Construction Dewatering Plan that is approved by the Central Coast RWQCB. The plan would be submitted to the RWQCB for review and approval. No dewatering can occur until such actions are permitted by the RWQCB. Documentation of the permit would be maintained at the construction site at all times during operation. The plan would include, but not be restricted to the following information:

- Identification of the site(s) of dewatering and effluent discharge.
- Characterization of the expected quality of effluent based on analytical testing (including sediment, metals, and any other constituents of concern identified by the RWQCB).
- Estimated rates, timing and duration of effluent discharges.
- Detailed information of the BMPs for removal of sediment or other pollutants prior to discharge (e.g., sediment trapping, filtering, etc.).
- Specific information on the disposal of the effluent (e.g., retained on site, discharge to land off-site under agreement with owner, discharge to sanitary sewer, off-site transport to disposal site).

Mitigation Measure WQ-3: Minimize the potential for soil erosion during and after construction. The contract specifications for the Project would include the requirement that the contractor file for a Notice of Intent to comply with the SWRCB's General Permit for Discharges of Storm Water Associated with Construction Activities (General Permit). Prior to the initiation of construction, the contractor will prepare a site-specific SWPPP for submittal to Santa Cruz and Monterey counties for review and approval.

Mitigation Measure WQ-4: Implement Best Management Practices for O&M. Apply herbicides and pesticides consistent with the application methods described in the Pajaro River and Salsipuedes and Corralitos creeks Management and Restoration Plan. These methods include:

- Use of herbicides at or below concentrations recommended by the manufacturer.
- Use of proper precautions to avoid spills.
- Worker training to ensure that herbicide is sprayed only on target vegetation.
- Use of Roundup herbicide for on-land application only.
- Minimal in-channel use of Rodeo herbicide.

4.19 CUMULATIVE EFFECTS

NEPA defines a cumulative effect as an environmental affect that results from the incremental effect of an action when combined with other past, present and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7). Sections 4.19.1 and Chapter 1, Section 1.7 (Existing Programs, Studies, Projects), provide a description of the past, present and future projects. NEPA requires a discussion of cumulative impacts when they are significant. The discussion should reflect the severity of the impacts and their likelihood of occurrence and should be guided by the standards of practicability and reasonableness. The Pajaro Project, with mitigation, would not have any significant adverse effects on any of the discussed resources. However, some of the resources would experience some temporary, short-term effects for the duration of construction. The Project's potential to incrementally contribute to significant cumulative effects on specific resources is discussed below.

4.19.1 Past, Present and Reasonably Foreseeable Future Projects

This section describes implemented, developed, or planned projects that may result in environmental effects similar to those of the identified alternatives, such that these effects, when combined, constitute cumulative impacts.

Historical Flood Risk Management Efforts

The City of Watsonville and the town of Pajaro were built on the natural floodplain and have experienced frequent flooding since these communities were established. From 1938 to 1940 the Works Progress Administration and Monterey County constructed 14,700 feet of levee and revetment on the left bank of the Pajaro River and 7,760 feet of levee on Corralitos Creek near the City of Watsonville. In 1949, USACE completed construction of a Federal flood risk management project which consisted of 11.5 miles of levees along lower Pajaro River and 3 miles of levee along Salsipuedes in the immediate vicinity of the City of Watsonville and the town of Pajaro. The 1949 project incorporated the levees constructed earlier along Pajaro River and Corralitos Creek. Monterey and Santa Cruz Counties assumed responsibility for operating and maintaining these levees. The levee system reduced flood risk and allowed continued agricultural and urban development but constrained the river and creek to specific alignments, reducing channel meandering, and further isolating rivers and creeks from their historical floodplains. As agricultural and urban development increased within the floodplain, more people and properties were at risk of flooding. Even with the 1949 project, flooding has periodically occurred, affecting the City of Watsonville, the town of Pajaro, and surrounding agricultural lands.

Emergency Levee Repairs (PL 84-99 Projects)

Since the project was constructed in 1949, high water events and breached and failing levees have resulted in emergency levee repairs and flood fighting. USACE constructed

emergency levee repairs following high water events or levee breaches in 1955, 1986, 1989, 1993, and 1998. In 1989, USACE constructed emergency repairs following the 7.1 magnitude Loma Prieta earthquake which caused significant levee damage. High water events in 2017, have required emergency repair and/or rehabilitation under PL 84-99 to 38 sites within the Pajaro project area. Repair work was initiated in 2017 and will be completed in 2018.

Local Flood Risk Management Projects - Section 408 Projects

Pajaro River Levee Bench Sediment Excavation Project. Santa Cruz and Monterey counties excavated excess sediment (up to 336,000 cubic yards) from select locations along 7.5 miles of levee benches between Highway 1 and the Murphy's Crossing Road along the upper terrace benches inside the Pajaro River levees to improve the flood-carrying capacity of the levee system. This project created a two-year floodplain to reestablish flow levels at bankfull capacity. This sediment excavation project was specifically designed to relieve the magnitude and severity of potential flooding caused by failure of the Pajaro River levees. The excavation sites encompassed an area of 39.1 acres and included nine excavation sites in Santa Cruz County and two sites in Monterey County. The work was completed in two phases, which were approved by USACE in 2010 and 2013.

Pajaro Levee Remediation Project. The City of Watsonville is investigating the need to put sheet-piles in the existing Pajaro Levee that separates the river from the Watsonville Wastewater Treatment Plant. As part of this project geotechnical borings were completed in 2016 to aid in assessing the seepage and stability status of some existing levees in the project area. Geotechnical investigations are in progress. This project would be located in Reach 1 just downstream of the proposed Pajaro Project.

Local Development Projects

Lakeside Organics. Lakeside Organics' new headquarters, including a drainage system, is being built at 25 Sakata Lane. In order to accommodate the new buildings, Lakeside Organics will construct a water catchment system in which water from the developed parcel a 61,000-square-foot produce cooler at 25 Sakata Lane is drained to two catchment ponds on an adjacent county agricultural parcel.

Former Indalex Aluminum Factory. Four restaurants and two hotels are planned for the former site of the Indalex aluminum factory at 1715 W. Beach St. The 7.3-acre. The project will include a four-story, 122-room Hampton Inn and a "smaller, custom" hotel that would be four stories and include 80 rooms. Approved by the Watsonville City Council in June 2015, construction began in 2017 on one hotel, a restaurant, and two small shops. Construction is expected to be completed in fall 2018.

Harkins Slough Road Housing Development. This 48-unit townhouse project at 35 Harkins Slough Road will complete construction in 2018.

Sunshine Garden. Construction began on this 87-unit housing project in 2016. It is located on the shores of Watsonville Slough at 1773 Santa Victoria Ave., off Ohlone Parkway. The plans call for 10 family homes and 77 town homes on a nearly 7-acre parcel along the Watsonville Slough. Estimated for completion in 2018.

4.19.2 Cumulative Effects

Sections 4.2 to 4.18 identify potential direct and indirect environmental effects of the proposed action. These effects are assessed in the following analysis in terms of their potential to combine with similar environmental effects of the projects listed above, resulting in cumulative impacts. The analysis is focused on considering the potential for those impacts identified in Sections 4.2 to 4.18 to result in an incrementally significant effect.

The extent of the geographic area that may be affected with implementation of the alternatives varies depending on the resource under consideration. Not all projects discussed above would contribute, along with the Pajaro Project, to cumulative environmental effects for each environmental issue area. Therefore, for each discussion below, the past, present and reasonably foreseeable future projects that are considered are limited to those having potential effects similar to those of the Pajaro Project and that could interact with impacts generated by the proposed action.

The Pajaro Project would not have any significant adverse effects on any of the discussed resources. However, some of the resources could have temporary, short-term, less than significant (with mitigation) adverse effects for the duration of construction. These resources are discussed below and the potential for the project to incrementally contribute to a significant cumulative effect to these resources.

Resource Effects

Aesthetics. The Project would alter the visual character in some areas by the placement of floodwalls and higher levees. In other areas agricultural viewsheds would be transformed into more natural open space with a backdrop of agricultural lands. Other projects in the counties and City of Watsonville would not contribute to visual impacts in the same viewshed because local policies or guidelines ensure visual impacts are reduced to the extent feasible. For instance, the City of Watsonville adopted Livable Community Residential Design Guidelines in 2001 to clarify expectations in the quality and style of projects and ensure that developments are also consistent with General Plan policies. Therefore, the Pajaro Project would not result in an incrementally significant effect on aesthetics.

Agriculture. Monterey and Santa Cruz counties have policies in place to discourage the conversion of productive farmland to other land uses. Implementing the Pajaro Project would remove some actively farmed lands adjacent to some levees in areas and convert them to flood risk management structures and open space with native plant regeneration in the offset areas. The City of Watsonville has a minimal amount of farmland that is not considered Prime, Unique, or of Statewide Importance so no impacts would be related to Watsonville agriculture from the

Project. The Project would remove Prime Farmland from production in the two counties. State and local policies discourage farmland conversion. Given the abundance of farmland and Prime, Unique, and Statewide Importance and the reduce risk of flooding that would be afforded to the remaining farmland in the project vicinity, we have determined that the Pajaro Project would incrementally contribute to a significant adverse effect on agriculture.

Air Quality. Continued coordination with the Central Coast Air Resources Board and implementation of mitigation measures to ensure that the limited and temporary construction and O&M effects on air quality would not result in, or contribute to, violation of a Federal or state air quality standards. The Pajaro project would not result in incrementally significant effects on air quality.

Hydrology, Hydraulics, and River Morphology. Public policies and regulations are employed to protect against flood hazards and regulate building in the 100-year floodplain. The Project would reduce the frequency of inundation of floodwaters outboard of the proposed levees and floodwalls. Where determined necessary, hydraulic mitigation features have been incorporated into the Project to avoid transferring floodwaters or flood risk to unprotected areas. This would ensure that the project does not result in an incrementally significant effect on hydrology and hydraulics. The Project in combination with public policies and regulations in the study area would improve the overall Pajaro River morphology. The Project has additional levee setbacks in all Project alternatives, which would reduce the constraints on the river during high-flow events. The Project would not result in an incrementally significant effect on River Morphology.

Land Use. The City of Watsonville land use designations for the properties adjacent to the Pajaro River are primarily residential. Outside the urban areas, lands are primarily designated for commercial agriculture. The proposed Project would not change this land use pattern or the relative amounts of different land uses and would not result in an incrementally significant impact on land use.

Noise. Noise generated by Project construction, particularly along haul routes, has the potential to incrementally result in a significant effect when combined with other construction traffic in the project area. Implementation of a traffic management plan, including coordination of haul routes and construction timing, with local traffic management offices would ensure that the Pajaro project does not result in an incrementally significant impact on noise. O&M practices would be similar to current practices and would not result in an incrementally significant impact on noise.

Recreation. Recreational opportunities in the Project area are limited to the levee roads, informal pathways, and adjacent parks. Santa Cruz County has some open space designations that are located in the Project's upper reaches. The City of Watsonville has some open space adjacent to the Pajaro River but it has restricted human use. The Project's impacts to recreation would be primarily limited to times during construction. Multiple public policies are in effect to preserve, enhance, and create recreational opportunities for the public. Although the Project does

not include specific recreational opportunities or components, future community plans indicate the intention to create trails along the levees; therefore, the Project could indirectly enhance recreational opportunities in the Project area by creating new levees. The Project does not result in an incrementally significant adverse effect on recreation.

Socioeconomics. Agriculture is an important industry in both Monterey and Santa Cruz counties. Agricultural conversion would result in a loss of agricultural production (approximately $10,000 per acre) to landowners. State and local policies discourage farmland conversion. Implementation of the Pajaro Project would benefit local and regional socioeconomic conditions by reducing flood risk and the associated risk to life safety, property, and agricultural production. The proposed Project would not result in an incrementally significant adverse impact on socioeconomics.

Traffic and Circulation. The Project would result in a temporary increase in traffic levels, largely in the immediate Project area and along access routes. As a result of the Project being completed in phases, the traffic increase would be temporary, during construction, and would be localized to the areas under construction at the time and to the associated haul routes. The traffic would require detours as two bridges would be replaced as part of the Project. These effects are expected to be largely separated in space and time from the traffic effects of other projects. With the traffic mitigation measures contained in this GRR/EA, which would be similar to those required of other construction projects, traffic impact would be mitigated at the individual project level and within the context of the overall transportation system. The Project would not result in an incrementally significant contribution to traffic impacts.

Vegetation and Wildlife. Project construction activities and maintenance may impact wildlife and habitat in the lower Pajaro river watershed. Implementation of mitigation measures, including the seasonal timing of maintenance, would mitigate most of the maintenance-related impacts and the construction impacts would be temporary. Habitat disturbance would be mitigated regardless of the Project alternative is selected for the Project consistent with USACE policy and the requirements of ER 1105-2-100. Effects would be less than significant. However, if an unforeseen project is initiated at the same time as this Project, temporary cumulatively considerable impacts on biological resources could occur. To avoid this occurrence, USACE will work with the project sponsors to ensure that work is coordinated with other local efforts such that multiple disturbances to the same habitat areas are avoided to the extent feasible. Avoiding multiple disturbances of the same habitat areas would ensure the Pajaro Project does not incrementally contribute to a significant effect on vegetation and wildlife.

Water Quality. Water quality in the project area is impaired and Lower Pajaro River, Salsipuedes and Corralitos Creeks are all 303(d) listed waterways. Future development in the two counties may increase runoff which could result in impacts to water quality. On occasion O&M of the stream and creek channels may be necessary and could also result in adverse effects on water quality. All construction projects and O&M activities associated with the Pajaro Project would be required to implement BMPs and meet Federal, state and local requirements for avoiding degradation of water quality in adjacent waterways, including consistency with TMDL's. The proposed Pajaro Project would implement measures to avoid and minimize

adverse water quality impacts. Consultation with the Central Coast Regional Water Quality Control Board and securing Section 401 water quality certification would ensure that this project does not incrementally contribute to significant adverse water quality effects.

4.20 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Although not required in an EA, this section provides a discussion of the irreversible and irretrievable commitments of resources that may be involved should the project be implemented. The irreversible and irretrievable commitments of resources are the permanent loss of resources for future or alternative purposes. These are resources that cannot be recovered or recycled or those that are consumed or reduced to unrecoverable forms. Project implementation would result in the irreversible and irretrievable commitments of energy and material resources during project construction and maintenance, including the following:

- Construction materials, including such resources as soil and rocks;
- Land and water area committed to new/expanded project facilities;
- Energy expended in the form of electricity, gasoline, diesel fuel and oil for equipment and transportation vehicles that would be needed for project construction, O&M; and
- Water used for dust abatement.

The use of these nonrenewable resources is expected to account for only a small portion of the region's resources and would not affect the availability of these resources for other needs within the region. Construction activities would not result in inefficient use of energy or natural resources.

As described throughout this GRR/EA, without implementation of the Pajaro Project, the risk of levee failure and flooding would remain high. While a precise quantification of environmental impacts associated with potential levee failure is not possible, there is a potential for a variety of significant environmental impacts. Levee failure and the resulting emergency and reconstruction efforts could expend more energy, overall, than construction of the Pajaro Project. A large volume of debris would result from a flood event, such as cars, appliances, housing materials and vegetation. They would all be generated with a flood and would likely have to be disposed of in a landfill. After debris removal was completed, re-building would occur and new materials would be required to construct homes, businesses, roads and other urban infrastructure. Thus, project implementation preempts potentially substantial future consumption and is likely to result in long-term energy and materials conservation.

4.21 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

Although not required in an EA, this section provides a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. Within the context of this GRR/EA, "short-term" refers to the construction period, while "long-term" refers to the operational life of the project and beyond.

Project construction would result in short-term construction-related effects such as interference with local traffic and recreation facilities and increased air emissions, ambient noise level, dust generation and are not expected to alter the long-term productivity of the natural environment. Project implementation would also result in long-term effects, including permanent loss of riparian vegetation, habitat for fish and wildlife, changes to Waters of the United States and loss of visual resources.

Project implementation would contribute to long-term productivity of the environment by improving the FRM system, including levees, that protects the City of Watsonville, the town of Pajaro, and surround commercial agricultural lands and thereby reducing the overall flood risk to residential, business and government buildings and infrastructure. This would reduce flood-related risks to human health and safety and to important infrastructure. The long-term beneficial effects of the project would outweigh its short-term adverse impacts to the environment.

CHAPTER 5 - PUBLIC INVOLVEMENT, COORDINATION, CONSULTATION, AND COMPLIANCE

This chapter summarizes public and agency engagement related to this study. Consultation with Native American Tribes is also addressed. Finally, this chapter describes the proposed project's compliance with applicable Federal laws, regulations and policies.

5.1 PUBLIC INVOLVEMENT

Since 2001, Monterey and Santa Cruz Counties have led a robust flood risk management public involvement program that has helped to inform the Pajaro Flood Risk Management Study. USACE also conducted NEPA and water resources planning public involvement specific to the Pajaro FRM study.

5.1.1 Monterey and Santa Cruz Counties Flood Risk Management Public Involvement Program

To meet the flood risk management goals of Monterey and Santa Cruz Counties the Pajaro River Flood Protection Community Stakeholder Process began in June 2001. The goal of the process was to arrive at a community flood risk management concept to be included in the USACE Pajaro River Flood Risk Management GRR. As part of the community process, Monterey and Santa Cruz Counties held over twenty formal meetings from June to December 2001, with the objective of developing a Locally Preferred Plan (LPP) that could be included in the study and NEPA analysis. These meetings involved members of the interested public, and also included focus group meetings with the agricultural industry, local environmental organizations, regulatory agencies, City of Watsonville, town of Pajaro, and community organizations.

Pajaro River Flood Protection Working Group

The Pajaro River Flood Protection Working Group consisted of executive and technical staff from the USACE, Santa Cruz and Monterey Counties, District staff of Congress Member Sam Farr, hydraulics engineers, and planning process consultants. The Working Group was charged with supporting the stakeholder process by synthesizing all information and viewpoints and initiating Project Design Options for stakeholder consideration.

Stakeholder Meetings. A partial list of the Working Group meetings with their corresponding summaries is available at *http://www.pajaroriver.com/*. During the course of these

meetings, the stakeholders, with input from the general public, helped identify key issues, reviewed modeling results of alternative flood channel configurations, and took the steps required to arrive at a community consensus on the Locally Preferred Plan (LPP). Two public hearings were conducted on March 16, 2004, to consider selection of the LPP. One hearing was at 2:00 p.m. at the County Courthouse Board of Supervisors Chambers, 240 Church Street, Salinas in Monterey County. The other hearing was at 7:00 p.m. at the Watsonville City Council Chambers, 250 Main Street, Watsonville in Monterey County. Chapter 3 and Appendix A of this GRR/EA summarize the working group recommendations as they relate to identification of action alternatives and alternatives not carried forward for further consideration.

Newsletters. The Working Group published newsletters in June 2002, November 2002, and July 2003 to report to the public on the progress of stakeholder meetings. These newsletters are available for viewing at *www.pajaroriver.com*.

Action Pajaro Valley

Action Pajaro Valley (APV) is a non-profit community and land use mediation organization based in Watsonville. In May 2003, Action Pajaro Valley created the Pajaro River Task Force and technical Stream Team to address Pajaro River levee reconstruction and maintenance issues facing residents of the Pajaro Valley (APV 2010).

5.1.2 Pajaro Flood Risk Management Study NEPA Notice of Intent and Scoping Meetings

Scoping was conducted to identify public and agency issues and concerns pertaining to Pajaro Flood Risk Management General Reevaluation Study and to scope the NEPA analysis and documentation. The purpose of scoping is to help focus the environmental review on important resources and issues. Questions and comments provided during scoping were considered and incorporated, as appropriate, into the alternatives formulation and the environmental review process.

Notice of Intent

USACE published a Notice of Intent (NOI) in the Federal Register (June 8, 2001, 66 FR 30894) to advise the interested public and agencies that USACE and the study partners intended to *prepare a combined EIS/EIR in support of a cost shared study for flood damage reduction of lands surrounding the Pajaro River in the Lower Pajaro River Watershed*. The notice invited interested parties to participate in a scoping meeting, provide comments identifying relevant environmental and socioeconomic issues to be addressed in the environmental analysis, and to provide information about studies, published and unpublished data, alternatives that should be addressed in the analysis, and potential measures associated with the proposed actions. Scoping comments were requested by July 31, 2001.

Public Scoping Meeting

A public scoping meeting was held on June 21, 2001, at the Watsonville Senior Center, located at 114 East Fifth Street, City of Watsonville, California. An official transcript of the meeting was prepared by Melinda Nunley, Certified Shorthand Reporter 9332, and Notary Public for the County of Santa Cruz, California. The scoping process involved solicitation of comments from the general public, local focus groups, and input from federal, state, and local agencies and organizations with interest in, or jurisdiction within, the Pajaro River watershed.

At the scoping meeting, USACE and the state CEQA lead agencies provided information on the background and purpose of the proposed action, requested public comment on relevant environmental and socioeconomic issues to be addressed in the environmental review, and provided preliminary information to the public on the NEPA and CEQA processes. During the meeting, 35 individuals spoke on behalf of themselves, stakeholders, or local and state government agency representatives. A total of 50 individual verbal comments and/or questions were received.

5.1.3 Scoping Comments

Scoping comments received at the public meeting and during the scoping period are summarized below.

Verbal Comments

Comments received during the scoping meeting are categorized into four broad categories: (1) alternatives analysis, (2) scope of the impacts analysis, (3) project components, and (4) miscellaneous (not necessarily pertaining to the environmental review). All comments are summarized below.

Alternatives Analysis. Several comments regarding alternatives analysis were received. Many of the comments centered on the overall approach to the alternatives analysis. Four comments focused on the need for an economic development plan. Specifically, commenters stressed the need to include as many user benefits as possible, including flood damage reduction, ecosystem restoration, recreation, and water storage. Three comments specifically addressed the need to combine this project with other proposed water supply projects. One commenter further stated that the project should include recreation and a fee for recreationists to aid in project funding. One commenter asked that several engineering designs be included in the alternatives, including ring levees and setback levees with several configurations. Four comments asked that the project be defined to include the entire watershed; and one commenter specifically mentioned combining this project with the Pajaro Valley Water Management District Basin Management Plan. Two commenters stressed the need for multi-agency and stakeholder coordination in preparing the NEPA document. Additionally, some commenters suggested specific alternatives such as the construction of a reservoir and dam, passing water under Highway 1, dredging the

channel deeper, designing the alternatives to maintain a mature riparian forest, and constructing a pipeline to convey water from the upper watershed to storage facilities in the lower watershed.

Impact Analysis.

Riparian Vegetation. Many comments pertaining to the scope of the impacts analysis were received. Several comments regarding the potential impacts to riparian vegetation were made. Some commenters stressed the need to retain riparian vegetation to protect water quality, endangered species, and species diversity, and to provide bank stability and flood protection. One commenter stressed the need to maintain riparian vegetation for viable habitats during both construction and operation and maintenance. Other commenters stated that clearing riparian vegetation allowed the river to convey larger quantities of water thereby reducing the threat of flooding. Additionally, two commenters expressed concern that an alternative that proposed to set back levees would create environmental habitats (i.e., riparian habitats) that could not be cleared due to habitat sensitivity and potential preservation requirements.

Agriculture. Many comments were made regarding agriculture within the Pajaro River Basin. Specifically, commenters were concerned with socioeconomic impacts to farmers. Specific comments were made regarding eminent domain and reimbursement for capital gains tax if farmland is taken. Reimbursement for crops lost if farmland is inundated with floodwaters was also commented on.

Groundwater. In addition, two comments were made concerning degradation to groundwater from both overdraft and saltwater intrusion. One commenter suggested using floodwater for groundwater recharge to protect groundwater resources.

Listed and Non-Listed Species. One commenter expressed concern about additional listed species being discovered along the project site. One comment was made asking that the EIS/EIR analyze the ability of non-ESA listed species to successfully migrate between habitat areas if an alternative proposed the construction of a floodwall.

Project Components. Several comments centered on the various project components. Three commenters stated that past man-made structures designed for flood damage reduction (e.g., floodwalls and levees) were inefficient, provided a false sense of security, and, in the case of a floodwall, are unattractive. Many comments were made regarding information pertaining to proposed control structures. Specifically, one comment was made concerning the heights of proposed floodwalls, four comments were made regarding water storage facilities, and two comments were voiced pertaining to the construction of weirs.

Miscellaneous. Several questions and comments not pertaining to the content of the EIS/EIR were received. One commenter asked that a copy of both the 1976 feasibility report and the 1994 reconnaissance report be provided for public review and comparison. Another

commenter asked for a clarification of the National Economic Development Plan (NED), one comment was made regarding cost sharing, and one commenter questioned the ownership of water in California.

Written Comments

Written comments were received during the scoping period from just one entity, USFWS. Their comments are summarized below.

- Formal consultation with USFWS is required if the Project will affect listed species or critical habitat.
- Formal conference is required if the Project will jeopardize the continued existence of a species or adversely affect or modify critical habitat.
- EIS/EIR should thoroughly address the following issues and topics:
  - Discuss Purpose and Need for the Project, include historical and current contributions to threats of flood damage
  - Describe and analyze alternatives that reduce impacts to fish and wildlife resources
  - Include structural and non-structural alternatives
  - Coordinate with agencies and communities to address causes such as sedimentation
  - Coordinate with other Pajaro River projects, specifically Pajaro River Management and Restoration Plan
  - Discuss sensitive species – include distribution, abundance, status, ecology, and survey and habitat assessments.
  - Discuss information gaps relevant to analyses
  - Review the CNDDB and contact CDFG for info on species of concern
  - Continue coordination with NMFS on federally listed steelhead (*Oncorhynchus mykiss*)
  - Evaluate effects on primary constituent elements of CRLF critical habitat
  - Address tidewater goby (*Eucyclogobius newberryi*) and western snowy plover (*Charadrius alexandrinus nivosus*)
  - Evaluate how effects to potential habitat may affect recovery of least Bell's vireo (*Vireo bellii pusillus*)
  - Address Monterey spineflower (*Chorizanthe pungens* var. *pungens*)

5.1.4 How Public Views Influenced the Alternatives Development and Scope of the Environmental Review

The Pajaro River Flood Protection Working Group developed principles for consideration in the design of the project. Through the collaborative and iterative planning process, the USACE, Counties of Santa Cruz and Monterey, and stakeholder groups developed a suite of measures and alternative plans to address the issues of flooding in the Project area. Chapter 3 and Appendix A of this GRR/EA discuss the alternative screening process in detail.

5.1.5 Changes Since Publication of the NOI

Since publication of the NOI in 2001, USACE and the study sponsors have worked with stakeholders to identify and analyze a broad range of measures, alternatives, and mitigation. As part of this process, the study partners have incorporated measures to avoid, minimize and compensate for adverse environmental effect. As a result, the environmental review conducted as part of this study has initially concluded that, with mitigation, the proposed alternatives would not result in any significant environmental effects. Therefore, an EA has been prepared instead of an EIS. Also, the Corps now requires water resources planning and National Environmental Policy Act (NEPA) documents to be integrated into a single document, in this case, an integrated GRR/EA. The California Environmental Quality Act (CEQA) document for the study is being prepared separately by Santa Cruz and Monterey Counties as the CEQA lead agencies.

5.1.6 Next Steps in the Environmental Review Process

A notice of availability of the draft GRR/EA will be published in the Federal Register when the document is released for public review. This draft report will be circulated for a 30-day public review period to Federal, State, and Local agencies, organizations, and individuals who have an interest in the project. A public meeting will be held during the review period to provide additional opportunities to discuss and comment on the draft report. The meeting will be held on November 8, 2017, at the Watsonville Civic Plaza Community Room, 275 Main Street, 4th Floor, City of Watsonville, California, 95076-5133, from 6:00 p.m. to 8:00 p.m. All comments received during the public review period will be considered and incorporated into the final report, as appropriate. Public comments and the USACE responses to those comments will be included with the final report as an appendix.

5.1.7 Document Recipients

Federal, state and local elected officials and agencies with interest in, or responsibilities for, flood risk management and related activities in the project area, as well individuals known to have an interest in the project, will be provided notice of the availability of the draft GRR/EA for review and comment.

5.2 AGENCY CONSULTATION AND COORDINATION

Beyond formal public scoping, USACE and Monterey and Santa Cruz Counties have been in communication with Federal, state, and local agencies in the course of project planning, design development, and preparation of this draft report. These communications have taken the form of in-person meetings, telephone conversations, and written correspondence. The communications have addressed consistency with other planning studies and projects in the region, pursuit of agency approvals, and information to be considered in the document. The following agencies and organizations were consulted during the environmental review: Action

Pajaro Valley (APV), Amah Mutsun Tribal Members, California Coastal Commission, CDFW, NMFS, OHP, Sierra Club, State Water Resources Control Board, Central California Regional Water Quality Control Board, and USFWS.

Eleven resource agency meetings were held among USACE, NMFS, USFWS, and CDFW to actively engage the resource agencies in the Project. The largest array of groups participated in the Pajaro River Technical Stream Team, a subcommittee of the Pajaro River Task Force, organized to ensure early and informal participation of public agencies and other organizations in the collaborative project planning process. More recently, Resource agency meetings were held in 2010 and 2012. On November 17, 2010, a meeting was held with the lead agencies, City of Watsonville, NMFS, and SWRCB to discuss the Operations and Maintenance Manual for the Project. On April 10, 2012, a meeting was held with lead agencies, NMFS, USFWS, and CDFW to discuss the ability to obtain permits to construct the various alternatives.

5.2.1 U.S. Fish and Wildlife Service

Endangered Species Act

The USACE has been informally consulting with the USFWS under the Federal ESA regarding the potential effects of the action alternatives on federal-listed species and designated critical habitat, including California red-legged frog (CRLF), tidewater goby, and the western snowy plover. The USACE has prepared a Biological Assessment (BA) (Appendix E-1) and has determined that the proposed action, construction and operation of the TSP, would have no effect on the tidewater goby and western snowy plover or on the Santa Cruz tarplant. However, USACE intends to request concurrence from USFWS with our determination that the proposed action may affect, but is not likely to adversely affect, the federally listed California red-legged frog. USACE also intends to request to formally conference on the potential for adverse modification of California red-legged frog habitat currently proposed for designation as critical habitat. USFWS's response to these requests are expected prior to publication of the final GRR/EA.

Fish and Wildlife Coordination Act

As required by the Fish and Wildlife Coordination Act, the recommendations of the Secretary of the Interior, through the USFWS, haves been sought throughout the planning process. The Draft Fish and Wildlife Coordination Act report is in Appendix E-2. The USFWS' recommendations together with the USACE's responses are below:

USFWS Comment 1. Based on our review of information provided by the Corps, the Service believes that in regards to the proposed mainstem alternatives, Alternative 3 (Alternative 1 plus Optimized Channel Migration Zone (CMZ)) provides the most benefit to wildlife resources, specifically including the federally threatened California red-legged frog (*Rana draytonii*) and migratory birds, which are known to inhabit this area, and the federally endangered tidewater goby (*Eucyclogobius newberryi*), which may inhabit this area. As stated in the information [the Corps] provided, the CMZs are designed to provide for cost savings on

levee construction and operations and maintenance as well as to provide for a more self-sustaining channel. The Service believes that a reduction in operations and maintenance activities (habitat clearing, dredging, bench excavation, etc.) would reduce potential impacts to federally listed species while at the same time a more self-sustaining channel would provide an increase in natural habitat features, increasing the potential for the subject species to persist and thrive in this area. As such, the Service recommends that Alternative 3 be selected as the preferred mainstem alternative.

USACE RESPONSE. The Pajaro River Flood Risk Management General Reevaluation Study is a single purpose flood risk management study. Nevertheless, the study incorporated a wide range of measures and alternatives plans for addressing flood risk in the lower Pajaro River Valley. These plans included a range of CMZ alternatives, the optimized version of which appear in the final set of alternatives as Alternatives 3, 7, and 8. As required by Federal and USACE water resources planning regulations, the NED plan was identified from among these final alternatives. This is the plan that maximizes National Economic Development benefits. By regulation, the NED plan generally is the plan that must be identified as the tentatively selected plan (preferred alternative). None of the CMZ plans were identified as the NED plan or as an element of that plan, therefore, by regulation and policy, these alternatives may not be recommended by USACE.

USFWS Comment 2. In Regards to the proposed tributary alternatives, the Service believes that Alternatives 7 (Optimized CMZ with Corralitos Left-Bank Levee Alternative) and 8 (Optimized CMZ with Ring Levee or Relocation Along Corralitos Left-Bank Alternative) similarly provide the greatest benefits to wildlife resources, specifically, the California red-legged frog, tidewater goby, and migratory birds. As stated above, the Service believes the CMZ aspect of these alternatives would result in a reduction in operations and maintenance activities and therefore, a reduction in potential impacts to federally listed species. Additionally, a more self-sustaining channel would provide an increase in natural habitat features, increasing the potential for the subject species to persist and thrive in this area. As such, the Service recommends that Alternative 7 or 8 be selected as the preferred tributary alternative.

USACE RESPONSE. Please see the USACE response to USFWS Comment 1 as it also pertains to USFWS Comment 2.

5.2.2 National Marine Fisheries Service

The South Central California Coast ESU steelhead, which are listed under the Federal ESA as Threatened, is known to occur within the Project area. USACE has been informally consulting on an ongoing basis with NMFS regarding the steelhead and has prepared a BA (Appendix E-1) that addresses the potential effects on steelhead from construction, operation, maintenance, and repair of the TSP. USACE intends to request concurrence with our determination that the project may affect, but is not likely to adversely affect, this species. NMFS response to this request is expected prior to publication of the final GRR/EA.

5.2.3 California Office of Historic Preservation/State Historic Preservation Officer

A letter, dated 16 October 2017, was sent to the California State Historic Preservation Officer (SHPO) to initiate consultation on the Pajaro River Flood Risk Management Project (Project). In accordance with Section 106 of the National Historic Preservation Act, this letter also requested concurrence from the SHPO on the determination and documentation of the area of potential effects (APE) (36 CFR § 800.4[a] [1]) and requested comments on the development of a programmatic agreement (PA) for the Project. The PA will guide implementation of, and adherence to, the Section 106 process and would define the roles of the different project proponents (36 CFR § 800.14[b][3]).

5.2.4 Consultation with Native American Tribes

A list of potentially interested Native Americans was obtained from the Native American Heritage Commission. Consultation letters were sent to the Amah Mutsun Tribal Band, the Amah Mutsun Tribal Band of Mission San Juan Bautista, the Costanoan Rumsen Carmel Tribe, the Costanoan Ohlone Rumsen-Mutsen Tribe, the Esselen Tribe of Monterey County, the Indian Canvon Mutsun Band of Costanoan, the Muwekma Ohlone Indian Tribe of the San Francisco Bay Area, the Ohlone/Coastanoan-Esselen Nation, the Salinan Tribe of Monterey and San Luis Obispo Counties, and the Xolo-Salinan Tribe. The first letter, dated 16 October 2017, informed them of the general reevaluation study and requested any information they may have on areas of traditional cultural interest to their tribal members. The letters included a description and location maps for the final array of alternatives, and a copy of the draft PA for review. The draft and final GRR/EA will be provided to the Tribes identified above.

5.2.5 California Department of Fish and Wildlife (CDFW)

The Fish and Wildlife Coordination Act (FWCA) of 1980 (16 USC 2901 et seq.) requires federal agencies undertaking projects affecting water resources to consult with the state agency responsible for fish and wildlife resources, which in this case is CDFW. The agency will receive copies of the Draft GRR/EA and CDFW's comments will be invited and considered under NEPA and under the FWCA. CDFW will also receive copies of the Final GRR/EA. Mitigation designed to conserve fish and wildlife and their habitat is identified in Chapter 4, Sections 4.6 Aquatic Resources, 4.14 Special Status Federal Species, and 4.17 Vegetation and Wildlife.

5.2.6 California Coastal Commission

Under the California Coastal Act, the California Coastal Commission (CCC) has legal jurisdiction of the Pajaro River extending from the river's mouth to the Highway 1 Bridge at approximately River Mile 4. This reach is outside of the construction footprint of all of the proposed action alternatives. In a memorandum dated June 13, 2001, the CCC adopted the proposal to develop a River Concept Plan designed to identify and refine feasible options to Pajaro River flooding "…while simultaneously enhancing and protecting habitat, scenic, riparian corridor, recreational, and agricultural resources." USACE has been consulting with the CCC on measures that could be incorporated into the project design consistent with the River Concept

Plan and serve to minimize adverse effects to unique and sensitive coastal resources for the Pajaro River Project.

5.2.7 Central Coast Regional Water Quality Control Board

The RWQCB participated with other agencies and stakeholders in identifying problems, opportunities, and alternatives. USACE has continued to coordinate with the RWQCB and will seek a letter of support for the project prior to publishing the final GRR/EA. If the project is approved and funded, USACE would work with the RWQCB to secure water quality certification prior to initiating construction.

5.4 ISSUES OF KNOWN OR EXPECTED CONTROVERSY

The following issues were identified as a result of public scoping, stakeholder engagement, and conduct of the environmental review. While these issues are addressed in the GRR/EA they are expected to be of continuing concern to the public.

5.4.1 Property Acquisition

A specific issue of concern involves potential conflicts with private property within or near the construction area. In some cases, permanent property acquisition would be needed for project construction and O&M. Temporary construction easements will likely be needed for construction staging and equipment access, and temporary restrictions on access to private property may also be necessary.

5.4.2 Construction-Related Effects

Some portions of the levee system in the project area are adjacent to residential areas and other developed land uses. Construction activities are likely to result in construction-related effects including noise and traffic detours (car, bicycle, and pedestrian). These effects are described, together with mitigation measures to reduce adverse effects, in Chapter 4.

5.4.3 Levee Encroachment

The project would require removal, relocation or replacement of features in, on, or under the levee or adjacent O&M corridors such as structures, pipelines, walls, stairs, utilities and other elements such as vegetation.

5.4.4 Setback Levee Distance

A long-standing concern among some agencies and stakeholders is the appropriate and desirable distance from the waterway that levees should be setback. To provide the most ecological benefits some prefer a large setback distance. To preserve agricultural values and private property, others prefer a small setback distance, or no setback at all. A variety of distances were analyzed during development of the final alternatives.

5.5 COMPLIANCE WITH APPLICABLE LAWS, REGULATIONS, AND POLICIES

This table provides a summary of the status of consultation and other requirements that must be met before the proposed Pajaro River Flood Risk Management Project could be implemented.

Table 5-1: Summary of Federal Environmental Compliance for Proposed Project

Regulatory Requirements	Status of Compliance/Expected Completion
National Environmental Policy Act	*In progress*. This GRR/EA was developed consistent with the requirements of NEPA. Full compliance will be achieved once the NEPA process is complete and USACE signs a FONSI or ROD, as appropriate.
Federal Endangered Species Act	*In progress*. USACE has prepared a BA to address potential project effects on Federally listed species and designated critical habitat. USACE has concluded that the project "may affect, but is not likely to adversely affect" the Federally listed South Central California Coast ESU steelhead (Threatened), California red-legged frog (Threatened), or designated critical habitat for the steelhead. USACE will conference with USFWS on potential effects to proposed critical habitat for California red-legged frog. Full compliance will be achieved once USFWS and NMFS have concurred with USACE's determination.
Magnuson-Stevens Fishery Conservation and Management Act	*In progress*. USACE has prepared a BA that meets the "essential fish habitat" assessment requirements for the south-central California Coast Evolutionarily Significant Unit (ESU) for steelhead. USACE is transmitting NMFS the BA together with a request to consult under MSFCMA concurrent with publication of this draft GRR/EA. Once USACE has received, considered and responded to NMSF's recommendations, the project will be in full compliance.
Fish and Wildlife Coordination Act	*In progress*. USFWS has provided a draft letter report in compliance with the FWCA. See Appendix E-2. The final

Regulatory Requirements	Status of Compliance/Expected Completion
	report, together with the USACE responses to the USFWS recommendations will be included in the final GRR/EA.
Migratory Bird Treaty Act	*Full Compliance*. Chapter 4 identifies measures to avoid adverse effects on migratory birds. These measures are incorporated into the proposed project. Actions will be required prior to, and during construction, to remain in full compliance.
Clean Water Act	*In progress*. USACE will request a letter of support for the project from the Central Coast Water Resources Control Board. Once this letter is received the project will be in full compliance for this project phase. If the project is approved and funded, USACE will seek Section 401 water quality certification once the final designs are developed and prior to initiating construction. Once 401 certification is received the project would be in full compliance. Requirements related to water quality specified in the 401 certification and the project environmental documents would need to be implemented throughout construction to remain in compliance.
Clean Air Act	*Full compliance*. A federal conformity determination is not required. Implementation of mitigation measures specified in Section 4.5 would ensure that project effects on air quality are minimized.
Coastal Zone Management Act	*Full compliance*. Coordination with the California Coastal Commission (CCC) confirmed that the project is outside of CZMA jurisdiction (i.e., east of Highway 1). Mitigation measures have been incorporated into the project to avoid adverse downstream effects, mainly on water quality.
National Historic Preservation Act	*In progress*. SHPO concurrence with the APE has been requested. Consultation with Native American Tribes has been initiated. A draft PA is included in Appendix E-3. The project will be in full compliance with the NHPA once the PA has been executed.
Executive Order 11988 – Floodplain Management	*Full compliance*. The project would reduce flooding to parts of the floodplain that are already urbanized. Project features include new setback levees and removal of existing channel-adjacent levees, thereby reconnecting a portion of the floodplain with the waterway. Local land use plans and zoning prioritize protection of commercial agricultural lands

Regulatory Requirements	Status of Compliance/Expected Completion
	that surround both Watsonville and Pajaro and provide a key economic driver for those communities and the region.
Executive Order 11990 – Protection of Wetlands	*Partial compliance.* A draft 404(b)(1) evaluation is included in Appendix E-5. All of the Action Alternatives would result in the temporary loss of wetlands (riparian habitat). Each of the alternatives had been designed to minimize impacts on wetlands to the extent practicable. Full compliance for this project phase will be achieved once the RWQCB has reviewed and provided comment on the draft GRR/EA and USACE has considered and responded, as appropriate, to their comments.
Executive Order 12898 – Environmental Justice	*Full Compliance*. Both the City of Watsonville and the town of Pajaro meet key thresholds for consideration under Environmental Justice. Section 4.13 Socioeconomics and Environmental Justice provides additional details. All of the Action Alternatives would reduce flood risk to one or both of these communities. TSP would reduce flood risk to both Watsonville and Pajaro.

CHAPTER 6 – TENTATIVELY SELECTED PLAN

6.1 TENTATIVELY SELECTED PLAN

As presented in Chapter 3, Alternative 1 on the Mainstem of the Pajaro River and Alternative 6 on the Tributaries have been identified as the NED Plan and recommended as the Tentatively Selected Plan (TSP) (**Figure 6-1**).

6.2 FEATURES AND ACCOMPLISHMENTS

The TSP plan includes the following components:

Mainstem Alternative 1

This alternative includes improvements on both banks of Reaches 2, 3, and the left bank of Reach 4. Improvement on both banks of Reach 2 include demolition of the existing levee and construction of a new 100-foot setback levee. In Reach 3 on both banks the existing levee would be improved in place with a floodwall. In Reach 4 on the left bank the existing levee would be degraded and a new 100 foot setback levee would constructed with a completion levee that ties into high ground constructed on the east end. These levees would be constructed to provide FRM up to the 1% ACE (1/100) event. There would be no improvements to the right bank of Reach 4 since this reach was not economically justified.

The levees would range from 7-9.5 feet in height. The floodwall will be approximately 8 feet in height depending on construction method. Approximately 9200 lineal feet of bank protection rip rap will be placed on the left bank and 4300 lineal feet of bank protection rip rap will be placed on the right bank.

Tributary Alternative 6

The levee design for the right bank reaches of Salsipuedes and Corralitos Creek provides FRM up to the 1% ACE (1/100) flood event for the areas on the right bank of the streams. Incremental economic analysis indicated that improvements to levees on the left bank of the tributaries was not economically justified if designed to provide FRM for the 1% (1/100) ACE. Further analysis of the features on the left bank determined that features providing FRM to the urbanized areas along the left bank, the upper portion of reach 5 above Lakeview Road and Reach 6, were economically justified to provide FRM for the 4% ACE (1/25) event, consistent with the existing levee located further downstream in Reach 5.

In Reach 5 right bank, above the confluence with the Pajaro River, approximately 5,300 lineal feet of floodwalls or a combination levee with a floodwall on top would be constructed where urban development prevents raising existing levees. A 4,500 foot levee setback between 100 to 225 feet would be constructed upstream of the floodwall section. Then an approximately 500 foot long section of the existing levee would be rebuilt in place. For Reach 5 left bank, beginning 8,800 feet upstream from the confluence with the Pajaro River, a floodwall or a combination levee with a floodwall on top will be constructed on the left–bank between Lakeview Road and College Road—a distance of approximately 5,000 feet.

Reach 6, both right and left bank, includes construction of a new levee, approximately 5900 feet in length, constructed 50 to 75 feet from the edge of the Corralitos Creek channel.

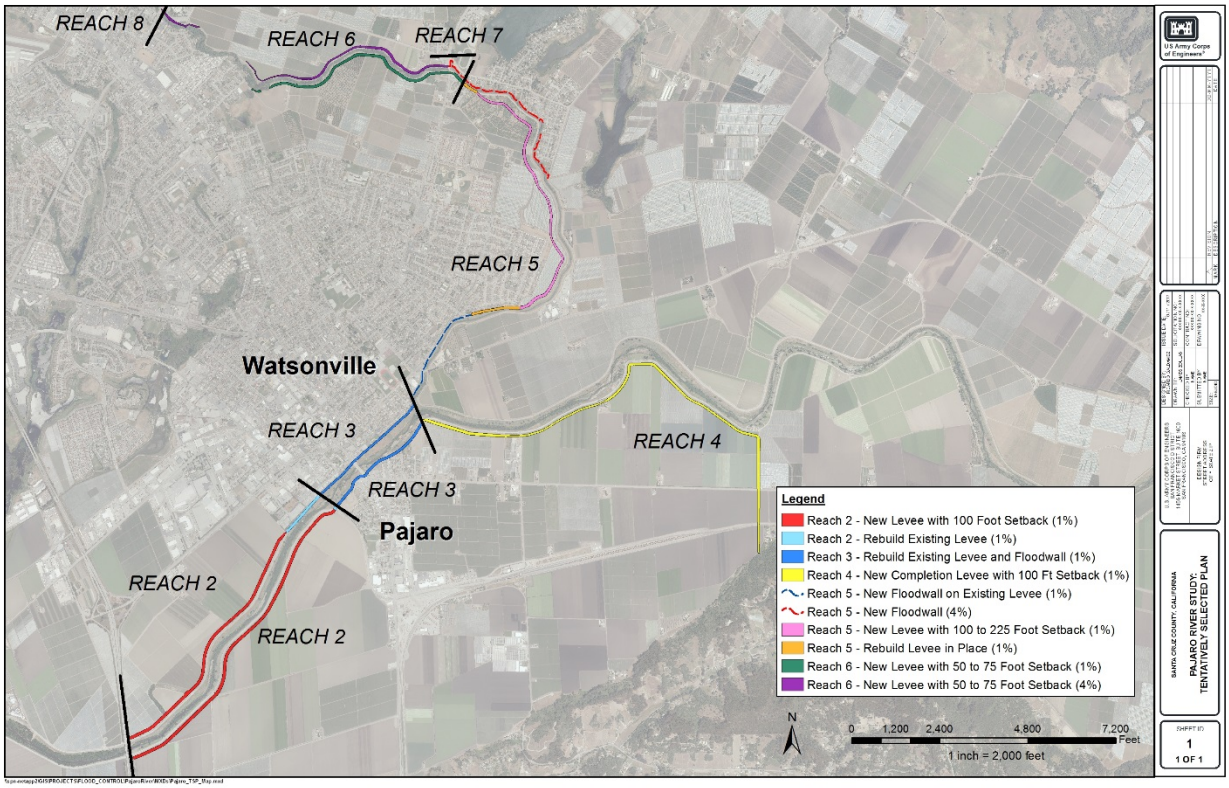

Figure 6-1: Tentatively Selected Plan

6.3 MITIGATION

The project has been designed to be self-mitigating through incorporation of setback levees and no additional compensatory mitigation costs are anticipated.

6.4 OPERATIONS, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION

Once project construction is complete, it would be turned over to the non-Federal project partners with an O&M manual in accordance with the executed PPA for construction. The PPA is signed before construction begins. Following construction, the non-Federal partners would be responsible for continued O&M of the project consistent with the new and/or amended O&M manuals, also referred to as OMRR&R Manuals, which specify requirements for operating and maintaining the project.

Local Maintaining Agencies

The Pajaro Storm Drain Maintenance District (PSDMD) was formed in 1951, pursuant to the procedure enacted by the Storm Drain Maintenance District Act of 1939. PSDMD maintains channels within its District boundary for flood flow conveyance and also provides for emergency response activities that respond to flow conveyance during inclement weather. The Santa Cruz County Flood Control and Water Conservation District Zone 7 was formed in 1991 to engineer, construct, finance, and maintain a storm drainage system or water conservation projects within the District boundary, as well as to provide funding for the local match share of the Pajaro River Flood Risk Reduction Project. The District boundary is similar to, but not exactly the same as, the PSDMD boundary.

The Monterey County Water Resources Agency (MCWRA) is the agency that performs maintenance activities in what Monterey County calls Flood Control Zones 1 and 1A. Maintenance occurs along approximately 11.5 miles of levee on the Monterey County side of the Pajaro River.

6.5 REAL ESTATE

The Real Estate Plan discusses in detail, by reach, the real estate interests to support the construction, operation, and maintenance of the recommended plan. The real estate interests include the estates, number of ownerships, and estimated land values. The baseline cost estimates include a cost estimate and the Federal and non-Federal costs associated with acquiring the lands for the project; costs also include residential commercial, and business relocations. The non-Federal administrative costs include right of way planning and management, securing rights of entry for Engineering and Environmental Studies, surveying existing roadways for plats and legal descriptions, right of way field staking, appraisal services, independent appraisal review, acquisition services, relocation assistance, title and escrow support, and condemnation support. The Federal administrative costs include feasibility report and design level estimated costs associated with the areas and estates that are required for the construction, operation and maintenance for the project. Several of the measures included in the plans increase the footprint of the flood control system including construction of setback levees, widening levees on the land side as a result of construction of a floodwall, and flattening of the waterside and/or landside slopes. Permanent maintenance roads along the landside toe for the new levees increase the real estate footprint of the project as well.

Other land requirements for the project include temporary borrow areas, permanent ditch/irrigation and drainage facility relocations, temporary construction areas, and temporary staging areas. The non-Federal sponsor will acquire adjacent land for relocation of infrastructure from the flood control corridor and planned improvements outside the flood control corridor, with appropriate easements provided to utility owners upon completion of the work. To meet its project footprint needs, the non-Federal Sponsor must acquire fee title to fish and wildlife mitigation lands, if applicable, permanent easements for levees, walls, and other permanent structures, flowage areas, waterway improvements, spoil and borrow areas required for future maintenance work, and right-of-way relocation of public highways and public utilities. Permits or temporary easements for excavated material or borrow areas are required during construction.

Finally, the plan requires relocations of many government and public owned utilities (City, County, etc.) in the study area. Other relocations include residential and nonresidential structures to accommodate the expanded project footprint along Reach 5 and Reach 6.

6.6 PLAN ECONOMICS AND COST SHARING

The estimated first costs, along with total annual costs, annual benefits, net economic benefits and the benefits-to-cost ratios are shown in **Table 6-1** and **Table 6-2.** Project cost apportionment is presented in **Table 6-3**. These values are based on October 2016 price levels, an interest rate of 2.875% and a 50-year period of economic analysis, assuming initiation of Corps construction in FY 2019.

Table 6-1: Economic Analysis of the Tentatively Selected Plan (October 2016 price level, 50-year Period of Analysis, 2.875% discount rate, in $1,000s)

MCACES Account	Construction Item	GRR Recommended Plan[1]
1	Lands and Damages[2]	46,124
2	Relocations[2]	63,306
6	Fish & Wildlife Facilities[3]	0
11	Levees & Floodwalls	74,018
16	Bank Stabilization	3,116
18	Cultural Resources Preservation	0
	Subtotal	**186,564**
30	Planning Engineering & Design	38,628
31	Construction Management	20,364
	Total First Cost	245,556
	Associated Costs	
	Total Costs	**245,556**

[1]Costs are in October 2016 (FY17) price levels at 2.875 percent and 50-year period of analysis; project cost Estimate from SPN, September 2017.
[2]LERRDs cost estimates have been updated and are currently estimated at a total of $84.3M per refinements to current project footprint as a result of the economic optimization analysis. The LERRDs cost estimate for the Final Integrated GRR/EA will be updated accordingly.
[3]The project has been designed to be self-mitigating through incorporation of setback levees and no additional compensatory mitigation costs are anticipated.

Table 6-2: Annual Costs and Benefits of the Tentatively Selected Plan (October 2016 price level, 50-year Period of Analysis, 2.875% discount rate, in $1,000s)

Item	TSP Plan[1] ($1,000s)
First Cost	245,556
Interest During Construction (IDC)	2,726
Total	248,282
Interest and Amortization	9,422
OMRR&R	200
Subtotal	9,622
Monetary Benefits (FRM)	17,985
Net Annual FRM Benefits	8,363
FRM Benefit-Cost Ratio	1.9

[1]Costs are in October 2016 (FY17) price levels at 2.875 percent and 50-year period of analysis; project cost Estimate from SPN, September 2017.

Table 6-3: Preliminary Cost-Share Apportionment for Tentatively Selected Plan[1]

ACT	ITEM	FEDERAL	NON-FEDERAL	TOTAL
1	Lands and Damages[2]		46,124	46,124
2	Relocations[2]	-	63,306	63,306
6	Fish and Wildlife Facilities[3]	-	-	-
11	Levees and Floodwalls	74.018	-	74,018
16	Bank Stabilization	3,116		3,116
18	Cultural Resources	-		-
30	PED	38,628		38,628
31	Construction Management	20,364		20,364
	Subtotal First Cost	136,126	109,430	245,556
	Non-Federal 5% Cash Contribution	-12,278	12,278	
	Total First Cost	123,848	121,708	245,556
	Cost Share % of Total First Cost	50.4%	49.6%	

[1]Costs are in October 2016 (FY17) price levels at 2.875 percent and 50-year period of analysis; project cost Estimate from SPN, September 2017.
[2]LERRDs cost estimates have been updated and are currently estimated at a total of $84.3M per refinements to current project footprint as a result of the economic optimization analysis. The LERRDs cost estimate for the Final Integrated GRR/EA will be updated accordingly.
[3]The project has been designed to be self-mitigating through incorporation of setback levees and no additional compensatory mitigation costs are anticipated.

6.7 RISK AND UNCERTAINTY

In general, the ability of the plan to provide the expected project outputs and level of performance depends on the following: the validity of pertinent assumptions, base data, and analytical techniques used in this study; the successful completion of future studies, designs, and construction; and appropriate OMRR&R after construction.

With the TSP in place, the project area improves from an approximate 8% annual chance of flooding on the mainstem to less than 1% annual chance of flooding, and from a 42% annual chance of flooding on the tributaries to a 1% and 4% annual chance of flooding on the right and left banks, respectively. Further information about specific annual exceedance probabilities and the performance of levees for a range of hydrologic events within sub-impact areas can be found in the Economic Appendix.

6.8 RESIDUAL RISK

The recommended plan would substantially lessen the probability of an uncontrolled flood in the study area due to levee failure. After implementation of the recommended plan, the project area will, however, have a remaining risk of flooding due to the chance of overtopping from a flood event that exceeds the design event. Depending on the size of the flood event the flooding depth in portions of the project area could be greater than 3 feet above ground elevation, with some areas having flood depths up to 6 feet. The duration of the flooding is likely to be a few weeks after the water levels in the river have receded. Large amounts of pumping would be needed to remove flood waters from the basins. The average expected residential and public displacement times are 6 months. Residential evacuees could total up to 5,000 citizens. During a large flood, residents of the affected area either self-evacuate or are assisted. During the flood and in its immediate aftermath, many of these displaced residents would have to stay at shelters. Rivers can rise from low flow levels to damaging floods within one to three days. The average annual residual damages in the project area are presently estimated to be $13,548,000 per year. Following is a discussion of further actions being taken to address residual risk.

6.9 EXECUTIVE ORDER 11988

Executive Order 11988 requires Federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of natural flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities."

The Water Resources Council Floodplain Management Guidelines for implementation of EO 11988, as referenced in ER 1165-2-26, require an eight-step process that agencies should carry out as part of their decision-making on projects that have potential impacts to or within

the floodplain. The eight steps reflect the decision-making process required in Section 2(a) of the EO 11988. The eight steps and responses to them are summarized below.

1. **Determine if the proposed action is in the base flood plain.**

Yes, the proposed project involves improving levees located in the base 1% (1/100) ACE floodplain.

2. **If the action is in the base flood plain, identify and evaluate practicable alternatives to the action or to location of the action in the base flood plain.**

Strengthening and/or rebuilding of the existing system of levees is the only practicable alternative and the first increment to address flood risk management within the project area.

Several alternatives outside of the urban area were evaluated. Diversion of flood flows into upper basin reservoirs and lakes was considered and was not retained because it was determined that the alternative would only address limited volumes of water and it was not economically feasible. Increasing the storage of College Lake was not retained because it was found to be hydraulically ineffective.

Detailed analyses were performed for the project-level alternatives and have found the proposed action to be the only practicable alternative that achieves the objectives of the project. Construction of the proposed project will remove hundreds of commercial, institutional, and residential structures, and transportation facilities and approximately 12,600 residents out of the base floodplain.

3. **If the action must be in the flood plain, advise the general public in the affected area and obtain their views and comments.**

Public involvement activities undertaken are described in Chapter 7, Consultation and Coordination of the EIS/EIR. Notices required under NEPA have been mailed to affected property owners throughout the Pajaro River Project environmental review process, soliciting input on the content of the environmental document and noticing various public meetings. Additionally, notices have also been posted in the local Watsonville newspaper, Register Pajaronian and the City of Watsonville, Santa Cruz County, and Monterey County websites announcing various public meetings. Public comments received on the NOI/NOP were considered and addressed, where appropriate in the DEA; public comments received on the DEA and draft finding of no significant impact (FONSI) will be addressed in the FEA; and public comments received on the FEA will be considered and addressed in determining whether to sign a FONSI or prepare an environmental impact statement.

4. **Identify beneficial and adverse impacts due to the action and any expected losses of natural and beneficial flood plain values. Where actions proposed to be located outside the base flood plain will affect the base flood plain, impacts resulting from these actions should also be identified.**

Potential impacts associated with the Pajaro River are identified in Chapter 4, "Environmental Consequences and Mitigation Measures," of the integrated GRR/EA. Construction of in-place levee improvements and vegetation removal would result in loss of vegetation and wildlife habitat along the project levees where the in-place improvements occur. Setting back the levees along long portions in parts of the Pajaro River and the Tributaries would reduce the need to remove vegetation in those areas.

The Recommended Plan includes construction of setback levees along portions of both the Pajaro River and the Tributaries which would reconnect approximately 90 acres of the floodplain to seasonal inundation and restore and preserve the natural and beneficial values of the base flood plain. Improvements to the levee systems would not affect the base floodplain.

5. If the action is likely to induce development in the base flood plain, determine if a practicable non-flood plain alternative for the development exists.

Strengthening of the existing system of levees, including setback levees, is the only practicable alternative and first increment to address flood risk management within the Pajaro River project area.

Within the project area, population growth and urban development are driven by local, regional, and national economic conditions. Local land use decisions within the incorporated area are within the jurisdiction of Santa Cruz County and the City of Watsonville, and Monterey County.

Due to soil and climate conditions agriculture is the largest, most valuable industry in Monterey County and one of the most valuable industries in Santa Cruz County. Both of the counties are committed to maintenance of their agricultural heritage.

The Santa Cruz County General plan includes natural and agricultural resource protection policies, as well as policies designed to maintain the rural character of that portion of the county located outside of the "Urban Services Line" (Santa Cruz County 1994) and includes the following objectives and policy:

General Plan Objective 5.13. Commercial Agricultural Land. (LCP to maintain for exclusive agricultural use those lands identified on the County Agricultural resources Maps as best suited to the commercial production of food, fiber, and ornamental crops and livestock, and to prevent conversion of commercial agricultural land to non-agricultural uses. To recognize that agriculture is a priority land use and to resolve policy conflicts in favor of promoting agricultural on designated commercial agricultural lands.

Policy 5.13.5. Principal permitted uses on Commercial Agriculture (CA) zoned lands. Maintain a Commercial Agricultural (CA) Zone District for application to commercial agricultural lands that are intended to be maintained exclusively for long term commercial agricultural use. Allow principal permitted uses in the CA zone district to include only

agricultural pursuits for the commercial cultivation of plant crops, including food, flower and fiber crops and raising of animals including grazing and livestock production.

The City of Watsonville has adopted a general plan, consistent with state law, which provides an overall framework for growth and development within the project area. The City of Watsonville General Plan includes the following implementation measure for agricultural land protection applicable to this project.

Implementation 2.2.5. Establishment of an agricultural and Open Space Buffer. The City shall maintain a buffer policy to protect agricultural and environmental resources from urban encroachment.

The Monterey County General Plan and Land Use Plan seeks to preserve agricultural land in the County and includes goals and objectives for agricultural land protection. The following goals and policies are applicable to this project.

Goal AG-1. Promote the long term protection, conservation, and enhancement of productive and potentially productive agricultural land.

Policy AG-1.8. Development projects on lands dedicated for agricultural use that require a discretionary permit shall be referred to the County's Agricultural Advisory Committee for their review and recommendation to the decision making body.

Policy AG-1.12. States in part that "the county shall prepare, adopt, and implement a program that requires projects involving a change in land use designation resulting in the loss of Important Farmland (as mapped by the California Department of Conservation Farmland Mapping and Monitoring Program) to mitigate the loss of that acreage."

Using the above information, it was concluded that there is substantial evidence that the recommended plan as a whole would accommodate anticipated growth in the project area in a manner that would be consistent with adopted local and regional growth management plans. Thus, the project, is not growth inducing itself and is compliant with EO 11988.

6. As part of the planning process under the Principles and Guidelines, determine viable methods to minimize any adverse impacts of the action including any likely induced development for which there is no practicable alternative and methods to restore and preserve the natural and beneficial flood plain values. This should include reevaluation of the "no action" alternative.

There is no practicable alternative other than the strengthening of the existing system of levees to reduce flood risk to existing residents in the project area.
Construction of in-place levee improvements and vegetation removal would result in loss of vegetation and wildlife habitat along the Pajaro River and Tributaries. Setting back the levees would reduce the need to remove vegetation along the stream channel in the areas where setback levees are proposed on the Pajaro River and Tributaries.

The Recommended Plan includes construction of a setback levee along both the Pajaro River and Tributaries which would reconnect about 91 acres of the floodplain to seasonal inundation. The setback levees would restore some of the natural and beneficial floodplain values.

7. If the final determination is made that no practicable alternative exists to locating the action in the flood plain, advise the general public in the affected area of the findings.

See response to Item 3, above.

8. Recommend the plan most responsive to the planning objectives established by the study and consistent with the requirements of the Executive Order.

The objective of the project is to reduce the risks associated with flooding to public health, safety, and property in the project area. The project is responsive to the EO 11988 objective of "avoidance, to the extent possible, of long-and short-term adverse impacts associated with the occupancy and modification of the base flood plain and the avoidance of direct and indirect support of development in the base flood plain wherever there is a practicable the impacts of floods on human safety, health, and welfare. Based on the Santa Cruz County, Monterey County, and City of Watsonville General Plans, agricultural land in the project area and within the FEMA 100-year floodplain that will have flood risk reduction as a result of the proposed project, are designated for continued agricultural use. The recommended plan, with the setback levees along portions of both the Pajaro River and the Tributaries, would improve the natural and beneficial values of the base floodplain in the setback areas.

6.10 ENVIRONMENTAL OPERATING PRINCIPLES

The Recommended Plan supports each of the seven USACE Environmental Operating Principles (EOPs). The re-energized Environmental Operating Principles are:

1. Foster sustainability as a way of life throughout the organization.
2. Proactively consider environmental consequences of all Corps activities and act accordingly.
3. Create mutually supporting economic and environmentally sustainable solutions.
4. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
5. Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
6. Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.
7. Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

The environmental operating principles are met in the following ways:

Environmental balance and sustainability (EOP 1, 2, 3 &4)

- Project avoids or minimizes environmental impacts while maximizing future safety and economic benefits to the community

Planning with the environment (EOP 1, 2, 4, and 5)

- Worked with local resource agencies during planning phase to minimize impacts to the environment

Integrate scientific, economic and social knowledge base (EOP 6)

- Report will be updated based on Public Reviews

Seeks Public input and Comment (Win-win solutions) (EOP 7)

- Held stakeholder meetings and public workshops throughout the process

6.11 CAMPAIGN PLAN

The mission of the U.S. Army Corps of Engineers is to provide vital public engineering services in peace and war to strengthen the Nation's security, energize the economy and reduce risks from disasters. In order to meet this mission, the agency has developed the USACE Campaign Plan (FY13-18) as a component of the corporate strategic management process to establish priorities, focus on the transformation initiatives, measure and guide progress and adapt to the needs of the future. The goals and supporting objectives of the Campaign Plan are:

Goal 1 – Support National Security

Objective 1a – Support Combatant Commands and other U.S. government agencies

Objective 1b – Partner with Installation Management Communities

Objective 1c – Achieve National/Army energy security and sustainability goals Objective 1d – Support the Engineer Regiment

Goal 2 - Transform Civil Works

Objective 2a – Modernize the Civil Works project planning program and process

Objective 2b – Enhance Civil Works budget development with a systems Watershed – Informed approach

Objective 2c – Deliver quality solutions and services

Objective 2d – Deliver reliable, resilient and sustainable infrastructure systems

Goal 3 - Reduce Disaster Risk

Objective 3a – Enhance interagency disaster response and risk reduction capabilities

Objective 3b - Enhance interagency disaster recovery capabilities

Objective 3c - Enhance interagency disaster mitigation capabilities Objective 3d – Strengthen Domestic Interagency Support

Goal 4 - Prepare for Tomorrow

Objective 4a – Maintain and advance DoD and Army critical enabling technologies

Objective 4b – Build trust and understanding with strategic engagement, communication, and cyber- security

Objective 4c – Streamline USACE business, acquisition and governance processes

Objective 4d – Build ready and resilient people and teams through talent management / leader development

The Pajaro River FRM Study has been responsive to these goals and objectives by:

Deliver reliable, resilient and sustainable infrastructure systems:

- Designing a project which avoids or minimizes environmental impacts while maximizing future safety and economic benefits to the community
- The TSP allows for expanded floodplain flooding in the setback area.

Deliver quality solutions and services:

- Designing a project which avoids or minimizes environmental impacts utilizing setback levees while reducing flood risk and reducing the residual flood risk for public safety of the project area

Build trust and understanding with strategic engagement, communication, and cyber-security:

- The Feasibility Study team organized and participated in stakeholder meetings and public workshops throughout the process and worked with local groups to achieve a balance of project goals and public concerns.

Build ready and resilient people and teams through talent management / leader development:

- The study successfully employed the use of District Quality Control (DQC), Agency Technical Review (ATR), and Risk Analysis, to assist in the review of the development of a technically sound recommendation of Federal Interest.

6.12 PLAN IMPLEMENTATION

Completion of the following steps would lead to project implementation.

6.12.1 Report Completion

The draft Integrated Report will be released for Public Review on 31 October 2017. Public, Agency Technical, and Policy Review will then be conducted. The Public review period will extend for 30 days, 30 November 2017. The team will then respond to all of the comments. An Agency Decision Milestone conference to receive agency endorsement of the TSP will occur in January 2018. The TSP will then become the recommended plan. Following the ADM the team will prepare a feasibility level design of the recommended plan, which will be presented in the Final Integrated Document, scheduled for release in May 2018.

6.12.2 Report Approval

Approval of the report will occur, depending on the results of the Authorities Analysis, either through a Directors Report, where the USACE Director of Civil Works will approve the project if it's within the 1966 Project Authorization, or through a Chief's Report, if the project requires new authorization.

6.12.3 Project Authorization and Construction

If the project is approved through the Director's Report the project is considered authorized and will be eligible for construction funding as part of the budgetary process.

If the project is approved through a Chief's Report, the project will need to be authorized through a Water Resources and Development Act (WRDA) or other congressional authorization. Once the project is authorized it will be eligible for construction funding as part of the budgetary process.

6.12.4 Division of Responsibilities

After authorization, the project would be eligible for construction funding. The project would be considered for inclusion in the President's budget based on: national priorities, magnitude of the Federal commitment, economic and environmental feasibility, level of local support, willingness of the non-Federal sponsor to fund its share of the project cost, and budget constraints that may exist at the time of funding. Once Congress appropriates Federal construction funds, the USACE and the non-Federal sponsors would enter into a project partnership agreement (PPA). This agreement would define the Federal and non-Federal responsibilities for implementing, operating and maintaining the project.

USACE would officially request the non-Federal partner to acquire the necessary real estate immediately after the signing of the PPA. The advertisement of the first construction contract by USACE would follow the certification of the real estate. The non-Federal sponsor would become responsible for the project following the delivery of the O&M manual and as-built drawings.

6.13 SCHEDULE

The estimated schedule for project implementation is shown in the **Table 6-4**:

Table 6-4: Implementation Schedule

Item	Completion Date
Plans and Specifications for First Contract Complete	2019
PPA Signed	2020
Real Estate Acquisitions Completed for First Contract	2021
Advertise First Construction Contract	2021
Completion of All Construction	2025

7.0 PREPARERS

USACE San Francisco District (lead District), USACE Sacramento District, County of Santa Cruz, Monterey County Water Resources Agency, and the City of Watsonville participated in the development of this draft GRR/EA. Contributing personnel are identified in **Table 7-1**.

Table 7-1: Personnel Directly Involved in Preparing this GRR/EA.

U.S. Army Corps of Engineers, San Francisco District	
Jessica Burton Evans	NEPA and Environmental Compliance Review
Chris Eng	Senior Environmental Manager, Pajaro River Project
Rita Foti	Cost Engineer
Ricardo Galdamez	Engineering Technical Lead
James Howells, Jr.	Plan Formulation
Tom Kendall	Planning Chief
Jaime O'Halloran	Project Manager
James Zoulas	GIS
U.S. Army Corps of Engineers, Sacramento District	
Mariah Brumbaun	Traffic and Circulation
Patty Goodman	Special Status Species
Victoria Hermanson	Aesthetics, Vegetation and Wildlife
Gene Maak	Hydrology and Hydraulics
Andrew Muha	Lead Planner
Patrick O'Day	Cultural Resources/Section 106
Timi Shimabukuro	Economics, Other Social Effects
Tanis Toland	NEPA Manager
County of Santa Cruz	
Mark Strudley	Flood Control Program Manager (Dept of Public Works)
Todd Sexauer	Environmental Planner
Riley Gerbrandt	Civil Engineer
Monterey County Water Resources Agency	
David E. Chardavoyne	General Manager
Manual Quezada	Senior Water Resources Engineer
Mark Foxworthy	Associate Water Resources Engineer
City of Watsonville	
Steve Palmisano	Director of Public Works and Utilities

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