US Army Corps of Engineers ®
San Francisco District

PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT
SANTA CRUZ AND MONTEREY COUNTIES
CALIFORNIA

PUBLIC COMMENTS
APPENDIX H OCTOBER 2018

Appendix H
Comments Received on the Draft Integrated GRR/EA – Federal Agencies

Comment #	Comment	Response
National Marine Fisheries Service		
011-1	The Draft ORR/EA Alternative 3 includes the CMZ design concept. NMFS is pleased to see the levee setbacks of various proposed widths have been incorporated into the design alternatives, including the TSP. NMFS is also pleased that the CMZ recommendation was integrated as a final alternative and evaluated for consideration. However, the GRR/EA does not clearly identify why this alternative was not evaluated based on a larger suite of possible objectives for regionally important issues.	We thank NMFS for the valuable comments. The Pajaro River study is a single purpose flood risk management study. Therefore, the CMZ alternatives were evaluated utilizing FRM benefits and costs associated with levee construction, as required for single purpose flood risk management studies (please see Flood Control Act of 1936, as amended; Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (1983); and, the USACE Planning Guidance Notebook (ER 1105-2-100)). USACE must recommend the National Economic Development (NED) alternative. This is the alternative that "reasonably maximizes net benefits consistent with protecting the Nation's environment." The CMZ alternatives were not the most cost effective, in part because of RE costs associated with additional land acquisition. The net benefits associated with Mainstem Alternative 1 and Tributary Alternative 6 were greater than for the CMZ Alternatives. Maintenance of the larger setback area is also a concern. The O&M costs are currently being re-evaluated.
011-2	• Page 66: The text in Table 3-1 is not fully displayed.	Concur - The table will be corrected for the final report
011-3	• Page 69: Section 3.4 Optimization and Incremental Analysis of Alternatives: The project cost and net benefit analysis for the alternatives do not consider all of the short term and long-term benefits. The analysis overlooked several potential benefits to regional water supply, water quality protection, and recreational lands. While slightly more expensive (according to the document), Mainstem Alternative 3, which included the CMZ levee design, would limit levee length but maximize space for flood attenuation and groundwater recharge, and would also provide an opportunity for larger areas to be dedicated as open space or parks. The	See response to comment 011-1. The higher cost of Alternative 3 in comparison with Alternative 4 is primarily related to the additional real estate costs associated with the larger setback. Table 3-5 of the Final GRR/EA shows a comparison of Alternatives 1, 2, 3 and 4, including the benefit-cost ratio for each.

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	GRR/EA does not provide estimates of levee length and the proportion set-back distances for each reach and alternative. This information plays a significant role in the construction and other costs associated with the project and the ability of their ability to meet a wide variety of objectives. For example, the description of Mainstem Alternative 3 on Page 58 notes benefits of this alternative would be reduced levee length as well as operations and maintenance and construction costs. By comparison of Figures 3-3 and 3-4, Alternative 4 appears to have more (i.e., longer) levee proposed than Alternative 3, however, the costs for Alternative 3 are higher in Table 3-2 and 3-4. It is not clear from the document why this is the case.	
011-4	• Page 75: The end of the second paragraph indicates right bank levee improvements for agricultural lands upstream of the confluence was not economically justified. What factors were considered in making this determination? We believe the analysis should consider the economic benefits of the CMZ design alternative (Alternative 3), which include: permanent increased flood protection to some of the surrounding agricultural lands, aquifer recharge and water quality improvement, expansion of riparian floodplain habitat, and creation of local open space along the Pajaro River.	Because the purpose of the Pajaro River study is flood risk management, the economic justification is based on USACE policy for single purpose FRM studies. FRM benefits (economic value of avoided damages) and costs associated with levee construction. The CMZ alternatives were not the most cost effective, in part because of RE costs associated with additional land acquisition. The recommended plan, with setback levees in several reaches, ranging from 100-225 feet, will provide areas for aquifer recharge, expansion of floodplain habitat, and creation of local open space.
011-5	• Page 111: Physical Environment: Regarding the description of the Pajaro River within the action area, the paragraph states ((Riparian vegetation is very limited and generally consists f smaller plants, although a few mature trees are present." This contradicts the descriptions of reaches 2, 3, and 4 on Page 91: o Reach 2-"Thick native vegetation is found along the banks of the river as well as within a remnant oxbow currently disconnected from the river." o Reach 3 -"Thick native vegetation grows along the banks of the Pajaro River and large trees grow intermittently along the exterior bank of the levee." o Reach 4 -"Thick native vegetation along the banks of the Pajaro River form a meandering line of green through the agricultural fields.”	Agree. Section 4.3, Aesthetics, Reach 2, has been revised to read as follows: "Thick native vegetation is found in the bottom of the river channel as well as within a remnant of an oxbow currently disconnected from the river. A few scattered trees grow on the channel banks." Descriptions for Reaches 3 and 4 have been similarly revised. Section 4.6, Aquatic Resources, has been revised to read: "Riparian vegetation is very limited and generally consists of thickets of smaller trees and shrubs in the bottom of the channel with a few scattered mature trees on the channel banks."

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`011-6	• Page 116: Two project activities (Culvert Construction and Weir Construction) are introduced and briefly described here, but are not described more fully elsewhere in the GRR/EA, or the Biological Assessment. The proposed replacement weir at the exit of College Lake is of particular importance to NMFS because of the current adverse impact the existing facility has on fish passage and migration success.	
011-7	• Page 133: The last paragraph identified that Mainstem Alternative 3 would provide the greatest potential for groundwater recharge, yet this important benefit to regionally significant issues (i.e., water supply and seawater intrusion) seems largely ignored or under evaluated in the project costs and net benefits analysis (see comment referring to page 69 above).	The Pajaro River study is a single purpose flood risk management study. The CMZ alternative was evaluated utilizing FRM benefits and costs associated with levee construction. The CMZ alternatives were not the most cost effective, in part because of RE costs associated with additional land acquisition.
011-8	• Page 134 and 135: Tables 4.9-1 and 4.9-2 indicate there is zero acreage identified as Open Space or Other (parks, resource conservation areas, or public facilities) along reaches 2, 3, and 4 of the Pajaro River. Mainstem Alternative 3 would provide an opportunity to meet the necessary flood risk management objectives and would also contribute opportunities for permanent open space and park lands.	Thank you for your comment. Alternatives 1, 3, 4, TSP, and Recommended Plan all include setback levees that would increase open space in Reaches 2 and 3.
011-9	• Provide representative cross-section profiles and designs for each reach. Cross-section profiles should illustrate the range of anticipated levee setback widths (i.e., 100 to 225 feet) identified for the various reaches, placement of rock slope protection (RSP) and anticipated land cover communities and vegetation types (i.e., riparian forest, scrub-shrub, or upland communities) within levee setbacks.	For representative cross-sections for each reach please see the Civil Engineering Appendix (Appendix D).
011-10	• Provide estimates of the percentage of each reach where levees will be setback to various distances. For example, identify the percentage of Reach 5 that will have levee setbacks at 100 feet and 225 feet. Also, provide the area of new floodplain created within each reach by the levee setbacks.	This information is available in the Civil Engineering Appendix (Appendix B) in Tables 3-1 and 3-2 "RECOMMENDED PLAN AREA DETAILS." Please refer to the appendix.
011-11	• If available, provide estimates of the expected floodplain inundation frequency and duration on newly created floodplain areas for each reach under different stream flow return intervals (e.g., 1, 10, 25, 50 percent return flows).	Thank you for the recommendation. Through construction of setback levees and demolition of the associated existing levees, the RP would establish 77.3 acres of reconnected floodplain and associated habitat. On the Pajaro River mainstem, this floodplain is activated at the 20% AEP (1/5

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		ACE). From the start to finish, water would be on the floodplain about 18 hours. For the Salsipuedes setback, floodplain activation starts at the 50% AEP (1/2 ACE). Water would be on the floodplain for about 23 hours. This information is located in section 6.1 of the Final Report. Floodplains for the 1, 10, 25, and 50 percent return flows are available in the Hydraulic Appendix.
011-12	• Describe the proposed design plan for RSP placement and concealment. o Will RSP be covered with a protective liner and topsoil which will be planted with vegetation? o Confirm RSP is not proposed, nor will it occur, in the tributary reaches of the TSP (i.e., Alternative 6).	Riprap will be placed over a protective liner and the voids within the riprap will be filled with soil. Additionally, a 4" layer of top soil will be placed on top of the riprap for vegetation planting. No riprap is planned in the tributary reaches of the Recommended Plan.
011-13	• NMFS strongly encourages the Corps to include floodplain habitat complexity features into the final designs to provide high flow refuge and topographic heterogeneity that will facilitate a mosaic of natural vegetation community recruitment post project completion. With this recommendation, NMFS strongly encourages the Corps and non-federal partners to coordinate with NMFS staff on the development of these design elements.	We appreciate the recommendation. If the project is approved and funded, USACE will continue to coordinate and consult with NMFS as detailed designs are developed.
011-14	• Describe the scope of future operation and maintenance activities for the project and any anticipated effects of such activities on steelhead and their designated critical habitat. An analysis of the effects of the operations and maintenance will need to be included in section 7 consultation with NMFS.	General assumptions for the No Action Alternative operation and maintenance are described in Section 4.1.5. The effects of operation and maintenance activities are generally discussed for each resource, as appropriate, in the sections titled “Environmental Consequences – Action Alternatives.” If the project is approved and funded, the Operation, Maintenance, Repair, Replacement and Rehabilitation Manual would be amended. Criteria for operating and maintaining the project would be developed during PED. For federally listed species and designated critical habitat occurring in the project area, consultation with the NMFS and USFWS will include operation and maintenance.

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011-15	• The construction of levees along the Pajaro River and its tributaries by the Corps (since 1949) and other non-federal entities has contributed to the decline in the quality and function of habitat for steelhead in the Pajaro River watershed. As compensation for these irretrievable losses, and to better understand the population status and annual return estimates of adult steelhead to the Corralitos Creek watershed, NMFS recommends the Corps work with the non-federal sponsors to fund, install, and operate a steelhead counting system in the Corralitos Creek watershed. Locations for the system may include the City of Watsonville's surface water diversion and fish ladder structures on Corralitos Creek and Browns Valley Creek. The fish counting systems may include installation of camera counting stations (e.g., Vaki Riverwater) within the fish ladders and/or the implementation of a Passive Integrated Transponder tag (PIT-tag) program with fixed antenna stations to track the movements of both juvenile and returning adult steelhead. In addition to providing annual abundance estimates, fish counting programs also provide opportunities to determine correlations between run timing and environmental conditions including stream flow and water temperature, which collectively would be used to inform population recovery. Although a minor additional cost to the larger project, funding and implementation of a counting program by the Corps and/or non-federal sponsors would demonstrate continued commitment towards documenting steelhead status and progress towards recovery.”	Thank you for your recommendation. As part of this General Reevaluation study, compensatory mitigation may include only those feasible measures that are required to off-set effects of implementing the proposed project. The recommended steelhead counting system, does not appear to be consistent with this requirement.
U.S. Fish and Wildlife Service		
012-1	Based on our review of information provided by the Corps, the Service believes that in regards to the proposed mainstem alternatives, Alternative 3 (Alternative 1plus 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 newberry*i), which may inhabit this area.	Thank you for your comment. USFWS' perspective on this alternatives have been noted in Section 5.2.1 of the Final Report. We are not aware of tidewater goby or suitable habitat for this species in the project area, which is located entirely upstream of Highway 1.
012-2	As stated in the information you 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	Thank you for your comment.

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	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.	
012-3	As such, the Service recommends that Alternative 3 be selected as the preferred mainstem alternative.	Thank you for your comment. The purpose of the Pajaro River study is flood risk management. The CMZ alternative was evaluated utilizing FRM benefits and costs associated with levee construction. The CMZ alternatives were not the most cost effective, in part because of RE costs associated with additional land acquisition. The recommended plan, with setback levees in several reaches, ranging from 100-225 feet, will provide areas for aquifer recharge, expansion of floodplain habitat, and creation of local open space.
012-4	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 Relocations Along Corralitos Left-Bank Alternative) similarly provide the greatest benefits to wildlife resources, specifically including the California red-legged frog, tidewater goby, and migratory birds.	Thank you for your comment. USFWS' perspective on these alternatives has been noted in Section 5.2.1 of the Final Report.
012-5	As stated above, the Service believes that 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.	Thank you for your comment. This perspective is included in Section 5.2.1 of the Final Report.
012-6	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.	Thank you for your comment. This perspective is included in Section 5.2.1.1 of the Final Report.
012-7	As such, the Service recommends that Alternative 7 or 8 be selected as the preferred tributary alternative.	Thank you for your comment. Please refer to our response to comment 012-3

Appendix H
Comments Received on the Draft Integrated GRR/EA – State Agencies

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California Coastal Commission, Central Coast District Office		
008-1	CCC Jurisdiction	Thank you for your comment.
008-2	CCC Jurisdiction	Thank you for your comment.
008-3	…recommend evaluating the feasibility of: 1) revegetating areas subject to construction and excavation activities (i.e., through the planting of a riparian herb layer)	Concur. Exposed disturbed soil will be seeded with a suitable mix of grasses and forbs.
008-4	…recommend evaluating the feasibility of…2) "softer" riprap revetments (i.e., through alternatives to strictly concrete or rock revetments, including vegetated riprap or other similar "soft armoring" efforts currently being explored in the Oxnard/Ventura areas along the Ventura River and Santa Clara River).	We appreciate your recommendation. Other alternatives for slope protection like soil-bioengineering could be considered during the PED phase of the project.
008-5	…the project should entail protection measures for any listed sensitive species, and …the Commission typically requires a 3:1 mitigation for any impacts to riparian habitat, and thus these components should be incorporated into the project."	Please see the mitigation measures identified in Sections 4.6.3, 4.14.3, 4.17.3, and 4.18.3 which include measures to avoid and minimize adverse effects on listed sensitive species. The Commission's typical requirement for 3:1 mitigation for any impacts to riparian habitat is noted. If the project is approved and funded additional field surveys would be conducted to refine the assessment of impacts on vegetation and waters of the united states.
California Department of Fish and Wildlife, Bay Delta Office		
009-1	Operation and Maintenance Implementation of the COE's levee vegetation removal policies could have a significant impact on riparian habitat. The draft GRR/EA states that operation and maintenance (O&M) activities would maintain levees and 15 feet either side of the levees permanently free of trees and shrubs. Stream temperatures are higher and habitat for wildlife species is lower in rivers and streams containing limited riparian vegetation. It is unclear how much existing riparian vegetation would be impacted as a result of proposed O&M activities.	Thank you for your comment. Throughout most of Reaches 2, 3, 4 and much of Reaches 5 and 6, no or little existing woody vegetation is present within the existing vegetation free zone. Except in Reach 3 and a portion of Reach 5, the proposed project would construct levees that are set back from the channel banks. Where an existing levee is replaced by a setback levee the old levee would not fall within the required vegetation free zone; however, some vegetation management on and adjacent to the old levee would be required to ensure that roughness remains within acceptable parameters. Where a federal flood risk management levee, floodwall or other structure is improved or constructed as part of this project, O&M would ensure that woody vegetation would not become established within the

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		required vegetation free zone. As noted in our response to comment 008-5, if the project is approved and funded additional field surveys would be completed to refine the assessment of impacts on vegetation and waters of the united states.
009-2	The draft GRR/EA does not describe other O&M activities; therefore, CDFW is unable to determine how O&M will affect special-status species at this time. CDFW recommends that the GRR/EA provide further details and explanations of O&M activities, specifically how vegetation and sediment will be managed within and adjacent to the levees and floodwalls.	Thank you for your concerns for how vegetation and sediment will be affected during O&M. Detailed descriptions of O&M will be available during the PED phase with the final O&M Manual updates and revisions completed during the Construction phase. This information is only conceptually described during the study phase. However, all refinements to the project, including development of O&M requirements, undergo NEPA review which may include, as appropriate, preparation and circulation of additional or supplemental NEPA documents.
009-3	Fish Passage CDFW supports the construction of culverts and weirs that meet National Marine Fisheries Service (NMFS) guidelines for salmonid passage requirements. The draft GRR/EA currently does not provide explanation if the Project will provide salmonid passage throughout the Project. CDFW recommends assessing salmonid passage throughout the Project within the next step of the design process to identify if the Project will cause any salmonid passage issues.	Culverts and weirs are not included in the Recommended Plan but are discussed during the Affected Environmental Consequences under section 4.14 in SSS2. Salmonid passage could be assessed during the PED phase of the project.
009-4	**Bank Protection Methods** While the draft GRR/EA explains the general footprint of the Project, the document does not provide specifics on Project design, specifically bank protection. CDFW recommends that the GRR/EA indicate the location, volume, and method of installation for riprap and other bank protection. In general, CDFW recommends that bioengineering techniques be used for bank protection where feasible, as these techniques would allow for habitat to develop as well as providing sufficient bank stabilization.	
009-5	**Foothill Yellow-Legged Frog** In section 4.6 .1 under aquatic species, the draft GRR/EA states that foothill yellow-legged frog (FYLF) is one of four species found in the Pajaro River that have a special-status federal or state endangered species listing. However, in section 4.14 FYLF is only discussed in Mitigation Measure SSS-4. CDFW recommends that the	Thank you for your recommendation. Section 4.6.1. has been revised to include a general discussion of FYLF. A new mitigation measure, Mitigation Measure AQUA 1 has been added to Section 4.6.3 and reference to FRLF has been removed from Section 4.14.3, since this section focuses on Federally listed species.

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	GRR/EA incorporate general information about FYLF and incorporation of additional Mitigation Measures for the species, similar to how steelhead is described within section 4.14.2.	
009-6	FYLF is currently a candidate species under the California Endangered Species Act, and an Incidental Take Permit from CDFW is required if "take" of FYLF is anticipated during project construction or project operation and maintenance. More information regarding CDFW's Incidental Take Permit can be found at https://www.wildlife .ca.gov/Conservation/CESA/ incidental-Take-Permits.	Thank you for your comment.
Central Coast Regional Water Quality Control Board		
010-1	We support efforts to reduce flood risk in the lower Pajaro River area and support many specific aspects of the Pajaro River Flood Risk Management Project (Project). However, based on our review of the GRR/IEA, we identified aspects of the Project that the Corps should improve to protect water quality and beneficial uses of the Pajaro River and its tributaries. Also, we identified aspects of the Project and GRR/IEA where additional analysis and information would facilitate our ability to offer our full project support.	Thank you for your support of these efforts. Please find below responses to specific comments.
010-2	For over 15 years, we have consistently provided input seeking increased application of avoidance, minimization, and mitigation practices to the Project in order to best achieve water quality and beneficial use protection. Examples of our efforts include letters dated February 10, 2003 and July 27, 2012; participation in a three-day charrette meeting on August 26-28, 2014; and participation in multiple resource agency meetings dating back to 2010. While we see evidence in the GRR/IEA that our input has been taken into consideration and appreciate that effort, we also find that practicable alternatives we have suggested to reduce impacts to water quality and beneficial uses have not been incorporated into the Project.	Thank you for your comment. The participation of the Central Coast Regional Water Quality Control Board, through attendance in meetings and discussions and through correspondence and comments, has been very important to the planning process and is appreciated.
010-3	In particular, we provided previous input regarding the following topics, as well as many others: the importance of river and riparian corridor width, channel complexity, functional floodplains, active channel dimensions, and channel length; the benefits of channel migration zone levees; the potential for flood walls to accelerate flood flows and increase scour; the	We appreciate the input provided by the regional board. The alternatives that included the CMZ levees were evaluated and were found to not be the most cost effective, in part because of increased RE acquisition costs. The recommended plan, which includes setback levees ranging from approximately 100-225 feet in portions of the project, will provide for increased river and riparian corridor

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	potential for tieback levees to shift flooding and prompt increased maintenance; and the benefits of minimization of channel maintenance.	width, channel complexity, and functional floodplains compared to the current system. The floodwalls along reach 3 of the mainstem and reach 5 of the tributaries are necessary due to the urban encroachment and limited options due to the lack of available space on the land side of the levee.
010-4	It appears that the process the Corps has used to select its preferred Project alternative (the Tentatively Selected Plan or TSP) may play a significant role in the Corps' ability to incorporate our suggested water quality and beneficial use protection measures into the Project. The TSP was apparently selected based on it being the Project alternative with the highest benefit-cost ratio. However, the cost-benefit analysis methods used to assess each alternative should be improved to provide a more complete and accurate assessment of Project costs and benefits. Based on our review of the Economic Appendix, it appears that the environmental costs and benefits of each alternative were not considered. In addition, the maintenance costs considered for each alternative are identical, though an alternative with channel zone migration levees will likely necessitate fewer maintenance activities and costs. A more thorough cost-benefit analysis that includes consideration of environmental costs and benefits of each alternative should be conducted, such as a triple bottom line cost benefit analysis. More detailed analysis of maintenance costs of each alternative should also be conducted.	Thank you for your comment. The Pajaro River Study project purpose is limited to Flood Risk Management. The Recommended Plan, with setback areas ranging from 100-225 feet in portions of the project area, will provide environmental benefits similar to the CMZ levees with the highest net benefits according to our economic analysis.
010-5	The manner in which the TSP was determined to be the least environmentally damaging practicable alternative (LEDPA) also likely plays a role in some of our input not being incorporated into the Project. The conclusion in Appendix E-5 stating that the TSP is the LEDPA is not well justified. Appendix E-5 does not include analysis of any of the Project alternatives other than the TSP. Apparently, the TSP is the only alternative that was considered because "it is the alternative that may be recommended under the regulations governing USACE water resources planning regulations […]" However, all of the alternatives achieve a benefit-cost ratio greater than unity (1:1), which we understand is the threshold ratio necessary for recommending that a project move forward. As such, each alternative is practicable.	The Pajaro River Flood Risk Management Study is limited toflood risk management. As per USACE policyAlternatives 1 and 6 were determined to be the National Economic Development (NED) plans, as they provided the most net benefits compared to the other alternatives. The goal of the NED or federal perspective is to identify "the alternative plan with the greatest net national economic benefit consistent with protecting the nation's environment (the NED plan). The Recommended Plan, with setback areas ranging from 100-225 feet in portions of the project area, will provide environmental benefits similar to the CMZ levees but at less cost

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	Moreover, the benefit-cost ratios for each alternative would likely change with a more thorough cost benefit analysis. The analysis to identify the LEDPA should include a more complete cost benefit analysis and consideration of all alternatives. In turn, following such an analysis, the LEDPA should dictate which alternative is selected as the TSP, rather than the other way around.	
010-6	While we find that the choices of the TSP and LEDPA need further assessment, we have reviewed the GRR/IEA impact and mitigation analysis in detail. In general, we find assessment of the TSP and GRR/IEA difficult because we understand the model used to design and select the Project is inaccurate, and therefore the final Project design and associated impacts are currently unknown. We request the opportunity to review the Project once it is further developed using correct and accurate modeling. In addition, we find that the GRR/IEA in many areas lacks a sufficient level of detail. Impact, mitigation, and maintenance discussions in particular are typically too brief and general to fully assess Project impacts to water quality and beneficial uses. Our comments below on specific sections of the GRR/IEA identify discussions we find to be too brief and general.	Thank you for your comment. Our responses to comments on specific sections are included below.
010-7	Ultimately our goal is to collaborate with the Corps so that we can write a letter in support of the Project. Our comments are provided to achieve that goal. Additional analysis and information that demonstrates Project avoidance, minimization, and mitigation of impacts to waters of the State and protection of water quality and beneficial uses will help us reach that end.	Thank you for your comment and willingness to collaborate with USACE on this study. We appreciate your input.
010-8	A. The level of detail in this section should be increased to describe impacts to hydrologic and hydraulic conditions more fully. For example, the GRR/IEA states that modifications to the levee system may alter channel hydraulics under high flow conditions, which may cause channel modifications that alter habitat, and that this is a key factor affecting aquatic resources. However, the GRR/IEA does not include further analysis or description of the ways in which levee modifications might alter the hydraulics and how the channel and habitat may be affected. The GRR/IEA should be augmented to provide a more detailed discussion of	Thank you for your recommendation. For additional details please see the technical appendixes, which were circulated as part of the Draft GRR/EA and which have been updated and are being circulated as part of the Final GRR/EA.

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	the expected changes in hydrologic and hydraulic conditions, as well as the resulting scope and magnitude of impacts to the channel, habitat, and water quality.	
010-9	A. The proposed mitigation appears unlikely to reduce hydrologic and hydraulic impacts to less than significant levels. For example, this section references the mitigation described in sections 4.11.3 and 4.18.3, which are mostly actions to be taken during construction. These sections do not provide mitigation for direct impacts to aquatic habitat following completion of construction. The GRR/IEA should be revised to include compensatory mitigation measures for any hydrologic and hydraulic impacts to aquatic habitat that may occur after construction is complete. If river conditions such as bank complexity, structural diversity of vegetation, and wildlife abundance and diversity are permanently impacted due to changes in hydrologic and hydraulic conditions, appropriate mitigation may include rebuilding bed and bank complexity (e.g., replacing features such as woody debris/rocks and restoring pre-project contours/benches) and replanting diverse and abundant vegetation.	Thank you for your comment. As required by NEPA, effects are evaluated in comparison with the No Action Alternative. Assumptions about the No Action Alternative are described in Section 4.1.5. Although the proposed project is a flood risk management project, it has been developed with consideration to concerns raised and suggestions offered by a wide range of stakeholders, including those with expertise in environmental sciences. It has been designed to promote, to the extent feasible, a more environmentally sustainable design than currently exists or than would exist under the No Action Alternative. Mitigation planning has focused on avoiding and minimizing significant adverse effects. Compensatory mitigation per se, is not proposed. The setback levees included in the recommended plan would reconnect portions of the floodplain to the Pajaro River and would, in constructing new levees along the tributaries, set them back where this is feasible given the proximity of developed urban infrastructure. Please see the response to comment 10-10 regarding proposed efforts to plant vegetation as part of the proposed action.
010-10	A. This section also references mitigation section 4.17.3, which lists management practices such as reseeding of disturbed areas with forbs and grasses. To mitigate impacts to disturbed areas to less than significant levels, the GRR/IEA should include active and robust in-kind revegetation that replaces lost habitat functions and features. Similarly, while section 4.18.3 states that disturbed areas will be revegetated, it does not specify how they will be revegetated. To ensure impacts are mitigated to less than significant levels, the GRR/IEA should describe revegetation that will occur and how it will mitigate impacts.	Thank you for your comment. The project has been designed to be self-mitigating. Replacement plantings of trees and shrubs that must be removed from the channel in order to construct and maintain some features of the project will not be replanted in the channel. However, the proposed project does include construction of setback levees and establishment of offset areas where floodplain is connected to the waterway. Open woodland and savannah habitat will be established in these offset floodplain areas. This is important native habitat that is largely missing from the current landscape in the project vicinity. If the project is approved and funded, additional design details, construction plans and specifications, and operation and maintenance requirements would be developed during the PED phase.

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010-11	A. The GRR/IEA states that modifications to the levee system may change areas of erosion and deposition, which would affect habitat conditions in the Project area. However, the GRR/IEA does not describe the scope or magnitude of the erosion and deposition changes. The GRR/IEA should be augmented to analyze and describe how the erosion and deposition changes will alter existing water quality and aquatic habitat of the river and tributaries.	Thank you for your comment. The GRR/EA provides the level of detail available for the General Reevaluation Study phase. If the project is approved and funded additional engineering and technical studies would be completed to inform development of the pre-construction engineering designs and the operation and maintenance requirements. As described in Section 4.1.4 of the GRR/EA, all design refinements and new information would be reviewed 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. In addition, outstanding environmental compliance requirements related to Clean Water Act and Endangered Species Act would be addressed during prior to initiating construction.
010-12	A complete assessment would include a fluvial geomorphologic assessment that describes the potential impacts of each proposed feature (levee, floodwall, setback levee, or similar) in each reach, including: i. The response of waterbody flow to adding these features in terms of potential resultant undercutting, erosion, or deposition to upstream, opposite, and/or downstream banks and bed; ii. The response of waterbody morphology to changes in flow velocity and channel capacity, cross section, length, and gradient; iii. Impacts on vegetation and aquatic habitat resulting from changes in river/tributary flow and morphology; and iv. Impacts at hardscape sites such as undercutting or erosion directly adjacent to the hardscape areas. In particular, potential changes to the following locations and features should be included in your assessment: i. agricultural land north of the reach 4 levee; ii. Existing levees and municipal infrastructure at the confluence of Salsipuedes Creek and the Pajaro River that are impinged in the area created by flood walls in reach 5 and 3; iii. The completion levee in reach 4; and iv. The meanders in reach 4.	Thank you for your comment. Please see our response to Comment 10-11.

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010-13	A. As with the mitigation for hydrologic and hydraulic impacts, this section also focuses on mitigation implementation during the construction phase. To mitigate impacts to less than significant levels, the GRR/IEA should identify mitigation measures to offset loss of aquatic habitat and functions due to erosion and deposition that is expected to occur following construction completion.	Thank you for your comment. Mitigation measures are identified for those operation and maintenance activities that are reasonably foreseeable at this time. If the project is approved and funded, additional operation and maintenance requirements for the plan that are approved would be developed and analyzed.NEPA documentation may then be supplemented, if needed. Additional measures to mitigate effects identified during that environmental review would be included in a supplemental NEPA document, if applicable, and/or in documentation required for other regulatory permits.
010-14	A. This section does not provide enough information regarding impacts to substrate. The GRR/IEA should describe changes to substrate due to erosion and deposition resulting from Project features.	See our response to Comment 10-11.
010-15	A. This section states that it is unlikely that the Project would have an effect on channel morphology or on the substrate composition of the lower Pajaro River, Corralitos Creek, or Salsipuedes Creek. However, in the Channel Erosion and Deposition section, the GRR/IEA states that levees may alter areas of erosion and deposition, elements that may change the substrate and contribute to the shape of the channel. The GRR/IEA should be clarified to address this apparent inconsistency.	Thank you for your comment. We were unable to locate the inconsistency that was of concern to the reviewer. Effects of the alternatives on aquatic resources were described in Section 4.6.2 of the draft and final GRR/EA. Effects related to geomorphology are discussed in Section 4.8.2 of both the draft and final GRR/EA.
010-16	A. As with the mitigation sections proposed for hydrologic and hydraulic impacts, mitigation proposed for substrate also focuses on mitigating impacts from construction activities. To mitigate impacts to less than significant levels, the GRR/IEA should identify mitigation that will offset changes to aquatic habitat and functions due to substrate impacts that may occur following construction completion.	Thank you for your comment. Please see our response to Comment 10-13.
010-17	A. The water temperature section states, “Maintenance practices within the riparian zone may affect water temperatures.” The GRR/IEA also states, “Habitat components that are affected by hydrologic and hydraulics conditions include temperature...” However, the GRR/IEA does not adequately describe the scope and magnitude of this impact. The GRR/IEA should describe how various waterbody conditions that may change due to the proposed Project (e.g., hydraulics, hydrologic conditions, riparian zone	Thank you for your comment. The GRR/EA provides an appropriate level of detail for the General Reevaluation Study phase. If the project is approved and funded additional engineering and technical studies would be completed to inform development of the pre-construction engineering designs, the operation and maintenance requirements, and specific environmental regulatory requirements.

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	conditions, and bed, bank and substrate) may have an impact on temperature.	
010-18	A. The proposed mitigation for the Aquatic Resources section does not include mitigation for water temperature impacts that will occur during or after construction. The GRR/IEA should include mitigation for reducing impacts to water temperature to less than significant levels.	Thank you for your comment. Stream temperature dynamics are complex, especially heat budgets. A number of natural factors influence temperature including geographic setting and climate, seasons, water sources, channel shape, and riparian shading. Human factors may also influence water temperature through removal of riparian vegetation, actions that cause streams to become shallower and wider, changing the substrate type, discharge from industry and urban storm water. The proposed project would create more space in the project reaches for both floodwaters and vegetation. The system is constrained, however, by the proximity of urban development and the nature of the flood flows that affect this region. Some mature trees with large shade-producing canopies will be removed. The project does not propose to mitigate for this loss per se, rather, the construction of setback levees with degradation of the existing levees to reconnect portions of the floodplain to the river is an integral part of the Recommended Plan. This floodplain habitat is of high value ecologically and is scarce in this part of the system. No additional mitigation is planned.
010-19	A. Additional detail is needed in this section of the GRR/IEA to identify and substantiate impacts resulting from levee setbacks. The GRR/IEA states: i. Setting back the levees would "affect the processes that create aquatic habitat while additionally allowing the expansion of riparian zones which could affect habitat availability and quality," ii. With "wider riparian zones, more natural channel processes would occur," and iii. This would provide more habitat complexity than currently exists. While the Project proposes to increase space in the river and tributaries, the GRR/IEA lacks enough detailed information to demonstrate that the Project will create more habitat complexity and value within the increased space. Additional information should be added to the GRR/IEA	Information provided is at an appropriate level of detail for the General Reevaluation study phase. If the project is approved and funded additional information will be developed to support development of detailed designs and additional operations information.

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	addressing this issue, since increased habitat in these areas is critical to reduction of impacts to less than significant levels.	
010-20	A. The GRR/IEA states that levee setbacks are central to mitigating Project impacts, and specifically states, "The project has been designed to be self-mitigating through incorporation of setback levees and no additional compensatory mitigation costs are anticipated." To demonstrate this mitigation is sufficient in offsetting impacts to a less than significant level, the GRR/IEA should include a thorough assessment of the proposed aquatic habitat condition in the areas to be gained through levee setbacks in comparison to the existing habitat conditions that will be impacted. For each reach (each section that changes in width from the previous section) in the setback areas, the GRR/IEA should include: i. A description and measure of the area gained once the current levees are removed not counting the 15-foot tree and shrub free zones. ii. A description of the characteristics of riparian habitat expected in the setback areas including: a. A measure of the area that will remain unvegetated due to typical expected scour, if any. b. A measure of the area that will be able to sustain mature vegetation and more complex bank features, if any. iii. A description of how the setback area will respond to erosion and deposition. In order to identify how much habitat is to be gained in the setback areas, an assessment of how these setback areas will respond to features that increase erosion and deposition is needed.	Thank you for your comment. Please see table 4.1-3 Comparison of Key Features for each Action Alternative and Table 4.17-1 Acres of Vegetation and Habitat Affected by Each Alternatives are included in both the draft and final GRR/EA. Chapter 6 Recommended Plan, Section 6.4 Mitigation of the final GRR/EA includes the following text: "Through construction of setback levees and demolition of the associated existing levees, the RP would establish 77.3 acres of reconnected floodplain and associated habitat. On the Pajaro River mainstem, this floodplain is activated at the 20% AEP (1/5 ACE). From the start to finish, water would be on the floodplain about 18 hours. For the Salsipuedes setback, floodplain activation starts at the 50% AEP (1/2 ACE). Water would be on the floodplain for about 23 hours. Scattered native trees and some shrubs will be established in these floodplain offset areas to develop open woodland and savanna habitats. Both riparian forest/woodland communities and floodplain woodland savanna habitats are scarce in the lower Pajaro River region and both are important to native wildlife. As with all projects where floodplain is reconnected, a reasonable amount of succession will need to take place in order to reestablish the riparian habitat consistent with the natural condition of the floodplain. If the project is approved and funded, additional site specific information will be developed to guide selection of the planting pallet and the planting, establishment, and maintenance plans. USACE and the NFS' will accomplish this in consultation with USFWS, NMFS, and the California DFW, and in coordination with the RWQCB and CCC."

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010-21	A. A description of how the current levees will be removed and how the riverbed beneath the current levees will be addressed should be added to the GRR/IEA.	Thank you for your comment. Please see the Civil Design Appendix. Additional information about how project construction may be accomplished would be developed during PED if the project is authorized and funded.
010-22	A. The GRR/IEA does not include adequate information describing the reaches within the proposed floodwall construction. This section should be augmented to clarify the design of the floodwall channel and its planned habitat condition. For example, it is unclear if the entire channel is proposed to be concrete. In addition, to adequately describe impacts associated with the floodwalls, the GRR/IEA should describe maintenance that will be conducted within the floodwall channels and type of habitat that will be sustained.	Thank you for your comment. Information provided in at an appropriate level of detail for the General Reevaluation Study. With regard to the floodwall channel, this measure is not included in the Recommended Plan and no additional analysis is planned for this element.
010-23	A. As with the mitigation proposed for other aquatic resource impacts, this section also focuses on mitigation implementation during the construction phase, but omits revegetation to mitigate removal of vegetation and other aquatic habitat features resulting from floodwall construction. The GRR/IEA should identify mitigation measures for permanent removal of aquatic habitat and functions due to the floodwall channel design that will reduce impacts to a less than significant level. The GRR/IEA should also identify mitigation for aquatic habitat losses expected to occur following construction completion such as temporal losses of aquatic habitat due to time necessary for establishment of a natural channel bottom and time necessary to recover from higher velocity floodwaters confined within floodwalls.	Thank you for your comment. In areas where floodwalls are proposed space is very constrained and revegetation with woody species adjacent to the floodwalls is not anticipated. The Recommended Plan includes new setback levees with an appropriate floodplain habitat reconnected to the river. This habitat is scarce in the area and has high ecological value. Where the comment discusses establishing a natural channel bottom, it seems to be focused on a floodwall with concrete channel measure which is not included in the Recommended Plan.
010-24	A. During the November 8, 2017 conference call with resource agencies, the Corps reported that the hydraulic model on which the Project is based has a significant error. The GRR/IEA should be revised upon completion of accurate modeling. Impacts and necessary mitigation cannot be accurately identified based on incorrect modeling.	Thank you for your comment. The hydraulic model has been updated and the results are reflected in the final GRR/EA, including the Hydraulics appendix.
010-25	A. Additional detail is needed in this section to identify geomorphological impacts. For example, the new floodwalls can increase high flow velocities and scour, potentially impeding steelhead migration. A new levee located only on the south side of reach 4 can exacerbate scour	Comment acknowledged. information provided is at an appropriate level of detail for the General Reevaluation Study. Additional information is available in the Hydraulics and Geotechnical Appendixes. If the project is approved and funded additional engineering and technical studies would be completed to inform

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	on the opposite bank. These geomorphological impacts and others should be identified and described in more detail.	development of the pre-construction engineering designs, the operation and maintenance requirements, and specific environmental regulatory requirements, including consultation with NMFS regarding the federally protected steelhead and its designated critical habitat.
010-26	A. The only proposed mitigation for the Hydrology, Hydraulics, Geomorphology section is for replacing water supply wells that will get covered by Project features. To mitigate impacts to less than significant levels, the GRR/IEA should identify mitigation measures to offset impacts to aquatic habitat and functions due to changes in geomorphology that is expected to occur following construction completion.	Thank you for your comment. The primary change that would result from implementing the Recommended Plan is associated with setting back levees and reconnecting the river with its floodplain. These features are intended to change to the geomorphology and to introduce more natural functions and processes to these reaches. No additional mitigation is believed to be required.
010-27	1. The detail in this section should be increased to better identify impacts to vegetation and wildlife. The GRR/IEA describes wildlife habitat in the Project area but does not adequately describe how the Project will impact vegetation and wildlife. The GRR/IEA should be augmented to describe impacts to vegetation and wildlife in terms of the following characteristics: A. Loss of nesting, roosting, and foraging sites in trees, shrubby vegetation, herbaceous vegetation, emergent vegetation, and wetlands; B. Impacts to features that are specific to particular wildlife species, for example, features that attract southwestern pond turtles for basking and egg laying; and C. Impacts to cover and forage for larger animals.	Thank you for your comment. See our response to Comment 10-11.
010-28	Flood walls and higher levees may cause increased velocity of river and tributary waters. The GRR/IEA should assess and identify the impacts of increased velocities to aquatic organisms, for example, their ability to find refuge and migrate, and which age classes/species may be most impacted.	Thank you for your comment. Please see the Hydraulics appendix which includes discussion of project effects on velocities. The minor changes in velocity magnitude and location are not expected to adversely affect aquatic organisms.
010-29	Based on Table 4.17-1 in the GRR/IEA, the TSP will result in loss of native vegetation including riparian habitat and potentially wetlands. The GRR/IEA should be revised to include a comprehensive impact and mitigation section that describes and quantifies impacts to each type of aquatic and riparian vegetation, quantifies mitigation for each type of impact, and describes how mitigation will reduce impacts to less than significant levels.	Thank you for your comment. The project is designed to be self-mitigating through the use of setback levees with off-set floodplain habitat. If the project is approved and funded, field surveys would be conducted during PED to identify and quantify vegetation that would be removed or altered by project implementation. The planting plan for the floodplain offset areas would also be developed during PED.

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010-30	The GRR/IEA states "Wetlands are not well captured with the GIS tools used in this analysis. Where present they may be included within water or grassland." The GRR/IEA should be revised to identify and describe all wetlands with the Project area that may be impacted.	Thank you for your comment. The project has been developed to avoid work in waters of the United States to the extent practicable. If the project is approved and funded a formal wetland delineation would be completed during PED.
010-31	Some of the mitigation in the vegetation and wildlife section describes reseeding disturbed areas. Depending on the habitat quality of the areas disturbed, reseeding may not be robust enough mitigation to reduce impacts to a less than significant level. The reseeding should be assessed in terms of mitigating impacts to habitat, and augmented where necessary to reduce those impacts to less than significant levels.	Thank you for your comment. Reseeding would be accomplished in consideration of the appropriate plants and seeding method for the specific site conditions. See also our response to Comment 010-33.
010-32	6. The GRR/IEA describes the Project as self-mitigating, but there is little analysis provided to support this determination. In order to support this position, the GRR/IEA should identify and quantify the Project impacts to aquatic and riparian habitat and compare them to the gains in aquatic and riparian habitat resulting from the Project. This analysis should include a reach-by-reach inventory, with detailed descriptions of lost habitat functions and demonstration of how those functions will be regained.	Thank you for your recommendation. Additional text related to the self-mitigating aspects of the RP has been added to Section 6.3.
010-33	7. To mitigate impacts to aquatic and riparian habitat to less than significant levels, mitigation should include planting the same or very similar species of vegetation to those impacted. Temporal losses should be decreased by planting vegetation that is close in size and function to the impacted vegetation, as opposed to planning for revegetation that begins from seed. To reduce the risks involved in trying to re-create aquatic habitat, replacing a larger amount of individuals and area is often necessary to mitigate impacts to less than significant levels, depending on factors such as temporary versus permanent impacts, temporal loss, distance of lost habitat from replacement location, quality of proposed mitigation, and other project-specific factors.	Thank you for your comment. If the project is approved and funded, a planting plan would be developed that would take into consideration the characteristics of vegetation adversely affected by the project, local site conditions, system flood carrying capacity, and maintenance requirements, The planting plan, including the proposed plant pallet, would be developed in coordination with regulating agencies to ensure that impacts to these aquatic and riparian habitats are mitigated to less than significant levels.
010-34	8. To maintain impacts at less than significant levels, ruderal vegetation that is removed should be replaced with native vegetation of at least similar stature, if not of a more robust and diverse nature. Replacing ruderal vegetation with native vegetation and preventing the ruderal vegetation from re-growing has the potential to serve as mitigation credit.	We appreciate the recommendation. Section 4.17.3, Mitigation Measure WILD-1: Implement General Construction and O& Best Management Practices bullet 4 has been revised to read: *"Minimize project impacts by reseeding all disturbed areas at the completion of construction with an appropriate mix of native forbs and grasses."*

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010-35	9. As with the mitigation for other sections above, the mitigation for this section focuses on mitigation implementation during or prior to the construction phase. To mitigate impacts to less than significant levels, the GRR/IEA should identify mitigation measures to offset the impacts to vegetation and wildlife that is expected to be ongoing following construction completion.	Thank you for your comment. Please see sections 4.6.3 and 4.17.3, as they both include mitigation measures that address construction and O&M.
010-36	1. The GRR/IEA does not identify water quality impacts due to proposed Project features such as levees and floodwalls (with or without setbacks) that create a confined space through which the velocity of high flows is increased, potentially inducing scour. As noted in the GRR/IEA, the Pajaro River, and Salsipuedes and Corralitos Creeks are subject to TMDLs for sediment and turbidity. The GRR/IEA should be revised to include an assessment of the Project's potential to cause impacts such as increases in sediment discharge, sediment transport, and turbidity. The GRR/IEA should include mitigation to reduce any impacts to less than significant levels.	The hydraulic analysis conducted for this study shows that velocities throughout most of the project area would be reduced in comparison with existing conditions or increased slightly (up to 1 foot per second). Scour is an ongoing situation in the project area under existing conditions and under the No Action Alternative. The hydraulic analysis completed for the proposed project shows that the project would reduce scour in the project area in comparison with existing and without project conditions. Please see the Hydraulics Technical Appendix of the Final Report.
010-37	2. The mitigation discussed in the GRR/IEA for water quality impacts focuses primarily on measures to be implemented during the construction phase of the Project (with the exception of Operations and Maintenance (O and M)). Mitigation for impacts to water quality that may occur following completion of construction should also be assessed and identified.	Thank you for your comment. For effects on water quality of O&M required for the proposed project please see Section 4.18.2. Mitigation is described in Section 4.18.3.
010-38	3. The GRR/IEA should be augmented to describe the O and M in more detail so that related impacts can be fully identified. While the GRR/IEA briefly discusses vegetation management and application of herbicide and rodenticide, it does not describe the scope and magnitude of these activities. Without such an assessment, impacts cannot be fully ascertained. To better describe proposed O and M, the GRR/IEA should include: i. Triggers for the commencement of O and M (such as composite roughness coefficients); ii. Areas of vegetation removal due to O and M (if any) in each reach; iii. Temporal intervals between O and M; iv. Any proposed sediment removal, and expected changes to channel morphology due to O and M;	Thank you for your comment. Detailed descriptions of O&M are not developed during this project development phase. This information is conceptually described during the study phase and, if projects are approved and funded, additional specific information is developed during PED, with the final O&M Manual updates and revisions completed during the Construction phase. All refinements to the project, including development of O&M requirements, undergo NEPA review which may include, as appropriate, preparation and circulation of additional or supplemental NEPA documents.

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	v. Proposed rip rap/flood wall/levee maintenance; and vi. Figures identifying O and M within the river and tributaries.	
010-39	4. The GRR/IEA should include mitigation to reduce impacts to habitat resulting from O and M to less than significant levels.	Thank you for your comment. For measures to mitigate adverse effects on habitat that could result from O&M to a less than significant level please see Sections 4.6.3 and 4.17.3.
010-40	1. In section 3 EROSION the appendix states, "The plan for erosion management features to cover sediment and channel stability is ongoing; more analysis is expected to provide greater insight." This analysis and insight should be incorporated into the GRR/IEA, if it has not been already.	The referenced text appears in Section 3 of the Hydraulics Technical Appendix. The Final GRR/EA (which includes the Appendixes) has been updated to reflect information developed and analyses completed since publication of the Draft Report. If the project is approved and funded additional technical analyses will be completed for the RP during PED.
010-41	2. In section 4.3 Erosion Protection the appendix reports, "Erosion protection should be carefully considered in collaboration with hydraulic engineering. Project alternatives should be formulated with a "rock" and "no-rock" approach within reaches/sub-reaches." Assuming the rock reference is to the rip rap proposed for application on the levees, the GRR/IEA should be augmented to discuss the feasibility of a "non-rock" approach throughout the Project or in particular locations.	Thank you for your comment. Based upon the available information and analyses conducted during this study, we have concluded that riprap is required to stabilize banks, primarily along the mainstem of the Pajaro River, due to the velocities reached during high flows. If the project is approved and funded, additional technical information and analyses would be conducted to refine designs related to the location, extent, and type of bank stabilization required in the project area.

Appendix H
Comments Received on the Draft Integrated GRR/EA – Local, NGO, Public

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001-1	In Reach 5 it shows building a flood wall on the existing levee along Bridge St. and then rebuilding the levee behind the homes along Delta Way. Why not continue the floodwall on top of the existing levee behind the homes on Delta Way? That levee was just rebuilt in 2013. It seems like it would be more cost effective and less disruptive to build the floodwall on the existing levee.	Along Bridge Street the floodwall is being constructed so we don't encroach on the street with a larger levee footprint. For the levee along Delta Way there is available real estate to construct the enlarged levee by taking up portions of some backyards. Constructing a new levee utilizing current engineering standards is the preferred method of levee construction and flood risk reduction
002-1	I have read that farmers in the Central Valley are being paid by the State of California to allow their fields to flood in lieu of building or shoring up the levees around farm fields. This option provides the benefit of providing water to the overdrafted aquifers. I have several thorough articles about this process and will send them to the Corps and the Counties. Perhaps the ag land here is much more expensive than that in the Central Valley. If so, cost analysis would show what is most cost effective as well as environmentally effective.	Thanks for the information and provide the backup information if possible, Farmland in the Pajaro Valley is relatively expensive and produces high value crops such as strawberries; much of which are classified as "organic". Due to the presence of potentially hazardous materials in floodwaters, inundation of the farm land would result in the land needing to stay fallow for some time before being put back into production. A longer time (up to 5 years) would need to transpire before the floodwater impacted land would be able to be classified as organic.
003-1	I think you all have done a very good job presenting this project to the public. It will certainly be difficult if not impossible to make this project 100% acceptable to all those affected by it. But time is of the essence, so please proceed as rapidly as possible.	Acknowledged. Thank you for your comment.
004-1	When bridges height are increased what impact will occur to the surrounding residential areas?	Tentatively based on a preliminary design, the highways (152 and 129) approaching the bridge will need to be raised at a rate of 3 feet vertical elevation increase per every 100-feet horizontal (3% slope). In the case of Highway 152, which needs to be raised by 10 feet, a 3% slope would have an impact approximately 333-feet away from the bridge edges on both directions requiring modifications to the intersections and to all entrances to private properties located within that distance. Details of the modifications to the intersections and entrances

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		to private property will be resolved in the Planning, Engineering, and Design (PED) phase of the project."
005-1	Please put landmarks (local) on your maps/slides for us to understand what we are looking at.	The maps are developed to present various information from the report.
006-1	With an increased pressure created in the channel by restricting flow due to vegetation (trees) that's been allowed to fill the primary channel, what is going to be done to remove/clear the channel congestion (trees)? Any modification to the river channel without cleaning out the root problem, is simply a Band-Aid.	Managing the vegetation in the channel is the responsibility of the local sponsors based on the criteria in the O&M manual and coordination with resource agencies. The O&M manual will be updated to account for the new levee improvements.
007-1	Add major landmarks to project maps	The maps are developed to present various information from the report.
007-2	Add GRR/EA process graphic to report. Provided technical information on Soap Lake	A new table (Table 1-1) has been added to Chapter 1, Section 1.9. The table compares the USACE planning process, SMART planning phases and milestones, and the NEPA process.
029-1	What is the formula used to determine why agricultural land is not protected and the town of Pajaro is?	The study area was divided into economic impact areas. Economic impact areas are used to describe the consequences of flooding in a smaller subarea of the larger study area. They are typically delineated by factoring in the source(s) of flooding, land use within the area, physical barriers/borders (e.g. Railroad tracks, roads, levees, etc.) that might cause on area to flood differently than another, and also political /legal boundaries that may require a separate reporting of results. Economic impact areas help to facilitate data collection, and enable a more detailed risk assessment of specific locations within the study area in terms of chance and consequence of flooding. Estimating damages and benefits by economic impact areas allows for a more complete incremental analysis, which aids in the identification of a plan that reasonably maximizes net benefits. Page 48 of the main report shows a figure with the Economic Impact Areas. The town of Pajaro and the area on the left bank of the Pajaro River is within Economic Impact Area C; this area could all be inundated by a breach in the levee on the left bank of the Pajaro River. The

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		agricultural land on the north side of the Pajaro River and east of the confluence of Salsipuedes Creek and the Pajaro River is in Economic Impact Area E; this area could be impacted by flooding from either the Pajaro River or the Tributaries. Based on the difference between the expected damages in the area without levee improvements and the residual damages after the levee improvements - the benefits of the project are calculated. The cost of the levee improvements are subtracted from the benefits to determine the net benefits. The net benefits for EIA C that includes Pajaro and the surrounding agricultural area was positive, meaning the levee improvements are economically justified. The net benefits for the ag are in EIA E were negative, meaning the levee improvements were not justified.
029-2	What is being done to repair the damage caused by the 2016-2017 storms. When will repairs be implemented?	The 2016-2017 storms resulted in 17 sites needing repairs on the Pajaro River and Salsipuedes Creek. All 17 sites were completed in late August 2018.
029-3	The 1955 and subsequent floods could have been diminished if the Culverts under Highway 1 had been properly sized. Is the Corps doing an improvement on those culverts?	The culvert capacity under Highway 1 was improved after the 1955 event; possibly by the county. Under the new flood control project this culvert would be considered to be an "internal drainage feature" and therefore not included in the new study.
029-4	What is being done to remove the "tons" of garbage presently resting on shoals in the middle of the channel?	Managing the vegetation and debris in the channel is the responsibility of the local sponsors based on the criteria in the O&M manual. The O&M manual will be updated to account for the new levee features.
013-1	We were very encouraged to hear about the most recent plan by the army core of engineers to offer flood protection along the Corralitos, Salsipuedes and Pinto creeks. However after reading the report on this program and attending this meeting we have learned that any improvements suggested to help prevent flooding to the Orchard park community have been removed from the plan. How is this possible? How is it that we who have the most to lose are being left out? Please for the men, women and children of Orchard Park, DON 'T DO THIS TO US AGAIN	Flood Risk Management features were not economically justified for the Orchard Park area, the costs exceeded the benefits. The area will have FRM improvements consisting of the floodwall and levees in the upper portion of Reach 5 and Reach 6. As a further study the project could evaluate whether improvements to the culverts below Highway 152 can be improved as part of the road work associated with the raising of the HWY 152 bridge.

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014-1	Please include bicycle paths in your Pajaro river levee reinforcement plan, thereby accomplishing a dual purpose: a) insuring resident's protection from flooding while; 2) protecting citizens who ride bikes…a win/win situation!	While the purpose of the proposed project is to reduce flood risk, some opportunities for recreation (walking and bicycling) could be incorporated in the future by the non-federal project partner.
015-1	1. Initially, we take exception to the statement in the Notice, that you have concluded that, with mitigation, the proposed alternatives would not result in any significant effects.	Thank you for your comment.
015-2	2. Further, and more broadly, we believe that the Project chosen in the GRR/EA, and the Process by which it was developed, are flawed and should be redone. These Process and the Project Deficiencies are described below:	Thank you for your comment. Please see our responses (below) to similar comments.
015-3	The decision not to do an EIS/EIR is wrong and leads to a poorly designed project. Any project of this magnitude imposed on a natural setting such as this will have enormous environmental impacts, and this one certainly does. The existing river corridor is rich with native plants and animals, and they should not be in jeopardy. Further, the decision not to do an EIS/EIR deprives the public of a proper "scoping process" that would determine the full environmental impacts of the project and provide for mitigations.	Thank you for your comment. The GRR/EA discloses the effects of nine action alternatives and the No Action Alternative and identifies mitigation measures to avoid or reduce any adverse effects to less than significant. This study included robust scoping and public and agency engagement. A summary is provided in Chapter 5, Public Involvement, Coordination, Consultation, and Compliance.
015-4	Alternatives Analysis is flawed in that it does not consider several obvious alternatives, Including: a. Spending at least some of the project funds for work in the upstream watershed, that would reduce the downstream flow. b. Providing for some of the river flow to be utilized for local water conservation and ground water recharge. c. Constructing a much smaller project that would cost less and cause less environmental damage.	The current project is a reevaluation of the 1966 authorized project. The project is a single purpose FRM study. The areas with 100-foot setback levees will provide increased GW recharge. The project is smaller than the 1966 authorized study and is self-mitigating which limits the environmental damage.
015-5	The section titled "Scope of this Environmental Analysis" involves the hydraulic modeling problem indicating that "It may 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." This situation introduces process credibility issues, perhaps mischaracterizing alternatives capability to deliver on benefits, costs, mitigate impacts, and integration with regional flood protection infrastructure.	The hydraulic model issue only effected under the with-project condition in areas with setback levees and did not impact plan formulation or selection of the NED plan. The model issue was resolved and the levee designs were revised and costs were developed for the re-designed levees. This information is presented in the final report.

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	We believe that these issues should be resolved before, rather than after, design decisions are made.	
015-6	We believe that the project is too big and too expensive and fails to consider the financial impact on the Local Sponsors. We believe that considering costs and benefits, the project may never be funded at either the federal or local level or the needed flood protection for Watsonville and Pajaro will remain out of reach.	The purpose of the project was to determine if there is a federal interest in providing FRM to the study area. The project delivery team is working on the OSE account documentation to enhance the project's ability to secure federal funding, Local sponsors will need to pass a bond measure to provide the local share of the project costs.
015-7	Design flow has not been properly established. It has been set without due consideration for present and future conditions in the upper watershed. The FPA has produced a Watershed Study that outlines how optimization could occur involving coordination with their Program and related IRWMP projects. The Local Sponsors have also produced studies and the BEP which in our view has been expected to be optimized into the LRP; the BEP as a channel and Riparian Corridor element and the LRP a setback levee project, respectively, each with their own operation and maintenance protocols, integrated to assure performance expectations are manageable.	Design flows have been properly established. The peak flow frequency for the 2015 Hydrology Update conducted by SPN on Pajaro River at Chittenden and Corralitos Creek at Freedom has gone through DQC at SPK and is validated. Structural and non-structural applications upstream are outside the scope of this study.
015-8	A letter to the ACE dated 2/18/16, from the Pajaro River Subcommittee of the Sierra Club, asked for a project that would do the following: 1. Provide flood protection for Watsonville and Pajaro. The project would surely provide flood protection but is so expensive that it may never be built, leaving both communities still unprotected.	The purpose of the project was to determine if there is a federal interest in proving FRM to the study area. The project delivery team is working on the OSE account documentation to enhance the projects ability to secure federal funding, Local sponsors will need to pass a bond measure to provide the local share of the project costs.
015-9	2. A complete hydrologic study that addresses the Pajaro River Flood Protection Authority work in the upper watershed. The GRR fails to do that.	.
015-10	3. A proper review of the project plans by the Resource Agencies and certification that proper provisions have been made for wildlife, habitat and water conservation purposes. We are not aware of any such certification.	Chapter 5 discusses consultation and coordination with regulatory agencies conducted as part of this study. It also summarizes, in Table 5-1, the status of compliance with key environmental laws, regulations, and executive orders.
015-11	4. Provisions for public access onto the levees and into the river corridor for public recreation and education. We are not aware of such provisions, in fact, we understand that right of way	Please see our response to comment 014-1.

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	acquisition will be for flood control purposes only.	
015-12	5. Planning and analysis to address water conservation and ground water recharge impacts. This has not been included in the GRR.	The project purpose is flood risk management. Although the benefits have not been quantified, the setback levees will provide for increased ground water recharge compared to the existing project.
015-13	6. A management plan for the River that allows for maintenance without destruction of wild life habitat. We are not aware of any attempt to provide a management plan.	The O&M manual will be revised to include the new project features.
015-14	7. An estimate of the cost of the project and how it will be paid for. We have an estimated cost but no idea how it will be paid for.	Please see our response to comment 015-4 (above).
016-1	Our first request, with the intent to ensure a comprehensive approach and process through which all of the key stakeholders in the community are able to dialogue and contribute, is to extend the period for public comment on the GRR/EA until January 31, 2018. The report is extensive and requires time and expertise in order to provide robust and constructive criticism that we hope will ensure both local buy-in and ultimately the highest degree of success to address the problems and opportunities identified in the study.	This study is on a very constrained schedule for completion; therefore, this extension request was not granted. Nevertheless, USACE and our project partners welcome public input throughout the study.
016-2	The Tentatively Selected Plan (TSP) does not mitigate, and in some cases would increase, the flood risk east of Reach 4, on the Santa Cruz County side of the Pajaro River, and Reach 1. Currently, we estimate that approximately 980 acres of Driscoll's berry production would be impacted by flooding in the Pajaro Valley with potential economic losses to our local growers in one season of over 28 million dollars not counting lost sales and fruit margin for Driscoll's.	The levee improvements on the right bank of reach 4 was not economically incrementally justified and therefore not included in the Recommended Plan. This existing levees in the area provide flood risk management to approximately a 4% annual chance exceedance event. The levees will continue to be maintained as part of the federal project.
016-3	As proposed, the project would not protect the Orchard Park or Interlaken Communities and their respective inhabitants, many of whom are farmworkers.	Flood Risk Management features were not economically justified for the Orchard Park area, the costs exceeded the benefits. The area will have FRM improvements consisting of the floodwall and levees in the upper portion of Reach 5 and Reach 6. As a further study the project could evaluate whether improvements to the culverts below Highway 152 can be improved as part of the road work associated with the raising of the HWY 152 bridge.

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016-4	Other areas not sufficiently covered or adequately addressed in the TSP include groundwater recharge, channel maintenance and preservation as well as economic implications for farmers, landowners and the broader community.	The setback levees will provide enhanced Ground Water recharge compared to the existing condition. Channel maintenance is part of ongoing O&M activities of the local sponsors. The Recommended Plan will provide enhance FRM for a large portion of the local community, including much of the City of Watsonville and the Town of Pajaro.
017-1	This letter is to inform you of my problems. I have property on Corralitos creek which flows into the Pajaro river. The creek used to run well for many years, but not now. Over the years the creek has lowered on the west side and risen on the east side. There is now an island on the north side which is about 4,000 square feet and about 80 yards away from my property. Due to the change of the creek I now get an overflow of water to the point of needing sandbags. Some of the bank of the creek is now two feet from my apartment building which you will have to demolish if you are ever to fix the bank which is getting washed off. I have done the best I could to hold the water off, but I am not superman.	The setback levee in Reach 6 along Corralitos Creek will increase the flow capacity of the creek and should provide some resolution to your current problem.
018-1	Our property is closer than two feet from the edge of the bank and we have done everything possible to prevent corrosion. All our efforts have been impacted my mother nature and the flood in 2016 really took a toll on the bank of the Corralitos creek behind our property located on East Lake Ave. We had to temporarily relocate our tenants due to the flooding of the creek.	The setback levee in Reach 6 of Corralitos Creek will increase the flow capacity of the creek and should provide some resolution to your current problem.
018-2	I have read your proposal and it sounds like all measures have been taken to protect the environment. I do not know how many years it will take to put your proposed plan into action and if there is a heavy rain the Corralitos Creek will flood again. I hope all measures will be taken to protect homeowners and prevent damages.	Thank you for your comment.
18-3	Our plea in the meantime if at all possible is the clearing of the overgrowth. There are numerous fallen trees, brush, trash, and debris (even homeless people can be found living along the creek bank). We desperately need the creek to be cleaned up and the overgrowth cleared.	The local sponsors are currently and will be responsible for O&M activities along the existing and new levees
019-1	My comments are to inform and ask for mitigation for Reach 7 drainage above the Hwy152 bridge confluence. Why we have been carved out Reach 6 is beyond me. Orchard Park is a unique community in the Interlaken area located between Corralitos Creek, Pinto Creek and College Lake. Its existence predates	The improvement for the College Lake drainage were not economically justified. The project could recommend for further study what improvements could be made to reduce the flood risk for the Orchard Park community including

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	Reclamation District 2049, Bay Village, Pajaro Dunes, Murphy's Crossing, E. Lake Village, two Community Hospitals (one at Green Valley Road), Saint Francis High School, the Middle School and most of the agriculture and growth of the City of Watsonville.	improvements to the culverts below Highway 152 as part of the road work associated with the raising of the Highway 152 bridge.
019-2	During the rainy season water accumulates from the mountain range into College Lake, which would flow into the culverts that go under Hwy152 and College Road if there was adequate drainage. That portion of the Salsipuedes is silted in due to farm runoff and negligence in maintenance. To make things worse Pinto Creek (overflow from Pinto Lake) tries to enter that Upper Salsipuedes Creek at a 90 degree angle just before the culvert The pump station is broken and the culverts were not designed well, the engineering is abysmal. In addition the Upper Salsipuedes is trying to enter the Corralitos/Salsipuedes confluence at an impossible angle. Sometimes water from the Corralitos Creeks backs up into College Lake. We live in fear of flooding every year now.	Please see our response to Comment 019-01.
019-3	I've enclosed nearly 200 signatures from the Interlaken area that has experienced flood evacuation calls 5 times this year. Flooding occurred in Orchard Park twice. We were out of our home for 10 weeks. I'm enclosing photos to help illustrate how badly we need help. The photo on page 40 of your draft document dated 10/31/17 is of Orchard Park and not the City of Watsonville. They had no flooding this year except for a stretch of Hwy129 for a couple of days. The brown house at the rear of the photo is my house. There must be some way to help that area drain better: a new pump near the upper culvert and Pinto Creek; revision of the confluence of Upper Salsipuedes and Corralitos Creek at College Road; widening of the banks of Upper Salsipuedes; possibly a joint venture with the Water Management District to store floodwaters for agriculture.	Please see our response to Comment 019-01.
019-4	The levee on the left side of Corralitos Creek is important but doesn't address drainage.	Please see our response to Comment 019-01.
020-1	Unfortunately, due to the fact that the draft study consists of over 900 pages of information, maps, charts, analysis, etc., it is basically impossible for members of the public to properly comment on the draft study by a deadline of	Thank you for your comment.

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	November 30, 2017. It is not reasonable to expect the public to comment, especially during a major holiday month, on a lengthy study with such a short window of time from the release of the study to the cutoff period for submitting comments.	
020-2	At times language within the study is vague on whether or not the UPRR Bridge would be raised for the "Alternative l" plan and other times definitive language is used to state the bridge "would not be raised." A clear statement from the Army Corps is necessary on this issue.	None of the last set six alternatives that were studied assumed raising the railroad bridge.
020-3	There is a statement within the study that talks about installing a "sliding: floodgate" at the railroad crossing in order to "provide improved flood capacity at the railroad crossing." This is an extremely worrisome proposal since the UPRR Bridge is rather old and its top is basically at the same height of the current levees that it crosses. Knowing that a chain is only as good as its weakest link, a levee is only as good as its weakest point. It is hard to imagine that a "sliding gate" of some sort would offer the same level of flood protection as that of a properly engineered and constructed floodwall It is one thing if the "sliding gate" were to be installed in an area of little population or developed property, but the proposed "sliding gates" would be used to protect almost the heart of the City of Watsonville and if there were a failure in such a gate, the flood waters would surely head to many of the lower-income areas of the city and lower-income households in Monterey County.	Modifications to the UPRR bridge are not required. However, floodgates will be needed not on the bridge itself but on the approach to the bridge where the RR intersects the levee(s). One floodgate on on the Santa Cruz levee and on another on the Monterrey County levee. The purpose of the floodgates is to close the levee oppenings that under normal operating conditions would allow uninterrupted passage of trains thru the levee. The floodgates would close only in the event of flooding. The floodgates are specialized engineering structures that perform acceptably well and as intended.
020-4	With a new levee project, the current SPRR Bridge would apparently be below the heights of the new levees and thus end up acting as a partial dam to river waters reaching such heights. This is another area that needs to be addressed by the Anny Corps.	The 2017 project hydrology and hydraulic studies have shown that the RR bridge does not need to be modified.
020-5	At a minimum, it is requested that the Army Corps answer the following questions: 1) Has the Anny Corps categorically ruled out the possibility of supporting the construction of a new railroad bridge that would be elevated to correspond with an increased levee height through Reach 3 of the proposed levee project? a. If yes, why has the Anny Corps decided not to construct a new railroad	The 2017 project hydrology and hydraulic studies have shown that the RR bridge does not need to be modified.

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	bridge? b. What is the estimated dollar difference between all the costs associated with constructing a new railroad bridge and all the costs associated with a sliding gate including, but not limited to, maintenance, repairs, and operation?	
020-6	2) With a new levee project that leaves the current SPRR Bridge in place, a very real possibility exists of the bridge acting as a partial-dam to river flow during specific heightened water elevations in the Pajaro River. Has the Anny Corps considered what might be the effect on any other levee sections and flooding possibilities if debris brought down the river were to accumulate against the SPRR Bridge? a. If yes, please explain how potential damming at said bridge will be addressed for the bridge itself and at any other parts of the new or old levee system. b. If no, why hasn't the Army Corps considered the potential problems, bot	The 2017 project hydrology and hydraulic studies have shown that the RR bridge does not need to be modified.
021-1	The FPA recognizes the success of the Pajaro River Project will require additional Federal funding to proceed through the next phase of project engineering and design and will be strongly based on the appropriate calculation of benefits and costs, as well as a design that maximizes project benefit-cost ratio (BCR). As an authority that represents communities on opposite ends of the economic spectrum, from the extremely affluent Silicon Valley to the severely disadvantaged communities of Pajaro and Watsonville , we have experience with how that economic status affects the BCR and the probability of the project receiving Federal funding to proceed to design and construction. We are concerned that the BCR, as currently presented in the GRR/EA, will not be competitive and future funding of the project is at risk. It is frustrating to see that the same project, if constructed in the northern area of our watershed, would likely have a significantly higher BCR and would be fundable, simply due to the economic status of the flood impacted communities.	Evaluating FRM projects through the net benefit analysis process is dependent on the value of the properties potentially impacted by flooding. USACE is working with the Local Sponsors to provide information in the report regarding impacts to the local community related to the Other Social Effects account. This information can be utilized by decision makers as part of the allocation of funding for project construction.
021-2	The City of Watsonville meets the California definition of a Disadvantaged Community with a Median Household Income (MHI) of $46,675 or 76% of the California average. The Town of Pajaro meets the California definition of a	Thank you for your comment. Between release of the draft report and publication of the final report, the project team took a closer look at Other Social Effects, which includes the topics

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	Severely Disadvantaged Community with a MHI of $36,094 or 59% of the California average. Even more telling of the impoverished status is the per capita income. With such low income, multiple wage earners are forced to combine households and that can skew the MHI. The per capita income for Watsonville is $16,227 or 56% of the California average and Pajaro is $10,294 or 35% of the California average.	highlighted in the comment. The results are summarized in Chapter 2 of the main report and the updated Other Social Effects report is provided in the Economics Appendix (Appendix A).
021-3	The FPA believes the Corps policy of using property values as the primary input in the BCR calculations leaves these disadvantaged communities at risk. The BCR for this project is currently at 1.8, making it unlikely to receive Federal funding. This BCR does not take into account public safety impacts or the potential loss of life, it is simply based on the low economic value placed on communities like Watsonville and Pajaro. We strongly urge the Corps to consider other factors when prioritizing projects, otherwise critically needed flood risk reduction projects protecting low-income communities will never be constructed.	Please see our response to comment 021-1.
021-4	While the FPA was only formed in 2000, the Counties of Santa Cruz and Monterey have been working with the Corps since the project was authorized in 1966. While the FPA appreciates the significance of this project milestone, we cannot afford to be delayed in securing the funding needed to keep this project development moving forward. Since construction of the 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 and the loss of life. As stated in the report, the 1995 storm resulted in the greatest flood damages, approaching nearly $100 million and, tragically, one flood-related death. Again, we strongly urge the Corps to look beyond the BCR and consider protection of life and property when prioritizing projects.	Please see our response to comment 021-1.
021-5	Flood protection for the very vulnerable residents in Watsonville and Pajaro is of primary importance to the FPA, and we offer any assistance to support the Corps in the process. As an Authority representing four counties in the heart of California, we would be pleased to work with you on legislative proposals to change Corps policy in such a way that our constituents are not unfairly treated in the process and placed in harm's way simply because they do not live in areas with high property values.	As stated above we are working with the local sponsors to develop information relative to potential loss of life and Other Social Effects to better present the flooding concerns on the vulnerable populations in the Watsonville and Pajaro communities

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022-1	While the proposed project addressed improvements that will provide flood benefits to the neighboring communities, we request that it retain and improve the existing bicycling opportunities along the access roads on the tops of the levees by doing the following:	Thank you for your comment. Please see our response to comment 014-1.
022-2	1. Restore Bikeways. We are pleased that the GGR/EA acknowledges existing and proposed bicycle and pedestrian paths on Reaches 2, 3, 5, 6, 7 and 8 (Section 4.12 - Recreation). We request that bikeways be restored as called for in Mitigation Measure TRAF-7: Restore Bikeways and Pedestrian Trails, which says "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" (Section 4.15 – Traffic and Circulation).	Concur. Section 4.12.5 now reads as follows: "**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 RP) 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 Mitigation Measure TRAF-7 (Restore Bikeways and Pedestrian Trails) and 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."
022-3	2. Open all access roads to the public. While all of the access roads are currently used by the public, only those within the City of Watsonville are legally accessible for all to use. We request that this project make all of the access roads where improvements are taking place to be legally accessible.	Please see our response to comment 014-1.
022-4	3. Allow bicycling on all access roads. Currently, a portion of the access roads have surfaces that are safe for bicyclists. The existing roads that are accessible to bicycles have either a well maintained paved surface or a well compacted base rock surface. We request that the existing bicycle accessible access roads be retained and that all of the access roads where improvements are taking place be constructed to be accessible to bicycles.	Please see our response to comment 014-1.
022-5	4. Provide public access at various locations. We request that the existing access points to the access roads be retained and that new points be provided at various locations where improvements are taking place and that these points be accessible to bicyclists and all users.	Please see our response to comment 014-1.
022-6	5. Incorporate the City of Watsonville Trails and Master Plan. The GRR/EA makes no mention of the City of Watsonville Trails Master Plan, which was adopted by Watsonville in 2012. Please incorporate the Master Plan into the GRR/EA and include the trails proposed along the levees on the Pajaro River	The Final Report now references the City of Watsonville Trails and Master Plan in Section 4.12, Recreation.

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	and the Salsipuedes and Corralitos Creeks. The Master Plan can be found online at https://www.cityofwatsonville.org/DocumentCenter/View/3207.	
023-1	As a resident of the Pajaro River Flood Control Area, I am concerned that the area west of Highway 1 is not included in the project. The area of West Beach Road is unsafe because of flooding from high tide and rain. Breaching of the River has been consistently delayed for needed permits. The farmland off Beach Road has been repeatedly flooded causing economic damage to Pajaro Valley.	The area west of Highway 1 was not included in the project because it was determined that levee improvements were not incrementally justified.
024-1	ASAP (the public discussion of this topic ends on the 30th) would you please provide the proper agencies in both counties -- and make avail able online "artists' renditions" depicting what the plans might look like when completed: At least the favored plan, so that both aerial and ground views of the Pajaro River and its tributaries Salsipuedes & Corralitos Creeks can be visualized, depicting a low (or no) water flow in the system, as well as views of a super heavy runoff. Please include much-needed measured dimensions, including height of levee from base of channel in the various reaches that will protect us all, we hope before the next heavy runoff on the order of past floods. Your artistic renderings will surely be published in newspapers of both counties, so that thousands of readers can hand hold hard copy. And TV channels KSBW & KION would gladly put these depictions on several newscasts.	
025-1	3. The 1944 plan called for the Pajaro River Federal Flood Control Channel levee to be built. It encompassed 10 plus miles of the river on the left and right banks not including tributaries. The new TSP is considerably downsized and will not fully protect the valley. Will the present Pajaro River Federal Flood Control Channel Project remain in full force and effect even though portions will be better protected than others? Will the present Operation and Maintenance Manual remain in effect for the full project of 1944?	Some portions of the existing 1949 project are not being improved because it was determined that the improvements were not incrementally justified. The existing 1949 project features that aren't being improved will continue to be maintained by the local sponsors. The current O&M manual will be updated to account for the levee improvements.
025-2	4. A continuous problem is the Cal Trans Highway 1 dam/berm which crosses the Monterey County side of the valley East of Reach 1. Due to this dam, the flood of 1995 was not allowed to flow naturally to the ocean. The water rose over 15 ft and flowed over Highway 1 in a 12 hr period. To this day, the issue remains unresolved, and must be addressed. Trafton Rd., which runs under Highway 1 is approximately 12 ft higher than the farm land. At the toe of the levee a farm road was built to go under Highway 1, it is approximately 4 ft	

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	higher than the farm land. There is one 4 ft culvert that is traditionally silted up. Needless to say, when a flood occurs this is not adequate to drain the Mo. Co. side of the valley. We understand the new project will hopefully change that. We are many years from a completed project and we have come close to flooding several times since 1998. Please refer to the picture attached of the satellite image dated March 15, 1995. This picture shows the devastation of the silted valley and destruction of the strawberry and row crops.	
025-3	5. There is no Pajaro Valley without farming. To protect a portion of it seems wrong as the communities cannot exist without the farms. Strawberries alone in 2016 generated $724,606,000 in Monterey County with a large portion coming from the Monterey side of the Pajaro Valley. Strawberries hire about 1.8 to 2 people per acre with the longest harvesting season in the world. The whole valley depends on agriculture.	Significant amounts of the farmland are protected by the existing levee system. The levees that aren't being improved because they were not incrementally justified will still be maintained by the local sponsors and will continue to reduce the flood risk for the farmland behind those levees.
025-4	6. The Federal Register/Vol. 80, NO. 228 Food Safety Modernization Act known as FSMA is the 2018 regulatory law for the agricultural industry. Per the FSMA ruling, the surface water from a flood creates a known or reasonable foreseeable hazard which is a biological hazard potential associated with the food or farm it directly touches. If a flood occurs on the land it may be a year or in some cases, several years before a crop can be planted. This is happening right now in our valley to a landowner due to a Jan 2017 flooding event. The land has still not been released to plant. The acreage being protected by the new project cannot financially sustain the whole valley, if any unprotected areas were to flood.	No Action Alternative (Section 4.1.5) description for Agriculture has been revised to read: 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 (due to waterlogged soils, the need to remove deposited sediment, and/or requirements to comply with the Food Safety Modernization Act which recognize floodwaters as a known or reasonably foreseeable biological hazard)."
025-5	7. We have advocated giving up ground up to 100 feet when discussing a full river levy project, where necessary to have good flow. In Reach 2, a 100 ft setback on both sides seems unnecessary. In both Reach 2 and Reach 4, the setbacks create a larger space for the homeless population to live in. Considering the fact that there is little to be done about this problem, won't widening the river here create an even larger cost of maintenance due to the increased environmental hazards from people living in the river and their waste? 20 years have passed and debris dams, mature trees, gophers, squirrels and the homeless population have grown dramatically. This is a major concern that by widening the river East of Hwy 1, will not only create a greater bottleneck of the river there, but the widening area will create a much larger	The local sponsors will be responsible for O&M activities. Control of the homeless population will be the responsibility of the respective counties

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	area for the debris dams, trees, gophers, and squirrels and homeless population to infiltrate. Please see the 2017 current debris dam pictures attached.	
025-6	8. We question the 12 foot high Tie Back levee from the East end of Reach 4 South crossing San Juan Rd., and the Rail Road tracks with proposed Flood gates. Considering all the traffic on San Juan Rd. and that it is one of the only thoroughfares to Hwy 101 during inclement weather, as well as, trains going through every day, the cost to achieve the Tie Back may be about the same or less to just continue the new levee setback and completion to the end of the levee at the Staka property. The Monterey side levee ends on the 10 mile mark about 2 miles less than Santa Cruz which goes to and up Murphy Rd.	
025-7	9. With regards to the cost to benefit ratio, we believe this must be challenged as the numbers must be updated to include transitioning land to organic ground, the cost of wells, fences, pipes, tractors, equipment, all manner of farming equipment products that may be in the fields during a flood event. Additionally, this does not include the cost of crops in ground or harvest costs.	Thank you for your comment. The economic damages/benefit analysis for agriculture includes organic crops, and reflects crop damages/net income losses from a potential flood event. Harvest costs are not included in the estimate of damages/losses because it is assumed that a flood event that destroyed the crops would result in no crops to harvest; land clean-up costs were factored into the analysis, however.
026-1	We agree that the proposed project could have a significant effect on the environment, but disagree that the mitigation features would reduce all significant impacts for a mitigated FONSI. The project has been designed without sufficient information to be self- mitigating	Thank you for your comment. The GRR/EA discloses the effects of nine action alternatives and the No Action Alternative and identifies mitigation measures to reduce any adverse effects to less than significant.
026-2	Page 80: Introduction 4.1.4 Scope of this Environmental Analysis, the discussion involves the aforementioned hydraulic modeling problem indicating that: "It may 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." This situation introduces process credibility issues, perhaps mis-characterizing alternatives capability to deliver on benefits, costs, mitigate impacts, and integration with regional flood protection infrastructure. The discussion goes further to say:	The hydraulic issue was resolved and the revised water surface elevations were determined and incorporated into the design of the tentatively selected plan. This resulted in levees approximately 3-4 feet higher than were presented in the TSP. Costs were developed for the new levees and economic evaluation was conducted. It was determined that, if considered as separable elements, the levees on the left bank of the Pajaro River were not incrementally justified. Based on the results of the economic analysis the NED plan for the left bank of the Pajaro River and the Town of Pajaro is at an approximate 4%* ACE event if the reach is treated as hydraulically separable. However, the NED for the right bank of the Pajaro River (Watsonville) is targeted at an approximate 1%* ACE

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	"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." We are most concerned that the aforementioned refinements will not address the underlying defects in the process, involving incomplete analysis and mis-characterization of the strengths of each alternative to deliver on benefits at expected costs. Based on our understanding of the circumstances we believe Alternative three is superior due to its wider channel and erosion protection as discussed in detail later in our comments.	event. Therefore, the separability assumption has been revisited. FRM benefits for the City of Watsonville optimize at approximately a 1% Annual Chance Exceedance event. Consistent with hydraulic inseparability recommend including features that provide the same level of protection for Pajaro considering Other Social Effects, levee parity, and induced flooding concerns. Alternative 3, that included the CMZ levees were evaluated and not the most cost effective, in part because of increased RE acquisition costs. The recommended plan, which includes setback levees ranging from approximately 100-225 feet in portions of the project, will provide for increased river and riparian corridor width, channel complexity, and functional floodplains compared to the current system. The floodwalls along reach 3 of the mainstem and reach 5 of the tributaries are necessary due to the urban encroachment and limited options due to the lack of available space on the land side of the levee.
026-3	Page 30 1.7 EXISTING PROGRAMS, STUDIES, AND PROJECTS; The GRR EA does not make reference or cite the significant investments in watershed wide flood protection infrastructure relevant to this project. Given this situation we view the public review currently in progress as flawed, and it will need reconsideration as discussed earlier in our comments. Following this reconsideration, the draft GRR EA should be re-released for public review and comment. The reconsideration needs to properly inform stakeholders and technical contributors of how the alternatives could be integrated with the status of the investments made in regional flood protection infrastructure made to date. Perhaps the GRR EA will need to be linked to an umbrella CEQA document where these investments could be characterized, quantified, and correlated to the attributes of the alternatives. These investments involve millions of dollars spent producing studies and projects intended to interface with this LRP. In our view, some of these studies and projects are work in progress, and would require a Project assessment and performance evaluation	This project is a General Re-Evaluation of the existing 1966 project. While other FRM efforts in the watershed were considered, it was beyond the scope and funding limits of this project to fully evaluate those projects or include them under a larger CEQA document. The project sponsors will be preparing a CEQA document for this project at a later date and may have an opportunity to address the watershed concerns/issues you identified.

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	to determine their status, prior to addressing their interrelationships, dependencies, constraints, and limitations within the watershed.	
026-4	Local Agency Relevant studies and projects are organized within the Pajaro River Watershed Integrated Regional Water Management Plan (IRWMP), which provides a background, problem definition and management strategy dependent on objectives and performance of the LRP. The most direct interrelationships exist between the 26-4 Santa Cruz-Monterey County Bench Excavation Project (BEP) and the Pajaro RIver Watershed Flood Protection Authority (FPA) Soap Lake Floodplain Preservation Project (SLFPP). The opportunities for ecological vitality and sustainable flood protection identified on page 9 have clear nexus with the LRP, and a favorable flood risk management outcome requires effective coordination among these projects at least.	While other FRM efforts in the watershed were considered, it was beyond the scope and funding limits of this project to fully evaluate those projects or include them under a larger CEQA document. The project sponsors will be preparing a CEQA document for this project at a later date and may have an opportunity to address the watershed concerns/issues you identified
026-5	We appreciate that the GRR EA document is intended primarily to comply with USCE process, which appears to us as isolated, leading to the single purpose project as authorized in 1966, fragmented from reality, apparently having difficulty integrating with the overarching multi-purpose watershed scale Program of projects funded by the State of California. Perhaps this GRR EA could serve a useful purpose to advise the IRWMP partners how the Alternatives could adapt to the aforementioned strategy for flood risk management and other water resource projects slated within the Watershed. Presently, the draft GRR EA release could be viewed as a milestone accomplishment in the FPA Strategy. This strategy includes a decision tree planned to guide and optimize a Locally Preferred Alternative that address the watershed circumstances and situation. Phase 2, Chapter 5, Figure 5-1 illustrates the considerations involved with this strategy. http://www.pajaroriverwatershed.org/files/Phase_2_Report/Individual%20chapters/Chapter%205.pdf The current status of the FPA strategy implementation needs to be included in the GRR EA to enable a process of alternative development and optimization to occur intelligently. The FPA has developed a Project Assessment and Performance Evaluation Plan for their work products (PAPE) (http://pajaroriverwatershed.org/pdf/paep.pdf). This PAPE is anticipated to provide a reality check on how effective their program and projects are to date, and what additional measures may be necessary to achieve	The recommended plan is currently designed to provide flood risk reduction up to an approximate 1% annual chance exceedance event for the urbanized areas of Pajaro and Watsonville. When the recommended plan is constructed any flood attenuation provided by the Soap Lake Floodplain Preservation project will further reduce the risk of flooding in the downstream areas.

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	the 1% flood protection goal they set for the Pajaro River Watershed Community. Hopefully, the final GRR EA will address this concern.	
026-6	Page 58: 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. We anticipate that Alternative 3 in conjunction with the Soap Lake Floodplain Preservation Project and a supplemental project, has the most reliable potential to deliver on the 1% sustainable flood protection goal and optimization of regional benefits planned for. We anticipate that sustainable flood protection is practicable and will ultimately result in avoidance of riparian/wildlife habitat, and ground water recharge impacts. It is superior to address the flood conveyance and erosion stability issues that persist in the Lower Pajaro River, and at adapting to changes in the watershed. It also would be most efficient and timely addressing NEPA and CEQA processing, readily demonstrating sequential avoidance and minimization of adverse long and short term impacts. Perhaps more importantly it superior adapting to the IRWMP objectives and funding criteria. Alternative 3 is capable to integrate with other IRWMP Partner programs involving compensation for groundwater recharge and perhaps applicable to agricultural lands that the LRP will not protect from flooding.	The purpose of the Pajaro River study is for flood risk management. The CMZ alterative was evaluated utilizing FRM benefits and costs associated with levee construction. The CMZ alternatives were not the most cost effective, in part because of RE costs associated with additional land acquisition. The recommended plan will provide will provide flood risk reduction up to an approximate 1% annual chance exceedance event. When the recommended plan is constructed any flood attenuation provided by the Soap Lake Floodplain Preservation project will further reduce the risk of flooding in the downstream areas.
026-7	Alternative 3 is viewed as superior addressing integration/optimization With other projects that would produce: 1. Robust flood protection involving adaptability to greater magnitude floods than expected, reduced stress on levee and floodwall stability/fragility via reduced depths and velocity. 2. Supplemental water supply; more area subject to flooding available. Floodplain and channel complexity length facilitating greater amounts of ground water recharge and Integration with Pajaro Valley Water Management Agency Programs. 3. Wildlife habitat, directly benefiting from less constrained channel geomorphology and riparian vegetation	As part of the plan formulation process the US Army corps of Engineers recommends the plan that provides the most net benefits, or the National Economic Development (NED) plan. During comparison of the alternative plans it was determined that Alternative 3 did not to provide the most net benefits. Mainstem Alternatives 1 and 4 provided more net benefits, than Alternative 3, in part a result of the increased real estate acquisition costs needed for the CMZ levees. The setback areas associated with Mainstem Alternative 1 and Tributary Alternative 6 will address to some extent many of the points you identified.

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	establishment, enabling stream complexity, and lower velocity (involving characteristic lower vegetation resistance to flow; resistance being a function of velocity squared). 4. Adjacent landowner property impact avoidance; involving lower flood water depths and velocity, enabling shorter flood walls and levees, minimizing hydrostatic forces that cause outboard levee areas to liquefy, and result in sand boils that jeopardize structures, utilities, and land stability. 5. Superior Integration with the BEP, which includes an adaptive management plan to enable recovery of the riparian corridor quantity and quality via intelligent monitoring and maintenance.	
026-8	Page 111: Section 4.6 AQUATIC RESOURCES 4.6.1 Affected Environment Physical Environment The GRR EA does not accurately describe the physical condition of the River omitting the improvements made by the BEP. These improvements are based on a detailed study recommending a channel stability and ecological restoration strategy. These recommendations, adopted into Policy via Local Partner CEQA Authority, include channel grading and implementation of a Riparian Vegetation Plan. This project represents a major investment in time and money, and in our view establishes the baseline condition from which to evaluate LRP long and short-term impacts, including maintenance for floodwater capacity,	The Santa Cruz-Monterey County Bench Excavation Project (BEP) was considered in developing the alternatives and analyzing the effects of the proposed project. Monterey and Santa Cruz Counties are the non-Federal partners on the Lower Pajaro River Flood Risk Management General Reevaluation Study. If the project is approved and funded, additional engineering analyses and technical studies would be completed during the Preconstruction Engineering and Design (PED) phase.
026-9	Page 159 : 4,14,2 Environmental Consequences 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	The Hydraulics Appendix provides additional information that may be of interest to the reviewer. The design water surface elevation used in this study was 38,900 feet, which represents the 1% Annual Probability of Exceedance (APE).

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	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. This description of habitat needs for the steelhead trout, involving stream characteristics favorable for habitat. We agree the setback Levees proposed in the LRP could improve the situation if they were set back an adequate distance to accommodate the increase of design flow from 19000 CFS to 45000 CFS, and perhaps more, subject to the findings of the aforementioned PAPE. The LRP essentially doubles the expectations of the River's conveyance capability, perhaps at depths and velocities with the potential to aggravate the documented channel and bank erosion problems in the Lower Pajaro River. The potential for this problem to further arise and exacerbate is evident as described in the aforementioned FPA Watershed Study, Phase 3, Chapter 2, link provided below.	
026-10	As mentioned earlier, the GRR EA speaks to the opportunity for sustainable flood protection described on page 41, and eludes to the issue of the Project's venerability to loss of flood protection from landscape changes in the upper watershed that increase flood flow downstream to the Pajaro Valley. The PRWFPA has addressed this issue with a Watershed Study specifying goals and strategy to integrate with this project. It also quantifies induced flooding consequences in the event the strategy fails as described in Phase 3-4a, Chapter 2, Table 2.1 of said Study (http://www.pajaroriverwatershed.org/files/PajaroPh3_4a/Ph3_4a_2.pdf). This strategy prescribes a proactive Program supporting projects and land development policies involving local agency authority to manage effective performance. To date, it appears they have approved a 9000 acre Floodplain Preservation Project and recommended land-use polices applicable to the upper watershed counties and cities. Implementation progress is unclear, involving where responsibility, authority, control, and leadership are in place and effective. It is clear that control of LRP design flow rate (the quantity of flood water discharging from the upper watershed to the lower), depends on FPA's performance acquiring Soap Lake properties and persuading upper watershed counties and cities to effectively regulate land use. It is also	As part of the plan formulation process the US Army Corps of Engineers recommends the plan that provides the most net benefits, or the National Economic Development (NED) plan. During comparison of the alternative plans it was determined that Alternative 3 did not to provide the most net benefits. Mainstem Alternatives 1 and 4 provided more net benefits, than Alternative 3, in part a result of the increased real estate acquisition costs needed for the CMZ levees.

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	clear that the Local Sponsor's control, responsibility and authority is in peril if the FPA's performance is less than expected. The aforementioned PAPE may clarify this issue. Alternative 3, providing greater setback levees, is superior at addressing this issue, which has a significant likelihood of occurrence given climate change and other circumstances threatening control. We are concerned that sustainability uncertainty may result in misguided allegedly emergency actions similar to those taken after the 1995 flood, where extreme vegetation removal was thought to improve protection despite the consequent exposure to severe levee and bank erosion threatening levee fragility and stability, exacerbating levee failure risk issues.	
026-11	The GRR EA describes the groundwater basin and cite work by Hanson and others outlining the composition and characteristics of the various sub aquifers within the basin. Adverse impacts to groundwater recharge resulting from the LRP objective to eliminate the Pajaro Valley Floodplain are dismissed as insignificant, without reference to supporting analysis. The report is clear that the Floodplain represents a large area, which historically may occur on a 15-Year return period, and remain flooded for extended periods of time. A quantitative analysis of these baseline conditions was prepared by the writer which indicates loss of this Floodplain groundwater recharge in the order of 2000 acre feet of water, annualized over a 100-Year period. This quantitative analysis is an extension of the work of Dr. Andrew Fisher by the writer (Kenneth Reiller PE) and has been collaborated with the PVWMA circa 2015. Dr. Fisher's publications include a groundwater recharge study in the vicinity of Reach 4 of the LRP, and suitability mapping of Manageable Aquifer Recharge (MAR) https://websites.pmc.ucsc.edu/~afisher/post/Driscolls/SurfSuit-Edit150922.pdf areas in the Pajaro Valley. Groundwater recharge rates reported in these publications were compared to those cited in the GRR EA and found to be agreeable. This information, applied to the aforementioned MAR Map-encompassed by the 1995 Floodplain Area, USGS stream flow data, and personal accounts from levee managers, witnesses and observation by myself and supported analysis, estimate the ground water recharge resulting from the 1995 flood. This quantity, projected statistically for a range flooding events over a 100-years, is viewed as a base line condition from which to quantify	Historic conditions no longer exist in the project area. On the Pajaro River mainstem, the floodplain is activated at the 20% AEP (1/5 ACE). From the start to finish, water would be on the floodplain about 18 hours. For the Salsipuedes floodplain activation starts at the 50% AEP (1/2 ACE). Water would be on the floodplain for about 23 hours.

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	potential groundwater recharge impacts from the alternatives. Although all alternatives are unable to avoid this impact, Alternative 3 most effectively minimizes this impact and accommodates mitigation. This issue has been submitted to the aforementioned PVWMA and Dr. Fisher for quality control and quality assurance purposes, and then submitted to the USACE at various Project meetings. Dr. Fisher identified supplemental information appropriate to specific site conditions to refine this estimate. We believe the loss of Floodplain groundwater recharge is a significant adverse impact that needs to be avoided and preferably enhanced via the LRP and the IRWMP.	
026-12	Page 20: Executive Summary 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.	Thank you for your comment.
026-13	In conclusion, central to our concerns is the apparent lack of coordination in the GRR EA process, as previously described in this comment letter. Page 30 of the GRR EA (1.7 EXISTING PROGRAMS, STUDIES, AND PROJECTS) lists non–USACE relevant regional studies. This list does not contain the relevant IRWMP and related PRWFPA Work Products that view this LRP as a	The list will be revised to include the relevant PRWFPA projects. As previously discussed the Soap Lake Floodplain Restoration Project consists of the preservation of approximately 9100 acres of farmland through either the purchase of the land by fee or floodplain easements. Based on

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	critical path project element in their watershed strategy for flood protection management and integration of other IRWMP Projects. Many of these projects are dependent on LRP outcomes, and determine what measures they must take to adapt their projects to the LRP and Community needs. In these terms, we view this GRR EA as a focused environmental document, typically reliant on a related Programmatic environmental document which encompasses potential environmental benefits and impacts comprehensively. We are unclear of the opinion of the Local Sponsors, who will apparently be taking the lead on the CEQA process in this regard. The IRWMP Programmatic Environmental Impact Report (2007, Section 524 page 5-13, http://www.valleywater.org/Services/IntegratedRegionalWaterManagement/2007_Pajaro_River_Watershed_IR WM_Plan.aspx and the FPA Watershed Study (Phase 3 chapter 4, page 4-3, http://www.pajaroriverwatershed.org/files/PajaroPh3_4a/Ph3_4a_4.pdf somewhat address this matter but we believe the adequacy of this GRR EA is dependent on a clear understanding.	review rights to approximately 1900 of the 9100 acres of the 100-year floodplain have been acquired. There is no dedicated funding stream for acquiring the remaining parcels. Since it is unknown when or if all the parcels will be acquired the Corps are not fully able to determine the impacts/benefits of the project on the downstream area. The project sponsors will be preparing a CEQA document for this project at a later date and may have an opportunity to address the watershed concerns/issues you identified
026-14	It appears, the FPA Watershed Study and Soap Lake Floodplain Preservation Project will manage discharges into the subject USACE LRP, and Local Sponsors will manage LRP levees to safely convey these discharges, as well as the BEP to manage the ecological restoration element for the LRP. Perhaps the constraints placed on the USACE via the 1966 single purpose flood control purpose Authorization disadvantage LRP integration with the aforementioned FPA strategy. This complicates the review process at the Federal and State level due to the LRP scope being limited to the 1949 project footprint. As the Local Partners utilized the State Of California paradigm for developing multi-agency infrastructure projects via the IRWMP, integrating the State and USACE environmental review process is anticipated to provide an optimized robust solution to public safety, property damage reduction, business prosperity, and environmental goals of the Pajaro Watershed Community. We have encouraged the USACE and Local Sponsors to achieve this integration as discussed in our earlier correspondence found in the following link https://waterpowerlaw.sharefile.com/d-s33c23671dd44bc38. Hopefully, Local Partner resourcefulness will demonstrate this capability and	Thank you for your comment.

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	remain successful in the State Grant Funding competition, which has been the principal source of funding enabling progress to date.	
027-1	My primary request for additional information revolves around Section 3.4.2 Incremental Analysis of the Alternatives with regard to the decision to eliminate the levee improvements on the right side of reach 4 while maintaining the levee improvements on the left side, as described in the modifications to the current TSP in the November Update Report. Sec 3.4.2 describes the incremental analysis was conducted "to assess the economic feasibility of each separable element", in order to avoid "masking the subsidizing of net benefits"…"in locations where urban areas are mixed with agricultural areas." Yet, it would appear that that method was only applied to the Santa Cruz side, and not the Pajaro side of the Pajaro River main stem.	Based on the economic impact areas evaluated as part of the study the right bank of reach 4 was not economically incrementally justified, meaning the costs to reduce the flood risk in that area exceeded the benefits. Note that due to the location of the right bank of reach 4 relative to the Mainstem and the tributaries and the town of Watsonvile, the Right Bank of Reach 4 contains mostly agricultural lands. The economic impact area for the left bank of the Mainstem of the Pajaro River included both the urban area of the Town of Pajaro. The agricultural economic model included benefits associated with organic farming and impacts associated with loss of productivity. The federal and local cost share
027-2	Table 3-11 only provides a BCR for the town or Pajaro that includes the upstream agricultural land, yet the right bank of reach 4 is analyzed as a separate entity independent of the town of Watsonville. Considering the BCR for Watsonville is nearly four times greater than for Pajaro and surrounding farm ground, I would like to see what the BCR is for Watsonville including the agricultural area on the right side of reach 4.	Please refer to the Appendix D (Economic Appendix) for a breakdown of the BCR by economic impact area. See response to 027-1 for an expanded discussion.
027-3	Please explain why Alternative 2 appears to be a significantly reduced project scope than Alternative 1, yet the costs outlined in Table 3-2 are higher. I would like to see the BCR for the ring levee around Pajaro separately from the BCR for the agricultural farm ground protected by the new levee on the left side of reach 4.	While the total length on levee in Alternative 2 (Ring Levee) is less than the length of levee in Alternative 1, there are significant costs associated with floodgates needed for several instances when the levee crosses roads and pumping plants needed for the ring levee alternative.
027-4	I would also like to clearly understand how the federal and local cost share is intended to be apportioned to both counties on either side of the Pajaro because it would appear that Santa Cruz is going to subsidize 100-year flood protection on the Monterey county side, while not receiving equal protection on the Santa Cruz side. Please explain how this proposal justifies protecting the left side of reach 2 and not the right side of reach 4.	Based on the economic impact areas evaluated as part of the study the right bank of reach 4 was not economically incrementally justified, meaning the costs to reduce the flood risk in that area exceeded the benefits. The economic model included benefits associated with organic farming and impacts associated with loss of productivity. The federal and local cost share will be determined through the Authorities Analysis
027-5	Please also provide an update to Table 3-4 and 3-11, with the modifications outlined in the TSP in the Update Report, with the detail requested above	Please refer to the Appendix D (Economic Appendix) for a breakdown of the BCR by economic impact area.

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	treating both counties with equal levels of protection for the cities and the agricultural lands as separate entities as described in Sec 3.4.2 Incremental Analysis of the Alternatives.	
027-6	As we have witnessed many times during flood events, and as described in detail in the Appendix report, persistent high-water levels in the main stem and tributaries cause saturation of the earthen levee material, causing collapse where weakness exists. The levees on both sides are of similar condition and the risk of failure is borne somewhat equally today. However, if the Monterey levee is new, and constructed with methods and materials that are superior to our existing levees, it is certain that failure, as a result of high water levels, will occur on the Santa Cruz side comprising a shift of 100% of that risk to the Santa Cruz side as a direct result of construction of a superior levee on the Monterey side.	The existing levees on the right bank of reach 4 on the Santa Cruz side will provide flood risk reduction up to about a 4% annual chance exceedance event.
027-7	Please provide a thorough, detailed and fact-based analysis to demonstrate that the residents and property owners of Santa Cruz County will not be compelled to pay more to subsidize Monterey County while receiving less protection from this important project.	Project Cost Sharing - Each county will be responsible for the cost share portion for the levee improvements in their respective county. Santa Cruz will pay their share for the improvements on the Santa Cruz side and Monterey County will pay their share for the improvements on the Monterey County side.
028-1	Please do the work required to bring the Pajaro River Levee system up to the level of protection needed to prevent more needless suffering through flooding of our communities. Last year due to heavy rains the Salsipuedes Creek required emergency repairs to prevent flooding to homes in this senior community. Our lives, homes and wellbeing depend on the levee system being capable enough to protect us from future flooding. Please do the work needed to reach that level of protection for all our community that resides in close proximity to the Pajaro River Levee system. Thank you.	The Pajaro River FRM project will help to reduce the flood risk to people and property along both the Mainstem Pajaro river and the tributaries.
030-1	At this stage in project history, the success of the Pajaro River Flood Risk Management Project will be measured by its ability to be federally funded and built. Federal funding to proceed through the next project phases, engineering design and construction, will be strongly based on the appropriate calculation of benefits and costs, as well as a design that maximizes project benefit-cost ratio (BCR). Due to the USACE policies that govern how benefits and costs are calculated,	As discussed at the Agency Decision Milestone conference and at subsequent meetings the team is developing the Other Social Effects account discussion to provide additional rationale for acquisition of project funding.

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	Zone 7 is concerned that the BCR, as currently presented in the GRRIEA, will not be competitive and future funding of the project is at risk. Our comments below address these economic considerations and how this inequity will affect the likelihood that USACE will be able to provide public safety to our local communities in the face of ongoing flood threat.	
030-2	Of particular ongoing concern to Zone 7 as a local project sponsor is the outcome of the Authority Analysis and articulation of project authority within the report. Historic floods of 1955 and 1958 demonstrated the insufficiency of the federal facility as constructed in 1949, which led to project authorization in 1966 for flood risk management and facility reconstruction. Our ongoing understanding, based on close partnership, coordination, and conversation with USACE since 1966, as well as legislation, is that our 1966 project authority remains in place and will allow for approval of a Director's Report under the Chief of Engineers discretionary authority and Congressional project authorization provided by Section 203 of the 1966 Flood Control Act. 30-2 Zone 7 would therefore like to see this reflected in the language of the report on page 26, where the current description of project authority is insufficient. Specifically, the language here should mirror section 2 of Appendix C, Draft Real Estate Plan: "Section I 07 of WRDA 1990 provided that the Pajaro River FRM project as authorized by the FCA of 1966 remain authorized. As such, a USACE legal opinion [cite new authority analysis here] was prepared and concluded that: a) the project authorization provided by Section 203 of the Flood Control Act of 1966 remains valid; b) the non-Federal cost share for this project will be set at 25% in accordance with Section I 03 of the Water Resources Development Act (WRDA) of 1986 as physical construction as authorized by Section 203 of the 1966 FCA has not yet been initiated; and c) because this project was authorized in 1966 prior to WRDA 1986, Section 902 limits are not applicable."	The Authorities Analysis is currently under review by the Office of Counsel and the PDT believes that the analysis will conclude that the current project is within the existing 1996 authorization. The authorization language on page 26 will be revised to include the language referenced from the Draft RE Plan as suggested.
030-3	Furthermore, on page 32, section 1.8, and on page 6 of the Executive Summary, we suggest the following phrase be stricken (pending the outcome of the Authority Analysis currently in-process): "...or if warranted through with a new Chief of Engineers Report (Chief s Report) and a new Congressional project authorization."	Concur - Depending on the outcome of the authorities analysis the language in Section 1.8 will be revised

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030-4	The success of project funding will be strongly based on appropriate calculation of benefits and costs, as well as a design that maximizes project benefit-cost ratio (BCR). The economic formulation must use appropriate assumptions and accounting, and the planning and design phases must allow flexibility so that separable elements may be added as Locally Preferred Plan increments to reduce federal project cost and increase federal project BCR.	The project economics utilized benefit categories to the extent possible. As discussed the PDT is developing the Other Social Effects account to make the project more competitive against other projects with higher BCRs.
030-5	Separable Elements. The draft report identifies costs associated with specific features and elements of the project. It may be advantageous to "extract" some of the project elements as separable local elements under a Section 408 process or other appropriate vehicle to reduce costs and therefore 30-5 increase project BCR. An example of this would be non-federal sponsor partnership with California Department of Transportation in addressing bridge reconstruction at Highways 129 and 152. It may also be worthwhile to explore whether such separable elements could be approved for Section 104 credit consideration. Language addressing these concerns should be added to Section 2.6 on page 44, "Other Planning Considerations".	Concur - The project sponsors are developing cost estimates for the bridges; these costs will be utilized if they are provided in time for submission of the final report. Language will be added in Section 2.6 (or elsewhere) that includes some options for project implementation
030-6	Fragility Curves. The fragility curves for the existing project levees are presented on page 11 of the Draft Geotechnical Appendix, Figure 4. Past levee failures have all occurred at water surface elevations less than 100% loading. This suggests the upper bound curve should include a point at 100% failure at less than 100% loading. The description of levee fragility requires a fair representation of reality because it strongly affects benefits calculation and because levee integrity has historically played a primary role in levee failures and public safety. Zone 7 would like to see an adjustment to the fragility curves that is faithful to historic observations, and the non-federal sponsor invites further collaboration in examining historic flow records to help identify the appropriate loading level associated with failure.	The USACE fragility methodology is consistent with the field observations, and note that there is 50% chance the levee would fail if it were loaded to approximately 70 % of levee height (upper bound fragility curve). When the water loads to the top of the levee, there is near certainty the levee will breach. It is noted that in 2017, the water was near the levee crest, however flood fighting was successful in preventing breach. On a statistical basis, the median expected failure load is approximately 70% of levee height for the curves presented in the report and used in modeling.
030-7	1. On page 32 of the Draft Economic Appendix, section 4.1.3, Table 12 provides somewhat dubious performance statistics. While so-called "freeboard" for the without project condition provides some level of uncertainty in calculating assurance statistics, the assurance values should be	Thank you for your comment. Assurance results are computed in the economic model (HEC-FDA) and are based on the engineering curves (exceedance probability-discharge, stage-discharge, levee fragility), the uncertainty associated with

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	uniformly approaching l% for at least 2% and higher (I% and 0.2%) ACE flows.	discharge (as calculated by the equivalent record length in the economic model) and stage (as estimated by the hydraulic engineer), and the top of levee elevation. The curves and uncertainty differ by index point location, and therefore the assurance results will differ across index point locations.
030-8	2. Regarding the assessment on page 48 of the Draft Economic Appendix, prevention of flood fighting costs is a legitimate benefit category and should be included in the benefit-cost analysis.	Thank you for your comment. The Economic Senior Oversight Group (SOG), which is composed of Division, Headquarters, Institute for Water Resources (IWR), and Office of Water Policy Review (OWPR) economists at the Corps of Engineers, has determined that benefits associated with the prevention of flood fighting costs should not be included as a benefit category for FRM projects. This decision applies to all FRM projects Corps-wide.
030-9	3. In the existing agricultural economic model as described in the draft report, production loss due to flooding is expected for 1year. California Code of Regulations require multiple years of fallow in response to flooding. Therefore, 2-3 years of crop production loss is expected and should be incorporated into the agricultural economic model.	Thank you for your comment. Multiple-year net income losses associated with organic crops have been incorporated into the economic model (agriculture) and are reflected in the current estimate of without-project expected annual damages and with-project expected annual benefits.
030-10	4. The expected damages to the City of Watsonville Wastewater Treatment Plant, recycled water facility, Water Resources Center, Coastal Distribution System, and other associated facilities are not included in the economic analysis. These damages should be included in the benefits calculation.	Thank you for your comment. The Wastewater Treatment Plant (WWTP) is located west (downstream) of HWY 1, along the right bank of Reach 1; Reach 1 is not part of the Recommended Plan. The WWTP sustains greater depths of flooding from the Main Stem Pajaro River (i.e., flooding from Reach 1 at IP2) than from the Tributaries (i.e., flooding from Corralitos Creek at IP 7). For this reason, FRM benefits associated with the Recommended Plan cannot be claimed for the treatment plant, since flooding and associated damages to teh WWTP would still occur even with the Recommended Plan in place. Benefits associated with the WWTP could have been claimed if the depths of flooding from the Main Stem were lower than the depths of flooding from the Tributaries. Potential benefits would have been based on reduced frequency of flooding to the plant, since the Recommended Plan would reduce the frequency of flooding from the Tributaries but not from the

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		Main Stem (Reach 1) adjacent to where the WWTP is located; the frequency of flooding from the Tributaries is greater than from the Main Stem Pajaro River, as currently estimated. Floodplain analyses indicate that the depths of flooding surrounding the WWTP are relatively shallow (average 1.5 feet for 1% ACE event) from either source of flooding (Pajaro River, Corralitos Creek).
030-11	5. In section 18 of the Draft Real Estate Appendix, costs of $l30M and $l92M are listed for the Mainstem and Tributary project costs. These are not consistent with (and are higher than) costs outlined elsewhere in the report.	(This comment has been overcome by events. The full cost estimate of the Recommended Plan, which includes real estate, has been redeveloped since this comment was made.)
030-12	6. The draft economic model does not appear to include expected damages that affect the benefits calculation for the Southern Pacific Railroad facility in and near the Town of Pajaro, including the line, switching yard, presence of cars and contents, and how damages could affect the economic distribution of goods coming in and out of Pajaro Valley. These damages should be included in the benefits calculation.	Thank you for your comment. Damages related to railroad infrastructure/activity are not included. Depths of flooding on the tracks are relatively shallow; potential flooding to contents of railroad cars would be minimal to none since the height above the top rail (ATR) is about 48 inches, and depths of flooding maxes out at about 2 ft (500yr event). Also, rail commercial activity is minimal. Passenger train activity is also minimal (or non-existent). Most agricultural products (i.e., strawberries) in the study area are transported from the fields to the Watsonville storage coolers/warehouses, and then shipped on freight trucks cross country rather than on rail.
030-13	1. On page 2 of the Draft FONSI statement, the text suggests that a ring levee around Orchard Park is included in the TSP (bullet #3 for Salsipuedes and Corralitos Creeks). Optimization has removed the ring levee, so it should not appear in the FONSI letter.	Concur - The reference to the ring levee around orchard Park will be removed from the FONSI text.
030-14	2. On page 52, section 2.8, bullet 3 suggests 4% ACE protection on the main stem and Salsipuedes Creeks for without project conditions. Current level of protection (without project), as calculated by USACE (2003) is 8% on Pajaro River below Salsipuedes Creek and 10% on Salsipuedes Creek. (As reported in the USACE Pajaro River Flood Risk Management Project General Reevaluation Study Report Synopsis, 23 November 2016.)	Concur - The PDT will review the report documentation to ensure a correct and consistent reporting of the without project conditions
030-15	3. On page 76, Table 3-13, for Hydraulic Reach of Right Bank Reaches 5 and 6, the protected EIA lists protection at 4% ACE. This should be I% ACE.	Concur - The table will be revised to reflect the correct level of protection.

Comment #	Comment	Response
030-16	4. On page 116, section 4.6.2, under Floodwall Construction, it is suggested that "the construction of a concrete floodwall channel could reduce aquatic habitat and would require the removal of in-channel vegetation." The floodwall itself does not reduce aquatic habitat, unless the floodwall requires removal of vegetation as part of the design. This is not listed as part of the floodwall design.	Concur. A new paragraph was added to Section 4.6.2 to specifically address Floodwall construction. It now states: "Construction of the floodwalls would not affect aquatic habitat except where construction requires removal of waterside vegetation." The original paragraph title was revised to "Floodwall with Concrete Channel" to better reflect the content of the paragraph. The following note was also added: "Note that the floodwall with concrete channel is not included in the RP" (Recommended Plan).
030-17	5. On page 8 of the Draft Geotechnical Appendix, the text should also list 2017 as an instance of damage from levee through-seepage and under-seepage. This occurred along an extensive section of levee in Reach 4 on the right bank (Santa Cruz County) side, and was addressed by local flood fight efforts at considerable expense to the local sponsor.	This discussion will be added to the report, with a note explaining the 2017 performance is not included in the statistical analysis of fragility curve development, as this event occurred after the major analysis was already complete.
031-1	1. Authority Analysis: Confirm the 1966 Authorization. Of ongoing concern is the outcome of the Authority Analysis and discussion of project authority within the report. Historic floods of 1955 and 1958 demonstrated the insufficiency of the federal facility as constructed in 1949, which led to project authorization in 1966 for flood risk management and facility reconstruction. The City's understanding, based on close partnership, coordination, and conversation with USACE since 1966, as well as legislation, is that our 1966 project authority remains in place and will allow for approval of a Director's Report under the Chief of Engineers discretionary authority and Congressional project authorization provided by Section 203 of the 1966 Flood Control Act. The City along with our partner agencies would like to see this reflected in the language of the report on page 26, where the current description of project authority is insufficient. Specifically, the language here should mirror section 2 of Appendix C, Draft Real Estate Plan: "Section 107 of WRDA 1990 provided that the Pajaro River FRM project as authorized by the FCA of 1966 remain authorized. As such, a USACE legal opinion [cite new authority analysis here] was prepared and concluded that: a)	The Authorities Analysis is currently under review by the Office of Counsel and the PDT believes that the analysis will conclude that the current project is within the existing 1996 authorization. The authorization language on page 26 will be revised to include the language referenced from the Draft RE Plan as suggested.

Comment #	Comment	Response
	the project authorization provided by Section 203 of the Flood Control Act of 1966 remains valid; b) the non-Federal cost share for this project will be set at 25% in accordance with Section 103 of the Water Resources Development Act (WRDA) of 1986 as physical construction as authorized by Section 203 of the 1966 FCA has not yet been initiated; and c) because this project was authorized in 1966 prior to WRDA 1986, Section 902 limits are not applicable."	
031-2	On page 32, section 1.8, and on page 6 of the Executive Summary, strike the following phrase: "…or if warranted through with a new Chief of Engineers Report (Chief's Report) and a new Congressional project authorization."	Pending the decision by the Office of Counsel on the Authorities Analysis the language in the report will be revised to reflect that decision
031-3	2. The Fragility Curves Do Not Reflect Actual Historical Damages. The fragility curves for the existing project levees are presented on page 11 of the Draft Geotechnical Appendix, Figure 4. Past levee failures have all occurred at water surface elevations less than 100% loading. This suggests the upper bound curve should include a point at 100% failure and less than 100% loading.	Please see our response to comment 030-6.
031-4	3. The Benefit-Cost Ratio (BCR) is Too Low to be Funded by the Corps. As the proposed project is presented in the draft report, the City has a low confidence in the future fundability of the project. Listed below are areas of critical concern to the City. The success of project funding will be based on appropriate calculation of benefits and costs, as well as a design that maximizes project benefit-cost ratio (BCR). The economic formulation must use appropriate assumptions and accounting. And the planning and design phases must allow flexibility so that separable elements may be added as Locally Preferred Plan increments to reduce federal project cost and increase federal project BCR.	Thank you for your comment. Please see our response to similar comments below.
031-5	4. Please Include the Value of the City's Wastewater Plant in the BCR. The value of the City of Watsonville's Wastewater and Recycled Water facilities and associated infrastructure are not adequately captured in the economic benefits calculation. The City of Watsonville's Wastewater facility provides critical services to the residents of City of Watsonville, Town of Pajaro,	Thank you for your comment. The Wastewater Treatment Plant (WWTP) is located west (downstream) of HWY 1, along the right bank of Reach 1; Reach 1 is not part of the Recommended Plan. The WWTP sustains greater depths of flooding from the Main Stem Pajaro River (i.e., flooding from Reach 1 at IP2)

Comment #	**Comment**	**Response**
	Freedom and Salsipuedes Sanitary Districts. The Recycled Water facility provides water to Pajaro Valley Water Management Agency in order to protect the critically overdrafted groundwater basin. The amount of water that is produced for PVWMA accounts for nearly 20% of the coastal pumping to stop seawater intrusion. The loss of both facilities to the community and region would be approximately $100M in infrastructure. This cost does not include the impacts of environmental or public health violations if the facility is out of service.	than from the Tributaries (i.e., flooding from Corralitos Creek at IP 7). For this reason, FRM benefits associated with the Recommended Plan cannot be claimed for the treatment plant, since flooding and associated damages to the WWTP would still occur even with the Recommended Plan in place. Benefits associated with the WWTP could have been claimed if the depths of flooding from the Main Stem were lower than the depths of flooding from the Tributaries. Potential benefits would have been based on reduced frequency of flooding to the plant, since the Recommended Plan would reduce the frequency of flooding from the Tributaries but not from the Main Stem (Reach 1) adjacent to where the WWTP is located; the frequency of flooding from the Tributuries is greater than from the Main Stem Pajaro River, as currently estimated. Floodplain analyses indicate that the depths of flooding surrounding the WWTP are relatively shallow (average 1.5 feet from 1% ACE event) from either source of flooding (Pajaro River, Corralitos Creek).
031-6	5. Flood Fighting Costs should be Included in the BCR. The City would like the Army Corps to include the cost and avoidance of risk from flood fighting throughout the winter months that project non-Federal sponsors and the City have invested in for the safety of our community.	Thank you for your comment. The Economic Senior Oversight Group (SOG), which is composed of Division, Headquarters, Institute for Water Resources (IWR), and Office of Water Policy Review (OWPR) economists at the Corps of Engineers, has indicated that benefits associated with the prevention of flood fighting costs cannot be considered as a legitimate benefit category.
031-7	6. Replace the Heights of the Floodwalls. The City has concerns about the height of the levee floodwalls. Within City limits there is a large amount of the population that utilizes the access road at the top of the levees for recreation. While this is a secondary benefit of the single authority project, 8- 10 foot levee floodwalls through the center of town will be a public safety issue for residents that will continue to recreate on the access road.	Due to the presence of homes near the existing levee in those locations, placing floodwalls on the levee is the only viable Flood Risk Management option without acquiring the homes and real estate.
031-8	7. Consider Not Rerouting Pinto Lake. In Alternative 5 and 6, p 13, the Corps suggests rerouting Pinto Creek into College Lake. Although this seems to be resolved when reading the economic appendices, the City would like to offer	Concur - Based on the incremental economic analysis the improvements to Pinto Creek were not economically justified and are not included in the Recommended Plan

Comment #	Comment	Response
	the following insight. The City has been leading the effort to remediate Pinto Lake. Pinto Lake has issues with cyanobacteria harmful algal blooms. Through research with regulatory agencies, UC Santa Cruz, UC Davis and CSU Monterey Bay, these blooms were potentially linked to the deaths of birds and several southern sea otters. This is significant because the blooms are fresh water while sea otters are marine mammals. The pathway Pinto Lake flows out to the ocean is through Pinto Creek, into Salsipuedes below College Lake. Given that College Lake is a source of irrigation water, the City would oppose any effort to route Pinto Creek into College Lake.	
031-9	Finally, a detail that stands out to staff reviewing the document, on page 36, the orange circle is not encompassing the Town of Pajaro.	Concur - The figure will be corrected in the final report.

US Army Corps of Engineers

Public Comment Sheet

NAME: [redacted] E-MAIL: [redacted]

ADDRESS: [redacted]

COMMENT/QUESTION:

001-1 In Reach 5 it shows building a flood wall on the existing levee along Bridge St. and then rebuilding the levee behind the homes along Delta Way. Why not continue the flood wall on top of the existing levee behind the homes on Delta Way? That levee was just rebuilt in 2013. It seems like it would be more cost effective and less disruptive to build the flood wall on the existing levee.

Thanks for all of your hard work on this project.

US Army Corps of Engineers

Public Comment Sheet

NAME: [redacted] E-MAIL: [redacted]

ADDRESS: [redacted]

Santa Cruz, CA 95062

COMMENT/QUESTION:

002-1 I have read that farmers in the Central Valley are being paid by the State of California to allow their fields to flood in lieu of building or shoring up the levees around farm fields. This option provides the benefit of providing water to the overdrafted aquifers. I have several thorough articles about this process and will send them to the Corps and the Counties.

Perhaps the ag land here is much more expensive than that in the Central Valley. If so, cost analysis would show what is most cost effective as well as environmentally effective.

US Army Corps of Engineers

Public Comment Sheet

NAME: [redacted] E-MAIL:

ADDRESS: [redacted] PHONE:

WATSONVille

COMMENT/QUESTION:

003-1 I THINK you ALL HAVE DONE A VERY GOOD JOB PRESENTING THIS PROJECT TO THE PUBLIC. It will certainly be difficult if Not impossible to make this PROJECT 100% Acceptable to all those affected by it. But time is of the essence, so please proceed AS RAPIDLY AS possible. Please also pass along my thanks to Ricardo for ANSWERING ALL OF my Engineering questions!

US Army Corps of Engineers

Public Comment Sheet

NAME: [redacted]

ADDRES[redacted]

COMMENT/QUESTION:

004-1 When bridges height are increased what impact will occur to the surrounding residential areas?

US Army Corps of Engineers

Public Comment Sheet

NAME: [redacted]

ADDRE[redacted]

WATSONVILLE CA. 95076

COMMENT/QUESTION:

005-1 Please put land marks (Local) on your Maps/Slides for us to understand what we are Looking at.

US Army Corps of Engineers

Public Comment Sheet

NAME: [redacted]

ADDRES[redacted]

WATSONVILLE, CA 95076

COMMENT/QUESTION:

WITH AN INCREASED PRESSURE CREATED IN THE CHANNEL BY RESTRICTING FLOW DUE TO VEGITATION (TREES) THATS BEEN ALLOWED TO

006-1 FILL THE PRIMARY CHANNEL, WHAT IS GOING TO BE DONE TO REMOVE/CLEAR THE CHANNEL CONGESTON (TREES)?

ANY MODIFICATION TO THE RIVER CHANNEL WITHOUT CLEANING OUT THE ROOT PROBLEM, IS SIMPLY A BANDAID.

US Army Corps of Engineers

Public Comment Sheet

NAME: ______________________ E-MAIL: ______________________

ADDRESS: ______________________ PHONE: ______________________

COMMENT/QUESTION:

007-1 - add major landmarks to project maps

007-2 - add GRR/EA process graphic to report

Kenn Reller
Colors@Cruzio.com

Soap Lake Attenuation

As mentioned in the previous section, Soap Lake acts as a detention basin that fills during large flow events and slowly recedes after the flood wave has passed. The effect on flooding downstream of the basin is a reduction in the flood magnitude due to attenuation of the peak flows. The total volume of water leaving Soap Lake is nearly the same as the volume that enters but it has been spread out. Figure 2-2 shows an example of attenuation by depicting inflow versus outflow hydrographs. Without the storage and attenuation, the outflow hydrograph would be the same as the inflow hydrograph.

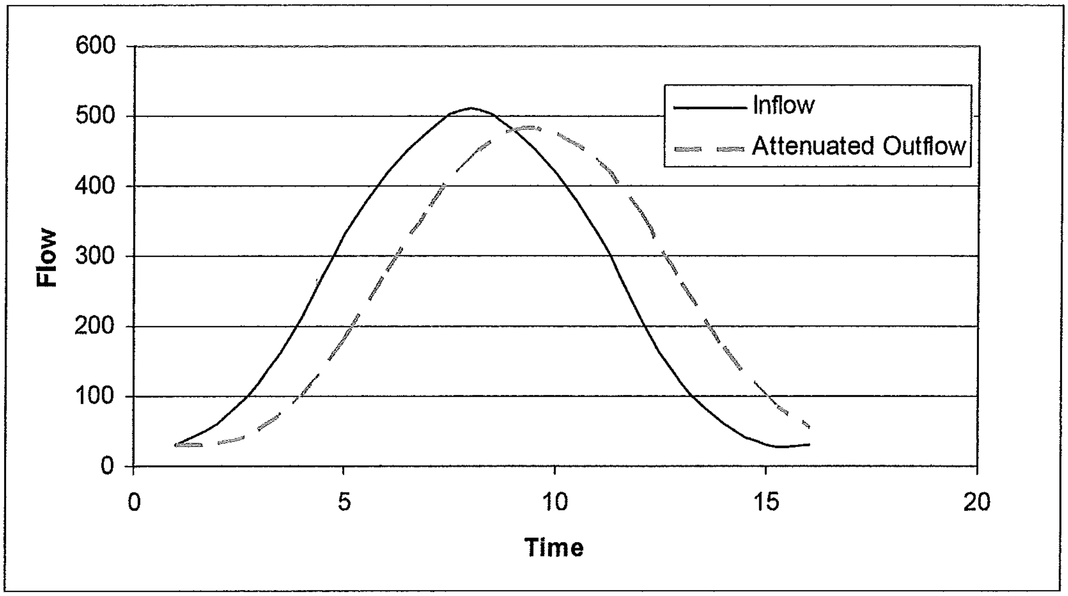

Figure 2-2: Example of attenuation impact on hydrograph.

Figure 2-3 shows modeled results of the peak flows downstream of Soap Lake during a 100-year event with and without attenuation. As can be seen in Figure 2-3, there is a significant difference in the peak flows for the attenuated outflow and the non-attenuated outflow. The lower peak translates into smaller required downstream flood control projects.

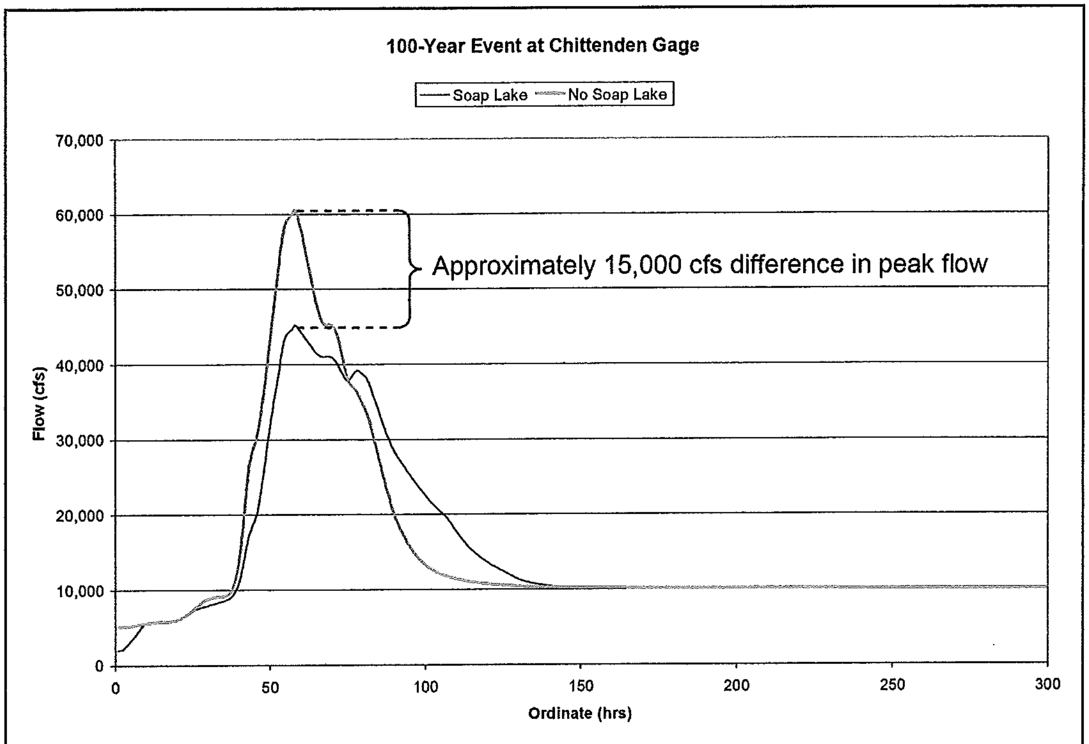

Figure 2-3: Model results of 100-year event flow at Chittenden Gage with and without Soap Lake attenuation.

Importance of Soap Lake

As demonstrated in Figure 2-3, Soap Lake can be considered a very important flood management feature for downstream areas in the Pajaro River watershed. HEC-1 modeling shows that the flood storage and attenuation within Soap Lake leads to a significant decrease in downstream peak flows. As can be seen in Table 2-1, attenuation in Soap Lake increases with event magnitude.

Table 2-1: Peak flows at Chittenden stream gage (Lat 36°54'01", Long 121°35'48") with and without Soap Lake attenuation.

Return Period (Yrs)	Flow with Soap Lake (cfs)	Flow without Soap Lake (cfs)	Peak Difference (cfs)
2	3,600	3,600	0
10	16,900	19,500	2,600
25	28,700	35,300	6,600
50	38,600	50,300	11,700
100	45,200	60,500	15,300
200	60,500	82,400	21,900

Figure 2-4 shows the data of the above table in a graphical format. One of the details that becomes apparent is the reduction in level of protection for the downstream areas if Soap Lake attenuation is removed. Existing or future flood protection projects assume that current storage levels are available. The 100-year flood flow at Chittenden is currently believed to be about 45,000 cfs. Without the Soap

Lake storage and attenuation, a 45,000 cfs flood flow would occur about every 37 years, instead of every 100 years.

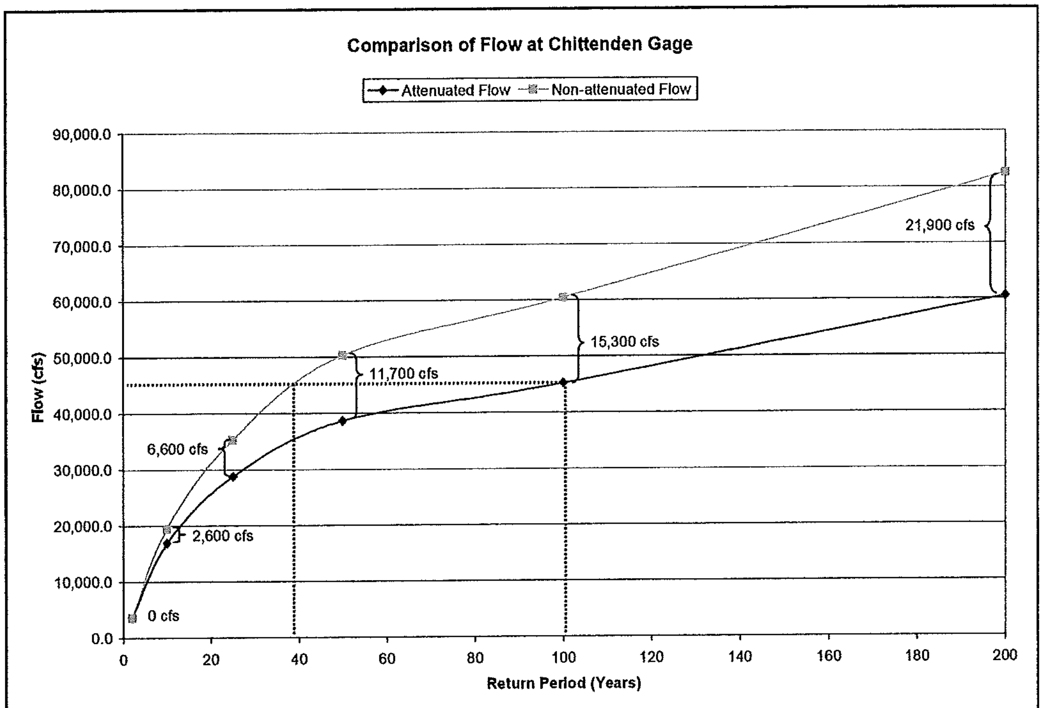

Figure 2-4: Effects of attenuation in Soap Lake on peak flows at Chittenden Gage.

Should Soap Lake be changed so that the floodplains no longer effectively attenuate peak flows, the downstream Lower Pajaro Project would be seriously impacted. A rough estimate of impacts was completed with the help of the Corps of Engineers. Raising the levees to accommodate the higher peak flows would have the following effects:

- **Additional levee cost**: The levees would cost approximately $60 million more than their current estimate of $112 million.
- **Additional land required**: As the levees are increased in height, their footprint is proportionally increased to maintain safe side slopes. Along the length of the levees, approximately 44 additional acres would need to be taken from the levee's neighboring land uses, agricultural and urban development.
- **Bridge modification**: The cost and land requirement increases do not account for impacts to bridges. The bridge and approach for Main Street in Watsonville would need to be rebuilt and the Highway 1 bridge and approach might need to be rebuilt. The railroad bridge would need to be significantly modified or abandoned to accommodate the additional levee height. Modification or rebuilding any of the bridges would be a significant additional cost and public nuisance.

Based on these impacts, the Lower Pajaro Project may not be feasible without the Soap Lake and its attenuation of large peak flows.

<u>Adaptive Management Plan for Vegetation Maintenance</u>

Following a five year plant establishment period for the excavated benches, the following vegetation maintenance would continue as outlined in the CDFG 1602 Streambed Alteration Agreement (Notification Number 1600-2004-0371-3), dated August 4, 2004, and from Table 3.4-1 of the Final EIR for the Pajaro River and Salsipuedes and Corralitos Creeks Management and Restoration Plan, Santa Cruz County, California (Harding ESE. 2002).

Table 5: Trees to be Removed at Excavation Sites

Tree No.	Species	Tree DBH (Inches)	Site Location
Santa Cruz County			
None	--	--	1R (Portion)
2	Cottonwood	17.5	2R
3	Cottonwood	27.5	
4	Cottonwood	20.5	
5	Cottonwood	33.5	
6	Cottonwood	33	
11	Cottonwood	24	3R
None	--	--	4R
15	Cottonwood	17.5	5R
16	Willow	16 & 18	
17	Cottonwood	28	
18	Willow	21	
19	Cottonwood	23	
20	Cottonwood	23	
21	Cottonwood	24	
22	Willow	28	
25	Cottonwood	25.5	
27	Cottonwood	23	
29	Cottonwood	24	
31	Cottonwood	23	5.5R
40	Box Elder	14	6R
41	Cottonwood	12	
42	Cottonwood	23	
55	Cottonwood	35.5	8R (Portion)
Monterey County			
None	--	--	1R (Portion)
214	Cottonwood	25	2L
217	Cottonwood	22.5	
218	Cottonwood	27	
219	Cottonwood	20.5	
220	Cottonwood	21	
264	Willow	22	4L
265	Cottonwood	21.5	
268	Cottonwood	22.5	
269	Cottonwood	19	
None	--	--	7R
62	Willow	28	8R (Portion)
63	Cottonwood	28.5	
65	Cottonwood	26	
66	Cottonwood	19 & 22	

Source: NHC, 2011.

- Prior to mowing of the benches, a qualified biologist would inspect the areas to be mowed and sprayed where the benches are greater than 32 feet wide. In these areas, sprouts of native sycamore, cottonwood and box elder would be flagged for retention so that an eventual spread of trees every 40 feet would be established. The numbers, survival and approximate locations of the sprouts would be recorded and reported to CDFG, after the second spraying in June.
- A maximum average of 60 shoots per 0.1 mile would be removed along the lower channel bank of the Pajaro River for all work. Therefore a total maximum of 4,500 shoots (7.5 miles time 60 shoots per 0.1 miles = 4,500 shoots) would be removed annually along the lower channel bank.
- On the toe of the lower channel bank of the Pajaro River, one willow clump would be flagged, marked, and retained on average of at least one clump every 40 feet (approximately 1,000 trees total over the 7.5 mile reach) and allowed to grow to maturity. Following bench excavation, the County would provide to CDFG a map showing the location of all such retained tree clumps and a written description of how the trees were marked and what measures would be implemented to ensure these trees are retained.
- A riparian buffer zone, five feet in width, would be established on each side of the low flow channel. In this buffer, only vegetation that is greater than three inches in diameter would be removed.
- Channel benches and upper channel bank (top eight feet); both banks. Mowing twice annually, in March and June, followed by an herbicide application.
- Lower channel bank (between lower limit of the upper eight feet and the toe of slope), both banks. Vegetation over three inches in diameter would be manually cut, mowed and/or knocked down with mechanical equipment. Removal would average 20-40 sprouts and shoots every 0.1 mile. At least 10 feet of vegetation would be left on the lower channel bank.

STATE OF CALIFORNIA—NATURAL RESOURCES AGENCY

EDMUND G. BROWN JR., *GOVERNOR*

CALIFORNIA COASTAL COMMISSION

CENTRAL COAST DISTRICT OFFICE
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SANTA CRUZ, CA 95060
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November 30, 2017

U.S. Army Corps of Engineers
San Francisco District
ATTN: CESPN-ET-PB-Pajaro River
1455 Market Street
San Francisco, CA 94103-1398

Subject: Pajaro River Flood Risk Management Environmental Assessment

To Whom It May Concern:

Thank you for providing the opportunity to review and comment on the draft integrated General Reevaluation Report and Environmental Assessment (GRR/EA) and the draft Finding of No Significant Impact (FONSI) for the proposed Pajaro River Flood Risk Management Project for Monterey and Santa Cruz Counties. The project seeks to address ongoing flooding issues in the "Pajaro River Project Area," which includes the City of Watsonville, the Town of Pajaro, and the surrounding agricultural lands, some of which are in the coastal zone. The GRR/EA evaluates an array of project alternatives to address flooding in the Pajaro Valley and identifies a Tentatively Selected Plan (TSP). Commission staff would like to share the following comments, observations and suggestions in response to the GRR/EA and FONSI:

008-1

1. **Coastal Permitting Requirements**. First, we would like to note that the Coastal Commission retains coastal development permit (CDP) jurisdiction for that portion of the Pajaro River located roughly within the existing levee berms and extending from the River mouth to the coastal zone boundary, i.e. the inland extent of Highway 1. As such, any development activities within this area will require a CDP from the Coastal Commission. Second, since the County boundary runs down the center of the River, Santa Cruz and Monterey Counties have CDP jurisdiction that roughly covers the existing berms that define the current River boundaries. As such, any development activities in the coastal zone that include the existing berms or areas outside of the River channel and the berms will require CDPs from both Monterey and Santa Cruz Counties (these CDPs will be appealable to the Coastal Commission). And third, as a federal project, all of the project (coastal zone and non-coastal zone components) may be subject to the Coastal Commission's federal consistency review procedures. Some of this required Coastal Commission consistency review may be subsumed within the Commission's CDP review.

2. **Coastal Act Section 30236 (Water Supply and Flood Control*)*.** As noted above, the Coastal Commission retains jurisdiction over the lower reaches of the Pajaro River, and therefore the Commission will be responsible for issuing a CDP for any development activities in this area. Thus, the Coastal Act will be the standard of review for any project

components within the Commission's retained permitting jurisdiction; the Coastal Act is
also the standard of review for federal consistency. Coastal Act Section 30236 (Water
Supply and Flood Control) provides for channelizations, dams, or other substantial
alterations of rivers and streams provided that they "incorporate the best mitigation
008-2 measures feasible, and be limited to (1) necessary water supply projects, (2) flood control
projects where no other method for protecting existing structures in the flood plain is
feasible and where such protection is necessary for public safety or to protect existing
development, or (3) developments where the primary function is the improvement of fish
and wildlife habitat." If it is determined that the Pajaro River Flood Risk Management
Project is necessary to protect existing development and public safety, the project would
be approvable under the Coastal Act provided it includes the *best* mitigation measures
008-3 feasible. We therefore recommend evaluating the feasibility of: 1) revegetating areas
subject to construction and excavation activities (i.e., through the planting of a riparian
herb layer); and 2) "softer" riprap revetments (i.e., alternatives to strictly concrete or rock
revetments, including vegetated riprap or other similar "soft armoring" efforts currently
008-4 being explored in the Oxnard/Ventura areas along the Ventura River and the Santa Clara
River). Finally, we would like to note that the project should entail protection measures
for any listed sensitive species, and that the Commission typically requires a 3:1
008-5 mitigation for any impacts to riparian habitat, and thus these components should be
incorporated into the project.

Thank you for your consideration. Please note that these are preliminary comments, and we hope to continue to work with the Army Corps of Engineers as this project develops. If you have any questions or concerns, please do not hesitate to contact me at the address and phone number listed above. For questions regarding potential federal consistency review of this proposed federal project, please contact Larry Simon, the Commission's Federal Consistency Coordinator, at (415) 904-5288.

Sincerely,

Rainey Graeven

Rainey Graeven
Coastal Program Analyst
Central Coast District Office
California Coastal Commission

State of California – The Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Bay Delta Region
7329 Silverado Trail
Napa, CA 94558
(707) 944-5500
www.wildlife.ca.gov

***EDMUND G. BROWN JR.**, Governor*
***CHARLTON H. BONHAM,** Director*

November 30, 2017

Mr. Chris Eng, Environmental Manager
U.S. Department of the Army
San Francisco District, Corps of Engineers
1455 Market Street, Suite 1737B
San Francisco, CA 94103
CESPN-ET-PB@usace.army.mil

Dear Mr. Eng:

Subject: Pajaro River Flood Risk Management General Reevaluation Report and Integrated Environmental Assessment, Santa Cruz and Monterey County

The California Department of Fish and Wildlife (CDFW) has reviewed the Pajaro River Flood Risk Management General Reevaluation Report and Integrated Environmental Assessment (GRR/EA) and is submitting comments to the U.S. Army Corps of Engineers (COE) San Francisco District, as the Lead Agency, of potential impacts to sensitive resources associated with the proposed Project.

Project Location and Description

The Project area is located along the Salsipuedes and Corralitos Creeks tributaries to the Pajaro River and the Pajaro River tributary to the Pacific Ocean in the counties of Santa Cruz and Monterey.

The Project includes improving and/or adding floodwalls and setback levees, as well as maintaining existing levees to reduce the threat of flooding to the City of Watsonville, the unincorporated community of Pajaro, and surrounding agricultural areas in the Counties of Santa Cruz and Monterey. The setback levees will allow the Pajaro River and its tributaries to evolve and reconnect to roughly 91 acres of floodplain.

Operation and Maintenance

009-1 Implementation of the COE's levee vegetation removal policies could have a significant impact on riparian habitat. The draft GRR/EA states that operation and maintenance (O&M) activities would maintain levees and 15 feet either side of the levees permanently free of trees and shrubs. Stream temperatures are higher and habitat for wildlife species is lower in rivers and streams containing limited riparian vegetation. It is unclear how much existing riparian vegetation would be impacted as a result of proposed O&M activities.

009-2 The draft GRR/EA does not describe other O&M activities; therefore, CDFW is unable to determine how O&M will affect special-status species at this time. CDFW recommends that the GRR/EA provide further details and explanations of O&M activities, specifically how vegetation and sediment will be managed within and adjacent to the levees and floodwalls.

Fish Passage

009-3 CDFW supports the construction of culverts and weirs that meet National Marine Fisheries Service (NMFS) guidelines for salmonid passage requirements. The draft GRR/EA currently does not provide explanation if the Project will provide salmonid passage throughout the Project. CDFW recommends assessing salmonid passage throughout the Project within the next step of the design process to identify if the Project will cause any salmonid passage issues.

Bank Protection Methods

009-3 While the draft GRR/EA explains the general footprint of the Project, the document does not provide specifics on Project design, specifically bank protection. CDFW recommends that the GRR/EA indicate the location, volume, and method of installation for riprap and other bank protection. In general, CDFW recommends that bioengineering techniques be used for bank protection where feasible, as these techniques would allow for habitat to develop as well as providing sufficient bank stabilization.

Foothill Yellow-Legged Frog

009-4 In section 4.6.1 under aquatic species, the draft GRR/EA states that foothill yellow-legged frog (FYLF) is one of four species found in the Pajaro River that have a special-status federal or state endangered species listing. However, in section 4.14 FYLF is only discussed in Mitigation Measure SSS-4. CDFW recommends that the GRR/EA incorporate general information about FYLF and incorporation of additional Mitigation Measures for the species, similar to how steelhead is described within section 4.14.2.

009-5 FYLF is currently a candidate species under the California Endangered Species Act, and an Incidental Take Permit from CDFW is required if "take" of FYLF is anticipated during project construction or project operation and maintenance. More information regarding CDFW's Incidental Take Permit can be found at https://www.wildlife.ca.gov/Conservation/CESA/Incidental-Take-Permits.

CDFW appreciates the opportunity to provide comments on the draft GRR/EA for the proposed Project and is available to meet with you to discuss our concerns. If you have any questions, please contact Ms. Monica Oey, Environmental Scientist, at (707) 944-5575; or Ms. Randi Adair, Acting Environmental Program Manager, at (707) 576-2786.

Sincerely,

Craig Weightman
Acting Regional Manager
Bay Delta Region

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Central Coast Regional Water Quality Control Board

December 11, 2017

Travis J. Rayfield
Lieutenant Colonel
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U.S. Army Corps of Engineers
1455 Market Street
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Email: Travis.J.Rayfield@usace.army.mil

VIA ELECTRONIC MAIL

Dear Lieutenant Colonel Rayfield:

COMMENTS ON THE PAJARO RIVER FLOOD RISK MANAGEMENT GENERAL REEVALUATION REPORT AND INTEGRATED ENVIRONMENTAL ASSESSMENT

Thank you for the opportunity to review and comment on the Draft Pajaro River Flood Risk Management General Reevaluation Report and Integrated Environmental Assessment (GRR/IEA). We support efforts to reduce flood risk in the lower Pajaro River area and support many specific aspects of the Pajaro River Flood Risk Management Project (Project). However, based on our review of the GRR/IEA, we identified aspects of the Project that the Corps should
010-1 improve to protect water quality and beneficial uses of the Pajaro River and its tributaries. Also, we identified aspects of the Project and GRR/IEA where additional analysis and information would facilitate our ability to offer our full project support. We are committed to working constructively with you to achieve a project that provides flood risk reduction and water quality and beneficial use protection. It is with that goal that we provide these comments. We have undertaken similar collaborative approaches in recent years, with substantial success, on other large flood control projects within our region, including the Salinas River Stream Maintenance Program and the Upper Llagas Creek Flood Protection Project.

GENERAL COMMENTS

As you are aware, the Central Coast Regional Water Quality Control Board (Central Coast Water Board) protects water quality and beneficial uses of waters of the State. We find that the most effective way to achieve this is to avoid impacts to waters of the State wherever possible, then minimization of remaining impacts, followed by implementation of compensatory mitigation to offset impacts that cannot be avoided or minimized. This approach is consistent with the Clean Water Act section 404(b)(1) guidelines applicable to the U.S. Army Corps of Engineers (Corps). For over 15 years, we have consistently provided input seeking increased application of avoidance, minimization, and mitigation practices to the Project in order to best achieve water quality and beneficial use protection. Examples of our efforts include letters dated February 10,
010-2 2003 and July 27, 2012; participation in a three-day charrette meeting on August 26-28, 2014; and participation in multiple resource agency meetings dating back to 2010. While we see evidence in the GRR/IEA that our input has been taken into consideration and appreciate that

effort, we also find that practicable alternatives we have suggested to reduce impacts to water quality and beneficial uses have not been incorporated into the Project.

010-3 In particular, we provided previous input regarding the following topics, as well as many others: the importance of river and riparian corridor width, channel complexity, functional floodplains, active channel dimensions, and channel length; the benefits of channel migration zone levees; the potential for flood walls to accelerate flood flows and increase scour; the potential for tieback levees to shift flooding and prompt increased maintenance; and the benefits of minimization of channel maintenance.

010-4 It appears that the process the Corps has used to select its preferred Project alternative (the Tentatively Selected Plan or TSP) may play a significant role in the Corps' ability to incorporate our suggested water quality and beneficial use protection measures into the Project. The TSP was apparently selected based on it being the Project alternative with the highest benefit-cost ratio. However, the cost-benefit analysis methods used to assess each alternative should be improved to provide a more complete and accurate assessment of Project costs and benefits. Based on our review of the Economic Appendix, it appears that the environmental costs and benefits of each alternative were not considered. In addition, the maintenance costs considered for each alternative are identical, though an alternative with channel zone migration levees will likely necessitate fewer maintenance activities and costs. A more thorough cost-benefit analysis that includes consideration of environmental costs and benefits of each alternative should be conducted, such as a triple bottom line cost benefit analysis. More detailed analysis of maintenance costs of each alternative should also be conducted.

010-5 The manner in which the TSP was determined to be the least environmentally damaging practicable alternative (LEDPA) also likely plays a role in some of our input not being incorporated into the Project. The conclusion in Appendix E-5 stating that the TSP is the LEDPA is not well justified. Appendix E-5 does not include analysis of any of the Project alternatives other than the TSP. Apparently, the TSP is the only alternative that was considered because "it is the alternative that may be recommended under the regulations governing USACE water resources planning regulations […]" However, all of the alternatives achieve a benefit-cost ratio greater than unity (1:1), which we understand is the threshold ratio necessary for recommending that a project move forward. As such, each alternative is practicable. Moreover, the benefit-cost ratios for each alternative would likely change with a more thorough cost benefit analysis. The analysis to identify the LEDPA should include a more complete cost benefit analysis and consideration of all alternatives. In turn, following such an analysis, the LEDPA should dictate which alternative is selected as the TSP, rather than the other way around.

010-6 While we find that the choices of the TSP and LEDPA need further assessment, we have reviewed the GRR/IEA impact and mitigation analysis in detail. In general, we find assessment of the TSP and GRR/IEA difficult because we understand the model used to design and select the Project is inaccurate, and therefore the final Project design and associated impacts are currently unknown. We request the opportunity to review the Project once it is further developed using correct and accurate modeling. In addition, we find that the GRR/IEA in many areas lacks a sufficient level of detail. Impact, mitigation, and maintenance discussions in particular are typically too brief and general to fully assess Project impacts to water quality and beneficial uses. Our comments below on specific sections of the GRR/IEA identify discussions we find to be too brief and general.

010-7 Ultimately our goal is to collaborate with the Corps so that we can write a letter in support of the Project. Our comments are provided to achieve that goal. Additional analysis and information that demonstrates Project avoidance, minimization, and mitigation of impacts to waters of the State and protection of water quality and beneficial uses will help us reach that end.

SPECIFIC COMMENTS

Section 4.6 Aquatic Resources

1. **Hydrologic and Hydraulic Conditions**

010-8

A. The level of detail in this section should be increased to describe impacts to hydrologic and hydraulic conditions more fully. For example, the GRR/IEA states that modifications to the levee system may alter channel hydraulics under high flow conditions, which may cause channel modifications that alter habitat, and that this is a key factor affecting aquatic resources. However, the GRR/IEA does not include further analysis or description of the ways in which levee modifications might alter the hydraulics and how the channel and habitat may be affected. The GRR/IEA should be augmented to provide a more detailed discussion of the expected changes in hydrologic and hydraulic conditions, as well as the resulting scope and magnitude of impacts to the channel, habitat, and water quality.

010-9

B. The proposed mitigation appears unlikely to reduce hydrologic and hydraulic impacts to less than significant levels. For example, this section references the mitigation described in sections 4.11.3 and 4.18.3, which are mostly actions to be taken during construction. These sections do not provide mitigation for direct impacts to aquatic habitat following completion of construction. The GRR/IEA should be revised to include compensatory mitigation measures for any hydrologic and hydraulic impacts to aquatic habitat that may occur after construction is complete. If river conditions such as bank complexity, structural diversity of vegetation, and wildlife abundance and diversity are permanently impacted due to changes in hydrologic and hydraulic conditions, appropriate mitigation may include rebuilding bed and bank complexity (e.g., replacing features such as woody debris/rocks and restoring pre-project contours/benches) and replanting diverse and abundant vegetation.

010-10

C. This section also references mitigation section 4.17.3, which lists management practices such as reseeding of disturbed areas with forbs and grasses. To mitigate impacts to disturbed areas to less than significant levels, the GRR/IEA should include active and robust in-kind revegetation that replaces lost habitat functions and features. Similarly, while section 4.18.3 states that disturbed areas will be revegetated, it does not specify how they will be revegetated. To ensure impacts are mitigated to less than significant levels, the GRR/IEA should describe revegetation that will occur and how it will mitigate impacts.

2. Channel Erosion and Deposition

010-11 A. The GRR/IEA states that modifications to the levee system may change areas of erosion and deposition, which would affect habitat conditions in the Project area. However, the GRR/IEA does not describe the scope or magnitude of the erosion and deposition changes. The GRR/IEA should be augmented to analyze and describe how the erosion and deposition changes will alter existing water quality and aquatic habitat of the river and tributaries.

010-12 A complete assessment would include a fluvial geomorphologic assessment that describes the potential impacts of each proposed feature (levee, floodwall, setback levee, or similar) in each reach, including:

i. The response of waterbody flow to adding these features in terms of potential resultant undercutting, erosion, or deposition to upstream, opposite, and/or downstream banks and bed;
ii. The response of waterbody morphology to changes in flow velocity and channel capacity, cross section, length, and gradient;
iii. Impacts on vegetation and aquatic habitat resulting from changes in river/tributary flow and morphology; and
iv. Impacts at hardscape sites such as undercutting or erosion directly adjacent to the hardscape areas.

In particular, potential changes to the following locations and features should be included in your assessment:

i. Agricultural land north of the reach 4 levee;
ii. Existing levees and municipal infrastructure at the confluence of Salsipuedes Creek and the Pajaro River that are impinged in the area created by flood walls in reach 5 and 3;
iii. The completion levee in reach 4; and
iv. The meanders in reach 4.

010-13 B. As with the mitigation for hydrologic and hydraulic impacts, this section also focuses on mitigation implementation during the construction phase. To mitigate impacts to less than significant levels, the GRR/IEA should identify mitigation measures to offset loss of aquatic habitat and functions due to erosion and deposition that is expected to occur following construction completion.

3. Substrate

010-14 A. This section does not provide enough information regarding impacts to substrate. The GRR/IEA should describe changes to substrate due to erosion and deposition resulting from Project features.

010-15 B. This section states that it is unlikely that the Project would have an effect on channel morphology or on the substrate composition of the lower Pajaro River, Corralitos Creek, or Salsipuedes Creek. However, in the Channel Erosion and Deposition section, the GRR/IEA states that levees may alter areas of erosion and deposition, elements that may change the substrate and contribute to the shape of the channel. The GRR/IEA should be clarified to address this apparent inconsistency.

010-16

C. As with the mitigation sections proposed for hydrologic and hydraulic impacts, mitigation proposed for substrate also focuses on mitigating impacts from construction activities. To mitigate impacts to less than significant levels, the GRR/IEA should identify mitigation that will offset changes to aquatic habitat and functions due to substrate impacts that may occur following construction completion.

4. Water Temperature

010-17

A. The water temperature section states, "Maintenance practices within the riparian zone may affect water temperatures." The GRR/IEA also states, "Habitat components that are affected by hydrologic and hydraulics conditions include temperature..." However, the GRR/IEA does not adequately describe the scope and magnitude of this impact. The GRR/IEA should describe how various waterbody conditions that may change due to the proposed Project (e.g., hydraulics, hydrologic conditions, riparian zone conditions, and bed, bank and substrate) may have an impact on temperature.

010-18

B. The proposed mitigation for the Aquatic Resources section does not include mitigation for water temperature impacts that will occur during or after construction. The GRR/IEA should include mitigation for reducing impacts to water temperature to less than significant levels.

5. Levee Setbacks

010-19

A. Additional detail is needed in this section of the GRR/IEA to identify and substantiate impacts resulting from levee setbacks. The GRR/IEA states:

   i. Setting back the levees would "affect the processes that create aquatic habitat while additionally allowing the expansion of riparian zones which could affect habitat availability and quality,"
   ii. With "wider riparian zones, more natural channel processes would occur," and
   iii. This would provide more habitat complexity than currently exists.

While the Project proposes to increase space in the river and tributaries, the GRR/IEA lacks enough detailed information to demonstrate that the Project will create more habitat complexity and value within the increased space. Additional information should be added to the GRR/IEA addressing this issue, since increased habitat in these areas is critical to reduction of impacts to less than significant levels.

010-20

B. The GRR/IEA states that levee setbacks are central to mitigating Project impacts, and specifically states, "The project has been designed to be self-mitigating through incorporation of setback levees and no additional compensatory mitigation costs are anticipated." To demonstrate this mitigation is sufficient in offsetting impacts to a less than significant level, the GRR/IEA should include a thorough assessment of the proposed aquatic habitat condition in the areas to be gained through levee setbacks in comparison to the existing habitat conditions that will be impacted. For each reach (each section that changes in width from the previous section) in the setback areas, the GRR/IEA should include:

i. A description and measure of the area gained once the current levees are removed not counting the 15-foot tree and shrub free zones.
ii. A description of the characteristics of riparian habitat expected in the setback areas including:
    a. A measure of the area that will remain unvegetated due to typical expected scour, if any.
    b. A measure of the area that will be able to sustain mature vegetation and more complex bank features, if any.
iii. A description of how the setback area will respond to erosion and deposition.

In order to identify how much habitat is to be gained in the setback areas, an assessment of how these setback areas will respond to features that increase erosion and deposition is needed.

010-21 C. A description of how the current levees will be removed and how the riverbed beneath the current levees will be addressed should be added to the GRR/IEA.

6. Floodwall Construction

010-22 A. The GRR/IEA does not include adequate information describing the reaches within the proposed floodwall construction. This section should be augmented to clarify the design of the floodwall channel and its planned habitat condition. For example, it is unclear if the entire channel is proposed to be concrete. In addition, to adequately describe impacts associated with the floodwalls, the GRR/IEA should describe maintenance that will be conducted within the floodwall channels and type of habitat that will be sustained.

010-23 B. As with the mitigation proposed for other aquatic resource impacts, this section also focuses on mitigation implementation during the construction phase, but omits revegetation to mitigate removal of vegetation and other aquatic habitat features resulting from floodwall construction. The GRR/IEA should identify mitigation measures for permanent removal of aquatic habitat and functions due to the floodwall channel design that will reduce impacts to a less than significant level. The GRR/IEA should also identify mitigation for aquatic habitat losses expected to occur following construction completion such as temporal losses of aquatic habitat due to time necessary for establishment of a natural channel bottom and time necessary to recover from higher velocity floodwaters confined within floodwalls.

Section 4.8 Hydrology, Hydraulics, Geomorphology

1. **Hydraulic Model**

010-24
A. During the November 8, 2017 conference call with resource agencies, the Corps reported that the hydraulic model on which the Project is based has a significant error. The GRR/IEA should be revised upon completion of accurate modeling. Impacts and necessary mitigation cannot be accurately identified based on incorrect modeling.

2. **Geomorphology**

010-25
A. Additional detail is needed in this section to identify geomorphological impacts. For example, the new floodwalls can increase high flow velocities and scour, potentially impeding steelhead migration. A new levee located only on the south side of reach 4 can exacerbate scour on the opposite bank. These geomorphological impacts and others should be identified and described in more detail.

010-26
B. The only proposed mitigation for the Hydrology, Hydraulics, Geomorphology section is for replacing water supply wells that will get covered by Project features. To mitigate impacts to less than significant levels, the GRR/IEA should identify mitigation measures to offset impacts to aquatic habitat and functions due to changes in geomorphology that is expected to occur following construction completion.

Section 4.17 Vegetation and Wildlife

010-27
1. The detail in this section should be increased to better identify impacts to vegetation and wildlife. The GRR/IEA describes wildlife habitat in the Project area but does not adequately describe how the Project will impact vegetation and wildlife. The GRR/IEA should be augmented to describe impacts to vegetation and wildlife in terms of the following characteristics:
    A. Loss of nesting, roosting, and foraging sites in trees, shrubby vegetation, herbaceous vegetation, emergent vegetation, and wetlands;
    B. Impacts to features that are specific to particular wildlife species, for example, features that attract southwestern pond turtles for basking and egg laying; and
    C. Impacts to cover and forage for larger animals.

010-28
2. Flood walls and higher levees may cause increased velocity of river and tributary waters. The GRR/IEA should assess and identify the impacts of increased velocities to aquatic organisms, for example, their ability to find refuge and migrate, and which age classes/species may be most impacted.

010-29 3. Based on Table 4.17-1 in the GRR/IEA, the TSP will result in loss of native vegetation including riparian habitat and potentially wetlands. The GRR/IEA should be revised to include a comprehensive impact and mitigation section that describes and quantifies impacts to each type of aquatic and riparian vegetation, quantifies mitigation for each type of impact, and describes how mitigation will reduce impacts to less than significant levels.

010-30 4. The GRR/IEA states "Wetlands are not well captured with the GIS tools used in this analysis. Where present they may be included within water or grassland." The GRR/IEA should be revised to identify and describe all wetlands with the Project area that may be impacted.

010-31 5. Some of the mitigation in the vegetation and wildlife section describes reseeding disturbed areas. Depending on the habitat quality of the areas disturbed, reseeding may not be robust enough mitigation to reduce impacts to a less than significant level. The reseeding should be assessed in terms of mitigating impacts to habitat, and augmented where necessary to reduce those impacts to less than significant levels.

010-32 6. The GRR/IEA describes the Project as self-mitigating, but there is little analysis provided to support this determination. In order to support this position, the GRR/IEA should identify and quantify the Project impacts to aquatic and riparian habitat and compare them to the gains in aquatic and riparian habitat resulting from the Project. This analysis should include a reach-by-reach inventory, with detailed descriptions of lost habitat functions and demonstration of how those functions will be regained.

010-33 7. To mitigate impacts to aquatic and riparian habitat to less than significant levels, mitigation should include planting the same or very similar species of vegetation to those impacted. Temporal losses should be decreased by planting vegetation that is close in size and function to the impacted vegetation, as opposed to planning for revegetation that begins from seed. To reduce the risks involved in trying to re-create aquatic habitat, replacing a larger amount of individuals and area is often necessary to mitigate impacts to less than significant levels, depending on factors such as temporary versus permanent impacts, temporal loss, distance of lost habitat from replacement location, quality of proposed mitigation, and other project-specific factors.

010-34 8. To maintain impacts at less than significant levels, ruderal vegetation that is removed should be replaced with native vegetation of at least similar stature, if not of a more robust and diverse nature. Replacing ruderal vegetation with native vegetation and preventing the ruderal vegetation from re-growing has the potential to serve as mitigation credit.

010-35 9. As with the mitigation for other sections above, the mitigation for this section focuses on mitigation implementation during or prior to the construction phase. To mitigate impacts to less than significant levels, the GRR/IEA should identify mitigation measures to offset the impacts to vegetation and wildlife that is expected to be ongoing following construction completion.

Section 4.18 Water Quality

010-36

1. The GRR/IEA does not identify water quality impacts due to proposed Project features such as levees and floodwalls (with or without setbacks) that create a confined space through which the velocity of high flows is increased, potentially inducing scour. As noted in the GRR/IEA, the Pajaro River, and Salsipuedes and Corralitos Creeks are subject to TMDLs for sediment and turbidity. The GRR/IEA should be revised to include an assessment of the Project's potential to cause impacts such as increases in sediment discharge, sediment transport, and turbidity. The GRR/IEA should include mitigation to reduce any impacts to less than significant levels.

010-37

2. The mitigation discussed in the GRR/IEA for water quality impacts focuses primarily on measures to be implemented during the construction phase of the Project (with the exception of Operations and Maintenance (O and M)). Mitigation for impacts to water quality that may occur following completion of construction should also be assessed and identified.

010-38

3. The GRR/IEA should be augmented to describe the O and M in more detail so that related impacts can be fully identified. While the GRR/IEA briefly discusses vegetation management and application of herbicide and rodenticide, it does not describe the scope and magnitude of these activities. Without such an assessment, impacts cannot be fully ascertained. To better describe proposed O and M, the GRR/IEA should include:
    i. Triggers for the commencement of O and M (such as composite roughness coefficients);
    ii. Areas of vegetation removal due to O and M (if any) in each reach;
    iii. Temporal intervals between O and M;
    iv. Any proposed sediment removal, and expected changes to channel morphology due to O and M;
    v. Proposed rip rap/flood wall/levee maintenance; and
    vi. Figures identifying O and M within the river and tributaries.

010-39

4. The GRR/IEA should include mitigation to reduce impacts to habitat resulting from O and M to less than significant levels.

Geotechnical Appendix

010-40

1. In section 3 EROSION the appendix states, "The plan for erosion management features to cover sediment and channel stability is ongoing; more analysis is expected to provide greater insight." This analysis and insight should be incorporated into the GRR/IEA, if it has not been already.

010-41 2. In section 4.3 Erosion Protection the appendix reports, “Erosion protection should be carefully considered in collaboration with hydraulic engineering. Project alternatives should be formulated with a “rock” and “no-rock” approach within reaches/sub-reaches.” Assuming the rock reference is to the rip rap proposed for application on the levees, the GRR/IEA should be augmented to discuss the feasibility of a “non-rock” approach throughout the Project or in particular locations.

Thank you for the opportunity to comment. We look forward to continue working with you on this project. If you have questions, please contact **Kim Sanders** at (805) 542-4771 or via email at Kim.Sanders@waterboards.ca.gov, or Phil Hammer at (805) 549-3882.

Sincerely,

for
John M. Robertson
Executive Officer

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NOV 3 0 2017

In response reply to: WCR-2017-8412

Lieutenant Colonel Travis J. Rayfield
Commander and District Engineer
United States Army Corps of Engineers
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ATTN: Christopher Eng

Dear Colonel Rayfield:

This letter is in response to a request by the U.S. Army Corps of Engineers (Corps) for public comment on the draft integrated General Reevaluation and Environmental Assessment (GRR/EA) and draft Finding of No Significant Impact (FONSI) for the Pajaro River Flood Risk Management Study, made available on October 31, 2017. The Corps requested public comments to be submitted within 30 days of issuance of the GRR/EA.

The Draft GRR/EA describes multiple project alternatives for both the mainstem (Alternatives 1-4) and the Salsipuedes-Corralitos Creek tributaries (Alternatives 5-8). The Draft GRR/EA also briefly describes the evaluation process used for the alternatives, both the selection and description of the Tentatively Selected Plan (TSP), the anticipated effects on the environment, and proposed mitigation measures. The proposed action (Alternatives 1-8) will occur in areas occupied by the South-Central California Coast (S-CCC) steelhead (*Oncorhynchus mykiss*) Distinct Population Segment (DPS) and their designated critical habitat, which are administered by NOAA's National Marine Fisheries Service (NMFS) under the federal Endangered Species Act (ESA). In NMFS' recovery plan for the S-CCC steelhead DPS (NMFS 2013), the Pajaro River was identified as a Core 1 Population, meaning the highest priority for species recovery. The recovery plan documents the many threats that have and are likely to continue to impact steelhead recovery which include channelization of the Pajaro River, poor water quality, among others.

Please find NMFS' comments on the Draft GRR/EA below:

General Comments on the Draft GRR/EA

- Since 2001, NMFS has provided technical assistance on various flood control project alternatives for the Pajaro River. Through this technical assistance, NMFS has recommended the use of setback levees, excavation of channel benches within the existing channel and levees, among other technical guidance. In a letter to the Corps dated April 30, 2012, NMFS proposed an additional levee design alternative based on the Channel Migration Zone (CMZ) concept and a preliminary cost-comparison analysis. The intent of the CMZ design is to provide a sustainable channel design that maximizes natural geomorphic and riverine processes, including improved floodplain connectivity, while providing necessary flood control benefits at similar costs. The April 2012 letter was followed by a joint letter filed by NMFS and Central Coast Regional Water Quality Control Board on July 27, 2012, which reaffirmed this recommendation.

011-1 The Draft GRR/EA Alternative 3 includes the CMZ design concept. NMFS is pleased to see the levee setbacks of various proposed widths have been incorporated into the design alternatives, including the TSP. NMFS is also pleased that the CMZ recommendation was integrated as a final alternative and evaluated for consideration. However, the GRR/EA does not clearly identify why this alternative was not evaluated based on a larger suite of possible objectives for regionally important issues.

011-2

- Page 66: The text in Table 3-1 is not fully displayed.

011-3

- Page 69: Section 3.4 Optimization and Incremental Analysis of Alternatives:

  The project cost and net benefit analysis for the alternatives do not consider all of the short-term and long-term benefits. The analysis overlooked several potential benefits to regional water supply, water quality protection, and recreational lands. While slightly more expensive (according to the document), Mainstem Alternative 3, which included the CMZ levee design, would limit levee length but maximize space for flood attenuation and groundwater recharge, and would also provide an opportunity for larger areas to be dedicated as open space or parks. The GRR/EA does not provide estimates of levee length and the proportion set-back distances for each reach and alternative. This information plays a significant role in the construction and other costs associated with the project and the ability of their ability to meet a wide variety of objectives. For example, the description of Mainstem Alternative 3 on Page 58 notes benefits of this alternative would be reduced levee length as well as operations and maintenance and construction costs. By comparison of Figures 3-3 and 3-4, Alternative 4 appears to have more (*i.e.,* longer) levee proposed than Alternative 3, however, the costs for Alternative 3 are higher in Table 3-2 and 3-4. It is not clear from the document why this is the case.

011-4

- Page 75: The end of the second paragraph indicates right bank levee improvements for agricultural lands upstream of the confluence was not economically justified.

  What factors were considered in making this determination? We believe the analysis should consider the economic benefits of the CMZ design alternative (Alternative 3), which include: permanent increased flood protection to some of the surrounding agricultural lands, aquifer recharge and water quality improvement, expansion of riparian floodplain habitat, and creation of local open space along the Pajaro River.

011-5

- Page 111: Physical Environment: Regarding the description of the Pajaro River within the action area, the paragraph states "Riparian vegetation is very limited and generally consists of smaller plants, although a few mature trees are present." This contradicts the descriptions of reaches 2, 3, and 4 on Page 91:

- Reach 2—"Thick native vegetation is found along the banks of the river as well as within a remnant oxbow currently disconnected from the river."
- Reach 3 – "Thick native vegetation grows along the banks of the Pajaro River and large trees grow intermittently along the exterior bank of the levee."
- Reach 4 – "Thick native vegetation along the banks of the Pajaro River form a meandering line of green through the agricultural fields."

011-6

- Page 116: Two project activities (Culvert Construction and Weir Construction) are introduced and briefly described here, but are not described more fully elsewhere in the GRR/EA, or the Biological Assessment. The proposed replacement weir at the exit of College Lake is of particular importance to NMFS because of the current adverse impact the existing facility has on fish passage and migration success.

011-7

- Page 133: The last paragraph identified that Mainstem Alternative 3 would provide the greatest potential for groundwater recharge, yet this important benefit to regionally significant issues (*i.e.,* water supply and seawater intrusion) seems largely ignored or under evaluated in the project costs and net benefits analysis (see comment referring to page 69 above).

011-8

- Page 134 and 135: Tables 4.9-1 and 4.9-2 indicate there is zero acreage identified as Open Space or Other (parks, resource conservation areas, or public facilities) along reaches 2, 3, and 4 of the Pajaro River. Mainstem Alternative 3 would provide an opportunity to meet the necessary flood risk management objectives and would also contribute opportunities for permanent open space and parklands.

Comments Specific to the TSP

011-9

- Provide representative cross-section profiles and designs for each reach. Cross-section profiles should illustrate the range of anticipated levee setback widths (i.e., 100 to 225 feet) identified for the various reaches, placement of rock slope protection (RSP) and anticipated land cover communities and vegetation types (*i.e.*, riparian forest, scrub-shrub, or upland communities) within levee setbacks.

011-10

- Provide estimates of the percentage of each reach where levees will be setback to various distances. For example, identify the percentage of Reach 5 that will have levee setbacks at 100 feet and 225 feet. Also, provide the area of new floodplain created within each reach by the levee setbacks.

011-11

- If available, provide estimates of the expected floodplain inundation frequency and duration on newly created floodplain areas for each reach under different stream flow return intervals (*e.g.*, 1, 10, 25, 50 percent return flows).

011-12

- Describe the proposed design plan for RSP placement and concealment.
    - Will RSP be covered with a protective liner and topsoil which will be planted with vegetation?
    - Confirm RSP is not proposed, nor will it occur, in the tributary reaches of the TSP (*i.e.*, Alternative 6).

011-13
- NMFS strongly encourages the Corps to include floodplain habitat complexity features into the final designs to provide high flow refuge and topographic heterogeneity that will facilitate a mosaic of natural vegetation community recruitment post project completion. With this recommendation, NMFS strongly encourages the Corps and non-federal partners to coordinate with NMFS staff on the development of these design elements.

011-14
- Describe the scope of future operation and maintenance activities for the project and any anticipated effects of such activities on steelhead and their designated critical habitat. An analysis of the effects of the operations and maintenance will need to be included in section 7 consultation with NMFS.

Conservation Recommendation

011-15
- The construction of levees along the Pajaro River and its tributaries by the Corps (since 1949) and other non-federal entities has contributed to the decline in the quality and function of habitat for steelhead in the Pajaro River watershed. As compensation for these irretrievable losses, and to better understand the population status and annual return estimates of adult steelhead to the Corralitos Creek watershed, NMFS recommends the Corps work with the non-federal sponsors to fund, install, and operate a steelhead counting system in the Corralitos Creek watershed. Locations for the system may include the City of Watsonville's surface water diversion and fish ladder structures on Corralitos Creek and Browns Valley Creek. The fish counting systems may include installation of camera counting stations (*e.g.*, Vaki Riverwater) within the fish ladders and/or the implementation of a Passive Integrated Transponder tag (PIT-tag) program with fixed antenna stations to track the movements of both juvenile and returning adult steelhead. In addition to providing annual abundance estimates, fish counting programs also provide opportunities to determine correlations between run timing and environmental conditions including stream flow and water temperature, which collectively would be used to inform population recovery. Although a minor additional cost to the larger project, funding and implementation of a counting program by the Corps and/or non-federal sponsors would demonstrate continued commitment towards documenting steelhead status and progress towards recovery.

Thank you for the opportunity to comment on the GRR/EA for the Project. If you have questions or concerns regarding this letter please contact Joel Casagrande at (707) 575-6016 or joel.casagrande@noaa.gov.

Sincerely,

Barry A. Thom
Regional Administrator

Enclosure
cc: Tanis Toland, Corps, Sacramento
Chad Mitcham, USFWS, Ventura
Kim Sanders, CCRWQCB, San Luis Obispo
Monica Oey, CDFW, Napa
Copy to file: 151422WCR2017SR00290

Thomas Kendall
Chief, Planning Branch
U.S. Army Corps of Engineers
1455 Market Street
San Francisco, California 94103

Subject: Pajaro River Flood Risk Management General Reevaluation Study, Santa Cruz and Monterey Counties

Dear Mr. Kendall:

The U.S. Army Corps of Engineers (Corps) has requested that the U.S. Fish and Wildlife Service (Service) provide comments under the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended, 16 U.S.C. 661 *et seq.*) for the Pajaro River Risk Management General Reevaluation Study (Study) in Santa Cruz and Monterey Counties. The Corps is in the process of completing the Study and has requested that the Service provide information specifying our preferred alternative(s). The proposed project is located along the Pajaro River, traversing the city of Watsonville and the town of Pajaro, in Santa Cruz and Monterey Counties.

The following supplementary information accompanied your request for comments. The purpose of the Study is to investigate and determine the extent of Federal interest in alternatives that would improve the flood risk management system to further reduce flood risk primarily to the city of Watsonville and town of Pajaro. This area has experienced multiple flooding events since the levee system was initially constructed. The primary study area includes a portion of Salsipuedes and Corralitos Creeks and the Pajaro River. Specifically, the alternatives are all located within the following reaches: Corralitos Creek just upstream of Airport Boulevard to the confluence with Salsipuedes Creek; Salsipuedes Creek from the confluence with Corralitos Creek downstream to the confluence with the Pajaro River; and, the Pajaro River downstream to Highway 1. You also provided summarized information regarding the range of focused alternatives that consists of four alternatives associated with the mainstem of the Pajaro River, and four alternatives associated with tributary improvements.

In accordance with and as stated in the FWCA, the Service provides the following comments in order to ensure that "wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs through the effectual and harmonious planning, development, maintenance, and coordination of wildlife conservation and rehabilitation…" We also submit the following recommendations under the authority of the

Endangered Species Act of 1973, as amended (Act). The purpose of the Act is to protect and recover federally listed species and the ecosystems upon which they depend. Under section 7(a)1, Federal agencies shall utilize their authorities in furtherance of the purpose of the Act by carrying out programs for the conservation of endangered and threatened species.

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
012-1 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 you 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
012-2 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
012-3 Alternative 3 be selected as the preferred mainstem alternative.

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
012-4 Ring Levee or Relocations Along Corralitos Left-Bank Alternative) similarly provide the
greatest benefits to wildlife resources, specifically including the California red-legged frog,
tidewater goby, and migratory birds. As stated above, the Service believes that the CMZ aspect
012-5 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-
012-6 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
012-7 Alternative 7 or 8 be selected as the preferred tributary alternative.

We appreciate the opportunity to provide our recommendations on the proposed project and are happy to provide further technical assistance at your request. If you have any questions, please contact Chad Mitcham of my staff at (805) 677-3328 or by electronic mail at Chad_Mitcham@fws.gov.

Sincerely,

US Army Corps of Engineers

Public Comment Sheet

NAME: [redacted]
ADDRE[redacted] Watsonville CA 95076
PHONE:[redacted]

My name is [redacted] and I own my home in the Orchard Park neighborhood. My home is one of 50 homes and 50 families. For 60 years, the Orchard Park neighborhood has been occupied by families of men, women and children. Children going to local schools, parents working, paying taxes and voting.....

Many of the people living in Orchard Park are now retired after working hard for much of their lives and are living on a fixed income. Like [redacted], who is 92, and lives in her home in Orchard Park. I myself am retired. Those not retired are working hard to raise their families and make ends meet.

In the winter of 2017 after heavy rains my house and those of my neighbors where flooded. I was forced to leave my home for 10 weeks. The cost was high......

A flood of Orchard Park of any proportions will cause hardship both financially and emotionally and pose a health risk for the hundreds of people living in the Orchard Park neighborhood.

We live in a flood zone. But there is much that can be done to alleviate the possibility of flooding in our neighborhood. However little or nothing has been done by our government to help the families of Orchard Park. We where very encouraged to hear about the most recent plan by the army core of engineers to offer flood protection along the Corralitos, Salsipuedes and Pinto creeks.

013-1

However after reading the report on this program and attending this meeting we have learned that any improvements suggested to help prevent flooding to the Orchard park community have been removed from the plan.............

How is this possible..........

How is it that we who have the most to lose are being left out......

Please for the men, women and children of Orchard Park,

DON'T DO THIS TO US AGAIN

From: [redacted]
To:
Subject: [EXTERNAL] bike paths on pajaro river levees
Date: Friday, November 17, 2017 8:18:25 AM

014-1 dear army corps of engineers...please include bicycle paths in your pajaro river levee reinforcement plan, thereby accomplishing a dual purpose: a) insuring residents protection from flooding while; 2) protecting citizens who ride bikes…a win/win situation!…thank you!... grace

015 014

[redacted]
Watsonville, CA 95076

November 28, 2017

U.S. Army Corps of Engineers,
San Francisco District
1455 Market Street, Suite 173B
San Francisco, California 94103-1398
CESPN-ET-PB@usace.army.mil

Attn: Mr. Chris Eng, Environmental Manager

SUBJECT: DRAFT Pajaro River Flood Risk Reduction Project (LRP) USACE GRR/RA.

Dear Mr. Eng:

This is in response to your Notice of the release of the Draft Integrated GRR/RA.

We have reviewed the GRR/EA documents and offer the following comments.

015-1
1. Initially, we take exception to the statement in the Notice, that you have concluded that, with mitigation, the proposed alternatives would not result in any significant effects.

015-2
2. Further, and more broadly, we believe that the Project chosen in the GRR/EA, and the Process by which it was developed, are flawed and should be redone. These Process and the Project Deficiencies are described below:

Process:

Environmental Review

015-3 The decision not to do an EIS/EIR is wrong and leads to a poorly designed project. Any project of this magnitude imposed on a natural setting such as this will have enormous environmental impacts, and this one certainly does. The existing river corridor is rich with native plants and animals, and they should not be in jeopardy. Further, the decision not to do an EIS/EIR deprives the public of a proper "scoping process" that would determine the full environmental impacts of the project and provide for mitigations.

Alternatives Analysis:

015-4 The Alternatives Analysis is flawed in that it does not consider several obvious alternatives, Including:

a. Spending at least some of the project funds for work in the upstream watershed, that would reduce the downstream flow.
b. Providing for some of the river flow to be utilized for local water conservation and ground water recharge.
c. Constructing a much smaller project that would cost less and cause less environmental damage.

015-5 The section titled "Scope of this Environmental Analysis" involves the hydraulic modeling problem indicating that: "It may 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." This situation introduces process credibility issues, perhaps mis-characterizing alternatives capability to deliver on benefits, costs, mitigate impacts, and integration with regional flood protection infrastructure. We believe that these issues should be resolved before, rather than after, design decisions are made.

Financial Analysis

015-6 We believe that the project is too big and too expensive and fails to consider the financial impact on the Local Sponsors. We believe that considering costs and benefits, the project may never be funded at either the federal or local level and the needed flood protection for Watsonville and Pajaro will remain out of reach.

Project Design

015-7 Design flow has not been properly established. It has been set without due consideration for present and future conditions in the upper watershed. The FPA has produced a Watershed Study that outlines how optimization could occur involving coordination with their Program and related IRWMP projects. The Local Sponsors have also produced studies and the BEP which in our view has been expected to be optimized into the LRP; the BEP as a channel and Riparian Corridor element and the LRP a setback levee project, respectively, each with their own operation and maintenance protocols, integrated to assure performance expectations are manageable.

Project Deficiencies

015-8 A letter to the ACE dated **2/18/16**, from the Pajaro River Subcommittee of the Sierra Club, asked for a project that would do the following:

1. Provide flood protection for Watsonville and Pajaro.
   The project would surely provide flood protection but is so expensive that it may never be built, leaving both communities still unprotected.
2. 015-9 A complete hydrologic study that addresses the Pajaro River Flood Protection Authority work in the upper watershed.
   The GRR fails to do that.
3. 015-10 A proper review of the project plans by the Resource Agencies and certification that proper provisions have been made for wildlife, habitat and water conservation purposes.
   We are not aware of any such certification.
4. 015-11 Provisions for public access onto the levees and into the river corridor for public recreation and education.
   We are not aware of such provisions, in fact, we understand that right of way acquisition will be for flood control purposes only.
5. 015-12 Planning and analysis to address water conservation and ground water recharge impacts.
   This has not been included in the GRR.
6. 015-13 A management plan for the River that allows for maintenance without destruction of wild life habitat.
   We are not aware of any attempt to provide a management plan.
7. 015-14 An estimate of the cost of the project and how it will be paid for.
   We have an estimated cost but no idea how it will be paid for.

Conclusion

We are concerned, and amazed, that the GRR/RE could conclude that environment impacts are mitigated by the project. We believe that the GRR/EA is flawed, both in the selected alternative, and in the process by which it was developed. The draft GRR EA should be revised and re-released for public review and comment.

Sincerely Yours

016

Driscoll's
Only the Finest Berries™

John Erb
Driscoll's, Inc.
345 Westridge Dr.
Watsonville, CA 95076
November 30, 2017

Mr. Chris Eng
Environmental Manager
Army Corps of Engineers
1455 Market St., Ste. 1737B
San Francisco, CA 94103-1398

Dear Mr. Chris Eng:

I am writing to you to provide comment on the draft integrated General Reevaluation Report and Environmental Assessment (GRR/EA) and draft Finding of No Significant Impact (FONSI) for the Pajaro River Flood Risk Management Study.

Driscoll's, which is headquartered and has deep roots in Watsonville, has a strong vested interest to advance flood mitigation efforts to ensure the safety of our employees and their families that live in the Pajaro Valley as well as our many berry growers, their employees and the sustainability of our collective enterprise. We want to recognize not only the great importance flood mitigation but also the significant progress on this topic and applaud the Army Corps of Engineers for the quality of the draft GRR/EA.

016-1 Our first request, with the intent to ensure a comprehensive approach and process through which all of the key stakeholders in the community are able to dialogue and contribute, is to extend the period for public comment on the GRR/EA until January 31, 2018. The report is extensive and requires time and expertise in order to provide robust and constructive criticism that we hope will ensure both local buy-in and ultimately the highest degree of success to address the problems and opportunities identified in the study.

016-2 The Tentatively Selected Plan (TSP) does not mitigate, and in some cases would increase, the flood risk east of Reach 4, on the Santa Cruz County side of the Pajaro River, and Reach 1. Currently, we estimate that approximately 980 acres of Driscoll's berry production would be impacted by flooding in the Pajaro Valley with potential economic losses to our local growers in one season of over 28 million dollars not counting lost sales and fruit margin for Driscoll's.

016-3 As proposed, the project would not protect the Orchard Park or Interlaken Communities and their respective inhabitants, many of whom are farmworkers.

Driscoll's
Only the Finest Berries™

016-4 Other areas not sufficiently covered or adequately addressed in the TSP include groundwater recharge, channel maintenance and preservation as well as economic implications for farmers, landowners and the broader community.

Although there are trade-offs to any plan, we feel there is opportunity to better address the issues mentioned in this letter and achieve the goals outlined in the GRR/EA. As stated above, we would very much appreciate additional time to provide more detailed, constructive input.

Thank you for your consideration.

Sincerely,

John Erb

John Erb
Driscoll's, Inc.

Enclosure

Cc

John Phillips

Mark Strudley

November 27, 2017

Corralitos Creek

Dear Army Engineers,

017-1 This letter is to inform you of my problems. I have property on corralitos creek which flows into the pajaro river. The creek used to run well for many years, but not now. Over the years the creek has lowered on the west side and risen on the east side. There is now an island on the north side which is about 4,000 square feet and about 80 yards away from my property.

Due to the change of the creek I now get an overflow of water to the point of needing sandbags. Some of the bank of the creek is now two feet from my apartment building which you will have to demolish if you are ever to fix the bank which is getting washed off. I have done the best I could to hold the water off, but I am not superman.

Thank you very much for your time, you can reach at [redacted] I wish you the best of luck with this project.

Your friendly taxpayer, [redacted]

018

November 2017

Army Engineers,

Request for removal of brush and debris from Corralitos Creek.

Our property is closer than two feet from the edge of the bank and we have done everything possible to prevent corrosion. All our efforts have been impacted my mother nature
018-1 and the flood in 2016 really took a toll on the bank of the corralitos creek behind our property located on East Lake Ave. We had to temporarily relocate our tenants due to the flooding of the creek.

The sight of the corralitos creek is quite scary, the brush and trees are very overgrown. The county went in to try to clean it up and there has been minimal progress. I have read your proposal and it sounds like all measures have been taken to protect the environment. I do not know how many years it will take to put your proposed plan into action and if there is a heavy
018-2 rain the Corralitos Creek will flood again. I hope all measures will be taken to protect homeowners and prevent damages. Our plea in the meantime if at all possible is the clearing of the overgrowth. There are numerous fallen trees, brush, trash, and debris (even homeless
018-3 people can be found living along the creek bank). We desperately need the creek to be cleaned up and the overgrowth cleared.

Thank you for listening to our concerns, I hope your plan is successful, please keep us mind, the Corralitos Creek needs a lot of attention. For additional information please contact me at [redacted]

[redacted]

November 11, 2017

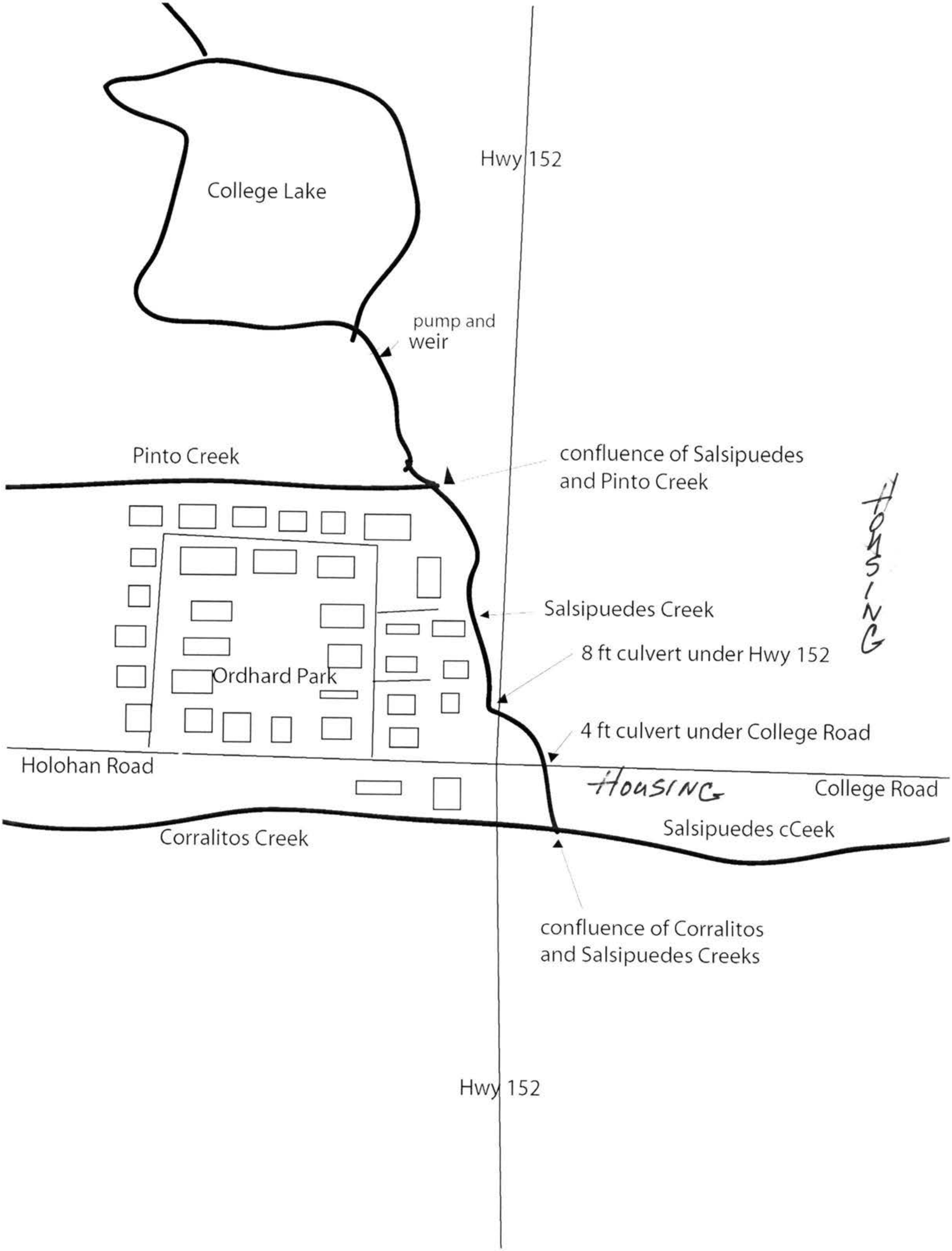
From:
[redacted]
Watsonville, CA 95076
[redacted]

U. S. Army Corps of Engineers
San Francisco District
Attn: Mr. Chris Eng
Environmental Manager
1455 Market Street, Ste 1737B
San Francisco, CA 94103-1398

Re: COMMENTS: Pajaro River Flood Risk Management Project

1 My comments are to inform and ask for mitigation for Reach 7 drainage above the Hwy152
bridge confluence. Why we have been carved out out Reach 6 is beyond me.
Orchard Park is a unique community in the Interlaken area located between Corralitos Creek,
Pinto Creek and College Lake. It's existence predates Reclamation District 2049, Bay Village,
Pajaro Dunes, Murphy's Crossing, E. Lake Village, two Community Hospitals (one at Green
Valley Road), Saint Francis High School, the Middle School and most of the agriculture and
growth of the City of Watsonville.
2 During the rainy season water accumulates from the mountain range into College Lake, which
would flow into the culverts that go under Hwy152 and College Road if there was adequate
drainage. That portion of the Salsipuedes is silted in due to farm runoff and negligence in
maintenance. To make things worse Pinto Creek (overflow from Pinto Lake) tries to enter that
Upper Salsipuedes Creek at a 90 degree angle just before the culvert. The pump station is
broken and the culverts were not designed well, the engineering is abysmal. In addition the
Upper Salsipuedes is trying to enter the Corralitos/Salsipuedes confluence at an impossible
angle. Sometimes water from the Corralitos Creeks backs up into College Lake. We live in fear
of flooding every year now.
3 I've enclosed nearly 200 signatures from the Interlaken area that has experienced flood
evacuation calls 5 times this year. Flooding occurred in Orchard Park twice. We were out of our
home for 10 weeks. I'm enclosing photos to help illustrate how badly we need help.
The photo on page 40 of your draft document dated 10/31/17 is of Orchard Park and not the
City of Watsonville. They had no flooding this year except for a stretch of Hwy129 for a couple of
days. The brown house at the rear of the photo is my house.
There must be some way to help that area drain better: a new pump near the upper culvert and
Pinto Creek; revision of the confluence of Upper Salsipuedes and Corralitos Creek at College
Road; widening of the banks of Upper Salsipuedes; possibly a joint venture with the Water
Management District to store floodwaters for agriculture.
We have always supported all the previous projects for Pajaro, Pajaro Dunes, farmland, City of
4 Watsonville, Bay Village. We have been told so many times we were next but have yet to see
help. The levee on the left side of Corralitos Creek is important but doesn't address drainage.
We appreciate the effort and of course understand resources are limited. We are hoping this
plan comes to fruition and we hope our situation will be included. We deserve protection too.
Thank you for your time and all the work that is going into this project.

Melinda Rambo


Hwy 152
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confluence of Corralitos
and Salsipuedes Creeks
Hwy 152

PETITION

We are the residents of the LAKEN COMMUNITY and we are concerned that we are not getting adequate flood protection for our area. It has come to our attention that a decision concerning flood protection planning is coming up and that we may not be protected under the new plan. We ask that any plan moving forward provide us with flood protection. In addition, we demand to know what protection we will receive under this current plan.

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PETITION

We [redacted]

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NAME ADDRESS PHONE

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PETITION

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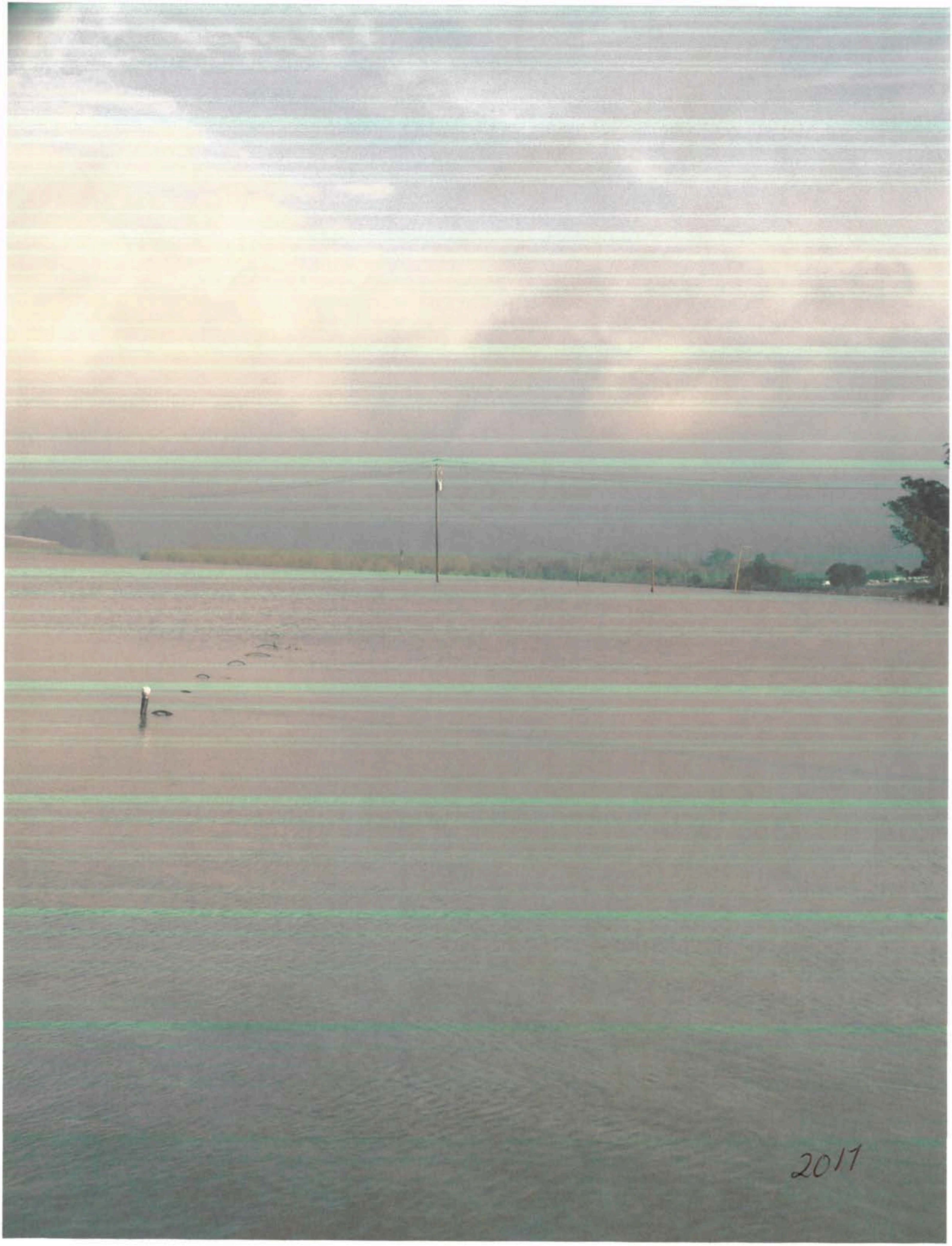
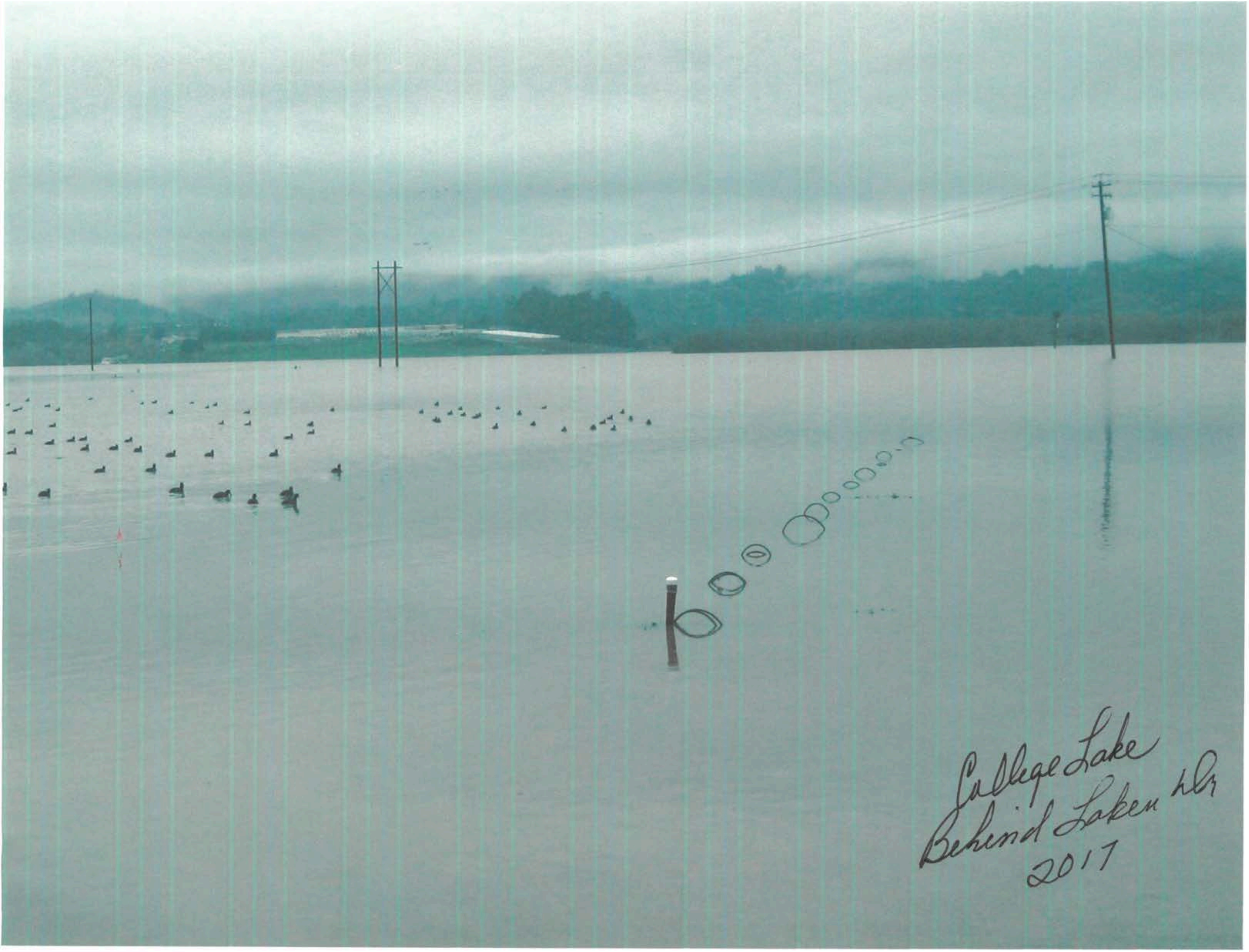
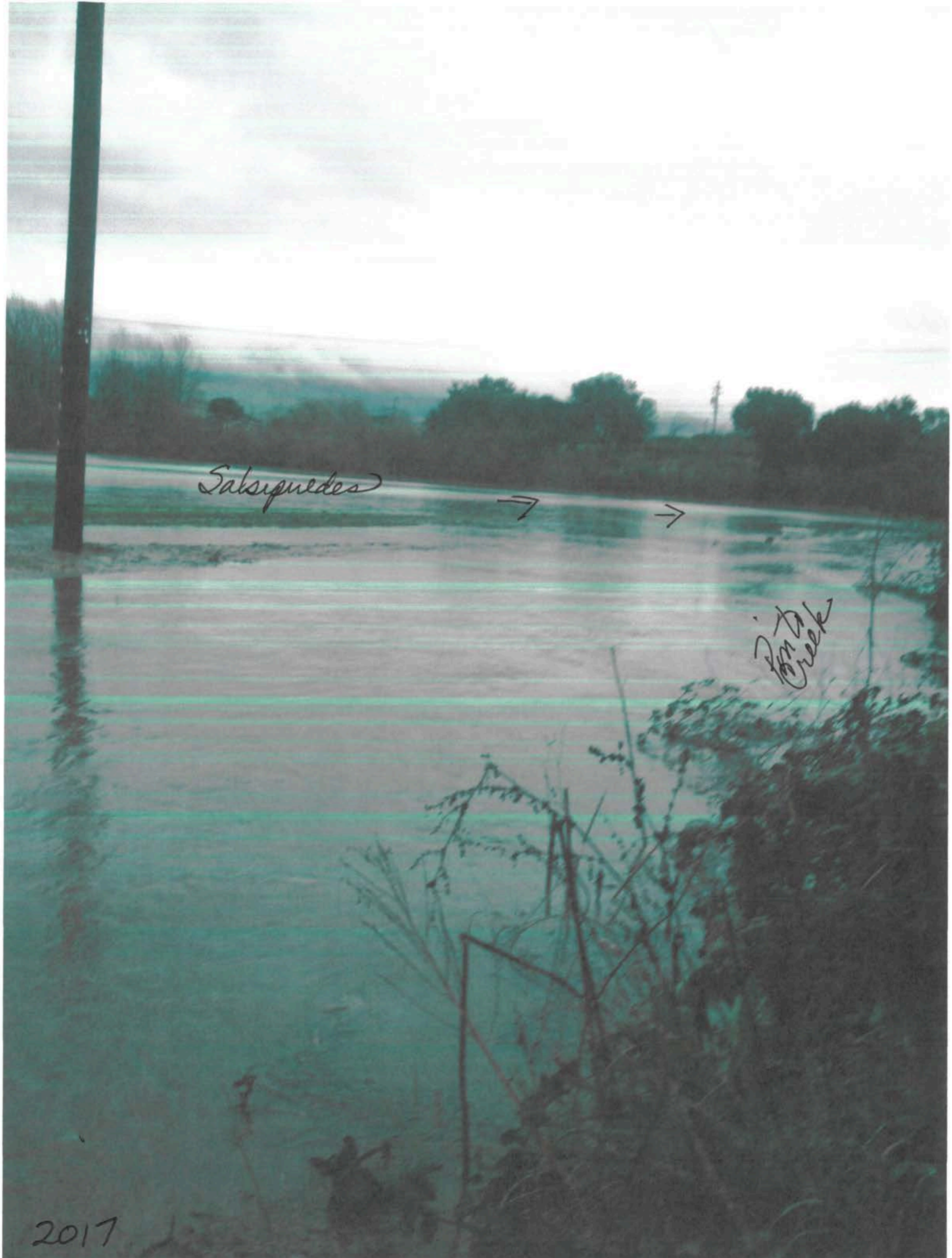
Richard Park
Feb 22 2017


2011


College Lake
Behind Laken Rd
2017

2010


Upper Salsipuedes
Culvert
Weir


Salsipuedes
Pinto Creek
2017

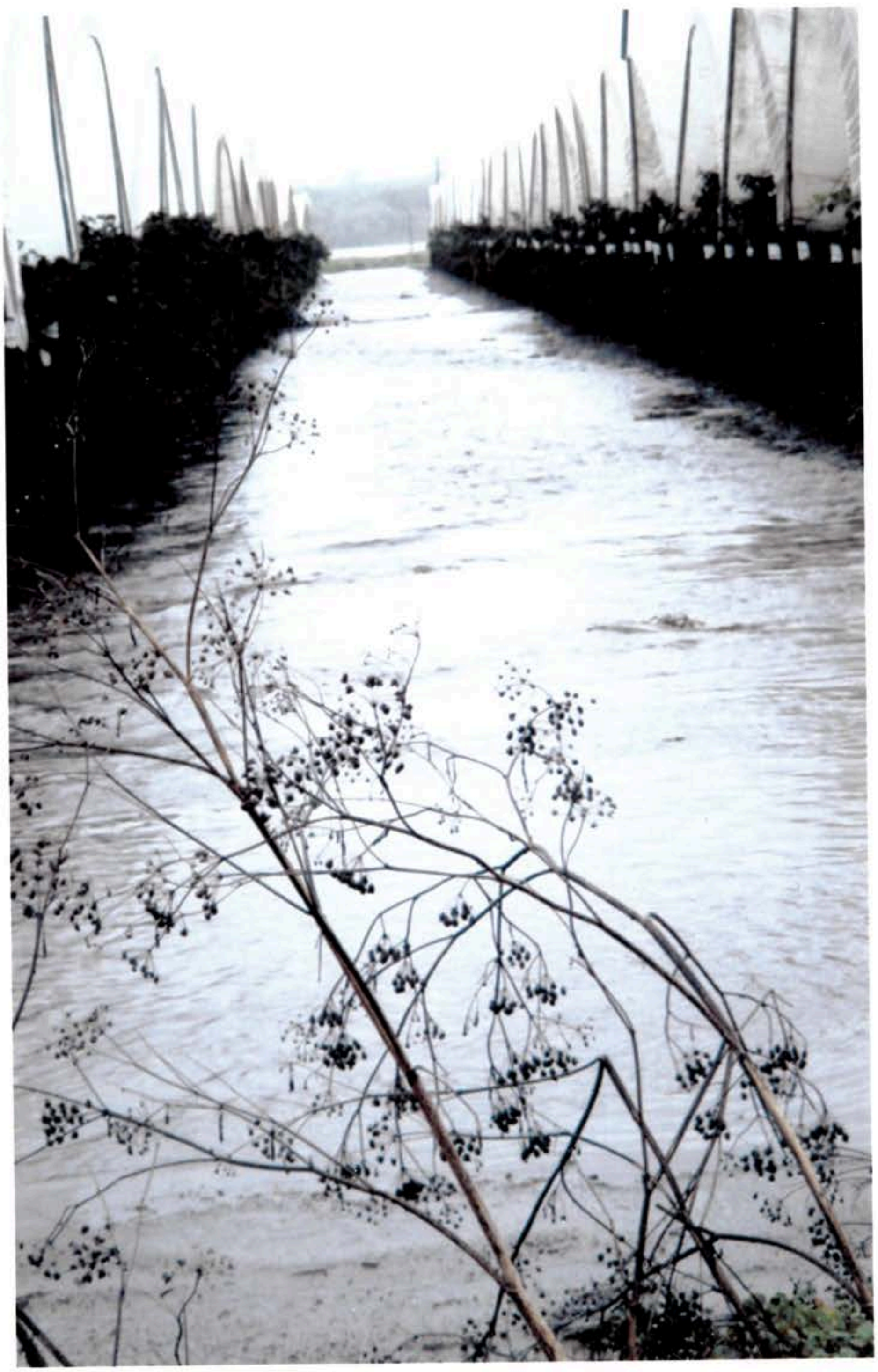
Salsipuedes and Pinto creek confluence Oct 2012
creek beds overgrown

hwy 152 and Holahan culvert Oct. 2012
creek bed overgrown

2011 Salsipuedes and Pinto creek flood
from 64 Laken drive back yard

corralitos and salsipuedes creek Oct. 2012

2009 Pinto creek flood
from 64 Laken drive back yard



[redacted]
Watsonville, CA 95076
November 30, 2017

U.S. Army Corps of Engineers
San Francisco District
Attn: Mr. Chris Eng
Environmental Manager
1455 Market St. Suite 1737B
San Francisco, CA 94103-139

re: Pajaro River Levee Project: Comments on draft study.

Dear Mr. Eng:

After attending the November 8, 2017 Community meeting held in Watsonville for the public to hear about the Pajaro River Levee Project "draft study" from the U.S. Army Corps of Engineers, it was obvious that there are numerous areas of concern regarding the latest project proposal.

020-1 Unfortunately, due to the fact that the draft study consists of over 900 pages of information, maps, charts, analysis, etc., it is basically impossible for members of the public to properly comment on the draft study by a deadline of November 30, 2017. It is not reasonable to expect the public to comment, especially during a major holiday month, on a lengthy study with such a short window of time from the release of the study to the cutoff period for submitting comments.

At this time, because of the limited opportunity to adequately study the draft study and possibly comment on other items or issues within the draft study, this letter's comments on the study will be solely focused on the Union Pacific Railroad bridge which is referred to as the "UPRR Bridge" in the study. Said bridge, which is within the Reach 3 area of the proposed project, crosses the Pajaro River from Santa Cruz County to Monterey County.

Although comments in this letter are limited to the UPRR Bridge, the commentator reserves the right to bring up additional issues and questions, as they are discovered, to the parties involved.

020-2 At times language within the study is vague on whether or not the UPRR Bridge would be raised for the "Alternative 1" plan and other times definitive language is used to state the bridge "would not be raised." A clear statement from the Army Corps is necessary on this issue.

020-3 There is a statement within the study that talks about installing a "sliding floodgate" at the railroad crossing in order to "provide improved flood capacity at the railroad crossing." This is an extremely worrisome proposal since the UPRR Bridge is rather old and its top is basically at the same height of the current levees that it crosses. Knowing that a chain is only as good as its weakest link, a levee is only as good as its weakest point. It is hard to imagine that a "sliding gate" of some sort would offer the same level of flood protection as that of a properly engineered and constructed floodwall.

It is one thing if the "sliding gate" were to be installed in an area of little population or developed property, but the proposed "sliding gates" would be used to protect almost the heart of the City of Watsonville and if there were a failure in such a gate, the flood waters would surely head to many of the lower-income areas of the city and lower-income households in Monterey County.

With a new levee project, the current SPRR Bridge would apparently be below the heights of the
020-4 new levees and thus end up acting as a partial dam to river waters reaching such heights. This is another area that needs to be addressed by the Army Corps.

At a minimum, it is requested that the Army Corps answer the following questions:

1) Has the Army Corps categorically ruled out the possibility of supporting the construction of a new railroad bridge that would be elevated to correspond with an increased levee height through Reach 3 of the proposed levee project?

020-5

   a. If yes, why has the Army Corps decided not to construct a new railroad bridge?

   b. What is the estimated dollar difference between all the costs associated with constructing a new railroad bridge and all the costs associated with a sliding gate including, but not limited to, maintenance, repairs, and operation?

2) With a new levee project that leaves the current SPRR Bridge in place, a very real possibility exists of the bridge acting as a partial-dam to river flow during specific heightened water elevations in the Pajaro River. Has the Army Corps considered what might be the effect on any other levee sections and flooding possibilities if debris brought down the river were to accumulate against the SPRR Bridge?

020-6

   a. If yes, please explain how potential damming at said bridge will be addressed for the bridge itself and at any other parts of the new or old levee system.

   b. If no, why hasn't the Army Corps considered the potential problems, both at the bridge and any other parts of the levee system, of damming at said bridge?

The study work that the Army Corps of Engineers has done on the issue is appreciated, but the timing of the release of the study so near the holiday season with limited time to study and comment on the project is disturbing and should be avoided for future public comment periods.

Please provide timely answers and comments to the questions and issues posed in this letter.

Sincerely yours,

[redacted]

021

Pajaro River Watershed
Flood Prevention Authority

P.O. Box 2453, Seaside, CA 93955 Phone: 831.883.3750 FAX: 831.883.3755 www.pajaroriverwatershed.org

November 29, 2017

Member Agencies:

County of Monterey

County of San Benito

County of Santa Clara

County of Santa Cruz

Monterey County Water Resources Agency

San Benito County Water District

Santa Clara Valley Water District

Santa Cruz County Zone 7 Flood Control District

U.S. Army Corps of Engineers, San Francisco District
Attn: Mr. Chris Eng, Environmental Manager
1455 Market St, Suite 1737B
San Francisco, CA 94103-1398

Dear Mr. Eng:

The four-county Pajaro River Watershed Flood Prevention Authority (FPA) appreciates the opportunity to comment on the draft integrated General Reevaluation Report and Environmental Assessment (GRR/EA) and draft Finding of No Significant Impact (FONSI) for the Pajaro River Flood Risk Management Study. The Army Corps of Engineers (Corps) release of the GRR/EA and FONSI is a significant milestone accomplishment and we appreciate the hard work ACE staff has invested in the project and the considerable effort required to produce the report and analysis contained within it.

The FPA was established by the California State Legislature in 2000 to "identify, evaluate, fund and implement flood prevention and control strategies in the Pajaro River Watershed on an intergovernmental basis." The Pajaro River watershed encompasses a 1,310 square mile region terminating in the Monterey Bay. The FPA is made up of the four counties and flood management agencies in the watershed, including:

County of Santa Clara	Santa Clara Valley Water District
County of San Benito	San Benito County Water District
County of Santa Cruz	Santa Cruz County Zone 7 Flood Control District
County of Monterey	Monterey County Water Resources Agency

The geographical nature of the watershed made it critical that a Joint Powers Authority representing the entire watershed work together to develop a sustainable flood protection strategy. The eight Directors of the FPA represent the interests of their respective counties and flood districts but share the regional support of the Pajaro River Flood Risk Management Project.

021-1

The FPA recognizes the success of the Pajaro River Project will require additional Federal funding to proceed through the next phase of project engineering and design and will be strongly based on the appropriate calculation of benefits and costs, as well as a design that maximizes project benefit-cost ratio (BCR). As an authority that represents communities on opposite ends of the economic spectrum, from the extremely affluent Silicon Valley to the severely disadvantaged communities of Pajaro and Watsonville, we have experience with how that economic status affects the BCR and the probability of the project receiving Federal funding to proceed to design and construction. We are concerned that the BCR, as currently presented in the GRR/EA, will not be competitive and future funding of the project is at risk. It is frustrating to see that the same project, if constructed in the northern area of our watershed, would likely have a significantly higher BCR and would be fundable, simply due to the economic status of the flood impacted communities.

021-2

The City of Watsonville meets the California definition of a Disadvantaged Community with a Median Household Income (MHI) of $46,675 or 76% of the California average. The Town of Pajaro meets the California definition of a Severely Disadvantaged Community with a MHI of $36,094 or 59% of the California average. Even more telling of the impoverished status is the per capita income. With such low income, multiple wage earners are forced to combine households and that can skew the MHI. The per capita income for Watsonville is $16,227 or 56% of the California average and Pajaro is $10,294 or 35% of the California average. As stated in the ACE report:

> *"It is likely that flood damages would occur within the town of Pajaro and/or the City of Watsonville, which would affect these 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."*

021-3

The FPA believes the Corps policy of using property values as the primary input in the BCR calculations leaves these disadvantaged communities at risk. The BCR for this project is currently at 1.8, making it unlikely to receive Federal funding. This BCR does not take into account public safety impacts or the potential loss of life, it is simply based on the low economic value placed on communities like Watsonville and Pajaro. We strongly urge the Corps to consider other factors when prioritizing projects, otherwise critically needed flood risk reduction projects protecting low-income communities will never be constructed.

021-4

While the FPA was only formed in 2000, the Counties of Santa Cruz and Monterey have been working with the Corps since the project was authorized in 1966. While the FPA appreciates the significance of this project milestone, we can not afford to be delayed in securing the funding needed to keep this project development moving forward. Since construction of the 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 and the loss of life. As stated in the report, the 1995 storm resulted in the greatest flood damages, approaching nearly $100 million and, tragically, one flood-related death. Again, we strongly urge the Corps to look beyond the BCR and consider protection of life and property when prioritizing projects.

021-5 Flood protection for the very vulnerable residents in Watsonville and Pajaro is of primary importance to the FPA, and we offer any assistance to support the Corps in the process. As an Authority representing four counties in the heart of California, we would be pleased to work with you on legislative proposals to change Corps policy in such a way that our constituents are not unfairly treated in the process and placed in harm's way simply because they do not live in areas with high property values.

Thank you for your consideration, and please let us know if you have any questions about the FPA and our strong support for the Pajaro River project.

Sincerely,

John Phillips, Supervisor, County of Monterey
Chair
PRWFPA

Cc:
LTC Travis J. Rayfield, San Francisco District, US Army Corps of Engineers

SANTA CRUZ COUNTY REGIONAL TRANSPORTATION COMMISSION
1523 Pacific Ave., Santa Cruz, CA 95060-3911 • (831) 460-3200 FAX (831) 460-3215 EMAIL info@sccrtc.org

November 30, 2017

U.S. Army Corps of Engineers, San Francisco District
Attn: Mr. Chris Eng, Environmental Manager
1455 Market St, Suite 1737B
San Francisco, CA 94103-1398

RE: Pajaro River Flood Risk Management Study-DRAFT General Reevaluation Report and Integrated Environmental Assessment Comments

Dear Mr. Eng;

The Santa Cruz County Regional Transportation Commission's (RTC) Bicycle Advisory Committee appreciates the opportunity to comment on the draft integrated General Reevaluation Report and Environmental Assessment (GRR/EA) and draft Finding of No Significant Impact (FONSI). The RTC's Bicycle Advisory Committee serves to assist in the development and maintenance of a complete, convenient and safe regional bicycle and pedestrian network. Such a network increases the opportunity and attractiveness of bicycle and pedestrian trips for transportation purposes and reduces the dependency on automobile travel.

022-1 While the proposed project addressed improvements that will provide flood benefits to the neighboring communities, we request that it retain and improve the existing bicycling opportunities along the access roads on the tops of the levees by doing the following:

022-2 1. **Restore Bikeways.** We are pleased that the GGR/EA acknowledges existing and proposed bicycle and pedestrian paths on Reaches 2, 3, 5, 6, 7 and 8 (Section 4.12 - Recreation). We request that bikeways be restored as called for in Mitigation Measure TRAF-7: Restore Bikeways and Pedestrian Trails, which says "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" (Section 4.15 – Traffic and Circulation).

022-3 2. **Open all access roads to the public.** While all of the access roads are currently used by the public, only those within the City of Watsonville are legally accessible for all to use. We request that this project make all of the access roads where improvements are taking place to be legally accessible.

022-4 3. **Allow bicycling on all access roads.** Currently, a portion of the access roads have surfaces that are safe for bicyclists. The existing roads that are accessible to bicycles have either a well maintained paved surface or a well compacted base rock surface. We request that the existing bicycle accessible access roads be retained and that all of the access roads where improvements are taking place be constructed to be accessible to bicycles.

022-5 4. **Provide public access at various locations.** We request that the existing access points to the access roads be retained and that new points be provided at various locations where improvements are taking place and that these points be accessible to bicyclists and all users.

5. Incorporate the City of Watsonville Trails and Master Plan. The GRR/EA makes no mention of the City of Watsonville Trails Master Plan, which was adopted by Watsonville in 2012. Please incorporate
022-6 the Master Plan into the GRR/EA and include the trails proposed along the levees on the Pajaro River and the Salsipuedes and Corralitos Creeks. The Master Plan can be found online at https://www.cityofwatsonville.org/DocumentCenter/View/3207.

Please take advantage of this unique opportunity to improve bicycling facilities within the project limits by complying with all of these requests. We welcome any feedback or questions regarding our comments.

The Committee thanks you for your consideration of this request. Please feel free to contact the RTC's Bicycle Program Manager and staff to the Bicycle Advisory Committee, Cory Caletti at (831) 460-3201 or by email at ccaletti@sccrtc.org, for this and any other committee related matters.

Sincerely,

Amelia Conlen
Bicycle Advisory Committee Chair

cc: Santa Cruz County Regional Transportation Commission
Santa Cruz County Regional Transportation Commission's Bicycle Committee
City of Watsonville Public Works Department
County of Santa Cruz Public Works Department

S:\Bike\Committee\CORR\BC2017\Pajaro_River_levee_comment_ltr_RTC_Bicycle_Committee_Nov2017.docx

SANTA CRUZ COUNTY REGIONAL TRANSPORTATION COMMISSION
1523 Pacific Ave., Santa Cruz, CA 95060-3911 • (831) 460-3200 FAX (831) 460-3215 EMAIL info@sccrtc.org

November 30, 2017

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The Committee thanks you for your consideration of this request. Please feel free to contact the RTC's Bicycle Program Manager and staff to the Bicycle Advisory Committee, Cory Caletti at (831) 460-3201 or by email at ccaletti@sccrtc.org, for this and any other committee related matters.

Sincerely,

Amelia Conlen
Bicycle Advisory Committee Chair

cc: Santa Cruz County Regional Transportation Commission
Santa Cruz County Regional Transportation Commission's Bicycle Committee
City of Watsonville Public Works Department
County of Santa Cruz Public Works Department

S:\Bike\Committee\CORR\BC2017\Pajaro_River_levee_comment_ltr_RTC_Bicycle_Committee_Nov2017.docx

November 4, 2017

U. S. Army Corps of Engineers
San Francisco District

ATTN: CESPN-ET-PB-Pajaro River
1455 Market Street
San Francisco, CA 94103-1398

RE: Pajaro River Flood Control Project

023-1 As a resident of the Pajaro River Flood Control Area, I am concerned that the area west of Highway 1 is not included in the project. The area of West Beach Road is unsafe because of flooding from high tide and rain. Breaching of the River has been consistently delayed for needed permits. The farmland off Beach Road has been repeatedly flooded causing economic damage to Pajaro Valley.

Sincerely,

Richard Jadrich
86 Puffin Lane
Watsonville, CA 95076

024

1455 Market St.

RICHARD LYNDE
498 ARGOS CIRCLE
WATSONVILLE, CA 95076

CESPN-ET-PB Pajaro River
ARMY CORPS OF ENGINEERS
San Francisco, CA 94103-1398

15 Nov. 2017
NEW LEVEES FOR RIVER SYSTEM

TO THE CORPS:

At last you have tentative plans for the much needed flood safety improvements to the ancient and dangerous levee systems now weakly guarding Watsonville in Santa Cruz County and the village of Pájaro in Monterey County from another big and costly flow that also inundates agricultural land, most recently in 1995. While unable to attend the recent City Hall presentation by yourselves which, as depicted in a Register-Pajaronian photo, included large charts on panels, I did go to the library where I flipped the hundreds of pages in the two-volume plan(s) report. Amid the lengthy texts (of about eight plans) were occasional tiny schematic line drawings that sketched out the dimensions of each one, a method familiar to hydrologists but obscure to the rest of us. ASAP (the public discussion of this topic ends on the 30th) would you please provide the proper agencies in both counties -- and make available online -- "artists' renditions" depicting what the plans might look like when completed: At least the favored plan, so that both aerial and ground views of the Pájaro River and its tributaries Salsipuedes & Corralitos Creeks can be visualized, depicting a low (or no) water flow in the system, as well as views of a super heavy runoff. Please include much-needed
024-1 measured dimensions, including height of levee from base of channel in the various reaches that will protect us all, we hope before the next heavy runoff on the order of past floods. Your artistic renderings will surely be published in newspapers of both counties, so that thousands of readers can hand hold hard copy. And TV channels KSBW & KION would gladly put these depictions on several newscasts. Thanks for all the good work so far on planning. Keep it up. And please do provide the artists' illustrations now, so all may visualize your plans for desperately needed improvements to flood control on the Pájaro River and its two local feeder creeks. Thank you.

SINCERELY, Richard Lynde
RICHARD LYNDE

copy: REGISTER-PAJARONIAN
(831) 763-7703

P.S. Attached is my letter of 2012, published in the Register-Pajaronian and Sentinel.

RPOPIN

get in touch: www.register-pajaronian.com | newsroom

Army Corps of Engineers

This letter was also published by The Santa Cruz Sentinel on Sunday, April 8, 2012.

LETTER TO THE EDITOR

Monterey County officials need to pay their fair share for Pajaro River cleanup

Since 90 percent of the excavation of sediment from the Pajaro River near Watsonville will be on the Santa Cruz County side, Monterey County Officials do not wish to pay 50 percent of the cost of removal.

At first glance, this might sound fair. But during the disastrous flooding in 1995 from broken levees near Murphy's Crossing in Monterey County that sent volumes of water downstream into the Village of Pajaro, causing millions of dollars of damage along with depositing huge amounts of leftover sediment to be cleaned up, the levee break was caused by years of neglected maintenance as well as inadequate inspections by government agencies including the Army Corps of Engineers.

In "the old days," both government agencies and individual landowners cooperated to clean out this river early each fall. They had remembered the big floods of 1955 and 1958 that also saw parts of downtown Watsonville under several feet of water. They were glad that everything held during the torrential runoffs of early 1982. But between then and 1995, they were all hamstrung by all sorts of environmental regulations. So they did nothing, because they were not allowed.

Now, 17 years later, there is a chance for some action at last in cleaning out a few miles of the Pajaro River this coming fall. But it requires complete cooperation between both Santa Cruz and Monterey Counties in obtaining all of the public financing and grants available, and in agreeing that they are equally responsible for all future upgrades to the Pajaro River. Using the county line as a measure of percentages of financial obligation could surely result in future neglect which would result in more flooding on both sides of the river.

As for the reluctant Monterey County officials splitting dollars over their own protection: Don't you know that water runs downhill, as it did in 1995, into lower land on your side? Can't you set politics aside for once and cooperate in the best interests of all the thousands of people on both sides? With this in mind, pay your fair share — 50 percent.

Richard Lynde
Watsonville

OPINIONS WELCOMED

The Register-Pajaronian welcomes letters, guest columns and cartoons about local issues for the Opinion page. Letters and columns may be dropped off at the Register-Pajaronian, 100 Westridge Drive, Watsonville, CA 95076. E-mail is the best way to send columns and letters — news-...register-pajaronian.com. Our fax number is 722-

Jus

Everybody wants to see ju... tice done in the Trayvon Mart... case, and almost everybody a... as if they already know wh... that is. Never mind the Rev. ... Sharpton, activist and crus... ing journalist all in one. Nor... MSNBC colleague Lawre... O'Donnell, who recently ... nounced he'd decided to fo... wearing a hoodie on TV to ... more like a prosecutor.

Here's GOP presidential ... didate Rick Santorum on "... the Nation," assessing sh... George Zimmerman's m... health. "Someone has a ... sick mind who would p... someone like this," Sant... said. "This is clearly a he... act. You know, there are ... people who have a

From:	Toland, Tanis J CIV CESPK CESPD (US)
To:	Eng, Christopher K CIV USARMY CESPN (US)
Subject:	FW: [EXTERNAL] PAJARO RIVER FLOOD RISK MANAGEMENT REPORT COMMENTS Nov 30, 2017
Date:	Monday, December 4, 2017 4:13:08 PM
Attachments:	FullSizeRender (1).jpg FullSizeRender.jpg SKMBT_55217113016170.pdf

The email below and attachments also need to be included with the public comments.

-----Original Message-----
From: Toland, Tanis J CIV CESPK CESPD (US)
Sent: Friday, December 1, 2017 12:07 PM
To: O'Halloran, Jaime L CIV USARMY CESPN (US) <Jaime.L.O'Halloran@usace.army.mil>; Muha, Andrew T CIV USARMY CESPK (US) <Andrew.T.Muha@usace.army.mil>; Eng, Christopher K CIV USARMY CESPN (US) <Christopher.K.Eng@usace.army.mil>; Burton Evans, Jessica L CIV USARMY CESPN (US) <Jessica.L.BurtonEvans@usace.army.mil>
Subject: FW: [EXTERNAL] PAJARO RIVER FLOOD RISK MANAGEMENT REPORT COMMENTS Nov 30, 2017

All,

We received the forwarded email and attachments providing comments on the draft report.

Tanis

-----Original Message-----
From: kvm42@aol.com [mailto:kvm42@aol.com]
Sent: Thursday, November 30, 2017 9:21 PM
To: Toland, Tanis J CIV CESPK CESPD (US) <Tanis.J.Toland@usace.army.mil>
Cc: clintm@royalberries.com; kvm42@aol.com; mms@royalberries.com; luis@royalberries.com; cjmiller@royalberries.com
Subject: [EXTERNAL] PAJARO RIVER FLOOD RISK MANAGEMENT REPORT COMMENTS Nov 30, 2017

11/30/2017

U.S. Army Corp of Engineers, San Francisco District
Attn: Mr. Chris Eng, Environmental Manager
1455 Market St., Suite 1737B
San Francisco, CA 94103-1398

Dear Mr. Eng:

1. We wish to thank Congressman Jimmy Panetta for resurrecting the plan to fix the Pajaro River. We are very grateful to him, the Army Corps, Monterey County, Santa Cruz County and the City of Watsonville for continuing to work on this much needed project.

2. It is important to recognize the tiny impoverished community of Pajaro. The inability to tax infrastructure is very diminished as there are only five new commercial businesses that have been built since 1995, and two are vacant.

025-1 3. The 1944 plan called for the Pajaro River Federal Flood Control Channel levee to be built. It encompassed 10 plus miles of the river on the left and right banks not including tributaries. The new TSP is considerably downsized and will not fully protect the valley. Will the present Pajaro River Federal Flood Control Channel Project remain in full force and effect even though portions will be better protected than others? Will the present Operation and

Maintenance Manual remain in effect for the full project of 1944?

025-2 4. A continuous problem is the Cal Trans Highway 1 dam/berm which crosses the Monterey County side of the valley East of Reach 1. Due to this dam, the flood of 1995 was not allowed to flow naturally to the ocean. The water rose over 15 ft and flowed over Highway 1 in a 12 hr period. To this day, the issue remains unresolved, and must be addressed. Trafton Rd., which runs under Highway 1 is approximately 12 ft higher than the farm land. At the toe of the levee a farm road was built to go under Highway 1, it is approximately 4 ft higher than the farm land. There is one 4 ft culvert that is traditionally silted up. Needless to say, when a flood occurs this is not adequate to drain the Mo. Co. side of the valley. We understand the new project will hopefully change that. We are many years from a completed project and we have come close to flooding several times since 1998. Please refer to the picture attached of the satellite image dated March 15, 1995. This picture shows the devastation of the silted valley and destruction of the strawberry and row crops.

025-3 5. There is no Pajaro Valley without farming. To protect a portion of it seems wrong as the communities cannot exist without the farms. Strawberries alone in 2016 generated $724,606,000 in Monterey County with a large portion coming from the Monterey side of the Pajaro Valley. Strawberries hire about 1.8 to 2 people per acre with the longest harvesting season in the world. The whole valley depends on agriculture.

025-4 6. The Federal Register/Vol. 80, NO. 228 Food Safety Modernization Act known as FSMA is the 2018 regulatory law for the agricultural industry. Per the FSMA ruling, the surface water from a flood creates a known or reasonable foreseeable hazard which is a biological hazard potential associated with the food or farm it directly touches. If a flood occurs on the land it may be a year or in some cases, several years before a crop can be planted. This is happening right now in our valley to a landowner due to a Jan 2017 flooding event. The land has still not been released to plant. The acreage being protected by the new project cannot financially sustain the whole valley, if any unprotected areas were to flood.

025-5 7. We have advocated giving up ground up to 100 feet when discussing a full river levy project, where necessary to have good flow. In Reach 2, a 100 ft setback on both sides seems unnecessary. In both Reach 2 and Reach 4, the setbacks create a larger space for the homeless population to live in. Considering the fact that there is little to be done about this problem, won't widening the river here create an even larger cost of maintenance due to the increased environmental hazards from people living in the river and their waste? 20 years have passed and debris dams, mature trees, gophers, squirrels and the homeless population have grown dramatically. This is a major concern that by widening the river East of Hwy 1, will not only create a greater bottleneck of the river there, but the widening area will create a much larger area for the debris dams, trees, gophers, and squirrels and homeless population to infiltrate. Please see the 2017 current debris dam pictures attached.

025-6 8. We question the 12 foot high Tie Back levee from the East end of Reach 4 South crossing San Juan Rd., and the Rail Road tracks with proposed Flood gates. Considering all the traffic on San Juan Rd. and that it is one of the only thoroughfares to Hwy 101 during inclement weather, as well as, trains going through everyday, the cost to achieve the Tie Back may be about the same or less to just continue the new levee setback and completion to the end of the levee at the Staka property. The Monterey side levee ends on the 10 mile mark about 2 miles less than Santa Cruz which goes to and up Murphy Rd.

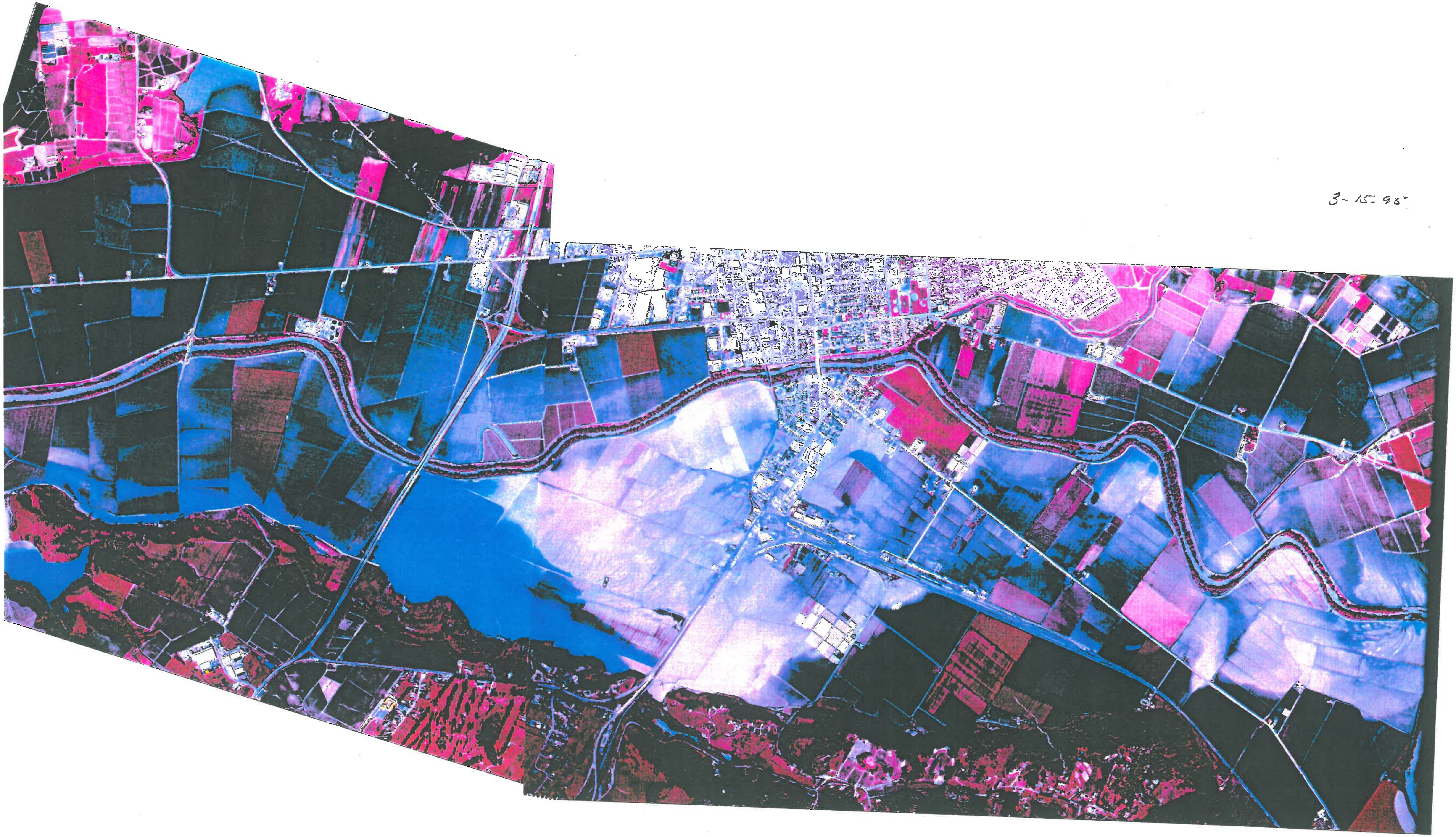
025-7 9. With regards to the cost to benefit ratio, we believe this must be challenged as the numbers must be updated to include transitioning land to organic ground, the cost of wells, fences, pipes, tractors, equipment, all manner of farming equipment products that may be in the fields during a flood event. Additionally, this does not include the cost of crops in ground or harvest costs.

Thank you for your consideration, we sincerely appreciate the opportunity to work with everyone for the betterment and completion of the Pajaro River Federal Flood Control Project.

Sincerely,

Clint Miller
Karen Miller

Mara Miller
CJ Miller
Luis De La Garza
Royal Oaks Farms, LLC
Rancho Royal Oaks, LLC



3- 15- 98.

Lois Robin, Chair
Pajaro River Watershed Committee of the Sierra Club
Ventana Chapter
lolotusi@cruzio.com 831-464-3939

U.S. Army Corps of Engineers
San Francisco District
Attn: Mr. Chris Eng, Environmental Manager
1455 Market Street, Suite 173B
San Francisco, California 94103-1398
CESPN-ET-PB@usace.army.mil

SUBJECT: DRAFT Pajaro RIver FloodRisk
Reduction Project (LRP) USACE GRR ER. November 29,2017

Dear Mr. Eng:

Thank you for the opportunity to comment on the subject draft documents for the Lower Pajaro River Risk Reduction Project (LRP). We attended the November 8 meeting in Watsonville where it was explained that the hydraulic models for this project are problematic, involving erroneous results for all water surface frequencies for all alternatives proposed. We understand that this disparity introduces uncertainty as to whether the levee and or flood wall heights for all Alternatives may require an additional height, in the order of three feet from what was used in the process of preparing the subject GRR EA. We have commented on this issue and others below according to GRR EA Sections and Page, which lead us to the conclusion that the process to select the superior alternative is flawed. The aforementioned hydraulic problem and the lack of coordination with regional flood protection infrastructure directly impact this process, and we believe the process should be reconsidered, properly scoped, including re-analysis of alternatives to justify conclusions supporting selection of the superior alternative.

Page 1: DRAFT FINDING OF NO SIGNIFICANT IMPACT Pajaro River Flood Risk Management Project Monterey and Santa Cruz Counties, California

026-1 We agree that the proposed project could have a significant effect on the environment, but disagree that the mitigation features would reduce all significant impacts for a mitigated FONSI. The project has been designed without sufficient information to be self- mitigating and needs to address the following:

026-2 Page 80: Introduction 4.1.4 Scope of this Environmental Analysis, the discussion involves the aforementioned hydraulic modeling problem indicating that:

> "It may 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."

This situation introduces process credibility issues, perhaps mis-characterizing alternatives capability to deliver on benefits, costs, mitigate impacts, and integration with regional flood protection infrastructure. The discussion goes further to say:

> "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."

We are most concerned that the aforementioned refinements will not address the underlying defects in the process, involving incomplete analysis and mis-characterization of the strengths of each alternative to deliver on benefits at expected costs. Based on our understanding of the circumstances we believe Alternative three is superior due to its wider channel and erosion protection as discussed in detail later in our comments.

026-3 Page 30 1.7 EXISTING PROGRAMS, STUDIES, AND PROJECTS; The GRR EA does not make reference or cite the significant investments in watershed wide flood protection infrastructure relevant to this project. Given this situation we view the public review currently in progress as flawed, and it will need reconsideration as discussed earlier in our comments. Following this reconsideration, the draft GRR EA should be re-released for public review and comment. The reconsideration needs to properly inform stakeholders and technical contributors of how the alternatives could be integrated with the status of the investments made in regional flood protection infrastructure made to date. Perhaps the GRR EA will need to be linked to an umbrella CEQA document where these investments could be characterized, quantified, and correlated to the attributes of the alternatives. These investments involve millions of dollars spent producing studies and projects intended to interface with this LRP. In our view, some of these studies and projects are work in progress, and would require a Project assessment and performance evaluation to determine their status, prior to addressing their interrelationships, dependencies, constraints, and limitations within the watershed.

026-4 Local Agency Relevant studies and projects are organized within the Pajaro River Watershed Integrated Regional Water Management Plan (IRWMP), which provides a background, problem definition and management strategy dependent on objectives and performance of the LRP. The most direct interrelationships exist between the Santa Cruz-Monterey County Bench Excavation Project (BEP) and the Pajaro RIver Watershed Flood Protection Authority (FPA) Soap Lake Floodplain Preservation Project (SLFPP). The opportunities for ecological vitality and sustainable flood protection identified on page 9 have clear nexus with the LRP, and a favorable flood risk management outcome requires effective coordination among these projects at least.

Page

Page 32: 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).

We appreciate that the GRR EA document is intended primarily to comply with USCE process, which appears to us as isolated, leading to the single purpose project as authorized in 1966, fragmented from reality, apparently having difficulty integrating with the overarching multi-purpose watershed scale Program of projects funded by the State of California. Perhaps this GRR EA could serve a useful purpose to advise the IRWMP partners how the Alternatives could adapt to the aforementioned strategy for flood risk management and other water resource projects slated within the Watershed. Presently, the draft GRR EA release could be viewed as a milestone accomplishment in the FPA Strategy. This strategy includes a decision tree planned to guide and optimize a Locally Preferred Alternative that address the watershed circumstances and situation. Phase 2, Chapter 5, Figure

5-1 illustrates the considerations involved with this strategy.
http://www.pajaroriverwatershed.org/files/Phase_2_Report/Individual%20chapters/Chapter%205.pdf The current status of the FPA strategy implementation needs to be included in the GRR EA to enable a process of alternative development and optimization to occur intelligently. The FPA has developed a Project Assessment
026-5 and Performance Evaluation Plan for their work products (PAPE) (http://pajaroriverwatershed.org/pdf/paep.pdf). This PAPE is anticipated to provide a reality check on how effective their program and projects are to date, and what additional measures may be necessary to achieve the 1% flood protection goal they set for the Pajaro River Watershed Community. Hopefully, the final GRR EA will address this concern.

Page 58: 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.

We anticipate that Alternative 3 in conjunction with the Soap Lake Floodplain Preservation Project and a supplemental project, has the most reliable potential to deliver on the 1% sustainable flood protection goal and optimization of regional benefits planned for. We anticipate that sustainable flood protection is practicable and
026-6 will ultimately result in avoidance of riparian/wildlife habitat, and ground water recharge impacts. It is superior to address the flood conveyance and erosion stability issues that persist in the Lower Pajaro River, and at adapting to changes in the watershed. It also would be most efficient and timely addressing NEPA and CEQA processing, readily demonstrating sequential avoidance and minimization of adverse long and short term impacts. Perhaps more importantly it superior adapting to the IRWMP objectives and funding criteria. Alternative 3 is capable to integrate with other IRWMP Partner programs involving compensation for groundwater recharge and perhaps applicable to agricultural lands that the LRP will not protect from flooding.

Alternative 3 is viewed as superior addressing integration/optimization With other projects that would produce:
1. Robust flood protection involving adaptability to greater magnitude floods than expected, reduced stress on levee and floodwall stability/fragility via reduced depths and velocity.
2. Supplemental water supply; more area subject to flooding available. Floodplain and channel complexity length facilitating greater amounts of ground water recharge and Integration with Pajaro Valley Water Management Agency Programs.
026-7 3. Wildlife habitat, directly benefiting from less constrained channel geomorphology and riparian vegetation establishment, enabling stream complexity, and lower velocity (involving characteristic lower vegetation resistance to flow; resistance being a function of velocity squared).
4. Adjacent landowner property impact avoidance; involving lower flood water depths and velocity, enabling shorter flood walls and levees, minimizing hydrostatic forces that cause outboard levee areas to liquefy, and result in sand boils that jeopardize structures, utilities, and land stability.
5. Superior Integration with the BEP, which includes an adaptive management plan to enable recovery of the riparian corridor quantity and quality via intelligent monitoring and maintenance.

As discussed earlier, The FPA has produced a Watershed Study that outlines how optimization could occur involving coordination with their Program and related IRWMP projects. The Local Sponsors have also produced studies and the BEP which in our view has been expected to be optimized into the LRP; the BEP as a channel and Riparian Corridor element and the LRP a setback levee project, respectively, each with their own operation and maintenance protocols, integrated to assure performance expectations are manageable.

Page 111: Section 4.6 AQUATIC RESOURCES 4.6.1 Affected Environment Physical Environment

026-8 The GRR EA does not accurately describe the physical condition of the River omitting the improvements made by the BEP. These improvements are based on a detailed study recommending a channel stability and ecological restoration strategy. These recommendations, adopted into Policy via Local Partner CEQA Authority, include channel grading and implementation of a Riparian Vegetation Plan. This project represents a major investment in time and money, and in our view establishes the baseline condition from which to evaluate LRP long and short-term impacts, including maintenance for floodwater capacity,

026-9

Page 159 : 4,14,2 Environmental Consequences

> 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.

This description of habitat needs for the steelhead trout, involving stream characteristics favorable for habitat. We agree the setback Levees proposed in the LRP could improve the situation if they were set back an adequate distance to accommodate the increase of design flow from 19000 CFS to 45000 CFS, and perhaps more, subject to the findings of the aforementioned PAPE. The LRP essentially doubles the expectations of the River's conveyance capability, perhaps at depths and velocities with the potential to aggravate the documented channel and bank erosion problems in the Lower Pajaro River. The potential for this problem to further arise and exacerbate is evident as described in the aforementioned FPA Watershed Study, Phase 3, Chapter 2, link provided below.

026-10

As mentioned earlier, the GRR EA speaks to the opportunity for sustainable flood protection described on page 41, and eludes to the issue of the Project's venerability to loss of flood protection from landscape changes in the upper watershed that increase flood flow downstream to the Pajaro Valley. The PRWFPA has addressed this issue with a Watershed Study specifying goals and strategy to integrate with this project. It also quantifies induced flooding consequences in the event the strategy fails as described in Phase 3-4a, Chapter 2, Table 2.1 of said Study (http://www.pajaroriverwatershed.org/files/PajaroPh3_4a/Ph3_4a_2.pdf).
This strategy prescribes a proactive Program supporting projects and land development policies involving local agency authority to manage effective performance. To date, it appears they have approved a 9000 acre Floodplain Preservation Project and recommended land-use polices applicable to the upper watershed counties and cities. Implementation progress is unclear, involving where responsibility, authority, control, and leadership are in place and effective. It is clear that control of LRP design flow rate (the quantity of flood water discharging from the upper watershed to the lower), depends on FPA's performance acquiring Soap Lake properties and persuading upper watershed counties and cities to effectively regulate land use. It is also clear that the Local Sponsor's control, responsibility and authority is in peril if the FPA's performance is less than expected. The aforementioned PAPE may clarify this issue. Alternative 3, providing greater setback levees, is superior at addressing this issue, which has a significant likelihood of occurrence given climate change and other circumstances threatening control. We are concerned that sustainability uncertainty may result in misguided allegedly emergency actions similar to those taken after the 1995 flood, where extreme vegetation removal was

thought to improve protection despite the consequent exposure to severe levee and bank erosion threatening levee fragility and stability, exacerbating levee failure risk issues.

Page 133: 4.8 HYDROLOGY, HYDRAULICS, GEOMORPHOLOGY 4.8.1 Affected Environment
Groundwater Hydrology

026-11 The GRR EA describes the groundwater basin and cite work by Hanson and others outlining the composition and characteristics of the various sub aquifers within the basin. Adverse impacts to groundwater recharge resulting from the LRP objective to eliminate the Pajaro Valley Floodplain are dismissed as insignificant, without reference to supporting analysis. The report is clear that the Floodplain represents a large area, which historically may occur on a 15-Year return period, and remain flooded for extended periods of time. A quantitative analysis of these baseline conditions was prepared by the writer which indicates loss of this Floodplain groundwater recharge in the order of 2000 acre feet of water, annualized over a 100-Year period. This quantitative analysis is an extension of the work of Dr. Andrew Fisher by the writer (Kenneth Reiller PE) and has been collaborated with the PVWMA circa 2015. Dr. Fisher's publications include a groundwater recharge study in the vicinity of Reach 4 of the LRP, and suitability mapping of Manageable Aquifer Recharge (MAR) https://websites.pmc.ucsc.edu/~afisher/post/Driscolls/SurfSuit-Edit150922.pdf areas in the Pajaro Valley. Groundwater recharge rates reported in these publications were compared to those cited in the GRR EA and found to be agreeable. This information, applied to the aforementioned MAR Map-encompassed by the 1995 Floodplain Area, USGS stream flow data, and personal accounts from levee managers, witnesses and observation by myself and supported analysis, estimate the ground water recharge resulting from the 1995 flood. This quantity, projected statistically for a range flooding events over a 100-years, is viewed as a base line condition from which to quantify potential groundwater recharge impacts from the alternatives. Although all alternatives are unable to avoid this impact, Alternative 3 most effectively minimizes this impact and accommodates mitigation. This issue has been submitted to the aforementioned PVWMA and Dr. Fisher for quality control and quality assurance purposes, and then submitted to the USACE at various Project meetings. Dr. Fisher identified supplemental information appropriate to specific site conditions to refine this estimate . We believe the loss of Floodplain groundwater recharge is a significant adverse impact that needs to be avoided and preferably enhanced via the LRP and the IRWMP.

Page 20: Executive Summary

> 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 fhydrograph 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
>
> 026-12 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.

In conclusion, central to our concerns is the apparent lack of coordination in the GRR EA process, as previously described in this comment letter. Page 30 of the GRR EA (1.7 EXISTING PROGRAMS, STUDIES, AND PROJECTS) lists non–USACE relevant regional studies. This list does not contain the relevant IRWMP and related PRWFPA Work Products that view this LRP as a critical path project element in their watershed strategy for flood protection management and integration of other IRWMP Projects. Many of these projects are dependent on LRP outcomes, and determine what measures they must take to adapt their projects to the LRP and Community
026-13 needs. In these terms, we view this GRR EA as a focused environmental document, typically reliant on a related Programatic environmental document which encompasses potential environmental benefits and impacts comprehensively. We are unclear of the opinion of the Local Sponsors, who will apparently be taking the lead on the CEQA process in this regard. The IRWMP Programmatic Environmental Impact Report (2007, Section 524 page 5-13, http://www.valleywater.org/Services/IntegratedRegionalWaterManagement/2007_Pajaro_River_Watershed_IRWM_Plan.aspx and the FPA Watershed Study (Phase 3 chapter 4, page 4-3, http://www.pajaroriverwatershed.org/files/PajaroPh3_4a/Ph3_4a_4.pdf somewhat address this matter but we believe the adequacy of this GRR EA is dependent on a clear understanding.

It appears, the FPA Watershed Study and Soap Lake Floodplain Preservation Project will manage discharges into the subject USACE LRP, and Local Sponsors will manage LRP levees to safely convey these discharges, as well as the BEP to manage the ecological restoration element for the LRP. Perhaps the constraints placed on the USACE via the 1966 single purpose flood control purpose Authorization disadvantage LRP integration with the aforementioned FPA strategy. This complicates the review process at the Federal and State level due to the LRP scope being limited to the 1949 project footprint. As the Local Partners utilized the State Of California paradigm for developing multi-agency infrastructure projects via the IRWMP, integrating the State and USACE
026-14 environmental review process is anticipated to provide an optimized robust solution to public safety, property damage reduction, business prosperity, and environmental goals of the Pajaro Watershed Community. We have encouraged the USACE and Local Sponsors to achieve this integration as discussed in our earlier correspondence found in the following link https://waterpowerlaw.sharefile.com/d-s33c23671dd44bc38.
Hopefully, Local Partner resourcefulness will demonstrate this capability and remain successful in the State Grant Funding competition, which has been the principal source of funding enabling progress to date.

Sincerely Yours

Lois Robin
Chair, Sierra Club Pajaro River Watershed Committee
Written for the Committee by Kenn Reiller

Attachment 1

From: Mary Ann Matthews <mmatthews@redshift.com>

No attribution necessary unless you want to say that it is based on studies by Matt Kondolf

(Monterey Bay Chapter CNPS letterhead)

P. O. Box 381
Carmel Valley, CA 93924
Jan. 10, 1997

U.S. Army Corps of Engineers
Regulatory Branch
333 Market Street
San Francisco, CA 94105-2197

RE: Section 404 Permit Application, San Benito River

Gentlepeople:

The Monterey Bay Chapter of CNPS, whose boundaries include Monterey and San Benito Counties, is deeply concerned about activities impacting the riparian communities in this area. Because instream mining of sand and gravel can have a destabilizing effect on rivers, leading to loss of valuable plant communities and subsequent bank failure, flooding, and other adverse effects both up and downstream, we have been involved for many years in monitoring and urging careful regulation of such activities.

Unfortunately we only recently learned from the AMBAG Monthly Notification for January 1997 about the Section 404 permit application for discharge of fill from sand and gravel excavation by various companies on the San Benito River and Tres Pinos Creek. Because we did not receive the Public Notice for these projects (although we have received notices recently for projects in Santa Cruz County and other areas out of our chapter territory), we do not have the detailed information necessary to provide site-specific comments.

We are, however, well aware of very serious destabilizing impacts to the San Benito River from ongoing mining operations, and we deplore the fact that

the most mining operations have not been subject to meaningful operational requirements. Because rivers are dynamic systems, traditional reclamation processes are not generally successful, and therefore the best approach is to minimize the impacts of mining by limiting extractions, establishing minimum river bed elevations that must be maintained, and by requiring preservation and replanting where necessary of native riparian vegetation. Past assumptions that mining impacts are minimal as long as extraction does not exceed replenishment have been shown to be incorrect because of the likelihood of up- and downstream erosion before equilibrium can be restored.
Further, the episodic flows of the San Benito, like those of other Central Coast rivers, make “annual average rates” meaningless.

We do have considerable experience to draw on relating to instream mining and its effects on the Carmel River, and we hope this information can be helpful to you in designing appropriate conditions for this application. There are three sites along the river where past operations have created serious problems that are still unresolved despite repeated reclamation efforts. A site at Valley Hills, where the river channel had widened and considerable acreage of private land had been eroded, was one of the first projects by the Carmel River Management Zone after it was established in 1983. Discussions with the staff of the Monterey Peninsula Water Management District indicate that although major work has been undertaken to restore the original channel and revegetate with willows, the area still has problems during high water events. Two other instream sand and gravel mining
sites, near Rancho San Carlos bridge and Robinson Canyon bridge, have required repeated channel restoration and revegetation, but both continue to
have erosion problems. The Robinson Canyon bridge had to be replaced some years ago because of flood damage, and the Rancho San Carlos bridge reportedly has severe structural problems. We recognize that other factors, such as the small upstream dams and vegetation removal for development and agricultural uses, have contributed to the instability, but the common additional factor that has exacerbated problems in these three sites is the existence of mining operations.

Mining companies have pointed out in the past that their operations can actually provide flood control benefits, but this is only true where the rivers are aggrading, that is, where sediment is building up faster than it can be moved downstream. However, rivers with dams, such as the San Benito and Carmel, generally have a sediment deficit rather than a surplus.

Because this permit application covers a very long segment of the San Benito
River, the cumulative impacts of past and future mining must be carefully

considered. For example, the extractions at the Tres Pinos Creek or upper end of the reach are likely to diminish the amount of aggregate available to
mining operators downstream.

We realize that additional regulations on extraction will increase the cost to mining companies, but the fact is that the environmental costs of instream mining have never been included in the cost of the product, and instead have been largely paid by the public as taxpayers.

The information in this letter is based on a variety of sources including studies by the Monterey Peninsula Water Management District and papers by G.
Mathias Kondolf, professor of hydrology at U.C. Berkeley. We have tried to utilize their information very carefully, but they are not responsible, of course, for any of the above comments. Finally, we would like to cite Dr. Kondolf's conclusions after examining the inadequacy of current regulation and management of instream mining. While many of them are beyond the purview
of the Corps, they do provide an excellent basis for environmentally sound regulation. He writes that the following statewide policies are needed:

1. Recognize the general nature of impacts from instream mining.
2. Consolidate the permitting process to replace what are currently repetitious permit requirements with a coordinated environmental review process.
3. Independently monitor volumes extracted and make those data publicly available.
4. Prohibit or restrict instream mining from rivers in sediment-starved reaches (e.g. downstream of reservoirs) and in rivers where incision is a problem.
5. Restrict instream mining in reaches used for spawning by anadromous salmonids and carefully monitor channel conditions so that mining is halted if detrimental effects become manifest.
6. Incorporate costs of environmental impacts (to bridges and other resources) into the price of instream-produced aggregate.
7. Encourage development of alternative sources of aggregate such as recycling.
8. Encourage counties to develop aggregate management plans with technical assistance from the state.*

We would appreciate being placed on the mailing list for future public notices in Monterey and San Benito Counties. We would also appreciate learning of any further opportunities to comment on specific sites on the San Benito River when we will have a chance to examine the impacts on riparian communities. Thank you for your consideration of our concerns.

Sincerely yours,

Mary

Ann Matthews

Conservation Chairman

*G. Mathias Kondolf. Environmental planning in regulation and management of instream gravel mining in California. Landscape and Urban Planning 29 (l994)
185-199.

June 18, 2002

Office of Counsel
U.S. Army Corps of Engineers
333 Market Street, Room 804
San Francisco, CA 94105

FOIA Request

Dear Office of Counsel:

This letter is to request access to records in the possession of the Army Corps of Engineers for the purpose of inspection and copying, pursuant to the federal Freedom of Information Act, 5 U.S.C. 552.

The records that I am asking to inspect and copy are: any authorization and/or application for authorization to work on flood control for the Pajaro River, located in Santa Cruz, San Benito, Santa Clara and Monterey Counties in California from any date, and any records concerning the Pajaro River since 1995.

Further, I ask to inspect and copy any records concerning the Watsonville, California slough system since 1995.

If these requests are denied in whole or in part please cite the specific exemptions which you believe apply and any case authority which you believe supports your conclusions. Also please inform me of the appeal procedures available to me.

If you believe a portion of the information I have requested is exempt from disclosure by express provisions of the law, please segregate and delete that material in order that the remainder of the information may be released.

I ask that any fees for access to this information be waived as the information requested will be used in a story that will significantly contribute to public understanding of government activities. If you still plan to charge me for any expense incurred in complying with this request, please notify me in advance.

Thank you for your timely attention to my request, and I look forward to hearing from you within the statutory 20-day period.

Sincerely,

Lois Robin
Executive Committee
Santa Cruz County Group
Ventana Chapter, Sierra Club
P.O. Box 604
Santa Cruz, California 95060
831-464-1184

"...to explore, enjoy and protect the wild places of the earth."

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January 15, 2003

Memorandum

To: Sierra Club, Santa Cruz Group

From: Richard Roos-Collins

Subject: Pajaro River Flood Control Project

You asked me to determine whether the General Reevaluation Report (GRR), which the U.S. Army Corps of Engineers (ACE), San Francisco District, is preparing for the Pajaro River Flood Control Project (FCP), is consistent with the legal requirements for restoration of the environmental quality of the Pajaro River. The short answer is no. The GRR will focus exclusively on flood control within the footprint of the original FCP, namely the lower 11.8 miles of the river and 2.6 miles of its tributary Salsipuedes Creek; and it will not consider environmental restoration as a purpose.

I. Introduction

The FCP was authorized by the Flood Control Act (1944). It was completed in 1949. As a result of flood damages thereafter, the Flood Control Act (1966) and Section 107 of the Water Resources Development Act (WRDA) (1990) authorized the ACE to study modifications to the FCP to correct possible deficiencies in design. The ACE published a Reconnaissance Study (1993) as the scoping phase of the GRR. Its Project Management Plan (March 2002) (PMP) describes how it will prepare the Feasibility Study, which is the next and final phase of the GRR. The GRR, including an Environmental Impact Statement (EIS), is scheduled to be completed in April 2004. The stated purpose of the GRR is to modify the FCP within its original footprint to provide the authorized level of flood protection in the lower watershed.

ACE has begun a separate study to develop a Pajaro River Watershed Management Plan (WMP). Section 905(b) of WRDA (1996) provided that the ACE will determine whether to modify the completed FCP in the "interest of flood control and ecosystem restoration, with emphasis on water quality, and other related purposes in the Pajaro River Watershed…." The ACE published a Basin Study (2000), which functions as the scoping phase of this effort to develop a WMP. That document recommends that the ACE and Counties would jointly prepare a WMP. This plan would incorporate the GRR as the solution for the lower watershed and would make further recommendations for management of the upper watershed. Basin Study, p. 11. The WMP was scheduled to be published by January 2008. However, since release of the Basin Study, the ACE has apparently not obtained funding to proceed to the next phase, a Feasibility Study of the WMP, and it has halted its efforts.

For the various reasons stated below, this parallel track will not work. The GRR will be ineffective, because it will not address facilities and activities in the upper watershed that have substantially increased the magnitude of peak flood flows and the sediment load in the lower river. The GRR will be deficient legally. It will not comply with the ACE's duty to assure that any civil work will comply with federal environmental laws on a continuing basis and indeed, will contribute to watershed restoration consistent with the primary purpose of flood control.

II. Purpose of GRR

The sole purpose of the GRR will be modification of the FCP design to improve flood protection in the lower river. While the GRR, through the EIS, will evaluate measures to mitigate adverse environmental impacts – to reduce the worsening of existing conditions, restoration of fish and wildlife habitat will not be a purpose. The ACE apparently believes that the Basin Study, which was separately authorized from the GRR, is the only venue for that purpose. That is wrong.

General law provides that environmental restoration is a primary purpose of each civil work, including a completed FCP. A GRR may include ecosystem restoration as a study purpose under this authority. ACE, Engineering Pamphlets (EP) 1165-2502, ¶5, Table 2; EP 1165-2-502, ¶7(c); Engineering Regulation (ER) 1105-2-100, ¶2-2(b). Indeed, general law authorizes systemic, not incremental, change to restore the natural functionality of a watershed.

For this purpose, ecosystem is defined as the dynamic and interrelated complex of plaint and animal communities, including people, and their non-living environment, as affected by a civil works project. EP 1165-2-1, ¶19-4. Ecosystem structure is the state and spatial distribution of microscopic and macroscopic material components in diverse living and non-living assemblages. Ecosystem function is a dynamic process characterized by rate and direction of change in material and energy flows through space and time. EP 1165-2-502, ¶7 n. 4.

An ecosystem restoration project should return an ecosystem that has been adversely affected by a civil work to "as near a desired natural condition as is justified and technically feasible" (EP 1165-2-1, ¶19-4), or a "close approximation" of its condition prior to disturbance (EP 1165-2-502, ¶7(c); ER 1105-2-100, ¶E-30(a)). It should partially or fully reestablish the attributes of a natural, functioning, and self-regulating system (EP 1165-2-502, ¶7(c)) of aquatic, wetland and terrestrial communities (EP 1165-2-502, ¶7(f)).

General law permits but does not require ecosystem restoration as a purpose in a GRR. However, it creates a strong presumption in favor of that purpose, particularly where the functionality of the FCP is affected by upstream, non-federal facilities and activities. A completed civil work should always be operated from a watershed perspective, which considers the interconnectedness of land and water resources, dynamic nature of economy and environment, and variability of social interests over time. EP 1165-2-1, ¶ 3.20(a)(1). Since watershed conditions are not static, the management of a civil work should be adjusted so as to achieve a desirable balance among multiple objectives. EP 1165-2-1, ¶ 3.20(a)(3).

III. Geographic and Developmental Scope of GRR

Based on the Reconnaissance Study (1993), the GRR will study alternatives to modify the FCP design within the existing footprint. It will not consider facilities and activities that have contributed to increases in peak flood flows and sediment load, or modifications thereof that may contribute to the functionality of the FCP. This cramped scope is a direct consequence of the ACE's choice not to include environmental restoration as a study purpose. Again, general law authorizes the ACE to design modifications to the FCP in the context of a WMP.

The study scope for an ecosystem restoration project should include all facilities and activities that have related impacts on the ecosystem. EP 1165-2-1, ¶19-4. Although the ACE may undertake an ecosystem restoration project only where its civil work contributes to the existing degradation, there is no mandate that the civil work be the sole or primary cause. EP 1165-2-502, ¶11; ER 1110-2-8154, ¶6(c). Indeed, the ACE should study an ecosystem restoration project in the context of a comprehensive program that includes contributive actions by other agencies and stakeholders. EP 1165-2-502, ¶7(j). A restoration project should complement and be complemented by related activities, in order to serve common management goals and objectives. EP 1165-2-1, ¶19-6.

IV. Analytical Procedures

The Reconnaissance Study was completed 10 years ago. It described problems in the FCP design and described existing conditions within the footprint. As discussed below, these are the first and second steps in the logic path required for a Feasibility Study, including a GRR. The ACE apparently intends to proceed directly to formulate alternatives for FCP modification. This approach has substantial defects. To begin, the PMP and attached schedule (p. 25) do not provide for reconsideration of any of the findings of the Reconnaissance Study. However, many relevant circumstances have changed since publication in 1993. These include: the 1995 flood, continuing aggradation in the channel form and resulting loss of carrying capacity, listing of Central Coast fisheries and other species under the Endangered Species Act, and other changes in environmental law and policy, including ER and EP's new provision that each Feasibility Study may include environmental restoration as a primary purpose. In short, the rush to complete the GRR on the basis of the outdated Reconnaissance Study is inconsistent with the ACE's duty to assure that each preliminary step is kept current as the predicate for the successive steps. Further, the successive steps in the GRR (identification, evaluation, comparison, and selection of alternatives) will be inherently defective, since they will be based on the assumption that environmental restoration is not a valid study purpose. These defects in the PMP are plain when compared to the general requirements for a six-step logic path in any Feasibility Study.

Step One is the statement of problems and opportunities. This statement should be framed in terms of the federal objective of maximizing the net benefits for national economic development or, for a restoration project, national ecosystem restoration (NER). ER 1105-2-100, ¶2-3(a)(1). It should also reflect the objectives of the non-federal sponsors and other participating stakeholders. Id., ¶2-3(a)(1)-(2). This statement should not preclude the consideration of all potential alternatives. It should encompass future as well as present conditions. It should be dynamic and iterative – that is, revised periodically as the study proceeds. ER 1105-2-100, ¶2-3(a)(1). Once the problem and opportunity statement – the study scope -- is framed, the next task under Step One is defining study objectives. Such objectives state the desired study results that would solve the problem or take advantage of the opportunity previously identified. They should be clearly stated to describe the desired environmental impact, its location, and its timing. ER 1105-2-100, ¶2-3(a)(4).

Step Two is an inventory and forecast of critical resources, including environmental, demographic, economic, and social conditions relevant to the problem and opportunity statement. ER 1105-2-100, ¶2-3(b). The inventory of critical resources relevant to the problem statement should include existing and future conditions. ER 1105-2-100, ¶2-3(b). This baseline provides the basis for evaluating the comparative benefits of alternative plans. In the context of a completed civil work (like this FCP), the inventory and forecast establish a baseline under a no-action plan (e.g., no modification to the FCP). The inventory and forecast should be periodically revised throughout the study. ER 1105-2-100, ¶2-3(b). In forecasting the environmental impacts of the no-action and alternative plans, a study should consider risk and uncertainty (EP 1165-2-502, ¶16(e), (g); ER 1105-2-100, ¶2-4(g)) and intended and unintended consequences (EP 1165-2-502, ¶ 7(g)). The study should systematically address the causes of ecosystem degradation and restoration in order to increase the likelihood of long-term success (resilience and persistence) and reduce the need for extensive operation and maintenance. EP 1165-2-502, ¶ 7(j). Finally, the analytical method (whether a habitat model or other scientifically based method) should be chosen to provide results at the level of detail appropriate for the planning objectives. ER 1105-2-100, ¶E-33(1).

V. Procedures for Public Participation

The PMP (2002) describes the tasks and schedules for drafting and finalization of the GRR. In addition to the general task of study oversight (p. 10), the only specific tasks assigned to Santa Cruz and Monterey Counties, which are the non-federal sponsors of this GRR, appear to be obtaining the necessary rights-of-way for any expansions in the levee system (*see* schedule following p. 25). The PMP provides for five meetings of stakeholders in 2003 and 2004 to review draft work products, but it does not specify any tasks for these stakeholders. *See* id., p. 25. Its quality assurance for work products appears to involve only ACE staff. *See* p. 22. In short, the PMP describes a process almost entirely under the ACE's internal control.

This is contrary to the requirement that a PMP should establish appropriate procedures to maximize the cooperative involvement of the non-federal sponsors and other stakeholders in the study. ER 1105-2-100, ¶B-2(c), ¶B-5(a). Since there is no single best approach to public participation, the PMP should establish a strategy appropriate to the circumstances of a given study. ER 1105-2-100, ¶B-5(c). The adopted strategy should identify the expected contributions of each stakeholder participating actively in the study. ER 1105-2-100, ¶B-5(a)(1)(e). At a minimum, it should include procedures agreeable to the non-federal sponsors for quality control of work products and for dispute resolution. ER 1105-2-100, ¶G-8(C)(5).

Indeed, in an ecosystem restoration project, ACE should establish collaborative partnerships with other agencies (including regulatory agencies, not just the non-federal sponsors) and non-governmental organizations (NGOs) in study and implementation. EP 1165-2-1, ¶19-6. In that context, a stakeholder may gather information, or share a database, develop a management plan, or cooperate in implementation, operations, maintenance, and monitoring. EP 1165-2-502, ¶11(b). For example, the ACE and non-federal sponsors should use such assistance to identify ecosystem boundaries and develop alternatives that will contribute to the objectives for ecosystem restoration. EP 1165-2-502, ¶10(b). Finally, in conducting the study of an ecosystem restoration project, the ACE and non-federal sponsors should use collaborative decision-making to aid in the development and evaluation of alternatives, including those whose benefits cannot be monetized. EP 1165-2-502, ¶7(o).

VI. Formulation, Analysis, and Comparison of Alternative Plans

Because of its limited purpose as defined in the 1993 Reconnaissance Study, the GRR will consider alternative modifications of the FCP within its footprint. While the PMP itself is silent on this choice, we believe that the ACE will not consider upstream measures, including non-structural. This range of alternatives is unnecessary cramped, even if flood control is the sole purpose of the GRR, and it is plainly wrong if ecosystem restoration becomes an added purpose. In short, the GRR may not conform with the general requirements for Step Three (formulation of alternative plans) in any Feasibility Study. Further, while we have not seen a clear statement how the ACE intends to conduct Steps Four and Five (analysis and comparison of alternatives), the PMP proposes a very cramped schedule and budget, suggesting that the GRR may not conform with the requirements of the ACE's rules. We restate the general requirements for Steps Three to Five below.

Step Three in any Feasibility Study is formulation of alternative plans. Alternative plans should be formulated to identify specific ways to achieve planning objectives. Each should consist of a system of structural or non-structural measures, strategies, or programs. ER 1105-2-100, ¶2-3(c)(1). Such plans should not be limited to management measures that the ACE may implement directly or exclusively under existing authorities. They should include measures that may be implemented by other public agencies or stakeholders (ER 1105-2-100, ¶2-3(c)), or that may require changes in existing laws, rules, and common law (ER 1105-2-100, Figure 1-1, ¶5).

The first task in formulating alternative plans is to identify management measures that could be implemented, giving equal consideration to structural and non-structural measures. The second task is combining management measures into plans that are significantly differentiated. ER 1105-2-100, ¶2-3(c)(2). These tasks should be undertaken iteratively. ER 1105-2-100, ¶E-34. Each plan should generally be formulated to reasonably maximize benefits to the national economy, the environment, or the sum of both. It should be formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability. ER 1105-2-100, Figure 1-1, ¶5(d); ER 1105-2-100, ¶E-38; EP 1165-2-502, ¶16.

The study should establish four accounts in order to compare the alternative and no-action plans: National Economic Development (NED), environmental quality (EQ), regional economic development (RED), and other social effects (OSE). ER 1105-2-100, Figure 1-1, ¶7; ER 1105-2-100, ¶2-3(d)(3). These accounts include monetized and nonmonetized outputs and costs, and they are used to determine which alternative plan maximizes net benefits. ER 1105-2-100, ¶2-4(d), (k).

Step Five is comparison of alternative plans. Here, building on the comparison of each alternative plan against the no-action plan accomplished in Step Four, the study ranks the alternate plans. For an ecosystem restoration project, cost-effectiveness and incremental cost analysis (CE/ICA), as prescribed by the ACE's guidance documents, should be used to determine whether the outputs of an alternative plan could be accomplished at less cost by another alternative. ER 1105-2-100, ¶E-36.

VII. Selection of Recommended Plans

The PMP states (p. 17) that the GRR will select the NED Plan, unless Santa Cruz and Monterey Counties commit to assume the costs of non-federal measures in a Locally Preferred Plan (LPP). In sum, the ACE will select that plan which maximizes monetizable benefits, such as prevention of flood damages, associated with the FCP. This criterion follows from the omission of environmental restoration as a study purpose. If that is also a study purpose, the criteria for selection of the recommended plan are a better balance of economic and environmental interests.

In any Feasibility Study, Step Six is selection of a recommended plan. The study should recommend a single plan among the alternatives. ER 1105-2-100, ¶2-3(f). The criteria for selection depend on whether the plan purpose is or includes ecosystem restoration. For all project purposes other than ecosystem restoration, the ACE should choose the alternative plan that maximizes National Economic Development (NED Plan), unless the Secretary of Army grants an exception based on overriding considerations. EP 1165-2-502, ¶8; ER 1105-2-100, ¶ 2-3(f). For an ecosystem restoration project, the ACE should select the plan that reasonably maximizes restoration benefits compared to costs. This is the National Ecosystem Restoration (NER) plan. ER 1105-2-100, ¶2-3(f)(2). The combined monetary and non-monetary benefits of an ecosystem restoration project should exceed its costs. EP 1165-2-502, ¶16(a). Plan selection is not justified on the basis of a traditional benefit-cost analysis, since the majority of benefits cannot be monetized. Therefore, an ecosystem restoration project need not have a benefit-cost ratio greater than 1.0. EP 1165-2-502, ¶16(a)(1). However, it should be a cost-effective means to address the restoration problem. EP 1165-2-502, ¶16(a)(2). An ecosystem restoration project should: (1) demonstrate acceptability to other public agencies and stakeholders; (2) be complete in providing for all necessary investments or actions necessary to achieve the restoration; (3) be effective in restoring ecosystem structure of function to a meaningful degree; (4) be efficient, in providing the benefit in a more cost-effective manner than an alternative plan; and (5) should have reasonable costs. EP 1165-2-502, ¶16(c)-(g). For a plan having both economic and restoration benefits, the plan with the greatest net sum of such benefits is to be selected. ER 1105-2-100, ¶E-28(e)(2).

VIII. Implementation of Selected Plan

The ACE-San Francisco District will submit the GRR to its headquarters for approval of the selected plan. If the study purpose is just modifying the FCP design, ACE will be responsible for construction, such as raising levees, and initial operation and maintenance (O&M); and the Counties will be responsible for subsequent O&M. There will not be any opportunities for continued local participation in the management of the FCP. Plainly, such participation would be helpful in assuring that the FCP continues to function in a manner that protects all affected interests.

An ecosystem restoration purpose would facilitate local participation in the continuing management of the FCP. A non-federal stakeholder may have a defined responsibility for implementation of an ecosystem restoration project, including operation and maintenance and monitoring. EP 1165-2-502, ¶ 10(b). An ecosystem restoration project should be planned and implemented in a systems context, considering aquatic, wetland, and terrestrial complexes in order to improve their potential for long-term survival as self-sustaining functioning systems. EP 1165-2-502, ¶ 7(f). Accordingly, it should be implemented in an adaptive manner. Id., ¶ 7(f), (k).

Attachment 4

Watershed Restoration for the Pajaro River

Watershed restoration for the Pajaro River will very simply restore the relationships between the river and its flood plain that were in place when the U.S. Army (not the Corps') designed and built the lower-river flood control structures. This means restoring the ability of the river and its tributaries in San Benito and Santa Clara counties to store flood waters in the flood plain that it constructed through natural processes. Its natural flood plain has been abandoned because of gravel mining that has lowered and confined the bed of the river over the last century. Exactly the same issue faces Sonoma County on the Russian River where downstream communities are flooded almost annually and where restoration options are being contemplated and, in some cases have been implemented.

For the Pajaro restoring Soap Lake function will provide about 15% of the available floodwater storage and restoring the San Benito River between Highway 101 and Tres Pinos will restore about 75% of the lost storage volume. The missing 10% has been lost in Hollister due to levees and housing in the flood plain and cannot be practically restored. There are several physical ways that the storage volume can be restored. My ideal vision calls for excavating 2.5 to 3.0 feet of old flood plain on one side of the Pajaro within a small portion of Soap Lake, using that material to build a levee in the middle of what is now a hay field, and letting the river flood naturally without any channel modification. The dense riparian and in-channel forest today pushes water out to the flood plain about every 15-20 years, and we would augment that storage through excavation that would also greatly increase capture, infiltration, and storage of groundwater. The cost of excavation could be paid for through the water savings to San Benito County (in lieu of San Luis Project water), or could be required of any future developer who wanted to develop what could be statutory wetland but is now only used for hay. Soap Lake would be smaller than it was in the 1800's but essentially unchanged. It would flood 3-4 feet deep at the 50-year return period flood, flooding areas that are today marginally flooded in San Benito and Santa Clara counties.

San Benito river flood plain would take more work to restore. Today the river is as much as 25-35 feet too deep (incised). To reoccupy its natural original 100-year flood plain area will take raising the riverbed. One way to do this is with gabion baskets (wire baskets filled with stream gravel), arranged every quarter mile or so along the channel, that are notched in the middle for fish passage. Another method is to drive sheet piles (vertically-driven sheets of corrugated steel), again notched to allow fish passage. These small in-channel dams slow water flow and capture sediment to slowly fill the channels. As the structure is buried in sediment, a new one is built on top of the old one until the river is raised to its original gradient. Gravel mining could continue as is done today, but that means that the structures have to function like leaky dams, ponding water in high flow periods. If gravel mining ceased, the riverbed could be restored faster with less impact on fish migration and better spawning habitat.

Basically, as the river goes into flood stage, with flows that would be equivalent to about 1000 cubic feet per second (cfs) measured at the Chittenden gauge, it would reoccupy the flood plains and terraces that today are abandoned except during really big flood events like 1995 and 1998. Those inner terraces would store about 8000 cfs for the first 24-hours as the flood discharge increased. This would have the effect of reducing the flood peak. Eight thousand cfs for 24 hours is about equal to 16,000 acre-feet of water. It is stored as the floodwaters rise and released as they fall, so the duration of downstream flooding increases. In 1995, the increased flood storage in the San Benito River alone would have reduced the flood peak on the order of 10,000 cfs at Chittenden, which would not have breached the levees despite poor maintenance of the channel. There would NOT be flooding of the San Juan Bautista valley or any of the agricultural lands. There would be flooding of the Hospital Road area and the full channel width of the upper San Benito River near Hollister. The Hollister sewage treatment plant would have to be protected by levees or moved. In the mid valley half way between San Juan Bautista and Hollister, the restored river at the time of a 25-year return period flood would be up to 1/2 mile wide compared to less than 1000 feet wide today. No orchards or structures would be flooded, but gravel mining apparatus would have to be brought to the level of the Lake San Benito San Juan valley floor, above flood stage. A person driving up 101 to Gilroy from San Juan or to Hollister from San Juan during the 1995 flood would see little or no difference in flood waters after restoration.

Given time, the river will restore its flood storage by eroding the now-oversteepened banks of its incised channel. This will take out bridges and housing in San Benito County. By bringing the river back in balance with its natural flood plain, that erosion will be prevented upstream and flooding will be greatly lessened downstream.

Dr. Robert Curry, Ph.D
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7/27/03

John Gregg,
Manager
San Benito County Water District
P.O. Box 899
Hollister, CA 95024

Dear Mr. Gregg:

We are pleased to provide a report by Philip Williams & Associates (PWA), "An Environmental Alternative for the Pajaro River Flood Plan" (July 2003). This report proposes new alternatives for further analysis by the U.S. Army Corps of Engineers (ACE) in its Feasibility Study to modify the existing federal flood control project. We just submitted this report to the ACE, San Francisco District. We now publish it in the hope that it will contribute to constructive discussion by all Stakeholders about how best to provide needed flood protection in the Pajaro River Basin in a manner that maintains and restores water quality, the steelhead and other fisheries, and other natural resources protected by our environmental laws.

PWA is an engineering firm that specializes in water resources planning and management. It is routinely engaged by the ACE and local agencies to help design feasible solutions where different purposes for river management, such as flood control and environmental protection, appear to irreconcilably conflict. See www.pwa-ltd./repproj.htm for a list of its representative projects. For example, it assisted the ACE, Sacramento District in the redesign of the Napa River Flood Protection Project, which will now protect the City of Napa against 100-year floods and also will restore the tidal marshlands and floodplain. The ACE describes this project as a national model for its mission of achieving flood protection in concert with environmental protection and even restoration. The Sierra Club-Pajaro River Committee engaged PWA to bring those same skills to bear on the Feasibility Study for the Pajaro River Flood Control Project.

The ACE began the Feasibility Study following the 1995 and 1998 floods. It developed a preliminary set of alternatives for modification to the existing project to reestablish 100-year flood protection. As presented at the May 12, 2003 meeting of the Stakeholders Group, the leading alternative (known as ACE Alternative 2A) would raise and set back the levees, remove the riparian vegetation within the active channel, and then routinely clear vegetation, sediment, and gravel on a going-forward basis over the next decades.

Over the next 18 months, the ACE intends to take these alternatives forward for further study of engineering and financial feasibility, as well as environmental impacts. However, the regulatory agencies, which must permit any project modification after the completion of such study, have already raised very substantial doubts whether ACE Alternative 2A or similar alternatives would comply with applicable environmental laws. These laws include: the Endangered Species Act, which prohibits death or injury to the steelhead which spawn in this river; and the Clean Water Act, which prohibits an increase in the suspended sediment load and otherwise requires that a federal project protect all beneficial uses, including fish and wildlife habitat. Following a February 10, 2003 letter by the Central Coast Regional Water Quality Control Board that expressed such concerns, we met with the ACE to request an expanded scope of alternatives in the Feasibility Study. Following the May 12th meeting, the ACE fairly responded: what do you recommend?

We recommend that the ACE consider certain alternatives identified in PWA's report. PWA developed and then modeled six new alternatives to test whether each would provide 100-year flood protection and also satisfy the performance standards suggested by the regulatory agencies for compliance with environmental laws. On the basis of preliminary analysis, PWA Alternatives 2, 3, 4 and 6 appear to be very promising. *See* Report Sections 6.3, 6.4, 6.5, and 6.7. These alternatives, which are variations on a new strategy, would lower the active channel to approximately its historic level, provide for the safe passage of the 100-year flood, and permit the reestablishment and maintenance of riparian vegetation and other fish and wildlife habitat. While each would require significant sediment removal in the initial reconstruction, that would reduce the long-term maintenance burden by an even greater amount, since the channel would regain its geomorphic stability. We believe that upstream storage, which is a potential feature of any downstream alternative, is also a very promising strategy, since it would reduce the peak flow that must pass between the levees. *See* Report Section 7. We note that Professor Robert Curry (California State University, Monterey Bay) has recently published an independent report about the feasibility of this strategy. *See* http://home.csumb.edu/c/currybob/world/Pajaro/.

The 1944 and 1966 authorizing statutes expressly require that the project provide flood control and achieve multiple purposes, including protection of the fish and wildlife habitat and other public uses of this river. These statutes also provide for consideration of an upstream storage strategy. Under the ACE's general rules, the ongoing Feasibility Study must consider the benefits and costs (including the costs of operation and maintenance) of each alternative over the project life, and it must identify the buildable plan which best achieves all of the authorized purposes.

We thus request that ACE, in coordination with the Counties as local sponsors, regulatory agencies, and other Stakeholders, give careful consideration to PWA alternatives 2, 3, 4, and 6 and upstream storage, along with those alternatives already on the table. We will assure that PWA experts are available to participate in further technical analysis and refinement of alternatives. More generally, we are committed to help develop and implement the best alternative that will provide 100-year flood protection in a cost-effective manner that also protects and restores environmental quality of the Pajaro River, as required by the authorizing statutes.

Please call me at 831-464-1184 or JoAnn Baumgartner, Co-Chair at 831-761-8408 if you have any questions about this report.

Sincerely,

Lois Robin,
Co-Chair, Pajaro River Watershed Committee
Sierra Club

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AN ENVIRONMENTAL ALTERNATIVE FOR THE PÁJARO RIVER FLOOD PLAN

FINAL REPORT

Prepared for

The Sierra Club

Prepared by

Philip Williams & Associates, Ltd.

July 10, 2003

PWA REF. #1675-1

Services provided pursuant to this Agreement are intended solely for the use and benefit of the Sierra Club.

No other person or entity shall be entitled to rely on the services, opinions, recommendations, plans or specifications provided pursuant to this agreement without the express written consent of Philip Williams & Associates, Ltd., 720 California Street, 6th Floor, San Francisco, CA 94108.

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Flooding on the Pájaro River in 1995 and 1998 caused extensive flood damage to the cities of Watsonville and Pájaro, and to the levees of the existing federal flood control project. In response the US Army Corps of Engineers (USACE), San Francisco District, is developing a new Pájaro River Flood Plan that is intended to offer greater flood protection both in the urban and downstream agricultural areas. The proposed alternatives (as of the May 12th 2003 USACE stakeholder presentation) are designed to offer protection against the 100-year flood (assumed to be 40,100 cfs at Murphy's Crossing and 45,500 downstream of the confluence with Salsipuedes Creek), and employ a combination of levee setbacks and raises, and maintenance of a hydraulically-smooth channel with a composite Manning's roughness coefficient (or n-value) of approximately 0.04. These alternatives assume hydraulic roughnesses so low that, in practice, they would not permit a properly functioning riparian corridor to develop – indeed, would require removal of most riparian vegetation within the flood corridor, with detrimental consequences for aquatic habitat, water quality and other environmental processes. We find that these alternatives would also perpetuate the current instability of the channel (as described in Section 4) as a result of which maintenance of the assumed hydraulic roughness may require vegetation and possibly sediment management over the project life. For these reasons, the alternatives fall short of the performance standards that the Resource Agencies -- California Regional Water Quality Control Board (RWQCB), California Department of Fish and Game, and National Marine Fisheries Service -- have reportedly laid out in letters and meetings with the USACE and local sponsors as necessary to comply with the Clean Water Act, Endangered Species Act, and other laws they administer to protect environmental quality. We have reviewed a letter from the RWQCB, dated February 10, 2003 and spoken with members of the staff of these agencies to better understand the nature of their concerns.

Philip Williams & Associates, Ltd. (PWA) has been retained to assess the potential for developing alternatives for modification of the existing project that meet two fundamental standards: first, the same level of flood protection as proposed by the USACE; and second, establishment and maintenance of channel conditions that promote geomorphic sustainability, a wider, more dense riparian corridor, and a more extensive range of ecologically-useful channel-floodplain interactions. We evaluated alternatives that would provide the desired capacity (100-year flood flow) within the existing project footprint, upstream detention storage to reduce that peak flood flow in Watsonville, and omission of downstream levee improvements or downstream flood corridor widening.

In this study we have developed and simulated a series of different approaches to achieve flood control with greater environmental benefits than the current proposals. We have used the different scenarios to assess the sensitivity of the Pájaro River system to different types of channel modification, and to highlight approaches that will lead to a true multi-objective flood plan.

2. CONCLUSIONS AND RECOMMENDATIONS

1. The plans proposed by the USACE as of May 12, 2003 will not allow the development of a geomorphically-stable channel and will require considerable and expensive long-term maintenance of the flood channel, including sediment and vegetation management and/or removal. We have not located any assessment to date by the USACE to quantify how vegetation and sediment would be managed on a long-term basis to maintain the assumed hydraulic roughness and design conveyance.
2. If USACE Alternative 2A is modified to include a more realistic hydraulic roughness (n=0.12) and riparian corridor width (minimum of 200 feet total), the water surface elevation would rise by approximately 2.0 feet, on average, during the design event (100-year).
3. Lowering the floodplain between the existing levees to a geomorphically stable elevation, as described in PWA Scenarios 2, 3, 4, and 6, will significantly lower flood flow stage, allow the development of a significant riparian corridor, and reduce long-term maintenance (sediment and vegetation removal after initial construction). It may reduce or even eliminate required increases in current levee elevations proposed by the USACE in Alternative 2A for most of the channel length. It will require the removal of significant quantities of sediment and existing vegetation in the short term. Based on this initial investigation the approach taken in PWA Scenario 4 appears to be the most promising of these scenarios.
4. There is an opportunity to refine the scenarios tested in this preliminary effort to develop a specific project alternative that will interact with the floodplain on a more appropriate recurrence interval (e.g., a 2-year flood), will minimize soil excavation and vegetation removal by limiting floodplain excavation to one side of the channel, and will require levee increases similar to or less than those proposed by the USACE in Alternative 2A. Such a refinement should include Corralitos and Salsipuedes Creeks, which are not discussed in this report due to time constraints.
5. We have calculated the relationship between the volume of upstream storage and the resulting reduction in downstream peak flow rate in Watsonville. Subsequent development of a relationship between upstream storage and flood elevation will allow the USACE, Resource Agencies, or other interested stakeholders to evaluate the feasibility of upstream storage as a feature of one or more alternatives which modify the levees or channel within the existing footprint.
6. Replacement of the Main Street Bridge or elimination of downstream levee improvements is not expected to have a large or extended effect on expected water surface elevations within the reach of the river by Watsonville.

This report has assessed several different approaches, and identified opportunities and constraints with each. It does not propose a fully developed alternative, though it assesses the potential to develop a geomorphically-stable channel with significant habitat benefits with footprints that are similar to those proposed by the USACE. Additional analysis is needed to achieve this and should include the following:

1. Further assessments of hydraulics, sediment transport, and cost-effectiveness, as appropriate to (A) evaluate the comparative geomorphic stability of each of the USACE and PWA alternatives; (B) quantify the comparative maintenance burden (including sediment and vegetation removal) required under each alternative to maintain the desired capacity over project life; and (C) evaluate the disposal alternatives (including potential beneficial uses) for any sediment.
2. Additional work to refine the design (e.g. refine excavation plans to optimize floodplain inundation frequencies, assessment of saline riparian conditions downstream of Thurwatcher Bridge, potential to create wetland habitat in tidal zone).
3. More detailed assessment of upstream flood detention storage. Upstream storage could potentially remove the need for levee raises in the project reach. Such further assessment should take into account the separate efforts now underway by RMC (Raines-Melton Consulting) and Professor Robert Curry (UC Santa Cruz) to evaluate the feasibility and location of specific storage sites.

3. LIMITATIONS WITH THE CURRENT ALTERNATIVE PLANS

As of the May 12th Stakeholder meeting, the USACE alternatives have the following limitations that our planning approach seeks to address:

- The hydraulic roughness simulated is too low to allow a sustainable riparian corridor to develop.
- The hydraulic roughness simulated is probably too low to allow form roughness from a riffle-pool sequence in the channel bed. The Resource Agencies have stated that such channel form is important to the quality of habitat for steelhead and other fish and wildlife species.
- As a result of the low hydraulic roughness built into the design, the channel will require frequent maintenance in the form of riparian vegetation removal and mowing, removal of channel vegetation and woody debris, and potentially channel bedform (riffle and pool) flattening.
- Such recurrent maintenance will have detrimental effects on both the ecology and the cost-effectiveness of the flood plan.
- Since the flood plan relies on maintaining a smooth channel, any future failure to remove vegetation could result in flooding.
- The channel as designed appears to be incised, disconnected from its floodplain and geomorphically unstable. Continuing incision, including head-cutting above Murphy's Crossing, appears to be likely.
- The flood plan will exacerbate such instability by raising levee heights while maintaining a steep, straight incised channel.

4. GEOMORPHIC INSTABILITY OF THE PÁJARO RIVER

The Pájaro River has been straightened and confined between levees over the last two centuries, with the greatest changes occurring following the construction of the flood plan in the late 1940s. Sinuosity (the ratio of channel length to valley length) was reduced from between 2.0 and 3.0 in 1885 to between 1.0 and 1.6 in 1995 (*source*: USACE San Francisco District, Pajaro River Stable River Planform Study, April 2003), associated with flood control, land drainage and consolidation of agricultural land. In the late 1940s, the current flood control project was constructed, placing levees along both sides of the channel. The flood control plan had the effect of increasing channel gradient (by maintaining a low sinuosity planform), increasing flow depth during floods (by introducing levees and preventing the river from discharging excess flows on to its floodplain) and increasing flow velocities (by removing vegetation cover from the channel bed and margin). In response the channel has degraded (eroded its channel vertically) by 3-5 feet between 1969 and 1995 (USACE). It is likely that erosion started before this time, and that this figure is an underestimation. We expect that channel erosion is a significant source of suspended sediment in the river, and may contribute to the Pájaro River's status as impaired due to sediment.

5. INVESTIGATION APPROACH AND METHODS

This report presents a series of channel scenarios that have been simulated in a hydraulic model and provisionally evaluated as potential alternatives to the existing USACE plans (as they were outlined in the May 12th 2003 USACE Stakeholder presentation). The plans have been developed after discussions with the Sierra Club and members of the Resource Agencies working with USACE, and have been tested using the 1D hydraulic model HEC-RAS Version 3.1.1. We have then provisionally evaluated the alternatives for their feasibility as multi-objective channels that combined geomorphic, habitat and flood defense value and sustainability. We have compared our alternatives with the USACE Alternative 2A to ensure that we achieve at least the same degree of flood protection in Watsonville, primarily by keeping the predicted water surface elevation at or below 35.8 feet NGVD at the Main Street Bridge. Several of the scenarios have been developed to assess the sensitivity of the Pájaro River to different flood design approaches, rather than as stand-alone alternatives.

All elevation references provided in this document refer to the National Geodetic Vertical Datum of 1929, or NGVD. The acronym will be omitted in subsequent elevation references for conciseness.

5.1 FEATURES OF THE ALTERNATIVE PWA SCENARIOS

5.1.1 Sustainable and High Value Riparian Corridor

A common feature to all our channel configurations is the development of a continuous dense riparian corridor of at least 100 feet on both sides of the river (we assume a roughness or n-value of 0.12), and a sufficiently rough channel bed to have riffle-pool sequences (n=0.04). After consultation with resource agency staff we have selected a 100-foot wide riparian corridor on both sides of the channel, with the exception of the Watsonville reach where land use constraints preclude such options. One hundred feet is a minimum buffer width to avoid excessive edge effects and to provide high value habitat. Designing the system around a high roughness allows the corridor to fully develop with minimal need for ongoing management and removes the need for periodic cutting. Vegetation clearance greatly reduces habitat value and increases recurrent maintenance costs, as well as creating a risk that if vegetation management stops flooding may occur, as happened in 1995.

5.1.2 Stable Geomorphic Channel Connected to the Floodplain

We developed a series of alternatives that are based around a geomorphically-stable channel that is connected to the floodplain (i.e. that experiences floodplain flows approximately every one to two years). This feature will result in reduced maintenance requirements and improved riverine habitat. The designs were based on consultation with resource agency and USACE staff. The design steps were as follows (Ann Riley, personal communication June 23rd 2003):

- Calculate the channel forming discharge based on flow recurrence data and a sediment transport curve (*source*: USACE San Francisco District, Pajaro River Stable River Planform Study, April 2003).
- Use Santa Clara Valley Water District isohyetal maps to calculate mean annual rainfall for the Pájaro basin.
- Use San Francisco Bay Area regional curves developed by Waterways Restoration Institute relating drainage basin area and mean annual rainfall to channel cross section area.
- Use 1858 topographical maps to measure channel meander wavelength and sinuosity.
- Use San Francisco Bay Area regional relationships between Rosgen 'C' type channel wavelength and bankfull width to calculate channel width.
- Use predicted width and cross section to estimate channel bankfull depth.
- Use cross section area and bankfull discharge to calculate velocity and ensure it is within the range of allowable velocities for this type of channel.

The dimensions of the geomorphically based channel design are shown in Table 1. Although further hydraulic and sediment transport analysis is needed to ensure that this empirically-designed channel is geomorphically stable, our experience suggests that this approach is more promising than using the current channel geometry and planform, which are recognized as being unstable (*source*: USACE San Francisco District, Pajaro River Stable River Planform Study, April 2003) and we have used these guidelines as the basis for our initial assessment and feasibility study. In scenarios where we increased sinuosity to a value greater than 1.2 we also made an additional increase in channel and floodplain roughness to account for additional turbulence and form roughness. For channel reaches with a sinuosity between 1.2 and 1.5 we added 10% to all Manning's n values, while for channel reaches with a sinuosity greater than 1.5 we added 20%.

5.1.3 Upstream Flood Storage

An additional aspect of our analysis has been to look into the feasibility of using additional upstream storage on the San Benito and Upper Pájaro rivers to supplement the downstream flood defense, thereby reducing flood flows at Watsonville. There is a historical precedent for greater upstream storage on both the San Benito and Upper Pájaro systems; the San Benito has a large floodplain that appears to have been abandoned after the channel incised, reducing flood detention storage and increasing flood peaks in the lower Pájaro River, while on the Upper Pájaro the construction of Miller Canal, incision of the Upper Pájaro and reduced roughness of Soap Lake has had a similar effect. *Both these locations represent situations where historic upstream channel and floodplain modification has increased flood hazard downstream, and it is therefore reasonable to look upstream to rectify some of the flood problems in Watsonville and Pajaro*. While it is beyond the scope of this report to identify locations and methods of mobilizing historic or supplemental flood storage, we have used a sensitivity analysis of flood storage versus flood elevation at Watsonville to identify how much storage would be required to achieve flood control in a more environmentally sustainable channel, and to provisionally assess whether such volumes are likely to be achievable. For the sensitivity analysis we ran flows at 5,000 cfs increments through the model. To account for flow inputs at Salsipuedes Creek we developed a regression curve relating inflow proportions from Murphy's Crossing and Salsipuedes Creek at different total flow levels, and partitioned the totals between the two inflows. In addition we used hydrograph analysis techniques to estimate the relationship between upstream storage and downstream flood peak reduction, based on the RMC 100-year hydrograph for the vicinity of Chittenden Pass (RMC HEC-1 model for the Phase 1 Study for the Pajaro River Watershed Flood Prevention Authority Study, July 2002). This topic is addressed in greater detail in Section 7.

5.1.4 Sensitivity Analyses

We have simulated two alternatives that test the sensitivity of flow levels upstream to levee raises downstream of Watsonville (PWA Scenarios 5 and 6). In these scenarios we left the levees at their existing height (rather than raise them by 4 feet as the USACE 2A Alternative proposes). The results of these simulations are discussed in the following section.

We also performed a sensitivity analysis of the effect of the Main Street Bridge on estimated water surface elevations by modifying the USACE Alternative 2A to remove the hydraulic effect of the bridge; it had little influence on estimated upstream water surface elevations. The bridge increases simulated water surface elevations just upstream by less than 0.1 feet. We therefore assumed no change in the Main Street Bridge in our scenarios.

6. SCENARIOS SIMULATED

In all of the PWA Scenarios discussed, the channel through Watsonville is left as outlined in USACE Alternative 2A. In the discussion we focus on the 100-year flood, taken as 40,400 cfs at Murphy's Crossing and 45,900 below Salsipuedes Creek. We have included a brief assessment of likely geomorphic evolution for each scenario, based on our experience in similar situations. However, more investigation is needed (including sediment transport analysis and further geomorphic studies) to enable more rigorous assessments to be made. Figure 1 shows the layout of the channel features modeled in the different scenarios. Figures 2 through 8 show flood elevations at key points in the channel for all scenarios simulated, while Figures 9 through 32 show individual cross sections and water surface elevations as referred to in the sections below.

6.1 USACE SCENARIO 2A

(100-ft levee setback geometry with no riparian corridor (n=0.04) and smooth form channel bed (n=0.03); see Figures 2 – 9, 15, 21, and 27)

This Scenario is the USACE-favored alternative (as of May 12th 2003). The hydraulic model was supplied by USACE (Bill Firth, June 23rd 2003).

6.1.1 Hydraulic Analysis

During the 100-year flood, flow elevation at the upstream face of Main Street Bridge was 35.8 feet, while at the Highway 1 Bridge it was 27.0 feet.

6.1.2 Advantages

This alternative probably represents the least amount of initial construction and disturbance to the channel, and lowest initial cost.

6.1.3 Disadvantages

This design has the highest maintenance costs and the greatest recurrent environmental impact (associated with repeated removal of the riparian corridor and clearing of the active channel). It has the lowest environmental value of the proposals considered in this report. The channel is geomorphically unstable and disconnected from the floodplain. Grade control would be required to prevent headward migration of the incised channel in Reach 4. There is minimal riparian corridor function due to the low roughness requirement.

6.2 PWA SCENARIO 1

(100-ft levee setback geometry with 100-ft riparian corridor on both sides (n=0.12) and rough form channel bed (n=0.04); see Figures 2 – 9, 15, 21, and 27)

This Scenario is based on the USACE Scenario 2A for underlying geometry (100-foot levee setback and existing channel geometry) with the addition of 100-foot wide high roughness riparian corridors and a rougher bed to allow for riffle-pool development. This Scenario was modeled primarily to assess the sensitivity of the flood plan to increases in channel and riparian corridor roughness.

6.2.1 Hydraulic Analysis

Under PWA Scenario 1 during the 100-year flood, flow elevation at the upstream face of Main Street Bridge was 38.7 feet, approximately 3 feet higher than the USACE Alternative 2A (35.8 feet). At Highway 1 Bridge the flood level was 29.3 feet, approximately 2 feet higher than the USACE alternative 2A (27.0 feet). The increase in stage is due to an increase in channel roughness from vegetation and channel form. Achieving the same flood elevation at Main Street Bridge as the USACE Alternative 2A in this channel would require a reduction in peak flow of approximately 11,000 cfs to 29,500 cfs. This equates to an upstream storage volume of approximately 24,000 acre-feet.

6.2.2 Advantages

This alternative represents no additional construction and disturbance to the channel beyond the USACE alternatives. The riparian corridor would be allowed to grow naturally, with some initial control of non-native species to give native species a competitive advantage, and the channel would be allowed to develop riffles and pools. Once established no additional vegetation or channel maintenance would be required, lowering recurrent costs and enhancing environmental value.

6.2.3 Disadvantages

This alternative does not have sufficient capacity to hold the design flow on its own, and relies upon new upstream flood storage. A further disadvantage is that the existing channel design is geomorphically unstable due to reduced sinuosity and flow confinement, and starts from a condition where historic incision has disconnected the channel from the floodplain. This design would not create a fully functioning river corridor with ‘natural’ river-riparian corridor interactions. Grade control would be needed upstream of Watsonville in Reach 4 to prevent headward migration of incision, while the floodplain benches would remain largely disconnected. Flow would only reach the benches during the 4 to 5-year events, rather than every one to two years, as we would expect in an equilibrium channel.

6.3 PWA SCENARIO 2

(100-ft levee setback geometry with 100-ft riparian corridor on both sides (n=0.12) and rough form channel bed (n=0.04), stable channel geometry, lowered terraces, current sinuosity; see Figures 2 – 8, 10, 16, 22, and 28)

In PWA Scenario 2 we have kept the channel invert (lowest point) at its present location, but have lowered the benches (areas within the levees) on both sides to a level where they form a new floodplain an appropriate height above the channel, based on the geomorphic channel design (Section 5.1.2). This would involve excavating the current benches on average 3-5 feet down below their current elevation and 100-150 feet wide to form a floodplain. The channel planform has been left in its current configuration, with the existing sinuosity.

6.3.1 Hydraulic Analysis

Under PWA Scenario 2 during the 100-year flood, flow elevation at the upstream face of Main Street Bridge was 30.0 feet, approximately 6 feet lower than the USACE Alternative 2A (35.8 feet). The decrease in stage is due to a large increase in flood storage area on the newly reconnected lower floodplain within the levees, which more than offsets the increase in channel roughness from vegetation and channel form. Flows greater than approximately 6,000 to 9,000 cfs escape from the low flow channel and disperse onto the lower floodplain. This option would not require upstream storage. This option would require less overall levee height increases to the project reach than what is proposed by the USACE in Alternative 2A.

6.3.2 Advantages

This design would have a higher flood capacity than the USACE 2A Alternative, is more geomorphically-stable (subject to more detailed analysis) than the current conditions, and would have a high degree of natural function. Flow inundation of the new, connected floodplain and dense riparian corridor would occur at similar frequencies as in an unmodified river, and we would expect to see a good range of complex ecological interactions between river and corridor. This option would have low or zero channel maintenance costs as the design tolerates a high roughness of both channel and riparian corridor.

6.3.3 Disadvantages

This design is quite invasive, involving the excavation of a large volume of sediment to lower the terraces to the new floodplain. As an initial estimate, approximately 11 million cubic yards would have to be excavated and disposed of. There would also be great disruption to the riparian corridor during and immediately after construction.

6.4 PWA SCENARIO 3

(100-ft levee setback geometry with 100-ft riparian corridor on both sides (n=0.12) and rough form channel bed (n=0.04), stable channel geometry, lowered terraces, 1858 sinuosity; see Figures 2 – 8, 11, 17, 23, and 29)

This Scenario is identical to PWA Scenario 2 but with increased channel length in Reaches 4 and 2 to restore the sinuosity at 1858 (assumed pre-disturbance) levels. The increase in sinuosity could be achieved within the USACE right-of-way footprint, though realignment and lengthening would be required. In Reach 2 this configuration takes advantage of the abandoned meander bend. For purposes of initial modeling, we did not assume any aggradation of the current channel profile under this alternative, though some aggradation is likely to result from the reduced shear stresses provided by the increased roughness and sinuosity of this alternative. Thus, actual reductions in water surface elevations are likely to be somewhat less than suggested by our initial analysis. This issue would need to be examined in greater detail if this design concept is pursued.

6.4.1 Hydraulic Analysis

Hydraulically this scenario performs in a very similar manner to PWA Scenario 2 in the critical reaches. Flood elevation during the 100-year event is slightly higher due to a lower gradient channel (30.2 feet at the upstream face of Main Street Bridge, compared with 30.0 feet under PWA Scenario 2 and 35.8 feet under the USACE 2A Alternative). At the Highway 1 Bridge flood level is 25.9 feet, compared with 27.0 feet for the USACE 2A Alternative. In Reach 4 the meandering creates a much more noticeable increase in flood level (approximately 3 feet higher than PWA Scenario 2) but this is still approximately 3 feet lower than the USACE 2A Alternative.

6.4.2 Advantages

This design would have higher flood capacity than the USACE 2A Alternative, is significantly more geomorphically stable (subject to more detailed analysis) than the current conditions, and would have a high degree of natural function. Flow inundation of the new floodplain and dense riparian corridor would occur at similar frequencies as in an unmodified river, and we would expect to see a good range of complex ecological interactions between river and corridor. Recurrent channel maintenance costs would be low to zero. This option would require less overall levee height increases to the project reach than what is proposed by the USACE in Alternative 2A.

6.4.3 Disadvantages

This design is quite invasive, involving the excavation of a large volume of sediment to lower the terraces to the new floodplain, and additional excavation in the relocated channel meanders. As an initial estimate, approximately 13 million cubic yards of material would have to be excavated and disposed of. There would also be great disruption to the riparian corridor during and immediately after construction.

6.5 PWA SCENARIO 4

(100-ft levee setback geometry with 100-ft riparian corridor on both sides (n=0.12) and rough form channel bed (n=0.04), stable channel geometry, selectively lowered terraces, 1858 sinuosity; see Figures 2 – 8, 12, 18, 24, and 30)

This Scenario is a less invasive version of PWA Scenario 3 that lowers the floodplain to the geomorphically-designed channel with less floodplain excavation, generally by lowering only one side bench. The floodplain is typically 100-150 feet wide, encompassing the riparian corridor on one side. The result would be a channel that had access to the floodplain and riparian corridor on one side during the mean annual flood, with the other side only being inundated at lower frequency events. For purposes of initial modeling, we assumed 2 feet of aggradation of the current channel profile outside of Watsonville under this alternative as a result of the reduced shear stresses provided by the increased roughness and sinuosity of this alternative.

6.5.1 Hydraulic Analysis

This Scenario has a slightly lower flood elevation than the USACE 2A Alternative, with a peak stage of 34.6 feet at the upstream face of the Main Street Bridge, compared with 35.8 feet under USACE 2A. At the Highway 1 Bridge the flood elevation is slightly higher under this Scenario (28.5 feet compared with 27.0 feet under USACE 2A). However, flow elevation is well below the bridge deck.

6.5.2 Advantages

This Scenario achieves a stable channel with a high degree of channel-riparian floodplain interaction while maintaining USACE 2A flood levels and minimizing the amount of excavation and disruption. Although the degree of river-floodplain interaction is less than PWA Scenarios 2 and 3, it is still very high, and the slightly raised riparian corridor on one side adds a more terrestrial habitat that increases ecotype diversity. This Scenario would have low or non-existent channel maintenance requirements, and associated environmental benefits.

6.5.3 Disadvantage

This Scenario involves the excavation of approximately 8 million cubic yards of sediment, and attendant disruption to the riparian corridor.

6.6 PWA SCENARIO 5

(As PWA Scenario 1 upstream of Watsonville, with no levee improvements downstream; see Figures 2 – 8, 13, 19, 25, and 31)

This Scenario was tested to determine the effect that downstream levee improvements have on upstream stages. It uses the PWA Scenario 1 channel and vegetation pattern upstream of Watsonville (USACE 2A geometry with full vegetation cover), and does not raise the levees downstream (with a guide levee to prevent water from flowing back up to Watsonville or Pájaro). On the north side the floodplain would be extended to Riverside Road, drawn south of the Highway 1 interchange and would then follow Beach Rd to Watsonville Slough. On the south side the floodplain would extend to Trafton Road (shown in Figure 1). Additional culverts would be needed under Highway 1 to achieve flood conveyance in this Scenario. This Scenario uses increased flood capacity downstream to reduce flood levels upstream. Further studies would be needed to evaluate flow levels relative to infrastructure on the floodplain.

6.6.1 Hydraulic Analysis

This Scenario has little effect upstream of Main Street Bridge, but significantly lowers flood levels from this point to the mouth of the river compared with PWA Scenario 1 even when Beach Road is assumed to be the northern limit of the active flow path. However, the increase in flood conveyance downstream of Watsonville does not significantly offset the increase in flood stage through Watsonville over USACE 2A due to increased channel roughness. At Main Street Bridge the 100-year flood level is reduced relative to Scenario 1 by 1.5 feet to 37.3 feet (compared with 35.8 feet under USACE 2A and 38.7 under PWA Scenario 1). At the Highway 1 Bridge the flood level is lowered almost 10 feet to 19.6 feet compared with 27.0 feet under USACE 2A and 29.3 feet under PWA Scenario 1. For this Scenario to pass the peak flow at the Main Street Bridge, at a stage equivalent to that of USACE 2A, a reduction of approximately 6,900 cfs, equivalent to approximately 12,000 acre-feet of upstream storage, would be necessary. Further analysis would be required to ensure that the channel was stable downstream of the Main Street Bridge, where the hydraulic gradient would become steeper under this scenario. With this flow reduction, levee raises similar to those of USACE 2A would be required.

6.6.2 Advantages

This Scenario has the advantages of PWA Scenario 1 (little additional change to the channel upstream) with the addition of lower flood levels. Costs would be reduced over the USACE 2A given the omission of downstream levee improvements. Upstream flood detention storage would still be necessary under this scenario, but maintaining current levee heights rather than raising the levees would reduce the amount of storage required from 24,000 to 12,000 acre-feet, making it a more viable option.

6.6.3 Disadvantage

This Scenario has the disadvantages of PWA Scenario 1 (channel is not geomorphically stable, and is poorly connected to its floodplain and riparian corridor) and would not, on its own, achieve the desired level of flood control without upstream storage. Unlike the USACE 2A Alternative, it would not reduce the frequency of flooding downstream of Watsonville and Pajaro.

6.7 PWA SCENARIO 6

(As PWA Scenario 4 upstream of Watsonville, with no levee improvements downstream; see Figures 2 – 8, 14, 20, 26, and 32)

This Scenario combines a geomorphically-stable channel connected to its floodplain on one side (layout as for PWA Scenario 4) with omission of downstream levee improvements from the project (layout as for PWA Scenario 5).

6.7.1 Hydraulic Analysis

As for Scenario 5, this Scenario has little effect upstream of Main Street Bridge, but significantly lowers flood levels from this point to the mouth of the river compared with PWA Scenario 4. Effects downstream of Watsonville are similar to those of Scenario 5. Further analysis would be required to ensure that the channel was stable downstream of the Main Street Bridge where the hydraulic gradient would become steeper under this Scenario.

6.7.2 Advantages

Upstream of Watsonville, this Scenario has the advantages of PWA Scenario 4 (a stable channel with a high degree of channel-riparian floodplain interaction while maintaining USACE 2A flood levels and minimizing the amount of excavation and disruption) with still lower flood levels at the lower end of the reach through Watsonville. Costs would be reduced over the USACE 2A Alternative, given the omission of downstream levee improvements and the reduced need for levee improvements in some reaches.

6.7.3 Disadvantage

This Scenario involves the excavation of approximately 8 million cubic yards of sediment, and attendant disruption to the riparian corridor. Unlike the USACE 2A Alternative, it would not reduce the frequency of flooding downstream of Watsonville and Pajaro.

7. RELATIONSHIP BETWEEN UPSTREAM FLOOD WATER STORAGE AND DOWNSTREAM FLOOD PEAK REDUCTION

PWA Scenarios 1 and 5 generated higher flood stages than the USACE Alternative 2A, indicating that additional upstream flood storage would probably be needed for these alternatives to be viable as flood plans. To calculate the volume of upstream storage required we measured the difference in allowable peak flow (assuming the same peak stage for both scenarios at the Main Street Bridge) between the PWA alternative and the USACE Alternative 2A (see Figure 4, red dotted line). We then took an approximation of the USACE 100-year design hydrograph based on an existing conditions hydrology model developed by others (RMC, Phase 1 Study, July 2002) (see Figure 33) and compared this with the channel capacity to give the volume of excess water that would need to be stored at the peak of a flood event. Figure 34 shows the estimated relationship between upstream flood storage and discharge at Murphy's Crossing. While this approach may understate actual storage requirements due to the assumption that water is stored only during a flood peak, it is a reasonable first approximation of upstream storage requirements.

To provide some context to these figures, the Phase 2 report of the Pajaro River Watershed Flood Prevention Authority Study (RMC, April 2003) identified potential increases in flood storage (obtained by raising the existing Pájaro tributary dams) of between 16,000 and 31,000 acre-feet (page 3-17). An estimated 21,000 acre-feet of storage could be obtained by inducing channel aggradation and reconnecting the floodplain along the San Benito River (R. Curry, personal communication, June 25, 2003). There may also be potential for increasing flood detention in Soap Lake by increasing floodplain roughness (for example by planting trees), restoring the Upper Pájaro channel, and by inducing greater flooding either with in-channel roughness, structures, or through selective floodplain lowering.

Upstream flood storage is not proposed as a stand-alone alternative for modification of the existing project. However, it may be used as a feature of any alternative to reduce peak flow and provide additional benefits, such as increased groundwater recharge.

8. SUMMARY OF THE DIFFERENT SCENARIOS

USACE Scenario 2A – initially a lower cost and non-destructive alternative but no environmental benefits, geomorphically-unstable channel, disconnected floodplain, requires repeated costly and environmentally damaging maintenance;

PWA Scenario 1 – initially a lower cost and non-destructive alternative but only partial environmental benefits (disconnected riparian corridor), unstable channel, requires significant amounts of upstream flood storage to be viable;

PWA Scenario 2 – significant environmental benefits and additional flood control, at a high initial cost due to substantial excavation requirements; lower long-term maintenance;

PWA Scenario 3 – very significant environmental benefits and additional flood control, at a very high initial cost due to substantial excavation requirements and new meander construction; lower long-term maintenance;

PWA Scenario 4 – significant environmental benefits and flood control, at a moderate cost, including lower long-term maintenance;

PWA Scenario 5 – lower cost and non-destructive through Watsonville and Pajaro and upstream, but only partial flood benefits, no flood benefit downstream, unstable channel, still needs storage upstream;

PWA Scenario 6 – significant environmental benefits as for Scenario 4, and lower cost than Scenario 4, but leaving downstream levees at present levels doesn't increase benefits through Watsonville and Pajaro and upstream, no flood benefit downstream.

Based on an initial assessment it appears that the approach taken in PWA Scenario 4 is the most advantageous alternative, and should be further developed and assessed. This approach combines creating a vibrant and fully functioning riparian corridor well connected to a geomorphically-stable river channel with the least possible amount of floodplain excavation, while maintaining flood control. The approach has low maintenance requirements and recurrent costs after completion.

Table 1. Channel Properties of the Different Scenarios Simulated

PWA Scenario	Geometry	Channel roughness	Riparian corridor roughness	*Reach 1*		*Reach 2*		*Reach 3*		*Reach 4*		Stage (ft) at Main Street Bridge (100-year)
				Channel width (ft)	Bankfull depth (ft)	Channel width (ft)	Bankfull depth (ft)	Channel width (ft)	Bankfull depth (ft)	Channel width (ft)	Bankfull depth (ft)	
USACE Alternative 2A	100 ft levee setback, existing channel geometry	0.03 – 0.075	0.04 – 0.1	~140	~14	~100	~17	~100	~14	~120	~14	35.8
PWA Scenario 1	100 ft levee setback, existing channel geometry	0.04	0.12	~140	~14	~100	~17	~100	~14	~120	~14	38.7
PWA Scenario 2	Geomorphic cross section, current planform	0.04	0.12	170	12	200	10	200	10	220	9	30.2
PWA Scenario 3	Geomorphic cross section, planform based on 1858 sinuosity	0.04	0.12	170	12	200	10	200	10	220	9	30.2

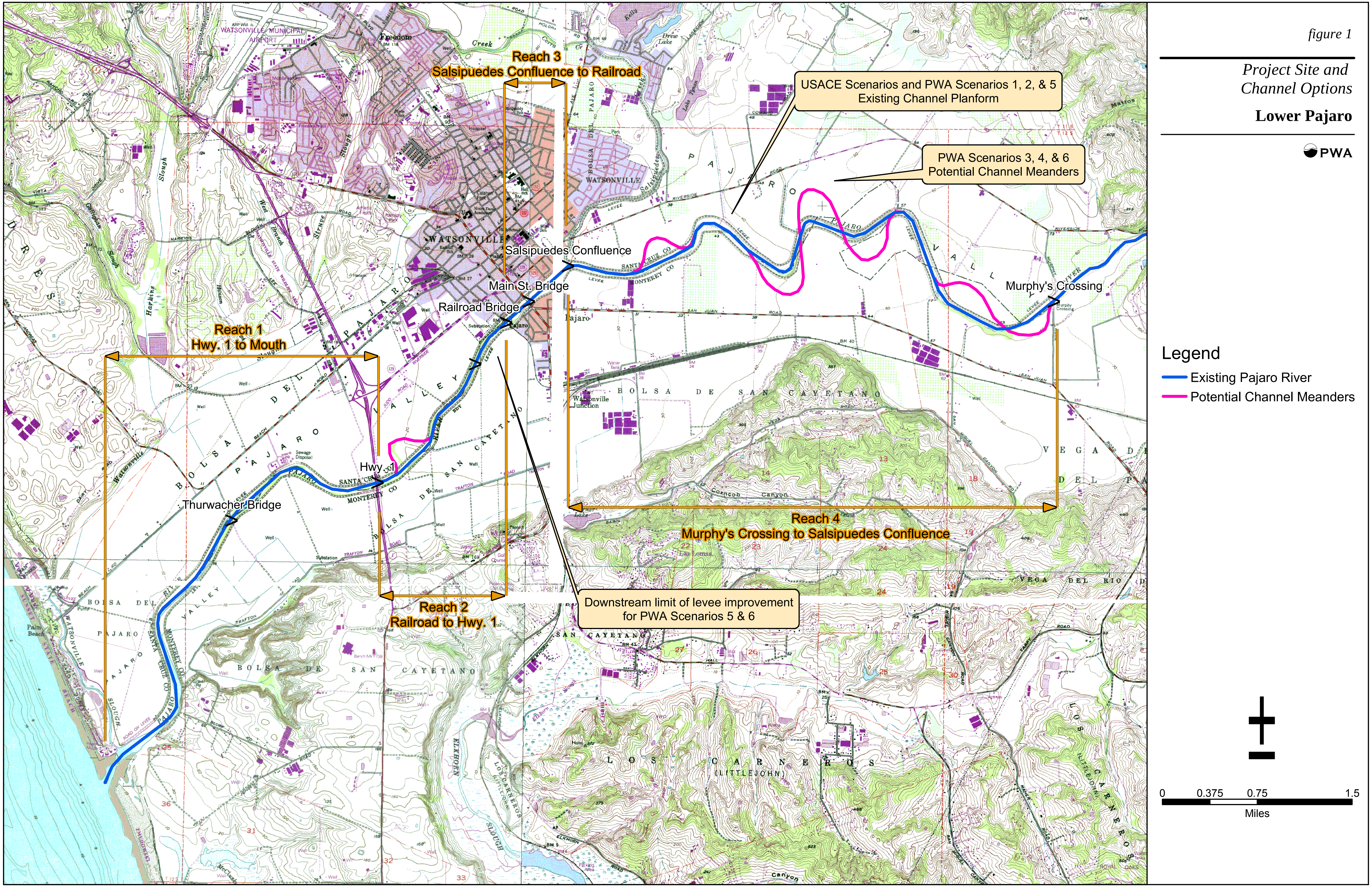
PWA Scenario	Geometry	Channel roughness	Riparian corridor roughness	*Reach 1*		*Reach 2*		*Reach 3*		*Reach 4*		Stage (ft) at Main Street Bridge (100-year)
				Channel width (ft)	**Bankfull depth (ft)**	**Channel width (ft)**	**Bankfull depth (ft)**	**Channel width (ft)**	**Bankfull depth (ft)**	**Channel width (ft)**	**Bankfull depth (ft)**	
PWA Scenario 4	Modified geomorphic cross section, 1858 sinuosity	0.04	0.12	170	12	200	10	~100	~14	~160	~12	34.7
PWA Scenario 5	100 ft levee setback, existing channel geometry, removed d/s levees	0.04	0.12	~140	~14	~100	~17	~100	~14	~120	~14	37.3
PWA Scenario 6	Modified geomorphic cross section, 1858 sinuosity, removed d/s levees	0.04	0.12	170	12	200	10	~100	~14	~160	~12	32.6

9. LIST OF PREPARERS

This report was prepared by the following PWA staff:

Elizabeth Andrews, P.E. – Project Director
Andrew Collison, Ph.D. – Project Manager
Richard Ziegler – Hydraulic Modeler

10. FIGURES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PWA
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Railroad Bridge
Murphy's Crossing
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Hwy. 1
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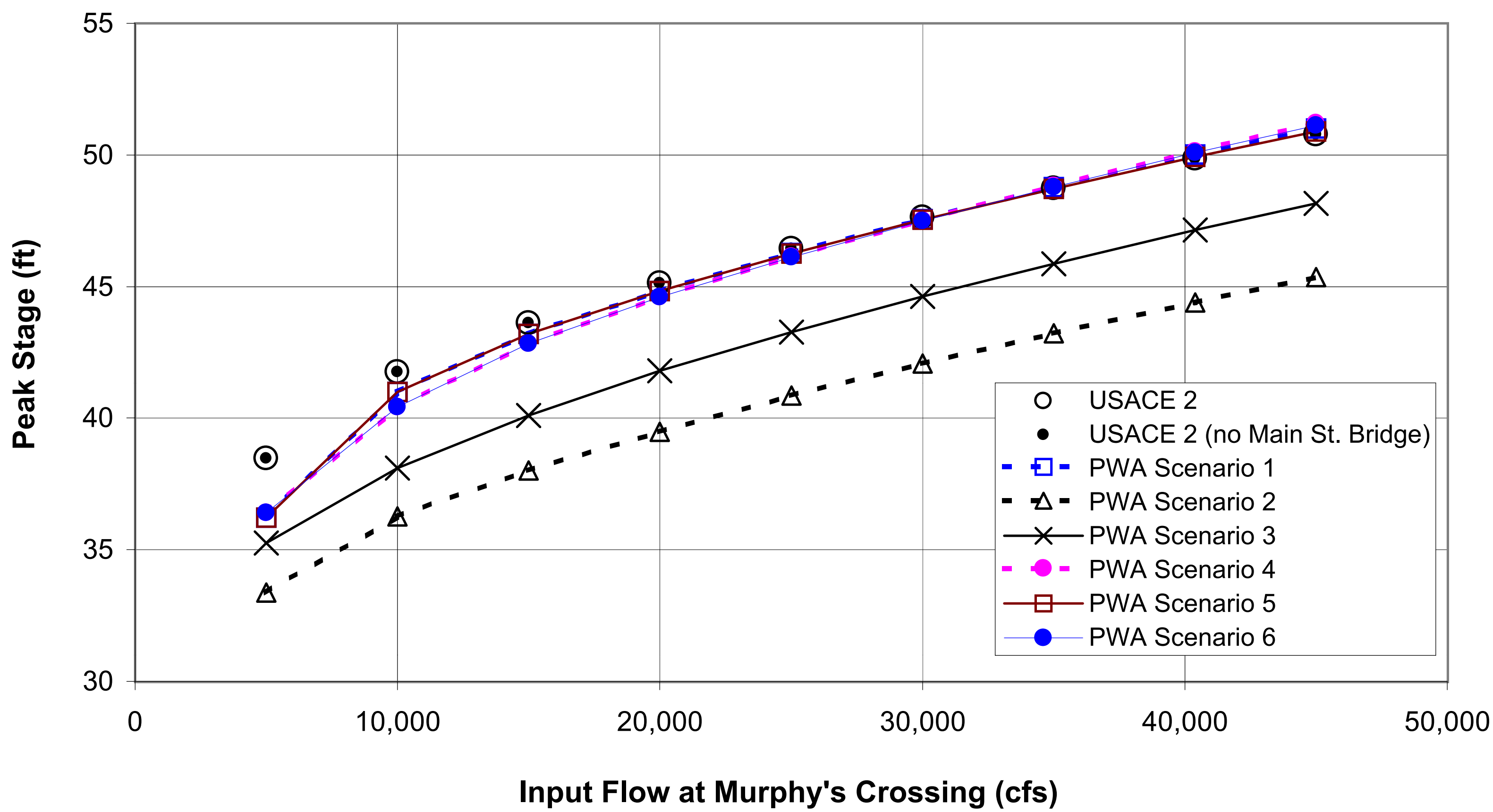
0.75
1.5
Miles
WATSONVILLE
BOLSA DEL PAJARO
BOLSA DE SAN CAYETANO
PAJARO VALLEY
LOS CARNEROS



PWA Scenarios (described further in text):
1) USACE 2, with minimum 100' veg (n = .12) corridor on each bank
2) Min 100' veg (n=.12) corridor and lowered floodplain (FP) on ea bank
3) Min 100' veg (n=.12) corridor and lowered FP on ea bank & channel meanders
4) Min 100' veg (n=.12) corridor on ea bank, channel meanders, and lower two-thirds of channel has lowered north bank FP and 2' aggradation
5) PWA 1 without levee improvements D/S of Railroad bridge
6) PWA 4 without levee improvements D/S of Railroad bridge

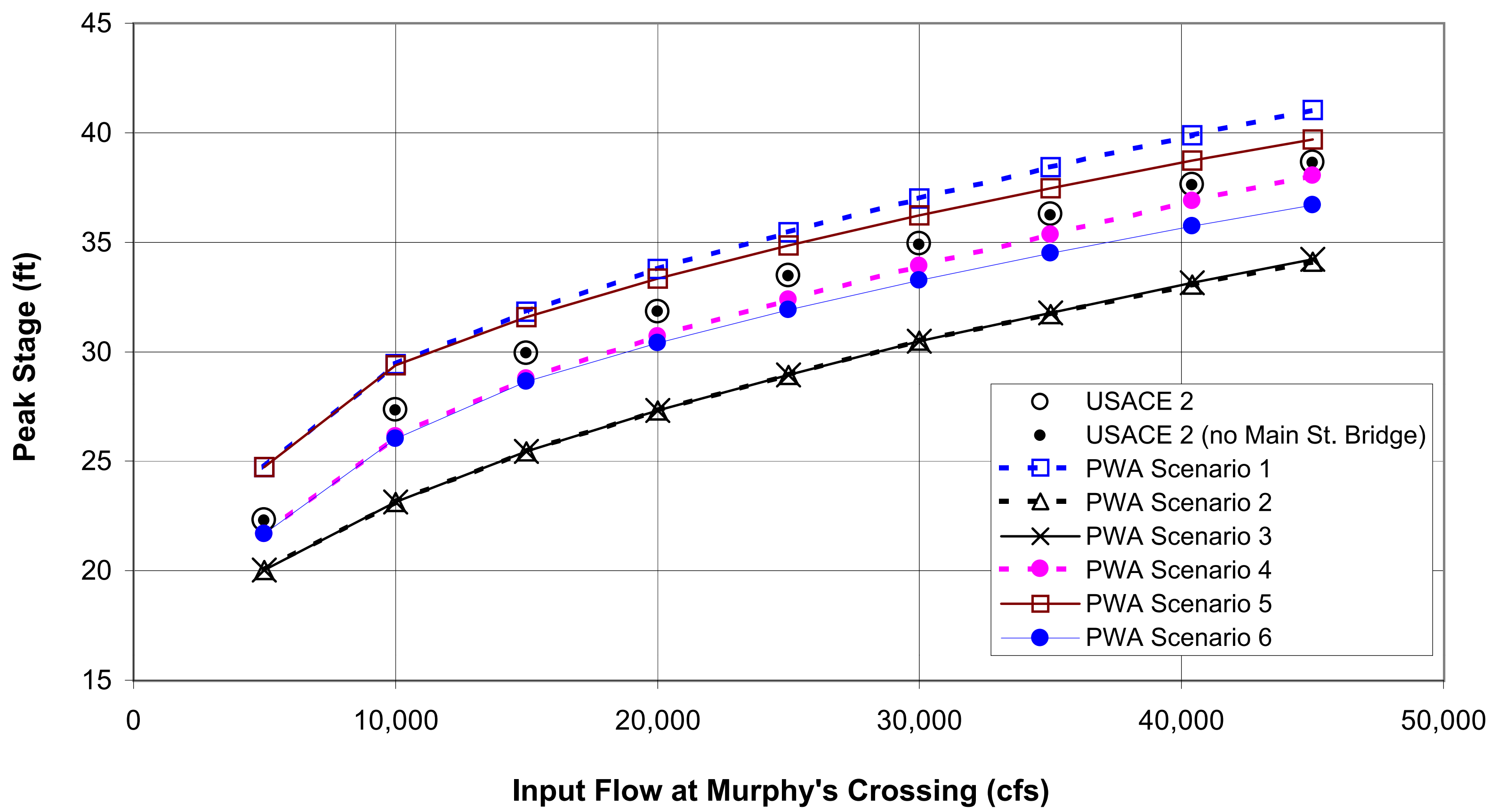
figure 2

Lower Pajaro

Reach 4, HEC-RAS 2071

PWA REF 1675

PWA



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2) Min 100' veg (n=.12) corridor and lowered floodplain (FP) on ea bank
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4) Min 100' veg (n=.12) corridor on ea bank, channel meanders, and lower two-thirds of channel has lowered north bank FP and 2' aggradation
5) PWA 1 without levee improvements D/S of Railroad bridge
6) PWA 4 without levee improvements D/S of Railroad bridge

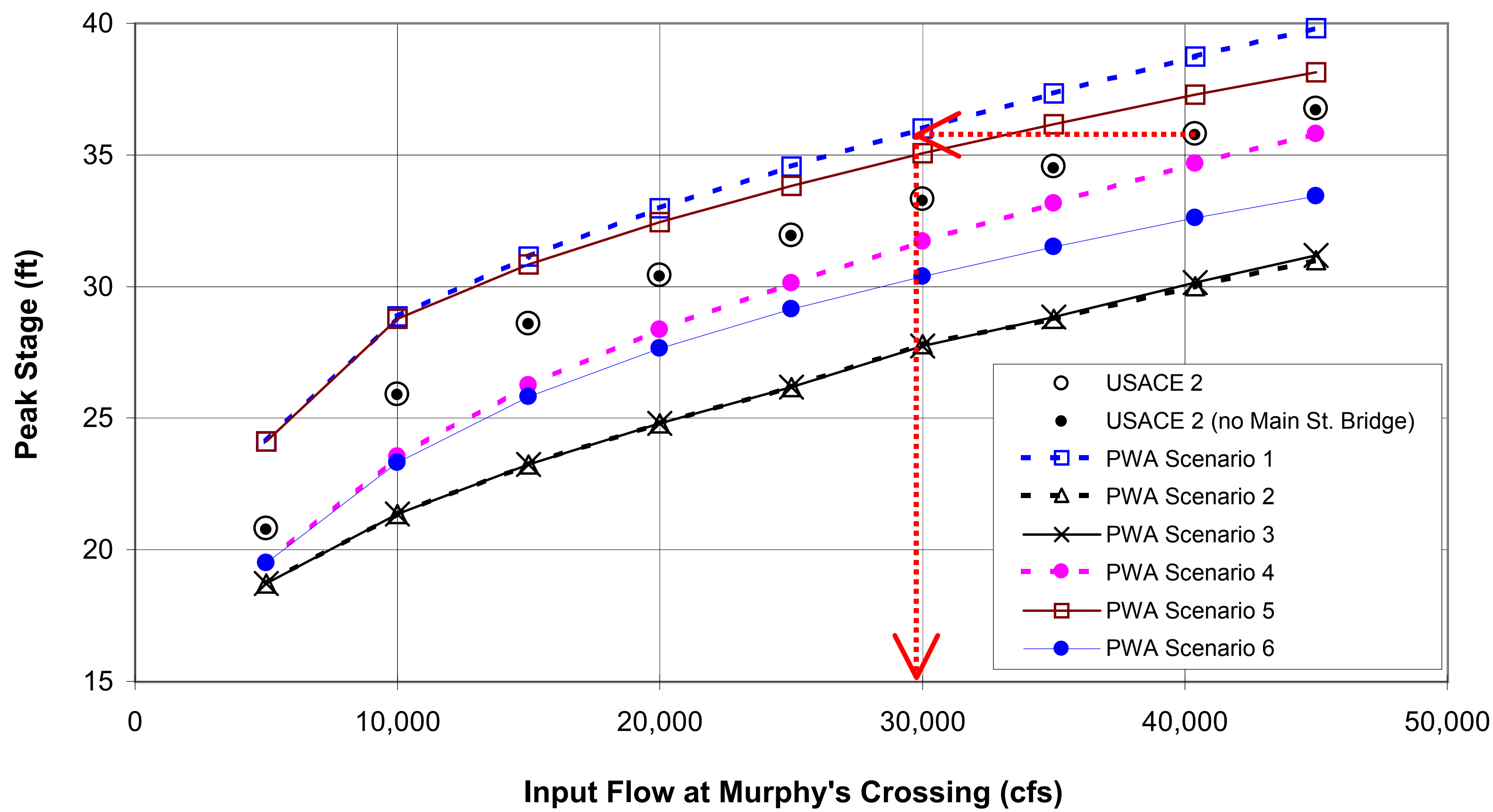
figure 3

Lower Pajaro

D/S of Salsipuedes Confluence, HEC-RAS 2035

PWA REF 1675

PWA



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1) USACE 2, with minimum 100' veg (n = .12) corridor on each bank
2) Min 100' veg (n=.12) corridor and lowered floodplain (FP) on ea bank
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5) PWA 1 without levee improvements D/S of Railroad bridge
6) PWA 4 without levee improvements D/S of Railroad bridge

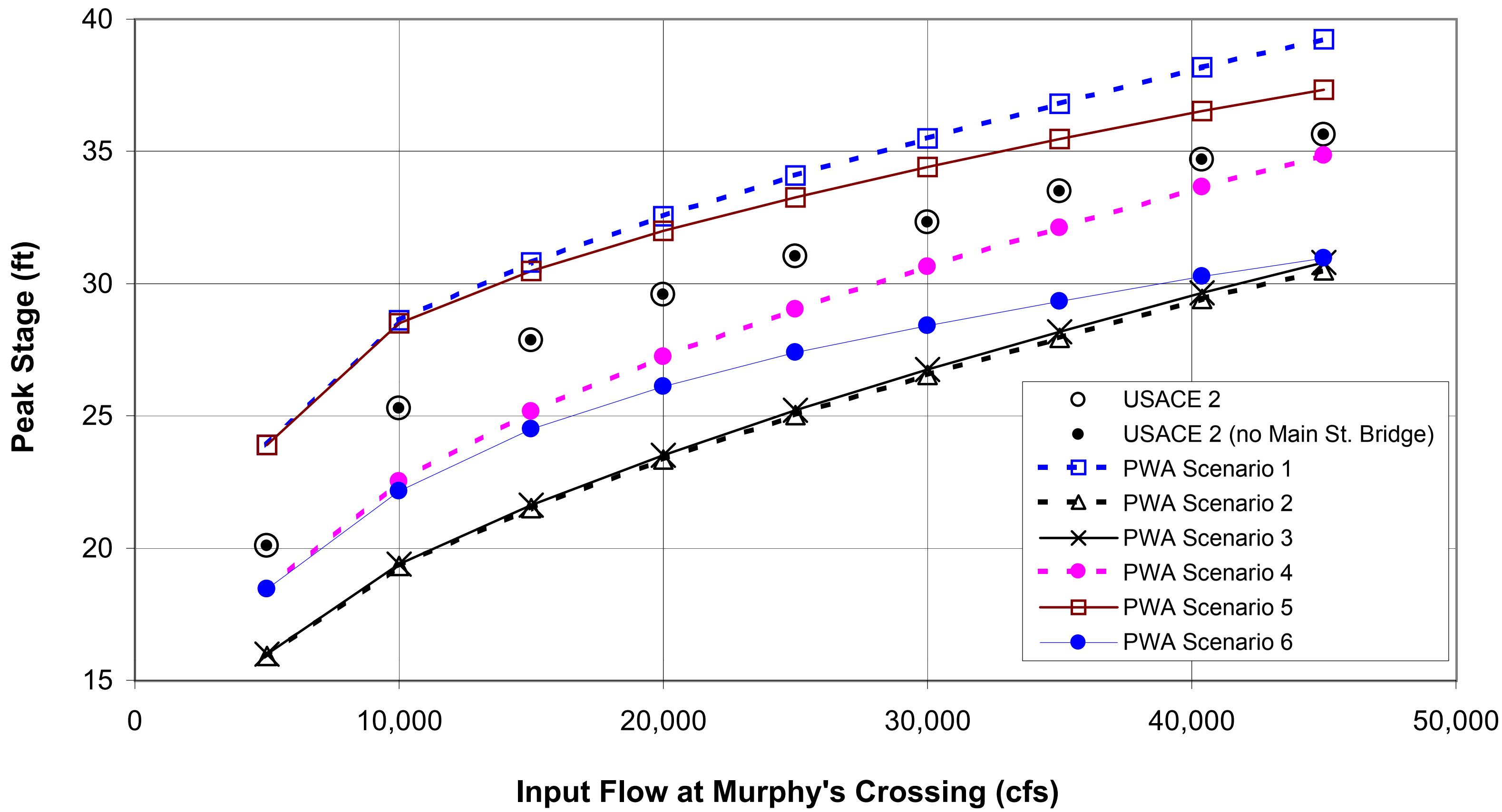
figure 4

Lower Pajaro

U/S face of Main St. Bridge, HEC-RAS 2028.8

PWA Ref 1675

PWA



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5) PWA 1 without levee improvements D/S of Railroad bridge
6) PWA 4 without levee improvements D/S of Railroad bridge

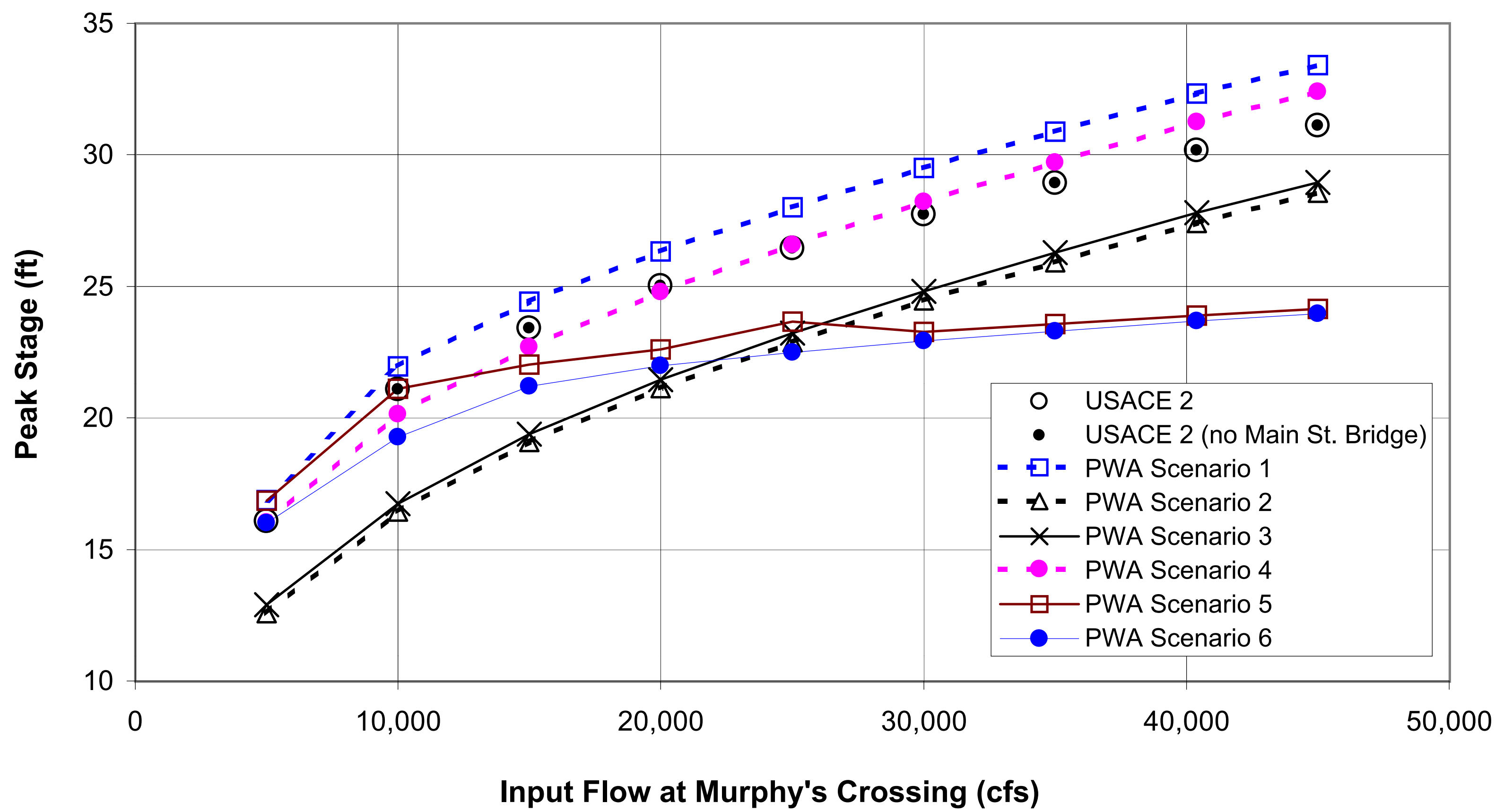
figure 5

Lower Pajaro

Near RailRoad Bridge, HEC-RAS 2025

PWA REF 1675

PWA



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1) USACE 2, with minimum 100' veg (n = .12) corridor on each bank
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4) Min 100' veg (n=.12) corridor on ea bank, channel meanders, and lower two-thirds of channel has lowered north bank FP and 2' aggradation
5) PWA 1 without levee improvements D/S of Railroad bridge
6) PWA 4 without levee improvements D/S of Railroad bridge

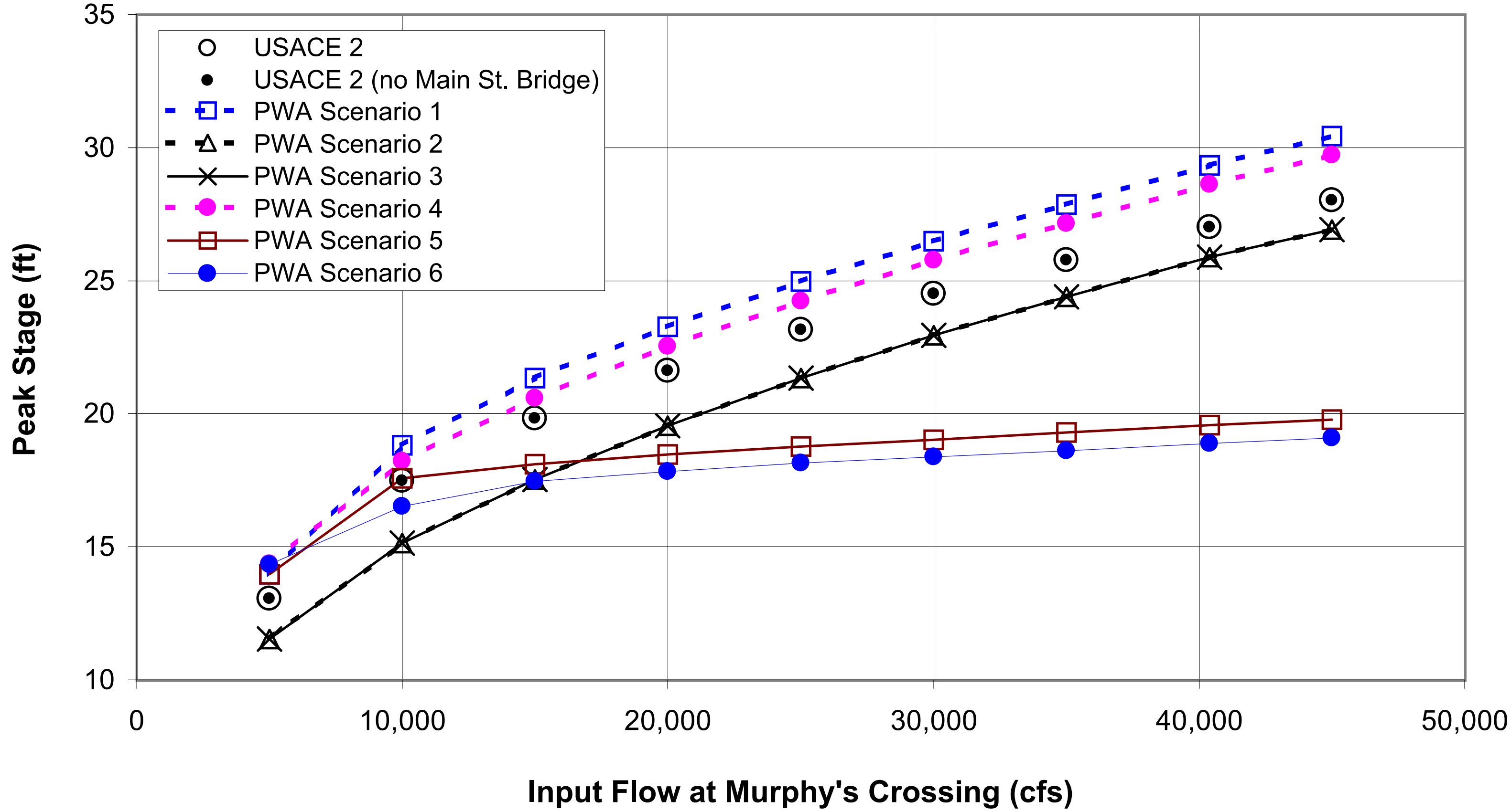
figure 6

Lower Pajaro

Reach 2, HEC-RAS 2010

PWA REF 1675

PWA



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1) USACE 2, with minimum 100' veg (n = .12) corridor on each bank
2) Min 100' veg (n=.12) corridor and lowered floodplain (FP) on ea bank
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5) PWA 1 without levee improvements D/S of Railroad bridge
6) PWA 4 without levee improvements D/S of Railroad bridge

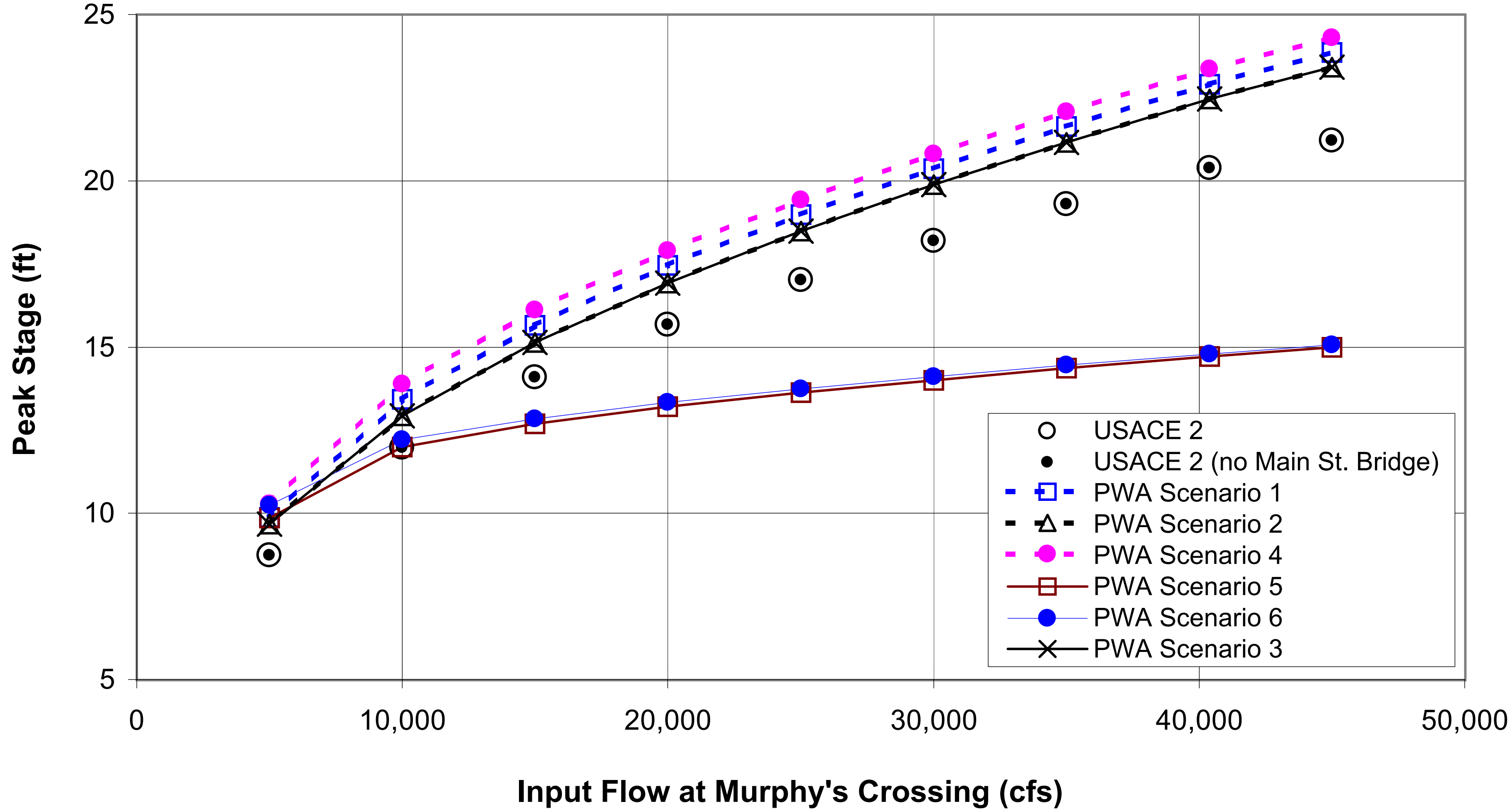
figure 7

Lower Pajaro

U/S face of Highway 1 Bridge, HEC-RAS 2001.2

PWA REF 1675

PWA



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2) Min 100' veg (n=.12) corridor and lowered floodplain (FP) on ea bank
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5) PWA 1 without levee improvements D/S of Railroad bridge
6) PWA 4 without levee improvements D/S of Railroad bridge

figure 8

Lower Pajaro

Near Thurwatcher, HEC-RAS 1006.2

PWA REF 1675

PWA

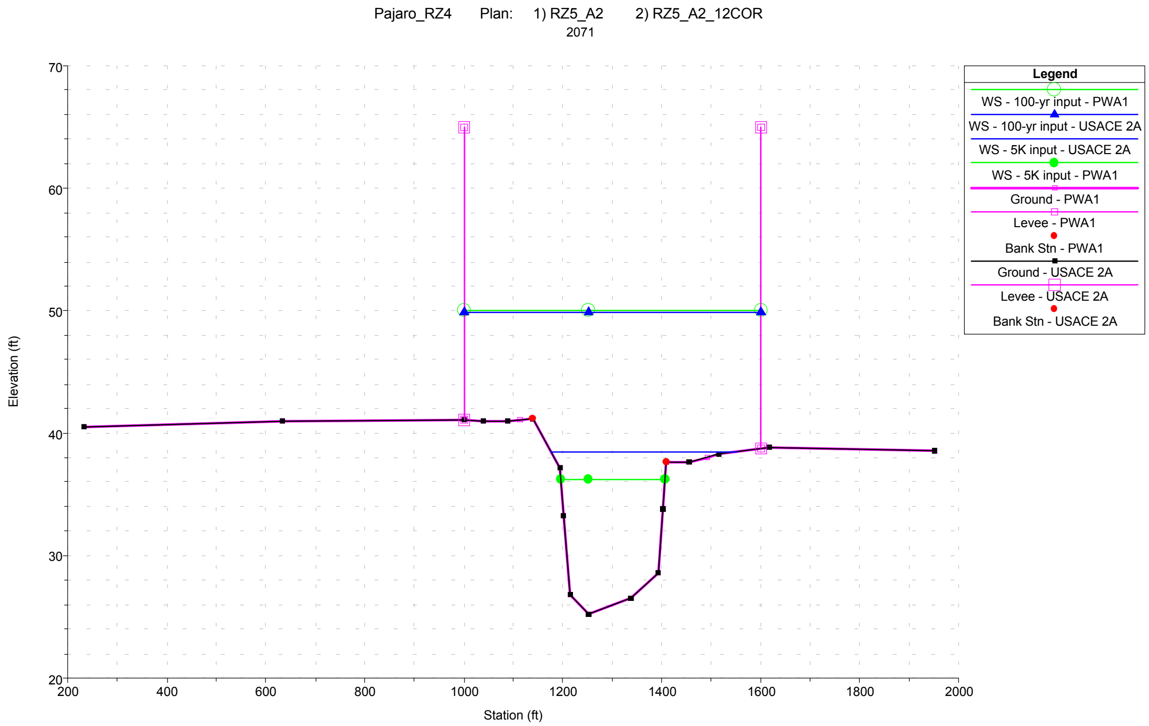

Figure 9. Reach 4, USACE 2A and PWA1
Channel cross-section and simulated water surface elevation (WS)

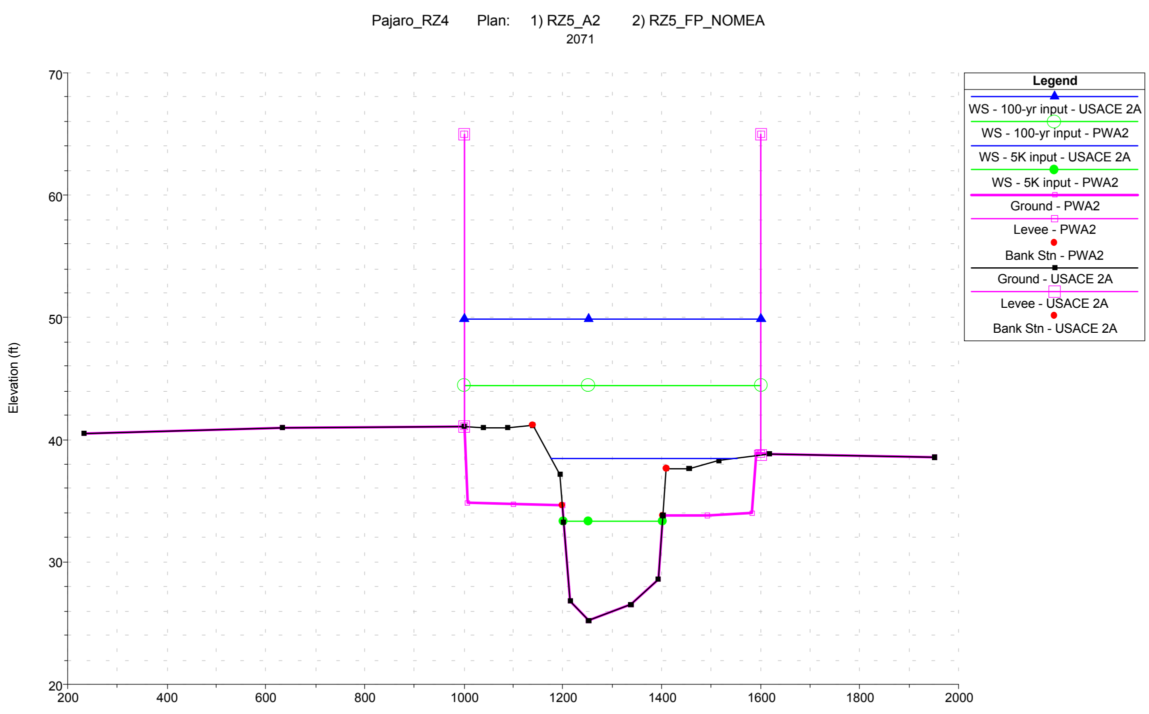

Figure 10. Reach 4, USACE 2A and PWA2
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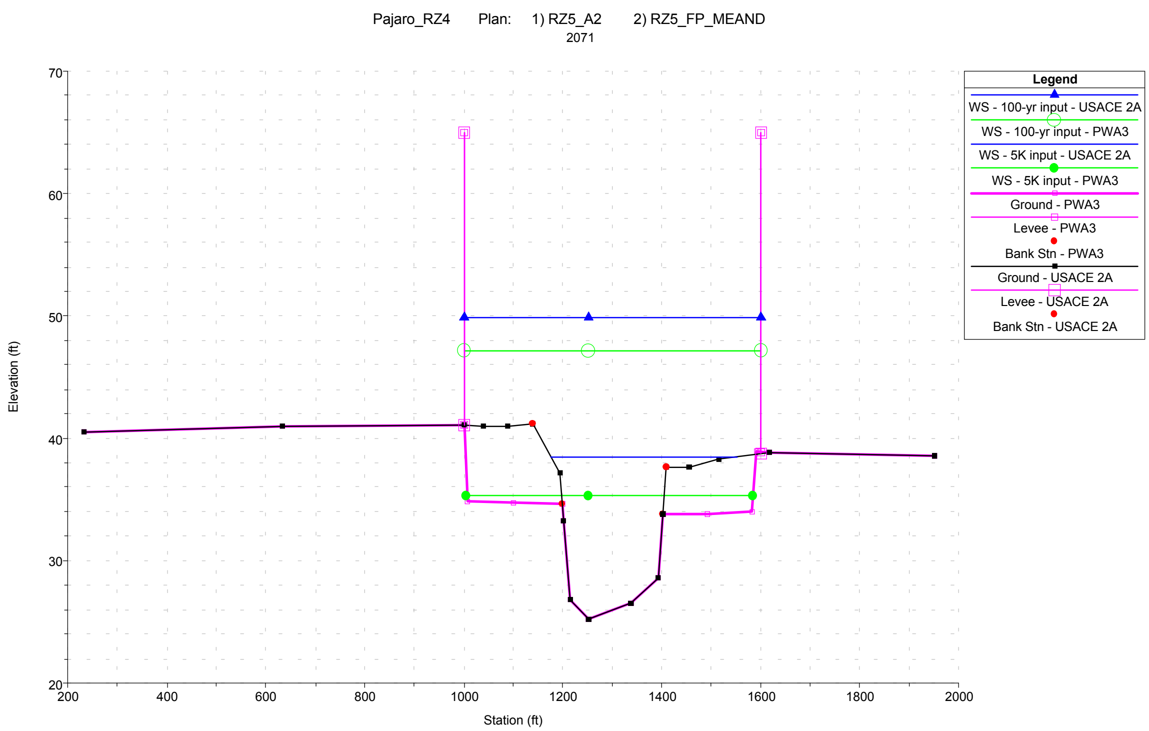

Figure 11. Reach 4, USACE 2A and PWA3
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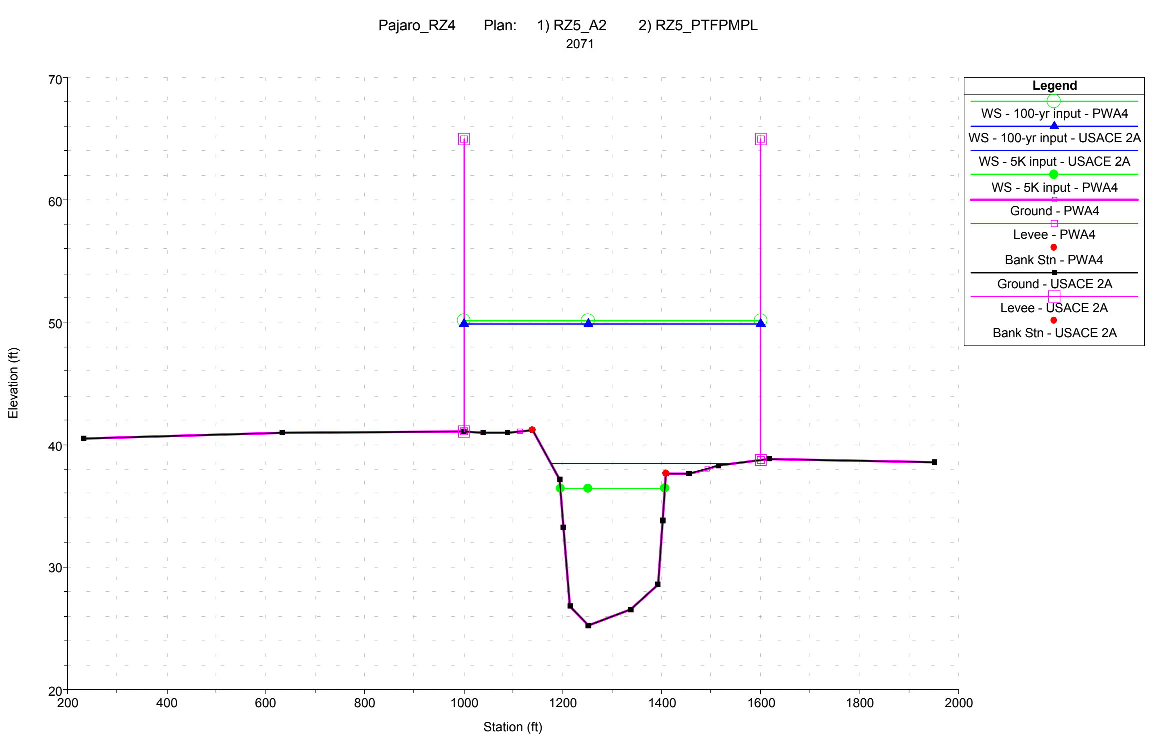

Figure 12. Reach 4, USACE 2A and PWA4
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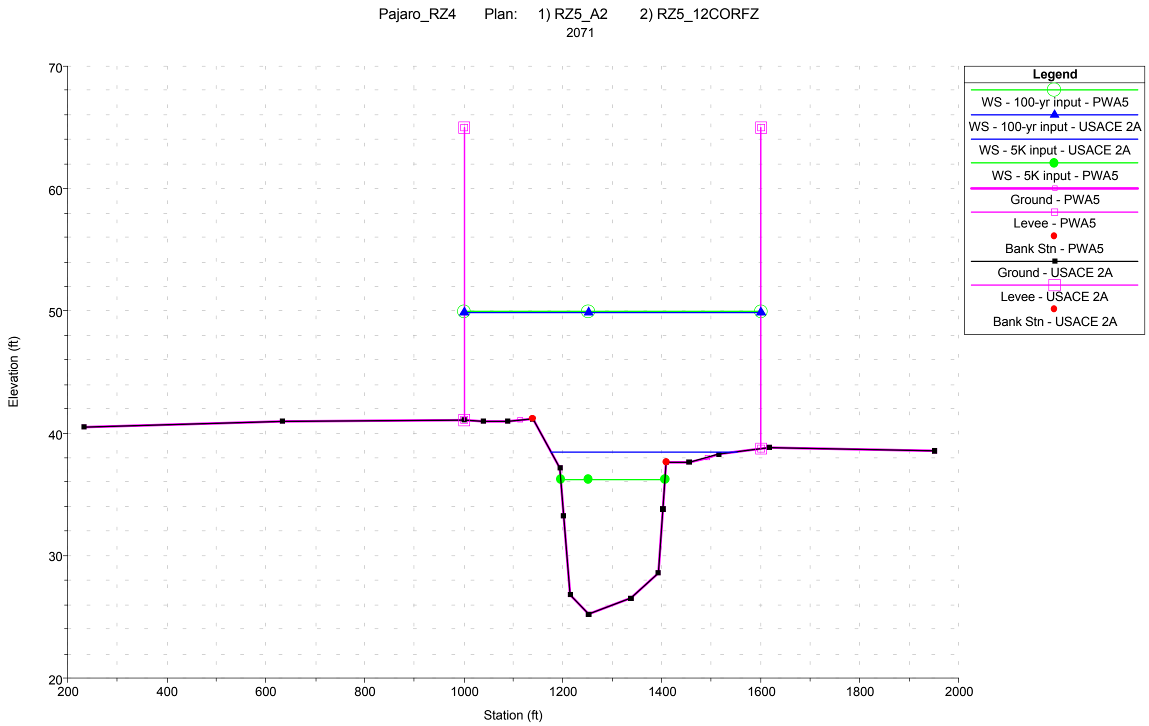
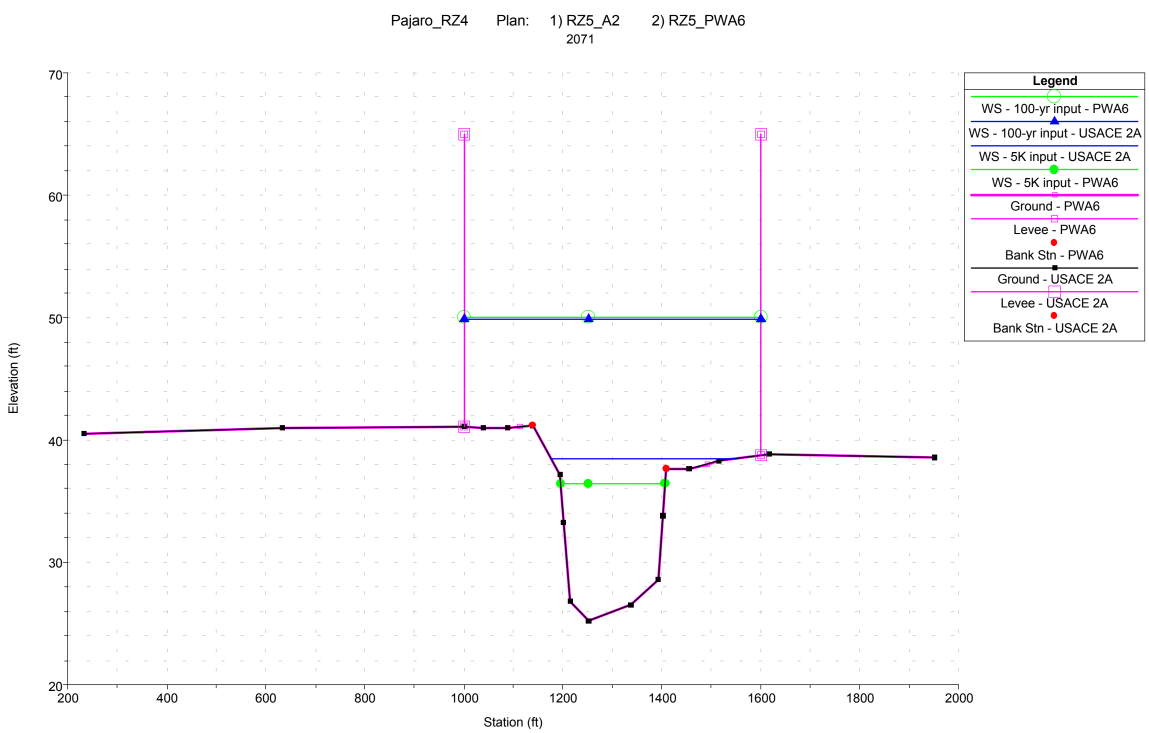


Figure 13. Reach 4, USACE 2A and PWA5
Channel cross-section and simulated water surface elevation (WS)



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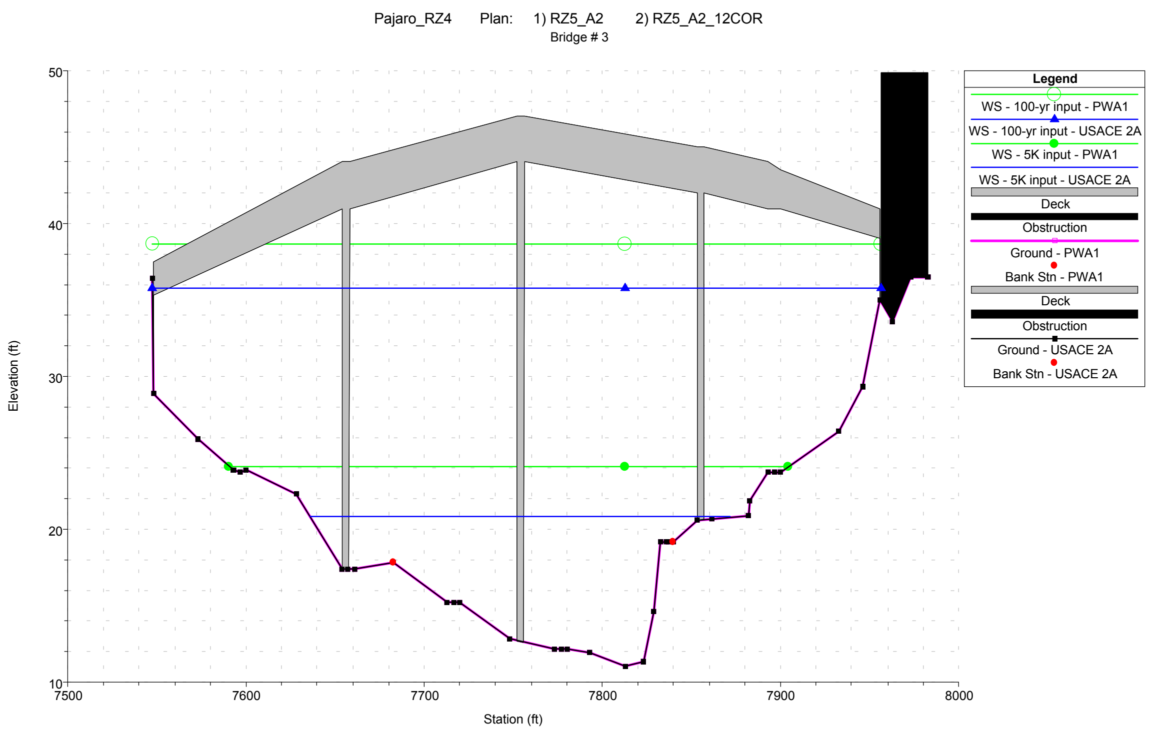

Figure 15. Upstream face of Main Street Bridge, USACE 2A and PWA1 Channel cross-section and simulated water surface elevation (WS)

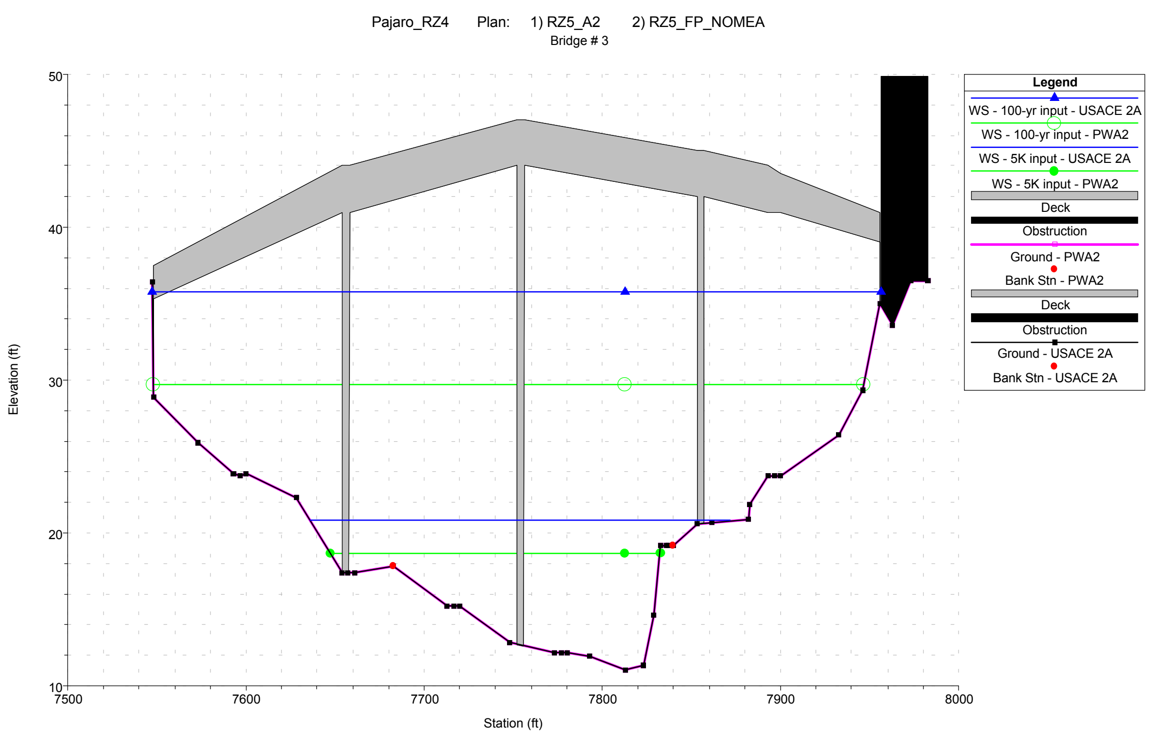

Figure 16. Upstream face of Main Street Bridge, USACE 2A and PWA2 Channel cross-section and simulated water surface elevation (WS)

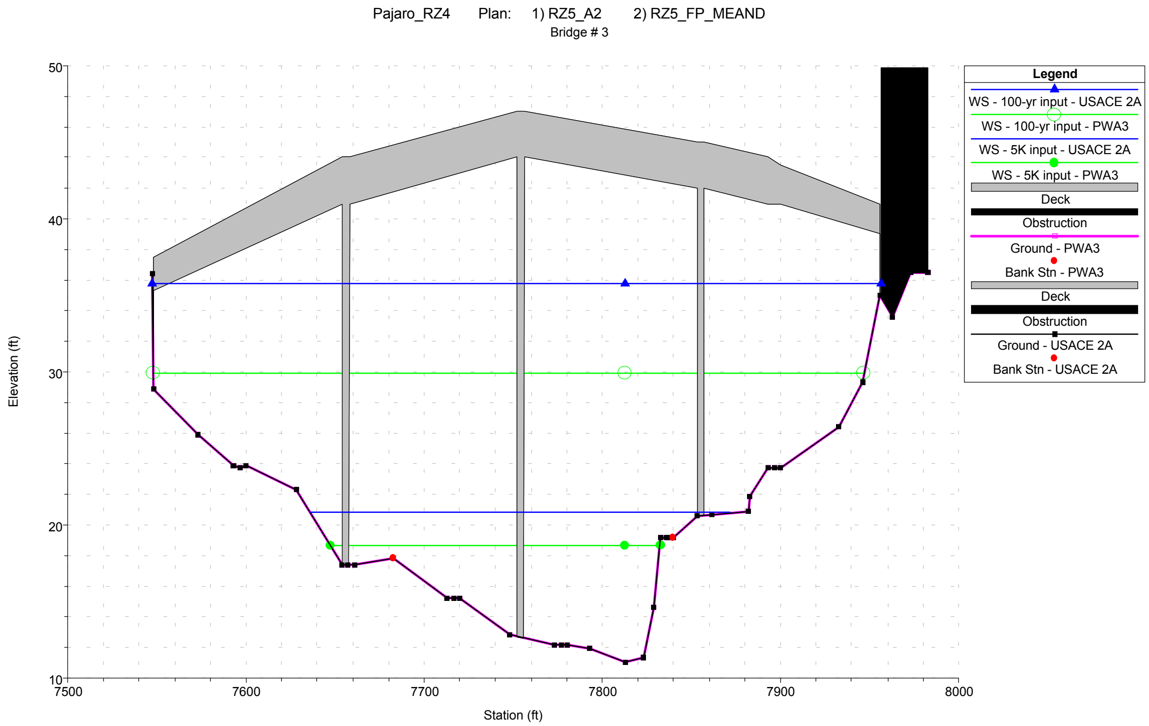

Figure 17. Upstream face of Main Street Bridge, USACE 2A and PWA3 Channel cross-section and simulated water surface elevation (WS)

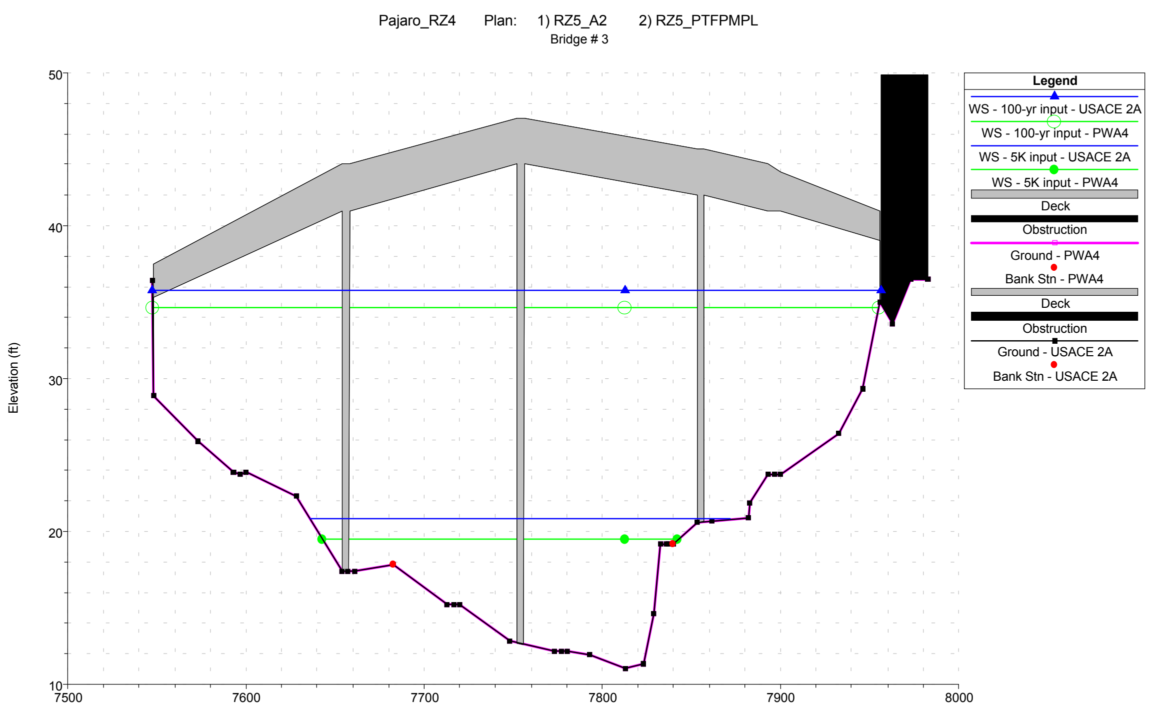

Figure 18. Upstream face of Main Street Bridge, USACE 2A and PWA4 Channel cross-section and simulated water surface elevation (WS)

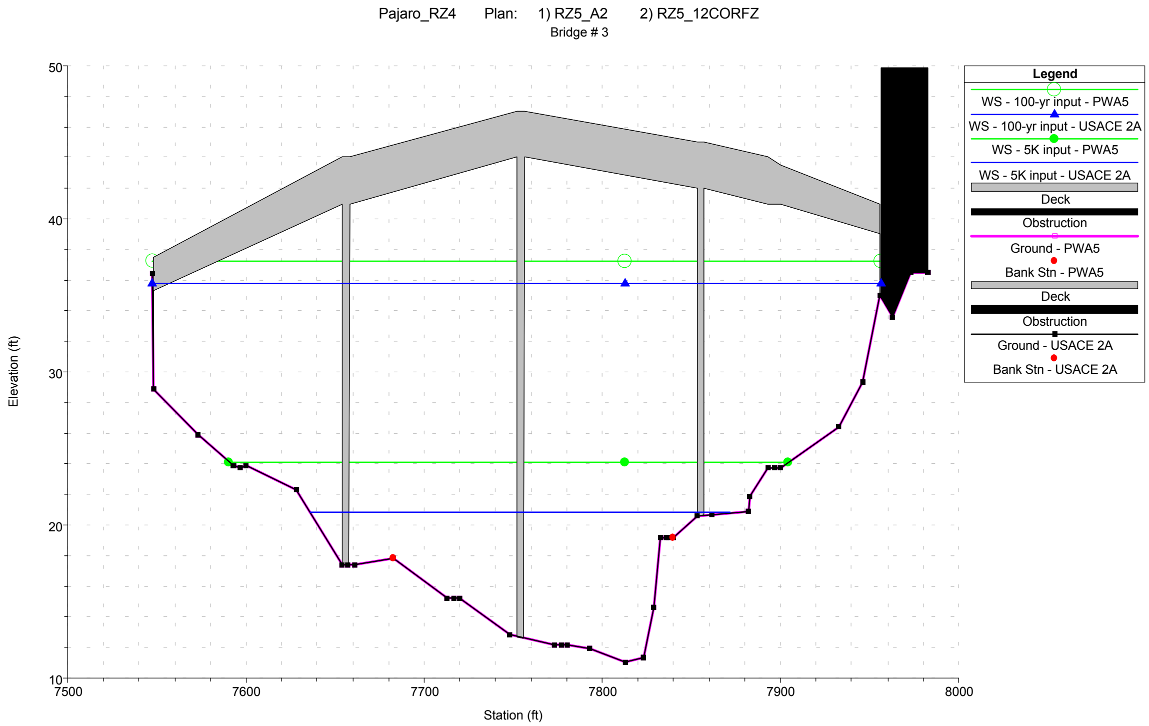

Figure 19. Upstream face of Main Street Bridge, USACE 2A and PWA5 Channel cross-section and simulated water surface elevation (WS)

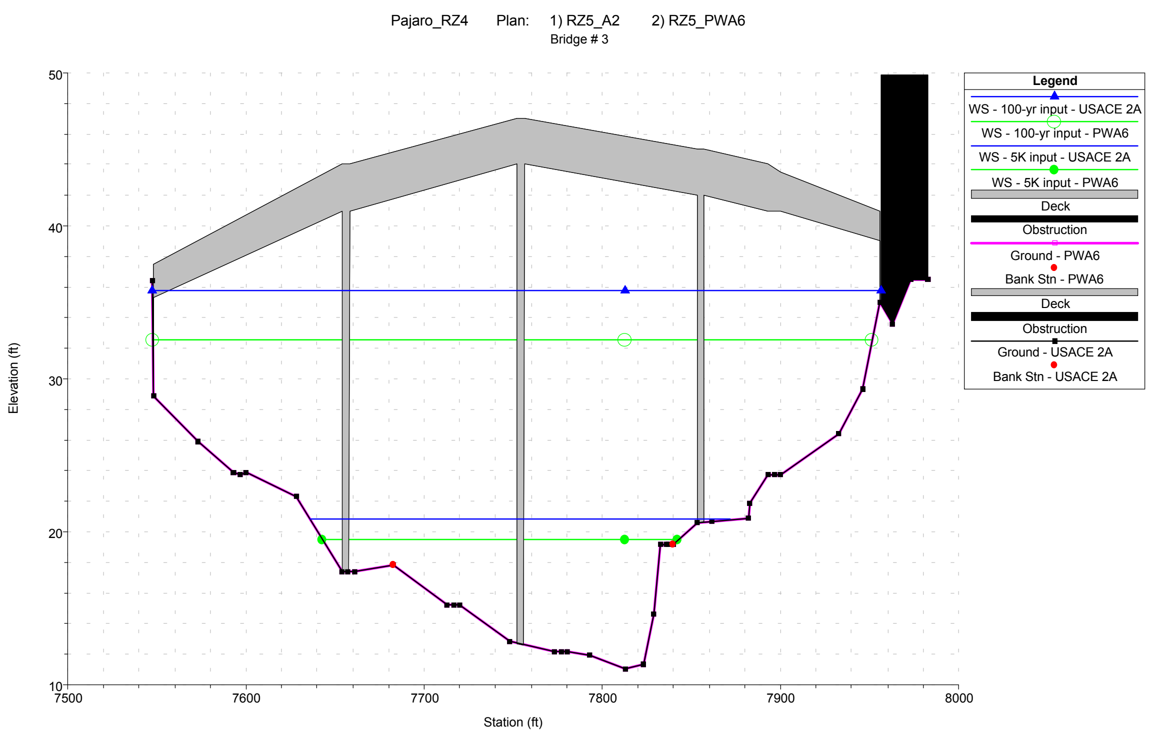

Figure 20. Upstream face of Main Street Bridge, USACE 2A and PWA6 Channel cross-section and simulated water surface elevation (WS)

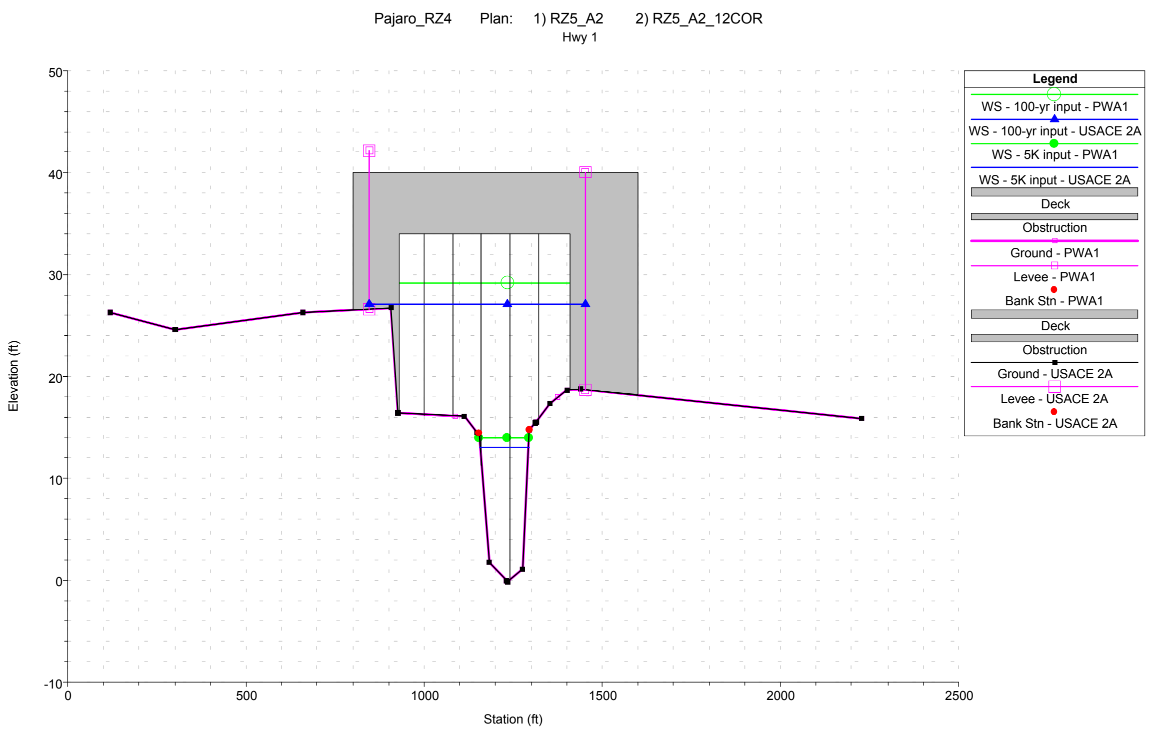

Figure 21. Upstream face of Hwy 1 Bridge, USACE 2A and PWA1 Channel cross-section and simulated water surface elevation (WS)

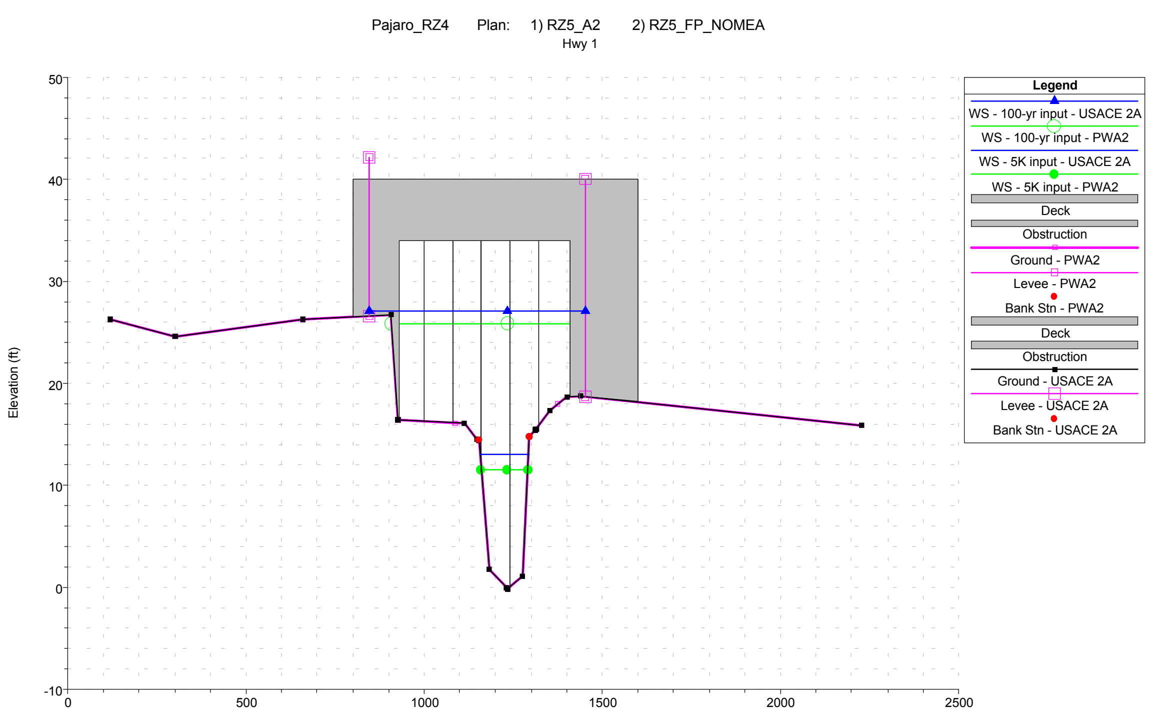

Figure 22. Upstream face of Hwy 1 Bridge, USACE 2A and PWA2 Channel cross-section and simulated water surface elevation (WS)

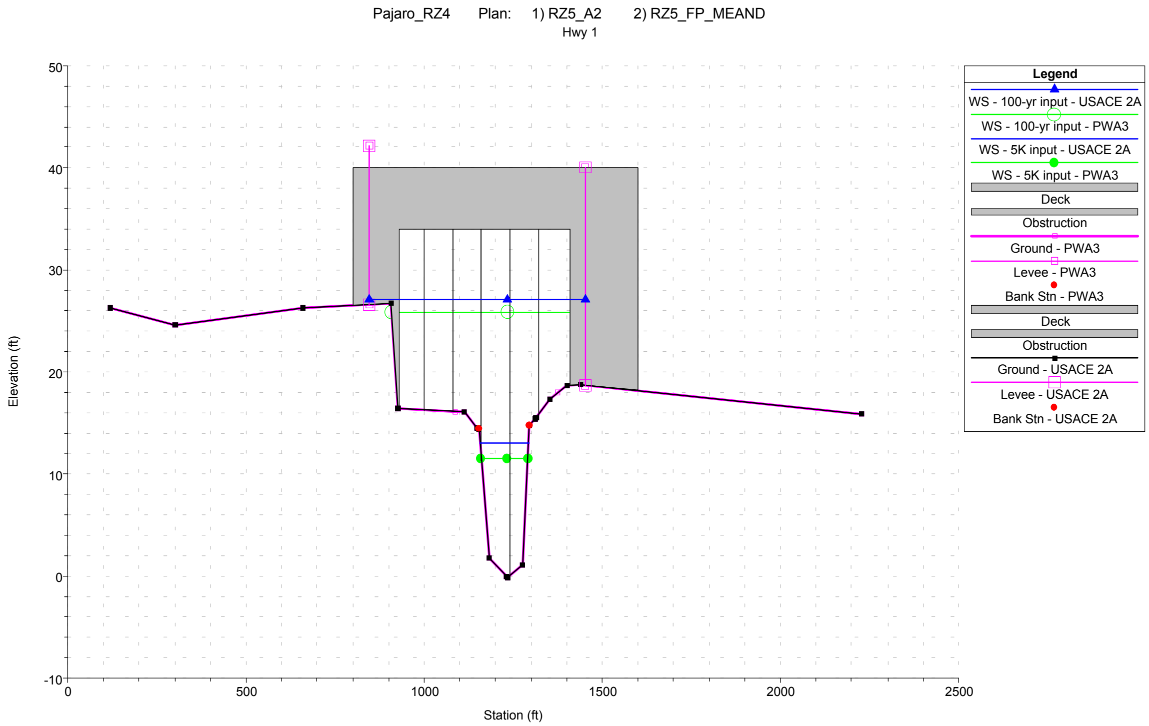

Figure 23. Upstream face of Hwy 1 Bridge, USACE 2A and PWA3 Channel cross-section and simulated water surface elevation (WS)

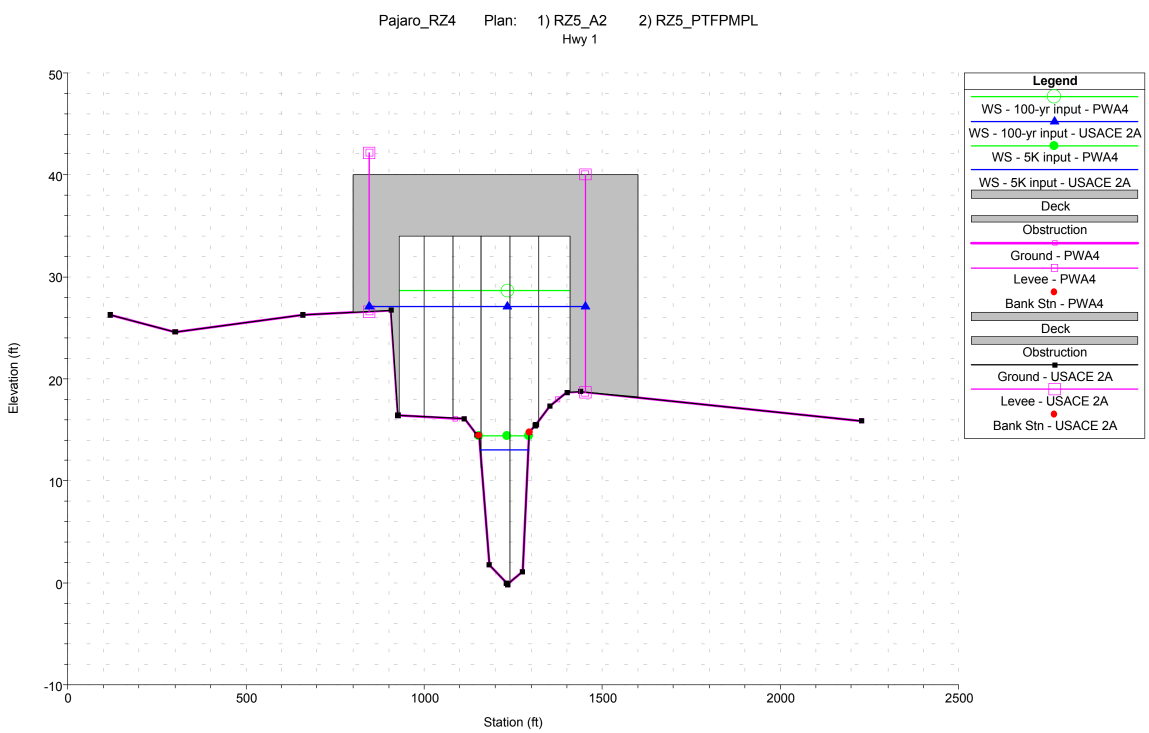

Figure 24. Upstream face of Hwy 1 Bridge, USACE 2A and PWA4 Channel cross-section and simulated water surface elevation (WS)

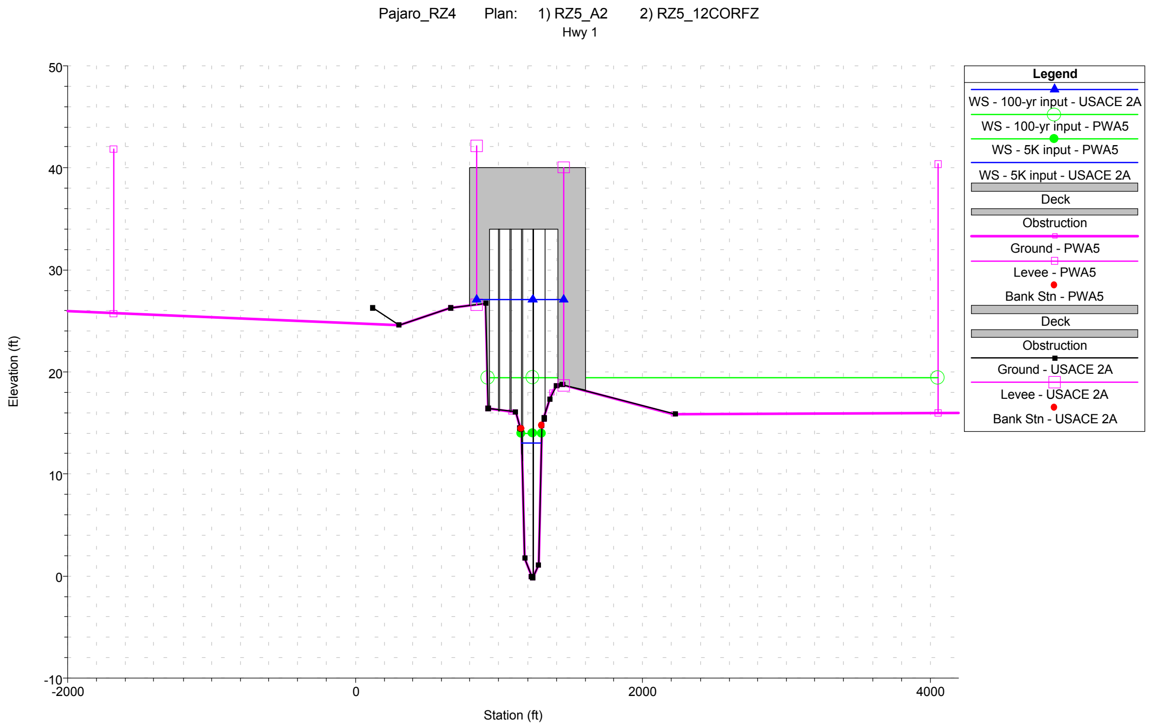

Figure 25. Upstream face of Hwy 1 Bridge, USACE 2A and PWA5 Channel cross-section and simulated water surface elevation (WS)

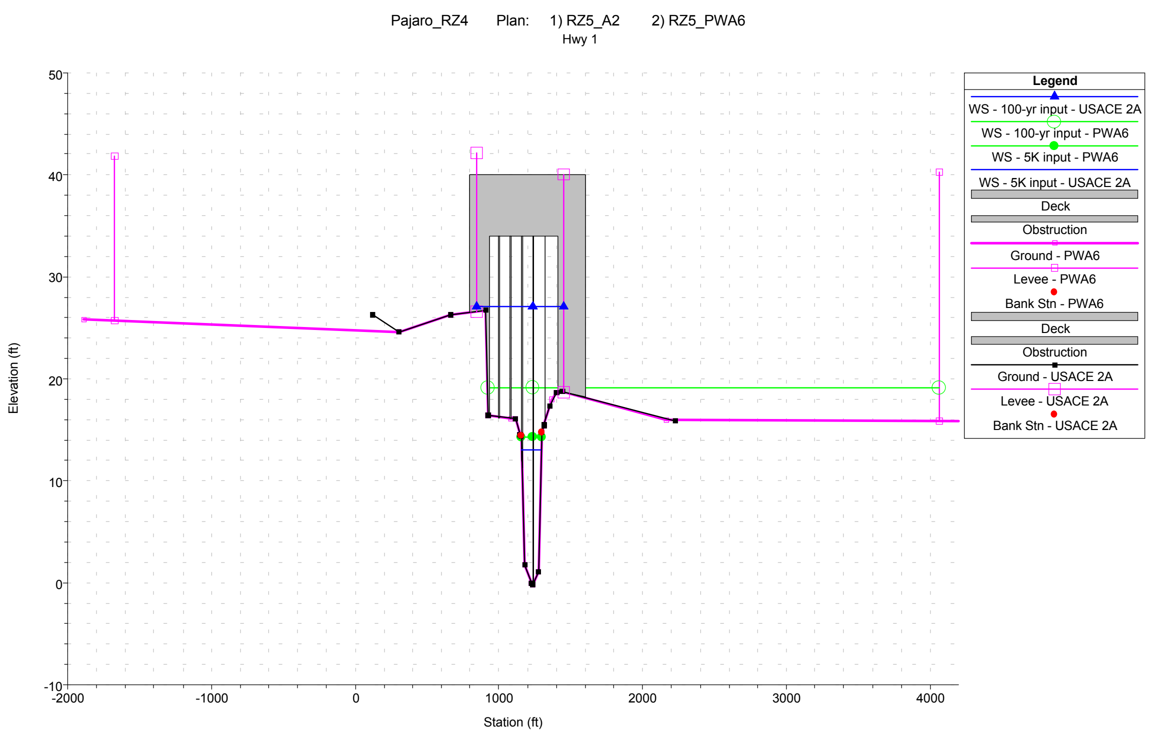

Figure 26. Upstream face of Hwy 1 Bridge, USACE 2A and PWA6 Channel cross-section and simulated water surface elevation (WS)

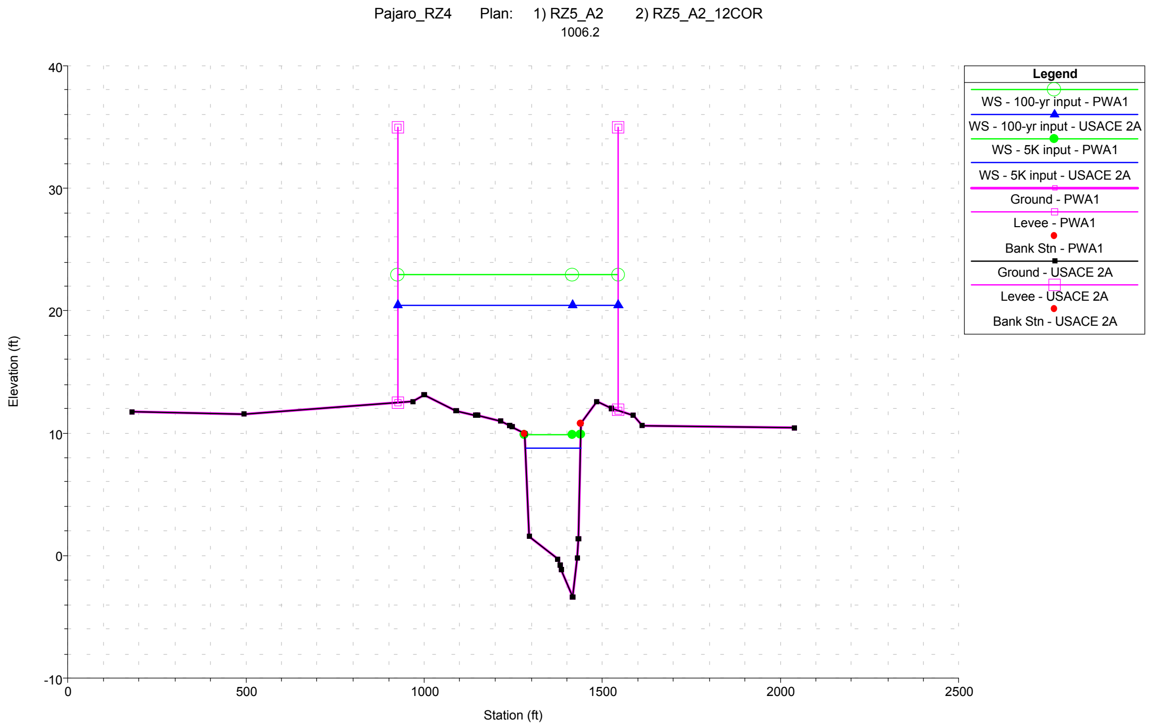

Figure 27. Reach 1, USACE 2A and PWA1
Channel cross-section and simulated water surface elevation (WS)

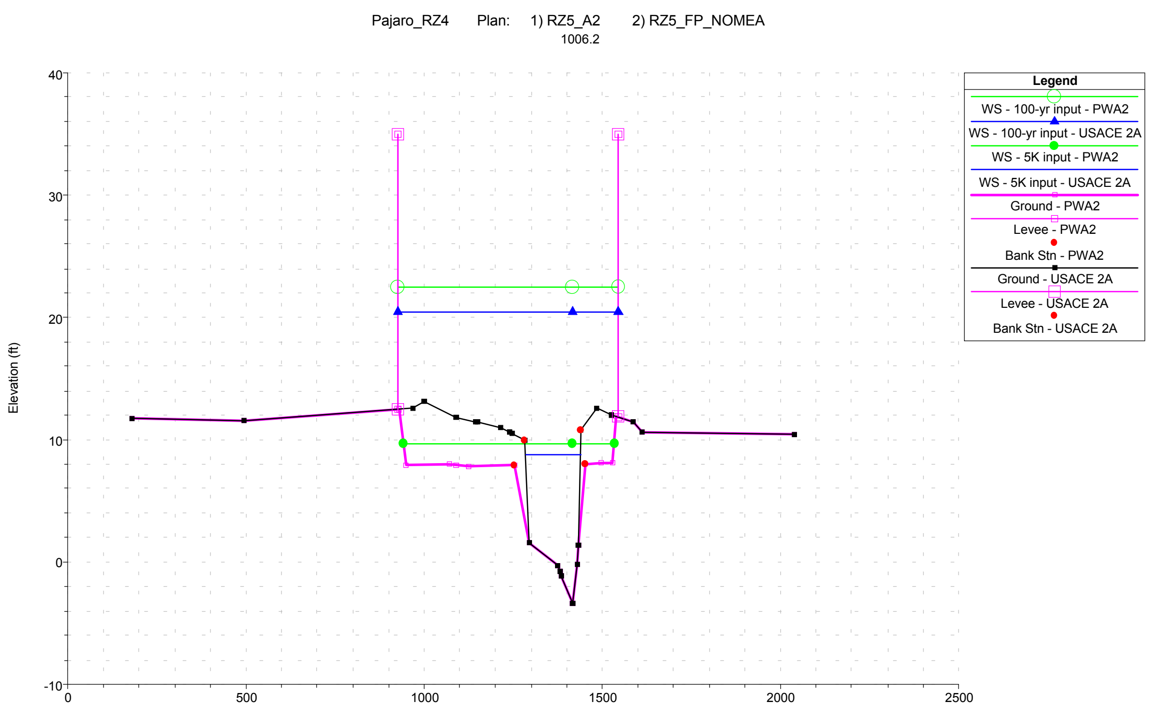

Figure 28. Reach 1, USACE 2A and PWA2
Channel cross-section and simulated water surface elevation (WS)

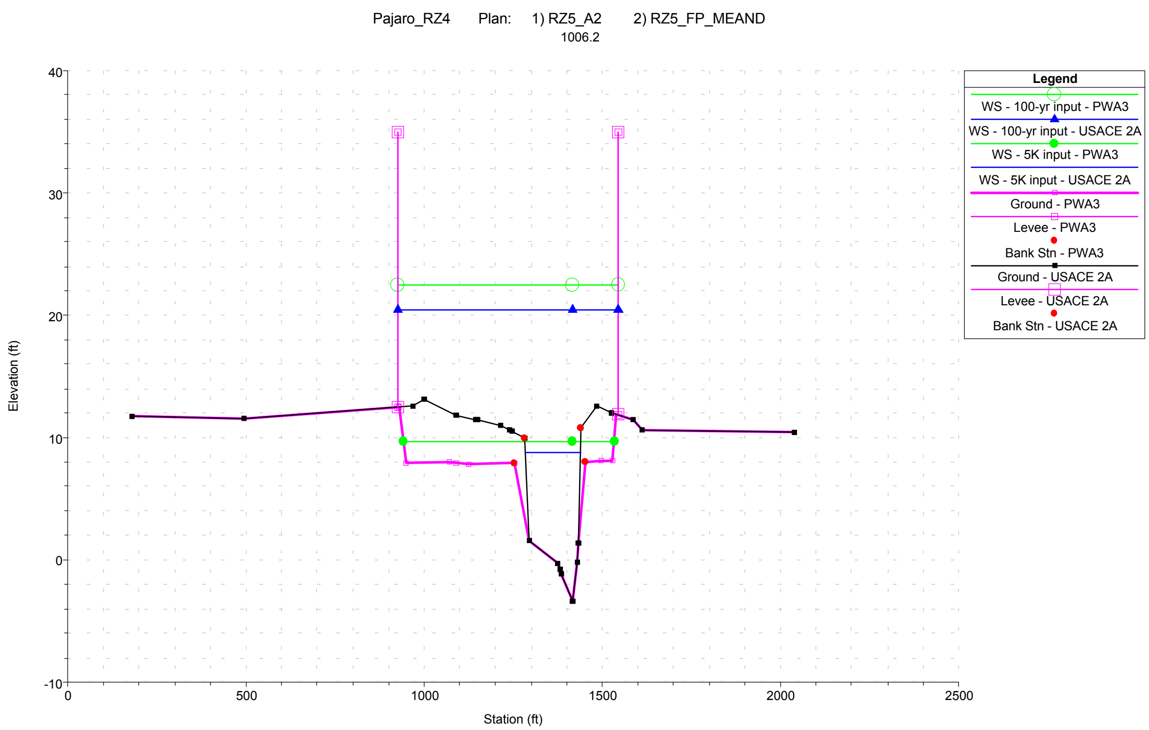

Figure 29. Reach 1, USACE 2A and PWA3
Channel cross-section and simulated water surface elevation (WS)

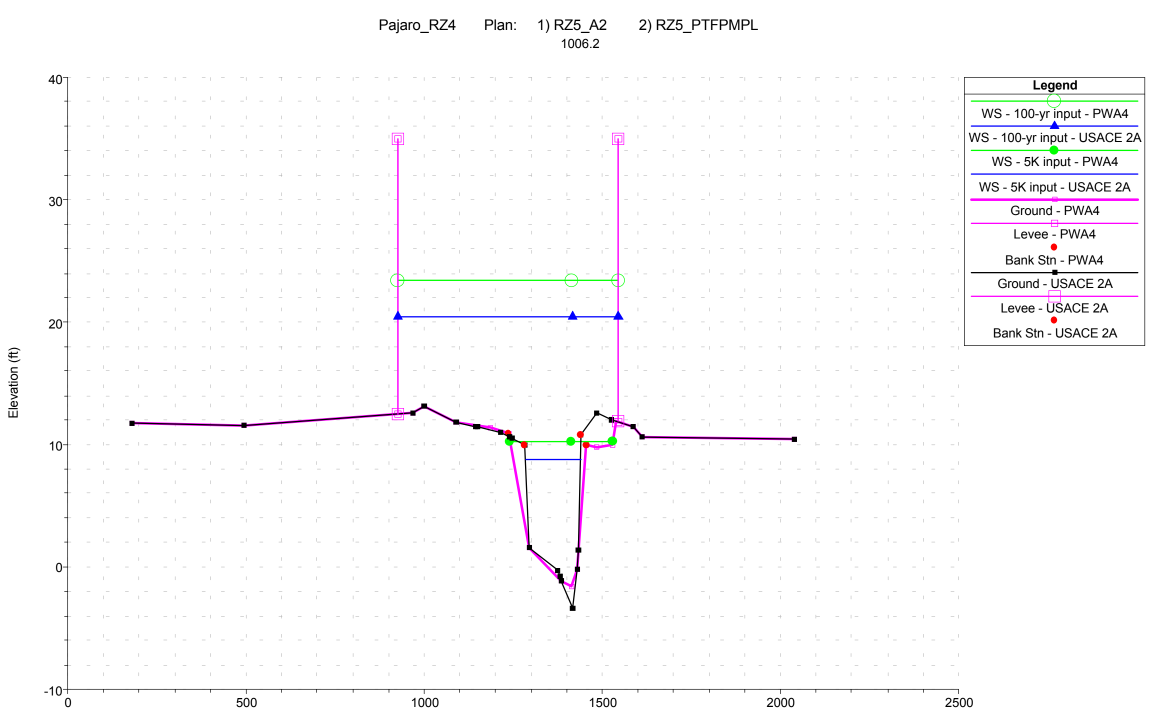

Figure 30. Reach 1, USACE 2A and PWA4
Channel cross-section and simulated water surface elevation (WS)

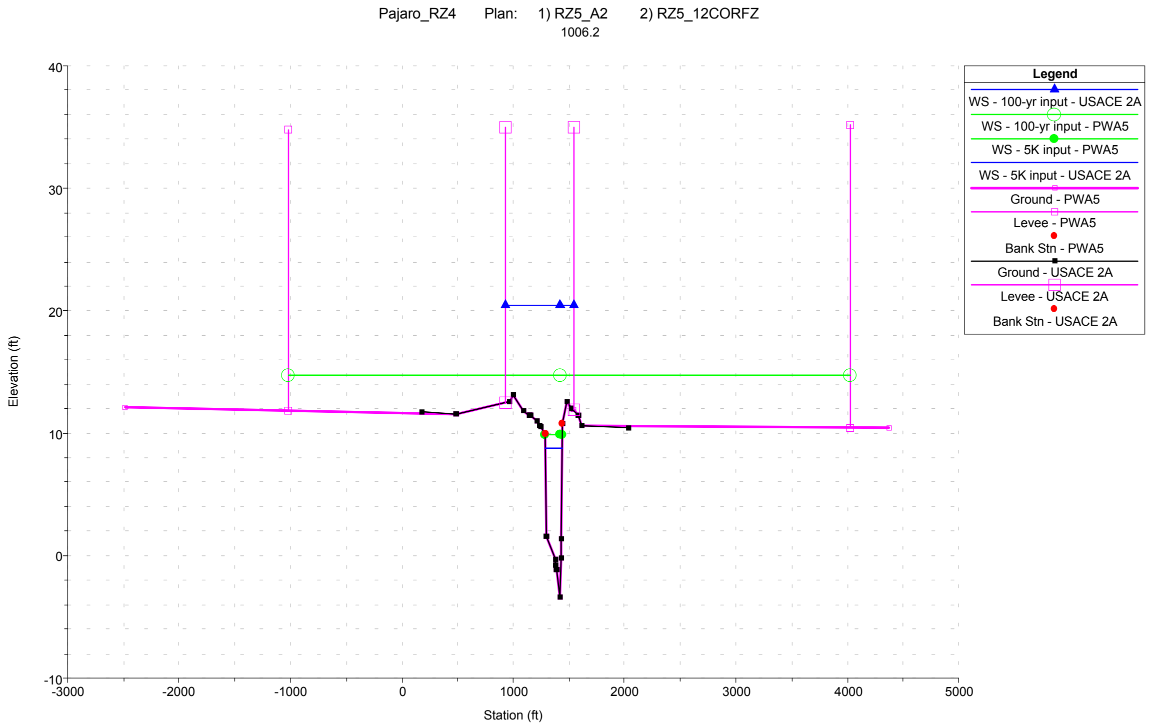

Figure 31. Reach 1, USACE 2A and PWA5
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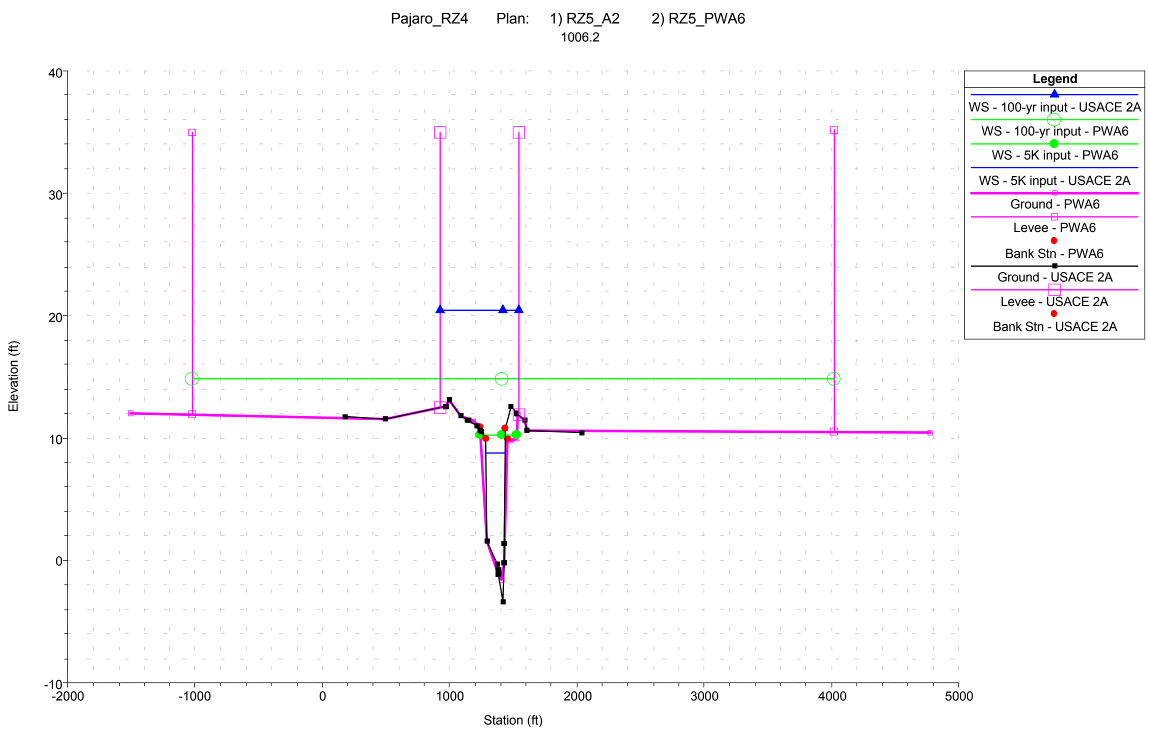
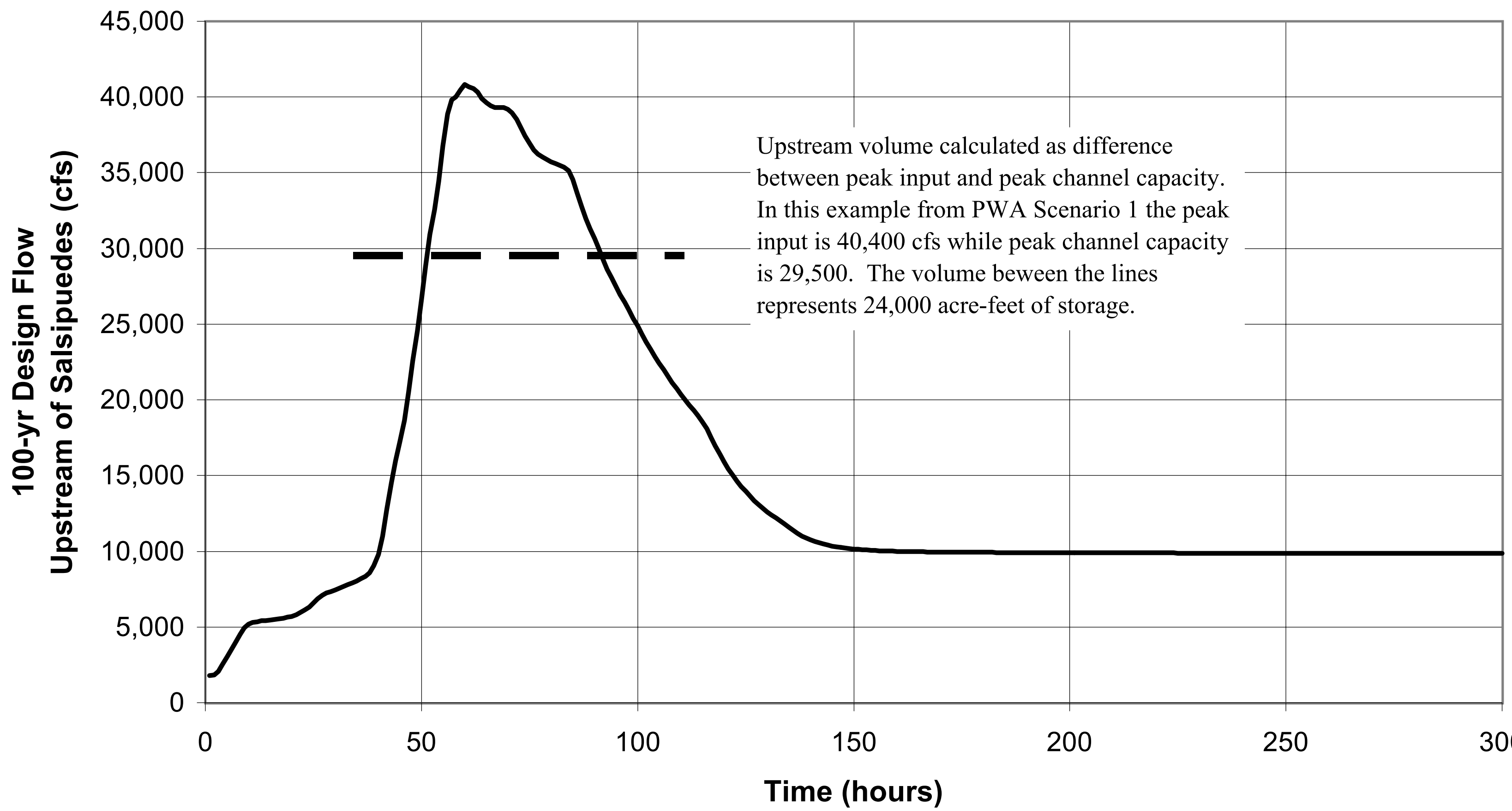


Figure 32. Reach 1, USACE 2A and PWA6
Channel cross-section and simulated water surface elevation (WS)



Notes: Hydrograph taken from RMC HEC-1 model output from LSL100.dat, node CP27R-Pajaro River, dated March 2002.

figure 33

Lower Pajaro

100-yr Hydrograph Upstream of Salsipuedes

PWA REF 1675

PWA

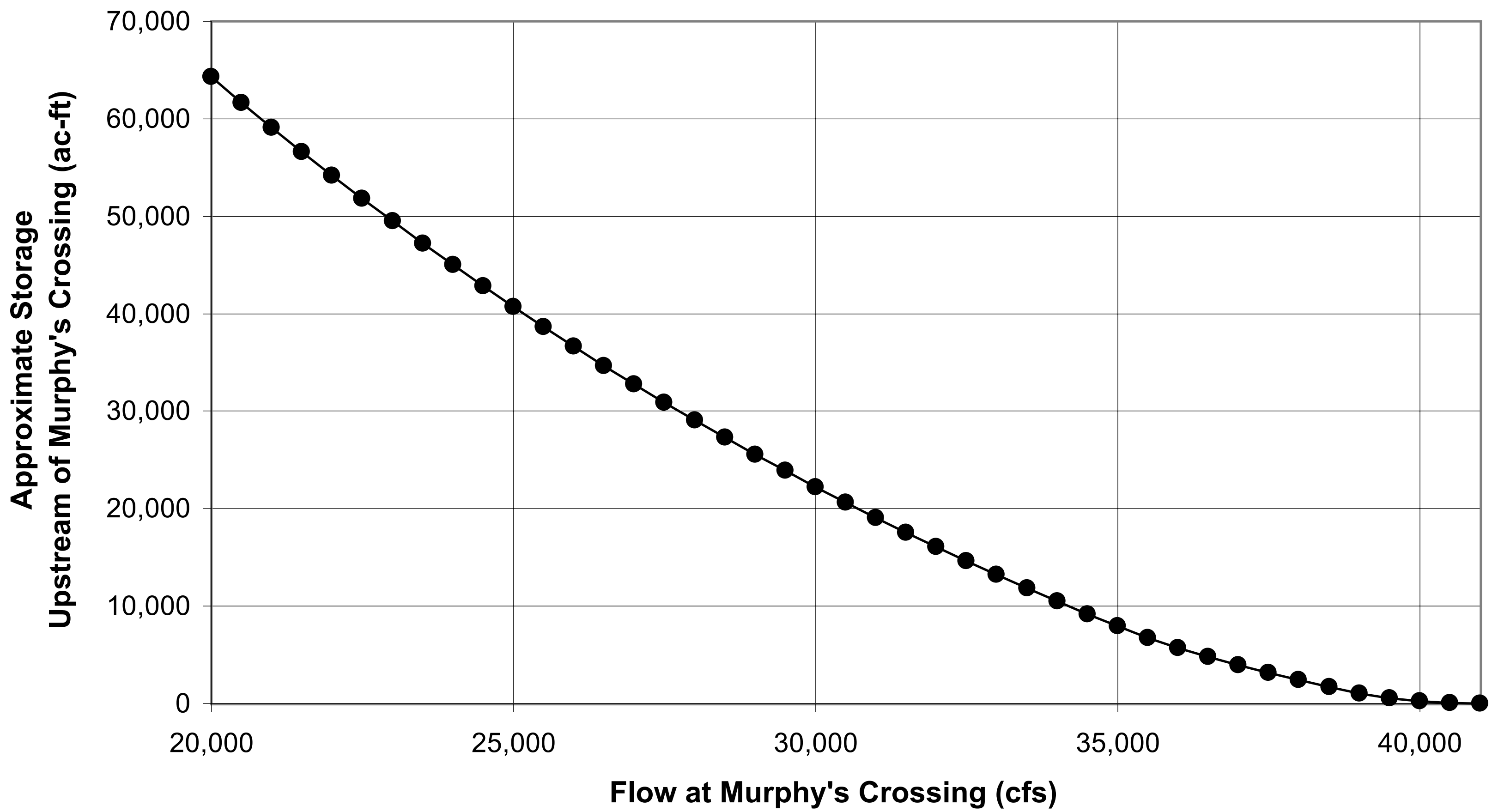


figure 34

Lower Pajaro

Approximate Storage Needed vs. Allowable Flow

PWA REF 1675

PWA

Santa Cruz County Group of the Ventana Chapter

P.O. Box 604, Santa Cruz, California 95061 phone: (831) 426-4453
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March 24, 2004

Board of Supervisors
County of Monterey
240 Church Street, East Wing Room 225
Salinas, CA 93901-2633

Re: **<u>March 16, 2004 Agenda Items S-23 (County of Monterey) and 55, 56 (County of Santa Cruz): Pajaro River Flood Control Project</u>**

Dear Supervisors:

The Sierra Club, through its Pajaro River Committee, respectfully requests that you not adopt the resolutions as submitted by your respective Staffs and instead amend them as described below to comply with the California Environmental Quality Act (CEQA) and other applicable laws.

The Sierra Club supports your efforts to modify the existing project to protect life and property, as well as environmental quality. As members of the Action Pajaro Valley (APV) Task Force, we support its March 16, 2004 letter, including the next-to-last paragraph which recommends specific amendments to the resolutions before you today. We now write separately to explain why we believe that the prudent and lawful course is to amend the resolutions as recommended.

As attached to the Staff Reports, both resolutions state that you "approve" Alternative 2A/4T as the Locally Preferred Plan for modification of the existing project. Respectfully, you may not approve that or any other alternative as the plan today.

First, the California Environmental Quality Act requires that you take final action to approve a project that may affect environmental quality, only once you have certified a final Environmental Impact Report (EIR). The U.S. Army Corps of Engineers (ACE) and the Counties have just begun the environmental review process and have not published even a draft EIR. Accordingly, you may not make a binding commitment to Alternative 2A/4T, even if you consider that to be the project description that begins the environmental review.

Second, the ACE has not completed its Feasibility Study of Alternative 2A/4T as required by its own Engineer Regulations. The May 12, 2003 financial analysis cited in your Staff Reports is preliminary and does not include detailed or current estimates of certain costs and benefits, as required by those regulations. For example, that analysis assumes that Operation and Maintenance (O&M) will average .75% of capital cost on an annualized basis. As reported in the March 5, 2004 memorandum attached to your Staff Reports, the ACE, Counties, and other experts now believe that sediment removal, which is part of the O&M cost, will be a significantly greater level of effort than previously understood, although the effort may vary depending on the channel design. Plainly, the O&M cost, which will largely fall to the Counties, should be accurately estimated for Alternative 2A/4T and any other reasonable alternative, before you approve a plan and thus assume the cost responsibility. Further, the ACE's May 12, 2003 analysis of Alternative 2A/4T does not include any explicit cost estimate for the environmental mitigation necessary for compliance with the Clean Water Act and Endangered Species Act. As a result, because even the ACE's Feasibility Study is at an early stage, it would be premature for the Counties to approve Alternative 2A/4T.

Third, approval of Alternative 2A/4T as the Locally Preferred Plan would undercut the collaborative effort of the APV Task Force, which includes the Counties, ACE, Resource Agencies, and other affected stakeholders. As reported in its March 1, 2004 Letter of Intent, the Task Force will cooperate in the further study and discussion of Alternative 2A/4T and other reasonable alternatives (as required by CEQA) during the environmental review process. At the conclusion of that collaborative effort, the Task Force intends to submit a joint recommendation for a Locally Preferred Plan.

In short, we respectfully request that you amend your resolutions as recommended by the APV Task Force. If you have any questions, please contact any of the undersigned.

Respectfully submitted,

Sierra Club Pajaro River Watershed Committee

Lois Robin, Co-Chair, (831) 464-1184

JoAnn Baumgarten, Co-Chair
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cc: Action Pajaro Valley Task Force

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Sediment Transport Characteristics of Reach Four of the Pajaro River Flood Plan: An Assessment Based on Two-Dimensional Modeling

Prepared for

RMC Water and Environment
and
Pajaro River Watershed Flood Prevention Authority

Prepared by

Philip Williams & Associates, Ltd.
with
DHI Water and Environment

May 13, 2005
Revised June 3, 2005

PWA Ref. #1767

Services provided pursuant to this Agreement are intended solely for the use and benefit of RMC Water and Environment and the Pajaro River Watershed Flood Prevention Authority.

No other person or entity shall be entitled to rely on the services, opinions, recommendations, plans or specifications provided pursuant to this agreement without the express written consent of Philip Williams & Associates, Ltd., 720 California Street, 6th Floor, San Francisco, CA 94108

Funding for this project has been provided in full or in part through a contract with the SWRCB pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control and Watershed Program. The contents of this document do not necessarily reflect views and policies of the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

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FIGURES

1. INTRODUCTION AND SUMMARY

This report describes the results of Sediment Transport Characteristics of Reach Four of the Pajaro River Flood Plan: An Assessment Based on Two-Dimensional Modeling, completed as part of Task 4.3: Pajaro River Watershed Sediment Studies as part of the Pajaro River Watershed Study.It is one of three sediment studies currently being conducted as part of a comprehensive study of the watershed for the Pajaro River Watershed Flood Prevention Authority. PWA, as a subconsultant to RMC Water and Environment, was tasked with 1) conceptually evaluating the sediment dynamics of the existing conditions and several proposed alternatives in one reach and 2) providing information that can be used to refine or amend the project design.

Previous phases of the Pajaro River Watershed Study, authorized by the Pajaro River Watershed Flood Prevention Authority (Authority), have identified potential flood control projects, compared them at a conceptual level, and developed the definition of the selected project known as the Soap Lake Floodplain Preservation Project. The Authority has also been participating in the Lower Pajaro River Flood Protection Project. The sediment study described in this report complements the Lower Pajaro Project by partially addressing some of their channel maintenance concerns and furthers the Authority's understanding of how various processes operate and interact within the watershed.

1.1 BACKGROUND TO THE CURRENT REPORT

The Pajaro River flooded in 1995 and again in 1998, causing damage and one fatality in the towns of Watsonville and Pajaro. One factor in the flooding was an increase in vegetation that had grown in the channel, reducing flood capacity below the original level of the 1940s flood control project. Associated with vegetation growth, there is believed to have been sediment deposition in both the channel and on the floodplain within the levees, though the exact balance between sediment deposition and removal is not clear. In response, the U.S. Army Corps of Engineers (USACE) developed a flood plan for the lower 12 miles of the Pajaro River. The project preferred plan (USACE 2A) involves setting back the existing project levees by 100 feet on both sides of the river, and raising them by 4 feet. It also involves a vegetation management plan that will keep the riparian vegetation to a relatively low level (Manning's n of 0.04 to 0.06), requiring periodic management.

The resource agencies (Regional Water Quality Control Board [RWQCB], California Department of Fish & Game [CDFG], National Oceanic and Atmosphere Administration – Fisheries [NOAA]) and several stakeholders objected to the vegetation clearance requirement of the USACE plan, and the agencies developed a set of performance criteria as a condition for issuing a permit to the project. These included the development and preservation of a wide, mature riparian corridor alongside the river. The performance criteria also called for minimal channel maintenance, including mineral sediment removal from the channel. PWA carried out a study (PWA, 2003) to see if the performance criteria could be incorporated into the flood plan. The study showed that a wide riparian corridor on its own would increase roughness, decrease conveyance, and raise water surfaces above the level required for 100-year flood protection (the project design flood). However, the PWA study used a one-dimensional (1D) hydraulic model (HEC-RAS) to demonstrate that it would be possible to convey the design flood if the riparian corridor was developed on lowered benches cut into the old floodplain. This conceptual approach would have the added environmental benefit of reconnecting the river to its floodplain, countering historic channel incision that had disconnected the two.

The issue of sediment transport was investigated by the Action Pajaro Valley-sponsored Stream Team. The Stream Team found that sediment accumulation was a potential problem in terms of both project performance (loss of conveyance over time) and the associated difficulties obtaining permits and winning agency and stakeholder support for in-channel sediment removal.

To develop a better understanding of sediment issues and possible solutions in the watershed, the Pajaro River Watershed Flood Prevention Authority commissioned three additional studies, the first of which is the topic of this report. The reports are:

1. a two-dimensional (2D) hydrodynamic and sediment transport model to assess the bench concept and assess its impact on sediment transport,
2. evaluation of a sediment trap in the upper project reach to prevent sediment accumulation in the flood-prone area, and
3. a sediment model of the San Benito River to assess inputs from this source.

The 2D model was requested in recognition of the fact that sediment erosion, transport and deposition processes in meandering rivers with floodplains or benches are poorly represented by one-dimensional models. One-dimensional models only simulate water and sediment fluxes on one direction (downstream). However, many of the key sediment transport processes relate to secondary currents that flow *across* the channel. An example might be the more rapid and erosive flow on an outside bend compared with slower, depositional flow on an inside bend. To predict the effects of creating benches it is necessary to evaluate these lateral flow processes in a two- or three-dimensional model. For this initial investigation it was not feasible to simulate the entire project reach. The model described in this report is a conceptual level model of one reach, rather than a physically-realistic model of the whole river. Its purpose is to shed light on different conceptual approaches to the flood plan and allow comparisons to be made between them, so that decisions can be made on a sounder technical footing.

1.2 ALTERNATIVES SIMULATED

A 2D coupled hydrodynamic and sediment transport model was developed for Reach Four, a 1.5 mile reach of the Pajaro River, using the MIKE-21C software. The location of the study reach is shown in Figure 1-1. The model simulated the following conditions (shown schematically in Figure 1-2 and as a typical cross-section in Figure 1-3):

1. Existing conditions, based on the USACE topography from 1995 supplemented with cross-sections from 2000.

2. USACE Alternative 2A, (the USACE Preferred Plan) reflecting a 100-foot levee setback on both sides of the river and a 4-foot increase in levee height from the topography modeled in Simulation 1.
3. Benched 2A, taking Alternative 2 and incorporating an 8-foot deep, 100-foot wide bench on one side of the channel.
4. Benched 2A taking Alternative 2 and incorporating a 4-foot deep, 100-foot wide bench on one side of the channel.
5. Benched 2A, taking Alternative 2 and incorporating an 8-foot deep, 100-foot wide bench on both sides of the channel.
6. Benched 2A taking Alternative 2 and incorporating a 4-foot deep, 100-foot wide bench on both sides of the channel.

Each 100-foot bench was simulated with a 50-foot wide riparian tree corridor and a 50-foot grass strip.

1.3 SUMMARY OF RESULTS

- None of the alternatives emerges as a clear favorite in terms of sediment transport characteristics, though it is possible to discern a potential hybrid approach that may combine the best attributes of all approaches.

- The existing channel in this reach slightly erodes in the 1.5-year flood and slightly aggrades in events equal to or larger than the 5-year flood. Given a typical distribution of events the channel will tend to aggrade over time as erosion on smaller events does not fully counter deposition on larger events. Of all the alternatives studied, the existing conditions will require the greatest amount of in-channel sediment removal over time, though this amount will not be extreme (in the order of a few feet per hundred years). In addition, the existing condition has a tendency to develop some erosion problems on the two sharpest meander bends during very large (100-year or so) flood events.

- The USACE 2A alternative is more geomorphically-stable than existing conditions, both vertically and laterally, and has average sediment trapping properties among the alternatives considered (better than existing conditions). It would require less in-channel sediment removal than existing conditions, and more sediment would be trapped on the benches where removal would be less environmentally damaging. However, it would not support much more riparian vegetation than the existing conditions, and the floodplain would be relatively disconnected from flows.

- Alternatives 3 and 5, with 8-foot deep benches, would trap more sediment and reduce sediment loading downstream, as well as increasing habitat value by allowing greater amounts of riparian vegetation in contact with the river. However, benches might promote lateral erosion on the two sharpest meander bends if they were continuous.

Alternative 5 in particular has very good sediment and habitat properties, but potentially suffers from the greatest lateral instability on sharp meander apexes.

- Alternatives 4 and 6, with 4-foot deep benches, would potentially promote slight channel incision, and generally have poor sediment transport characteristics for this setting, especially by exporting sediment downstream where it would require removal.

- The benching concept offers a way to maintain flood protection, reduce sediment load and increase habitat value. However, care must be taken to design the benches so that they do not accelerate erosion in the five sharp meander bends from Murphy Crossing downstream. In these bends either additional bank protection may be needed or the benches may need to be discontinuous.

2. INVESTIGATION METHODS

2.1 DESCRIPTION OF MIKE 21C MODEL

MIKE 21C is a two-dimensional curvilinear grid model specifically developed by DHI Water & Environment (DHI) to simulate river morphology. The hydrodynamic model solves the vertically-integrated equations of continuity and conservation of momentum (the Saint Venant equations) in two directions and includes descriptions for helical flow and vertical velocity profiles. These descriptions are important for simulating the physical processes associated with secondary flow in meandering systems. The morphological model, following calculation of bed material transport (bedload and suspended load), solves the equation for sediment continuity.

Two-dimensional models such as MIKE 21C are applicable to sediment transport modeling of the Pajaro River. This alluvial river has numerous meander bends inside levee walls. Some of these meanders have a small radius and have experienced erosion in recent history. The river also has graded sediments ranging from fine sands to coarse gravels whose transport can be successfully described by the available formulas in MIKE 21C.

2.2 INPUTS FOR THE 2D PAJARO RIVER MODEL

2.2.1 Project Location

The Pajaro River flood plan is being developed for the Pajaro River from its mouth at the Pacific Ocean approximately 11 miles upstream to Murphy Crossing. The Pajaro River forms the border between Santa Cruz and Monterey Counties in this location. The model is conceptual, in that its purpose is to shed light on the processes acting on the river as a whole rather than to prescriptively develop a plan for one reach. Therefore, the project reach is somewhat arbitrary. We simulated a large double meandering one mile downstream of Murphy Crossing because this offered an opportunity to assess sediment trapping processes on both bends and straight sections, and because previous one-dimensional models of the Pajaro River have not been able to assess the effects of lateral erosion and deposition processes in bends. The Pajaro River and the test reach are shown in Figure 1-1.

2.2.2 Model Boundaries

The study reach is approximately bounded by USACE Monument Nos. #2067 and #2082. This corresponds to a 2260 meter (1.40 miles) long reach over which channel and bench sedimentation were investigated. The model boundaries were extended beyond these limits to minimize boundary effects within the study reach. The model is approximately bounded by USACE Monument Nos. #2056 and #2084. This corresponds to a 4130 meter (2.56 miles) long reach with buffer reaches 630 meters (0.39 miles) long upstream and 1240 meters (0.77 miles) long downstream of the study reach.

2.2.3 Bathymetry

The bathymetry for the model was derived from the USACE's 1995 Digital Terrain Model (DTM) of the Pajaro River (Towill, Inc., 2002). The DTM was regenerated in GIS using ASCII files with the addition of a thalweg profile. The thalweg profile, as derived from cross-section surveys, was incorporated to represent the low flow channel that was missing from the DTM. The thalweg profile was noted to have an average bed slope of 0.1 percent. The bathymetry was then modified for each of the flood plan scenarios as detailed in Table 2-1 and Figure 1-2.

Table 2-1. Bathymetric Conditions for each Flood Plan Scenario

Scenario	Bathymetric Conditions
Alt1 (Existing)	Bathymetry based on 1995 conditions for the Pajaro River and modified to include a thalweg profile to represent the low flow channel.
Alt2 (Plan 2A)	Same as Alt1, but levees setback 100 feet and new benches at same elevation as adjacent floodplain outside the levees, covered in grass.
Alt3	Same as Alt2, but 100-foot wide right bank bench lowered 8 feet below existing grade with the 50 feet closest to the channel comprised of riparian trees, and the remaining 50 feet covered in grass. This design would require 267,000 cubic yards (cy) of excavation in the study reach.
Alt4	Same as Alt2, but 100-foot wide right bank bench lowered 4 feet below existing grade with the 50 feet closest to the channel comprised of riparian trees, and the remaining 50 feet covered in grass. This design would require 133,000 cubic yards (cy) of excavation in the study reach.
Alt5	Same as Alt2, but 100-foot wide right and left bank benches lowered 8 feet below existing grade with the 50 feet closest to the channel comprised of riparian trees, and the remaining 50 feet covered in grass. This design would require 501,000 cubic yards (cy) of excavation in the study reach.
Alt6	Same as Alt2, but 100-foot wide right and left bank benches lowered 4 feet below existing grade with the 50 feet closest to the channel comprised of riparian trees, and the remaining 50 feet covered in grass. This design would require 250,000 cubic yards (cy) of excavation in the study reach.

2.2.4 Hydrodynamic Boundary Conditions

Hydrodynamic boundary conditions for the flood plan scenarios listed in Table 2-1 for the 1.5-, 5-, 10-, 50-, and 100-year events were derived from unsteady simulations using the USACE HEC-RAS models for existing (Alt1) and levee setback (Alt2) conditions. The unsteady simulations were modeled with synthetic hydrographs that were derived from the typical hydrologic response associated with each annual flood event as observed at the Chittenden gage (this study). The peak discharge for each flood event was based on the USACE latest flow frequency estimates for the Pajaro River Basin (USACE, 1997; USACE, 2003), which are detailed in Table 2-2. The antecedent flow for each synthetic hydrograph was assumed to be 8.5 cms (300 cfs), which approximately corresponds to the average annual wet season flow as observed at the Chittenden gage (this study). Synthetic hydrographs were also approximated for Salsipuedes Creek by scaling the typical hydrologic response observed at the Chittenden gage.

Table 2-2. Flow Frequency Estimates for the Pajaro River Basin (USACE, 2003)

Recurrence Interval	Pajaro River at Chittenden		Salsipuedes Creek at Pajaro River		Pajaro River below Salsipuedes Creek	
(years)	(cms)	(cfs)	(cms)	(cfs)	(cms)	(cfs)
1.5[1]	48.1	1,700	not reported	not reported	53.8	1,900
5	305.8	10,800	66.5	2,350	348.3	12,300
10	492.7	17,400	99.1	3,500	557.8	19,700
50	948.6	33,500	192.6	6,800	1076.0	38,000
100	1135.5	40,100	236.4	8,350	1288.4	45,500

[1] Estimated from flow frequency curve (USACE, 2003) Note: The USACE prediction is different from the Authority estimate due to differences in definition of the 100-year flood.

Prior to performing the unsteady simulations, the USACE's HEC-RAS models were modified by removing the bridges to simplify the unsteady simulations and by changing the roughness coefficients to match the design conditions. The bridges were deemed far enough downstream not to significantly influence the hydraulic conditions in the vicinity of the study reach. In the study reach, the roughness coefficients were set to design conditions, which for the study reach equates to 0.04 for the channel and overbanks and 0.075 for the riparian vegetation along the banks.

During the unsteady simulations the timing of the synthetic hydrographs for the Pajaro River at Chittenden and Salsipuedes Creek were adjusted such that the peak discharges downstream of the confluence approximately matched the estimates in Table 2-2. Following these timing adjustments, time series of water level and discharge were extracted from the HEC-RAS models at USACE Monument Nos. #2056 and #2084 and used as boundary conditions to the MIKE 21C model. The upstream boundary conditions for Alt1 are shown by Figure 2-1; these boundary conditions are similar to those for Alt2. The Alt2 boundary conditions were similarly used for Alts 2-6.

To provide useful comparisons among the different alternatives, hydraulic conditions for Alt1 and Alt2 were simplified to be more conceptual. This was primarily achieved by setting the roughness coefficients for Alt1 and Alt2 to 0.04 for the entire 2D model domain. Since sediment transport is a function of roughness and as-modeled in-channel roughness elements remain constant in time and space, this was assumed a valid approach, especially considering that the channel can migrate in the model. For the remaining alternatives, the roughness coefficients were set to 0.04 for the channel and benches and 0.075 for the vegetative strips. It is important to note in the results that follow, that vegetation was only modeled as an increase in roughness, not as an increase in critical shear stress. In reality vegetation both reduces shear stress and increases critical shear stress (erosion resistance) reducing erosion on vegetated areas such as the bands and riparian corridors. However, this process was too complicated to model at the conceptual level. Thus some of the simulated bank erosion rates are likely to be higher than real rates would be. They do, however, allow relative comparisons to be made between alternatives.

2.2.5 Sediment Boundary Conditions

Sediment transport boundary conditions for the MIKE 21C model for the 1.5-, 5-, 10-, 50-, and 100-year events were derived from a coarse load rating curve developed for the Chittenden gage (RMC, 2002). This rating curve was developed for material larger than 0.062 mm and is given below as:

$$Q_s = aQ^b \tag{1}$$

where Q_s is the total sediment load in m^3/s or tons/day assuming a sediment density of 2650 kg/m^3, Q is discharge in cms or cfs, a is 7.21E-06 or 0.007 for Q_s in cms or tons/day, and b is 1.56. Equation 1 was applied to the discharge boundary conditions to estimate the coarse sediment load into the model. The coarse load was then distributed into four representative size classes that are defined later.

In general, the Pajaro River can be characterized as having a fine bed reach from the Pacific Ocean upstream to USACE Monument No. #2045 and a coarse bed reach upstream of this station to the upstream project boundary at Murphy Crossing. The reach average d_{50} for the fine and coarse reaches are 0.6 and 3.8 mm, respectively, for the full particle distributions provided in Figure 2-2. These distributions are based on samples reported in a prior report (PWA, 1997). Since material less than 0.062 mm was defined as washload, it was excluded from the analysis and is reflected in Figure 2-3. Figure 2-3 shows that the bed material in the coarse reach is slightly bimodal. The distribution was reduced to four representative size classes as shown by Table 2-3. The coarse reach percentages were used to define the distribution of the bed material and the fine reach percentages were used to approximate the distribution of the incoming coarse load.

Table 2-3. Representative Size Classes for Sediment Transport

Size Classes	Fine Reach (%)	Coarse Reach (%)	Particle Size (mm)
VFS, FS	6.6	2.8	0.16
MS, CS, VCS	84.2	35.7	0.61
VFG, FG, MG	9.0	45.3	5.1
CG, VCG	0.2	16.2	25.3

The Engelund & Hansen (1967) total load equation was used to model the sediment transport through the study reach. This total load equation is applicable for graded sediments ranging from 0.062 to 32 mm and is regarded as an appropriate model for rivers with the characteristics of the Pajaro River (Yang & Huang, 2001).

In this study, the following assumptions/limitations were imposed in MIKE 21C:

1. The system is fully alluvial except for the benches where only newly deposited material may erode.
2. Bank erosion was not described by a separate bank erosion model: erosion occurs where boundary shear stress exceeds critical shear stress. Neither the effects of vegetation on stabilizing stream banks or the mass failure of over-steepened stream banks are simulated. Thus, the model tends to overestimate hydraulic erosion of vegetated banks and benches, while potentially underestimating bank failure in over steepened conditions.
3. The bench tops are simulated as vertically non-erodible. Lateral bank erosion can migrate into them from the side. Erosion of deposited sediment can occur from the top, but only down to the initial grade. This assumption is based on the rationale that while lateral forces can undercut a vegetated bank, downwards erosion of a vegetated bench surface is highly unlikely.

An example of starting and end of run bathymetry output from MIKE 21C is shown in Figure 2-4, and bed scour plots from three alternatives are shown in Figure 2-5.

3. SIMULATION OF ALTERNATIVES

The six alternatives were simulated in MIKE 21C using the geometry and boundary conditions described above, and the results for each are presented in sequence below.

To assess the long term rates of sedimentation and erosion and allow comparison between alternatives, a set of simple assumptions were made regarding flood frequency. The frequency of events in a 100-year period was calculated (e.g. 67 1.5-year events, 20 5-year events) and the frequency multiplied by the sediment volume eroded or deposited. The sequence of events and associated sediment volumes was then summed for a 100- year period to give an approximate cumulative sediment budget. This method, though simplistic, allows us to weight the effects of small but frequent events and large but infrequent events to obtain an approximate average effect.

For each simulation the volume and depth of the surface was recorded, divided into channel, left bench area, right bench area and both bench areas. In some cases this definition is complicated since the channel migrates laterally during very high flows, so that the ending channel may occupy the position formerly defined as the right bench. In this instance the original definitions of location are used. The left and right benches show different values for two reasons. Firstly, more sediment is deposited on inside bends, and the reach selected has two inside bends on the left bank and one on the right bank. Secondly, the simulations of one lowered bench (Alternatives 3 and 4) assumed a right bank bench. In the description and analysis below the combined values for both benches are used.

Lateral channel stability was assessed by comparing the amount of bank top retreat during the 100-year flood. The amount of bank retreat on the outside of the two right bank meanders was measured, and the average of the two recorded. As noted above, the bank top retreat values are probably overestimates, as the model only accommodated increased hydraulic roughness, not increased erosion resistance.

3.1 EXISTING CONDITIONS

Under existing conditions (no levee setbacks, no lowered floodplain benches), the bed of the Pajaro River in the study reach is effectively vertically-stable (erosion of 0.02 feet) during the 1.5-year recurrence interval flood. This change lies within the uncertainty of the model. During larger floods the channel bed becomes slightly aggradational, with 0.24 feet of channel deposition in the 5-year flood, increasing to 0.64 feet in the 100-year flood. Assuming a typical distribution of flood events over 100 years (see description above), the channel in the study reach would aggrade by 541,886 cubic yards per century (5,418 cubic yards per year over a 1.4-mile reach). This is a low level of aggradation relative to the uncertainty associated with the model.

The channel is laterally-stable at the 1.5-year flood, with little migration. More significant erosion occurs during the 5-year flood, focused on the outside and downstream bends. During the 100-year flood the channel bank top does not retreat, but there is significant thalweg migration towards the outside bend that steepens the bank. For example, at the upstream meander bend the thalweg was predicted to erode laterally by 64 feet during the simulation, creating a near vertical bank.

Under existing conditions the benches are vertically-stable during the 1.5-year flood, as flow does not reach them. Under the 5-year flood water reaches the benches, but sedimentation is negligible until the 50-year flood (0.46 feet). During the 100-year flood 0.77 feet of deposition takes place on the benches. Most deposition occurs on the inside bend benches. Assuming a typical distribution of flood events over 100 years, the benches in the study reach would aggrade by 62,895 cubic yards per century (629 cubic yards per year over a 1.4-mile reach). This is a very low level of aggradation relative to the uncertainty associated with the model. The benches trap up to 16% of sediment passing through the reach during the 100-year flood.

Figure 3-1 shows the resulting changes at three cross-sections within the reach (upstream meander bend, cross over point, and third meander bend, respectively). Tables 3-1 and 3-2 show the results in the study reach by zone with regard to changes in net bed volume above an arbitrary datum, and average depth, respectively.

Table 3-1. Alternative 1 Depositional Trends – Net Change in Bed Volume by Zone

Recurrence	Net Change in Bed Volume by Zone (y^3)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-1,726	0	0	0
5	16,956	150	29	179
10	20,127	636	1,022	1,657
50	35,448	2,787	8,902	11,689
100	45,697	4,765	14,595	19,362

Table 3-2. Alternative 1 Depositional Trends – Average Change in Bed Depth by Zone

Recurrence	Average Change in Bed Depth by Zone (ft)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-0.02	0.00	0.00	0.00
5	0.24	0.01	0.00	0.01
10	0.28	0.05	0.09	0.07
50	0.50	0.21	0.74	0.46
100	0.64	0.36	1.22	0.77

3.2 USACE 2A ALTERNATIVE

Under USACE Alternative 2A (100-foot levee setback, no lowered benches) the bed of the Pajaro River in the study reach is effectively vertically-stable (erosion of 0.03 feet) during the 1.5-year recurrence interval flood. This change lies within the uncertainty of the model. During larger floods the channel bed becomes slightly aggradational, with 0.18 feet of channel deposition in the 5-year flood, increasing to 0.40 feet in the 100-year flood. Assuming a typical distribution of flood events over 100 years, the channel in the study reach would aggrade by 378,330 cubic yards per century (3,783 cubic yards per year over a 1.4-mile reach). This is a relatively low level of aggradation relative to the uncertainty associated with the model.

The channel is laterally-stable at the 1.5-year flood, with little migration. More significant erosion occurs during the 5-year flood, focused on the outside and downstream bends. During the 100-year flood there is no bank top retreat on the outside meander bends, but the thalweg was predicted to laterally erode into the bank by an average of 47 feet, creating near-vertical banks.

Under USACE Alternative 2A the benches are vertically-stable during the 1.5-year flood, as flow does not reach them. Under the 5-year flood water reaches the benches, but sedimentation is negligible until the 50-year flood (0.39 feet). During the 100-year flood 0.41 feet of deposition takes place on the benches. Most deposition occurs on the inside bend benches. Assuming a typical distribution of flood events over 100 years, the benches in the study reach would aggrade by 278,831 cubic yards per century (2,788 cubic yards per year over a 1.4-mile reach). This is a very low level of aggradation given the uncertainty associated with the model. The benches trap up to 33% of the sediment passing through the reach, being most efficient during the 50-year flood and declining slightly to 26% during the 100-year event.

Figure 3-2 shows the resulting changes at three cross-sections within the reach (upstream meander bend, cross over point, and third meander bend, respectively). Tables 3-3 and 3-4 show the results in the study reach by zone with regard to changes in net bed volume and average depth, respectively.

Table 3-3. Alternative 2 Depositional Trends – Net Change in Bed Volume by Zone

Recurrence	Net Change in Bed Volume by Zone (y^3)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-2,085	0	0	0
5	12,623	2,811	674	3,484
10	15,555	6,324	5,075	11,399
50	39,892	9,960	21,126	31,086
100	28,345	8,209	24,775	32,984

Table 3-4. Alternative 2 Depositional Trends – Average Change in Bed Depth by Zone

Recurrence Interval (years)	Average Change in Bed Depth by Zone (ft)			
	Channel	Right Bench	Left Bench	Both Benches
1.5	-0.03	0.00	0.00	0.00
5	0.18	0.07	0.02	0.04
10	0.22	0.15	0.13	0.14
50	0.56	0.23	0.56	0.39
100	0.40	0.19	0.66	0.41

3.3 ALTERNATIVE 3

Under Alternative 3 (100-foot levee setback, with 100-foot wide by 8-foot deep bench on one side of the river) the bed of the Pajaro River in the study reach is effectively vertically-stable (erosion of 0.05 feet) during the 1.5-year recurrence interval flood. This change lies within the uncertainty of the model. During larger floods the channel bed becomes slightly aggradational, with 0.17 feet of channel deposition in the 5-year flood, increasing to 0.95 feet in the 100-year flood. Assuming a typical distribution of flood events over 100 years, the channel in the study reach would aggrade by 404,615 cubic yards per century (4,046 cubic yards per year over a 1.4-mile reach). This is a relatively low level of aggradation relative to the uncertainty associated with the model. By comparison, the volume of sediment removed to create the benches would be 265,000 cubic yards.

The channel is laterally-stable at the 1.5-year flood, with little migration. More significant erosion occurs during the 5-year flood, focused on the outside and downstream bends. During the 100-year flood the bank tops on the outside meander bends were predicted to retreat by an average of 61 feet, eroding into the lowered bench.

Under Alternative 3 the benches are vertically-stable during the 1.5-year flood, as flow does not reach them. Under the 5-year flood water reaches the benches, but sedimentation is negligible until the 50-year flood (0.42 feet). During the 100-year flood 0.49 feet of deposition takes place on the benches. Most deposition occurs on the inside bend benches. Assuming a typical distribution of flood events over 100 years, the benches in the study reach would aggrade by 383,139 cubic yards per century (3,831 cubic yards per year over a 1.4-mile reach). This is a very low level of aggradation relative to the uncertainty associated with the model. The benches trap up to 35% of the sediment passing through the reach, being most efficient during the 1.5-year flood and declining slightly to 21% during the 5-year event.

Figure 3-3 shows the resulting changes at three cross-sections within the reach (upstream meander bend, cross over point, and third meander bend, respectively. Tables 3-5 and 3-6 show the results in the study reach by zone with regards to changes in net bed volume and average depth, respectively.

Table 3-5. Alternative 3 Depositional Trends – Net Change in Bed Volume by Zone

Recurrence	Net Change in Bed Volume by Zone (y^3)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-3,397	379	0	379
5	11,863	6,197	119	6,315
10	23,006	10,840	1,644	12,484
50	48,016	19,369	14,466	33,835
100	67,715	20,883	18,160	39,042

Table 3-6. Alternative 3 Depositional Trends – Average Change in Bed Depth by Zone

Recurrence	Average Change in Bed Depth by Zone (ft)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-0.05	0.01	0.00	0.00
5	0.17	0.14	0.00	0.08
10	0.32	0.25	0.04	0.15
50	0.68	0.45	0.39	0.42
100	0.95	0.48	0.49	0.49

3.4 ALTERNATIVE 4

Under Alternative 4 (100-foot levee setback, with 100-foot wide by 4-foot deep bench on one side of the river) the bed of the Pajaro River in the study reach is effectively vertically-stable (erosion of 0.07 feet) during the 1.5-year recurrence interval flood. This change lies within the uncertainty of the model. The bed is slightly erosive during the 5-year flood (0.14 feet of degradation), with 0.08 feet of erosion during the 10-year flood. The bed is slightly aggradational during the 50 and 100-year floods, with 0.1 feet and 0.25 feet of aggradation respectively. Assuming a typical distribution of flood events over 100 years, the channel in the study reach would erode by 533,558 cubic yards per century (5,335 cubic yards per year over a 1.4-mile reach). This is a low level of degradation relative to the uncertainty associated with the model. By comparison, the volume of sediment removed to create the benches would be 133,000 cubic yards.

The channel is laterally-stable at the 1.5-year flood, with little migration. More significant erosion occurs during the 5-year flood, focused on the outside and downstream bends. During the 100-year flood the bank tops on the outside meander bends were predicted to retreat by an average of 41 feet, eroding into the lowered bench.

Under Alternative 4 the benches are vertically-stable during the 1.5-year flood, as flow does not reach them. Under the 5-year flood water reaches the benches, but sedimentation is negligible until the 50-year flood (0.36 feet). During the 100-year flood 0.46 feet of deposition takes place on the benches. Assuming a typical distribution of flood events over 100 years, the benches in the study reach would aggrade by 314,883 cubic yards per century (3,148 cubic yards per year over a 1.4-mile reach). This is a very low level of aggradation relative to the uncertainty associated with the model. The benches trap up to 34% of the sediment passing through the reach, being most efficient during the 5-year flood and declining slightly to 28% during the 100-year event.

Figure 3-4 shows the resulting changes at three cross-sections within the reach (upstream meander bend, cross over point, and third meander bend, respectively). Tables 3-7 and 3-8 show the results in the study reach by zone with regards to changes in net bed volume and average depth, respectively.

Table 3-7. Alternative 4 Depositional Trends – Net Change in Bed Volume by Zone

Recurrence	Net Change in Bed Volume by Zone (y^3)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-4,579	3	0	3
5	-10,284	5,003	723	5,726
10	-5,445	6,225	4,278	10,503
50	7,102	11,473	17,732	29,205
100	17,651	12,734	24,011	36,746

Table 3-8. Alternative 4 Depositional Trends – Average Change in Bed Depth by Zone

Recurrence	Average Change in Bed Depth by Zone (ft)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-0.07	0.00	0.00	0.00
5	-0.14	0.11	0.02	0.07
10	-0.08	0.14	0.11	0.13
50	0.10	0.27	0.47	0.36
100	0.25	0.30	0.64	0.46

3.5 ALTERNATIVE 5

Under Alternative 5 (100-foot levee setback, with 100-foot wide by 8-foot deep benches on both sides of the river) the bed of the Pajaro River in the study reach is effectively vertically-stable (erosion of 0.05 feet) during the 1.5-year recurrence interval flood. This change lies within the uncertainty of the model. During larger floods the channel bed becomes slightly aggradational, with 0.09 feet of channel deposition in the 5-year flood, increasing to 0.9 feet in the 100-year flood. Assuming a typical distribution of flood events over 100 years, the channel in the study reach would aggrade by 303,819 cubic yards per century (3,038 cubic yards per year over a 1.4-mile reach). This is a low level of aggradation relative to the uncertainty associated with the model. By comparison, the volume of sediment removed to create the benches would be 501,000 cubic yards.

The channel is laterally-stable at the 1.5-year flood, with little migration. More significant erosion occurs during the 5-year flood, focused on the outside and downstream bends. During the 100-year flood the bank tops on the outside meander bends were predicted to retreat by an average of 69 feet, eroding into the lowered benches.

Under Alternative 5 the benches are vertically-stable during the 1.5-year flood, as flow does not reach them. Under the 5-year flood significant amounts of flood water reach the benches and 0.22 feet of deposition occurs, growing to 0.77 feet in the 100-year flood. Most deposition occurs on the inside bend benches. Assuming a typical distribution of flood events over 100 years, the benches in the study reach would aggrade by 864,566 cubic yards per century (8,646 cubic yards per year over a 1.4-mile reach). Though still not a very large amount of sediment, this is a significant increase in deposition compared with the other alternatives. The benches trap up to 86% of the sediment passing through the reach, being most efficient during the 1.5-year flood and declining slightly to 39% during the 100-year event.

Figure 3-5 shows the resulting changes at three cross-sections within the reach (upstream meander bend, cross over point, and third meander bend, respectively). Tables 3-9 and 3-10 show the results in the study reach by zone with regards to changes in net bed volume and average depth, respectively.

Table 3-9. Alternative 5 Depositional Trends – Net Change in Bed Volume by Zone

Recurrence Interval (years)	Net Change in Bed Volume by Zone (y^3)			
	Channel	Right Bench	Left Bench	Both Benches
1.5	-3,766	374	235	610
5	6,270	7,905	10,083	17,988
10	23,758	13,541	15,248	28,788
50	64,080	22,945	33,978	56,925
100	63,716	21,136	41,302	62,439

Table 3-10. Alternative 5 Depositional Trends – Average Change in Bed Depth by Zone

Recurrence Interval (years)	Average Change in Bed Depth by Zone (ft)			
	Channel	Right Bench	Left Bench	Both Benches
1.5	-0.05	0.01	0.01	0.01
5	0.09	0.18	0.27	0.22
10	0.33	0.31	0.41	0.36
50	0.90	0.53	0.91	0.71
100	0.90	0.49	1.10	0.77

3.6 ALTERNATIVE 6

Under Alternative 6 (100-foot levee setback, with 100-foot wide by 4-foot deep benches on both sides of the river) the bed of the Pajaro River in the study reach is effectively vertically-stable (erosion of 0.07 feet) during the 1.5-year recurrence interval flood. This change lies within the uncertainty of the model. The bed is slightly erosive during the 5- and 10-year floods (0.31 and 0.19 feet respectively). The bed is slightly aggradational during the 50- and 100-year floods, with 0.42 feet and 0.12 feet of aggradation respectively. Assuming a typical distribution of flood events over 100 years, the channel in the study reach would erode by 847,857 cubic yards per century (8,479 cubic yards per year over a 1.4-mile reach). This erosive trend is more defined than the trend for Alternative 4. This is a moderate level of degradation relative to the uncertainty associated with the model. By comparison, the volume of sediment removed to create the benches would be 250,000 cubic yards.

The channel is laterally-stable at the 1.5-year flood, with little migration. More significant erosion occurs during the 5-year flood, focused on the outside and downstream bends. During the 100-year flood the bank tops on the outside meander bends were predicted to retreat by an average of 41 feet, eroding into the lowered benches.

Under Alternative 6 the benches are vertically-stable during the 1.5-year flood, as flow does not reach them. Under the 5-year flood water reaches the benches, with 0.14 feet of deposition. Deposition increases with flood size, reaching 0.49 feet at the 100-year flood. Assuming a typical distribution of flood events over 100 years, the benches in the study reach would aggrade by 548,018 cubic yards per century (5,480 cubic yards per year over a 1.4-mile reach). This is a moderately high rate of aggradation relative to the uncertainty associated with the model. The benches trap up to 87% of the sediment passing through the reach, being most efficient during the 5-year flood and declining slightly to 31% during the 100-year event.

Figure 3-6 shows the resulting changes at three cross-sections within the reach (upstream meander bend, cross over point, and third meander bend, respectively). Tables 3-11 and 3-12 show the results in the study reach by zone with regards to changes in net bed volume and average depth, respectively.

Table 3-11. Alternative 6 Depositional Trends – Net Change in Bed Volume by Zone

Recurrence	Net Change in Bed Volume by Zone (y^3)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-5,123	10	0	10
5	-22,056	5,653	6,085	11,738
10	-13,401	8,561	11,496	20,056
50	30,080	14,836	21,273	36,109
100	8,664	13,150	26,642	39,792

Table 3-12. Alternative 6 Depositional Trends – Average Change in Bed Depth by Zone

Recurrence	Average Change in Bed Depth by Zone (ft)			
Interval (years)	Channel	Right Bench	Left Bench	Both Benches
1.5	-0.07	0.00	0.00	0.00
5	-0.31	0.13	0.16	0.14
10	-0.19	0.20	0.31	0.25
50	0.42	0.34	0.57	0.45
100	0.12	0.31	0.71	0.49

A summary of all changes in bed elevation and volume is shown in Figures 3-7 and 3-8. Changes in bench elevation and volume are shown in Figures 3-9 and 3-10.

4. DISCUSSION OF RESULTS

4.1 INTRODUCTION

The discussion below qualitatively and quantitatively assesses the sediment transport data in terms of potential project performance. We have ranked the alternatives based on the following criteria:

- Vertical channel stability. Channels are evaluated based on the degree of change in bed sediment storage, with the highest score given to the lowest changes.
- Horizontal channel stability. Channels are evaluated based on change in bank top position and qualitatively by change in overall channel cross-section. The highest scores are given to the channels with the smallest changes in channel cross-section and bank top position.
- Bench sediment trapping. On the assumption that the entire Pajaro River flood project experiences some excess in sediment delivery over capacity, and that sediment can be removed from the benches with less cost and environmental impact than from the channel, we have ranked sediment trapping on the benches as a benefit.
- Sediment export downstream. This is the total of erosion less deposition in the project reach. We have assumed that, since the entire project reach is affected by excess sedimentation, it is desirable to lower the sediment yield from the reach.

A summary of the volumes of sediment deposited and trapped is shown in Figure 4-1.

4.2 EXISTING CONDITIONS

Under existing conditions the Pajaro River is somewhat aggradational and laterally unstable during large flood events. Under typical annual conditions the bed is stable to slightly erosive, while during higher flows (5 years and above) it becomes aggradational. We would expect the river to aggrade during large events and then partially recover in the intervening lower flow years. Over time the bed has a tendency to aggrade, and will likely require periodic sediment removal to maintain flood capacity. However, the amount of deposition predicted by the model is not great relative to the uncertainty associated with sediment transport models. Compared with the other alternatives, the existing condition traps the most sediment in the channel and the least on the benches. It has amongst the highest downstream sediment yields. Overall the sediment transport characteristics of the current condition do not lend themselves to high geomorphic stability.

4.3 USACE 2A ALTERNATIVE

Compared with existing conditions, the USACE 2A alternative has 30% less channel aggradation over 100 years. It has the second most vertically-stable channel configuration of the alignments tested in this report. The thalweg is relatively unstable during large events and will tend to erode into the outside bends, but at a lesser rate than where lowered benches are present.

USACE 2A has much higher bench deposition rates than existing conditions, increasing from 62,985 cubic yards per century to 278,831 cubic yards per century (a 443% increase). The increase is due to the greater area of low velocity floodplain under Alternative 2A; the depth of deposition is actually slightly lower than under existing conditions. However, compared with the other alternatives the increase is relatively small; this alternative has the 5th most effective sediment trapping effect out of 6. Combining the bench and channel trapping, USACE 2A has the 3rd best downstream sediment yield.

Alternative 2A would have a more stable channel than the existing condition, and reduce sediment delivery downstream. As a result both this reach and the downstream reaches would require less frequent sediment removal than under existing conditions. The volume of sediment deposited on the benches would not be particularly burdensome to remove; 0.41 feet after the 100-year flood.

4.4 ALTERNATIVE 3

Compared with existing conditions, Alternative 3 has 25% less channel aggradation over 100 years. It has the third most vertically-stable channel configuration. The channel is predicted to be more laterally-unstable than existing conditions or USACE 2A at the outside meander bends, with 61 feet of retreat in the 100-year flood (ranked 5th out of 6). As discussed above, the lateral erosion values are probably unrealistically high as they omit increases in critical shear stress than can be considerable with vegetation. However, lateral instability could potentially erode much of the lowered bench at the bend apexes, eliminating some of the habitat benefit at this location.

Alternative 3 has much higher bench deposition rates than existing conditions or USACE 2A, increasing from 62,985 cubic yards per century to 383,139 cubic yards per century (a 609% increase over existing conditions). The increase is largely due to the greater surface area of low velocity floodplain under Alternative 3. Compared to existing conditions, the depth of deposition on the benches is slightly higher in events up to and exceeding the 10-year flood, but lower in the 50- and 100-year floor. This is because the lowered bench becomes more active during small events, but becomes slightly less efficient per unit area at higher flows. The bench is the 3rd most effective at trapping sediment, and overall this alternative is the 2nd most effective at reducing downstream sediment yield.

Alternative 3 would thus have a more vertically-stable channel than the existing condition, and reduce sediment delivery downstream. The volume of sediment deposited on the benches would not be particularly burdensome to remove; 0.49 feet after the 100-year flood. Its sediment transport performance is similar to the USACE 2A alternative, though Alternative 3 would allow for a riparian corridor on the lowered bench. However, the model predicts a large amount of lateral migration in the meander apexes, reducing the overall stability of this alternative.

4.5 ALTERNATIVE 4

Compared with existing, aggradational conditions, Alternative 4 has net channel erosion over 100 years. This alternative has the 4th most vertically-stable channel. It also has the 4th most horizontally-stable channel, with a predicted average meander bank top retreat of 42 feet in the 100-year flood.

Alternative 4 has the 4th highest bench deposition rates, increasing from 62,985 cubic yards per century to 314,883 cubic yards per century (a 501% increase). The increase is largely due to the greater area of low velocity floodplain under Alternative 4 as compared to existing conditions. The depth of deposition on the benches is slightly higher in the 10-year flood, but lower in the 50- and 100-year flood. This is because the lowered bench becomes more inundated during the 10-year event, but becomes slightly less efficient per unit area at higher flows.

Alternative 4 would thus have a vertically-stable to slightly erosive channel compared with the existing condition, depositional benches and a relatively high lateral migration rate at the meander bends. The net sediment yield would be slightly higher than at present, exporting an additional 218,675 cubic yards per century (2,187 cubic yards per year) into the downstream reach and potentially reducing its flood capacity. This alternative is ranked 5th best for downstream sediment yield.

Alternative 4 has less desirable sediment transport characteristics than the existing conditions or the USACE 2A alternative.

4.6 ALTERNATIVE 5

Compared with existing conditions, Alternative 5 has 44% less channel aggradation over 100 years, and is ranked highest of all the alternatives for vertical channel stability. It has the lowest ranked horizontal stability, with a predicted average meander bank top retreat of 69 feet under the 100-year flood.

Alternative 5 has the highest bench deposition rates, which increase from 62,985 cubic yards per century for existing conditions to 864,566 cubic yards per century (a 1,375% increase). The increase is due to a combination of greater area of low velocity floodplain under Alternative 3, and greater depth of deposition per unit area, especially in the 5- to 50-year flood range. Overall, Alternative 5 exports the least sediment downstream.

Alternative 5 has the most desirable sediment transport characteristics in all respects except horizontal stability. It would have a more vertically-stable channel than the existing condition, and significantly reduce sediment delivery downstream. The volume of sediment deposited on the benches would not be particularly burdensome to remove; 0.77 feet after the 100-year flood. Its sediment transport performance is an improvement on the USACE 2A alternative, and would allow for a frequently flooded riparian corridor on both lowered benches. As discussed above, the lateral erosion values are probably an overestimate as they omit increases in critical shear stress than can be considerable with vegetation. However, lateral instability could be a significant problem, and would probably require modification of the bench design at sharp outside meander bends.

4.7 ALTERNATIVE 6

Compared with existing, aggradational conditions, Alternative 6 has net channel erosion over 100 years. It has the least vertically-stable channel. It has a relatively large amount of bank retreat, with a predicted average meander bank top retreat of 41 feet under the 100-year flood (ranked 3rd among the alternatives).

Alternative 6 has the 2nd highest bench deposition rates, increasing from 62,985 cubic yards per century under existing conditions to 548,018 cubic yards per century (a 871% increase). The increase is largely due to the greater area of low velocity floodplain under Alternative 6. The depth of deposition on the benches is higher than existing conditions in the 5- and 10-year floods, but lower in the 50- and 100-year flood. This is because the lowered bench becomes more inundated during the 10-year event, but becomes slightly less efficient per unit area at higher flows.

Alternative 6 would thus have an erosive channel compared with the existing condition, and highly depositional benches. The net sediment yield would be higher than at present, exporting 299,838 cubic yards per century (3,000 cubic yards per year). It is ranked lowest of all the alternatives for downstream sediment yield.

Alternative 6 has less desirable sediment transport characteristics than the existing conditions or the USACE 2A alternative.

Table 4-1. Relative Sediment Transport Performance of the Alternatives

Alternative	Vertical channel stability	Lateral channel stability	Bench trapping	Sediment yield downstream	Score (low=good)
Existing condition	5	**1**	6	4	16
USACE 2A	2	**1**	5	3	11
Alt 3	3	5	3	2	13
Alt 4	4	4	4	5	17
Alt 5	**1**	6	**1**	**1**	9
Alt 6	6	3	2	6	17

Note: All columns except "Score" are ranked 1=best, 6=worst. The score is the unweighted sum of the rankings. The matrix assumes minimal bed change in sediment volume, minimum lateral movement, maximum bench trapping, and minimum sediment yield downstream are the most desirable conditions.

4.8 APPLICABILITY OF THIS STUDY TO THE DOWNSTREAM REACH

The main findings of this study (general sediment trends and differences between the alternatives) are relevant to the lower reaches of the project, but with some caveats. In general we would expect the rank order of the Alternatives' sediment performance to be the same downstream as in this study. There are, however, likely to be some differences between the upper and lower reaches that should be borne in mind. Firstly, the upper (study) reach is steeper than the lower reach. This study has shown that sedimentation is less of a problem than originally expected in the upper reach, potentially requiring little or no management action. However, deposition may be more of a problem downstream on the less steep reaches, requiring more management or upstream trapping. The pattern is complicated by downstream fining of sediment, which starts at the downstream end of the study reach, and by the input of additional sediment at Salsipuedes Creek. Finally, the downstream reaches have less acute meander bends. The rates of meander migration and the role of benches are likely to be less of a problem downstream of this reach. At the same time, benches on the inside of less acute meanders may trap less sediment than those simulated in this reach. Additional 2D study of the upstream and downstream reaches is needed to answer these questions and develop a picture for the whole project.

4.9 TOWARDS AN OPTIMUM DESIGN

Two trends clearly emerge from this analysis. Firstly, the lowered, vegetated benches are a viable means of increasing flood capacity, increasing habitat value and managing sediment. However, in tight meander bends they may increase the amount of lateral erosion unless additional bank protection is used. One potentially promising hybrid approach would be to take the USACE 2A alternative and cut discontinuous 8-foot deep benches on inside bends and gentle outside bends, but not on sharp outside bends or immediately downstream (in the future bend migration path). The five sharp bends upstream of Watsonville would probably require this approach, while the gentler bends downstream would probably be sustainable using vegetation-based stabilization. It is also desirable to maintain a good vegetation cover on the outside banks and benches, to prevent lateral erosion that might threaten the levees. Since studies have shown that vegetation provides greater bank protection as it matures it is important that any vegetation management is sensitive to this need and avoids reducing shear resistance on the outside bends.

Though this design would require additional analysis using a similar modeling approach to this study, the initial modeling indicates that it would be both viable and involve less cutting of material than the other benched alternatives. The conceptual design is shown schematically in Figure 4-2.

4.10 RECOMMENDATIONS FOR FUTURE WORK

Based on the work reported in this study, we recommend the development of a two-dimensional sediment transport model for the entire project reach (from the Chittenden gage to the Pacific Ocean). This study has shown the practicality, and value, of simulating sediment transport in 2D. Due to the sinuous nature of the river, the propensity for lateral erosion, and the tendency for sediment to accumulate on benches, a

2D model will be useful to optimize the location of benches so that they maximize flood protection, sediment management, and habitat value while minimizing the risk of erosion.

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6. ACKNOWLEDGEMENTS

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8. FIGURES

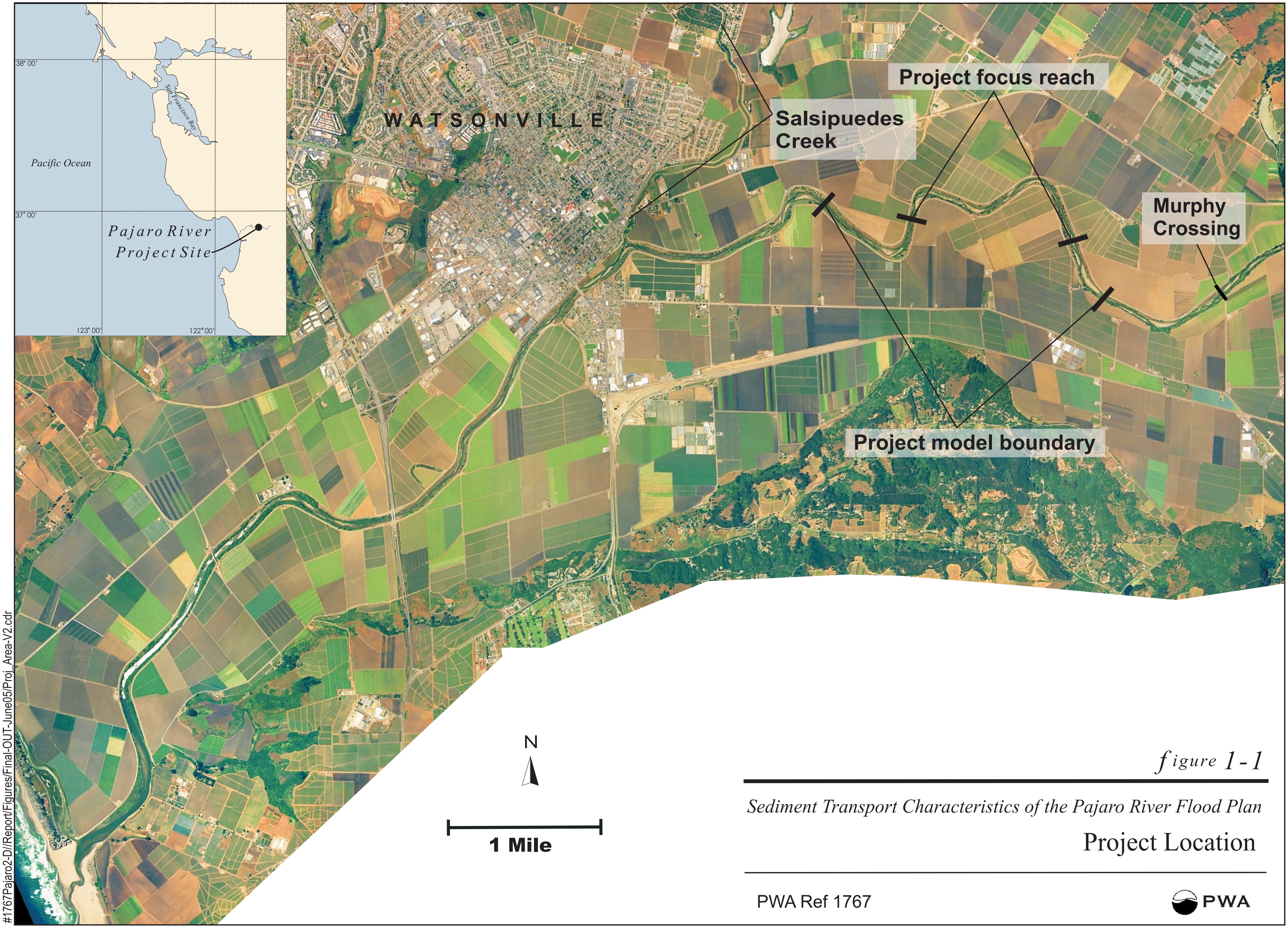

figure 1-1

Sediment Transport Characteristics of the Pajaro River Flood Plan

Project Location

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PWA

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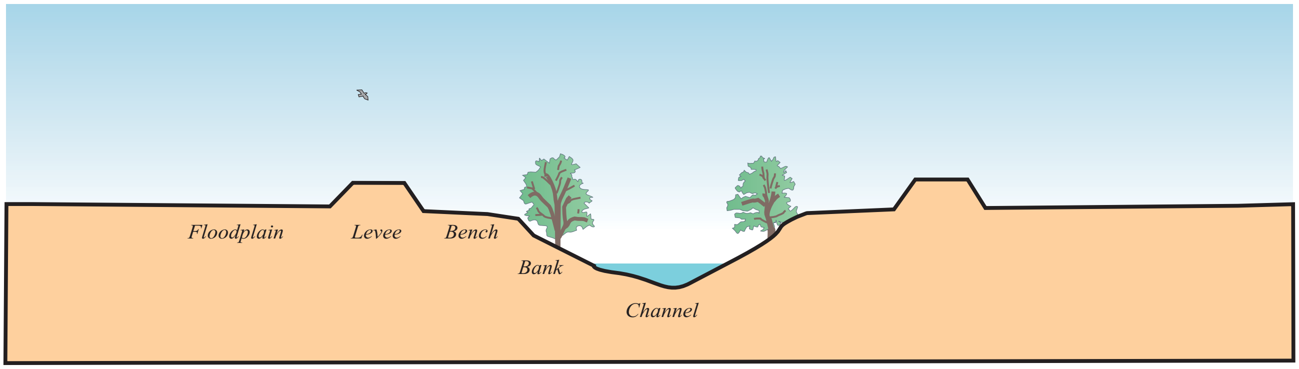
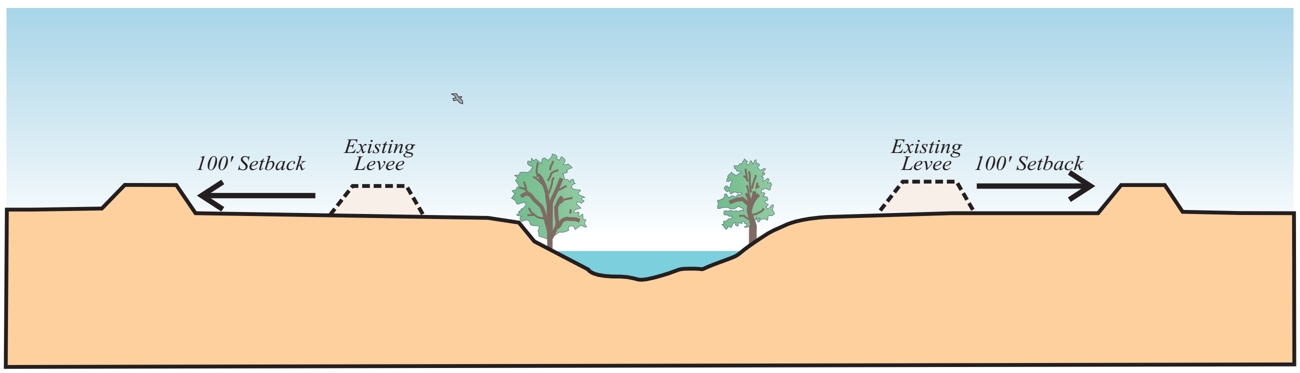
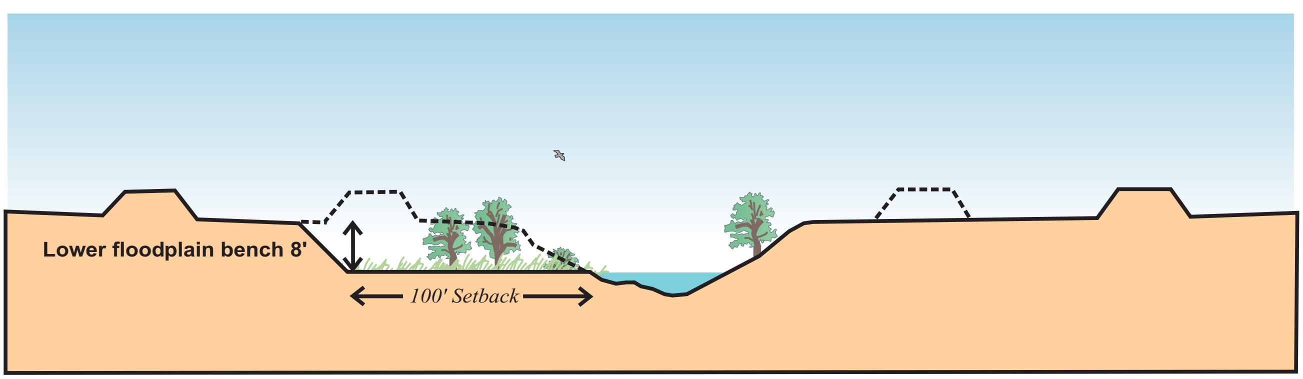


Existing Conditions



USACE Alternative 2a



Alternative 3

figure 1-2a

Sediment Transport Characteristics of the Pajaro River Flood Plan

Alternatives Simulated

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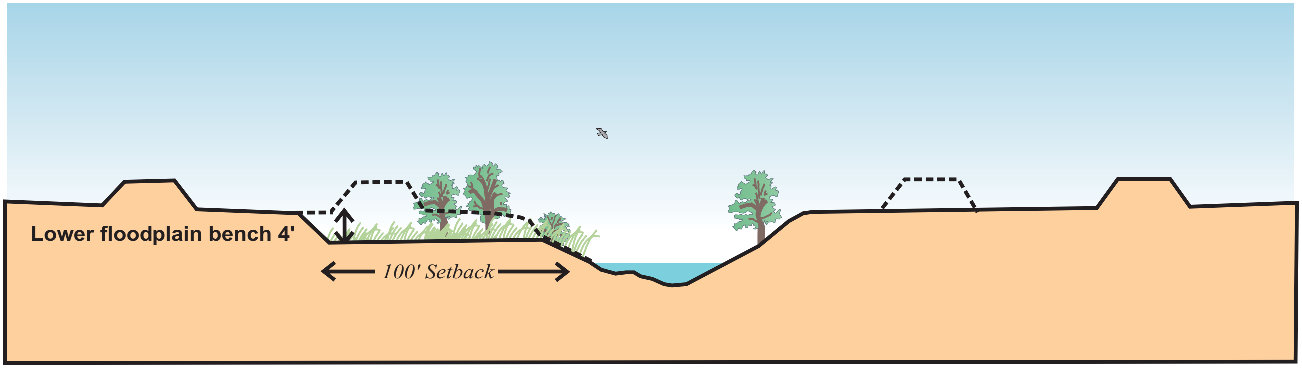
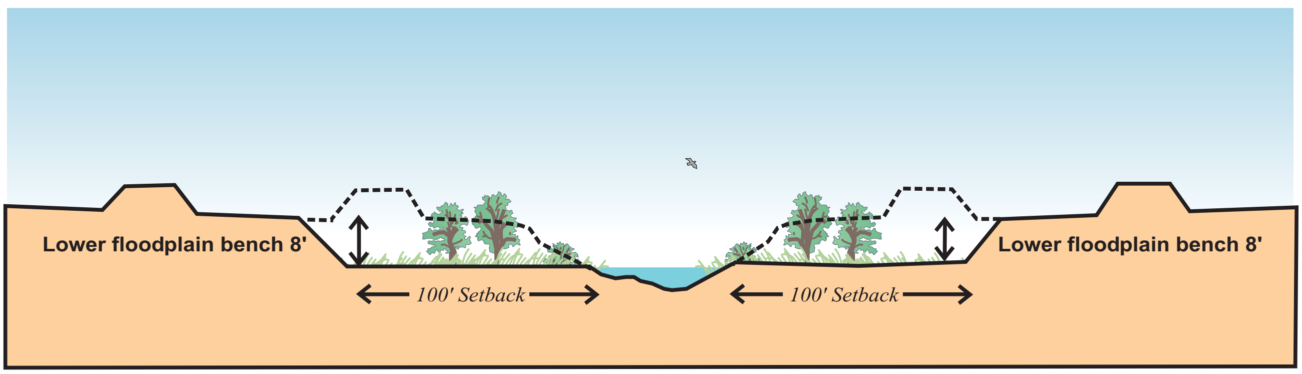


Alternative 4



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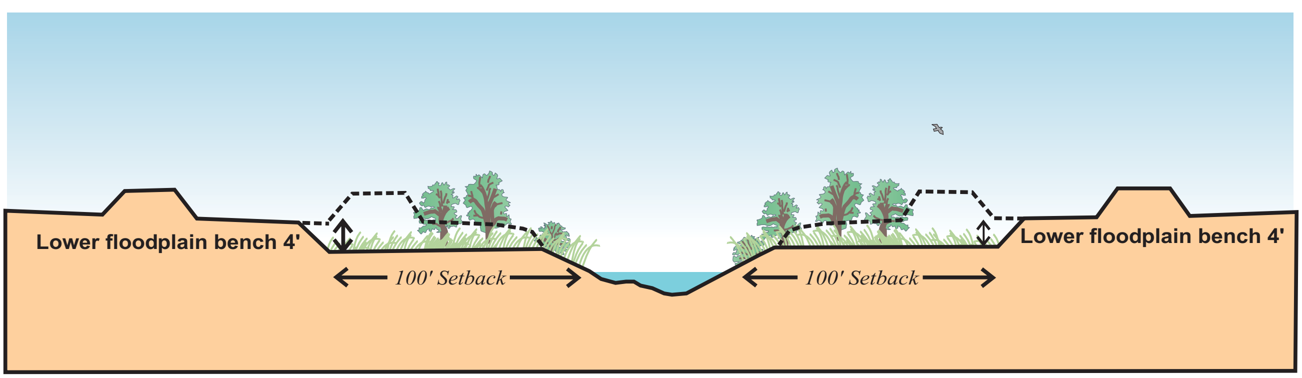

Alternative 6

figure 1-2b

Sediment Transport Characteristics of the Pajaro River Flood Plan

Alternatives Simulated

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PWA

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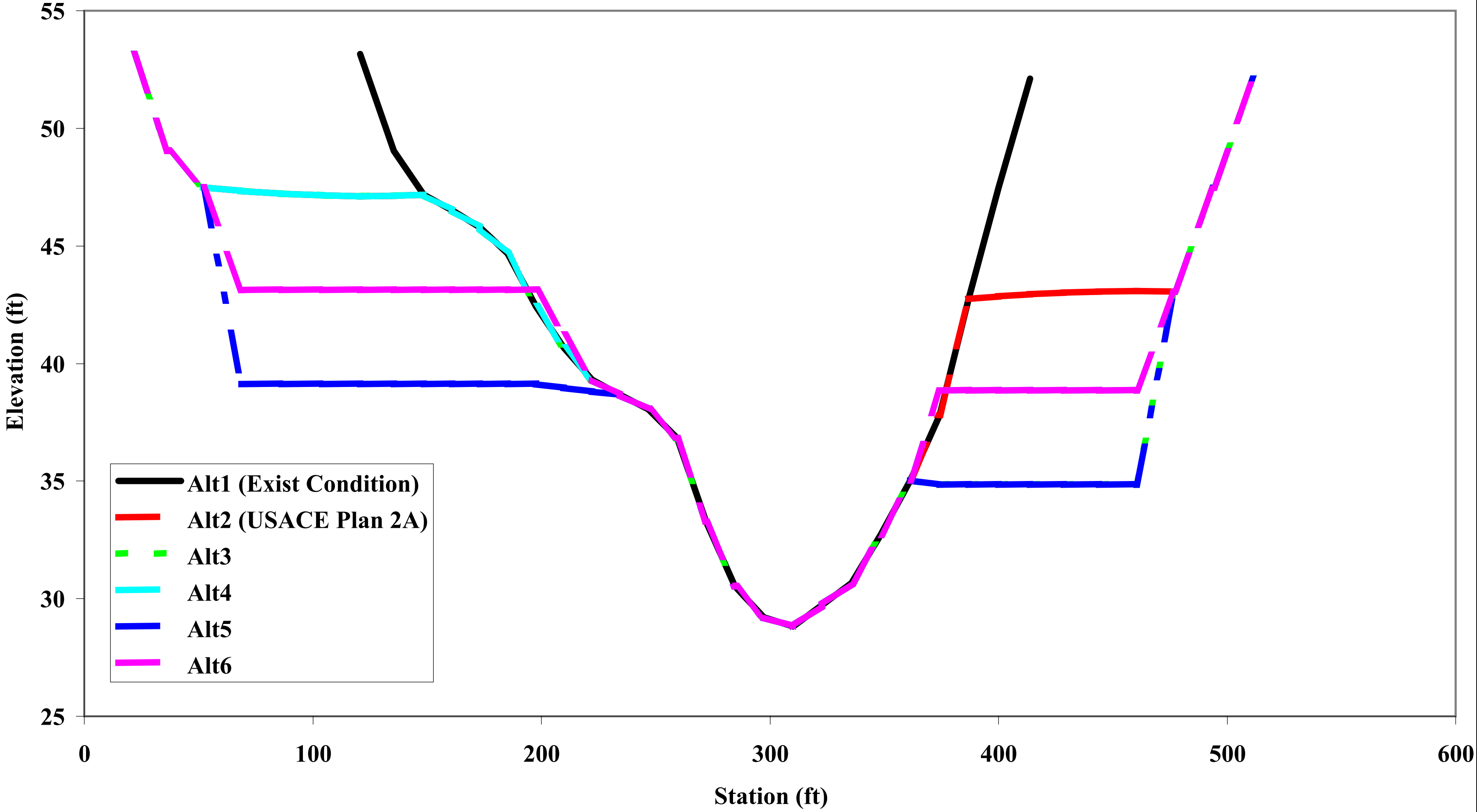

figure 1-3

Sediment Transport Characteristics of the Pajaro River Flood Plan

Typical Cross-section Initial Conditions

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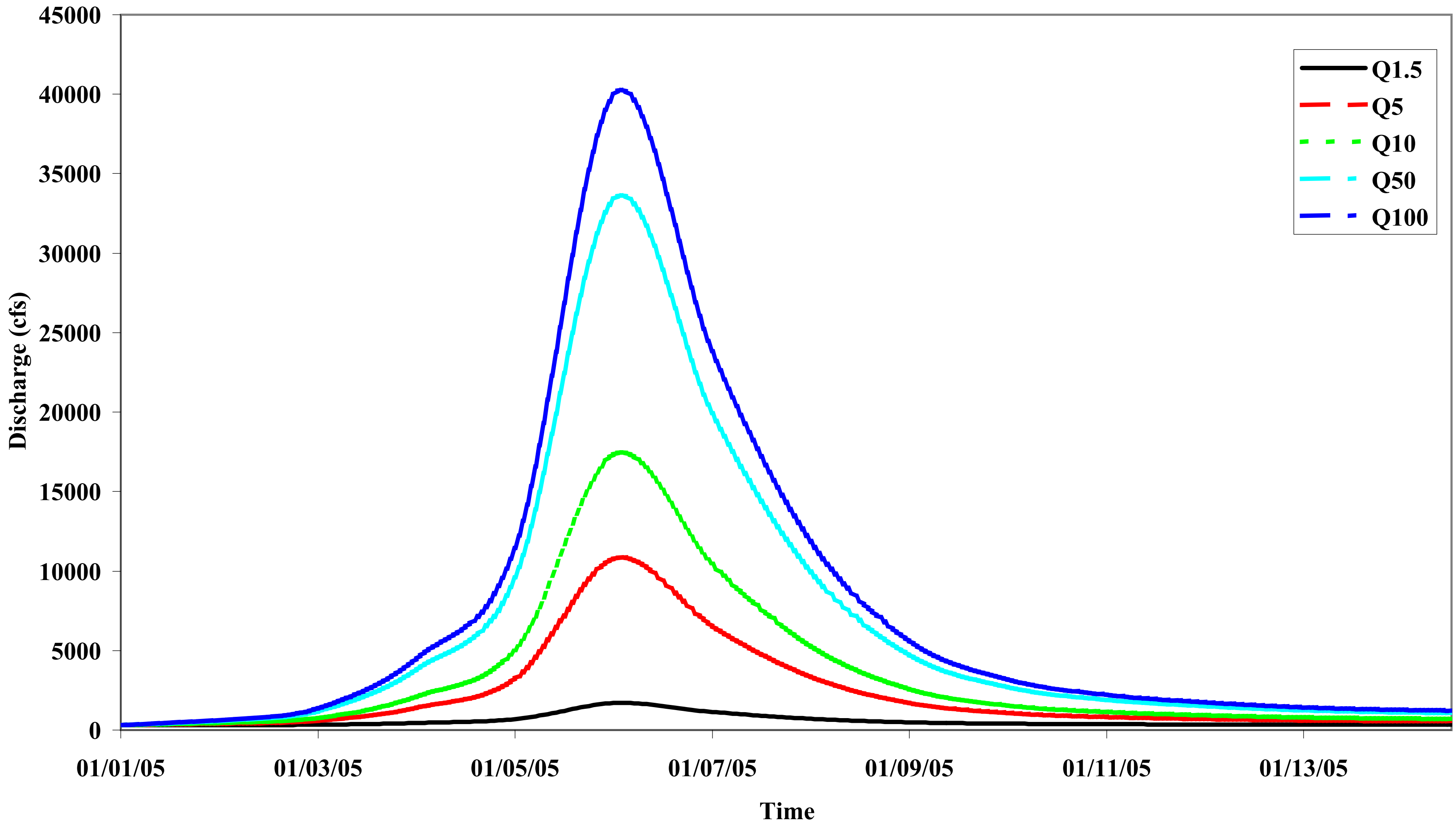

Notes: These hydrographs are typical boundary conditions for the other alternatives.
Source: Unsteady HEC-RAS output from a modified USACE existing conditions model (this study).

figure 2-1

Sediment Transport Characteristics of the Pajaro River Flood Plan

Upstream Boundary Flow Conditions for Alternative 1

PWA

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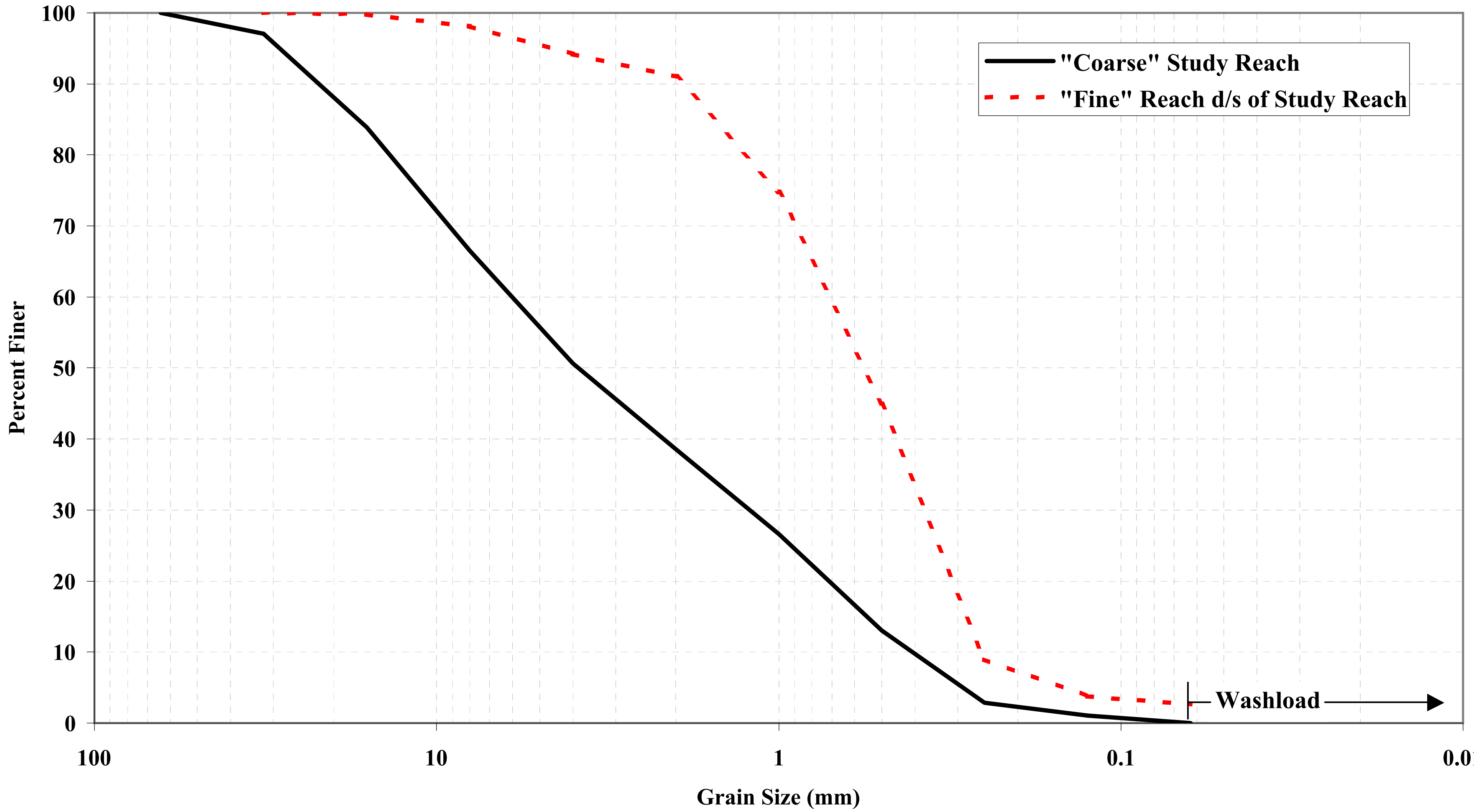


Notes: Full size distribution.
Source: Sediment distributions for select samples taken from PWA (1997).

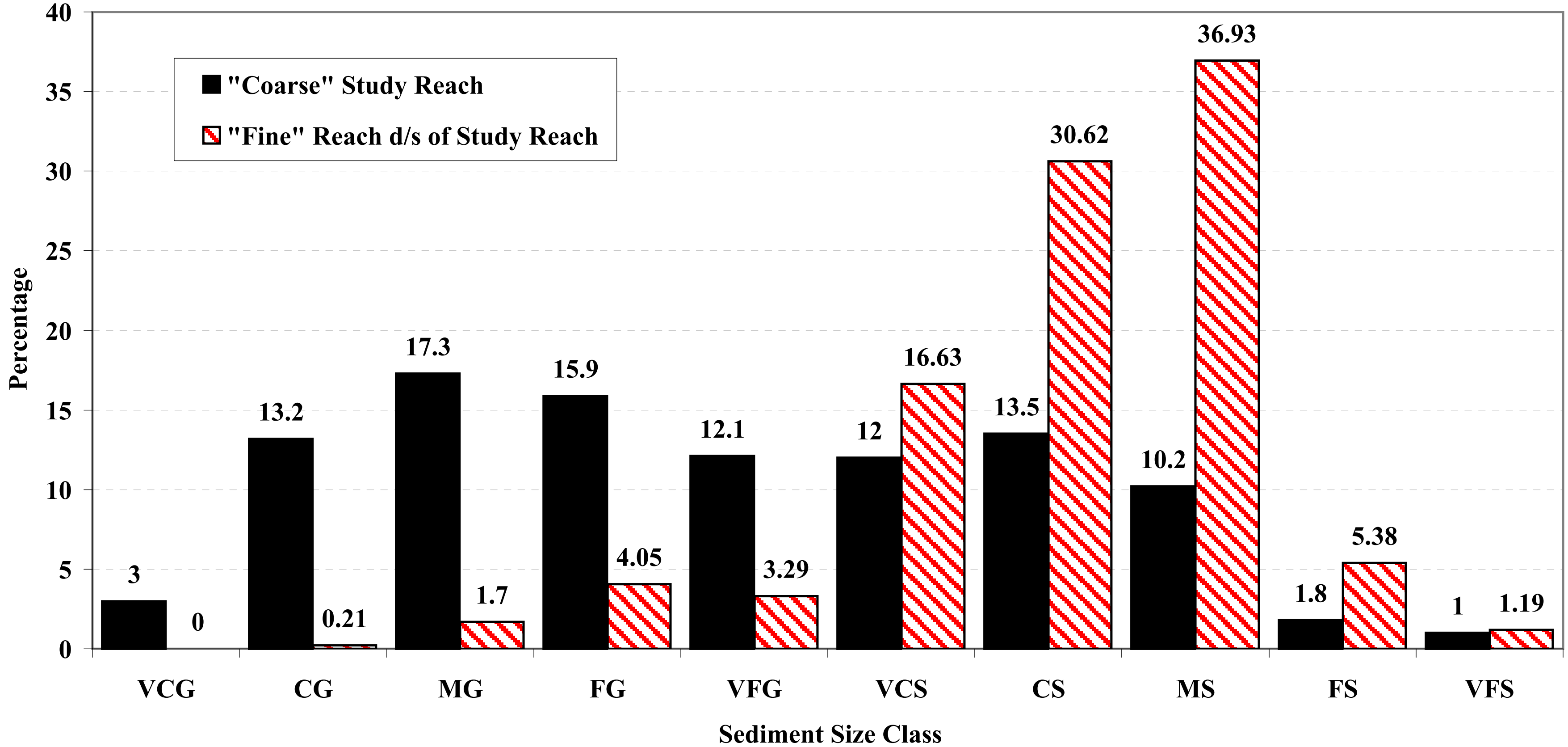
figure 2-2

Sediment Transport Characteristics of the Pajaro River Flood Plan

Lower Pajaro River Typical Sediment Distributions

PWA Ref 1767

PWA



Notes: Full size distribution truncated to material > 0.062 mm.
Source: Sediment distributions for select samples taken from PWA (1997).

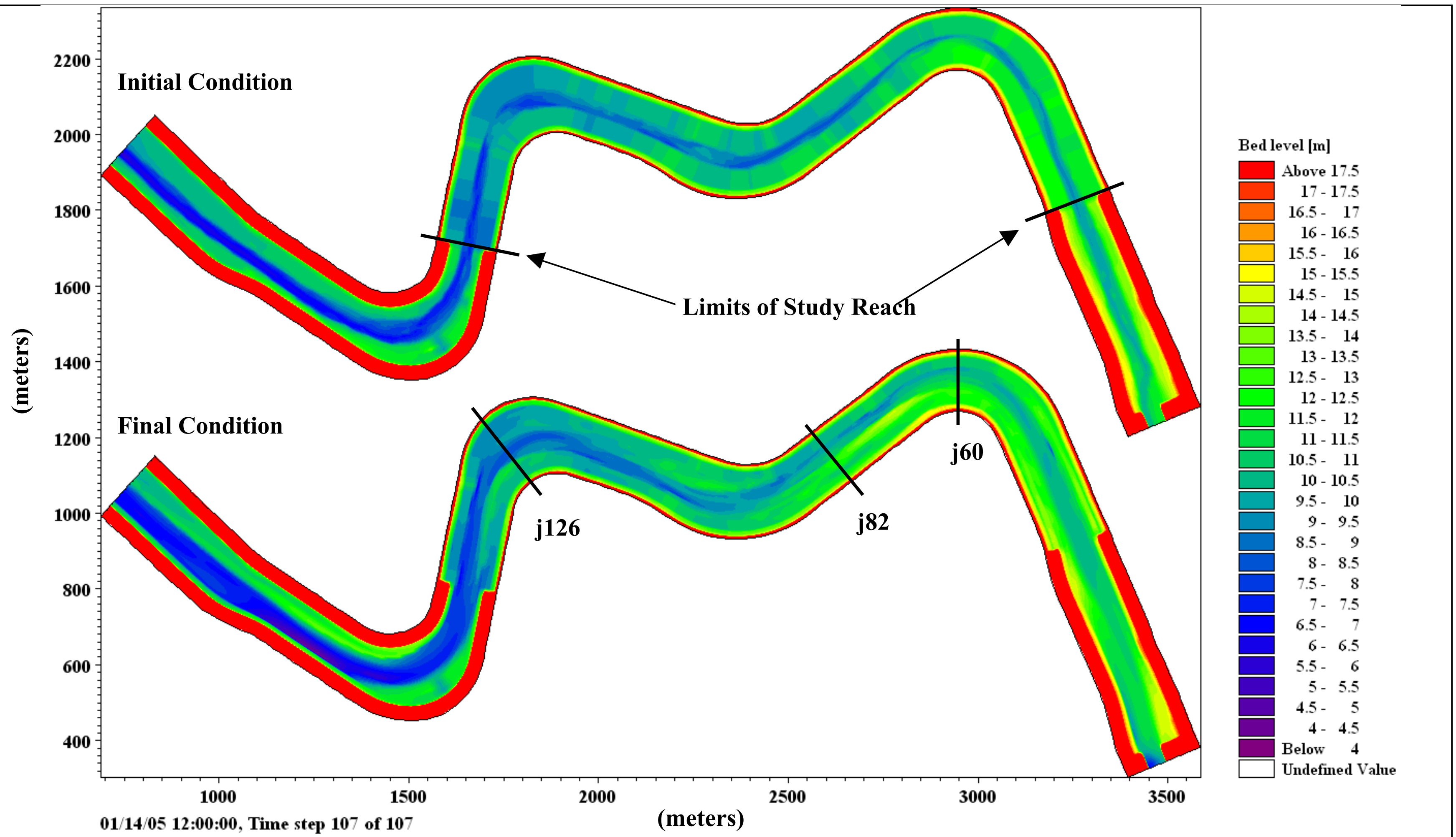
figure 2-3

Sediment Transport Characteristics of the Pajaro River Flood Plan

Lower Pajaro River Truncated Sediment Distributions

PWA Ref 1767

PWA



Source: MIKE21C output

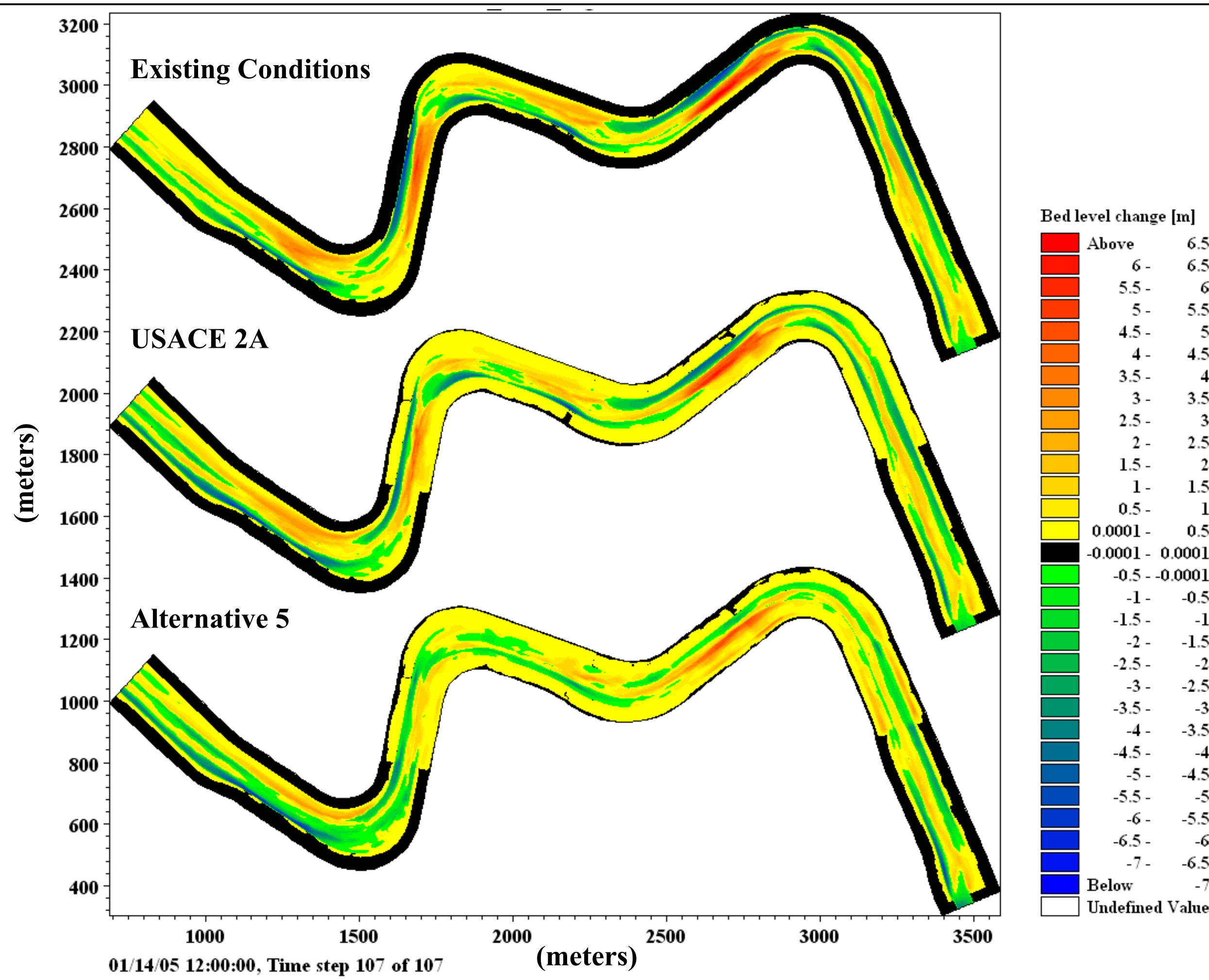
figure 2-4

Sediment Transport Characteristics of the Pajaro River Flood Plan

Initial and Final Bed Topography for Alternative 5

PWA Ref 1767

PWA



Source: MIKE21C output.
Note: figure shows change in bed elevation for Existing conditions, USACE 2A and Alternative 5, following the 100-year flood.

figure 2-5

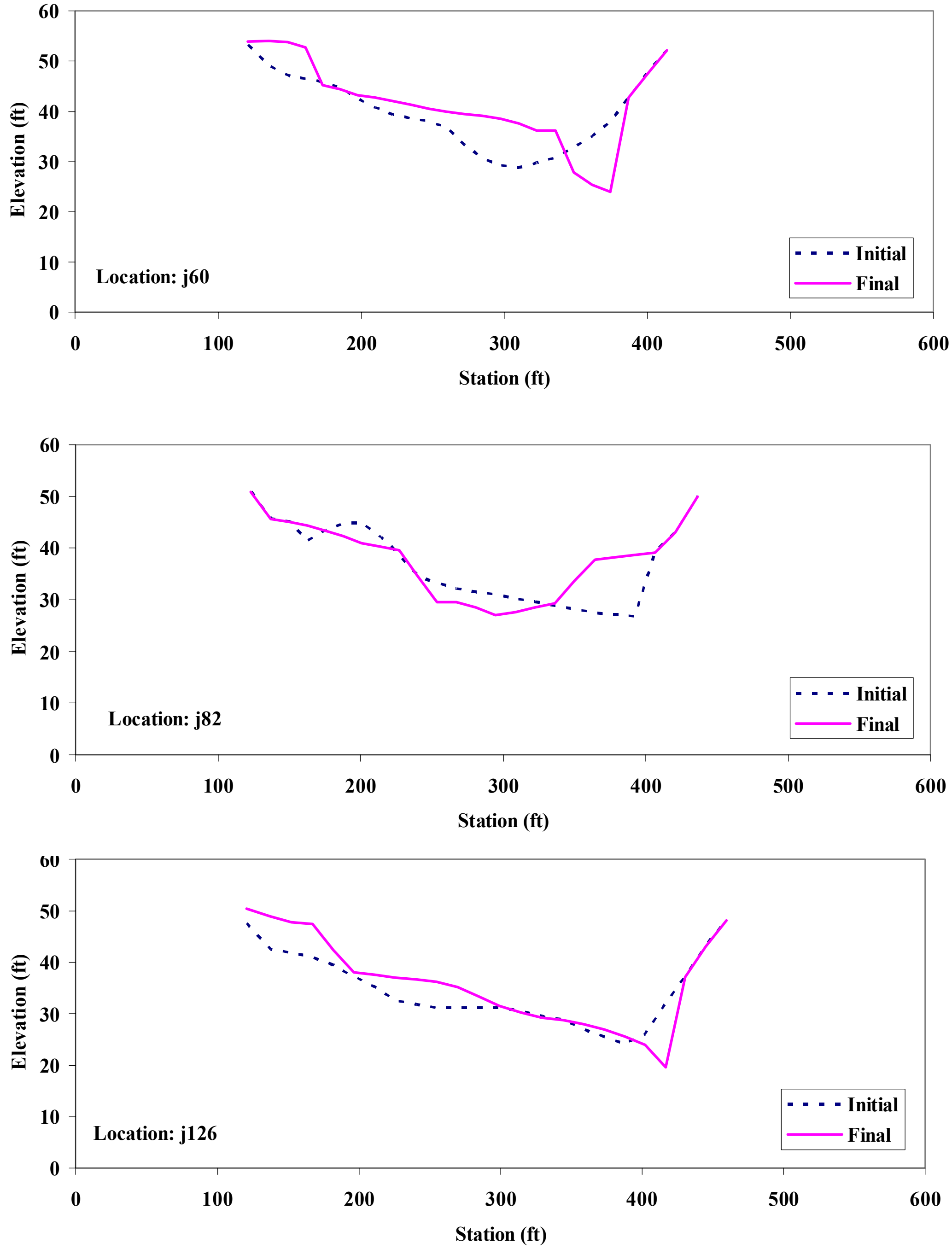
Sediment Transport Characteristics of the Pajaro River Flood Plan

Bed Elevation for Three Alternatives

PWA Ref 1767

PWA

\\Orca\pwa\Projects\1767.00_Pajaro_2d_model\Report\Figures\Final_OUT_June-05\1767_Ch2_Figs_2-1_2-5.xls\Fig2-5



Note: Location of cross-sections is shown on Figure 2-4.
Source: MIKE 21C model output.

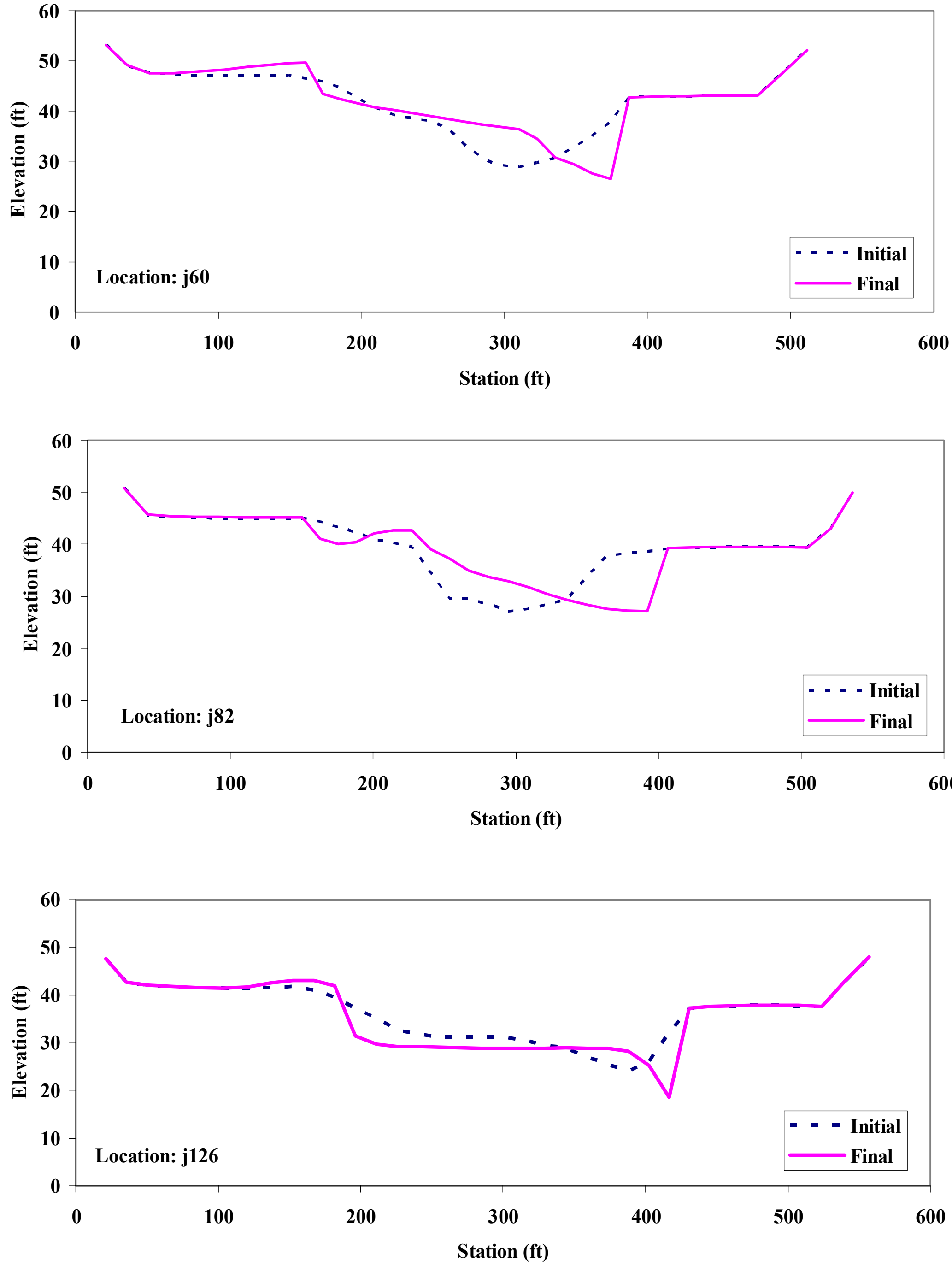
figure 3-1

Sediment Transport Characteristics of the Pajaro River Flood Plan

Cross-section Changes for Alt1 Q100

PWA Ref 1767

PWA



Note: Location of cross-sections is shown on Figure 2-4.
Source: MIKE 21C model output.

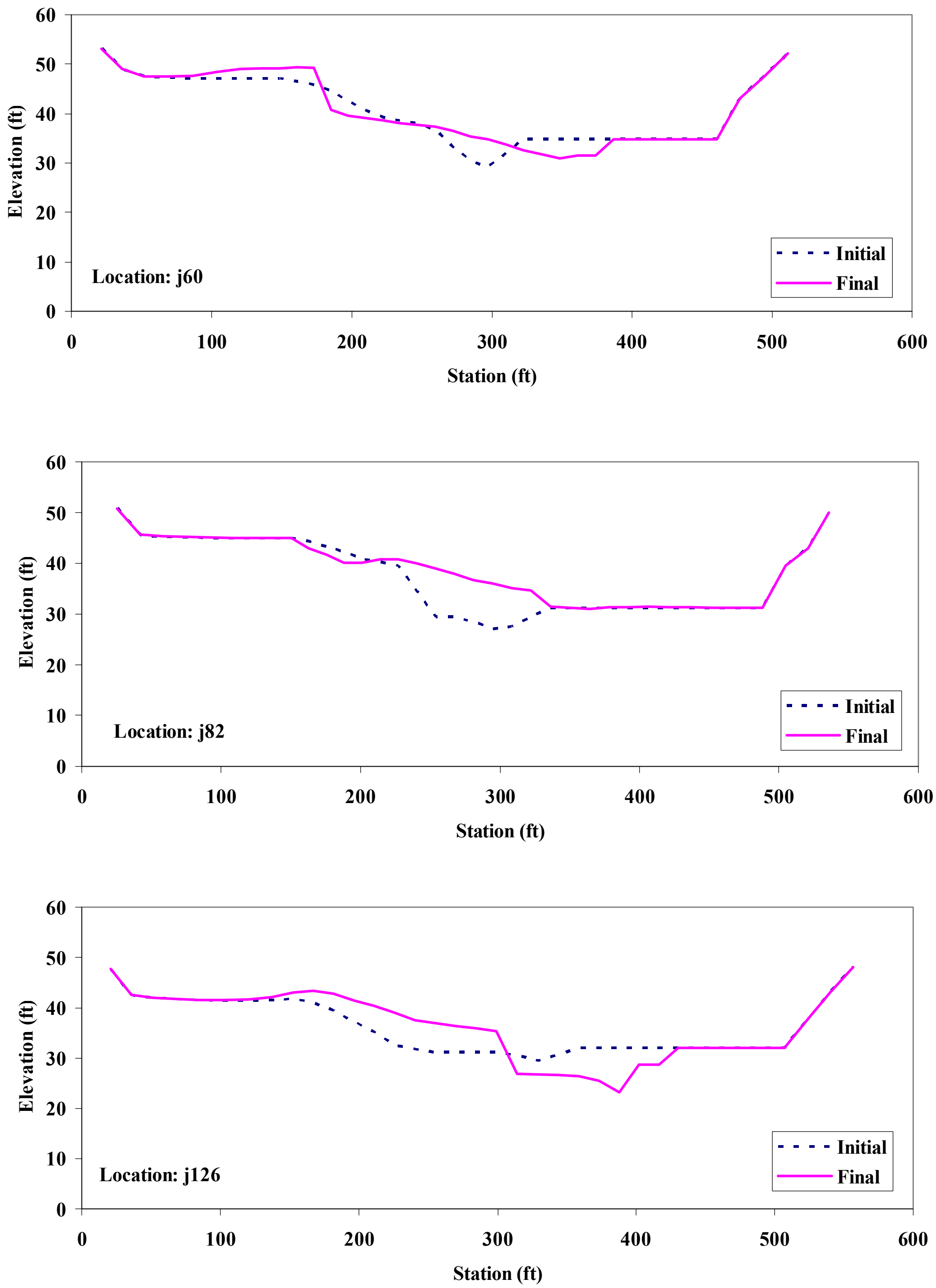
figure 3-2

Sediment Transport Characteristics of the Pajaro River Flood Plan

Cross-section Changes for Alt2 Q100

PWA Ref 1767

PWA



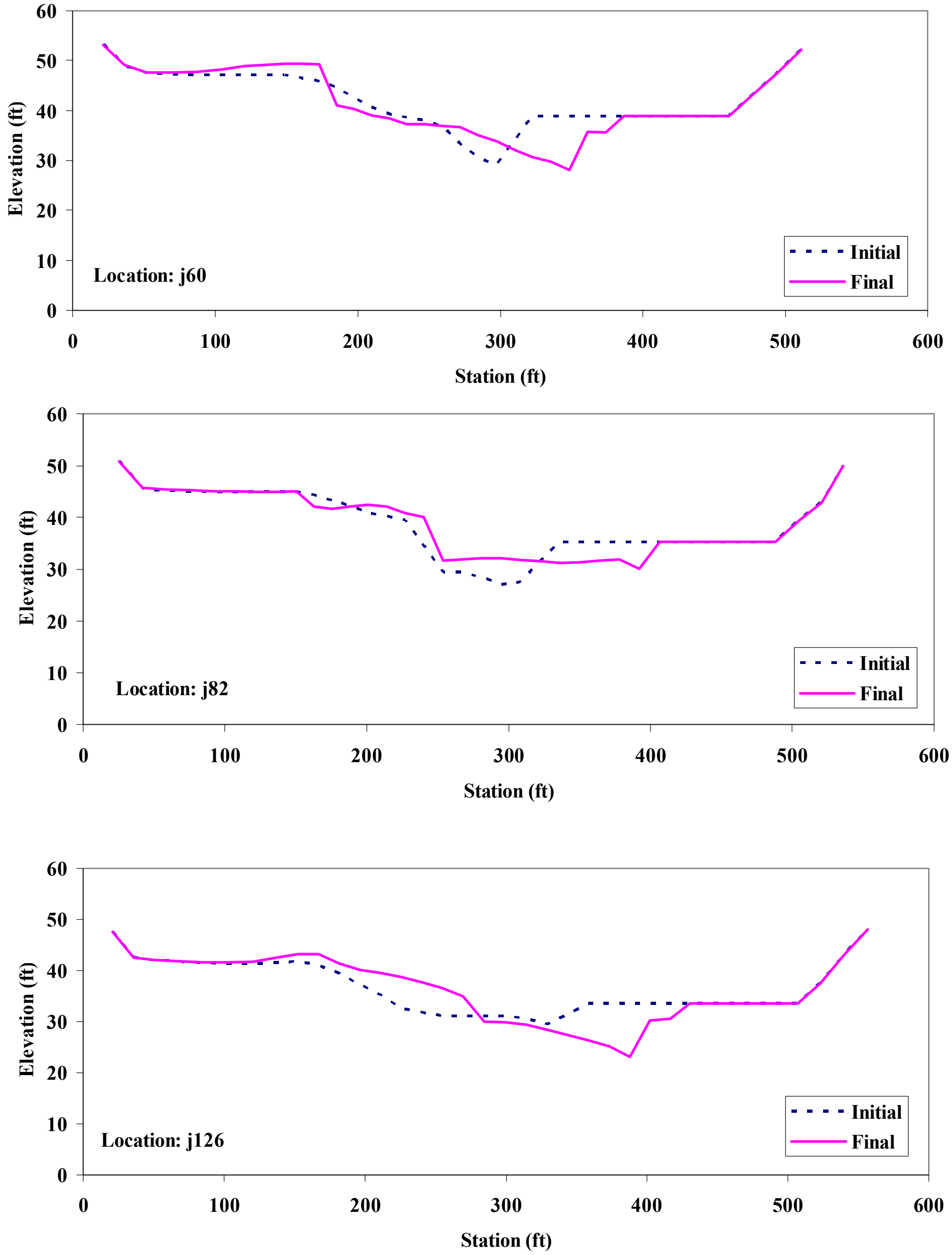
Note: Location of cross-sections is shown on Figure 2-4.
Source: MIKE 21C model output.

figure 3-3

Sediment Transport Characteristics of the Pajaro River Flood Plan

Cross-section Changes for Alt3 Q100

PWA Ref 1767



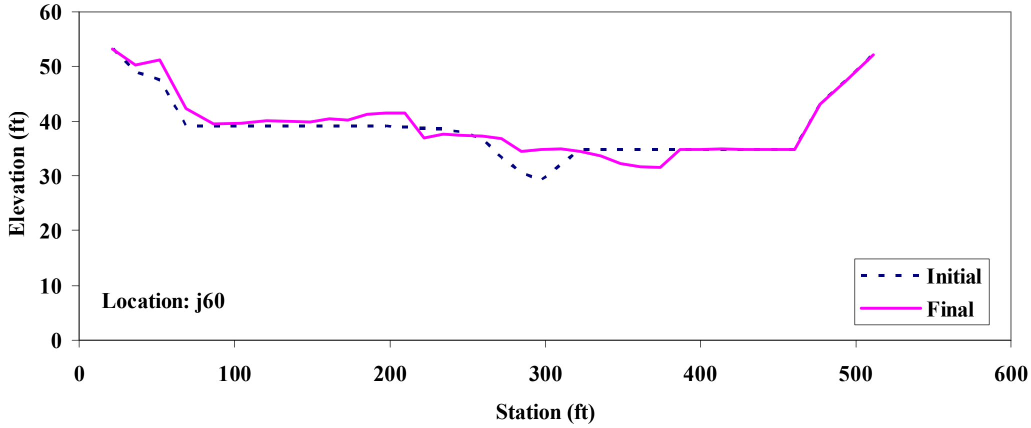
Note: Location of cross-sections is shown on Figure 2-4.
Source: MIKE 21C model output.

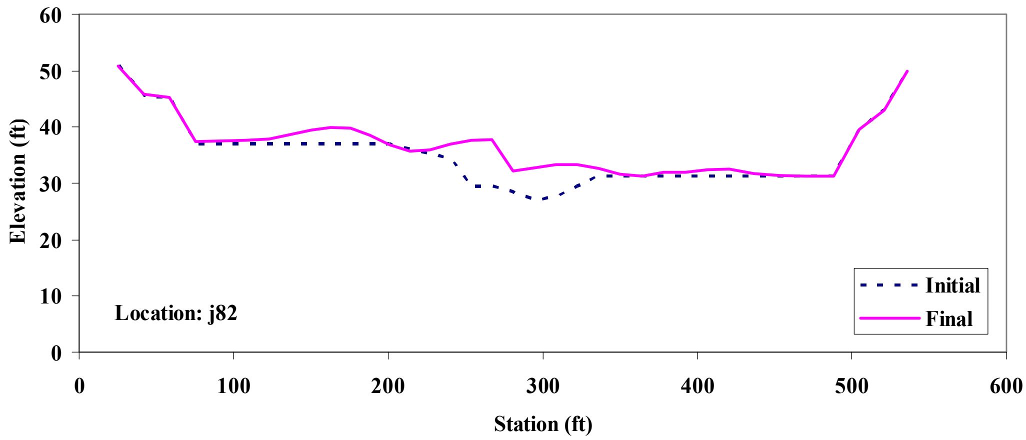
figure 3-4

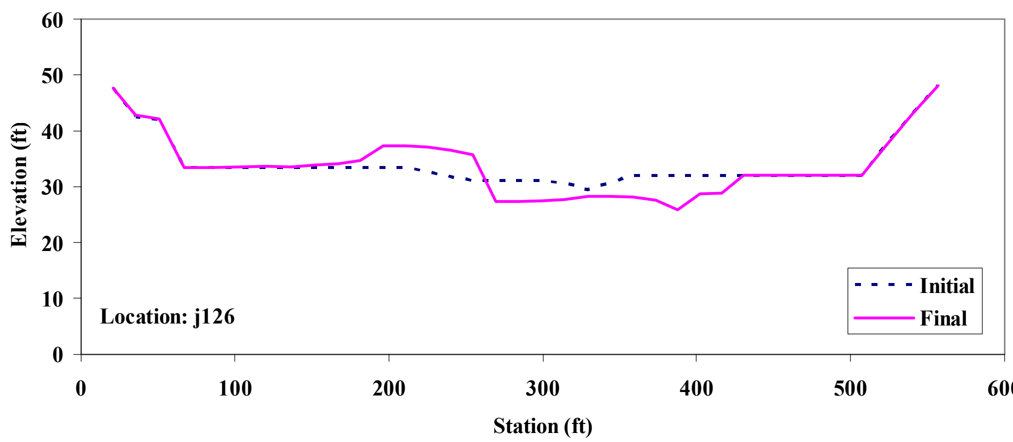
Sediment Transport Characteristics of the Pajaro River Flood Plan

Cross-section Changes for Alt4 Q100

PWA Ref 1767







Note: Location of cross-sections is shown on Figure 2-4.
Source: MIKE 21C model output.

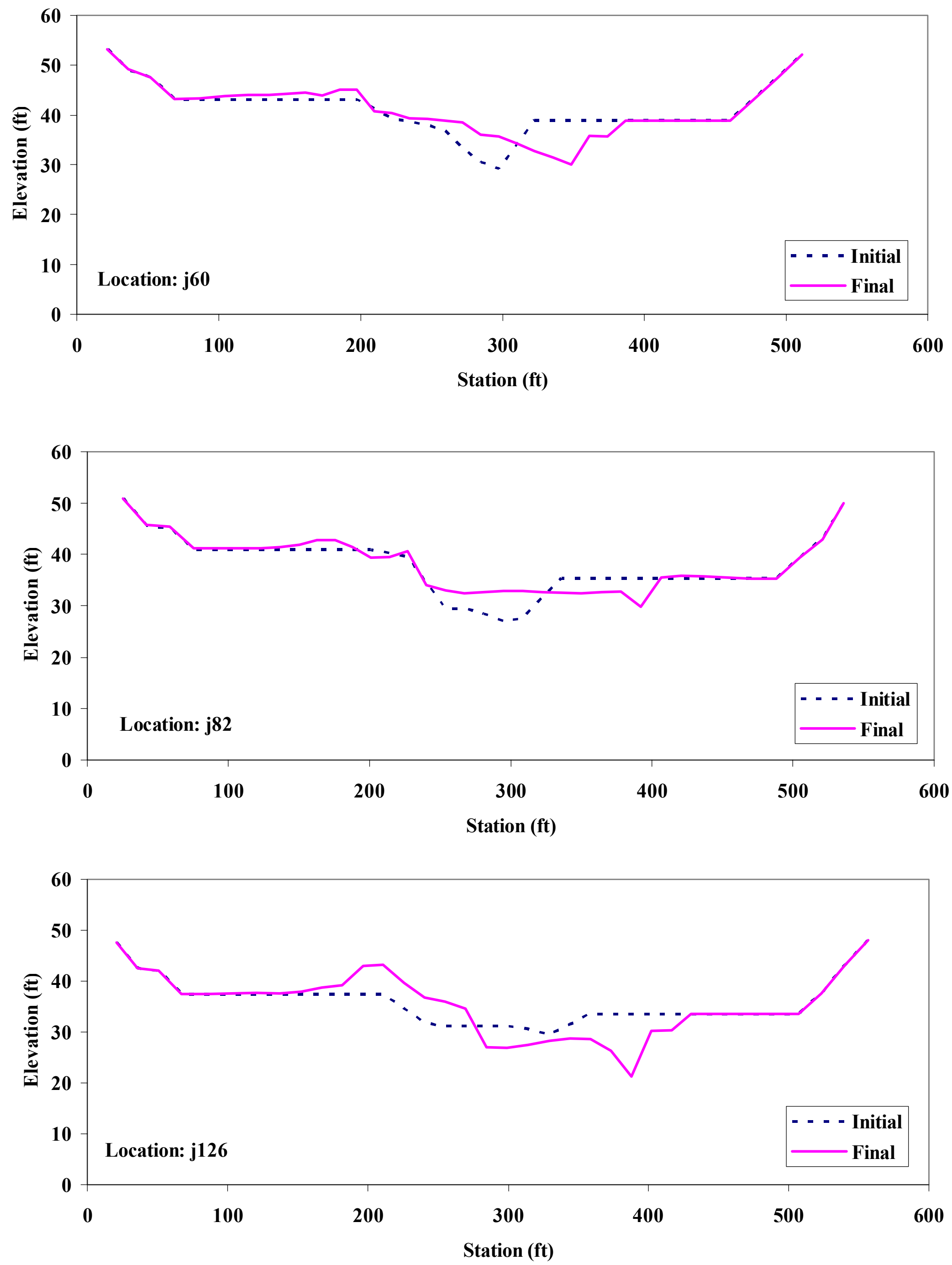
figure 3-5

Sediment Transport Characteristics of the Pajaro River Flood Plan

Cross-section Changes for Alt5 Q100

PWA Ref 1767

PWA



Note: Location of cross-sections is shown on Figure 2-4.
Source: MIKE 21C model output.

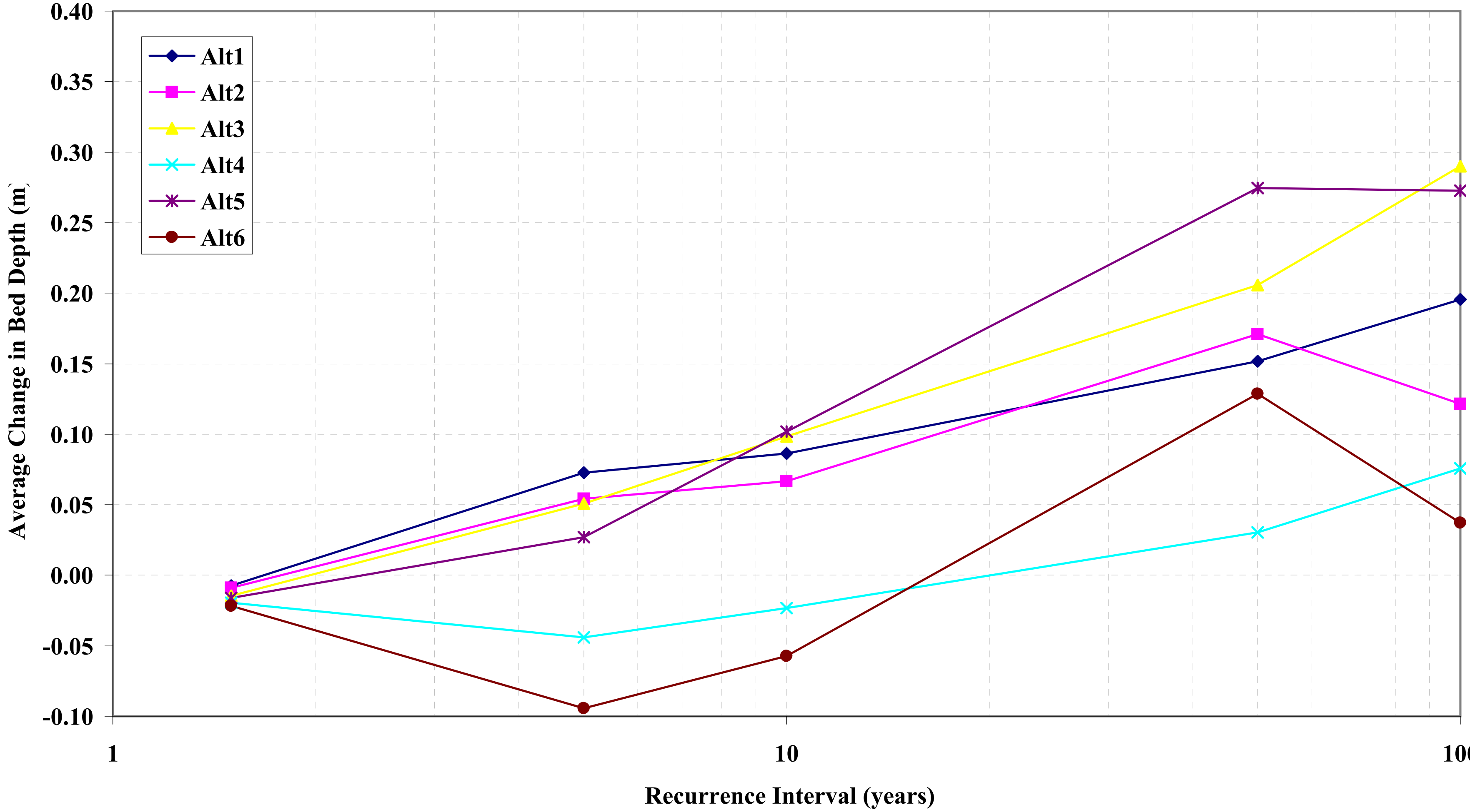
figure 3-6

Sediment Transport Characteristics of the Pajaro River Flood Plan

Cross-section Changes for Alt6 Q100

PWA Ref 1767

PWA



Notes: This is the average depth over the entire available bench/setback area, regardless of whether all the area was wetted during the simulation.
Source: MIKE 21C model output.

figure 3-7

Sediment Transport Characteristics of the Pajaro River Flood Plan

Average Change in Channel Depth

PWA Ref 1767

PWA

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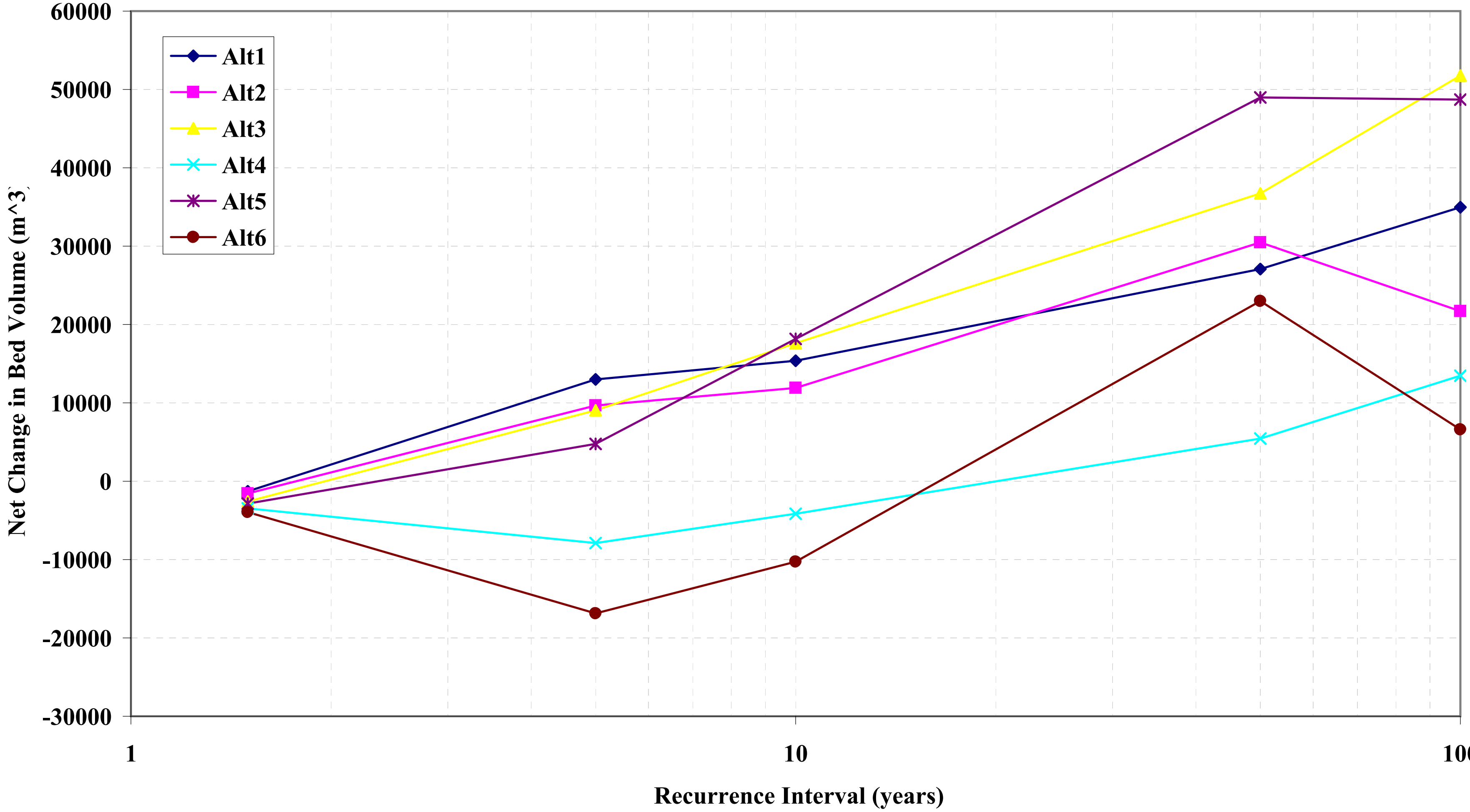


Notes: Reported volumes include a bed porosity of 35 percent.
Source: MIKE 21C model output.

figure 3-8

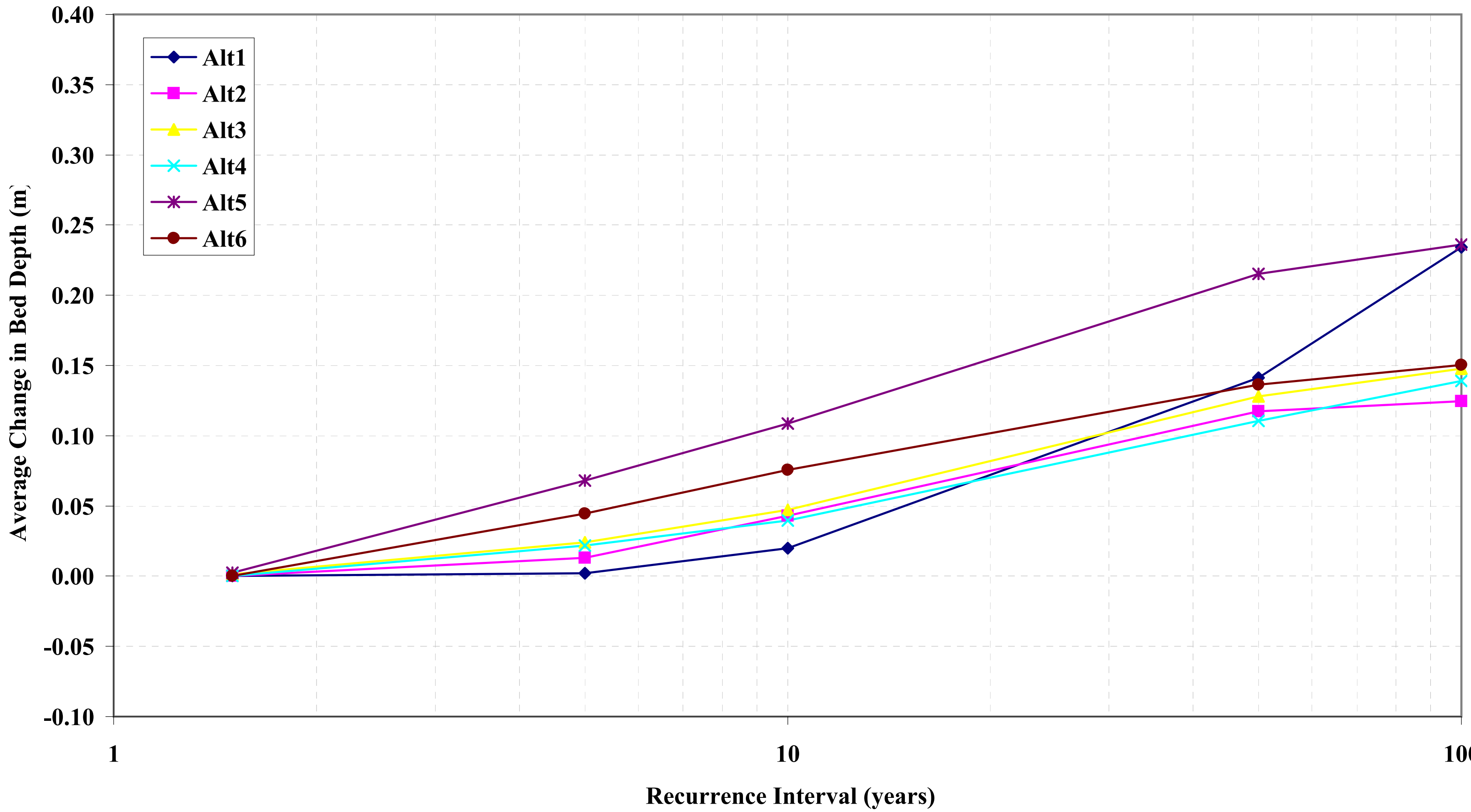
Sediment Transport Characteristics of the Pajaro River Flood Plan

Net Change in Channel Volume

PWA Ref 1767

PWA

\\Orca\pwa\Projects\1767.00_Pajaro_2d_model\Report\Figures\Final_OUT_June-05\Figs3-7_3-10_REV.xls\Fig3-8



Notes: This is the average depth over the entire available bench/setback area, regardless of whether all the area was wetted during the simulation. Alternative 1 is not directly comparable since it has a smaller bench area.
Source: MIKE 21C model output.

figure 3-9

Sediment Transport Characteristics of the Pajaro River Flood Plan

Average Change in Total Bench Depth

PWA Ref 1767

PWA

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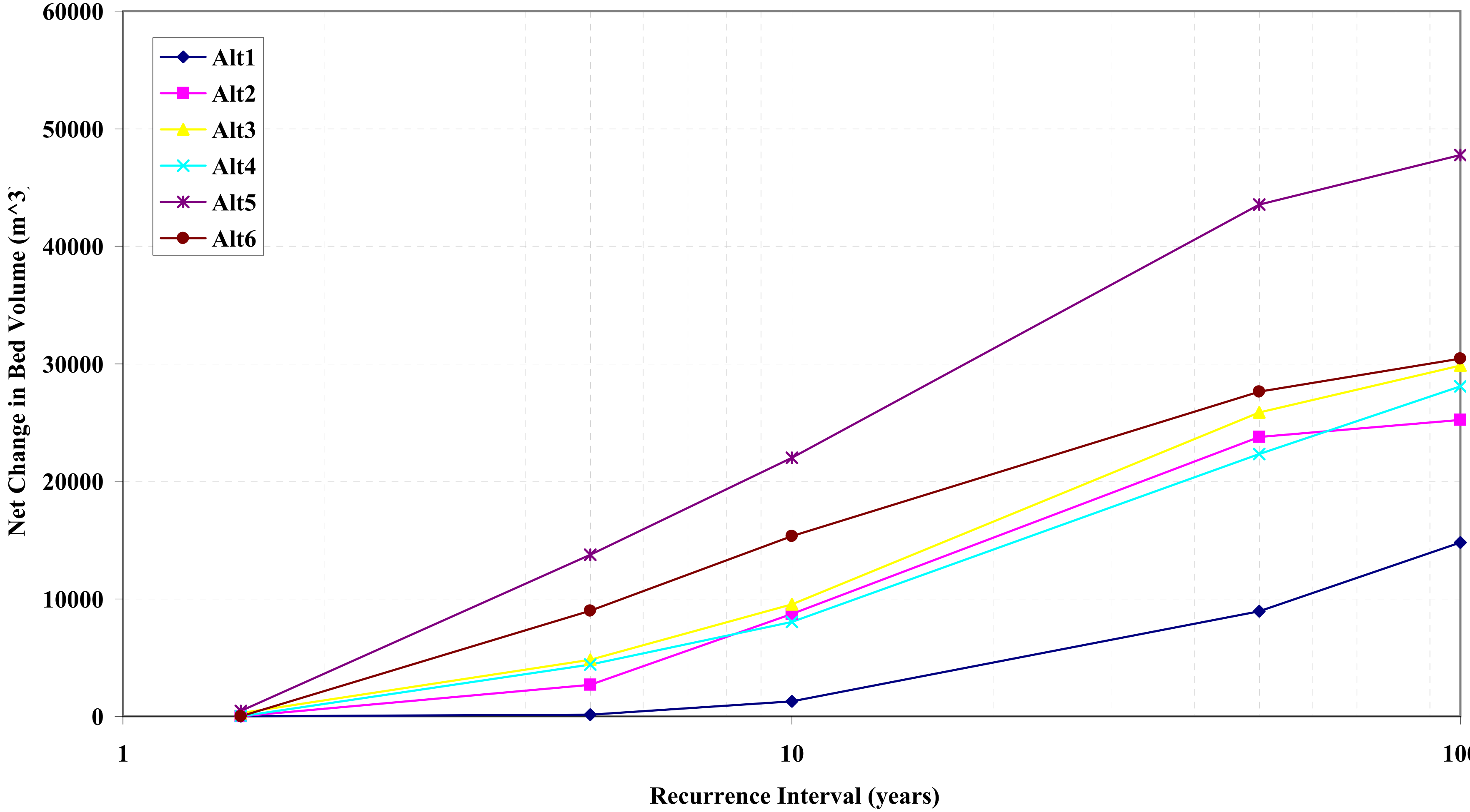


Notes: Reported volumes include a bed porosity of 35 percent.
Source: MIKE 21C model output.

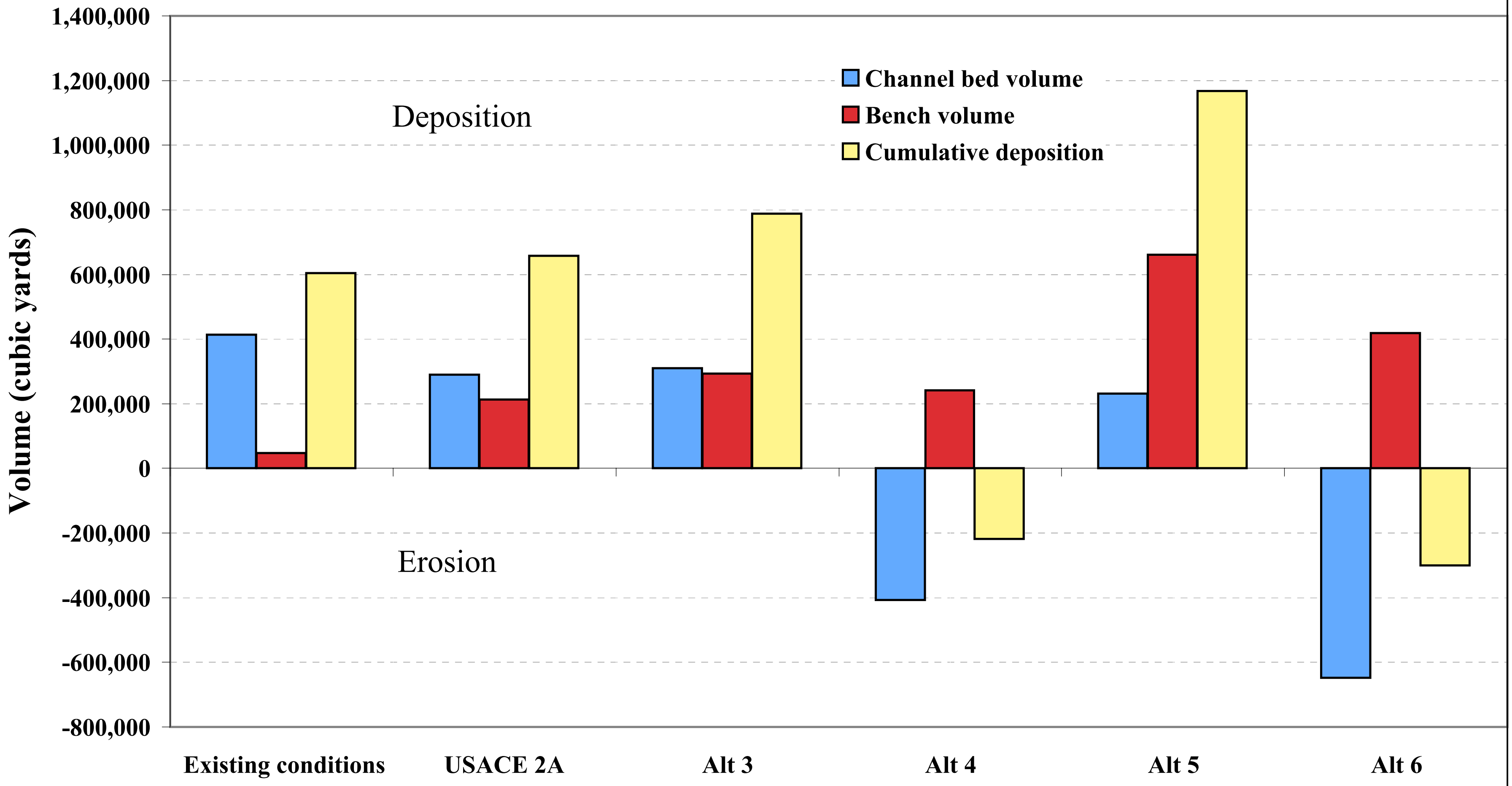
figure *3-10*

Sediment Transport Characteristics of the Pajaro River Flood Plan

Net Change in Total Bench Volume

PWA Ref 1767

\\Orca\pwa\Projects\1767.00_Pajaro_2d_model\Report\Figures\Final_OUT_June-05\Figs3-7_3-10_REV.xls\Fig3-10



Notes: Reported volumes include a bed porosity of 35 percent.
Volumes are aggregate for 100 years.
Source: MIKE 21C model output.

figure 4-1

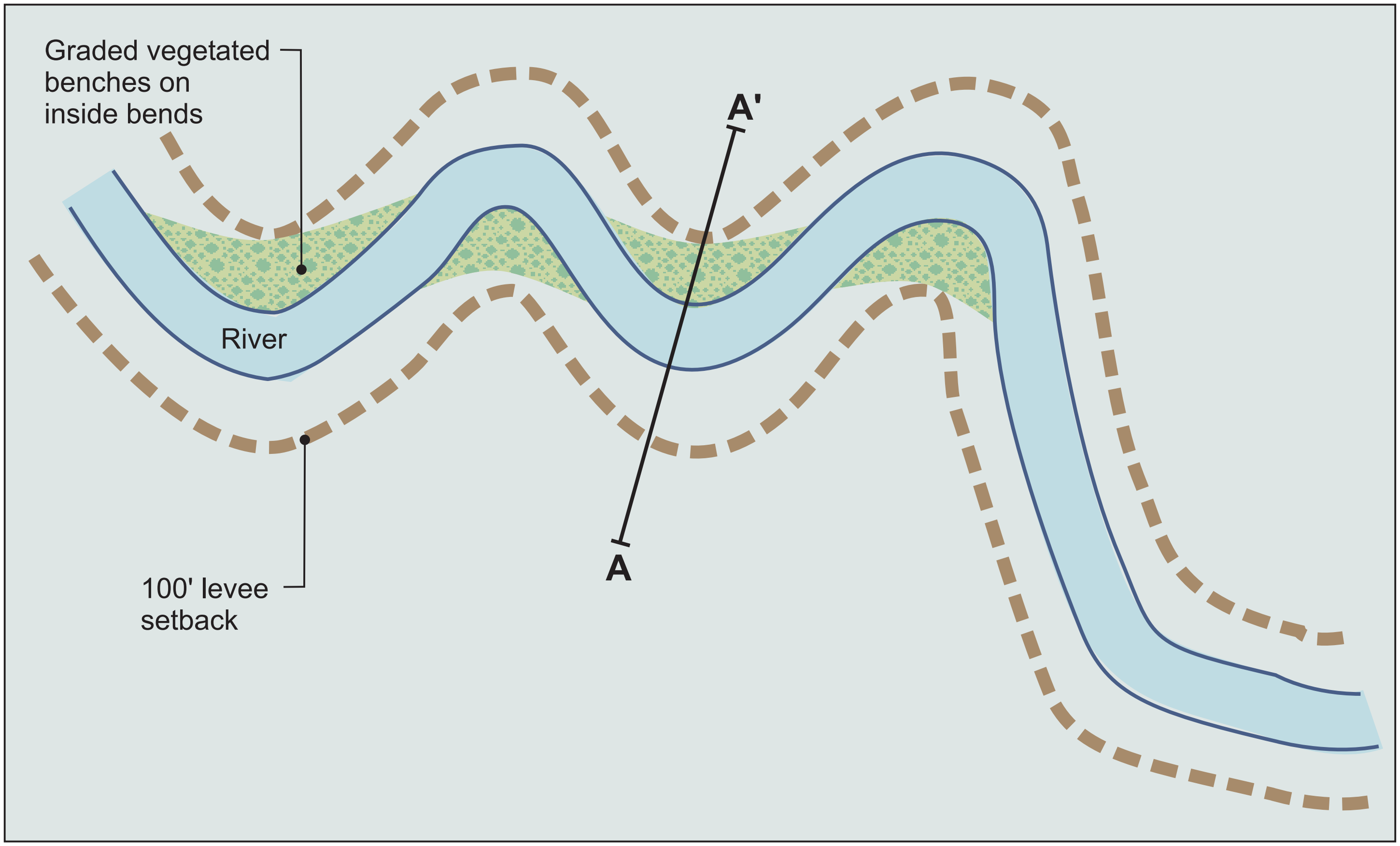
Sediment Transport Characteristics of the Pajaro River Flood Plan

Volume of Sediment Deposited and Eroded

PWA Ref 1767

PWA

\\Orca\pwa\Projects\1767.00_Pajaro_2d_model\Report\Figures\Final_OUT_June-05\Fig4-1_REV.xls\Fig4-1



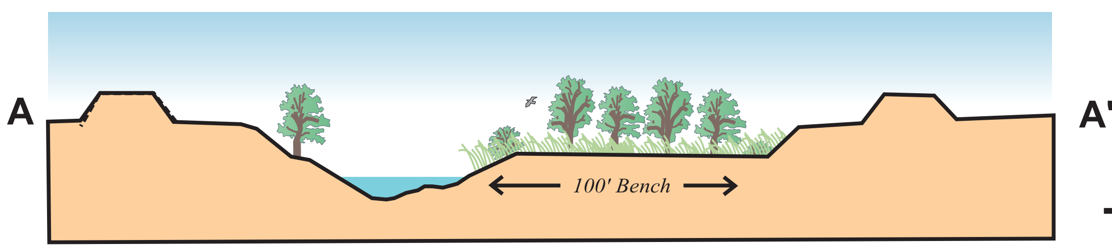


figure 4-2

Sediment Transport Characteristics of the Pajaro River Flood Plan

Conceptual Hybrid Approach

PWA Ref 1767

PWA

#1767Pajaro2-D//Report/Figures/Final-OUT-June05/ConceptualHybrd.cdr

Channel Erosion Potential in the Lower Pajaro River Flood Control Project

FINAL REPORT

Prepared for

Santa Cruz County

Prepared by

Philip Williams & Associates, Ltd.

October 14th, 2005

PWA Ref. #P05-076

Services provided pursuant to this Agreement are intended solely for the use and benefit of Santa Cruz County.

No other person or entity shall be entitled to rely on the services, opinions, recommendations, plans or specifications provided pursuant to this agreement without the express written consent of Philip Williams & Associates, Ltd., 720 California Street, 6th Floor, San Francisco, CA 94108.

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LIST OF TABLES

1. INTRODUCTION AND SUMMARY

This report further develops analysis originally reported in the study "Sediment Transport Characteristics of Reach Four of the Pajaro River Flood Plan: an assessment based on two-dimensional modeling" PWA, 2005, submitted to RMC Water and Environment, commissioned by the Pajaro River Watershed Flood Prevention Authority, and funded by the SWRCB pursuant to the Costa-Machado Water Act of 2000 (Proposition 13). This present study was commissioned and funded by Santa Cruz County.

1.1 BACKGROUND TO THE CURRENT REPORT

In May 2005, PWA developed a two-dimensional (2-D) sediment transport model for a 1.4-mile reach of the Lower Pajaro River. The objective of the study was to conceptually evaluate the impact on sediment dynamics and channel stability of elements of the Pajaro River flood plan. These elements included a 100-foot levee set-back and the grading of lowered, vegetated floodplain benches. The model predicted considerable amounts of lateral migration at two sharp meander bends during large flood events due to erosion of bank material, potentially threatening the proposed levee alignment. However, some of the predicted migration is likely overestimated due to limitations in the model and modeling approach used in the analysis. This study was commissioned to further evaluate the predicted erosion on sharp outside bends and develop a more reliable estimate.

The original study was carried out using the MIKE-21C model. MIKE-21C is a 2-D hydrodynamic and sediment transport model. The user develops a mesh of geometric elements to represent the river channel and floodplain, and the model predicts water depth and depth-averaged velocity for each element based on inputs of water at an upper boundary. The model also predicts shear stress, which is used to calculate erosion on the bed and banks of the river. Erosion is predicted to occur when shear stress exceeds critical shear stress, the threshold for erosion of the bank or bed materials (sediment). However, the model makes several assumptions and simplifications, which can lead it to overestimate the predicted amount of erosion. The model incorporates the hydraulic effects of vegetation growing on the banks and floodplain in the form of boundary roughness. Roughness reduces the predicted velocity and shear stress of the water in the model, as occurs in nature. However, in the approach used in PWA and DHI (2005) the model does not simulate the increase in erosion resistance that results from vegetation, leading to potential overestimations of erosion in some situations. In the current analysis we have extracted shear stress data from the model and directly compared them with the known erosion thresholds of bank materials (e.g. Fischenich, 2001).

1.2 ALTERNATIVES SIMULATED IN ORIGINAL REPORT

In the original report a 2-D coupled hydrodynamic and sediment transport model was developed for Reach Four, a 1.5-mile reach of the Pajaro River, using the MIKE-21C software. The model simulated six scenarios for 1.5-, 5-, 10-, 50-, and 100-year flow events, summarized as:

1. Alternative 1: Existing conditions, based on the USACE topography from 1995 supplemented with cross sections from 2000.
2. Alternative 2: USACE Alternative 2A, (the USACE Preferred Plan) reflecting a 100-foot levee setback on both sides of the river and a 4-foot increase in levee height from the geometry modeled in Simulation 1.
3. Alternative 3: Benched 2A, taking Alternative 2 and excavating an 8-foot deep, 100-foot wide bench on one side of the channel.
4. Alternative 4: Benched 2A taking Alternative 2 and excavating a 4-foot deep, 100-foot wide bench on one side of the channel.
5. Alternative 5: Benched 2A, taking Alternative 2 and excavating an 8-foot deep, 100-foot wide bench on both sides of the channel.
6. Alternative 6: Benched 2A taking Alternative 2 and excavating a 4-foot deep, 100-foot wide bench on both sides of the channel.

Each 100-foot bench was simulated with a 50-foot wide riparian tree corridor and a 50-foot grass strip. For this study, shear stresses were evaluated for 10-, 50-, and 100-year flow events for Alternatives 1, 2, 3, and 5. Santa Cruz County and the USACE have expressed interest in adopting elements of Alternative 3, modifying the USACE preferred plan and adding a cut bench on the Santa Cruz side of the Pajaro River. One purpose of this study is to evaluate in more detail the shear stresses predicted by the model to be encountered in such a plan, and to compare them with shear resistances from different types of channel material.

1.3 SUMMARY OF RESULTS

1. The shear stresses calculated for all conditions (existing, preferred plan and alternatives to the preferred plan) during the 100-year flood are considerably higher (orders of magnitude) at meander apexes than the critical shear stress (resistance threshold) for bare soil or alluvial materials. Maximum predicted shear stresses range from 0.65 lb/ft^2 on meander apexes under existing conditions, to 0.50 lb/ft^2 with a bench on one side of the channel. It is thus essential that some type of protective cover is applied and maintained on the outside banks, floodplain, floodplain terraces and levees at meander apexes under any flood management plan. Exposed earth banks within the low flow channel may also be prone to erosion that could undermine more resistant upper banks.

2. Design shear stresses at meander apexes during the 100-year flood under all potential channel conditions exceed those that can be overcome by the lowest classes of turf cover (Class C turf) or by short native grasses. Thus, denser and more resistant vegetative covers, such as willows planted from live stakes, are required on meander bends, regardless of which alternative is selected.

3. Predicted peak shear stresses in straight reaches are approximately two thirds of shear stresses at meander apexes. Predicted shear stresses in the straight sections of channel of

20-22 N/m^2 or pascals (0.42 - 0.46 lb/ft^2) greatly exceed the critical shear stress of bare soil or alluvial material, so protective bank cover is necessary to prevent erosion. Predicted shear stresses for straight reaches are in the range where continuous grass or turf covers should be able to overcome shear stress, once fully established. Non-vegetated parts of the channel (e.g. below the low flow channel top) may be eroded during high flows, undermining more resistant upper banks.

4. The results suggest that benching will reduce shear stresses during flows that inundate the lower floodplain.

5. The highest bank shear stresses predicted by the model for existing conditions under the 100-year flood are 31 pascals (0.65 lb/ft^2). These stresses are found in the upstream meander bend, on the Santa Cruz side of the river. This stress suggests a design shear stress of 1.49 lb/ft^2, allowing for factors of safety and for temporary fluctuations in stress. This stress level can be resisted by Class A and B turf, 6-inch rip rap, live brush mattresses (once established), and live willow stakes.

6. The highest predicted shear stress under the USACE Alternative 2A for the same site under the 100-year flood is 27 pascals (0.56 lb/ft^2), 13% lower than under existing conditions. This stress yields a design stress of 1.3 lb/ft^2. Though less than under existing conditions and so providing a greater safety margin for use of the materials outlined above, this reduction in expected shear stress does not expand the range of bank protection materials that can be safely used.

7. The predicted peak shear stress under Alternative 3 (8-foot deep bench on the Santa Cruz side of the river) is 24 pascals at the upper meander bend (0.5 lb/ft^2) with a design stress of 1.15 lb/ft^2. This is 23% lower than the predicted shear stresses under existing conditions and 10% less than under USACE Alternative 2A. In addition to the materials that are suitable for existing conditions or USACE Alternative 2A, this stress is within the range that can also be stabilized by the use of long native grasses.

2. INVESTIGATION METHODS

2.1 DESCRIPTION OF MIKE 21C MODEL

MIKE 21C is a 2-D curvilinear grid model specifically developed by DHI Water & Environment (DHI) to simulate river hydrodynamics and morphology changes. The hydrodynamic model solves the vertically-integrated equations of continuity and conservation of momentum (the Saint Venant equations) in two directions and includes descriptions for helical flow and vertical velocity profiles. These descriptions are important for simulating the physical processes associated with secondary flow in meandering systems. The morphological model, following calculation of bed material transport (bedload and suspended load), solves the equation for sediment continuity.

2-D models such as MIKE 21C are applicable to sediment transport modeling of the Pajaro River. This alluvial river has numerous meander bends inside levees. Some of these meanders have a small radius and have experienced erosion in recent history. The river also has graded sediments ranging from fine sands to coarse gravels; the transport of this range of grain sizes can be successfully described by the available formulas in MIKE 21C.

2.2 INPUTS FOR THE 2D PAJARO RIVER MODEL

2.2.1 Project Location

Model inputs were summarized in PWA and DHI (2005) and will only be briefly described here. The Pajaro River flood plan is being developed for the Pajaro River from its mouth at the Pacific Ocean to approximately 11 miles upstream to Murphy Crossing. The Pajaro River forms the border between Santa Cruz and Monterey Counties in this location. PWA and DHI (2005) simulated a meandering section of the Pajaro one mile downstream of Murphy Crossing because this offered an opportunity to assess sediment trapping processes on both bends and straight sections, and because previous one-dimensional (1-D) models of the Pajaro River have not been able to assess the effects of lateral erosion and deposition processes in bends.

2.2.2 Model Boundaries

The study reach is approximately bounded by USACE Monument Nos. #2067 and #2082. This corresponds to a 2260 meter (1.40 miles) long reach over which channel and bench sedimentation were investigated. The model boundaries were extended beyond these limits to minimize boundary effects within the study reach. The model is approximately bounded by USACE Monument Nos. #2056 and #2084. This corresponds to a 4130 meter (2.56 miles) long reach with buffer reaches 630 meters (0.39 miles) long upstream and 1240 meters (0.77 miles) long downstream of the study reach.

2.2.3 Hydrodynamic Boundary Conditions

Hydrodynamic boundary conditions for the flood plan scenarios listed in Table 1 for the 10-, 50-, and 100-year events were derived from unsteady simulations using the USACE HEC-RAS models for existing (Alternative 1) and levee setback (Alternative 2) conditions. The unsteady simulations were modeled with synthetic hydrographs that were derived from the typical hydrologic response associated with each annual flood event as observed at the Chittenden gage (this study). The peak discharge for each flood event was based on the USACE latest flow frequency estimates for the Pajaro River Basin (USACE, 1997; USACE, 2003), which are detailed in Table 1. The antecedent flow for each synthetic hydrograph was assumed to be 8.5 m^3/s (300 ft^3/s), which approximately corresponds to the average annual wet season flow as observed at the Chittenden gage (this study). Synthetic hydrographs were also approximated for Salsipuedes Creek by scaling the typical hydrologic response observed at the Chittenden gage.

Table 1. Flow Frequency Estimates for the Pajaro River Basin

Recurrence Interval	Pajaro River at Chittenden		Salsipuedes Creek at Pajaro River		Pajaro River below Salsipuedes Creek	
(years)	(cms)	(cfs)	(cms)	(cfs)	(cms)	(cfs)
10	492.7	17,400	99.1	3,500	557.8	19,700
50	948.6	33,500	192.6	6,800	1076.0	38,000
100	1135.5	40,100	236.4	8,350	1288.4	45,500

[1] Estimated from flow frequency curve (USACE, 2003) Note: The USACE prediction is different from the Authority estimate due to differences in definition of the 100-year flood.

During the unsteady simulations the timing of the synthetic hydrographs for the Pajaro River at Chittenden and Salsipuedes Creek were adjusted such that the peak discharges downstream of the confluence approximately matched the estimates in Table 1. Following these timing adjustments, time series of water level and discharge were extracted from the HEC-RAS models at USACE Monument Nos. #2056 and #2084 and used as boundary conditions to the MIKE 21C model.

To provide useful comparisons among the different alternatives, hydraulic conditions for each of the Alternatives were simplified to be more conceptual. This was primarily achieved by setting the roughness coefficients to composite values representing broad sections within the model. For Alternatives 1 and 2, the roughness coefficient was set to 0.04 for the entire 2D model domain. Since sediment transport is a function of roughness and as-modeled in-channel roughness elements remain constant in time and space, this was assumed a valid approach, especially considering that the channel can migrate in the model. For the remaining alternatives, the roughness coefficients were set to 0.04 for the channel and benches and 0.075 for the vegetative strips. It is important to note in the results that follow, that vegetation was only modeled as an increase in roughness, not as an increase in critical shear stress. In reality, vegetation both reduces shear stress and increases critical shear stress (erosion resistance), thereby reducing erosion on vegetated areas such as the grass and riparian corridors. However, this process was too complicated to model at the conceptual level. Thus some of the simulated bank erosion rates are likely to be higher than real rates would be, as our approach does not account for the increase in critical shear stress. Our approach does, however, allow relative comparisons to be made between alternatives.

2.2.4 Sediment Boundary Conditions

In general, the Pajaro River can be characterized as having a fine bed reach (D_{50}<2 mm) from the Pacific Ocean upstream to USACE Monument No. #2045 and a coarse bed reach upstream (D_{50}>2 mm) of this station to the upstream project boundary at Murphy Crossing. The reach average d_{50} for the fine and coarse reaches are 0.6 and 3.8 mm, respectively. These distributions are based on samples reported in a prior report (PWA, 1997). Since material less than 0.062 mm was defined as washload, it was excluded from the analysis. The bed material in the coarse reach is slightly bimodal. The distribution was reduced to four representative size classes as shown by Table 2. The coarse reach percentages were used to define the distribution of the bed material and the fine reach percentages were used to approximate the distribution of the incoming coarse load.

Table 2. Representative Size Classes for Sediment Transport

Size Classes	Fine Reach (%)	Coarse Reach (%)	Particle Size (mm)
VFS, FS	6.6	2.8	0.16
MS, CS, VCS	84.2	35.7	0.61
VFG, FG, MG	9.0	45.3	5.1
CG, VCG	0.2	16.2	25.3

Sediment transport boundary conditions for the MIKE 21C model were discussed in detail in PWA and DHI (2005) and will only be briefly described here. RMC (2002) developed a rating curve for material larger than 0.062 mm for the Chittenden gauge:

$$Qs=0.007Q^{1.56} \tag{1}$$

where Q_s is the total sediment load (tons/day)and Q is discharge (cfs). Equation 1 was applied to the discharge boundary conditions to estimate the coarse sediment load into the model.

The Engelund & Hansen (1967) total load equation was used to model the sediment transport through the study reach. This total load equation is applicable for graded sediments ranging from 0.062 to 32 mm and is regarded as an appropriate model for rivers with the characteristics of the Pajaro River (Yang & Huang, 2001).

In this study, the following assumptions/limitations were imposed in MIKE 21C:

1. The system is fully alluvial except for the benches, where only newly deposited material may erode.

2. Bank erosion was not described by a separate bank erosion model: erosion occurs where boundary shear stress exceeds critical shear stress. Neither the effects of vegetation on increasing the erosion resistance of stream banks, or the mass failure of over-steepened stream banks are simulated. Thus, the model tends to overestimate hydraulic erosion of vegetated banks and benches, while potentially underestimating bank failure in over steepened conditions.
3. The bench tops are simulated as vertically non-erodible. Lateral bank erosion can migrate into them from the side. Erosion of deposited sediment can occur from the top, but only down to the initial grade. This assumption is based on the rationale that while lateral forces can undercut a vegetated bank, downwards erosion of a vegetated bench surface is much less likely.

2.2.5 Shear Stress Estimates

Stream stability is often assessed by the ability of a reach to accommodate upstream water and sediment relative to the downstream base level (Fischenich, 2001). When hydraulic forces exceed resisting forces, localized sediment transport may occur and cause erosion. The extent of erosion is generally proportional to the magnitude of these forces and the time over which they are applied. In a simplified setting (e.g, steady 1-D flows), shear stress, τ, may be approximated by equating the driving forces (e.g., weight of water on the slope) with the resisting forces (e.g. resistance of the channel bed)

$$\tau = \gamma R S_f \qquad (1)$$

where γ is the specific weight of water, R is the hydraulic radius, and S_f is the friction slope. Resisting forces have generally been derived empirically, and are approximated by the critical shear stress (τ_c) first derived from Shields (1936) laboratory experiments.

However, the solution of shear stress in a 2-D setting is more complex. In MIKE 21C, shear stress is estimated using a formulation of Manning's equation, and separated into streamwise (τ_x) and cross-stream components (τ_y)

$$\tau_x = \frac{u\gamma\sqrt{u^2 + v^2}}{M^2 h^{1/3}} \qquad (2)$$

$$\tau_y = \frac{v\gamma\sqrt{u^2 + v^2}}{M^2 h^{1/3}} \qquad (3)$$

where u is the mean streamwise flow velocity, v is the mean cross-stream component of flow velocity, M is Manning's coefficient of resistance, and h is flow depth.

3. SIMULATION OF ALTERNATIVES

The model results indicate that predicted peak shear stresses are below 32 pascals (N/m^2) (0.7 lb/ft^2) throughout the study reach for Alternatives 1, 2, and 5 for the 10-, 50- and 100-year flow events (Q10, Q50, and Q100, respectively) (Table 3). Shear stresses generally increased with discharge, and localized cells of high shear stress were observed along the two major meander bends corresponding with the model domain of “j60” and “j126.”

Table 3. Maximum predicted shear stress for upstream (j60) and downstream (j126) meander bends for the Pajaro River study reach (lb/ft^2)

Alternative	Upstream Meander Bend (j60)			Downstream Meander Bend (j126)		
	Q10	*Q50*	*Q100*	*Q10*	*Q50*	*Q100*
Alternative 1	0.357	0.546	0.651	0.462	0.546	0.609
Alternative 2	0.294	0.441	0.567	0.357	0.399	0.588
Alternative 3	0.252	0.441	0.504	0.231	0.336	0.378
Alternative 5	0.189	0.315	0.378	0.252	0.273	0.315

In straight reaches away from meander apexes, predicted shear stresses were lower. Typical peak stresses along the river bank in straight reaches were in the range of 20-22 pascals (0.42 - 0.46 lb/ft^2) under existing conditions during the 100-year flood, with slightly lower values encountered under all the alternatives.

These results were analyzed against the shear resistance of different bank materials using a USACE methodology developed by Fischenich (2001). In this approach the predicted peak value is modified with a Factor of Safety and allowances for temporal and spatial variation to produce a design shear stress (Table 4). This value is then compared with published tolerances for different types of bank material (shown in Table 5). Fischenich recommends adding safety factors of 15% to estimates of shear stress from empirical calculations, to account for temporal fluctuations in shear stress, and further recommends the use of an overall safety factor of 1.3 to allow for error and data variance. Use of an unsteady 2D hydrodynamic model in theory reduces the necessity for such great allowances for temporal and spatial safety factors, since issues such as meander curvature (which increases local shear stress) and temporal fluctuations on rising and falling hydrographs are addressed. Chang (1988) calls for a 50% increase in predicted shear stress when applying empirically calculated shear stresses to design problems, but this approach was not taken since the model calculates shear stress in a more physically-realistic way and accounts for curvature and secondary circulation. We did, however, apply the recommended 15% increase in shear stress to allow for temporal fluctuations, and a highly conservative safety factor of 2.0 due to the importance of the levees and banks for flood protection. Thus the design shear stresses developed in the analysis (Table 4) are 230% of estimated shear stresses. This is very similar to the values resulting if Fischenich’s 15% increase for temporal fluctuations, 1.3 safety factor and Chang’s 50% increase for spatial variance are used (combining to give a 225% increase in design shear stress).

Peak design stresses associated with each alternative at the corresponding discharge (Q10, Q50, and Q100) are listed in Table 4.

Table 4. Maximum predicted design shear stress with a factor of safety of 230% (S_f=2.3) for the Pajaro River study reach (lb/ft^2).

Alternative	Upstream meander apex (j60)			Downstream meander apex (j126)		
	Q10	Q50	Q100	Q10	Q50	Q100
Alternative 1	0.821	1.256	1.497	1.063	1.256	1.401
Alternative 2	0.676	1.014	1.304	0.821	0.918	1.352
Alternative 3	0.580	1.014	1.159	0.531	0.773	0.869
Alternative 5	0.435	0.725	0.869	0.580	0.628	0.725

These peak design shear stresses may be compared with published tables showing the stress that different bank materials can withstand. One such table has been compiled by the US Army Corps of Engineers (Table 5).

Table 5. Permissible shear stresses for different bank materials

Boundary Category	Boundary Type	Permissible Shear Stress (lb/sq ft)	Permissible Velocity (ft/sec)	Citation(s)
Soils	Fine colloidal sand	0.02 - 0.03	1.5	A
	Sandy loam (noncolloidal)	0.03 - 0.04	1.75	A
	Alluvial silt (noncolloidal)	0.045 - 0.05	2	A
	Silty loam (noncolloidal)	0.045 - 0.05	1.75 – 2.25	A
	Firm loam	0.075	2.5	A
	Fine gravels	0.075	2.5	A
	Stiff clay	0.26	3 – 4.5	A, F
	Alluvial silt (colloidal)	0.26	3.75	A
	Graded loam to cobbles	0.38	3.75	A
	Graded silts to cobbles	0.43	4	A
	Shales and hardpan	0.67	6	A
Gravel/Cobble	1-in.	0.33	2.5 – 5	A
	2-in.	0.67	3 – 6	A
	6-in.	2.0	4 – 7.5	A
	12-in.	4.0	5.5 – 12	A
Vegetation	Class A turf	3.7	6 – 8	E, N
	Class B turf	2.1	4 - 7	E, N
	Class C turf	1.0	3.5	E, N
	Long native grasses	1.2 – 1.7	4 – 6	G, H, L, N
	Short native and bunch grass	0.7 - 0.95	3 – 4	G, H, L, N
	Reed plantings	0.1-0.6	N/A	E, N
	Hardwood tree plantings	0.41-2.5	N/A	E, N
Temporary Degradable RECPs	Jute net	0.45	1 – 2.5	E, H, M
	Straw with net	1.5 – 1.65	1 – 3	E, H, M
	Coconut fiber with net	2.25	3 – 4	E, M
	Fiberglass roving	2.00	2.5 – 7	E, H, M
Non-Degradable RECPs	Unvegetated	3.00	5 – 7	E, G, M
	Partially established	4.0-6.0	7.5 – 15	E, G, M
	Fully vegetated	8.00	8 – 21	F, L, M
Riprap	6 – in. d_{50}	2.5	5 – 10	H
	9 – in. d_{50}	3.8	7 – 11	H
	12 – in. d_{50}	5.1	10 – 13	H
	18 – in. d_{50}	7.6	12 – 16	H
	24 – in. d_{50}	10.1	14 – 18	E
Soil Bioengineering	Wattles	0.2 – 1.0	3	C, I, J, N
	Reed fascine	0.6-1.25	5	E
	Coir roll	3 - 5	8	E, M, N
	Vegetated coir mat	4 - 8	9.5	E, M, N
	Live brush mattress (initial)	0.4 – 4.1	4	B, E, I
	Live brush mattress (grown)	3.90-8.2	12	B, C, E, I, N
	Brush layering (initial/grown)	0.4 – 6.25	12	E, I, N
	Live fascine	1.25-3.10	6 – 8	C, E, I, J
	Live willow stakes	2.10-3.10	3 – 10	E, N, O
Hard Surfacing	Gabions	10	14 – 19	D
	Concrete	12.5	>18	H

[1] Ranges of values generally reflect multiple sources of data or different testing conditions.

A. Chang, H.H. (1988).
B. Florineth. (1982)
C. Gerstgraser, C. (1998).
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N. Data from Author (2001)
O. USACE (1997).

Source: Fischenich, 2001.

4. DISCUSSION OF RESULTS

The results confirm the earlier study that showed that benching on the Pajaro River should reduce shear stresses during flows that inundate the lower floodplain so created. While benches on both sides of the river (Alternative 5) reduce the shear stresses the most, there are significant reductions in shear stress from all alternatives compared with existing conditions. Benching on the Santa Cruz side (Alternative 3) reduces shear stresses below the level predicted for the USACE 2A Alternative, which in turn is an improvement over existing conditions.

The simulations show that predicted shear stresses in both straight reaches and meander apexes calculated for all conditions (existing, USACE preferred plan and the various alternatives to the preferred plan) are considerably higher than the critical shear stress (resistance threshold) for bare soil or alluvial materials. It is thus essential that some type of protective cover is applied to the banks, floodplain and floodplain terraces under any plan. It should also be noted that vegetation will not extend below the low flow water line of the Pajaro River, and that below this line there will be bare earth that is vulnerable to erosion during high flows. Though bankside vegetation will slow erosion down, erosion along the unvegetated portion of the low flow channel may undermine this protection and cause bank erosion.

Design shear stresses at meander apexes predicted during the 100-year flood under all potential channel conditions exceed those that can be overcome by the lowest classes of turf cover (Class C turf) or by short native grasses. Thus, the type of cover and its maintenance is important to the stability of the channel. Poorly established or maintained grass covers are not strong enough to resist the highest shear stresses predicted by the model. Denser and more resistant vegetative covers are recommended, regardless of which alternative is selected. The model suggests that willows, once established from live stakes, may provide sufficient shear stress to overcome the expected stresses at meander apexes. Adoption of benching reduces the shear stresses predicted, and thus allows for a wider range of vegetative treatments for bank stabilization with a greater safety margin.

The highest bank shear stresses predicted by the model for existing conditions under the 100-year flood are 31 pascals (0.65 lb/ft^2). On straight channel reaches away from the meander apexes the stresses are much lower, on the order of 20-22 pascals (0.42 - 0.46 lb/ft^2) under existing conditions during the 100-year flood. The design stress provided by the estimated shear stresses for straight reaches (0.94 – 1.03 lb/ft^2) under existing and project conditions is in the range that can be resisted by short grass, turf, or willow plantings.

Any model-based analysis of channel lateral migration must acknowledge the uncertainty associated with numerical simulation models. Historical analysis of the Pajaro River suggests that the river is laterally dynamic, and has experienced a significant reduction in channel sinuosity. This has left pockets of material that are more or less resistant than average, providing the potential for channel erosion by processes that were not evaluated in this study (e.g. levee failure due to preferential sub-surface flow). Nevertheless, this analysis provides a conceptual-level evaluation of the kind of vegetative materials that can generally be expected to resist erosion under the Alternative scenarios simulated.

5. REFERENCES

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6. ACKNOWLEDGEMENTS

We would like to thank William Firth at the USACE for his help providing the topography and model boundary conditions.

7. LIST OF PREPARERS

This report was prepared by the following PWA staff:

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Andrew Collison, Ph.D.	Project Manager
Brett Valle, Ph.D.	Hydrologist

Attachment 9

Assembly Member John Laird
Capitol Office:
State Capitol
P.O. Box 942849
Sacramento, CA 94249-0027

Subject: AB 2348 May 4, 2006

Dear Assembly Member Laird:

We have reviewed Assembly Bill 2348, researched background information regarding the history of the Pajaro River Project, and conditionally support the Bill provided the amendment discussed latter in this letter is included in the final Bill. We anticipate this amendment will address the tenets of successful flood protection described in the USACE Studies that originally recommended construction of the 1949 Levee Project in the Watsonville area and guided subsequent Projects and Watershed Management throughout the basin. (USACE 1944 Pajaro River Basin Report, excerpts attached).

As you know the 1949 Levee Project has not provided our community the 50-Year level of flood protection planned for, and the USACE has estimated our protection has decreased to an 8-Year level. Our community has recognized that this is a significant deficit in protection, and in partnership with the USACE is now in the last phases of study to identify and recommend remedies to this situation.

Our research confirms that Congress intended the Project to utilize a composite system of protection elements including the Natural Flood Protection Features present in the upper watershed, and the Levee construction in the Lower River, in order to provide 50-year protection. The upper watershed elements include the Soap Lake Area and the lower reaches of the San Benito River, where flood water detention storage and stream bed percolation function to reduce peak flows downstream. See the attached excerpt from the 1949 report incorporated into the authorization.

The integrity of these upper watershed elements have been the subject of on-going investigations by the Pajaro River Flood Protection Authority, which has been collaborating with the USACE in recent flood protection studies.

We anticipate the USACE and Local Sponsors will address the functional status of all the aforementioned composite elements integral to the failed 1949 Project, and include elements in the proposed Project that remedy our flood protection deficit situation.

Further more, we believe AB 2348 is essential to funding this Project, which is scheduled for approval latter this year.

We are optimistic that AB 2348 has this potential, but are uncertain if all necessary Project elements will be fundable under the criteria set forth in the Bill. That is because the Project Sponsors and other stakeholders have not resolved whether the Project as authorized is limited to its footprint in the lower river or may include upstream elements as we believe.

We would very much appreciate if you could help us with this uncertainty involving application of section 12585.7 of the Bill, which directs the Department of Water Resources to determine eligibility of specific Project elements. We request that Section 12585.7(e)(1) be amended as follows:

> The department of Reclamation Board shall include their recommendations with regard to increased cost sharing in the report prepared pursuant to subdivision (b) of Section 12582.7, if so prepared, or in any addendum to the report. *At the earliest feasible date prior to the publication of any environmental document for potential modification to the project, the department of Reclamation Board, in consultation with the project sponsors and other stakeholders, shall give consideration to whether measures outside of the existing project boundaries which may contribute to project purposes, including flood protection or fish, wildlife, or recreation mitigation, may be subject to the cost-sharing formulas described in subdivisions (a), (b), (c), or (d).*

Of specific interest are the Project upstream mitigation elements as presented in the attached Table.
We believe these Project elements are essential for a properly functioning Project that reliably delivers a sustainable level of flood protection over the Project's service life. This issue is central to our community's support for any project, and knowing this eligibility information will enable our Community leaders/Project Sponsors to effectively deliberate and approve a reliable final Project. Thank you for your consideration.

Lois Robin

Chair,
Sierra Club
Pajaro Rivee Watershed Committee

Attachment: 1.) Lower Pajaro Project Element Table
2.) Excerpt from page 29 of USACE 1944 Pajaro River Report

Cc Pajaro River Flood Protection Authority
C/o RAPS, Inc.
POB 809
Marina, CA 93933

US Army Corps of Engineers
Attention: Nicole Ortega
333 Market Street, 8th Floor
San Francisco, CA 94105

Congressman Sam Farr
701 Ocean Street, Room 318
Santa Cruz, CA 95060

Lower Pajaro River Project Elements Table

Government Body	Project Cost	Federal Share	State AB 2348 (50%&70%)	Local Share				Comment
				Santa Cruz	Monterey	Santa Clara	San Benito	
Total Project Cost	**$226,820,000**	**$169,740,000**	**$33,218,500**	**$11,405,750**	**$11,405,750**	**$150,000**	**$900,000**	
Lower River Project Cost	**$210,500,000**	**$157,500,000**	**$30,362,500**	**$11,318,750**	**$11,318,750**	**$0**	**$0**	
Bench Excavation Project	$33,000,000	$24,750,000	$ 5,775,000	$ 1,237,500	$ 1,237,500			
Levee Construction	$177,000,000	$132,750,000	$ 24,337,500	$ 9,956,250	$ 9,956,250			
LERDS	$500,000		$ 250,000	$ 125,000	$ 125,000			
Upper Watershed Mitigation	**$14,000,000**	**$10,500,000**	**$2,450,000**	**$0**	**$0**	**$150,000**	**$900,000**	
Upper Pajaro River Grade and Erosion Control Structures San Benito River Confluence to Soap Lake	$4,000,000	$3,000,000	$ 700,000			$150,000	$150,000	**Stabilize Erosion:** Colatteral Benefits address habitat conservation for ESA Species)
San Benito River Grade and Erosion Control Structures	$10,000,000	$7,500,000	$ 1,750,000				$750,000	**Stabilize Erosion:** Colatteral Benefits address errosion at water supply pipeline, bridges, agricultural lands, and homes. - Several Biotechnical Grade Control Structure (Boulders-Willows)
Lower River Enhancements	**$2,320,000**	**$1,740,000**	**$406,000**	**$87,000**	**$87,000**	**$0**	**$0**	
Habitat Enhancements	$400,000	$300,000	$ 70,000	$ 15,000	$ 15,000			**ESA Critical Habitat:** Biotechnical Erosion Control Structures (LWD)
Trails	$120,000	$90,000	$ 21,000	$ 4,500	$ 4,500			**Public Access** along Levee Tops
Picnic Areas	$1,000,000	$750,000	$ 175,000	$ 37,500	$ 37,500			**Environmental/Poverty Justice:** Pavillion, tables, rest rooms, Sheriffs Field Office
Recreation	$800,000	$600,000	$ 140,000	$ 30,000	$ 30,000			**Open Space** Senic Vista Sites

Attachment 2: Excerpts from USACE 1944 Pajaro River Report

64. *Complete flood protection versus partial flood protection.*—Investigations made during this survey have shown that construction of works to effect complete control of flood flows in the Pajaro River is not economically feasible under present conditions in the basin. Studies have clearly demonstrated that the only areas in the watershed where the cost of effective flood control works is commensurate with the benefits are in Pajaro Valley below river mile 11.8 and in South Santa Clara Valley in the vicinity of Gilroy.

65. The broad considerations governing the selection of any plan of improvement for flood control are that it must provide or require:

(*a*) Minimum disturbance of the natural regimen of the river.
(*b*) Maximum effectiveness in the areas where damages are concentrated.
(*c*) Minimum interference with existing development and facilities.
(*d*) Maximum opportunity for collateral benefits and multipurpose use of improvements.
(*e*) Positive action, the effects of which can be evaluated.

60. Flood peaks in the lower San Benito River are reduced considerably by channel storage in the river and by percolation into the stream bed. The combined effect of these features is large. For example, it is estimated that the storm of February 1938 produced a peak discharge of 20,000 cubic feet per second just below the confluence of Tres Pinos Creek and the San Benito River and that this peak was reduced to about 12,000 cubic feet per second just above the confluence of the San Benito and Pajaro Rivers. The corresponding maximum flood peak at Chittenden is estimated from high-water marks to have been 16,200 cubic feet per second.

61. It is apparent, therefore, that Pajaro Valley enjoys considerable flood protection from the regulating influences in the natural regimen of the river and its tributaries. Nevertheless, a considerable flood plain exists on both sides of the river in the valley. A substantial degree of protection is now afforded Watsonville and the urban and agricultural areas on the left bank of the river opposite Watsonville by levees constructed during 1939 and 1940, but, even under these improved conditions, the average annual flood damage in Pajaro Valley exceeds that of all other flood plain areas in the watershed. Flooding in the valley is not greatly influenced by tides or sand bar formations in Monterey Bay at the mouth of the river.

Attachment 10

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September 5, 2006

MEMORANDUM

To: Sierra Club, Pajaro River Committee

From: Richard Roos-Collins, Senior Attorney
Julie Gantenbein, Staff Attorney

Subject: Pajaro Flood Control Project

You requested an analysis of whether the General Reevaluation Report (GRR), which the U.S. Army Corps of Engineers (Corps), San Francisco District, is preparing for the Pajaro River Flood Control Project (FCP), is consistent with the legal requirements for restoration of the environmental quality of the Pajaro River. The short answer is no. As currently devised the GRR will focus exclusively on flood control within the footprint of the original FCP, namely the lower 11.8 miles of the river and 2.6 miles of its tributary Salsipuedes Creek. It will not consider environmental restoration as a purpose; it will not evaluate the watershed as a whole to determine how the FCP can achieve a desirable balance among multiple objectives in the watershed. We believe the current scope of the GRR is inconsistent with applicable federal and state law and regulations, and may subject the federal and local sponsors to potential liability for damages that result from future flooding.

Section I of this memo provides an introduction and background information regarding the FCP. Section II describes the purpose of the GRR. Section III describes the geographic and developmental scope of the GRR. Section IV describes the proper analytical procedures for developing any feasibility study, including a GRR. Section V discusses the sponsors' obligation to consider total costs, including operation and maintenance (O&M). Section VI discusses compliance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq.*, and the California Environmental Quality Act, CA Pub. Resources Code § 21000 *et seq.* Section VII discusses the liability of federal and local sponsors for potential damages from flooding.

The FCP schedule has been delayed several times since it was issued in August 2003 and now is a good time to reevaluate where the FCP is headed. We must continue to try to engage Corps and County legal and policy staff. We previously submitted our legal analysis regarding environmental restoration to them, but have not received a reply in more than two years. In a second effort to elicit their feedback, we have listed italicized questions addressed to the Corps and County throughout this memo. We should request that the Corps and County respond to the questions in writing in order to move closer to resolving our ongoing disagreement regarding the consideration and inclusion of environmental restoration as part of the GRR.

I. Introduction

The FCP was authorized by the Flood Control Act (1944). It was completed in 1949. As a result of flood damages thereafter, the Flood Control Act (1966) and Section 107 of the Water Resources Development Act (WRDA) (1990) authorized the Corps to study modifications to the FCP to correct possible deficiencies in design. The Corps published a Reconnaissance Study (1993) as the scoping phase of the GRR. Its Project Management Plan (March 2002) (PMP) describes how it will prepare the Feasibility Study, which is the next and final phase of the GRR. The stated purpose of the GRR is to modify the FCP within its original footprint to provide the authorized level of flood protection in the lower watershed.

The Corps has begun a separate study to develop a Pajaro River Watershed Management Plan (WMP). Section 905(b) of WRDA (1996) provided that the Corps will determine whether to modify the completed FCP in the "interest of flood control and ecosystem restoration, with emphasis on water quality, and other related purposes in the Pajaro River Watershed…." According to the Corps' proposal, the plan would incorporate the GRR as the solution for the lower watershed and would make further recommendations for management of the upper watershed. Basin Study, p. 11.

For the reasons stated below, this parallel track will not work. The GRR will be ineffective because it will not address facilities and activities in the upper watershed that have substantially increased the magnitude of peak flood flows and the sediment load in the lower river. The GRR will be deficient legally. It will not comply with the Corps' duty to assure that any civil work will comply with federal environmental laws on a continuing basis or its duty to contribute to watershed restoration consistent with the primary purpose of flood control.

II. Purpose of GRR

The sole purpose of the GRR will be modification of the FCP design to improve flood protection in the lower river. While the GRR, through the EIS, will evaluate measures to mitigate adverse environmental impacts – to reduce the worsening of existing conditions, restoration of fish and wildlife habitat will not be a purpose. The Corps apparently believes that the Basin Study, which was separately authorized from the GRR, is the only venue for that purpose. That is wrong.

General law provides that environmental restoration may be included in the purpose for each civil work undertaken by the Corps, including a completed FCP. A GRR may include ecosystem restoration as a study purpose under this authority. Corps, Engineering Pamphlets (EP) 1165-2502, ¶5, Table 2; EP 1165-2-502, ¶7(c); Engineering Regulation (ER) 1105-2-

100, ¶2-2(b). Indeed, general law authorizes systemic, not incremental, change to restore the natural functionality of a watershed.

For this purpose, ecosystem is defined as the dynamic and interrelated complex of plant and animal communities, including people, and their non-living environment, as affected by a civil works project. EP 1165-2-1, ¶19-4. Ecosystem structure is the state and spatial distribution of microscopic and macroscopic material components in diverse living and non-living assemblages. Ecosystem function is a dynamic process characterized by rate and direction of change in material and energy flows through space and time. EP 1165-2-502, ¶7 n. 4.

An ecosystem restoration project should return an ecosystem that has been adversely affected by a civil work to "as near a desired natural condition as is justified and technically feasible" (EP 1165-2-1, ¶19-4), or a "close approximation" of its condition prior to disturbance (EP 1165-2-502, ¶7(c); ER 1105-2-100, ¶E-30(a)). It should partially or fully reestablish the attributes of a natural, functioning, and self-regulating system (EP 1165-2-502, ¶7(c)) of aquatic, wetland and terrestrial communities (EP 1165-2-502, ¶7(f)).

General law creates a strong presumption in favor of including ecosystem restoration as a purpose in a GRR, particularly where the functionality of the FCP is affected by upstream, non-federal facilities and activities, as is the case here. *A completed civil work should always be operated from a watershed perspective*, which considers the interconnectedness of land and water resources, dynamic nature of economy and environment, and variability of social interests over time. EP 1165-2-1, ¶ 3.20(a)(1) (emphasis added). *A civil work should achieve a desirable balance among multiple objectives in the watershed*. EP 1165-2-1, ¶ 3.20(a)(3) (emphasis added). Thus, environmental restoration in this context means providing multiple benefits, including water supply and water quality enhancement, if doing so will not interfere with the primary purpose of flood control; it's about expanding the pie, so to speak.

These principles are reflected in the "broad considerations governing the selection of any plan of improvement for flood control" which state that any project must provide or require the following:

"(a) Minimum disturbance of the natural regimen of the river.

(b) Maximum effectiveness in the areas where damages are concentrated.

(c) Minimum interference with existing development and facilities.

(d) Maximum opportunity for collateral benefits and multipurpose use of improvements.

(e) Positive action, the effects of which can be evaluated."

Chief of Engineers Report Regarding Pajaro River, Calif. (1944), p. 29.

III. Geographic and Developmental Scope of GRR

Based on the Reconnaissance Study (1993), the GRR will study alternatives to modify the FCP design within the existing footprint. It will not consider facilities and activities that have contributed to increases in peak flood flows and sediment load, or modifications thereof that may contribute to the functionality of the FCP.

This limited scope is a direct consequence of the Corps' choice not to include environmental restoration as a study purpose. The Corps' decision to limit the scope is inconsistent with the FCP authorizations and general law, which direct the Corps to plan at a watershed scale.

The study scope for an ecosystem restoration project should include all facilities and activities that have related impacts on the ecosystem. EP 1165-2-1, ¶19-4. Although the Corps may undertake an ecosystem restoration project only where its civil work contributes to the existing degradation, there is no mandate that the civil work be the sole or primary cause. EP 1165-2-502, ¶11; ER 1110-2-8154, ¶6(c). Indeed, the Corps should study an ecosystem restoration project in the context of a comprehensive program that includes contributive actions by other agencies and stakeholders. EP 1165-2-502, ¶7(j).

The 1944 and 1966 reports prepared by the Chief of Engineers in anticipation of construction and modification of the FCP addressed the dynamics of the basin as a whole, not just the discreet section of river which would be directly affected by construction. For example, the Corps considered the natural flood protection provided upstream in determining the design of the FCP:

> "Flood peaks in the lower San Benito River are reduced considerably by channel storage in the river and by percolation into the stream bed. The combined effect of these features is large. … [¶] It is apparent, therefore, that Pajaro Valley enjoys considerable flood protection from the regulating influences in the natural regimen of the river and its tributaries."

Chief of Engineers Report Regarding Pajaro River, Calif. (1944), p. 28. The Corps acknowledged that water conservation and drainage problems were inseparably associated with flood problems throughout the watershed and would need to be addressed in the future. *See id.* at pp. 28-29. Such problems included erosion and sedimentation in tributaries to the Pajaro. *See id.*

Further, the Corps discussed the project in the context of a comprehensive basin plan: "In the second phase of the studies and investigations for the Pajaro River Basin a comprehensive water resources basin plan considering multiple-purpose reservoirs and channel improvements will be included as a master plan for the ultimate development of the resources within the economic complex of the area." Chief of Engineers Report Regarding Pajaro River, Calif. (1966), p. 25. Plainly the Corps did not intend to restrict the FCP to the original footprint forever.

Since the 1944 Report by the Chief of Engineers, there have been significant changes in activities and facilities in the upper watershed, which have diminished the natural flood protection. To date the Corps has not directly responded to our evidence and analysis which show that the purpose of the FCP, 100-year flood protection, cannot be achieved unless upstream peak flow and sediment load are reduced.

The Corps, in coordination with local flood agencies, has considered flood management issues in the upper watershed in separate studies, but has not adequately addressed these changes and how they affect the flood capacity downstream in the GRR. For example, the Pajaro River Watershed Flood Protection Authority's (PRWFPA) Watershed Study has examined flood management issues in the northern, upper watershed, and developed the Soap Lake Preservation Project. The Study also examined sediment conditions in the San Benito River located in the southern, upper watershed. On June 10, 2005, the Study Consultant issued a report entitled "Sediment Issues on the Pajaro River Flood Plan" to the PRWFPA Board that identified ongoing erosion in the San Benito River streambed which has caused 40 feet of channel incision to date. Degradation in the upper watershed was also addressed in the Central Coast Regional Water Quality Control Board's (RWQCB) amendment to the Central Coast Basin Plan in December 2005. One of the reports considered by the RWQCB in the amendment process was entitled "Qualitative and Quantitative Analysis of Degradation on the San Benito River" (Golder 1997). The Corps' decision not to assure that the planning assumptions used to estimate the design flow for the FCP consider these documented changes is inconsistent with their obligation to reduce the uncertainty associated with factors affecting the stage-discharge relationship. *See* EM 1110-2-161.

IV. <u>Analytical Procedures</u>

The Reconnaissance Study was completed almost 15 years ago. It described problems in the FCP design and described existing conditions within the footprint. These are the first and second steps in the logic path required for a Feasibility Study, including a GRR. However, the Corps has indicated its intention to proceed directly to formulate alternatives for FCP modification without undertaking the remaining steps. This approach has substantial defects. To begin, the PMP and attached schedule do not provide for reconsideration of any of the findings of the Reconnaissance Study. However, many relevant circumstances have changed since publication in 1993, including the 1995 flood, continuing aggradation in the channel form and resulting loss of carrying capacity, listing of Central Coast fisheries and other species under the Endangered Species Act, and other changes in environmental law and policy, including ER and EP's new provision that each Feasibility Study may include environmental restoration as a primary purpose.

The Corps' push to complete the GRR on the basis of the outdated Reconnaissance Study is inconsistent with its duty to assure that each preliminary step is kept current as the predicate for the successive steps. The successive steps in the GRR (identification, evaluation, comparison, and selection of alternatives) will be inherently defective because they will be based on the assumption that environmental restoration is not a valid study purpose. These defects in the PMP are plain when compared to the general requirements for a six-step logic path in any Feasibility Study.

Step One is the statement of problems and opportunities. This statement should be framed in terms of the federal objective of maximizing the net benefits for national economic development or, for a restoration project, national ecosystem restoration. *See* ER 1105-2-100, ¶2-3(a)(1). It also should reflect the objectives of the non-federal sponsors and other participating stakeholders. *Id.*, ¶2-3(a)(1)-(2). This statement should not preclude the consideration of all potential alternatives. It should encompass future as well as present conditions. It should be dynamic and iterative – that is, revised periodically as the study proceeds. ER 1105-2-100, ¶2-3(a)(1). Once the problem and opportunity statement – the study scope – is framed, the next task under Step One is defining study objectives. Such objectives state the desired study results that would solve the problem or take advantage of the opportunity previously identified. They should be clearly stated to describe the desired environmental impact, its location, and its timing. ER 1105-2-100, ¶2-3(a)(4).

Question 1: Explain how the problem and opportunity statement articulated by the Corps is consistent with all the objectives of the Counties and other participating stakeholders.

Question 2: Has the Corps reviewed and revised the problem and opportunity statement to reflect new information gathered in the course of the study? If so, please provide last revision.

Question 3: What is the basis of the Corps' apparent decision to exclude study objectives related to environmental restoration?

Question 4: What is the basis of the Corps' apparent decision to exclude study objectives related to facilities and activities in the upper watershed?

Step Two is an inventory and forecast of critical resources, including environmental, demographic, economic, and social conditions relevant to the problem and opportunity statement. ER 1105-2-100, ¶2-3(b). The inventory of critical resources relevant to the problem statement should include existing and future conditions. ER 1105-2-100, ¶ 2-3(b). This baseline provides the basis for evaluating the comparative benefits of alternative plans. In the context of a completed civil work (like this FCP), the inventory and forecast establish a baseline under a no-action plan (e.g., no modification to the FCP). The inventory and forecast should be periodically revised throughout the study. ER 1105-2-100, ¶2-3(b). In forecasting the environmental impacts of the no-action and alternative plans, a study should consider risk and uncertainty (EP 1165-2-502, ¶16(e), (g); ER 1105-2-100, ¶2-4(g)) and intended and unintended consequences (EP 1165-2-502, ¶ 7(g)). The study should systematically address the causes of ecosystem degradation and restoration in order to increase the likelihood of long-term success (resilience and persistence) and reduce the need for extensive operation and maintenance. EP 1165-2-502, ¶ 7(j). Finally, the analytical method (whether a habitat model or other scientifically based method) should be chosen to provide results at the level of detail appropriate for the planning objectives. ER 1105-2-100, ¶E-33(1).

Question 5: What is the basis of the Corps' apparent decision not to consider existing and future conditions of the upper watershed in preparing the inventory and forecast of critical resources?

Question 6: How does the Corps propose to analyze cumulative impacts of the various alternatives if it has not inventoried existing and future conditions of the upper watershed?

Question 7: Has the Corps systematically considered the ecosystem degradation in the upper watershed in evaluating the likelihood of long-term success for the FCP? If not, does it intend to? If so, please provide the document in which this analysis is contained.

A. <u>Procedures for Public Participation</u>

The PMP (2002) describes the tasks and schedules for drafting and finalization of the GRR. In addition to the general task of study oversight (p. 10), the only specific tasks assigned to Santa Cruz and Monterey Counties, which are the non-federal sponsors of this GRR, appear to be obtaining the necessary rights-of-way for any expansions in the levee system (*see* schedule following p. 25). The PMP describes a process almost entirely under the Corps' internal control.

This is contrary to the requirement that a PMP should establish appropriate procedures to maximize the cooperative involvement of the non-federal sponsors and other stakeholders in the study. ER 1105-2-100, ¶B-2(c), ¶B-5(a). Since there is no single best approach to public participation, the PMP should establish a strategy appropriate to the circumstances of a given study. ER 1105-2-100, ¶B-5(c). The adopted strategy should identify the expected contributions of each stakeholder participating actively in the study. ER 1105-2-100, ¶B-5(a)(1)(e). At a minimum, it should include procedures agreeable to the non-federal sponsors for quality control of work products and for dispute resolution. ER 1105-2-100, ¶G-8(C)(5).

Indeed, in an ecosystem restoration project, the Corps should establish collaborative partnerships with other agencies (including regulatory agencies, not just the non-federal sponsors) and non-governmental organizations (NGOs) in study and implementation. EP 1165-2-1, ¶19-6. In that context, a stakeholder may gather information, or share a database, develop a management plan, or cooperate in implementation, operations, maintenance, and monitoring. EP 1165-2-502, ¶11(b). For example, the Corps and non-federal sponsors should use such assistance to identify ecosystem boundaries and develop alternatives that will contribute to the objectives for ecosystem restoration. EP 1165-2-502, ¶10(b). Finally, in conducting the study of an ecosystem restoration project, the Corps and non-federal sponsors should use collaborative decision-making to aid in the development and evaluation of alternatives, including those whose benefits cannot be monetized. EP 1165-2-502, ¶7(o).

Question 8: Have the Corps or Counties developed a strategy, which includes specific tasks for stakeholders by study, for public participation in any of the studies? If yes, please describe. If not, do they intend to develop one?

B. Formulation, Analysis, and Comparison of Alternative Plans

Because of its limited purpose as defined in the 1993 Reconnaissance Study, the GRR will consider alternative modifications of the FCP within its footprint. While the PMP itself is silent on this choice, the Corps and local sponsors have indicated that they do not plan to consider upstream measures, including non-structural. This range of alternatives is unduly limited, even if flood control is the sole purpose of the GRR, and it is plainly wrong if ecosystem restoration becomes an added purpose. In short, the GRR may not conform to the general requirements for Step Three (formulation of alternative plans) in any Feasibility Study. Further, while we have not seen a clear statement how the Corps intends to conduct Steps Four and Five (analysis and comparison of alternatives), the PMP's tight, albeit delayed, schedule and budget, suggest that the GRR may not conform to the requirements of the Corps' rules. We restate the general requirements for Steps Three to Five below.

Step Three in any Feasibility Study is formulation of alternative plans. Alternative plans should be formulated to identify specific ways to achieve planning objectives. Each should consist of a system of structural or non-structural measures, strategies, or programs. ER 1105-2-100, ¶ 2-3(c)(1). Such plans should not be limited to management measures that the Corps may implement directly or exclusively under existing authorities. They should include measures that may be implemented by other public agencies or stakeholders (ER 1105-2-100, ¶2-3(c)), or that may require changes in existing laws, rules, and common law (ER 1105-2-100, Figure 1-1, ¶5).

The first task in formulating alternative plans is to identify management measures that could be implemented, giving equal consideration to structural and non-structural measures. The second task is combining management measures into plans that are significantly differentiated. ER 1105-2-100, ¶2-3(c)(2). These tasks should be undertaken iteratively. ER 1105-2-100, ¶E-34. Each plan should generally be formulated to reasonably maximize benefits to the national economy, the environment, or the sum of both. It should be formulated in consideration of four criteria: completeness, effectiveness, efficiency, and acceptability. ER 1105-2-100, Figure 1-1, ¶5(d); ER 1105-2-100, ¶E-38; EP 1165-2-502, ¶16.

The study should establish four accounts in order to compare the alternative and no-action plans: National Economic Development (NED), environmental quality (EQ), regional economic development (RED), and other social effects (OSE). ER 1105-2-100, Figure 1-1, ¶7; ER 1105-2-100, ¶2-3(d)(3). These accounts include monetized and nonmonetized outputs and costs, and they are used to determine which alternative plan maximizes net benefits. ER 1105-2-100, ¶2-4(d), (k).

Step Five is comparison of alternative plans. Here, building on the comparison of each alternative plan against the no-action plan accomplished in Step Four, the study ranks the alternate plans. For an ecosystem restoration project, cost-effectiveness and incremental cost analysis (CE/ICA), as prescribed by the Corps' guidance documents, should be used to determine whether the outputs of an alternative plan could be accomplished at less cost by another alternative. ER 1105-2-100, ¶ E-36.

Question 9: What is the Corps' plan for accomplishing Steps 3 through 5 as described above?

Question 10: If the Corps does not intend to undertake Steps 3 through 5, please explain how this decision is consistent with the engineering regulations cited above.

C. Selection of Recommended Plans

According to the 1944 Report, "[t]he broad considerations governing the selection of any plan of improvement for flood control are that it must provide or require:

(a) Minimum disturbance of the natural regimen of the river.

(b) Maximum effectiveness in the areas where damages are concentrated.

(c) Minimum interference with existing development and facilities.

(d) Maximum opportunity for collateral benefits and multipurpose use of improvements.

(e) Positive action, the effects of which can be evaluated."

1944 Report, p. 29. However, based on its communications to date, it does not appear the Corps will abide by these considerations. The PMP states (p. 17) that the GRR will select the NED Plan, unless Santa Cruz and Monterey Counties commit to assume the costs of non-federal measures in a Locally Preferred Plan (LPP). In sum, the Corps will select that plan which maximizes monetizable benefits, such as prevention of flood damages, associated with the FCP. This criterion follows from the omission of environmental restoration as a study purpose. If that is also a study purpose, the criteria for selection of the recommended plan are a better balance of economic and environmental interests.

In any Feasibility Study, Step Six is selection of a recommended plan. The study should recommend a single plan among the alternatives. ER 1105-2-100, ¶2-3(f). The criteria for selection depend on whether the plan purpose is or includes ecosystem restoration. For all project purposes other than ecosystem restoration, the Corps should choose the alternative plan that maximizes National Economic Development (NED) Plan, unless the Secretary of Army grants an exception based on overriding considerations. EP 1165-2-502, ¶8; ER 1105-2-100, ¶ 2-3(f).

For an ecosystem restoration project, the Corps should select the plan that reasonably maximizes restoration benefits compared to costs. This is the National Ecosystem Restoration (NER) Plan. ER 1105-2-100, ¶2-3(f)(2). The combined monetary and non-monetary benefits of an ecosystem restoration project should exceed its costs. EP 1165-2-502, ¶16(a). Plan selection is not justified on the basis of a traditional benefit-cost analysis, since the majority of benefits cannot be monetized. Therefore, an ecosystem restoration project need not have a benefit-cost ratio greater than 1.0. EP 1165-2-502, ¶16(a)(1). However, it should be a cost-effective means to address the restoration problem. EP 1165-2-502, ¶16(a)(2). An ecosystem restoration project should: (1) demonstrate acceptability to other public agencies and stakeholders; (2) be complete in providing for all necessary investments or actions necessary to achieve the restoration; (3) be effective in restoring ecosystem structure of function to a meaningful degree; (4) be efficient, in providing the benefit in a more cost-effective manner than an alternative plan; and (5) should have reasonable costs. EP 1165-2-502, ¶16(c)-(g). For a plan having both economic and restoration benefits, the plan with the greatest net sum of such benefits is to be selected. ER 1105-2-100, ¶E-28(e)(2).

As to the Corps' ultimate selection of a plan, we are not recommending that the Corps apply the NER standards, although that choice is clearly with the Corp's discretion. Instead we are recommending that environmental restoration be included in the project purpose, whatever the standard.

V. <u>Consideration of O&M Costs</u>

As discussed briefly in Section IV.B above, the Corps must consider operation and maintenance (O&M) costs when evaluating alternative plans under Steps 4 (evaluating alternative plans) and 5 (comparing alternative plans) of the Feasibility Study.

Again, the Corps uses four accounts to "facilitate the evaluation and display of effects of alternative plans." *Id.*, ¶ 2-3(d)(3). The NED Account must include "Implementation Outlays." Such outlays are defined as "...costs incurred by the responsible Federal entity and, where appropriate, contributed by other Federal or non-Federal entities to construct, operate, and maintain a project in accordance with sound engineering and environmental principles...." *Id.*, Appendix D, ¶ D-3(e), p. D-5.

Implementation Outlays must include "Operation, Maintenance, Repair, Rehabilitation and Replacement Costs" (OMRR&R). *Id.*, Appendix D, ¶ D-3(e)(9), p. D-8. These costs are defined as the "current value of materials, equipment, services, and facilities needed to operate the project and make repairs, rehabilitate, and make replacements necessary to maintain project measures in sound operating condition during the period of analysis." *Id.* As a general matter, such OMRR&R costs are the responsibility of non-federal sponsors. *Id.*, Appendix E, ¶ E-3(h), p. E-10.

Implementation Outlays must include "Fish and Wildlife Habitat Mitigation Costs." *Id.*, Appendix D, ¶ D-3(d)(5), p. D-6. Such costs are defined as "the costs of mitigating losses of fish and wildlife habitat caused by project construction, operation, maintenance, repair, rehabilitation, and replacement." *Id.* They are the costs of compliance with relevant laws for the protection of environmental quality, including the Clean Water Act and the Endangered Species Act, and any resulting regulatory permits.

The Corps must consider "Life Cycle Costs" in the development of cost estimates. *Id.*, Appendix E, ¶ E-5(d), p. E-17. These long-term costs, which must include "OMRR&R as well as any necessary environmental monitoring and compliance inspection costs, play an important role in the trade-offs between high capital cost projects and those that have high O&M costs." *Id.* Indeed, "accurate estimates of...the ultimate cost" of the selected plan is necessary to assure its constructability and operability." *Id.*, ¶ E-5(b), p. E-16.

Each cost estimate in the NED Account must include "a discussion of the scope of the estimate and the uncertainties associated" with it. *Id.*, Appendix E, ¶ E-5(c), p. E-16. The Corps must pay "special attention to large cost items and items that are sensitive to change." *Id.* That is because cost estimates during the Feasibility Study "are often perceived to be more accurate than they are, and therefore, project documents must include a discussion of the elements that make up the project cost estimate and of their variability." *Id.*, ¶ E-5 (b)(2), p. E-16. The Corps may use contingencies to address such uncertainties. *Id.*, ¶ E-5 (c), p. E-16. The ultimate analytical goal is that actual cost of the project will be "within 20 percent" of the estimated cost in the NED Account as stated in the final Feasibility Study. *Id.*

Question 11: Has the Corps prepared an economic analysis of O&M costs to allow comparison of alternatives? If yes, please provide.

Question 12: If the Corps does not intend to include an analysis of O&M costs please explain how this decision is consistent with the engineering regulations cited above.

VI. <u>NEPA/CEQA Compliance</u>

Under NEPA, the Corps must prepare an Environmental Impact Statement (EIS) prior to taking any action which has the potential to significantly affect the quality of the human environment. *See* 42 U.S.C. § 4332(2)(C). The EIS must include a detailed discussion on:

> "(i) the environmental impact of the proposed action,
>
> (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented."

Id. CEQA places similar obligations on state agencies to prepare an Environmental Impact Report (EIR). *See* CA Pub. Resources Code § 21100.

Federal and non-federal sponsors are supposed to coordinate their environmental review for a project. The standard practice is for the sponsors to prepare a joint EIS/EIR that satisfies NEPA and CEQA. Under Engineer Regulation (ER) 200-2-2, ¶ 20, the Corps must coordinate its NEPA procedures with State and local agencies to the fullest extent possible, including: (1) joint planning processes, (2) joint environmental research and studies, (3) joint public hearings, and (4) joint environmental impact statements. *See id.* (*incorporating by reference* 40 C.F.R. § 1506.2.

As discussed in Section IV.B above, the range of alternatives the Corps plans to consider is unduly limited, and thus is inconsistent with regulations implementing NEPA and the Corps' regulations for the formulation of alternative plans in the Feasibility Study. Instead of considering a reasonable range of alternatives, which includes upstream measures, the Corps has stated that the GRR will consider alternative modifications of the FCP within its footprint. This is inconsistent with 40 C.F.R. § 1502.14, which states that the section containing the analysis of alternatives is the "heart" of the EIS:

"it should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public. In this section agencies shall:

(a) Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.

(b) Devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.

(c) Include reasonable alternatives not within the jurisdiction of the lead agency.

(d) Include the alternative of no action.

(e) Identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless

> another law prohibits the expression of such a preference.
>
> (f) Include appropriate mitigation measures not already included in the proposed action or alternatives."

The Corps refusal to date to explore and analyze reasonable alternatives that look upstream will make the EIS/EIR vulnerable to challenge on this basis.

VII. <u>Potential Liability</u>

By not following proper analytical procedures in developing the GRR, and by declining to consider upstream conditions and measures, the Corps and Counties are vulnerable under constitutional and state law for potential flood damage to private landowners which may result from failure of the FCP.

Under the Fifth Amendment of the U.S. Constitution, the federal government may be liable for a constitutional taking if landowners can show that their land is subject, because of government action, to permanent or inevitably recurring floods. *See Turner v. United States,* 901 F.2d 1093, 1095 (Fed. Cir. 1990); *Hartwig v. United States*, 485 F.2d 615, 620 (1973). "Government action" includes design and construction of flood control features. *See Turner v. United States*, 23 Cl.Ct. 447, 449 (1991).

The local sponsors may be liable for flood damages to private landowners resulting from any failure of the FCP. As a matter of constitutional policy the State is liable for inverse condemnation if a public project imposes a disproportionate burden of the costs or risks on individual property owners. *See Paterno v. California (Paterno II)* (2003) Cal App. 4th 998, 1003; *Locklin v. City of Lafayette* (1994) 7 Cal. 4th 327; *Belair v. Riverside County Flood Control District* (1988) 47 Cal. 3d 550, 558; *Holtz v Superior Court* (1970) 3 Cal. 3d 296, 303. This liability may arise as a result of the Counties' decisions here if the resulting plan of flood control (the design, construction, operation and maintenance of the FCP and adjacent levees) creates an unreasonable risk to private properties and if the plan is a proximate cause of future damages. *See Paterno II; Arreola v. County of Monterey*, (2002) 99 Cal. App. 4th 722, 739.

In approving the NED alternative as currently articulated, i.e., without consideration of upstream measures, the Counties may also be subject to liability for "dangerous conditions of public property" under California Government Code section 835, or nuisance under California Civil Code section 3479. *See Paterno v. California (Paterno I)* (1999) 74 Cal. App. 4th 68. *See Vedder v County of Imperial* (1974) 36 Cal. App. 3d 654; *Cornette v. Dept. of Trans.* (2001) 26 Cal. 4th 63; *Zelig v County of Los Angeles* (2002) 27 Cal. 4th 1112; *Brenner v. City of El Cajon* (2003) 113 Cal. App. 4th 434.

CONCLUSION

We continue to believe that the Corps and Counties should expand the scope of the GRR to include ecological restoration as a project purpose and include upstream facilities. Failure to do so will result in a compromised FCP that may leave the sponsors vulnerable liable for damages under federal and state law. We recommend that the Sierra Club redouble efforts to engage Corps and County regulatory and legal staff and persuade them to reevaluate their decision to limit the GRR purpose and geographic scope to flood control in the lower watershed.

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Pajaro River Watershed Committee

Ventana and Loma Prieta Chapters

www.ventana.org

9/27/06

Susan Mauriello
Chief Administrative Office
Santa Cruz County
701 Ocean Street
Santa Cruz, CA 95060

RE: Pajaro River Flood Protection Project

Dear Susan:

Thanks for meeting with our Pajaro River Committee on June 28. We appreciate the attendance of your Pajaro River Staff along with Bill Phillips of Monterey County and Steve Palmisano of the City of Watsonville. We discussed common goals, project status, watershed studies and project authorizations. You invited us to submit a letter summarizing our position on these issues.

As we reflect on these issues, we realize that there is a far greater disparity in our various positions than we previously understood. Because of the magnitude of this disparity and its implications for the present process and schedule, we are sending a copy of this letter to the two Boards of Supervisors, and the Flood Prevention Authority, and ask the two Counties (the Local Sponsors) to reconsider the course of the project.

We believe that the present NED Project in the lower watershed is fatally flawed by its failure to include the upstream watershed (above Chittenden Pass) in the design of the project. We believe that it is fundamentally wrong to design a flood control project for the lower reaches of the river without first establishing the future flood flow potential, including discharges of both water and sediment from the upper watershed. We have long argued that the upper watershed should be included in the design for the NED Project and have been told repeatedly, that either this in not legally possible under the present ACOE project authorization or that the upper watershed is being studied and that somehow (some way, some day) it will be incorporated into the downstream project. While the FPA has done some important work in the upper watershed, these studies have not provided the necessary design parameters for a competent design of the lower river improvements.

The enclosed opinion from our legal counsel states that the ACOE and Local Sponsors have not only the ability but the duty to include the upper watershed in the design of the project. We also believe that the ACOE and the Local Sponsors will be liable for damages if they fail to incorporate upstream conditions in the Project design.

While there have been studies of the upper watershed, they are clearly insufficient to determine future flood flow from the upper watershed into the lower section of the

river. Certainly, upstream studies, to date, have not established the potential for reducing the design flow in the lower reaches of the river through improvements in the upper watershed. Further, they have not established that present upstream conditions will not change, adversely affecting the future downstream flood flow.
Yet, the NED Project continues through the design process as if design flows (and sediment loads) were known. This failure to link the two portions of the watershed in designing of this project is a fundamental flaw in this process.

We urge the ACOE and the Local Sponsors to reexamine the present commitment to a specific design for the lower Pajaro until a comprehensive plan is developed which considers the entire watershed. Failure to do so will result in either greatly underestimating the downstream flood flow or greatly over designing the downstream project (which has already drawn criticism as being either too expensive, requiring too much land or doing too much environmental damage).

We would be happy to meet further to consider ways to implement these recommendations.

Yours truly,

Lois Robin, Chair, Ventana Chapter Pajaro River Watershed Committee
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831 464-1184
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ORIGINAL SIGNED BY:

David Collier, Chair Loma Prieta Chapter Pajaro River Watershed Committee
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cc:

Santa Cruz Board of Supervisors
Monterey Board of Supervisors
Santa Clara Board of Supervisors
San Benito Board of Supervisors
U.S. Army Corps of Engineers
Assemblyperson John Laird
Assemblyperson Simon Salinas
Congressperson Sam Farr
Congressperson Mike Honda
Senator Barbara Boxer
Senator Diane Feinstein
Pajaro River Watershed Flood Protection Authority
Assoiation of Monterey Bay Area Governments

LAFCO
California Department of Fish and Game
Santa Cruz Department of Water Resources
American Rivers
National Marine Fisheries
Regional Water Quality Control Board
California State Lands Commission
City of Watsonville
City of Gilroy
City of Morgan Hill
City of Hollister
City of San Juan Bautista
Action Pajaro Valley
U.S. Fish and Wildlife Service

Attachment 12

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Pajaro River Watershed Committee

Ventana and Loma Prieta Chapters
www.ventana.org

December 20, 2006

Mary Bannister
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bannister@pvwma.dst.ca.us

Jeff Cattaneo
San Benito County Water District
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Carol Presley
Santa Clara Valley Water District
5750 Almaden Expressway
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RE: PAJARO RIVER WATERSHED INTEGRATED REGIONAL WATER MANAGEMENT PLAN

Dear Ms. Bannister, Mr. Cattaneo, and Ms. Presley:

The purpose of this letter is to request that the Pajaro Valley Water Management Agency, San Benito County Water District, and Santa Clara Valley Water District (collectively, IRWMP Sponsors) specify procedures for coordinating implementation of the Integrated Regional Water Management Plan (IRWMP) Work Plan with resources agencies, interested stakeholders, and the general public. We agree with the IRWMP Sponsors that effective coordination will be critical to implementing the IRWMP Work Plan successfully, and so believe that procedures for coordination should be specified in the Work Plan.

As stated in previous letters we fully support the Collaborative's mission to "preserve the economic and environmental wealth and well-being for the Pajaro River watershed through watershed stewardship and comprehensive management of water resources in a practical, cost

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effective and responsible manner." IRWMP Work Plan, p. 60. We further support the Collaborative's goals, particularly the goal of flood protection on a watershed level.

We believe that the projects identified in the IRWMP, in addition to the Levee Reconstruction, will contribute considerably to identifying and addressing upstream conditions which affect downstream flood capacity and critical habitat for species listed under the federal Endangered Species Act (ESA), 16 U.S.C. § 1531 *et seq.* Further, we believe effective data management and coordination between sponsor agencies, resource agencies, and other stakeholders will be absolutely essential for the IRWMP projects to be developed and implemented so as to "maximize opportunities for comprehensive management of water resources throughout the watershed." IRWMP Work Plan, p. 61.

Although the Work Plan recognizes the importance of coordination, it describes procedures for coordinating only in general terms. According to the Work Plan, "[d]issemination of data to stakeholders, agencies and the public is integrated into the IRWMP process." *Id.*, p. 86. It also provides for ongoing stakeholder involvement:

> "The Stakeholder Steering Committee was established to aid in the collaboration of Pajaro River watershed integrated projects. … The Stakeholder Steering Committee provides a forum for on-going coordination, collaboration, and review throughout the IRWMP process. [¶] Ongoing stakeholder coordination and involvement is envisioned to continue indefinitely following the completion of the IRWMP report. Stakeholder involvement will be crucial to the implementation of those strategies identified for implementation in the IRWMP."

Id.

Given that effective coordination will be critical to successful implementation of the Work Plan, we request that the Sponsors develop specific procedures for coordination. Such procedures should include a schedule and program management plan, which is updated on a regular basis and distributed to all interested stakeholders. Further, we recommend that the Sponsors develop a Program Evaluation and Review Technique (PERT) chart, or similar management tool which would enable all stakeholders to monitor progress on the various projects. We also request that the schedule be linked to other watershed planning efforts, such as the Santa Clara County Habitat Conservation Plan and Natural Community Conservation Plan (HCP). The HCP Schedule (available at http://www.scv-habitatplan.org/www/default.aspx.) identifies project milestones which are also critical to the following IRWMP projects due to their nexus with endangered species habitat:

a. Groundwater supply facilities

b. Local surface water supply project-diversions & recharge

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c. Purchase additional CVP or SWP entitlement Pajaro River Total maximum Daily Loads for Sediment

d. Continued Reservoir Operations and Maintenance

e. Lower Pajaro River Flood Protection Project; including the Levee Reconstruction Project and Bench Excavation Project.

f. Central Coast Regional Water Quality Control Board Pajaro River Total maximum Daily Loads for Sediment (including Llagas Creek, Rider Creek, and San Benito River).

See IRWMP Work Plan, Table 1-14.

Thank you for considering these comments. We look forward to working with your agencies and other stakeholders to implement the IRWMP Work Plan.

Sincerely,

____

Attachment 13

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Pajaro River Watershed Committee

Ventana and Loma Prieta Chapters
www.ventana.org

Mr. Donald J. Hill
Public Works Dept.
Santa Cruz County
701 Ocean Street
Santa Cruz, CA 95060

RE: PAJARO RIVER Flood Protection Program **December 30, 2006**

Dear Don:

Thank you for meeting with us on November 29,2006 to discuss the U.S. Army Corps of Engineers (ACOE or Corps) and Monterey and Santa Cruz Counties' (collectively, Counties) planning process for the Lower Pajaro River Flood Control Project (Pajaro River FCP). We have also received your December 6th email and Mr. Thomas Bolich's letter of December 18th. We appreciate the dialog for effective flood protection and offer three studies proposed for inclusion in the Corps and Counties' planning process. These studies focus on engineering aspects of the flood protection system which are integral to protecting and restoring environmental quality within the Pajaro River watershed.

In addition to meeting with the Counties to discuss the Pajaro River FCP, we have also been participating in efforts related to the Integrated Regional Water Management Plan (IRWMP) sponsored by the Pajaro Valley Water Management Agency, San Benito County Water District, and Santa Clara Valley Water District (collectively, IRWMP Sponsors). The IRWMP Work Plan (May 2005) identifies flood protection on the watershed level as one of its goals, and includes a number of projects intended to address flood protection in the upper watershed. However, based on our review of the current iteration of the IRWMP Work Plan, it does not appear that the IRWMP projects will adequately address facilities and activities in the upper watershed which impact operation and capacity of the Pajaro River FCP. Further, it is unclear to us whether the IRWMP Sponsors and Corps and Counties consulted to assure maximum synergy between proposed flood protection projects in the upper watershed and proposed modifications to the Pajaro River FCP in the lower watershed. We encourage the Corps, Counties and IWRMP Project Sponsors to develop a framework for coordinating their planning and environmental review processes and integrating their respective work products.

The proposed three studies for inclusion will provide information regarding upper watershed issues which have a significant impact on flood protection in the lower watershed;

however, to our knowledge, they are not included in the current IRWMP Work Plan or in the existing ACOE study plan.

These issues became apparent during our review of the Pajaro River Watershed Flood Protection Authority (PRWFPA) Watershed Study. This Study collected data and utilized a hydrologic model to analyze historic and present watershed landscapes, and the circumstances defining flooding problems and flood protection solutions.

Our review criteria to test this model utilized tenets from the 1949 Lower Pajaro River FCP Operations and Maintenance (O&M) Manual which define the flood capacity performance standards for the levees, and provides background on design provisions and management requirements. This manual directs attention to preceding authorization documents including House Document 505, 78th Congress, 2nd Session (ACOE 1944 Watershed Study) where system understanding theory discussion outlines how the Levee Project was intended to function integrally with other natural features and projects in the watershed. This Report also explains the Levee Project's dependency on upper watershed floodplains to attenuate flood flows effectively and reduce discharges to the lower Watershed River defining a baseline natural flood protection benefit. Furthermore it contemplated various improvement projects throughout the watershed intended to increase local flood protection benefits while avoiding adverse impacts to the natural flood protection baseline.

Our review Model applied this theory, testing flood attenuation sensitivity accordingly with the history of floodplain alterations, including land-use activities and flood protection projects since circa 1944. Results indicate upper watershed River conveyance is sensitive to the alterations with consequent reduction in flood flow attenuation involving larger discharges downstream. Continuing over time, these incremental flow increases amount to cumulative impacts to the level of flood protection provided by the Lower Pajaro River FCP. Our Review Model indicates a 12,000 cfs sensitivity range from these impacts, raising concern they will persist as a source to the current deficit in the level of flood protection. This concern is described further in Kenn Reiller's January 6, 2006 letter the PRWFPA (see Attachment WM1)

We also investigated potential remedial measures to address this deficit situation, and offer the proposed studies and projects accordingly. Our goal is to stabilize degrading stream conditions and minimize the deficit by adapting historic upper watershed Project designs and O&M Manuals. These measures would rehabilitate impaired flood attenuation performance with contemporary system understanding and management options. Information and principles provided for in these manuals would support Public Works Official system understanding and participation in regulatory programs to assure effective integration of flood protection and water quality objectives.

RECOMMENDED PROJECTS

A. Upper Pajaro River Hydrology and Restoration Study

The goal of the study is to assure effective performance of the PRWFPA's Soap Lake Floodplain Preservation Project (Soap Lake Project) by adapting historic ACOE flood protection projects essential to its proper functioning. The Study would revisit historic project design, O&M assumptions, and compare them with contemporary information and system understanding. The study would address data gaps, thereby assuring sufficient information to analyze and evaluate historic project effectiveness to control the Upper Pajaro River flood flow elevations that trigger the natural flood attenuation characteristics of the Soap Lake Project. These flow elevations are sensitive to the state of natural river channel gradients and vegetation conditions which are managed by historic O&M practices based on the ACOE 1944 Watershed Study Article 57-66.

Our review model tested the Stage-Storage-Discharge attenuation theory described in these articles, and found 5,000 cfs sensitivity to these practices. Attachment UPR1 illustrates this sensitivity. Comparing the PRWFPA and the ACOE Watershed Studies in this regard indicates differences in system understanding, raising concern that historic Project designs and O&M practices may not have been effective in sustaining Soap Lake's flood attenuation performance. We anticipate remedial measures will be necessary to address this concern, involving engineering studies that reconcile historic and contemporary system understanding and provide for adaptive management. These remedial measures would need to integrate formally with ACOE process to assure design flow rates for downstream flood protection projects are reasonable and manageable.

The proposed Study would investigate data bases, design assumptions, and systemic understanding of the projects listed below.

1. Historic
   a. ACOE 1944 Watershed Study
   b. Channel Clearing Project Pajaro River (ACOE 1957 Upper Pajaro River Project)
   c. ACOE Circa 1990 Uvas Creek Project
   d. Soil Conservation Service PL566 (SCS) Circa 1985 Lower Llagas Creek Project

2. Current
   a. PRWFPA's Watershed Study,
   b. ACOE work in progress
      - Lower Pajaro River FCP
      - Upper Llagas Creek Project

Based on this investigation, consistency between management objectives, success criteria, and performance measurement would be evaluated to identify problems, or demonstrate how the following Projects are operated to deliver intended outcomes.

1. The ACOE 1957 Upper Pajaro River Project and the 2005 Soap Lake Project
2. The Soap Lake Project and the Uvas Creek Project
3. The Soap Lake Project and the Lower Llagas Creek Project
4. The Soap Lake Project and the Upper Llagas Creek Project
5. Lower Pajaro River FCP

For example, the 1957 ACOE-Upper Pajaro River Project includes an O&M Plan providing for special management of the streambed elevations to maintain low channel gradients and consequent low floodwater conveyance. This low conveyance is necessary to assure the continued integrity of the natural regime of the river and its floodplain's natural flood attenuation effectiveness (see sheet 3 of plan, and articles 57-62 and 66 of 1944 ACOE Watershed Study. The proposed study would fill data gaps and revisit conveyance relationships between maintenance of River conditions, backwater effects, floodwater storage/attenuation, and frequency of Soap Lake formation. Any stream degradation, design defects, and or faulty design assumptions would be identified and addressed. This topic was investigated in PRWFPA Watershed Study which provided recommendations for additional study.

The proposed Study area would include limited reaches of the Upper Pajaro River (from its confluence with the San Benito River to Frazier Lake Road), and Uvas Creek (from its confluence with the Upper Pajaro River to Santa Teresa Expressway). These reaches include the aforementioned ACOE Projects that involve design assumptions that appear obsolete or conflict with contemporary information and flood protection strategies. We anticipate the ACOE will need to address concerns in conjunction with their Lower River Project Study.

We recommend the following scope of work be considered:

(1) Revisit the Corps' Uvas Creek Project to address Soap Lake peak reduction assumption issues as discussed in TM 3.3-3.4. . A pre and post Project flood routing analysis may reveal altered floodwater routes with implications involving less than anticipated storage (defective flood attenuation performance). See Attachment UPR2.

(2) Conduct hydraulic-hydrologic sensitivity study of the 1957 Project's influence on river stage and influence on Soap lake floodplain attenuation performance: (a) clarify present condition of Pajaro River (post incised channel); (b) estimate baseline conditions circa 1944 (pre incised channel); and (c) estimate stream enhancement synergy relating habitat complexity, stage, and flood attenuation performance-effectiveness of Soap Lake. See Attachment UPR1.

(3) Consider the project in Attachment UPR3 viewed as adaptive management remedial measure, perhaps required by the ACOE 1944 Watershed Study authorization to enable confidence in the Lower Pajaro River FCP.

(4) Evaluate downstream design flood flow reduction opportunities and constraints for use in proposed Study 3.

B. San Benito River Hydrology and Stability Study

The goal of the study is to assure that the San Benito River is managed effectively to address its flood attenuation benefits to the lower River Community. The Study would investigate the continuing degradation of the lower 13 miles of the San Benito River and estimate impacts to baseline flood attenuation performance which is described in articles 57-62 of the ACOE 1944 Watershed Study.

Our review model tested the streambed floodwater spreading and percolation attenuation theory described in these articles, and found 8,000 cfs sensitivity to cumulative impacts from in-stream gravel mining practices as discussed below. The proposed study would revisit the PRWFPA's Study entitled "Sediment Issues and the Pajaro River Flood Plan", Philip Williams & Assoc. June 6, 2005 (Excerpts provided in Attachment SBR1), fill data gaps and assess streambed floodwater spreading and percolation attributes reported functional to reduce flows to downstream reaches. Degradation in performance between historical and present conditions would be identified along with potential remedial measures to stabilize and perhaps recover functionality. The results of the study would be integrated with the Lower Pajaro River FCP to assure design flow rates for downstream flood protection projects are reasonable and manageable.

We recommend that the preliminary scope of work include the following tasks:

(1) Conduct field surveys addressing data gaps, and perform hydrologic/hydraulic analysis of streambed flood attenuation potential involving the extent of floodwater spreading and percolation into the streambed.
- Evaluate the aforementioned Review Model restoration modifications simulating the aforementioned attenuation ((Reiller's edited copy of PROFLO HECRAS Model, available upon request).

(2) Estimate stabilization and recovery potential:
- Consider study proposals in Attachment SBR2; Philip Williams and Associates' Graphic (Restoring the Ecosystem Function of Rivers and Floodplains)
- Consider hypothetical streambed stabilization project (based on the review Model) provided in Attachment SBR3

(3) Develop regulatory strategies to assure flood protection interests are clearly defined, represented, integrated, and effective within Regulatory Programs including:
  a. Central Coast Regional Water Quality Control Board (CCRWQCB) 2005;
    - Phase 5: Regulatory Action Selection Final Project Report, Pajaro River Total Maximum Daily Loads for Sediment (TMDL); including supporting 1997 Golder Report (available upon request);,
    - Review status of PRWFPA letter to CCRWQCB (March 16, 2006) provided in Attachment SBR4.
  b. ACOE Clean Water Act Section 404 and 401
    - Public Notice No. 96-5 (December 10,1996, available upon request)

- Review status of PRWFPA letter to Corps (March 15, 2006) provided in Attachment SBR41**.**

C. Watershed Management Study

The goal of the study is to assure management controls are in place to implement and sustain the multi-jurisdictional flood protection program. The Study would include a systems analysis of all the existing Federal flood protection projects throughout the watershed (discussed in proposed Study A) evaluating individual and collective project performance to systematically deliver flood protection as intended. The study would also include a management analysis of the projects authorization and local cooperation agreements, evaluating sponsoring agencies authority, responsibility, and control to assure effective system wide performance, and power to adapt anticipated poor performing Projects accordingly. The Study would integrate the findings from proposed Studies A and B to assure design flow rates for downstream flood protection projects are reasonable and manageable.

The information obtained by this study would be appended to the PRWFPA's Watershed Study Phase I Technical Memorandums No.1.2.5 (River Geometry), No. 1.2.10 (Watershed Scenario's), Chapters 2 (Modeling), and Chapters 4 (Conclusions). These Phase I Chapters provide a problem definition for this Study, including an inventory of the aforementioned Lower River FCP flood protection deficit. Attachment UPR1 illustrates how the PRWFPA Watershed Study is proposed to be appended to clarify the perceived sources of the flood protection deficit.

An accurate definition of this deficit is a prerequisite to any effective solution, which must account for all of the structural and non-structural flood protection features described in articles 57-66 of the ACOE 1944 Watershed Study. The subsequent ACOE Projects authorized and implemented via this Report included provisions and requirements to assure integrity of these features. The status of this integrity would be accounted for as part of the proposed Study.

Analysis of the actual performance of these upper watershed Projects is prerequisite to alternative development for the remedial Lower Pajaro River FCP. This Project is struggling to avoid and minimize conflicts between design flow rate carrying capacity, levee right of way widths, and vegetation/habitat design and O&M requirements. These conflicts arise from the apparent over-sized flood protection deficit and consequent excessive design flow rates which reflect the degraded River conditions discussed in proposed Projects A and B, and the lack of an effective flood management program to comprehensively define problems and integrate solutions.

The proposed Study would investigate options for the PRWFPA to sponsor the currently authorized yet un-sponsored 2003 ACOE Watershed Study to facilitate robust system understanding, mult-jurisdiction and community consensus, and confidence that underlying causes of flood protection deficit and the 1995 levee failure have been adequately investigated and addressed.

In 2005, the PRWFPA completed a Watershed Study similar to the ACOE 1944 Watershed Study, but in a less comprehensive and formal manner. This Study limited scope of investigation to areas where voluntary landowner participation in project implementation was apparent. Since the ACOE 1944 Watershed Study was more comprehensive, and the founding document enabling implementation of all the aforementioned Federal Projects, and is now more than sixty years old, it should be updated to integrate the PRWFPA's Watershed Study and address scope of investigation, data, and analysis gaps.

We recommend that the preliminary scope of work include the following tasks:

1. Review public comments, including letter from Kenn Reiller to the Pajaro River Flood Protection Authority (Jan. 6, 2006); excerpts provided in Attachment WM2.
2. Integrate results of proposed Studies A, B and C.
3. Provide updated O&M Manuals for individual Projects linking them to a system wide monitoring schematic of performance measurement and operational standards.
4. Revise Emergency Operations Plan with State Standard Emergency Management System including Part III (Emergency Action Plan to address Lower River levee over-topping and flood routing to avoid Community hardships (i.e., Cities of Watsonville and Pajaro).
5. Evaluate status of existing authorities to perform adaptive management-remedial work:
   (a) Lower Pajaro River FCP (via multi-party agreements among local sponsors, PRWFPA, and Corps);
   (b) Llagas Creek Project (via multi-party agreements between Counties, SCS (NRCS), ACOE, and PRWFPA;
   (c) Santa Clara Valley Water District Maintenance Permit (via annual maintenance projects to restore channel bottom and banks).
   (d) Recruiting Sponsor (s) for the authorized ACOE 2003 Watershed Study
   (e) IWRMP project integration schedule and PERT Chart.

CONCLUSION

We look forward to working with the Counties and Corps to advance and implement an effective flood protection program. Please feel free to contact me if you have any questions or concerns regarding this letter in advance of the next meeting currently scheduled for February 2007.

Sincerely,

Kenneth Reiller

____
Pajaro River Watershed Committee

Concurrence:

Lois Robin

____
Chair Pajaro River Watershed Committee

Attachment WM1 (sheet 1 of 3)
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Pajaro River Watershed Study

RMC Raines, Melton & Carella, Inc. Consulting Engineers/Project Managers

in association with Schaaf & Wheeler CONSULTING CIVIL ENGINEERS

Technical Memorandum No. 1.2.10 – Watershed Scenarios

Task: Use Model to Show Impacts of Four Land Use Scenarios

To: PRWFPA Staff Working Group

Excerpt refers to Corps of Engineers (ACOE) planning but does not address two important routing parameters described in ACOE 1944 Watershed Study

1947 Conditions

This land use scenario was selected because it was believed that it best reflects watershed conditions as they existed when the Corps of Engineers planned the existing Pajaro River Flood Protection Project. Modeling flooding for the year 1947 also represents conditions as they were in the year 1955.

The land uses in 1947 were estimated using USGS quadrangle maps from the years 1945 to 1953. Urban areas were fairly easily identified in the old quadrangles. Cropping patterns were more difficult to determine. The quadrangle maps showed a large portion of the valleys in orchard. Estimates based on the quadrangle maps and various historic photos were used to develop the changes in CN shown in Table 10.2. The decreases in

LAND USE SCENARIOS -3- **April, 2002**

percent impervious reflect the reduction in urbanization based on existing conditions. CN's generally decrease slightly from existing levels.

six

In addition to changing percent imperviousness and CN, the 1947 hydrologic model also changed ~~four~~ important routing parameters in the model. Three dams had not yet been constructed and thus were removed from the existing conditions model. These were: Uvas Dam, Chesbro Dam and Hernandez Dam. The only dam in place in 1947 was Pacheco Dam. Llagas Creek in 1947 did not have the existing engineered, partially leveed channel in its lower reaches. To account for this pre-channel condition, the routing in this reach was changed to reflect more attenuation that would be expected with a smaller channel and a larger floodplain. .

The urbanization of the watershed in 1947 is estimated as 1 percent as compared to 2.4 percent under existing conditions. The percent imperviousness of the watershed was approximately 1.1 percent as compared to 1.7 percent under existing conditions.

Attachment WM1 (sheet 2 of 3)
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The Phase 1 Modeling Results (left) involve apparent data gaps including information from Articles 57- 66 of the ACOE 1944 Watershed Study.

These Articles pertain to the Upper Pajaro and San Benito River's natural regime which is functional to attenuate floods and reduce discharges downstream.

Addressing these data gaps and reanalyzing the Model (PROFLO) redefines the flood protection deficit problem as noted in Fig. 3.1.

Phase 1 Modeling Results
Peak Flood Discharge at Chittenden

• Existing Conditions	
2-Year	3,100 cfs
100-Year	44,600 cfs
• Historic Conditions (1947)	
2-Year	3,700 cfs
100-Year	~~50,200 cfs~~
• General Plan Build-Out (2015 to 2020)	
2-Year	3,600 cfs
100-Year	45,200 cfs
• Ultimate Build-Out (2050)	
2-Year	4,300 cfs
100-Year	45,700 cfs
• Changes in Agriculture	
2-Year	3,300 cfs
100-Year	45,000 cfs

35,000 + cfs
See appended PROFLO Model simulating conditions reported in Articles 57-66 of the1944 ACOE Watershed Study.

40,000 + cfs
Soap Lake flood attenuation Impaired? **9,000 cfs** sensitivity to the 1957 ACOE Upper Pajaro River Project impacts; Reducing Soap Lake Stage-Floodwater Storage-Attenuation?

•Changes in Mining	
2-Year	?
100-Year	47,000 cfs

47,000 + cfs
San Benito River flood attenuation Impaired? **10,000 cfs** sensitivity to Mining impacts; Reducing Floodwater Spreading and Streambed Percolation ?

•Practicable Project	
?-Year	19,000 cfs
100-Year	39,000 cfs

39,000 cfs
Restoration of Upper Pajaro and San Benito River flood attenuation? **12,000 cfs** sensitivity to Adaptive Management Remedial Measures.

Attachment WM1 (sheet 3 of 3)

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Pajaro River Watershed Study
Final Phase 2 Report

5-1

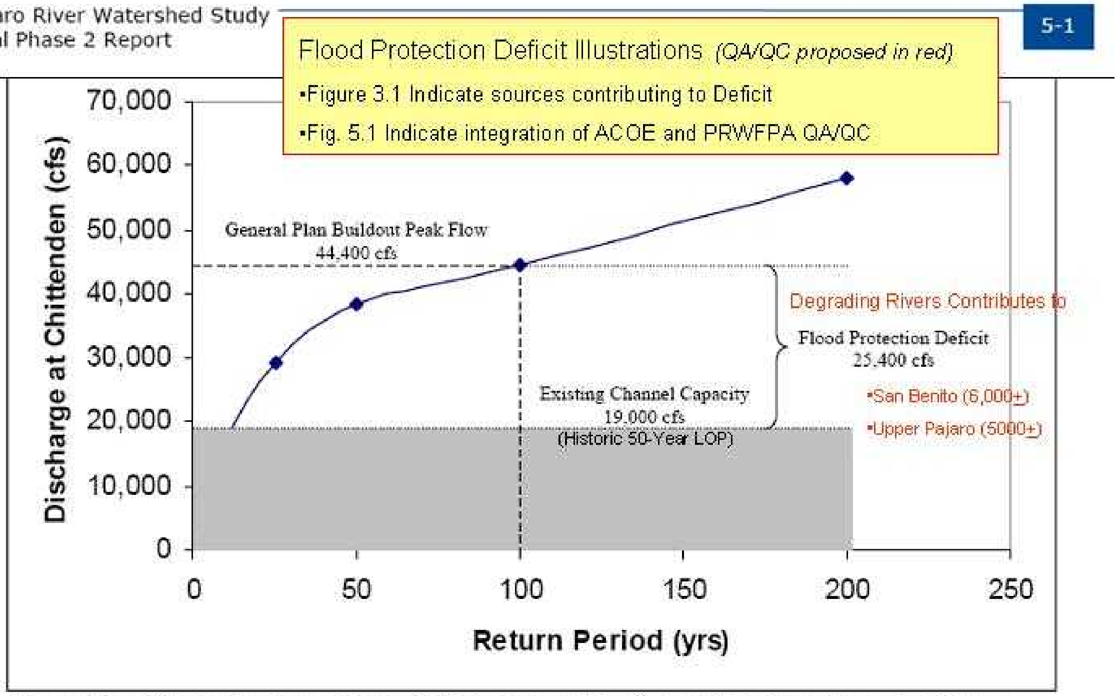

Figure 3-1: 100-year flood protection deficit based on existing Pajaro River channel capacity between

The level of flood protection provided by each alternative was defined as a percentage of the difference between the 100-year peak flood flow and the existing channel capacity as shown on Figure 3-1. Figure 3-1 is a graph of the Phase 1 model flood flow discharges at Chittenden at general plan buildout. The general plan buildout runoff provided for land use for the planning horizon between the years 2015 and 2020. The peak discharge at Chittenden is 44,400 cubic feet per second (cfs) in the general plan buildout land use scenario. The channel capacity downstream of Chittenden, assuming Corps levee certification, is 19,000 cfs, creating a potential overflow of about 25,400 cfs in this reach. Flood protection projects in the watershed would either attenuate the 25,400 cfs flow upstream or provide sufficient capacity for conveyance. A project that would reduce this capacity deficit by 2,540 cfs has a defined flood protection benefit of 10%; a project that would reduce the entire capacity deficit would have a flood protection benefit of 100%. Preliminary hydraulic modeling for each alternative provided the estimates of reduction in peak discharge overflow for the 100-year flood event.

5. Conclusions and Next Steps

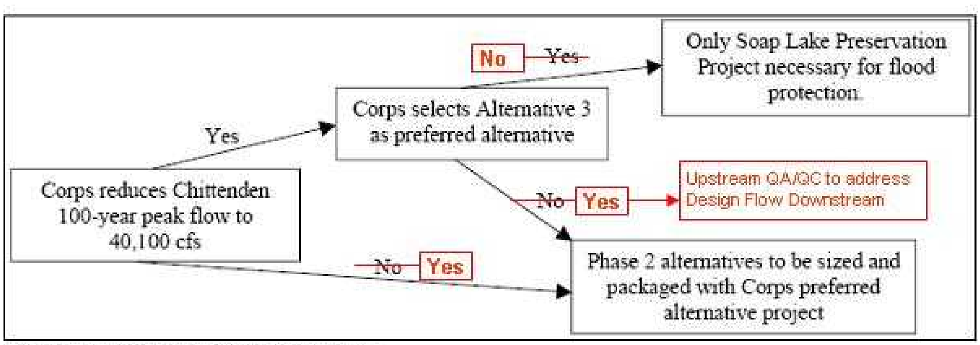

Figure 5-1: Decision Tree for Phase 3 Actions

Attachment UPR1 (sheet 1 of 2)
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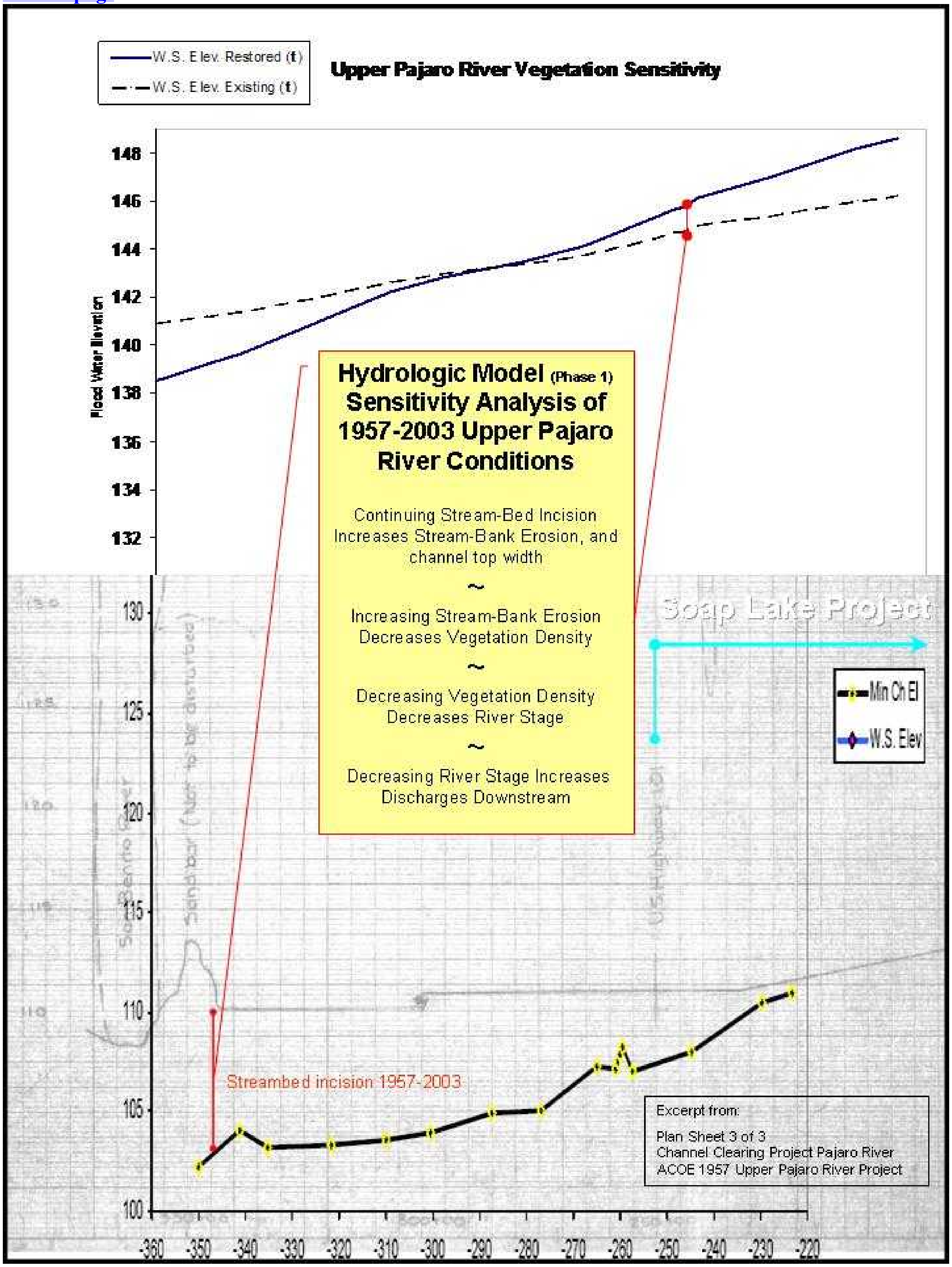

Attachment UPR1 (sheet 2 of 2)
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Soap Lake-Upper Pajaro River Model Sensitivity *(PROFLO)*

Upper Pajaro River Sta.115900 (Upstream Face Hwy.101 Bridge)	Upper Pajaro Restored & San Benito Reclaimed			Upper Pajaro & San Benito PROFLO Baseline			Sensitivity (cfs)
	Q Total (cfs)	Min Ch El	W.S. Elev	Q Total (cfs)	Min Ch El	W.S. Elev	
Phase 1 Soap Lake	19418	111	143.3	24630	108.2	142.4	5212
Phase 3 Soap Lake	21707	111	144.3	27285	108.2	143.7	5578

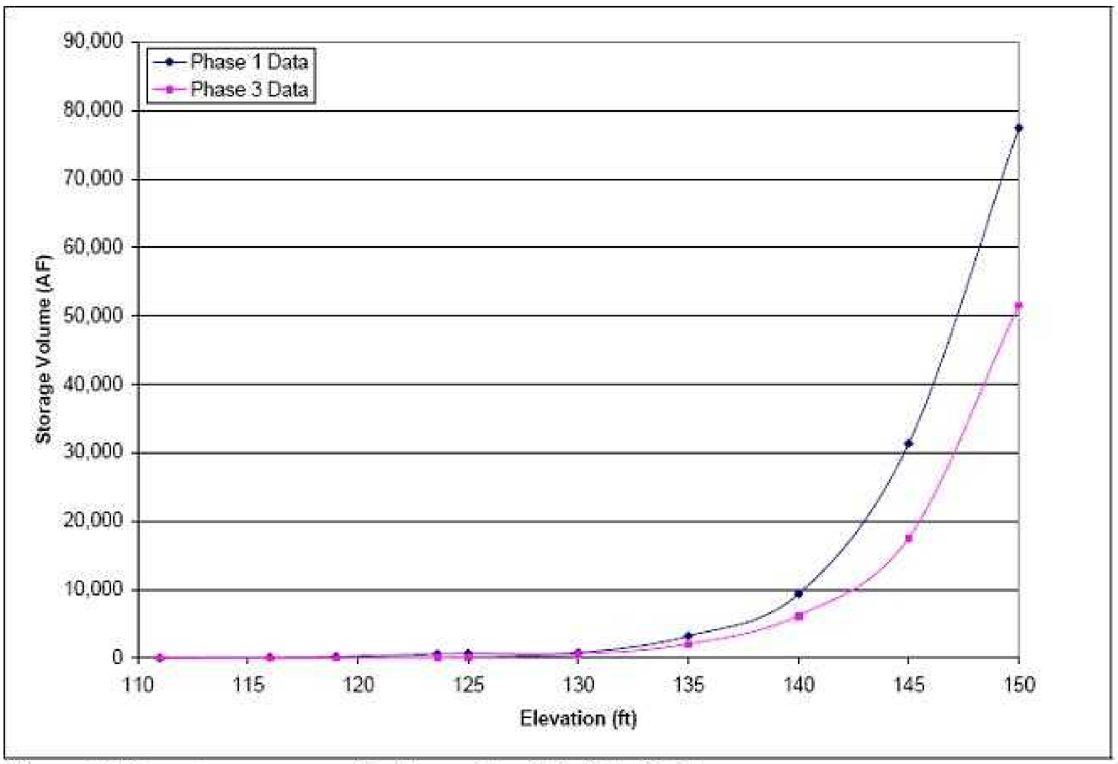
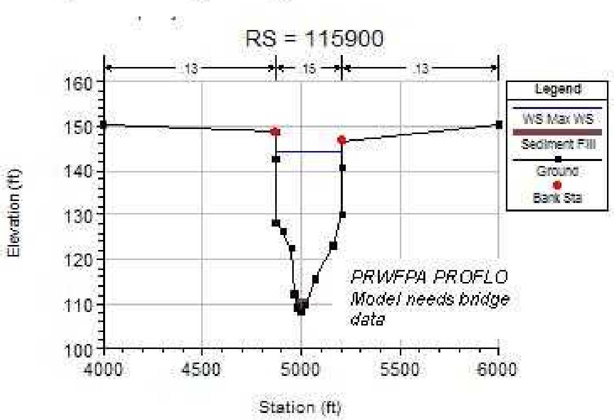
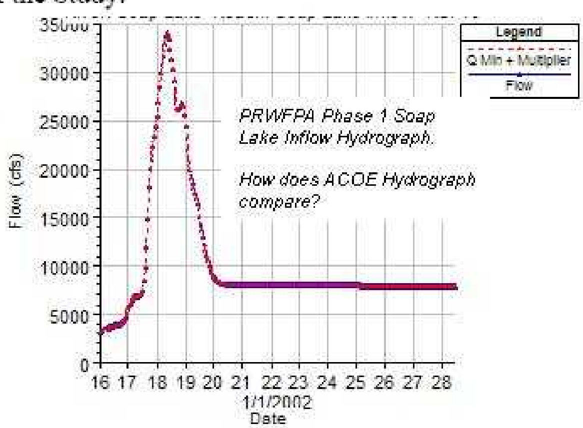


Figure 4: Stage storage curves for Phases 1 and 3 of the Study.





Attachment UPR2 (sheet 1 of 2)
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TM 3.3-3.4 conclusion

Conclusions

Tasks 3.3 and 3.4 have resulted in successful development of several products useful to both to this study and other efforts. A stage storage curve has been developed. It accurately defines the water surface elevation and storage for a defined area. Applicable to the Pajaro River Watershed Study and available as a reference for other studies, a general plan buildout floodplain for the 2-, 10-, 25-, 50-, and 100-year events has been developed based on Phase 1 hydrology.

The groundwork has also been laid for additional studies in this important area. The data gathered and model structure created for these tasks can be applied to future models. With calibrated input hydrology, detailed land use studies, and additional information regarding smaller waterways and passages, users could have additional confidence in and flexibility interpreting the results of the next generation of models.

The current Soap Lake hydraulic model describes the shape and location of Soap Lake during a range of event magnitudes. Model results indicate that the location of Soap Lake is actually further south-east than originally predicted by the FEMA approximated 100-year floodplain. There is also less storage than anticipated in the Uvas/Carnadero overbanks. In the right overbank, the topography creates a shallow channel between Uvas/Carnadero Creek and Hwy 101 but the creek levees, or banks, spill most of the excess water very high in the reach. Water does not overtop the banks throughout the reach and therefore little of the overbank is wetted. In the left overbank there is a ridge that rises well above the water surface that precludes storage in much of the area between Uvas/Carnadero and Llagas Creeks.

There is a shift in water storage over the course of a flood. During the peak inflows, much of the storage is in the upper study area and utilizes the upper reach overbanks as flow paths. The water surface generally tracks with the ground elevation. Once the peak inlet flows have passed, the water storage takes place in the lower reaches of Soap Lake. The extent of flooding is dictated more by the water surface at the outlet of Soap Lake, which creates a level water surface in the floodplain.

It is interesting to note the large jump in floodplain area between the 2- and 10-year events. As can be seen in Figure 27, the increase in floodplain is greater in the 2- to 10-year return period range than in the 10- to 100-year range. Also shown in Figure 27, the rate of floodplain spreading per increase in flow is greater in the 2- to 10-year event range than in the 10- to 25-year event range. This indicates that there is a wide, shallow floodplain next to the rivers and channels. There are significant implications associated with this topography. Small increases in flow to Soap Lake during frequent events result in a substantially bigger floodplain and therefore unusable agricultural land while inundated. An increase in channel roughness would also lead to more frequent, larger floods in Soap Lake.

Attachment UPR2 (sheet 2 of 2)
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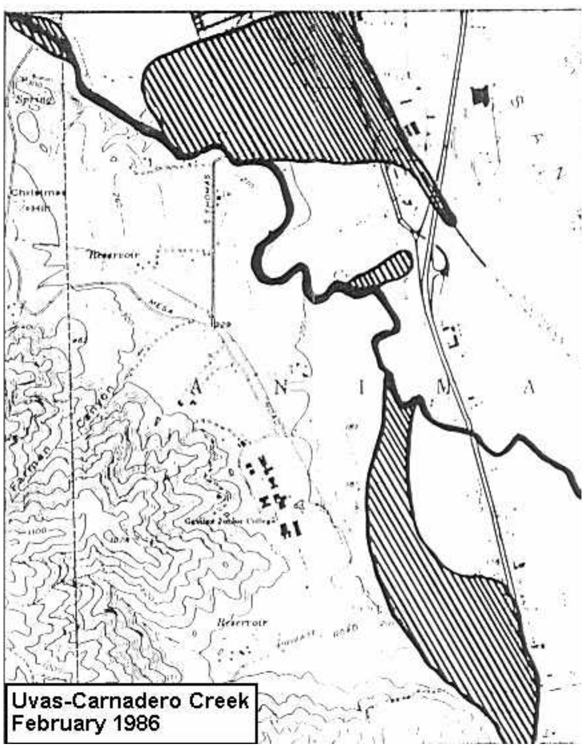
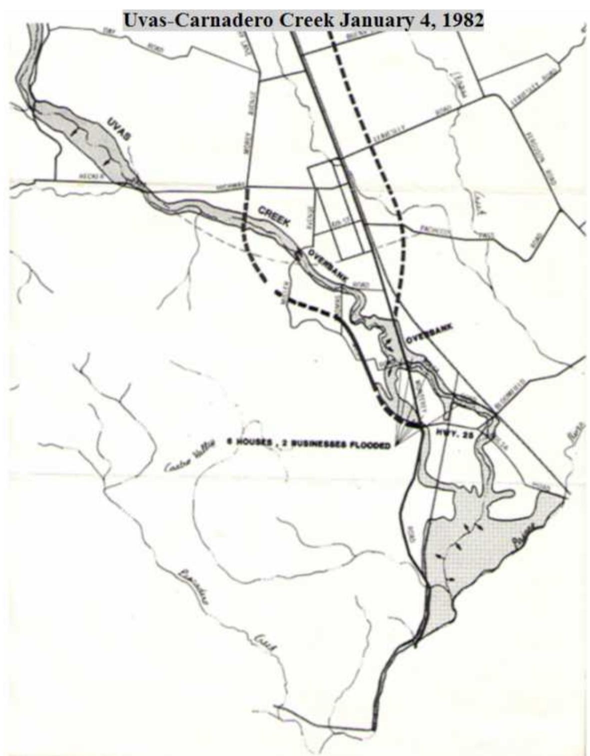
What are the implications of the "less storage than anticipated" as mentioned in TM 3.3-3.4 paragraph 3. Perhaps the circa ACOE Uvas Creek Levee Project induced flooding downstream contributing to the deficit in flood protect at the Pajaro River FCP.

Note Uvas Creek 1986 (left) most northerly spill flowed to Princevalle Storm Drain, and Llagas Creek floodplain where storage attenuation is present. Circa 1990 Levee Project contained and directed this floodwater southerly to spill at Gabilan Creek and ultimately the Pajaro River; see 1982 Flood Map (right). This altered route does not appear to have much storage attenuation as suggested in TM 3.3-3.4.





Attachment UPR3 (sheet 1 of 2)

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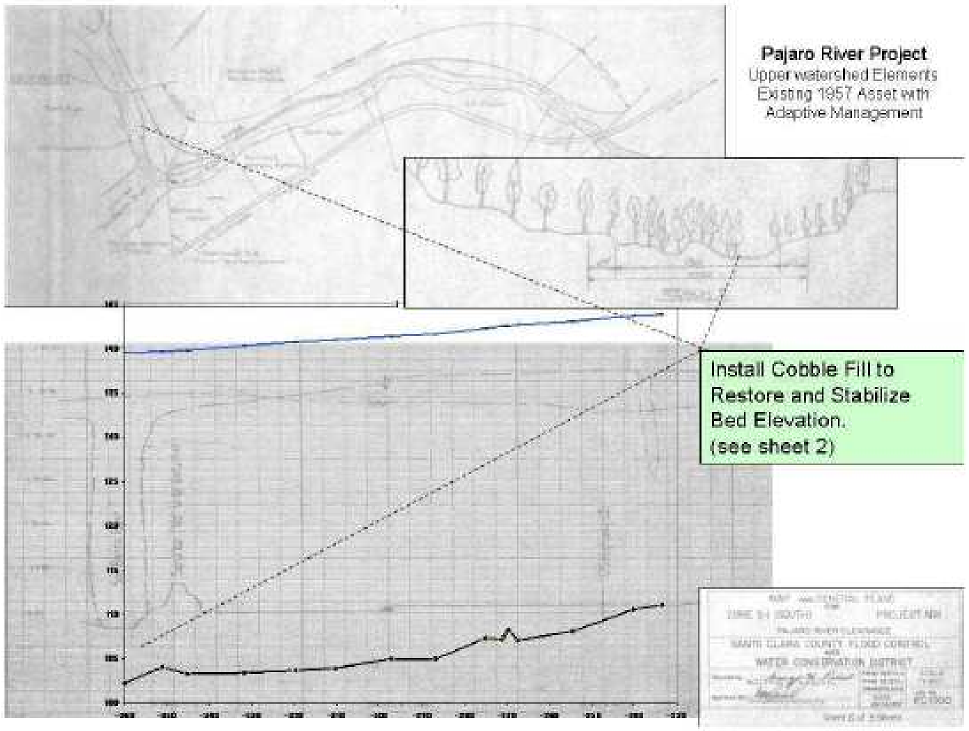
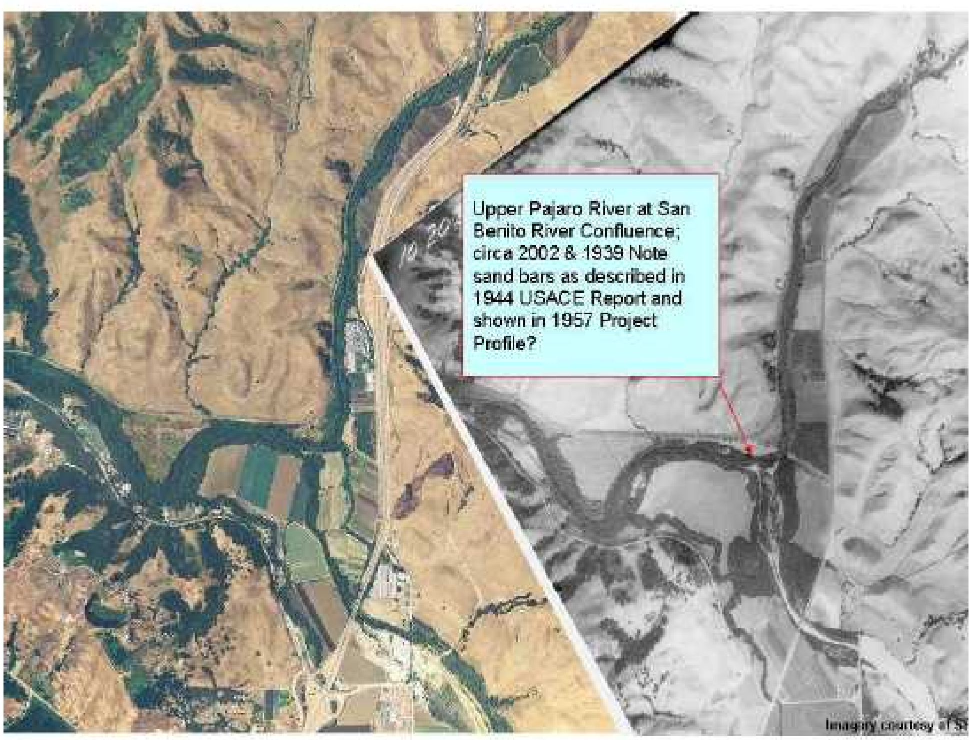
Proposed Upper Pajaro River Restoration

1957 Project Adaptive management Project





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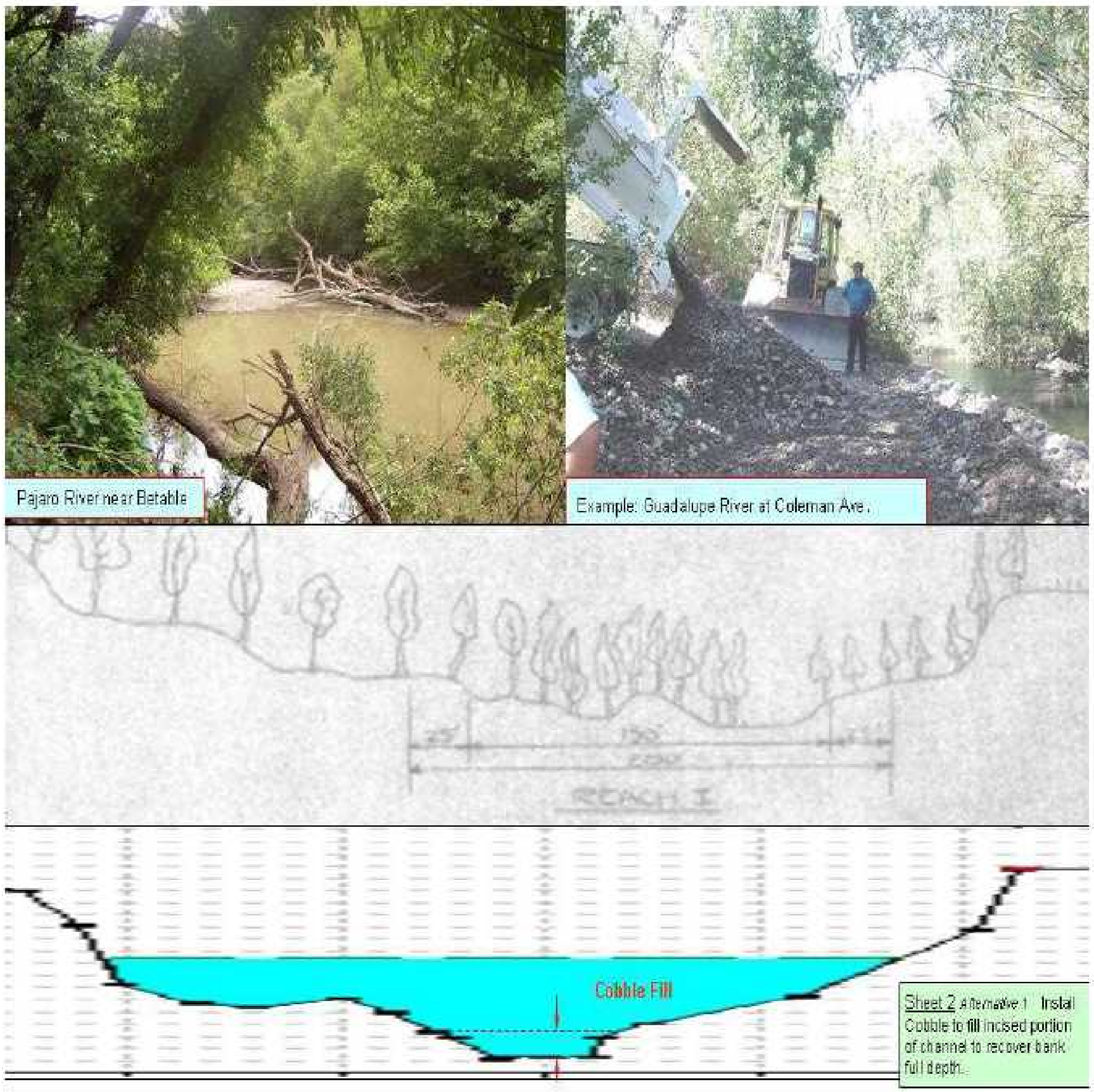
1957 Project Adaptive management Project



Attachment SBR1 (sheet 1 of 3)
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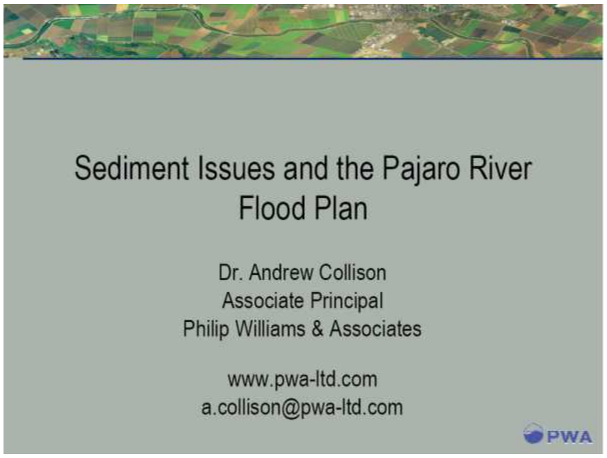

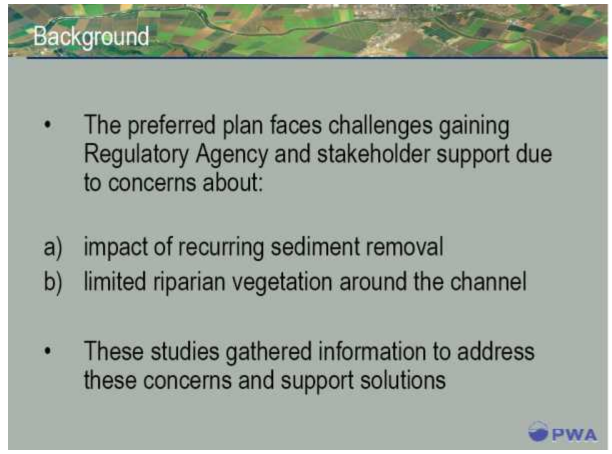

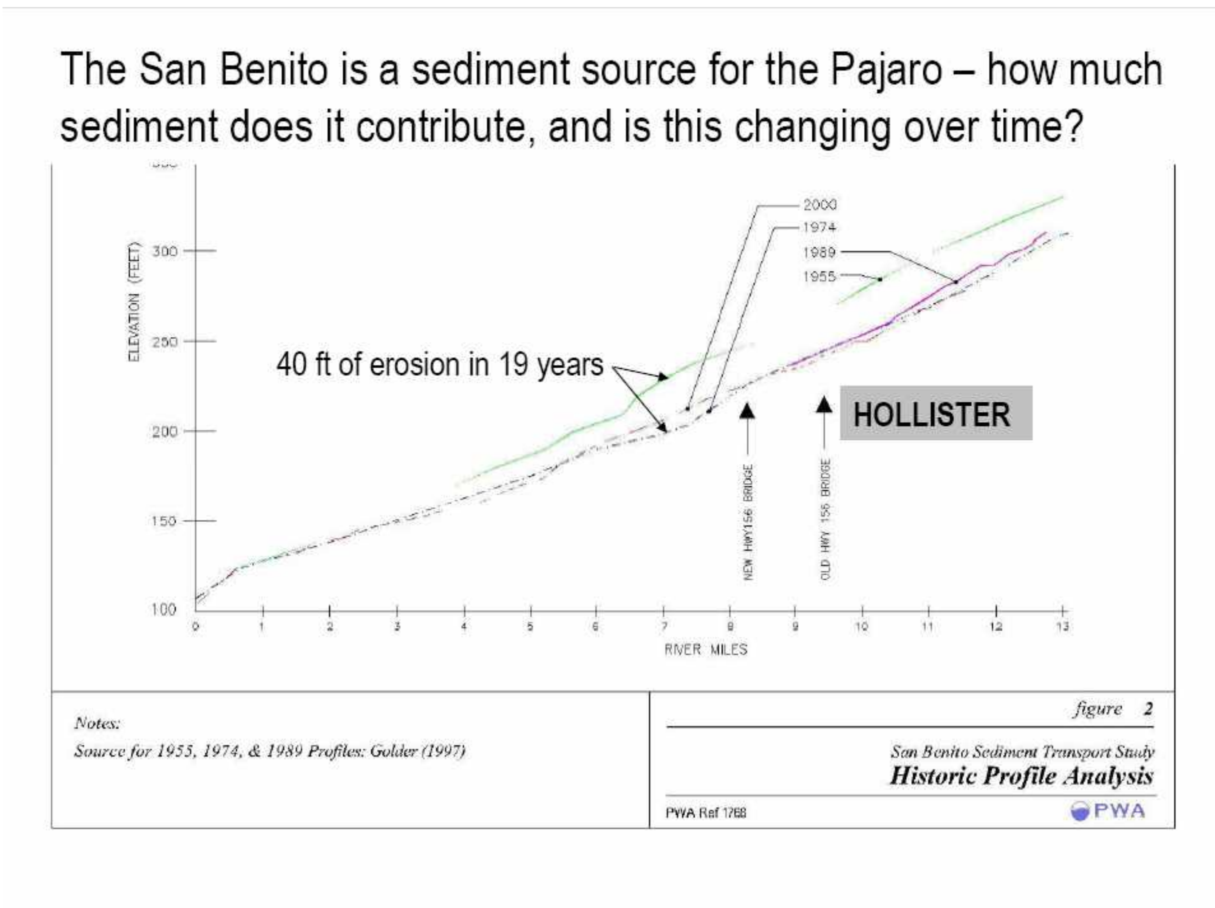

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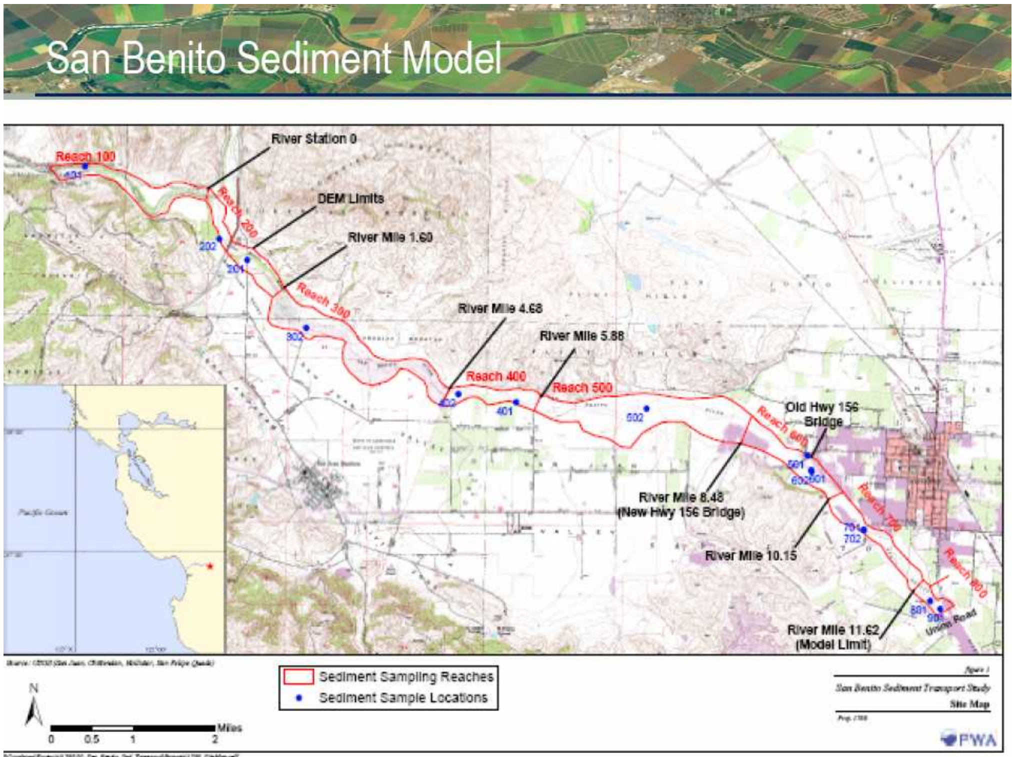
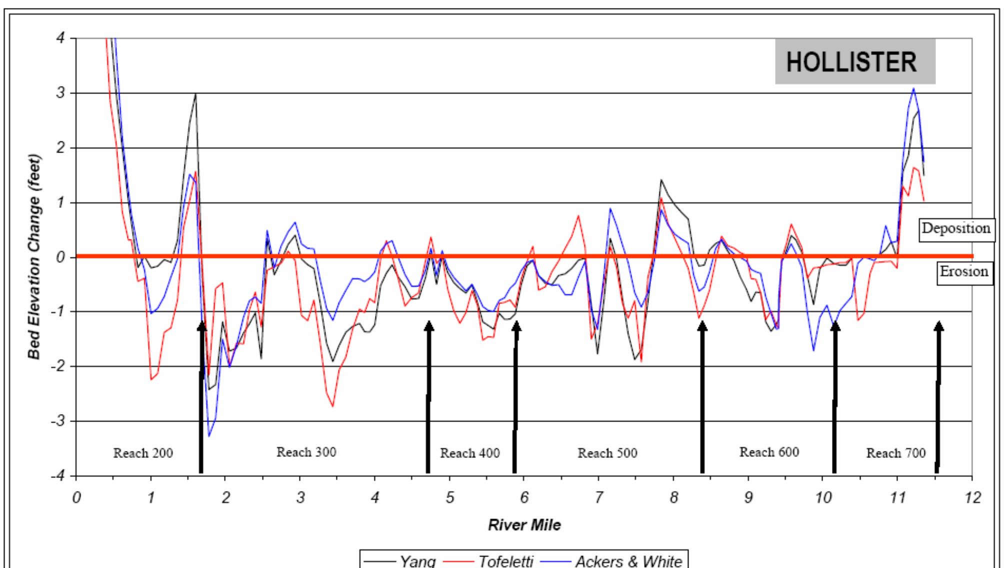




Notes: The high values shown near River Station 60,000 are a result of the model adjusting to the boundary condition.

figure 11

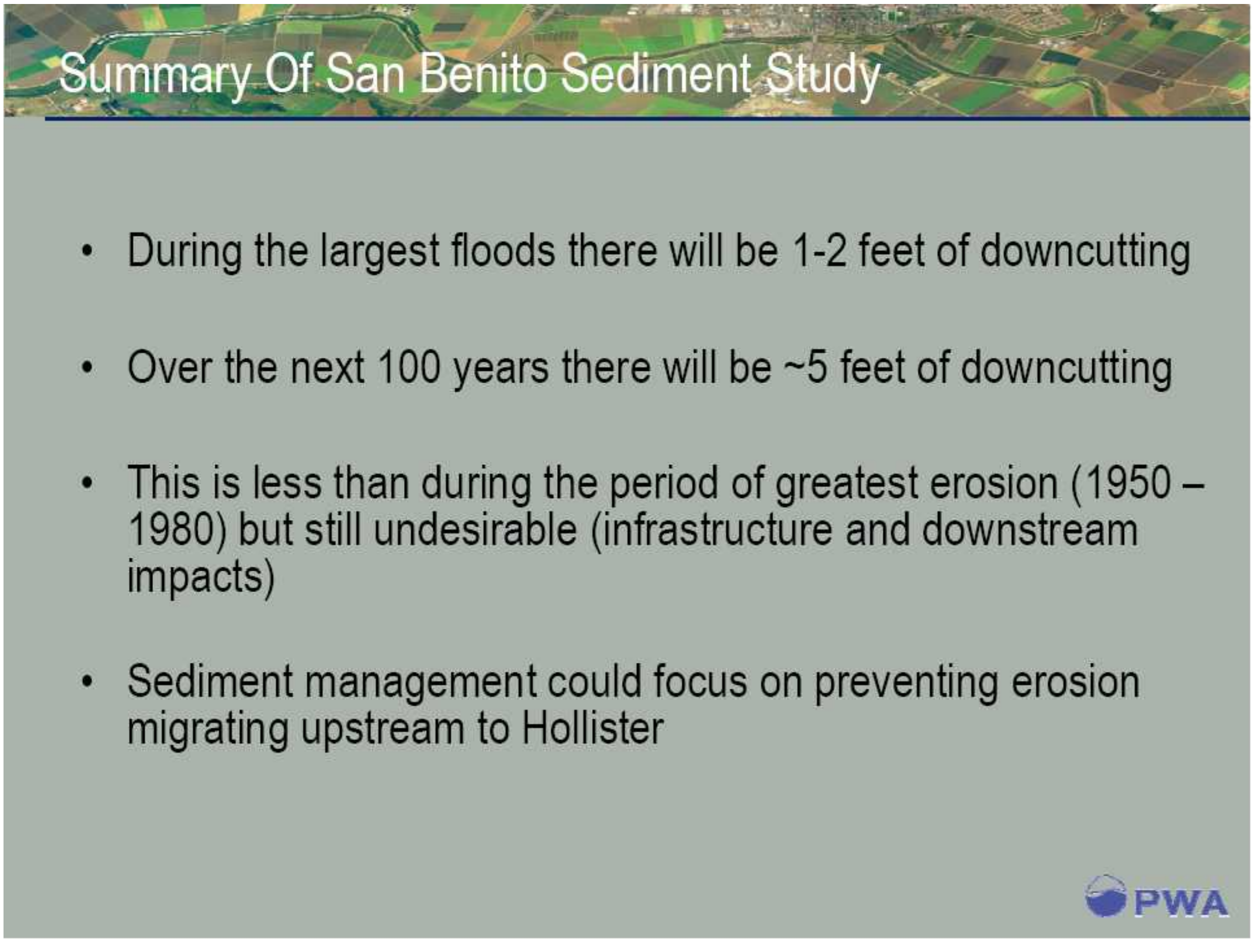
San Benito Sediment Transport Study

Channel Bed Change in Study Reach (100yr)

PWA Ref 1768

PWA

Attachment SBR1 (sheet 3 of 3)



Attachment SBR2 (sheet 1 of 1)
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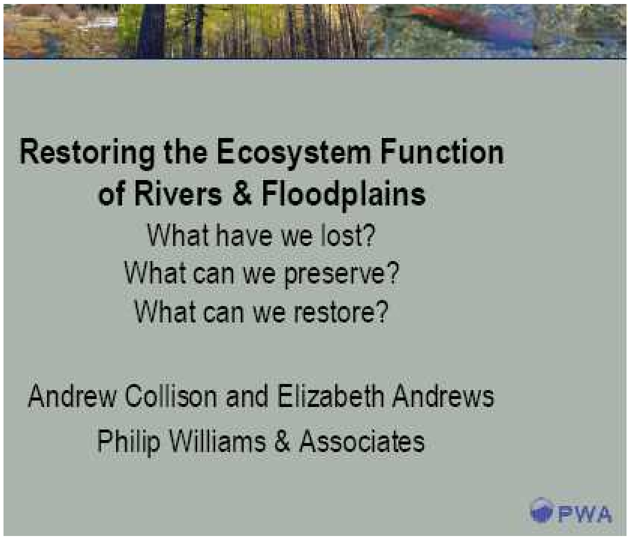

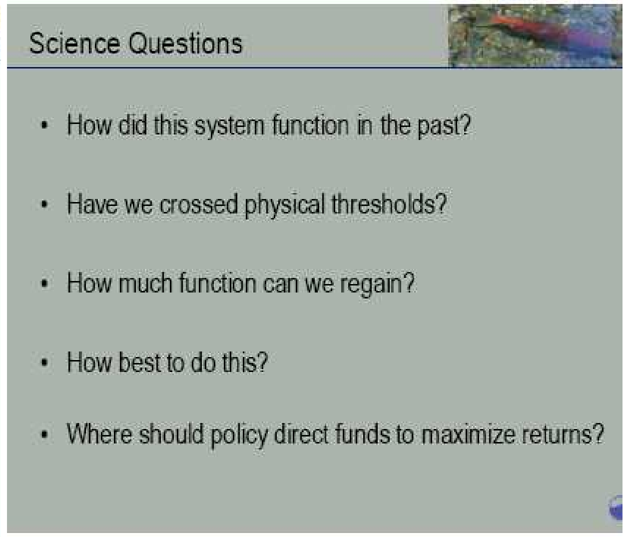

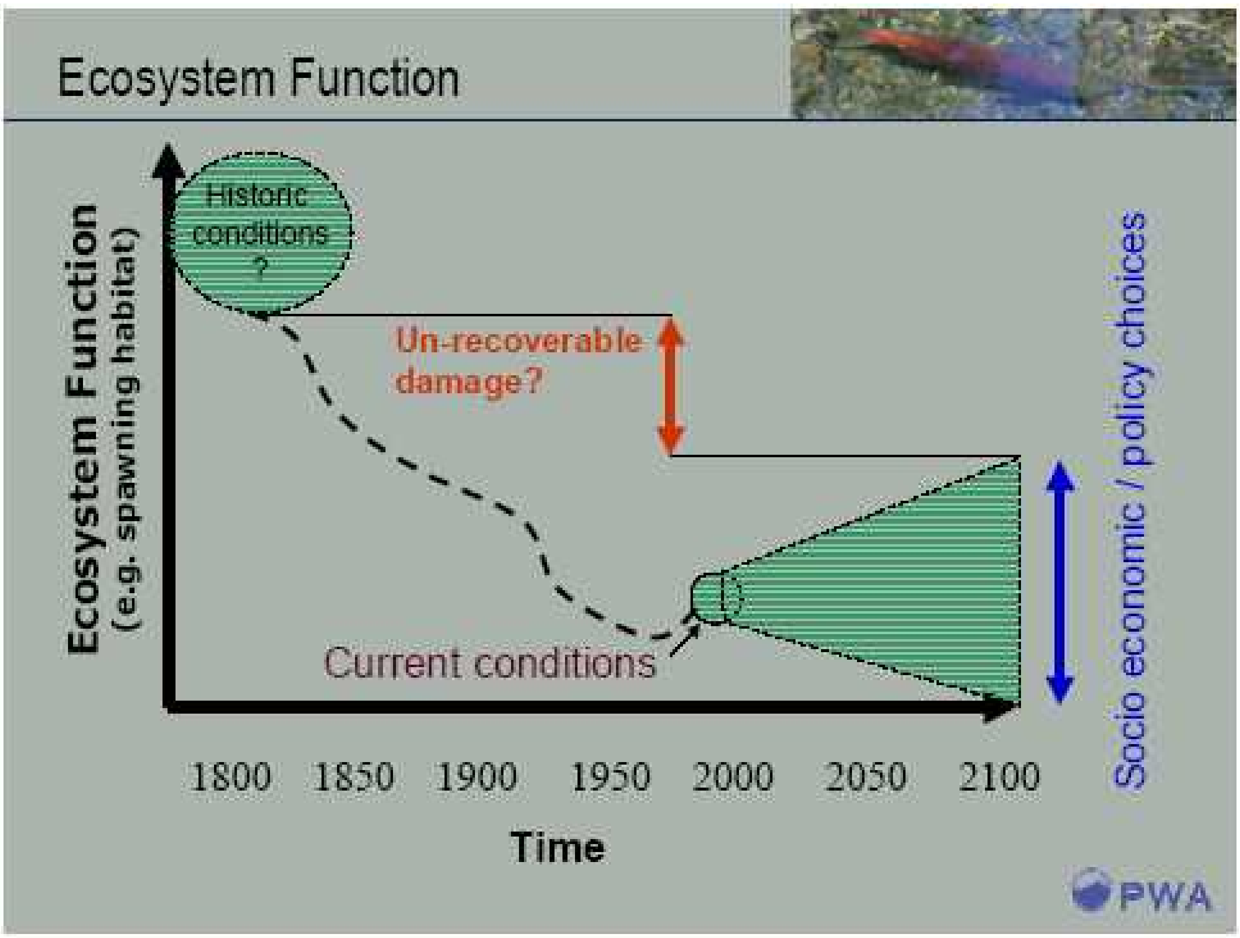

Attachment SBR3 (sheet 1 of 1)
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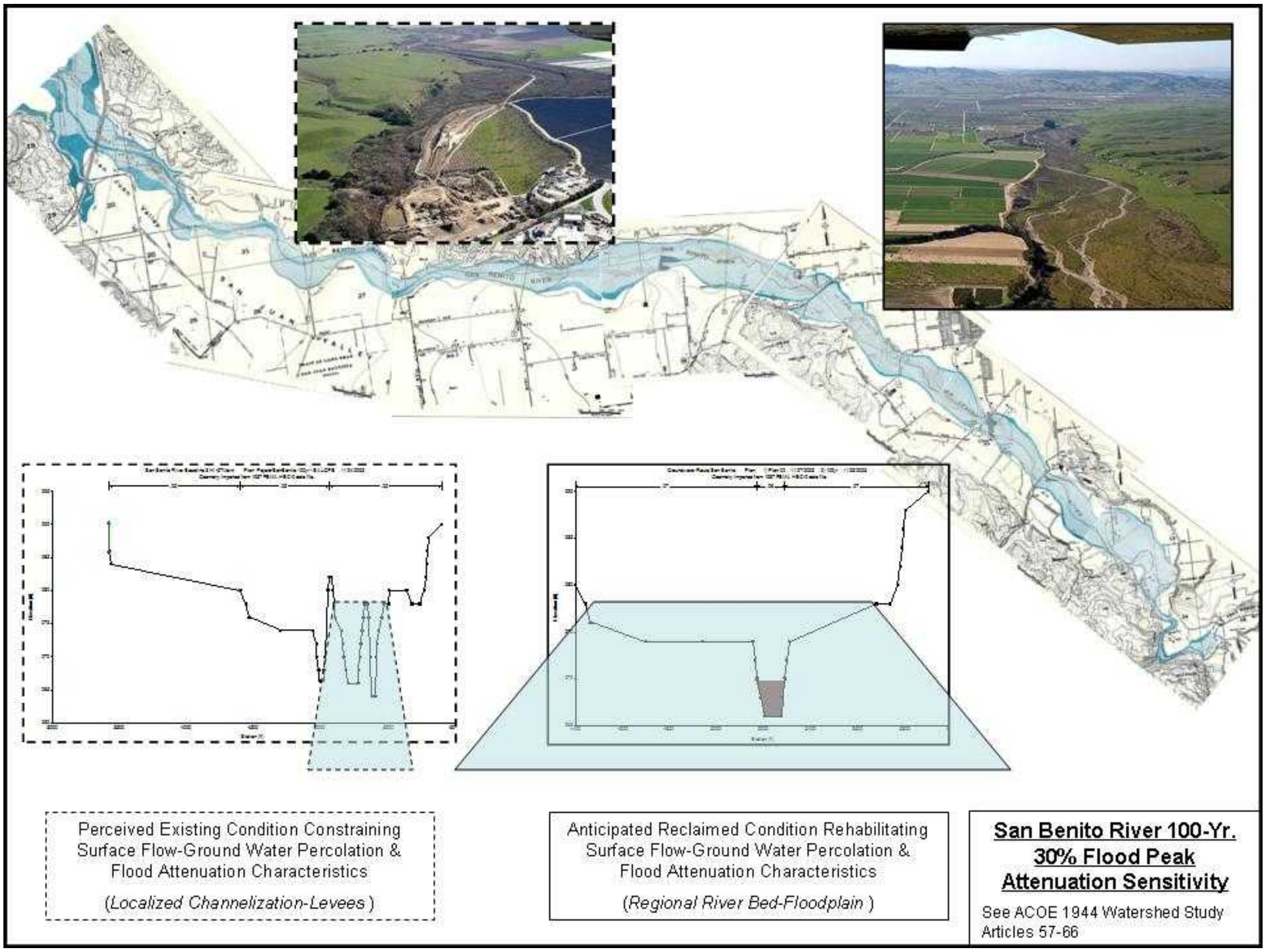


Attachment SBR4 (sheet 1 of 2)
Return to Page

March 16, 2006

Roger W. Briggs
Executive Director
Regional Water Quality Control Board
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401-7906

Dear Mr. Briggs,

At the direction of the Board of Directors of the Pajaro River Watershed Flood Prevention Authority, we are requesting the Central Coast Regional Water Quality Control Board to address the cumulative impact of quarry operations on the San Benito River, on downstream flooding and flood control, as part of the Total Maximum Daily Load regulatory framework.

The Authority was formed in 2000 by the California Legislature for the purpose of identifying, evaluating, funding and implementing environmentally sound flood prevention and control strategies in the Pajaro River Watershed, on an intergovernmental, cooperative basis as required by the Pajaro River Watershed Flood Prevention Authority Act. Its Board of Directors comprises one county supervisor, each from the counties of Monterey, San Benito, Santa Clara and Santa Cruz and one Board Director from each county's water management agency.

The U.S. Army Corps of Engineers has also been requested to review the San Benito County Sand/Gravel mining application that might soon be reviewed by them.

Thank you for your attention to this request.

Sincerely,

Nicolas Papadakis
Executive Coordinator

cc. Ken Reiller

Attachment SBR41 (sheet 2 of 2)
Return to Page

**Pajaro River Watershed
Flood Prevention Authority**
PO Box 809, Marina, CA 93933 • 831.883.3750

Pajaro River Watershed Flood Prevention Authority

March 15, 2006

Calvin Fong, Chief
Regulatory Branch
333 Market Street
San Francisco, CA 94105-2197

Dear Mr. Fong,

At the direction of the Board of Directors of the Pajaro River Watershed Flood Prevention Authority, we are requesting that the U.S. Army Corps of Engineers (USACE) review the San Benito County Sand/Gravel Mining application (#96-5 as indicated on the December 10, 1996 USACE public notice) for potential impacts to existing and proposed flood protection facilities and projects within the watershed. It is our understanding that the mining applications may soon be reviewed by the U.S. Army Corps of Engineers. Review of these mining applications is timely since the Corps is nearing final design phase of the Pajaro River Flood Protection Project located in Santa Cruz and Monterey Counties, just downstream of the mining activities.

The Board of Directors is also requesting the Central Coast Regional Water Quality Control Board to address the cumulative impact of quarry operations on the San Benito River, on downstream flooding and flood control, as part of their Total Maximum Daily Load regulatory framework.

The Authority was formed in 2000 by the California Legislature for the purpose of identifying, evaluating, funding and implementing environmentally sound flood prevention and control strategies in the Pajaro River Watershed, on an intergovernmental, cooperative basis as required by the Pajaro River Watershed Flood Prevention Authority Act. Its Board of Directors comprises one county supervisor, each from the counties of Monterey, San Benito, Santa Clara and Santa Cruz and one Board Director from each county's water management agency.

Sincerely,

Nicolas Papadakis
Executive Coordinator

cc. John Jacobson, Chief, Engineering and Technical Services Division
Nicole Ortega
Eric Taut
Ken Reiller

Pajaro River Watershed Flood Prevention Authority • 445 Reservation Road, Suite G, Marina, CA 93933

Attachment WM2 (sheet 1 of 3)
Return to page

Pajaro River Watershed Flood Prevention Authority
Board of Directors, c/o RAPS, Inc.
PO Box 809
Marina, CA 93933

Kenneth Reiller
990 Hecker Pass Rd.
Watsonville, CA 95076

Subject: San Benito River Incision
Impacts to Flood Protection
(Ref. 6/10/05 Agenda Item 6)

January 6, 2006

Since the June 10, 2005 Board meeting, the Subject flood protection impact concern I raised continues under discussion by the Staff Working Group (SWG).

Most recently, the SWG has coordinated the concern with the USACE quality assurance review for the Lower Pajaro River Flood Protection Project. I agree with this approach, recognizing the USACE and FEMA as authorities on the engineering/hydrology issues which underlie the concern.

Release of the NEPA-CEQA public review documents for this project is scheduled for early spring 2006, most likely following the quality assurance review. Perhaps this is a timely and appropriate place for concern/issue resolution.

The following outlines the issues that appear inadequately addressed, and may require mitigation to assure confidence in the Lower Pajaro River Flood Protection Project.

- The importance and need to manage the integrity of the flood attenuation characteristics of San Benito River (*groundwater percolation and channel storage*), involving the effectiveness of land use regulations to mitigate the cumulative adverse impacts resulting from the various in-stream gravel mining operations.

- The obsolescence and need to update/revise the 1957 USACE-Local Sponsor Pajaro River Snagging and Clearing Operation and Maintenance Manual, to assure proper function of the Soap Lake Preservation Project.

The attachments describe the basis of this view, and were considered by the Staff Working Group as reported in their 11/05/2005 Memorandum (attached).

I appreciate the progress made, and your resolve for sound flood protection.

Sincerely

Original Signed By

Kenneth Reiller

Attachments:

c.c. US Army Corps of Engineers
Attention: Nicole Ortega
303 Market Street, 8th Floor
San Francisco, CA 94105

Attachment WM1 (sheet 2 of 3)

MEMORANDUM

TO: **PRWFPA Board of Directors**
FROM: **Staff Working Group**
DATE: **November 4, 2005**

SUBJECT: **San Benito Agency Meeting**

As directed by the Board of Directors, on 10/26/05 the SWG held a joint meeting with representatives of some of the agencies involved with regulatory oversight of the San Benito River and the quarries within the watershed.

The SWG was involved in discussions with staff from the San Benito County Planning Department, the Central Coast Regional Water Quality Control Board, the Department of Conservation Office of Mine Reclamation, and the Natural Resource Conservation Service. Three of the staff of the U.S. Army Corps of Engineers also participated, via a conference telephone call. Six of the Authority member agencies were represented at the meeting, with a total of 18 SWG members and Agency staff participating in discussions summarized below:

- San Benito County Planner Mary Paxton reviewed the history of quarry regulation in San Benito County. Ms. Paxton related that of the 11 quarry operations of interest in the San Benito River watershed, three are active in mining and eight are either inactive and/or are in the process of obtaining reclamation plan approval. Ms. Paxton discussed some of the complex regulatory history of these quarries, which have included multiple use permit hearings, planning commission appeals, and litigation between San Benito County and the quarry operators.

- It was made clear that the laws regulating the quarry permitting process did not require or permit local agencies to address the cumulative effects of quarry activities on flood control issues. A lack of comprehensive data, legal requirements, controversy over reclamation plans, and multi-year litigation regarding some of the quarry sites are some of the reasons that a study of cumulative effects on flood control has not been conducted.

- At this meeting, the SWG discussed Mr. Kenn Reiller's concerns regarding the San Benito River sediment and channel dynamics in addition to sand and gravel

Attachment WM1 (sheet 3 of 3)

Plan Development 6.C
Page 30

quarry operations that are located on or adjacent to the San Benito River and its tributaries.

- At the meeting, Mr. Reiller expressed a more recent and more specific concern regarding the confluence area of the San Benito and Pajaro Rivers, and the potential of the San Benito River channel in that immediate area to be scoured and incised. His concern is that the lowering of the bottom of the river channel could affect the future performance of Soap Lake as a natural detention area. This could occur by lowering the hydraulic gradient of the river at the confluence, thus increasing the rate of outflow from Soap Lake, which could impact the channel stage discharge and storage function. Therefore, the concern is that the possible reduction of the Soap Lake area flood water detention capacity by the potential increase in outflow rate due to San Benito River incision may have the potential to increase downstream flooding.

- There is agreement among the SWG members that Mr. Reiller's concerns are of interest, and that the members would appreciate the opportunity to further discuss and explore these concerns at future SWG meetings in 2005 and early 2006. This would give the SWG an opportunity to further define the issues and consider possible solutions to be presented to the Authority Board for consideration.

- Conclusion

  It appears that the regulatory agencies are dealing with environmental concerns regarding the quarry operations, with the exception of the cumulative impact on flood control.

- Recommendation

  It is recommended that the Board authorize the SWG to meet further with Mr. Reiller and others to investigate the concerns presented along with potential strategies and solutions. If so instructed, the SWG would report back to the Board at the January and March Board meetings.

Attachment 14

Pajaro River Watershed Committee

Ventana and Loma Prieta Chapters

www.ventana.org

10/29/07

4701 Nova Dr.
Santa Cruz, CA 95062
robin@baymoon.com
831 464-1184

Nicole Ortega
U.S. Army Corps of Engineers
1455 Market Street 16th floor
San Francisco, CA 94103

Dear Nicole:

Thanks again for meeting with the Sierra Club's Pajaro River Committee on June 27th. We thought that it was a great meeting. We particularly appreciate that all options are still open for the design of flood control improvements.

We are writing to urge the inclusion of a design alternative that provides minimum to no improvements downstream of the urban areas of Watsonville and the community of Pajaro. We believe that this option would involve the least environmental disturbance, least cost and would not result in serious flood risk, considering that virtually all of the land in the flood plane in this area is in agriculture and could tolerate occasional flooding if properly managed.

Issues that would have to be considered in such an alternative include the Highway 1 "dam effect" and protection for Pajaro Dunes. Both issues will need to be addressed in any event and both seem to be manageable with this alternative.

Thanks to both you and Eric for your cooperation.

Lois Robin, Chair
Sierra Club Pajaro River Watershed Committee

"...to explore, enjoy and protect the wild places of the earth"

Printed on recycled paper

Attachment 15

Pajaro River Watershed Committee

Ventana and Loma Prieta Chapters

www.ventana.org

7/29/08

4701 Nova Dr.
Santa Cruz, CA 95062
robin@baymoon.com
831 464-1184

Lt. Col. Laurence M. Farrell, District Commander and Engineer
U.S. Army Corps of Engineers
1455 Market Street 16th floor
San Francisco, CA 94103-1398

Attention:
Tim Kelleher, Project Manager
Pajaro River Flood Control Project

Dear Sir:

We understand that you plan to release part of the General Reevaluation Report (GRR) on the Pajaro River Flood Control Project this fall and the remainder in the Spring of 2009. We request the following information so that the Sierra Club and other stakeholders may participate effectively in this continuing planning process.

Please describe specifically your proposed schedule for release of the GRR. In particular, we are interested in the further opportunities for public review and comment on the GRR as each part is developed.

We understand that you are undertaking detailed study of project alternatives. Which specific alternatives are included in this study? Which alternatives do you propose to exclude from detailed analysis? We attach for your reference present and prior comments which propose alternatives for detailed analysis.

What design flow below Murphy's Crossing are you using in this analysis? We attach for reference our prior comments on baseline and future conditions which may affect design flow as addressed in the letter to Don Hill.

Are you including mitigation in your detailed study of the benefits and costs of alternatives? Under the 2007 Water Resources Development Act, which builds upon prior administrative requirements (e.g., Engineer Pamphlet and Guidelines), a GRR recommendation must include a mitigation plan which specifies: (a) specific mitigation measures sufficient to prevent or mitigate the adverse impacts of the project, b) ecological success criteria, (c) monitoring, and (d) contingency plan.

We look forward to your reply. Please contact me if you have any questions about this letter. Thank you.

Lois Robin, Chair
Sierra Club Pajaro River Watershed Committee

Attachment: New alternative proposal
Attachment: Prior Comment to Don Hill

cc.

Timothy E. Kelleher, SPN
Project Manager, Pajaro River Flood Control Project, USACE
With attachments via EMail

Ellen Pirie, Chair and Members of the Board
Santa Cruz County Board of Supervisors

Dave Potter, Chair and Members of the Board
Monterey County Board of Supervisors

Kinberley Peterson, Mayor
City of Watsonville

Attachment 16

Pajaro River Watershed Committee
Ventana Chapter   www.ventana.org

October 22, 2009

Directors, Santa Cruz County Flood Control Zone Seven

700 Ocean Street

Santa Cruz, CA 95060

John Leopold, Ellen Pirie, Neal Coonerty, Tony Campos, Mark Stone, Dennis Osmer, Manuel Bersamin, Donald Cooley, Lorraine Stucki, Robert Stokes

Directors, Monterey County Water Resources Agency
P.O. Box 930
893 Blanco Circle

Salinas, CA 93901

Jose Mendez, Silvio Bernardi, Roger Moitoso, David Bunn. Ken Ekelund, Stephen P. Collins, Richard Morgantini, David Hart, Richard Ortiz

Re: Pajaro River Flood Control Project

Dear Directors:

The U.S. Army Corps of Engineers and the Counties constructed the Pajaro Flood Project in 1949 consisting of an earthen levee system from Murphy's Crossing to Monterey Bay. Because the levees did not prevent significant flood damages in 1995, the Army Corps and Counties began a planning process in 2000 to consider re-designs. The late Senator Henry Mello and former Assembly Member Fred Keeley sponsored legislation which, as enacted around 1999, established the Pajaro River Flood Protection Authority (FPA), which has proactively participated with the Army Corps in the development of the alternative re-designs. Congressman Farr obtained authorizations for two planning approaches to the Pajaro Valley; one providing federal funding for the Flood Protection Project as described, and the other was for a Watershed Study.

The Watershed Study would enable the recommended NED alternative to supplement other federally funded projects addressing other issues in the Pajaro Valley. The FPA has

considered this (see
HYPERLINK "http://www.pajaroriverwatershed.org/pages/downloads.htm)" www.pajaroriverwatershed.org/pages/downloads.htm)
and is currently working with the Army Corps and the State of California to continue planning under Congressman Farr's enabling legislation. The FPA is advancing a thoughtful strategy to assure that efficient flood protection is managed within the entire watershed, and Alternative 9D reflects this sound planning approach. This approach is illustrated in the FPA March 2007 Board Agenda Package Information appended to this letter.

Upon completion of the Watershed Study and implementation of its recommendations, the high flow rates of flood water reaching the Pajaro Vallry Valley will be decreased. Constraining levees will not be needed because flood water will be detained in upper watershed floodplains restored by projects authorized by the ACOE Watershed Study. These volumes would be released slowly into the lower river, extending live stream conditions and recharging ground water in the presently over-drafted Pajaro Valley groundwater basin. There will be reduced flooding on Pajaro Valley farm fields .

In the re-design study for the flood control project, the Army Corps has developed and considered many alternatives. Under its general rules, it will recommend the NED plan which provides net benefits on a national basis, unless the Counties advance a Locally Preferred Plan (LPP) and then pay the cost differential. In 2008, the Army Corps released a preliminary evaluation which suggests that the NED Plan will be Alternative 9D consisting of ring levees around the communities of Watsonville and Pajaro. Only Alternative 9D has the potential to integrate flood protection with solutions addressing other critical issues such as ground water management. Alternative 9D efficiently integrates contemporary planning consistent with Army Corps' regulations that credit collateral flood control benefits including ground water management.

The Army Corps has considered Alternative 2A, which proposes extensive new levees around the agricultural fields from Murphy's Crossing to Monterey Bay. Alternative 2A would quickly dispose into Monterey Bay National Marine Sanctuary all the water reaching the Pajaro Valley from the Upper Watershed. While it would provide 100 year protection for agricultural properties, this alternative would not help address groundwater shortage in the Pajaro Valley, and would not redirect floodwater to beneficial uses. It appears that Santa Cruz County prefers Alternative 2A, reasoning that it would provide immediate containment of flood waters and allow farming to proceed more consistently while diminishing fears of E coli contamination. However, Alternative 2A would also expedite the conversion of farmland to development in the floodplain and would cost $150,000,000 more than Alternative 9D. Alternative 2A would increase the local federal cost share by $38,000,000, an issue of substantial concern to the Counties in this time of severe budget constraints.

If Alternative 9D is selected, residential properties would receive the same 100 year flood protection and agricultural properties would remain at the 8 year level of protection, but that level would increase over time as the measures in the Watershed Study are implemented. Alternative 9D is compatible with projects available through the Watershed Study addressing groundwater basin problems. Lack of ground water availability is generally viewed as a greater threat to the Pajaro Valley's agricultural economy than flooding. These paradigms are shown in the FPA Studies provided in the appendix to this letter.

The Army Corps and Counties anticipate completion of environmental documentation (considering alternative re-designs) in 2010. We believe that selection of Alternative 2A would delay the final approval of the re-design due to the need for additional funding for continued planning, greater project construction and O&M costs.

Our Sierra Club Committee has participated actively in this and related planning processes. We have participated in this planning process for seven years with our letters, attended and commented at many meetings, traveled to sites throughout the watershed, consulted with authoritative sources and given much thought to the flood control project and the health of the entire Pajaro River watershed. While we anticipate that the Counties will consider all reasonable alternatives as the environmental document is prepared, we wish to state our unanimous support for the integration of Alternative 9D with upstream improvements recommended by the FPA's Watershed Study as the superior alternative for addressing the problems facing the Pajaro Valley.

Thank you for your attention and consideration of our comments.

Sincerely,

Lois Robin, Chair
Sierra Club Pajaro River Watershed Committee
831 464-3939 robin@baymoon.com

Ccc:
Representative Sam Farr
Senator Barbara Boxer
Senator Diane Feinstein

Assemblyman Bill Monning
Former Assemblyman John Laird
Former Assemblyman Fred Keeley

FPA Board Members:
Louis Calcagno, Chair, County of Monterey
Tony Campos, Vice-Chair, County of Santa Cruz
Don Gage, Member, County of Santa Clara
Silvio Bernardi, Member, Monterey County Water Resources Agency
Frank Bettencourt, Member, San Benito County Water District
Don Marcus, Member, County of San Benito
Sig Sanchez, Member, Santa Clara Valley Water District
Manuel Bersamin, Member, Santa Cruz Zone 7 Flood Control District
Saeid Vaziry, Associate Member, City of Gilroy
Mark Garzan, Associate Member, City of Morgan Hill
Doug Emerson, Associate Member, City of Hollister

U.S. Army Corps of Engineers
Tom Kendall,

City of Watsonville
Steve Palmisano
David Koch, Director of Public Works
Luis Alejo, Watsonville City Councilma

County of Santa Cruz
Bruce leClerque
Susan Muriello

Donna Bradford

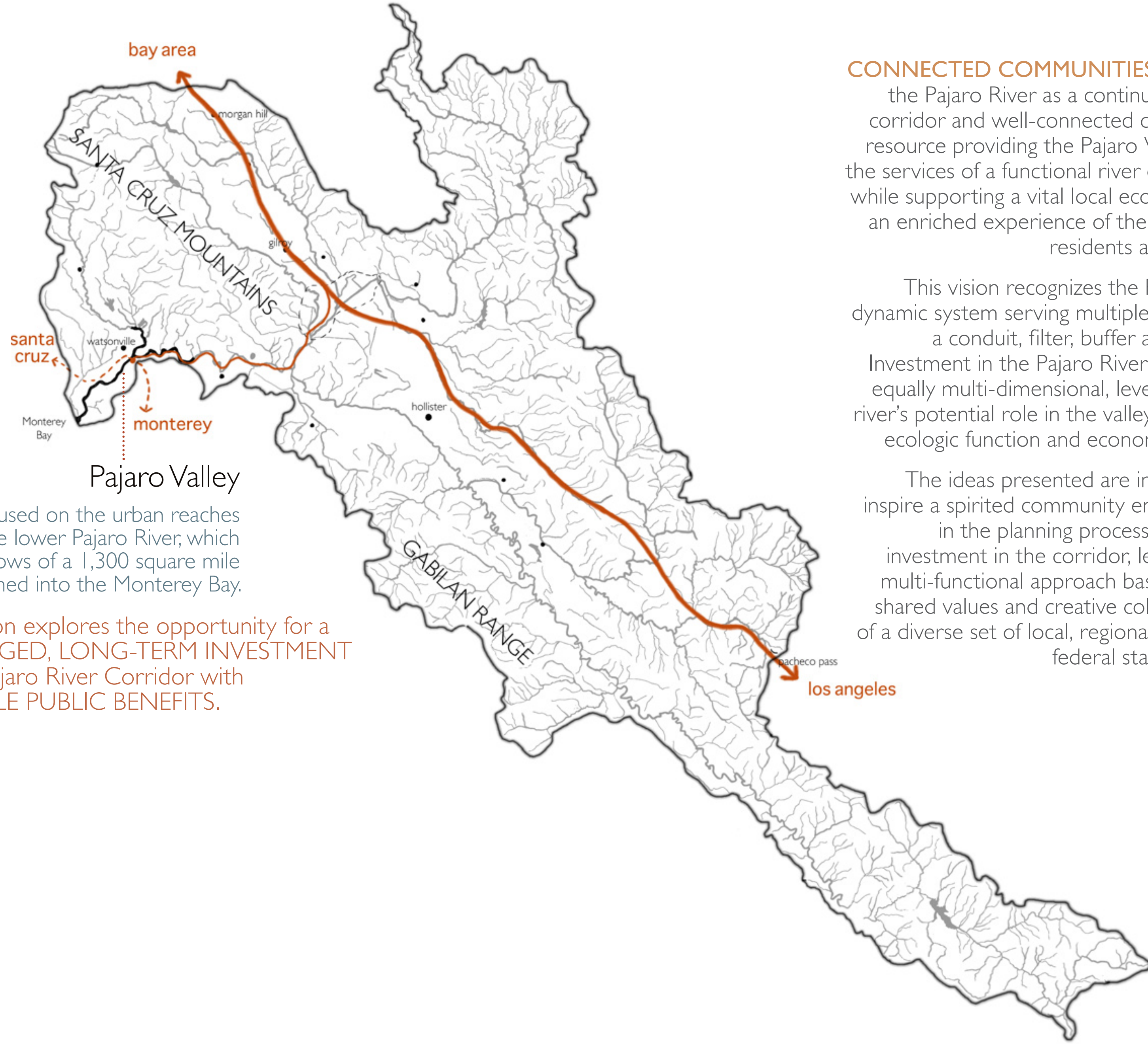
The Pajaro River Corridor

a healthy river, a healthy community

jennifer natali, mla
matt kondolf, phd

11.10.2009

OBJECTIVE



Pajaro Valley

We focused on the urban reaches of the lower Pajaro River, which conveys flows of a 1,300 square mile watershed into the Monterey Bay.

This vision explores the opportunity for a LEVERAGED, LONG-TERM INVESTMENT in the Pajaro River Corridor with MULTIPLE PUBLIC BENEFITS.

CONNECTED COMMUNITIES envisions the Pajaro River as a continuous green corridor and well-connected community resource providing the Pajaro Valley with the services of a functional river ecosystem while supporting a vital local economy and an enriched experience of the region for residents and vistors.

This vision recognizes the Pajaro as a dynamic system serving multiple functions: a conduit, filter, buffer and refuge. Investment in the Pajaro River should be equally multi-dimensional, leveraging the river's potential role in the valley's identity, ecologic function and economic future.

The ideas presented are intended to inspire a spirited community engagement in the planning process for future investment in the corridor, leading to a multi-functional approach based on the shared values and creative collaboration of a diverse set of local, regional state and federal stakeholders.

A CONCEPTUAL VISION: MULTI-FUNCTIONAL FOCUS

The river does more than flood.
What about other 99% of the time?

MULTIPLE FUNCTIONS

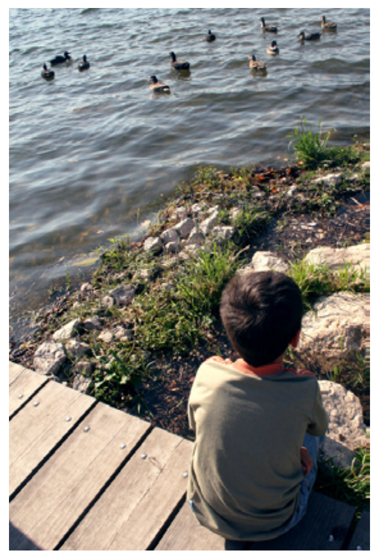
WATER, SEDIMENT & NUTRIENT FLOWS
- Sediment transport
- Water quality, nutrient inputs, eutrophication
- Flow volumes: seasonal, flood, drought
- Channel complexity, movement, floodplain access
- Groundwater recharge
- Adaptation to climate change & sea level rise

BIODIVERSITY & ECOLOGICAL SERVICES
- Protection of endangered and threatened species
- Prime birding and marine habitat
- Pollutant filtering, groundwater recharge
- Carbon sequestration
- Pollination, disease control, food supply

PRODUCTIVE LAND USE
- Protect prime agricultural land & soils
- Long-term land productivity: diversity & resilience
- Focused development: vibrant urban service areas
- Engage floodplain for soil & groundwater recharge
- Tie healthy land use to healthy local economy

COMMUNITY IDENTITY & COHESION
- River as indicator of community health
- Create a sense of place
- Community history and culture
- Pride, destination, activity, safety

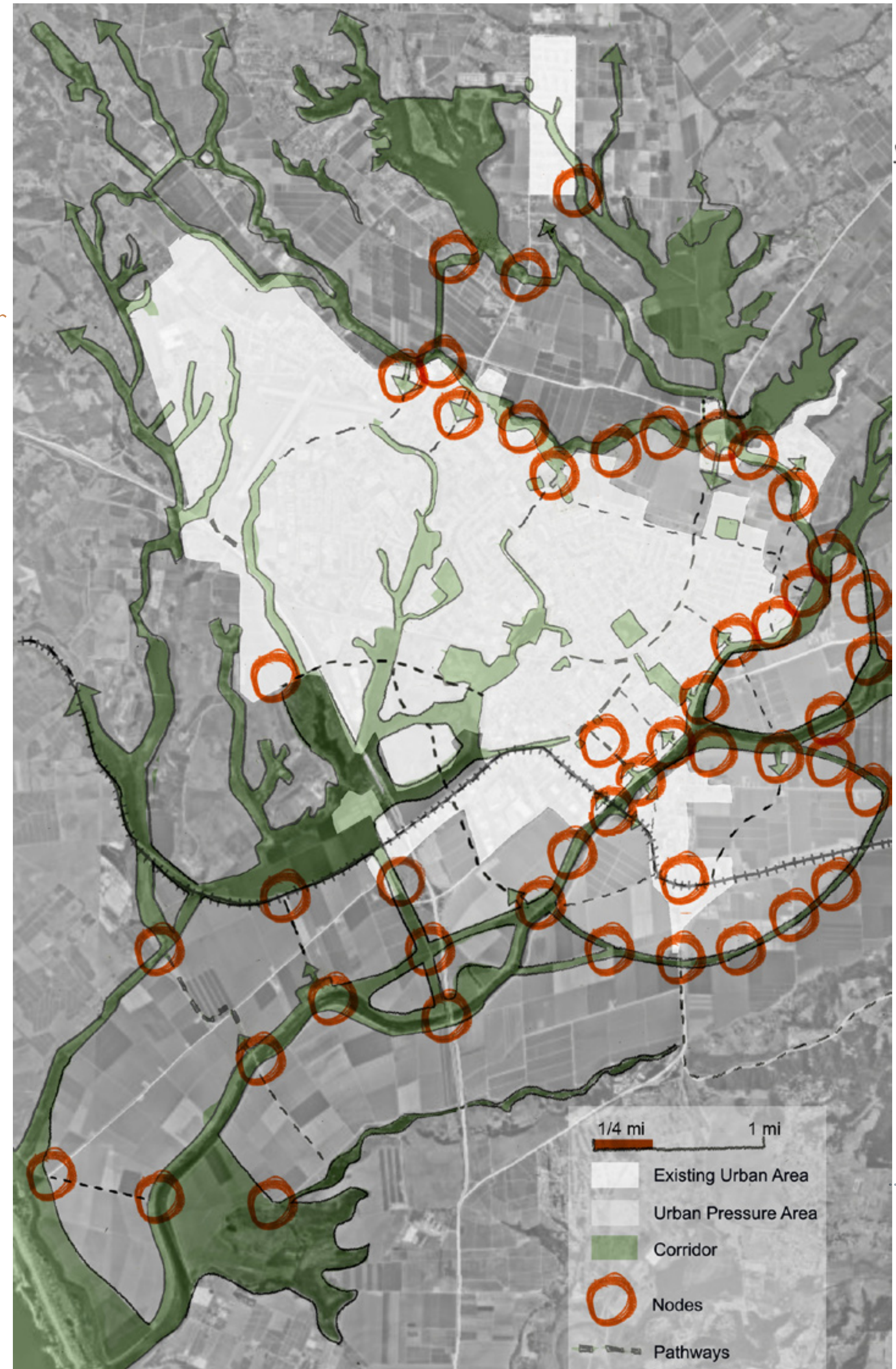
RECREATION & ECOTOURISM
- Create over 20 miles of interconnected trails
- Sustainability, health, quality of life, access to Nature
- Multi-modal transit network, bike commuting
- Regional centerpiece of wildlife & agro-tourism



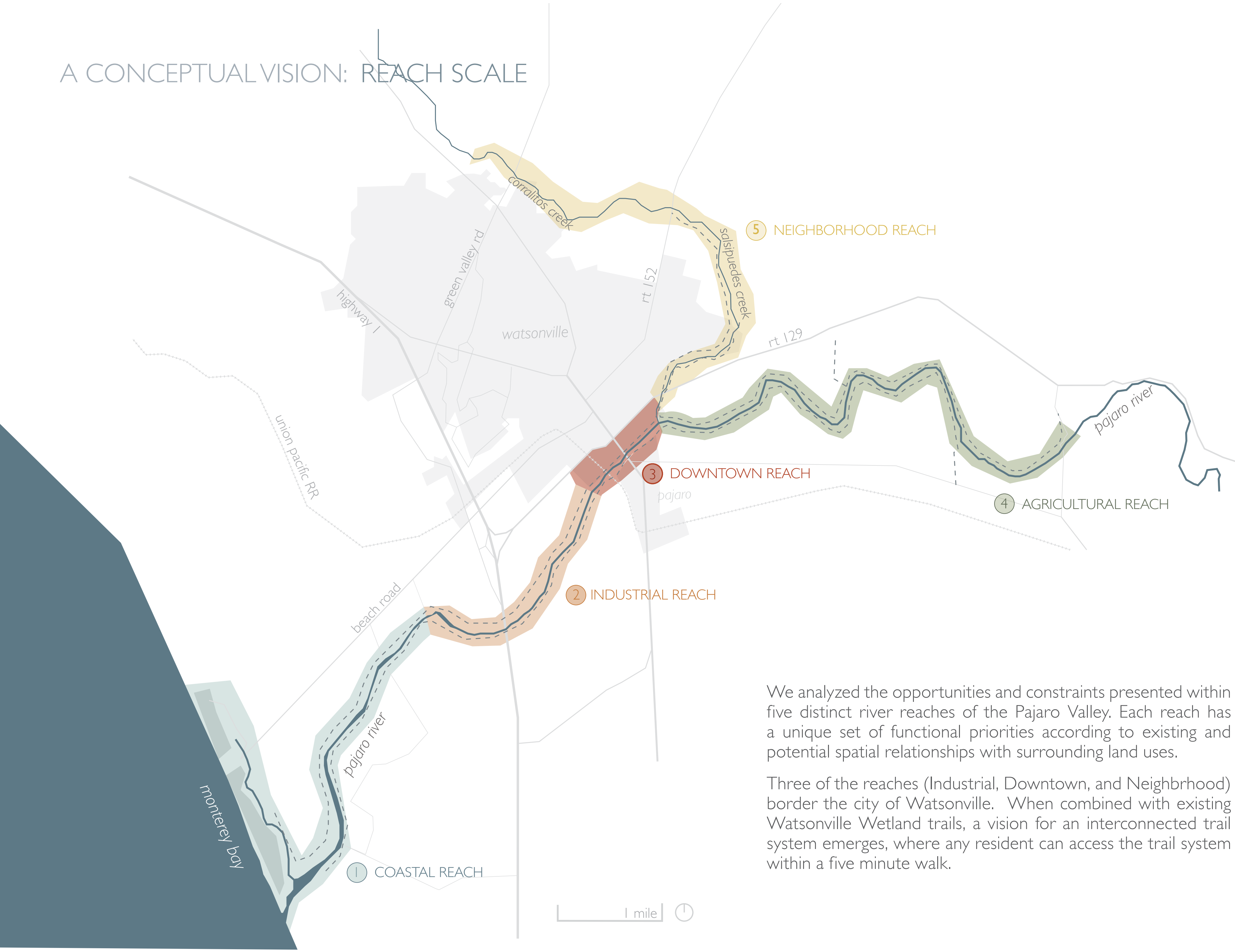
A CONCEPTUAL VISION: INTEGRATED DESIGN STRATEGY

DESIGN FOR HEALTH, SAFETY, EQUITY

- **LEVEE ALIGNMENT:** concentrate development pressures within 2-mile radius from Downtown (transit, civic, commercial destinations), connect corridors, promote multi-modal transport with "green infrastructure."
- **SETBACK LEVEES:** allow room for multi-functional corridor (flood flows, trees, recreation, habitat), $ developer fees.
- **ACCESS NODE SPACING:** space nodes within five minute walk (1/4 mile) of each other in urban areas to encourage activity, accessibility, and a sense of safety.
- **ACTIVATE ACCESS NODES:** bike ramps and racks, commuter parking, stream crossings, amenities, vistas, directional signage, interpretive info, and vendors to create destinations, intentional public space.
- **PATHWAYS TO ACCESS NODES:** Invest in pedestrian and bicycle amenities to connect all neighborhoods to the corridor.
- **CORRIDOR EDGES:** create variety of edge uses and destinations, emphasize public access, activity and vistas.
- **RIPARIAN COMMUNITY:** Create a natural backdrop for recreational use as a contrast from urban grid, increase habitat for threatened species, encourage community invesment in a healthy river through restoration, trail building and wildlife, in turn attract tourist activity.



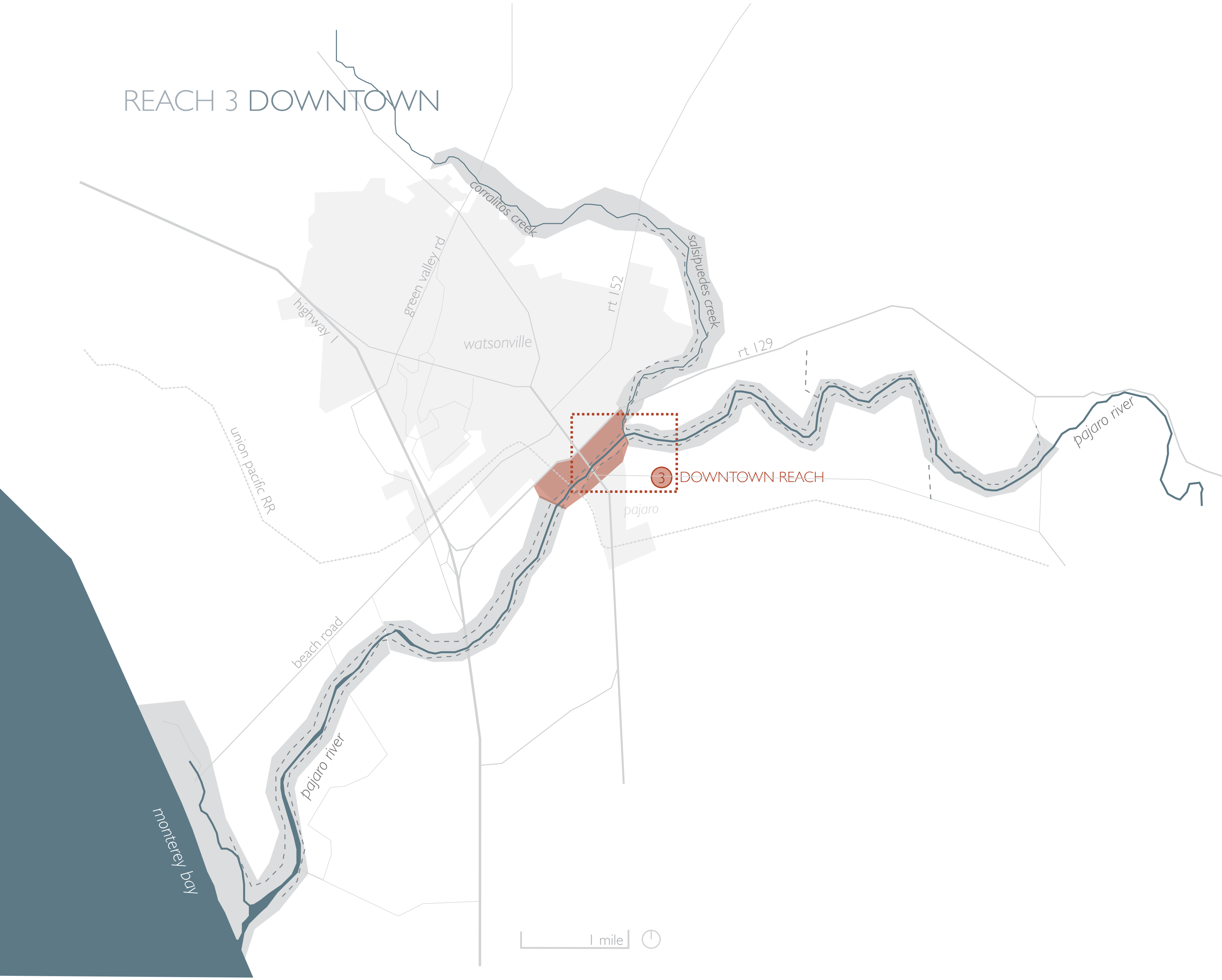
A CONCEPTUAL VISION: REACH SCALE



We analyzed the opportunities and constraints presented within five distinct river reaches of the Pajaro Valley. Each reach has a unique set of functional priorities according to existing and potential spatial relationships with surrounding land uses.

Three of the reaches (Industrial, Downtown, and Neighbrhood) border the city of Watsonville. When combined with existing Watsonville Wetland trails, a vision for an interconnected trail system emerges, where any resident can access the trail system within a five minute walk.

REACH 3 DOWNTOWN



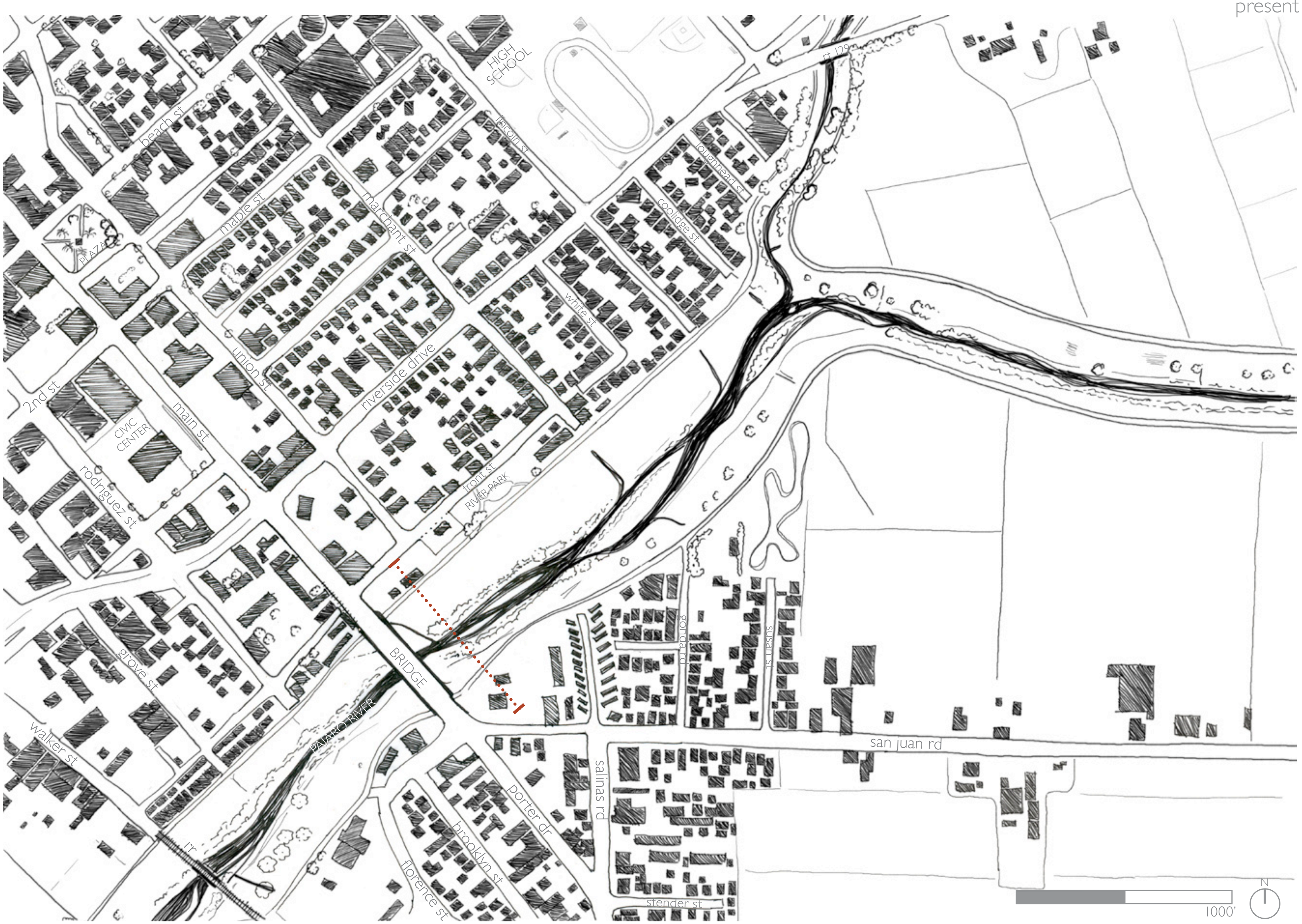
The Pajaro River Corridor
connected communities

REACH 3 DOWNTOWN

Enrich the vitality of Watsonville's downtown with a riverfront paseo, bringing eyes and activity to the corridor edge. Transform the one-mile urban river channel into a 70-acre public park that blends the formal gesture of a floodwall promenade with the nature-based recreational activities found in forested trails, scenic overlooks, and wildlife exploration. A strategic urban redevelopment along the river edge activates an expanded downtown with people.

REACH 3 DOWNTOWN

present



forest grassland shrub marsh water park urban tree patch building trail levee railroad

The Pajaro River Corridor
connected communities

REACH 3 DOWNTOWN

SECTION ACROSS PAJARO RIVER CHANNEL
200 ft upstream of Main St Bridge

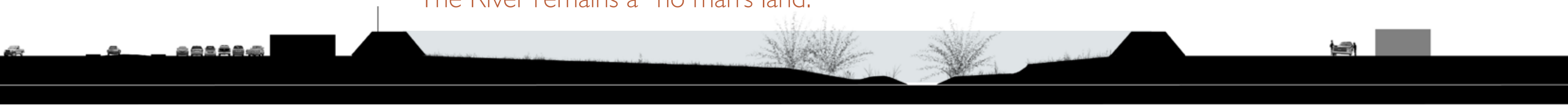
CURRENT STATE:
A liability

SECTION ACROSS PAJARO RIVER CHANNEL
200 ft upstream of Main St Bridge

BENEFIT OF RAISING LEVEE:
Flood risk reduction

RISK OF SINGLE PURPOSE APPROACH:
Expensive initial costs and long-term maintenance with negative impacts to imperiled wildlife and no benefit to everyday life of the city.

The River remains a "no man's land."

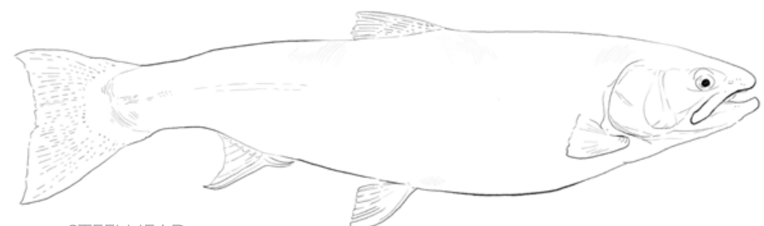


proposed conditions

INVESTMENT

- COST ESTIMATES: $100 to $250 million
- LOCAL PORTION (25%): $25 to $62.5 million

RISKS



STEELHEAD
Oncorhynchus mykiss, California Central Coast ESU
Federal Threatened Species (1997)

A LIABILITY OR A RESOURCE?

proposed conditions

INVESTMENT

- COST ESTIMATES: $100 to $250 million
- LOCAL PORTION (25%): $25 to $62.5 million
- STATE PORTION (50% LOCAL): $12.5 to $31 million

- PUBLIC BENEFITS (+20% STATE): $2.5 to $22 million
    - Habitat protection, creation, enhancement
    - Open space and recreation
    - Increased flood protection

MULTIPLE PUBLIC BENEFITS

With passage of AB 2348 in September 2006:

- Added Section 12585.7 to the State Water Code which defines that the State will pay 50% of the "local" share.
- "The State share....may be increased by up to an additional 20 percent, to a maximum of 70 percent, upon the recommendation of the department or the Reclamation Board, if either entity determines that the project will result in a significant contribution to any of the following objectives:"

A RESOURCE!

proposed conditions

REACH 3 DOWNTOWN

SECTION ACROSS PAJARO RIVER CHANNEL
200 ft upstream of Main St Bridge

MULTI-LEVEL VIEWS
Public terraces and private balconies lead eyes to the River Park.

FRONT STREET REDEVELOPMENT
Housing brings people and business within walking distance of downtown.

FLOODWALL PASEO
Formal floodwalls along downtown edges of Watsonville and Pajaro create an active-use promenade along both sides of the River.

RIVER PARK
Promote active and passive recreation with pathways for bike commuting and walking trails that wind through a revegetated floodplain.

Strategic tree placement and clearings create vistas and sense of safety

PAJARO RIVERFRONT
Activate corridor edge with public amenities, such as an open-air market, supporting a local economy and revitalizing under-utilized urban land.

vision

present conditions

REACH 3 DOWNTOWN

SECTION ACROSS PAJARO RIVER CHANNEL
200 ft upstream of Main St Bridge

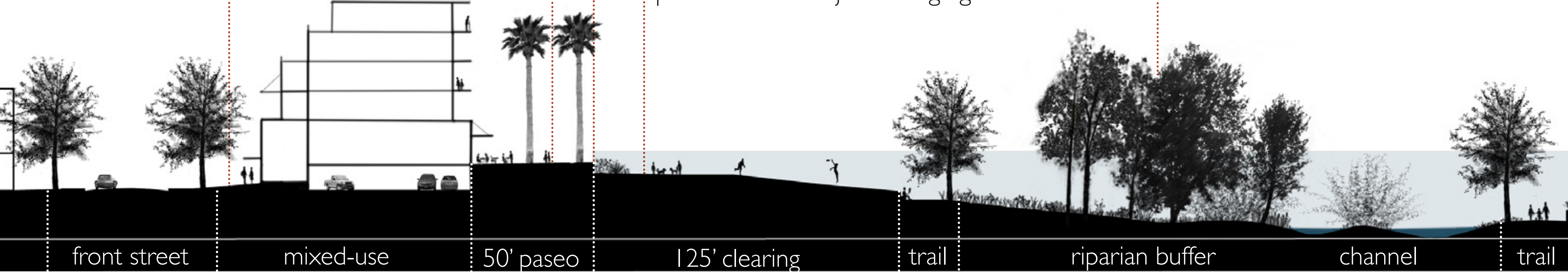
FLEXIBLE FLOOD BARRIERS
Temporary, quick-assembly aluminum barriers increase flood protection and allow open vistas and fluid access to the riverfront on an everyday basis.

STREET LEVEL
Garage and private entrance

PROMENADE LEVEL
Public, commercial access

OPEN CLEARINGS
Accessible and surrounded by activity, open clearings provide a safe, visible destination for frisbee-throwing, festivals, kite-flying, summer movies, musical performance or just lounging.

RIPARIAN BUFFER
A vegetated floodplain can host habitat for birds and refuge for fish, treat water, slow flood flows and create a natural backdrop for human recreation.

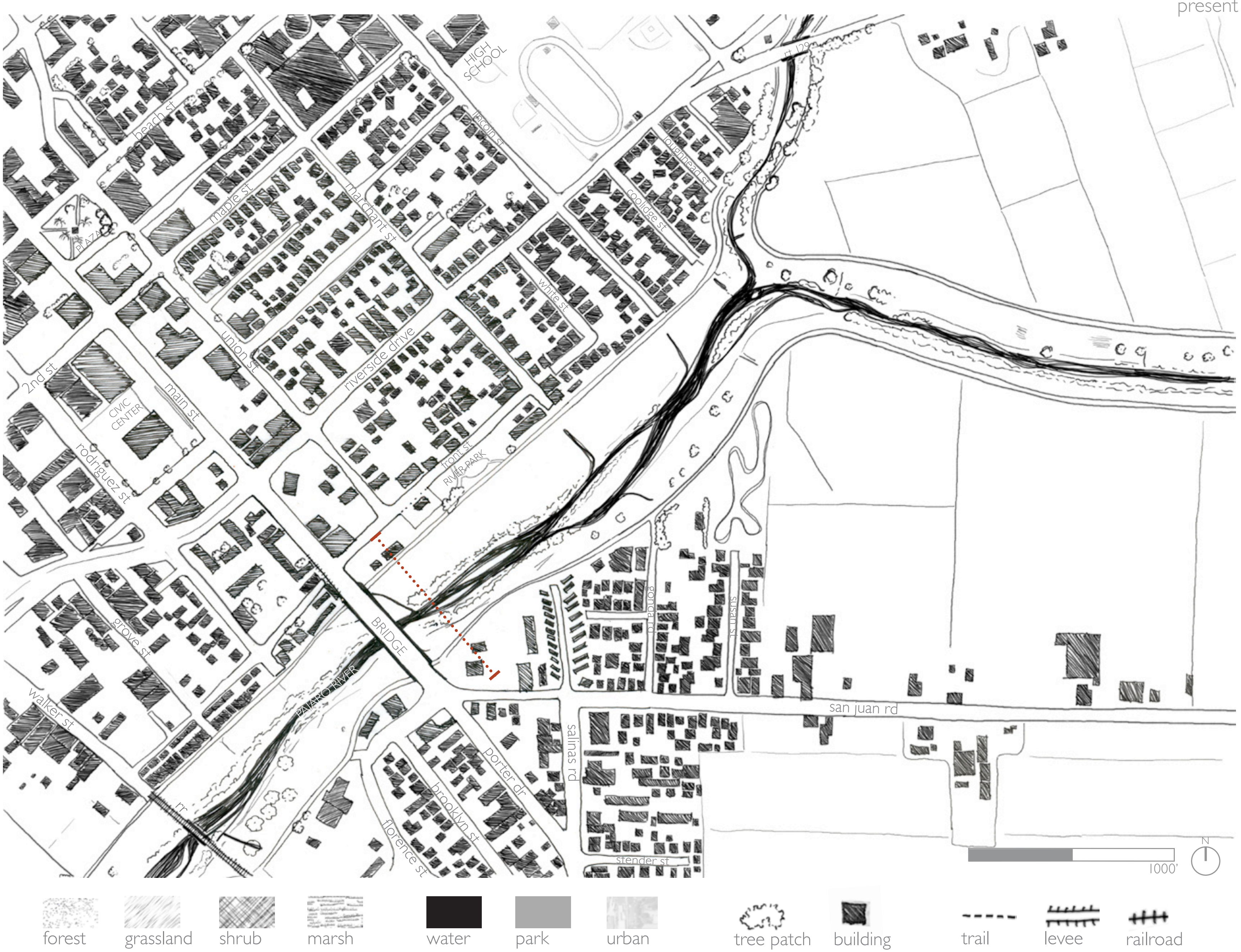


REACH 3 DOWNTOWN

view of watsonville's pajaro river paseo

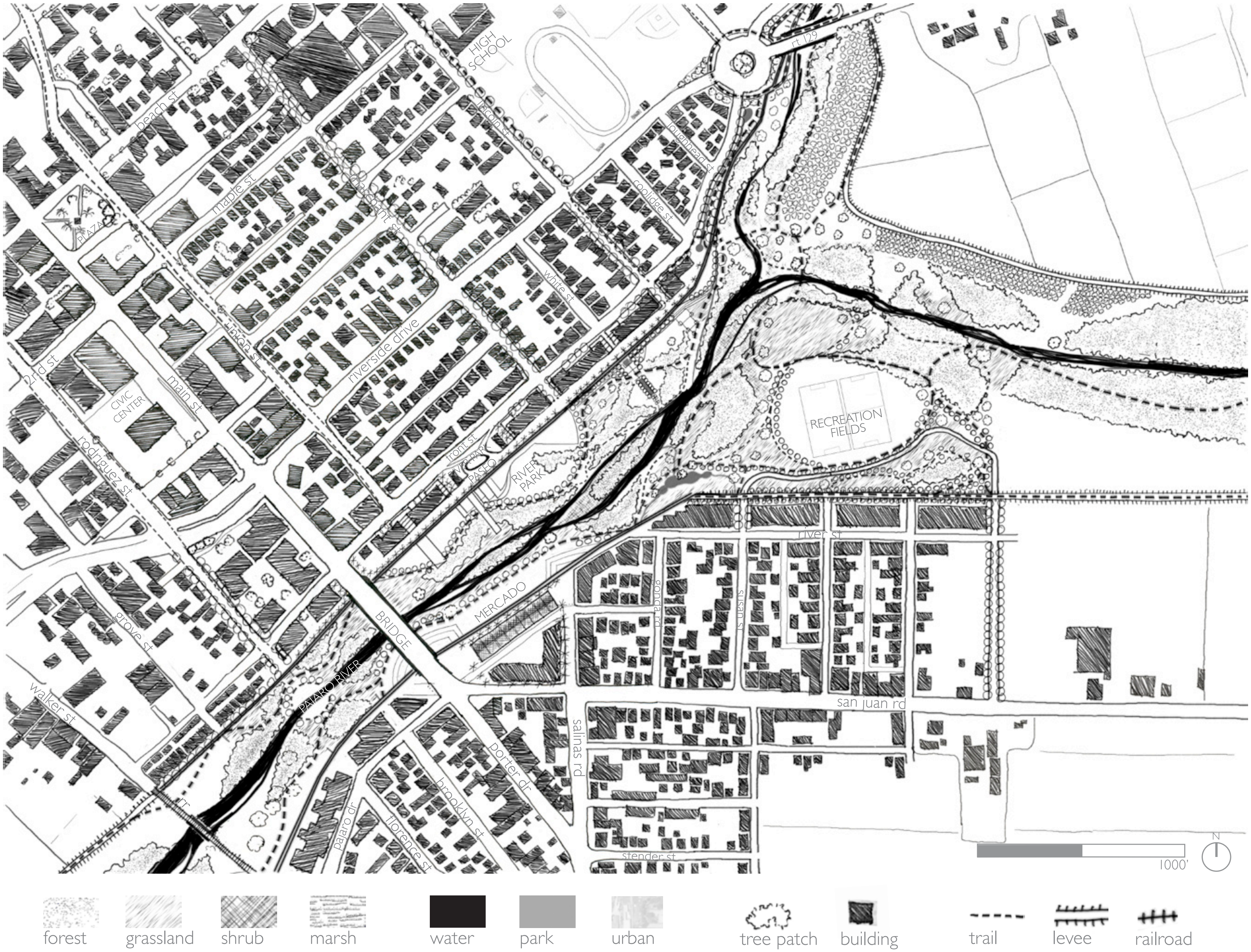
REACH 3 DOWNTOWN

present



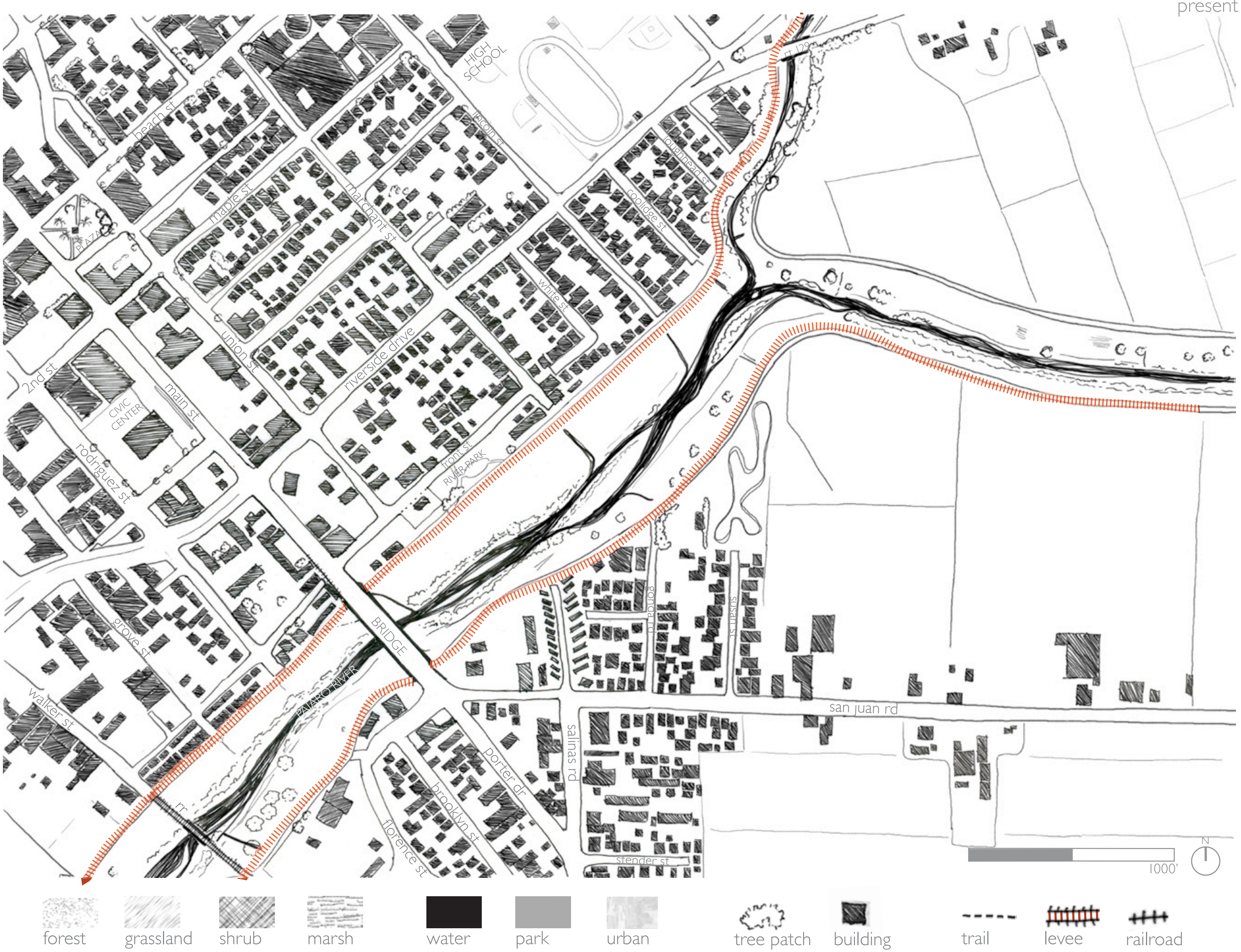
REACH 3 DOWNTOWN

vision



REACH 3 DOWNTOWN

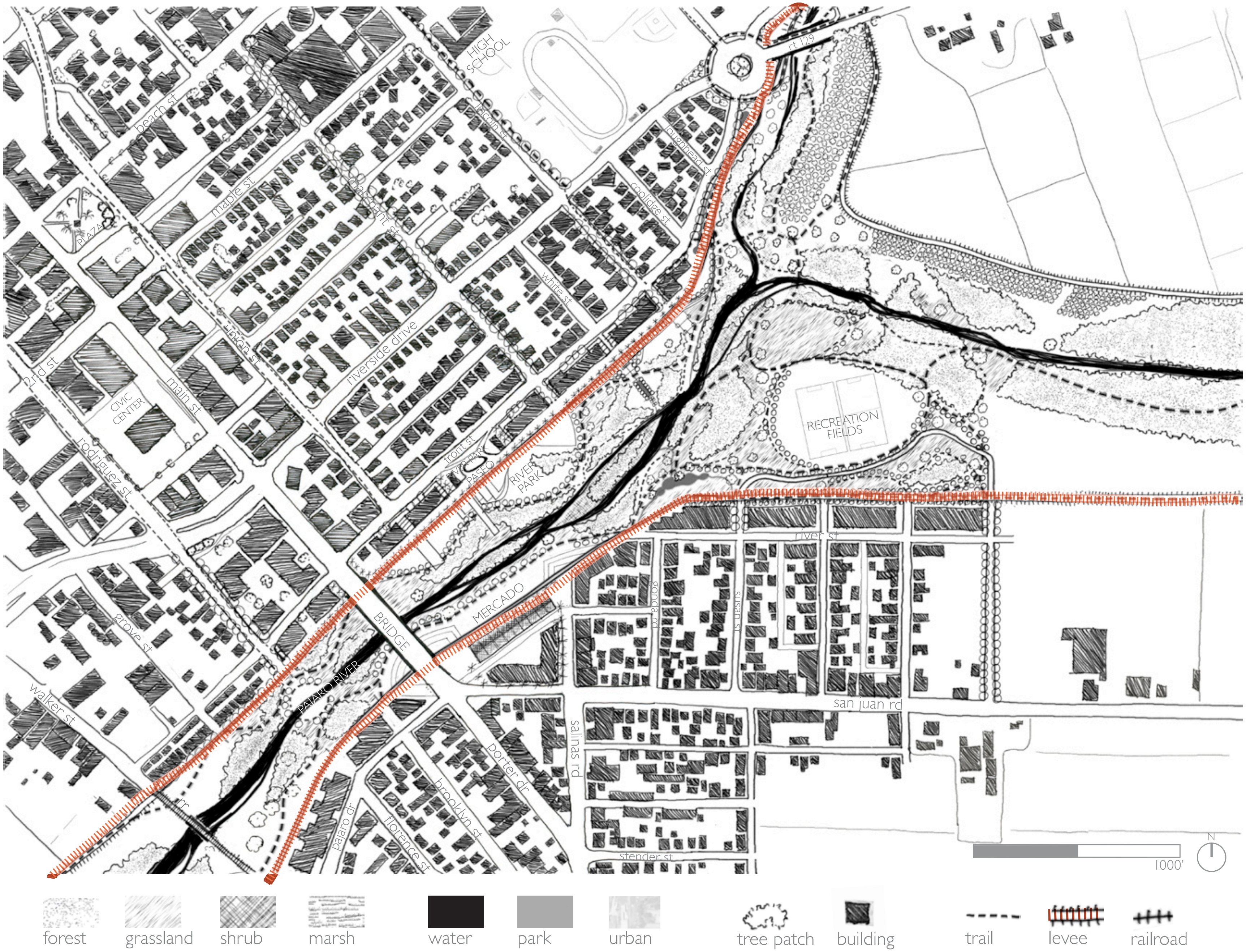
LEVEES
present



The Pajaro River Corridor
connected communities

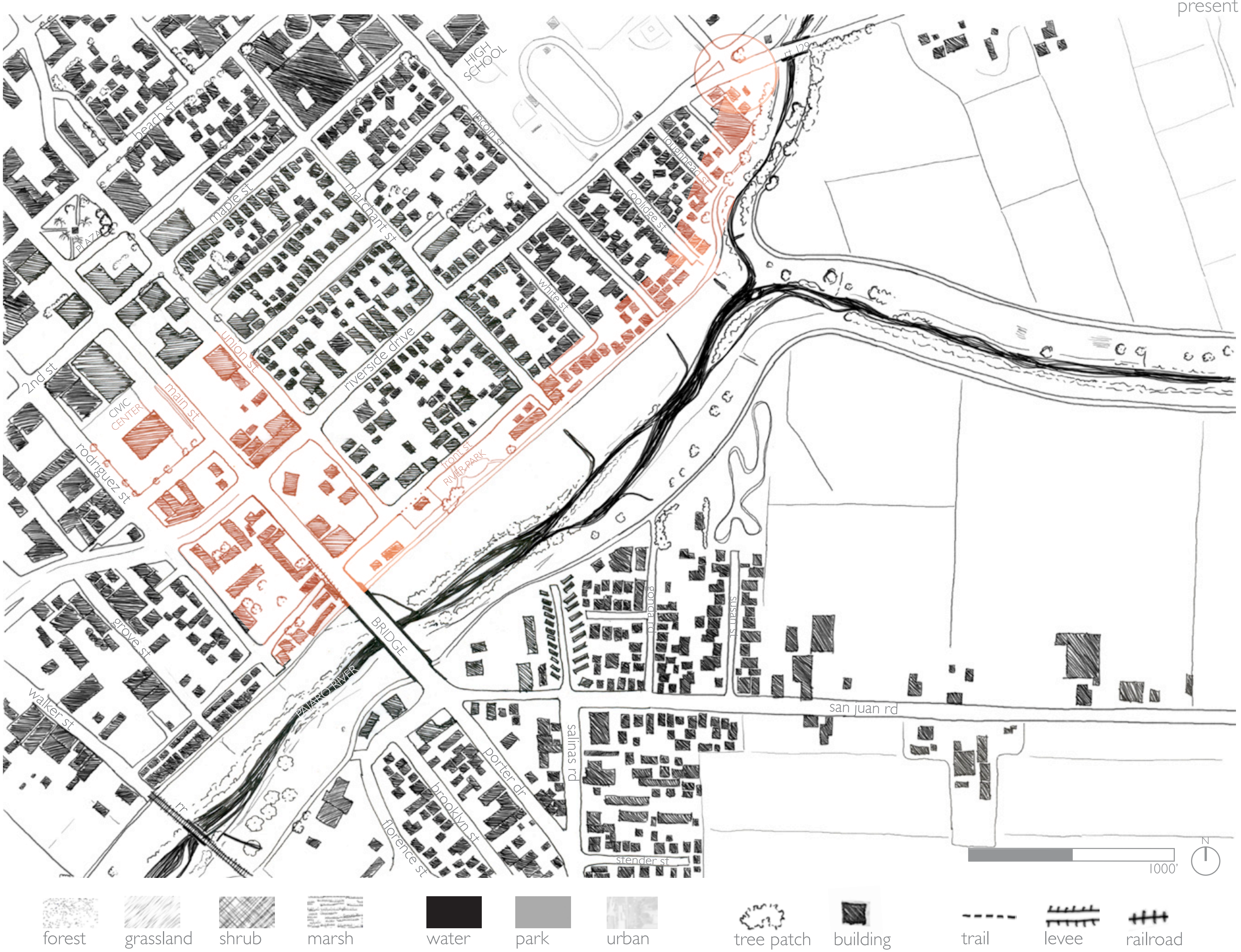
REACH 3 DOWNTOWN

LEVEES
vision



REACH 3 DOWNTOWN

REDEVELOPMENT AREA
present

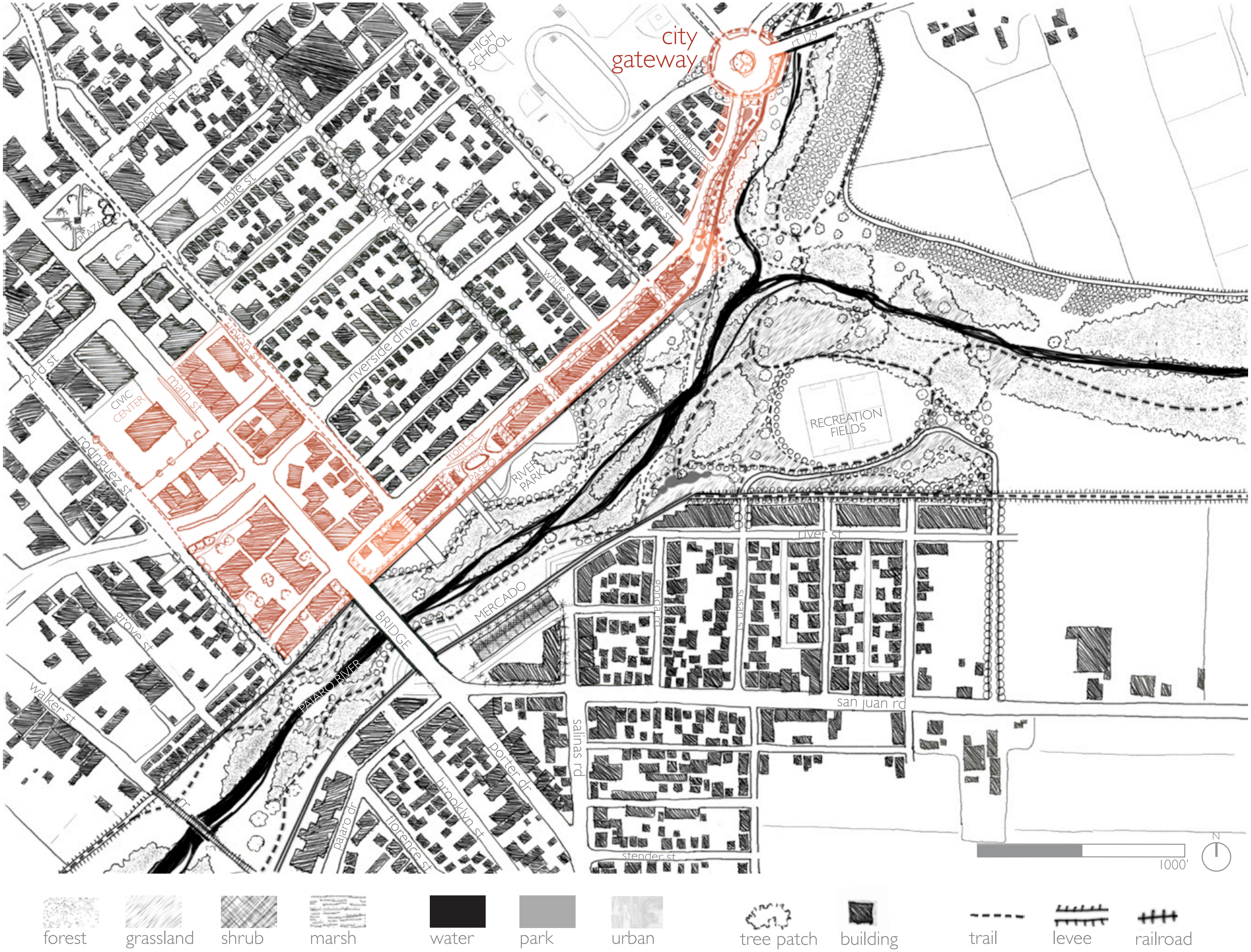


REACH 3 DOWNTOWN

REDEVELOPMENT AREA

populate a walkable downtown with infill and expand with riverfront promenada

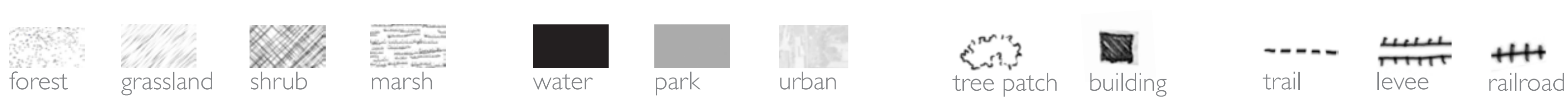
vision



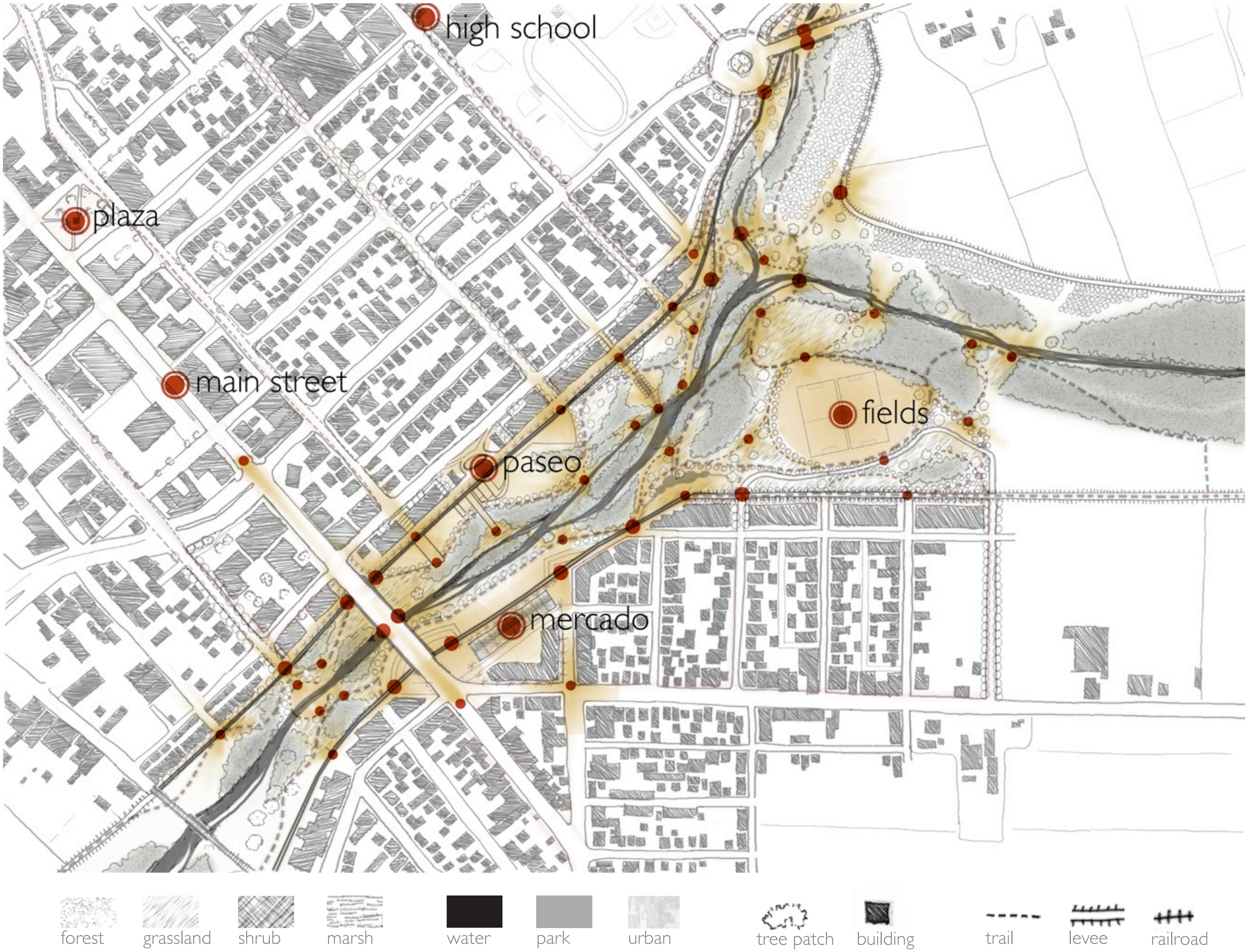
REACH 3 DOWNTOWN

CORRIDOR: 70-acre Park

currently Watsonville and Pajaro suffer from a park space deficit



DESTINATIONS and ACCESS POINTS and VISTAS



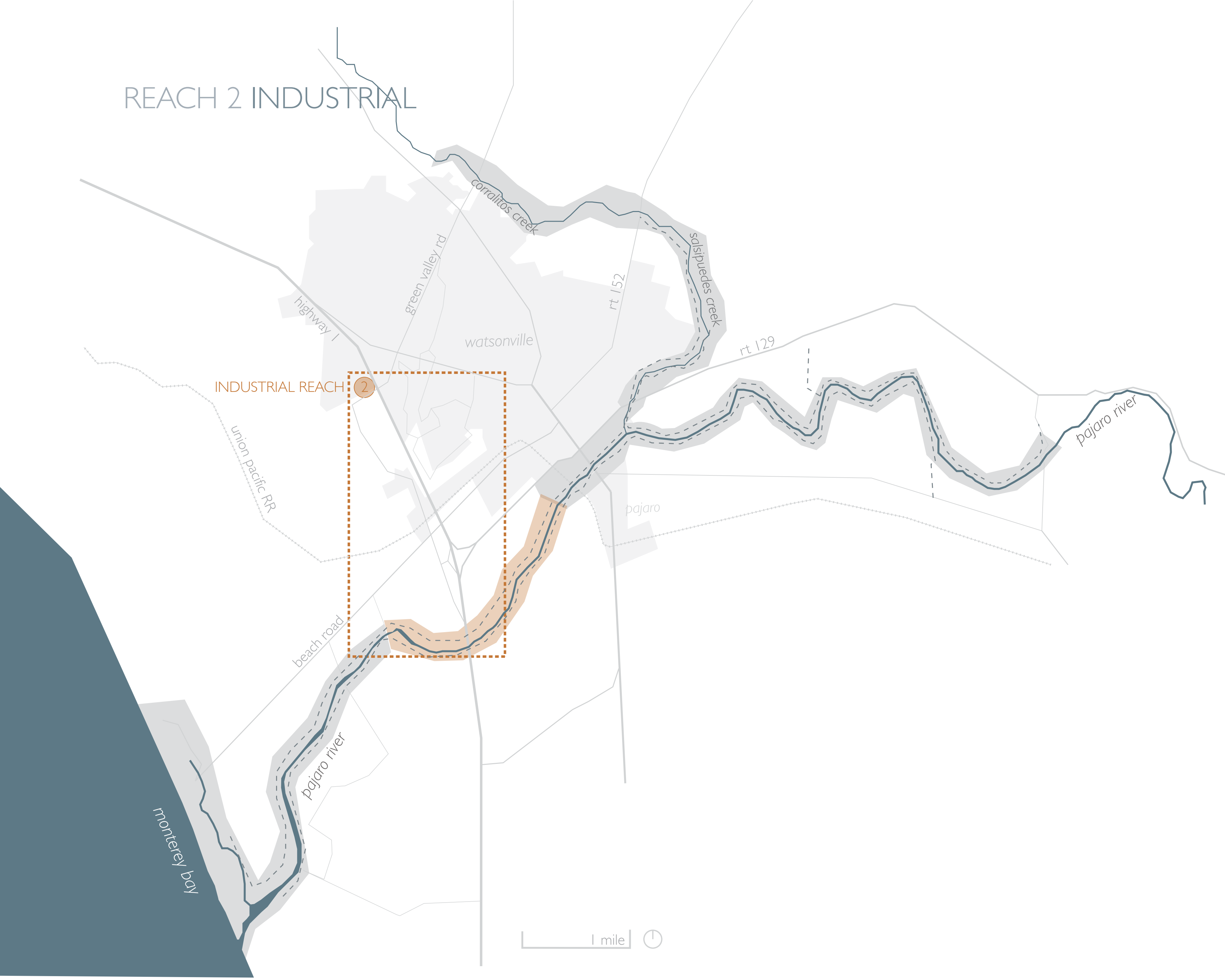
REACH 3 DOWNTOWN

BIKE PATHS and PEDESTRIAN PRIORITY AREAS

REACH 3 DOWNTOWN

HABITAT
support steelhead migration and riparian bird populations

REACH 2 INDUSTRIAL



The Pajaro River Corridor
connected communities

REACH 2 INDUSTRIAL

Join Pajaro River Corridor and Watsonville Slough trail systems with tree-lined, cross-valley pathways that enhance the network of multi-modal connections between regional destinations while filtering agricultural drainage and urban runoff.

REACH 2 INDUSTRIAL

FOCAL SPECIES

Require expansion of riparian buffer and thickets of vegetation

tricolored blackbird
California Species of Special Concern

Proposed Burrowing Owl Nesting Box Sites

burrowing owl
California Species of Special Concern

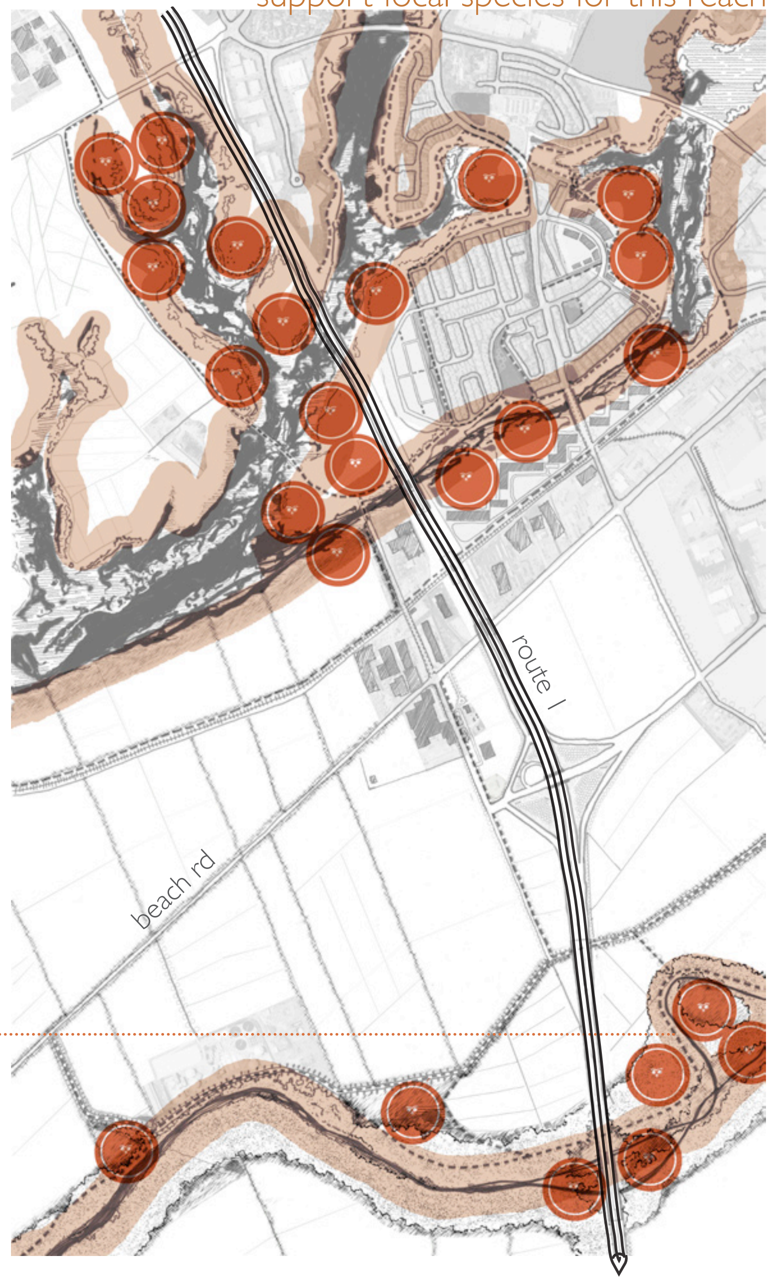
Require wet off-channel habitat (i.e. oxbows and floodplain)

red legged frog
Federal Threatened Species

Require connection to upland slopes for nesting

western pond turtle
California Species of Special Concern

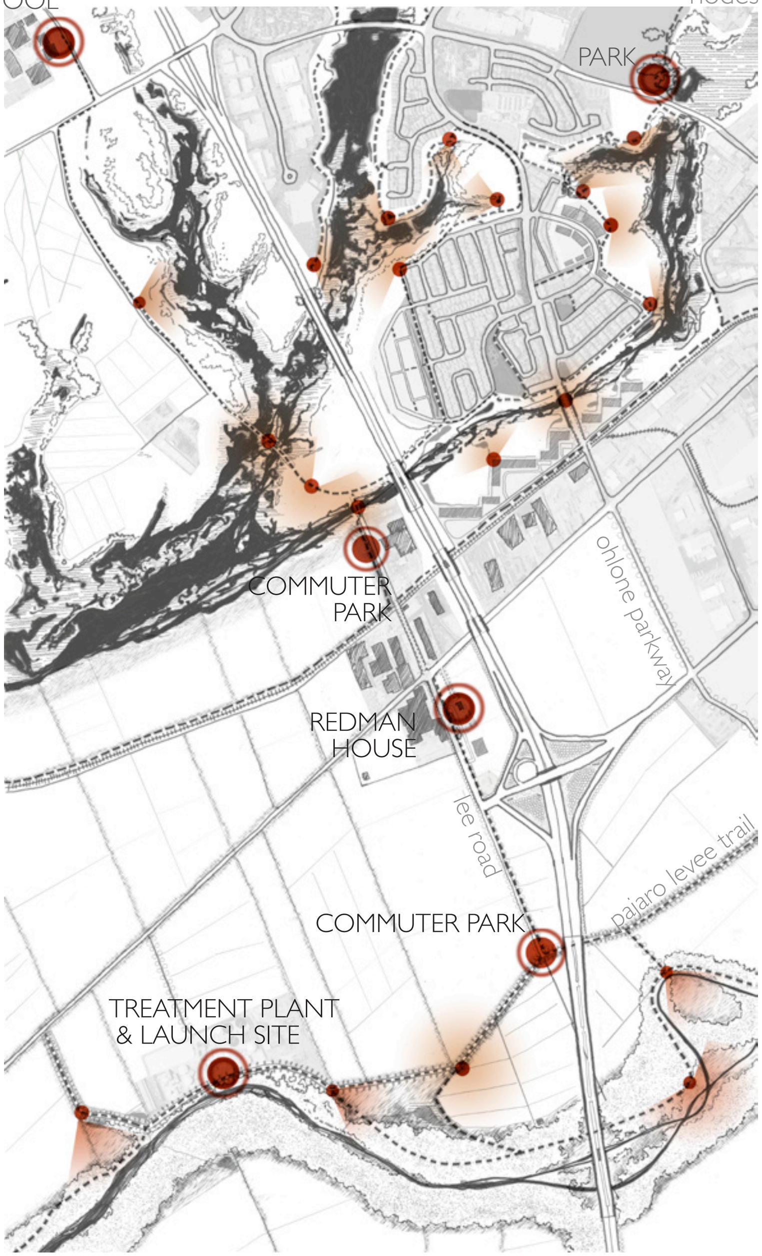
HABITAT
support focal species for this reach



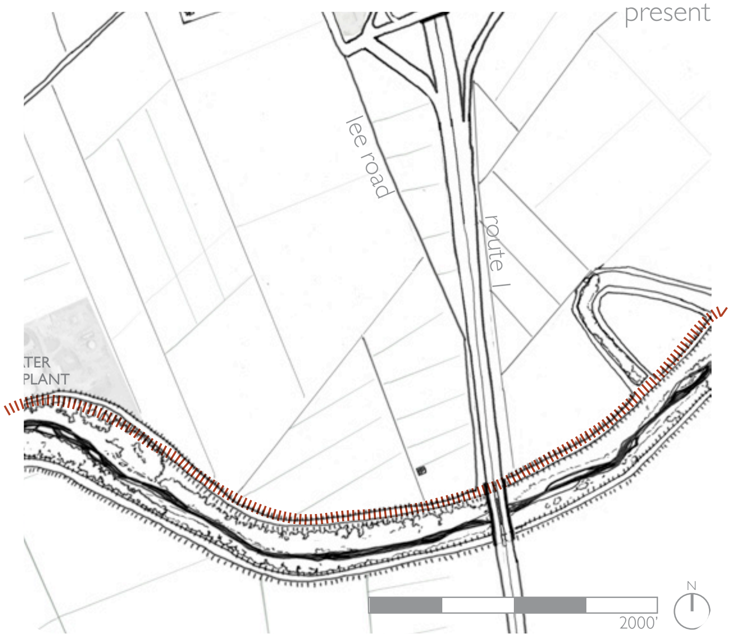
REACH 2 INDUSTRIAL

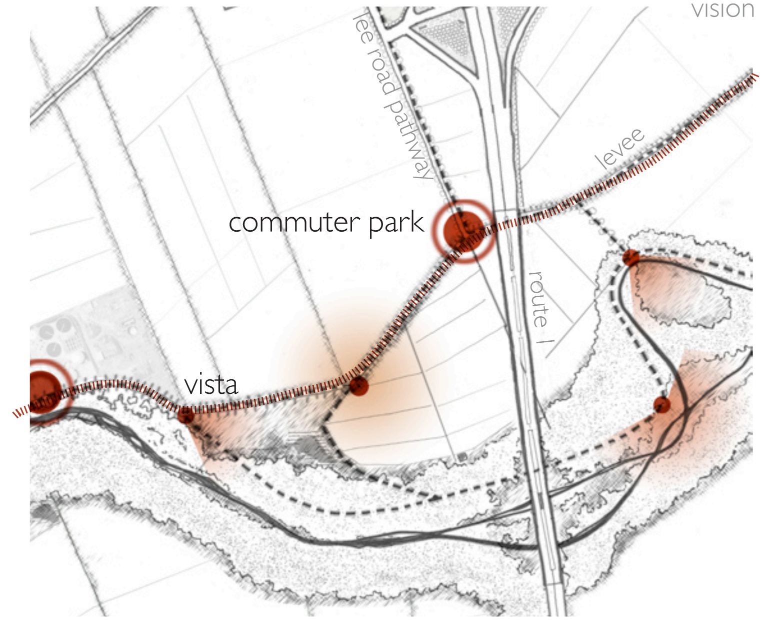
CONNECTIVITY

connect Wetlands trail system to Pajaro River trails



REACH 2 INDUSTRIAL

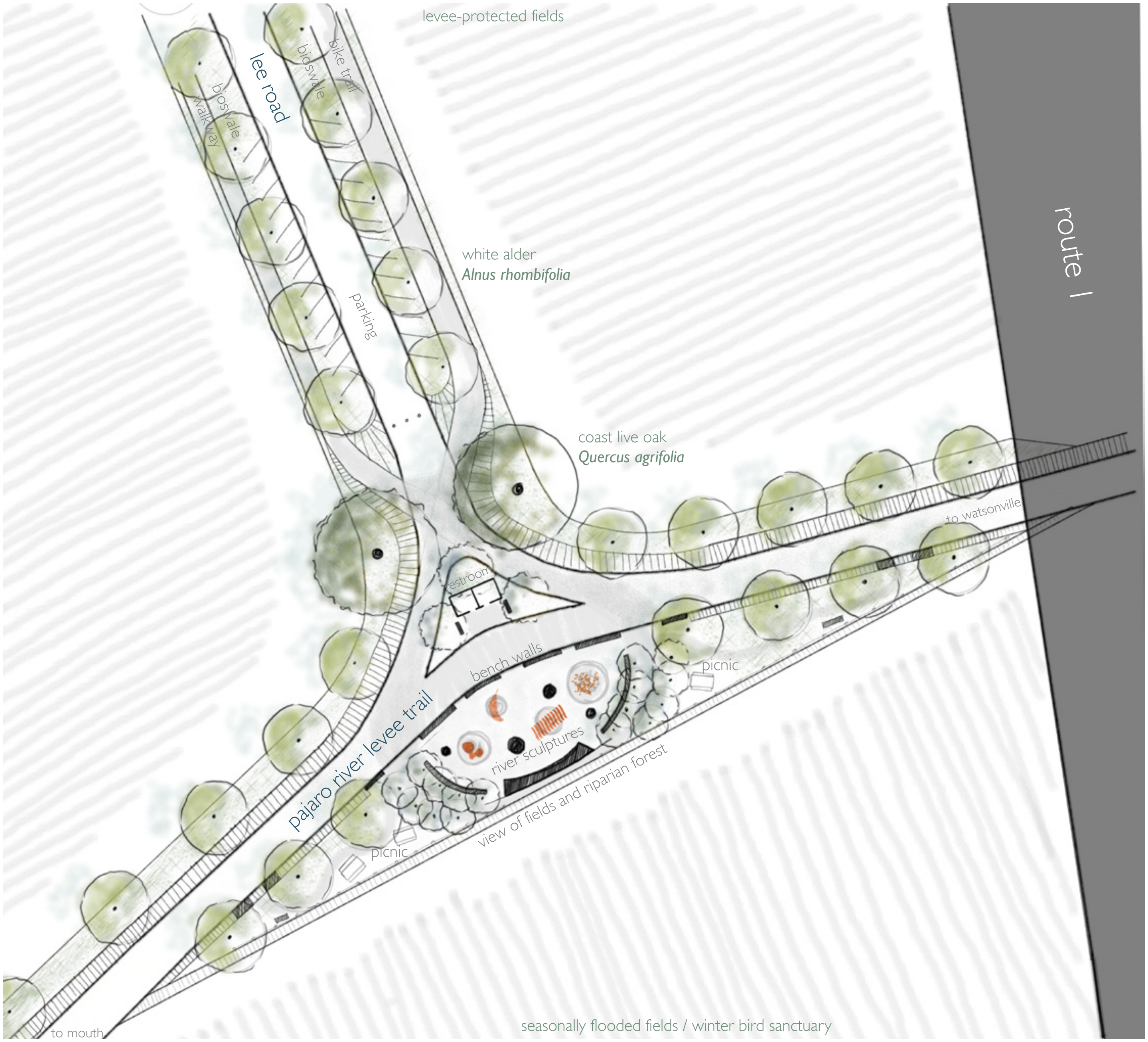




informal trail through widened riparian buffer

REACH 2 INDUSTRIAL

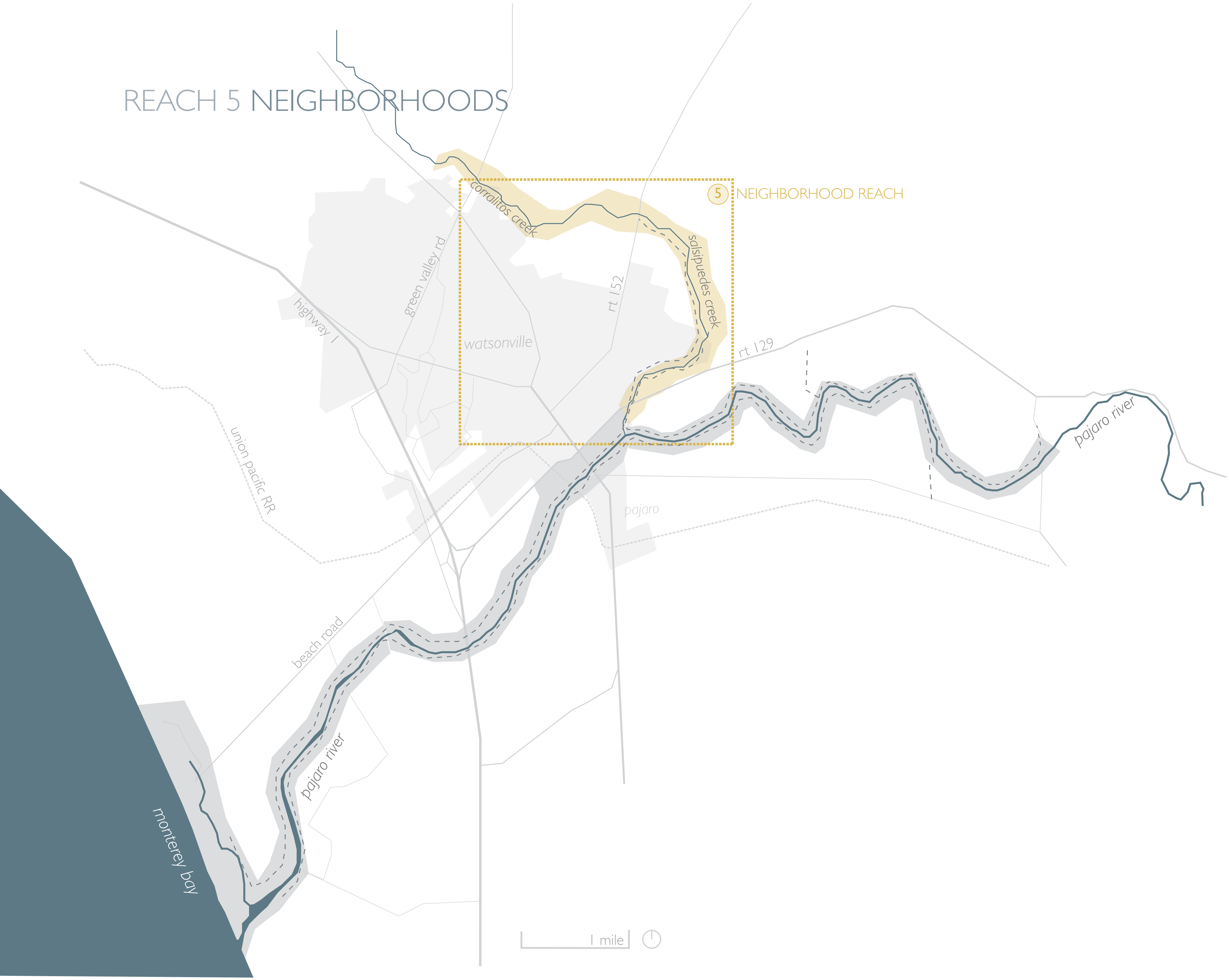
lee road parkway trail and commuter park concept



REACH 2 INDUSTRIAL

lee road parkway trail and commuter park concept

REACH 5 NEIGHBORHOODS



REACH 5 NEIGHBORHOODS

Encircle the city with a pedestrian and bicycle highway, connecting public amenities and creating opportunities for a diversity of park and recreation spaces. As the levees protect new lands, anticipate pressure for urban development by planning ahead and inviting the opportunity to create vibrant, walkable neighborhoods with convenient access to Watsonville's trail system.

REACH 5 NEIGHBORHOODS

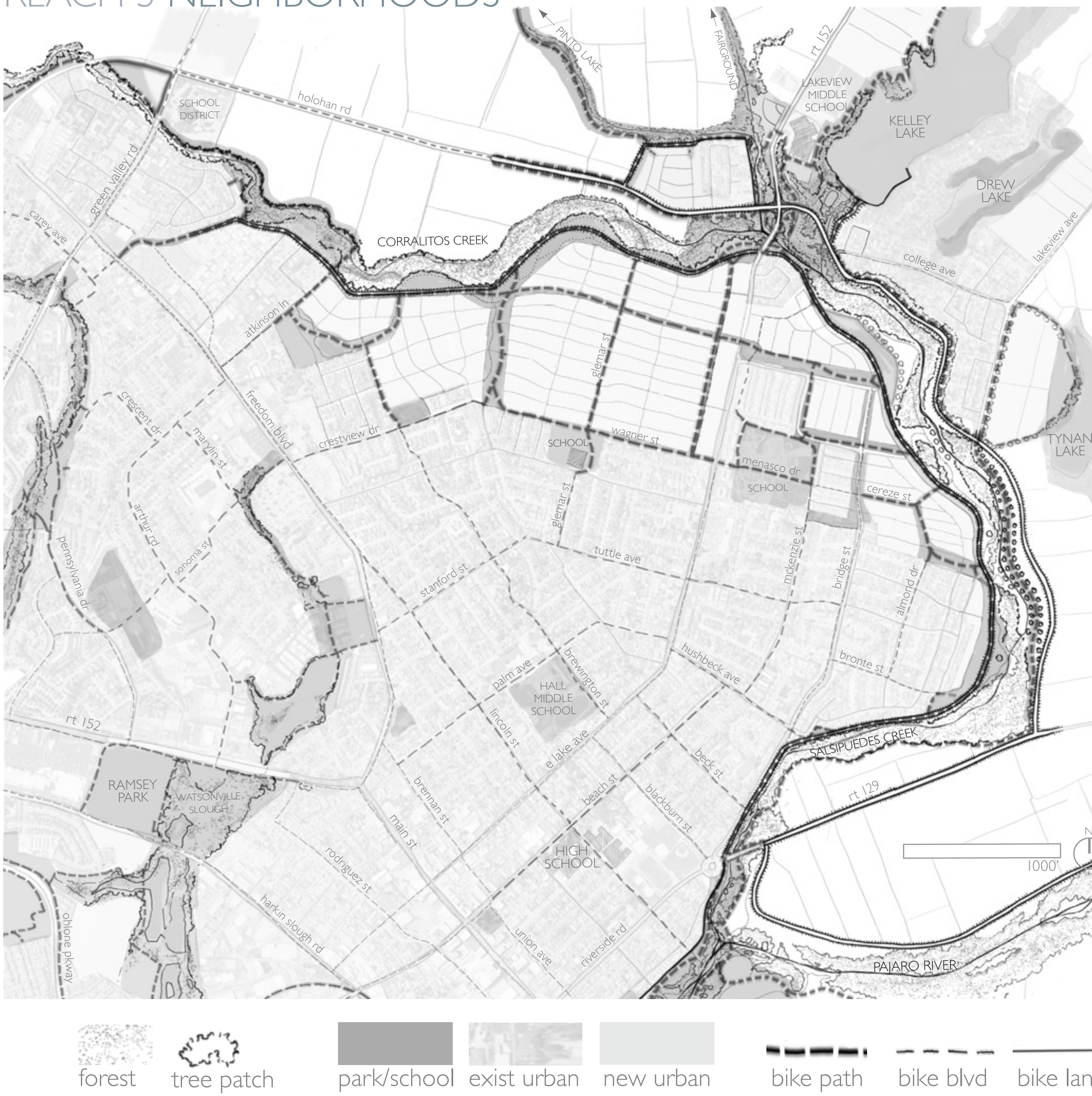
present

forest | tree patch | park/school | exist urban | new urban | bike path | bike blvd | bike lane | ped trail | levee

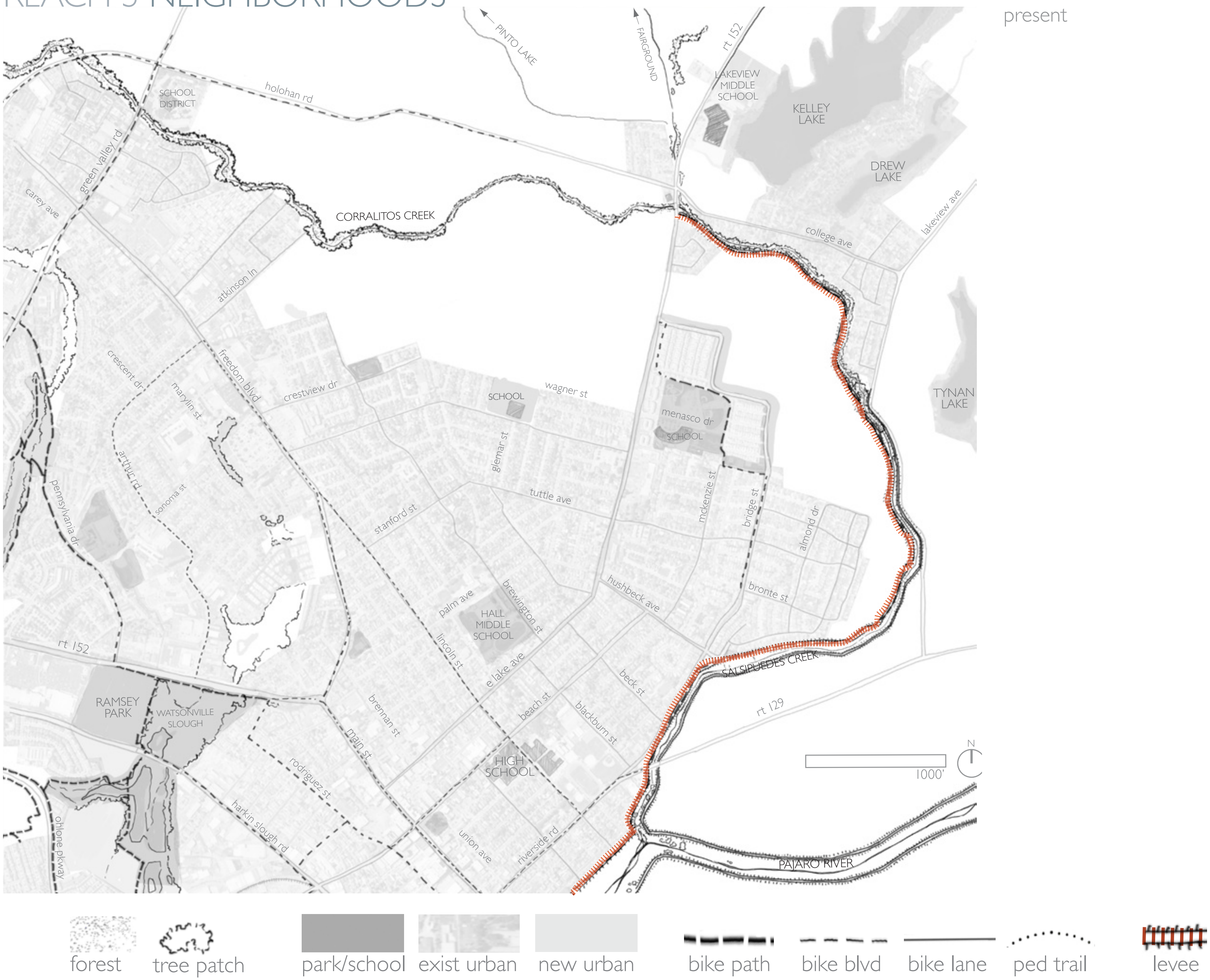
The Pajaro River Corridor
connected communities

REACH 5 NEIGHBORHOODS

vision

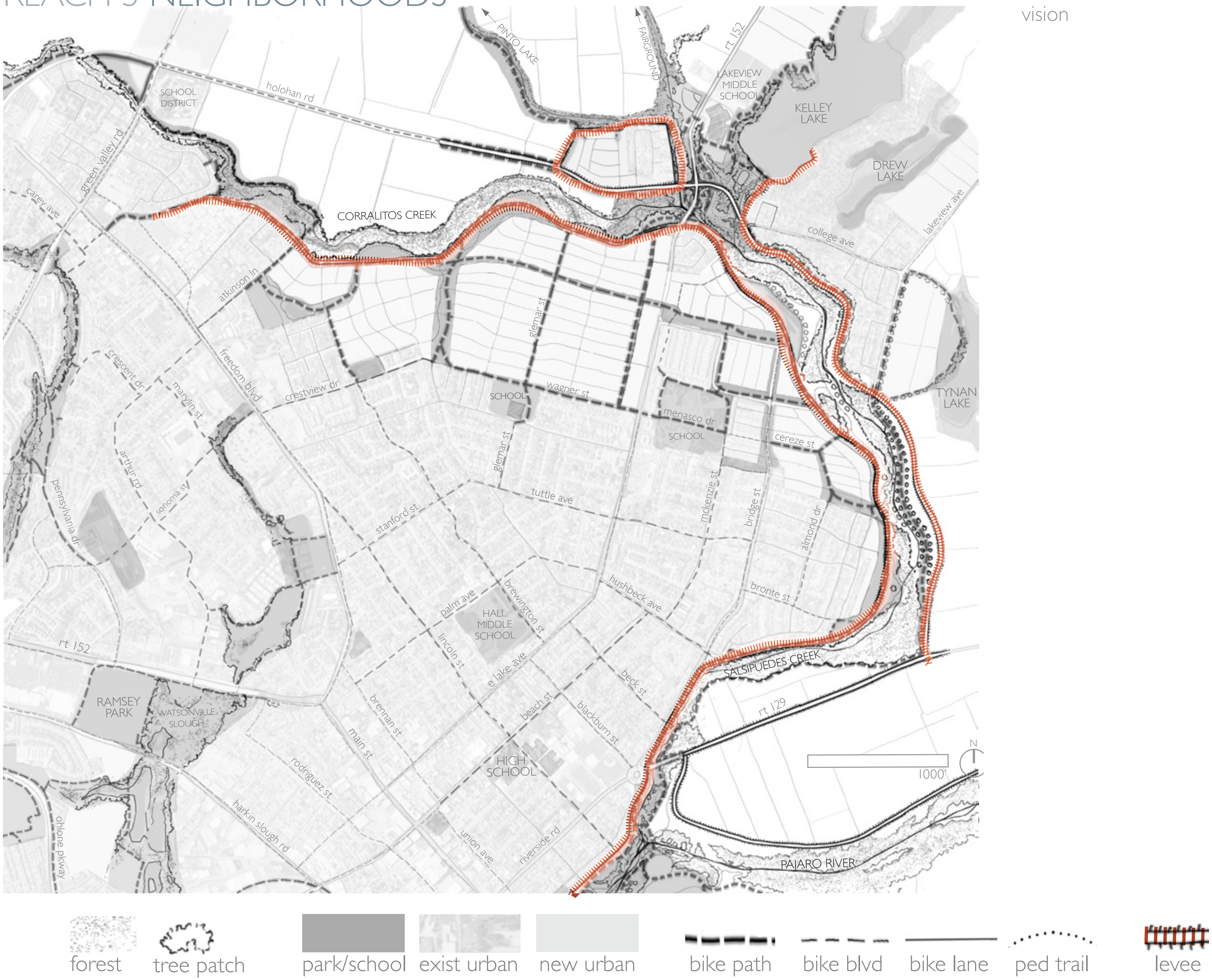


REACH 5 NEIGHBORHOODS



REACH 5 NEIGHBORHOODS

vision



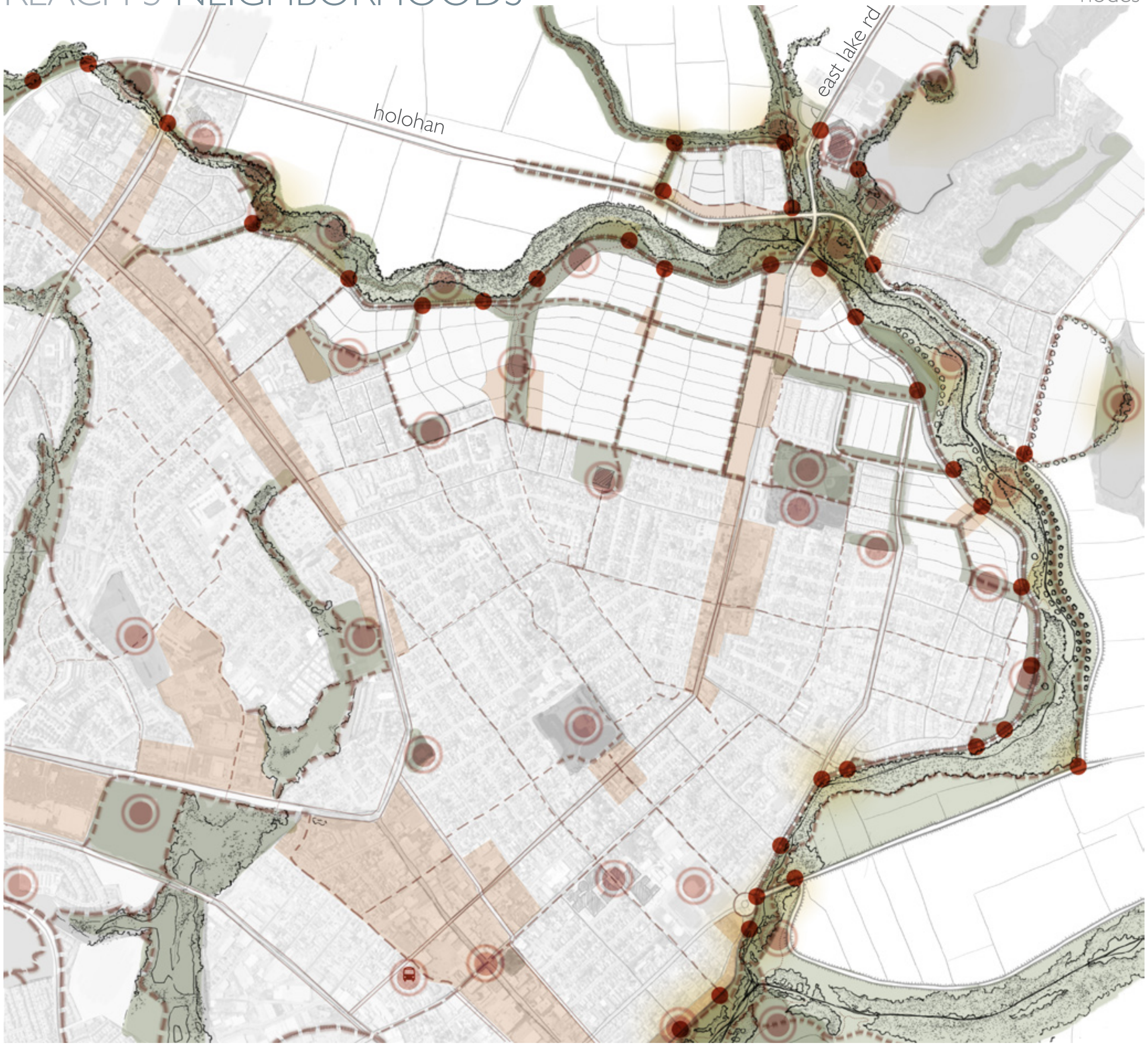
The Pajaro River Corridor
connected communities

REACH 5 NEIGHBORHOODS

corridor

REACH 5 NEIGHBORHOODS

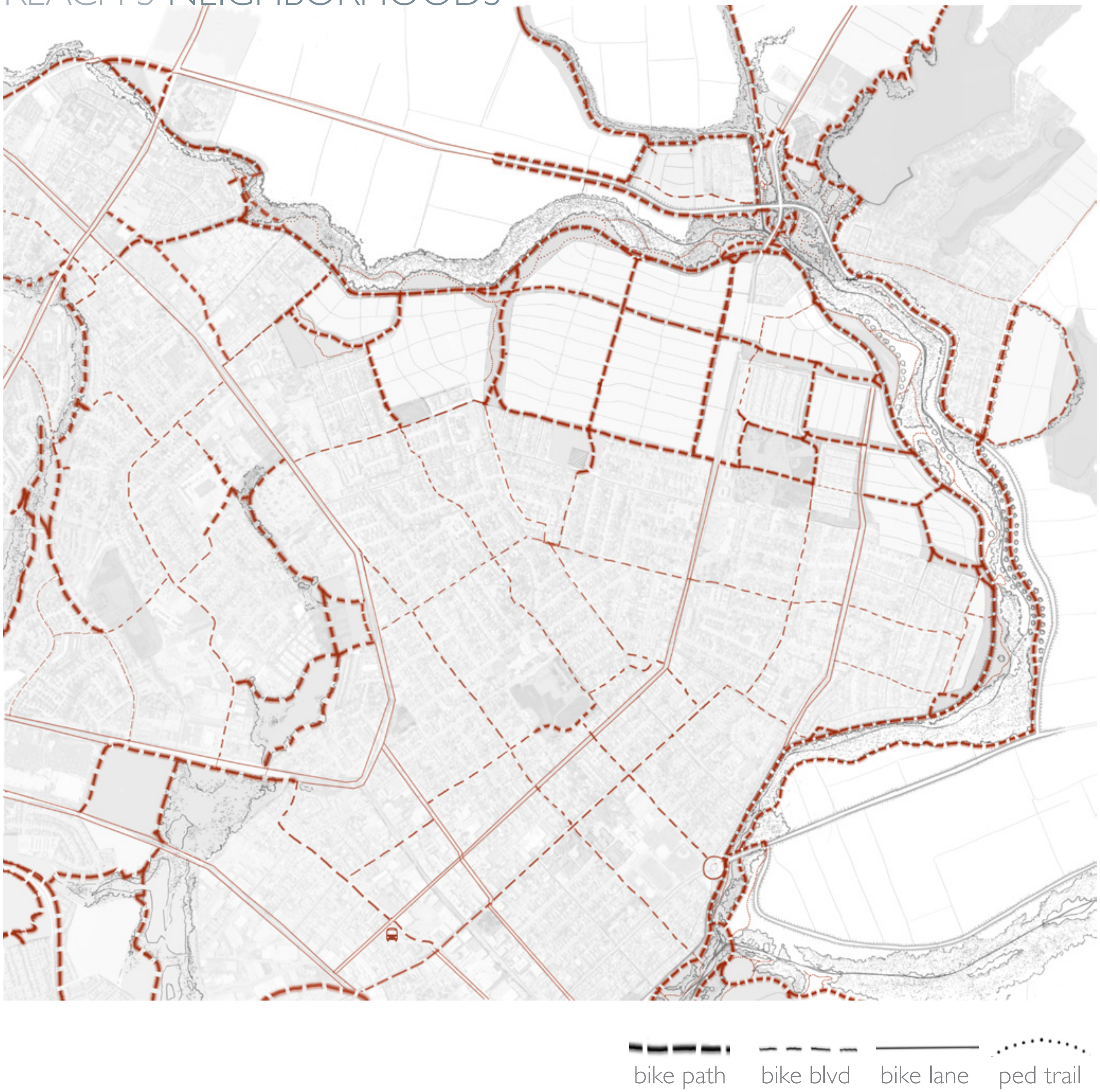
nodes



forest | tree patch | park/school | exist urban | new urban | bike path | bike blvd | bike lane | ped trail | levee

REACH 5 NEIGHBORHOODS

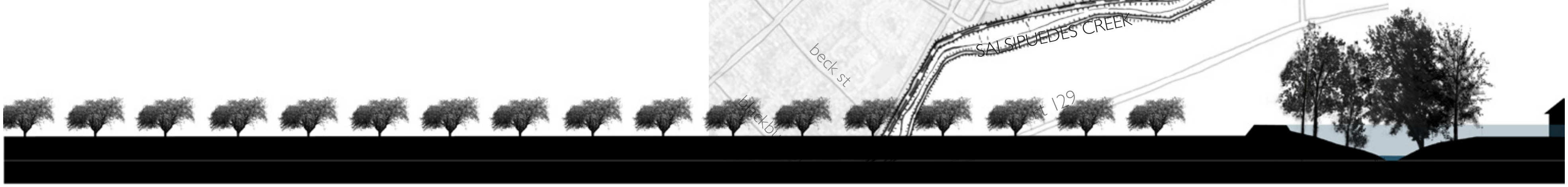
pathways



REACH 5 NEIGHBORHOODS

SECTION ACROSS SALSIPUEDES CREEK CHANNEL

1000 ft downstream of East Lake Avenue bridge

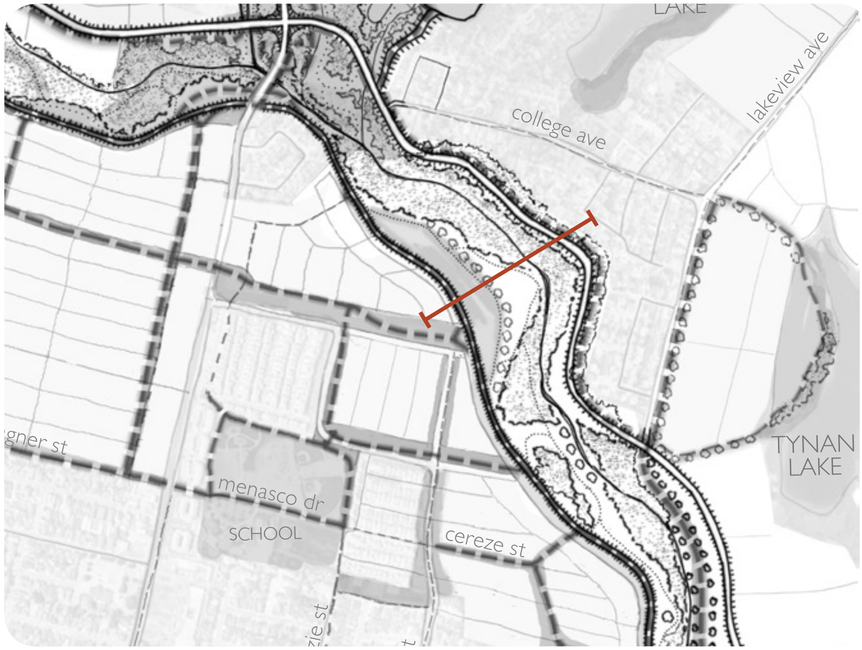


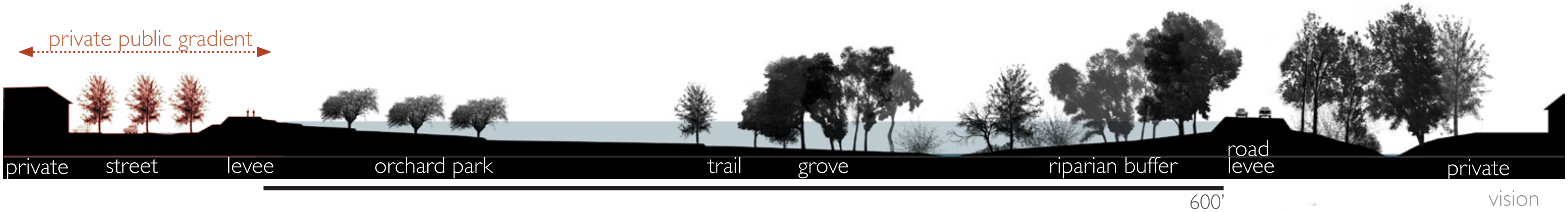
current

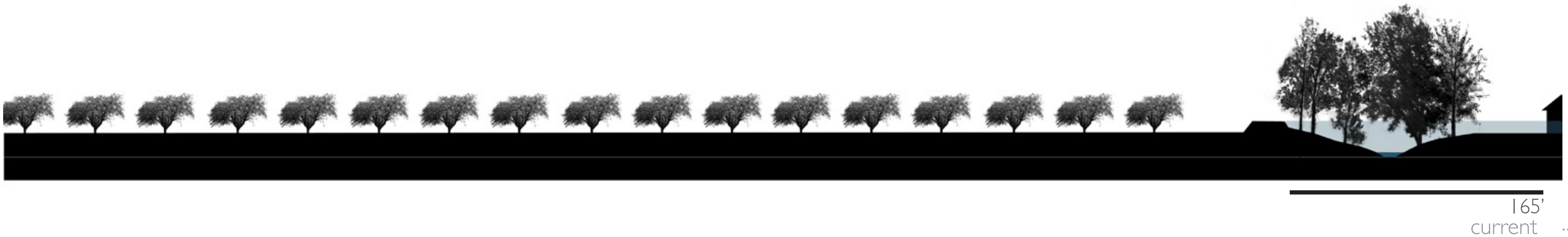
REACH 5 NEIGHBORHOODS

SECTION ACROSS SALSIPUEDES CREEK CHANNEL

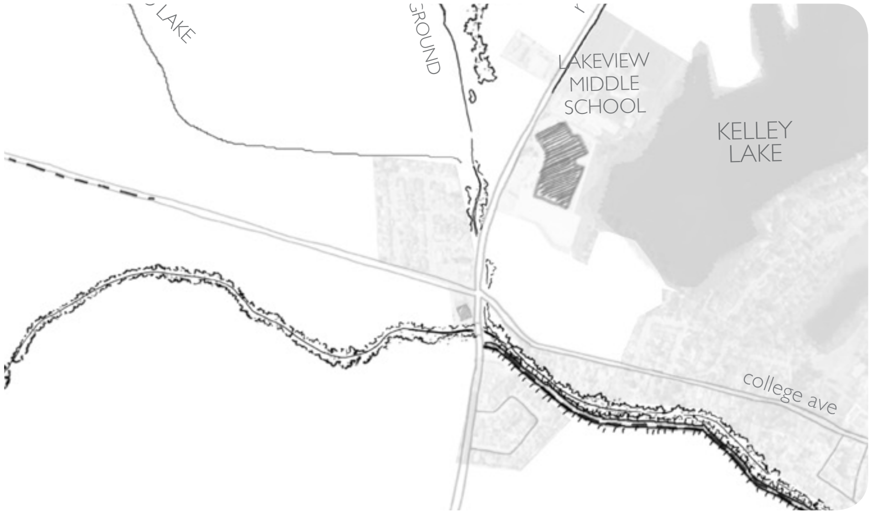
1000 ft downstream of East Lake Avenue bridge







REACH 5 NEIGHBORHOODS



Salsipuedes and Corralitos Creek converge in an urban park before they flow beneath a new pedestrian, bicycle and wildlife-friendly East Lake Avenue bridge.

WHAT IS OUR LEGACY?

"We pitched our camp on the bank of the river discovered by scouts, not far from the village which stood near the river-bottom. This was verdant and pleasant, covered with poplars, alders, and tall white oaks, live-oaks, and another kind of tree that we did not know. Here we saw a bird that the natives had killed and stuffed with grass; it appeared to be a royal eagle; it was eleven palms from tip to tip of its wings. On account of this find, we called the river the Rio del Pajaro."

from the diary of Miguel Costanso of the Portola Expedition
October 8, 1769

A CONCEPTUAL VISION: THE PAJARO IN TIME

How can we re-integrate the Pajaro River as a multi-functional resource for future generations?

LIABILITY

RESOURCE

The Pajaro River Corridor

connected communities

http://jennifernatali.com
jennifer.natali@gmail.com

California Regional Water Quality Control Board
Central Coast Region
895 Aerovista Place, Suite 101,
San Luis Obispo, California 93401-7906

Attention:
Angela Schroeter, Agricultural Regulatory Program Manager
aschroeter@waterboards.ca.gov
Howard Kolb, Agricultural Order Project Lead Staff
hkolb@waterboards.ca.gov.

Subject: preliminary draft Agricultural Order June 17,2010

Dear Angela Schroeter and Howard Kolb

Thank you for the opportunity to review the PRELIMINARY DRAFT AGRICULTURAL ORDER CONDITIONALLY WAIVING INDIVIDUAL WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM IRRIGATED LANDS (Order). Our review of this draft is oriented from the Sierra Club's interests to preserve and protect natural resources and associated water quality benefits provided by properly functioning streams and wetlands.

We appreciate the dilemma discussed in attachment 5, top of page 8, describing the challenge to implement a program to maximize water quality benefits and minimize implementation problems within the agricultural economy. We believe the draft order is on the right track to achieve the water quality objectives, and it appears compatible with some water resource and flood protection programs in the Central Coast that may contribute to solutions, offsetting costs to agriculturists. We are optimistic that the clarified and new regulations in the Order will result in agricultural practices that are able to integrate with multi-objective water resource and flood protection infrastructure projects and thus distribute and reduce costs among stakeholders. Presently in the Pajaro River Watershed, there are a few such projects which are organized into an Integrated Resource Water Management Plan (IRWMP) intended to benefit agricultural and other stakeholders in the Watershed. We anticipate the "Farm Plan" development process discussed in the Order will provide for water quality improvements that can be credited to the Watershed Projects, increasing their "Benefit Cost" ratios by making them more competitive for federal and state funding. Our comments below elaborate on this point in the Pajaro River Watershed, with which we are most familiar, but which we anticipate may be generic to the Central Coast region.

Our review comments are organized about Attachment B, utilizing the page number and topic to list our comments as follows:

Page 5, Farm Plan <CLARIFICATION AND ADDITION >

Farm Plan must focus on resolving priority water quality issues related to individual operations and the watershed. Farm Plan must include irrigation management, pesticide managment, nutrient management, salinity and sediment management, and Plan must identify and schedule implementation of practices to eliminate or minimize discharge of waste using best practicable treatment or control. Farm Plan nutrient management plan element must be certified by professional to be protective of water quality. Farm Plan must be updated at least annually. Upon notice by the Executive Officer, Farm Plan must be submitted to the Water Board. Discharger must modify Farm Plan upon notice *by the Executive Officer. Farm Plan must include photo documentation of aquatic habitat.*

We agree that the Farm Plan needs to address "*resolving priority water quality issues related to individual operations and the watershed."* However, it appears the Draft Order prioritizes irrigation run-off issues over the matter of storm water drainage. We believe both issues should be addressed in the Final Order. Poorly managed storm water has potential adverse water quality impacts to local drainage, regional receiving channels and natural streams. Lower watershed communities are at a significantly greater risk than those in the upper watershed due to the accumulated impacts as the watershed area increases. Strategic storm water management on the other hand may address this disparity and conversely have greater potential positive impacts to receiving waters if multi-objective goals for drainage and flood control projects are pursued watershed wide. Contemporary state and federal flood protection programs are capable of accommodating such multi-objective planning, and there are such projects presently taking place in the Pajaro River Watershed. These projects include the USACE Upper Llagas Creek Project in the Morgan Hill area and the USACE Lower Pajaro River Project in the Watsonville area. Presently these projects are preparing environmental impact studies including NEPA and CEQA documents which are expected to be reviewed by the CCRWCB during the interim renewal period of time for this Order. The Sierra Club will advocate said contemporary multi-objective planning policy for these projects and point out how they can contribute or support the beneficial uses of water as discussed in the Attachment 2 page of this Draft Order. We believe water quality problem solving needs to occur at various scales and take into account the roles and responsibilities of all involved.

We support the CCRWQCB's focus on the "Farm Plan", and its role of contributing to solutions at the local scale, but believe it needs to be strategically linked to large scale solutions such as the aforementioned flood control projects. We are optimistic that the water resource-flood control infrastructure planned for the Pajaro River Watershed will provide for a robust agricultural economy because of the contemporary planning, cooperation and progress made in the water resources area. We believe the CCRWQC will need to issue a 401 Water Quality Certification for these projects and should condition them to require water quality improvement design and construction elements.

Despite the growing pains Pajaro River Watershed water agencies have endured lately, continued progress has prevailed producing work plans and funding to solve the Pajaro Watershed's water resource problems. The aforementioned Pajaro River IRWMP could study the pollution issues identified and reported in the Farm Plans. The Final Order should identify this potential IRWMP linkage to multi-objective problem solving to optimize private enterprise and government solutions and funding at the watershed scale.

Perhaps an International Standards Organization (ISO) protocol can ultimately be developed specific to Pajaro Valley excess irrigation/ storm water discharge practices adjacent to:

- levees or modified floodplains
- reclaimed water pipelines
- wetlands
- groundwater recharge areas (instream and off stream)

Perhaps the universal recognition of an ISO for water quality could contribute to the array of solutions appropriate to address the food safety confidence issue.

Page 12, Aquatic Habitat Requirements; < ADDITION
See Preliminary Draft Order Attachment B- Terms and Conditions; Part G. >

Proposed requirements include 1) protection of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat; 2) minimum buffers widths for perennial and intermittent streams; 3) minimum buffer widths for lakes, wetlands, and estuaries. OPTION to minimum buffer requirements is development and implementation of a Riparian Function Protection and Restoration Plan; 4) identification of aquatic habitat on ranch maps and photo documentation.

We agree that Aquatic Habitat requires protection as a beneficial use including aquatic life (warm or cold freshwater habitat, wildlife habitat). We view aquatic and riparian habitat as inter-dependent with water quality in its role hosting the chemical, physical, and biological processes that function to keep water clean and vital. It serves as an indicator of the integrity and health of a watershed and its resistance to water pollution and groundwater contamination. We are encouraged by the case studies cited in the attachment page where constructed wetlands were installed providing a measured level of water quality improvement. We anticipate that such wetland projects will require formal planning at the watershed scale in context with features such as river reaches or lakes that perhaps have been modified for flood protection or water supply purposes involving public works infrastructure. We believe the aforementioned projects in the Pajaro River Watershed (and projects in other locations in the region) provide opportunities to address agricultural run-off pollution issues to a significant degree. The local drainage collection and drainage system typically situated at the outboard toe of a flood protection levee could be designed to include a constructed wetland to receive pre-treated agricultural run-off. This run-off would originate from the tail water at the low end of an irrigated field shown on the Farm Plan and could drain into the levee drainage/wetland system for interim storage, treatment, monitoring, and appropriate remedial measures before it would be discharged onto the lower terrace floodplain and riparian corridor. This highly productive zone of hydrophilic vegetation could be managed to improve water quality in the receiving water body.

Thank you for the opportunity to comment on the Draft Order and we look forward to participating at your July 8, 2010 public meeting in Watsonville.

Sincerely,

Kenn Reiller.
Chair, Sierra Club Water Committee

Cc

Pajaro River Watershed Flood Protection Authority
Santa Cruz County Flood Control and Water Conservation Zone 7

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Back ground information clipped from Draft Order review files

This is a message from the California Regional Water Quality Control Board, Central Coast Region (3)

____

The Board will hold a public hearing at its regularly scheduled meeting on Thursday, July 8, 2010, at 8:30 AM in Watsonville. Additional meeting information is provided on the attached Public Notice.

The California Regional Water Quality Control Board, Central Coast Region proposes to renew the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Agricultural Order No. R3-2009-0050) for 18 months, until December 8, 2011. Staff proposes no changes to the Order, except for the expiration date.

Persons wishing to comment on the proposed renewal of the Ag Order must submit comments in writing to the Water Board at its office in San Luis Obispo no later than June 18, 2010.

http://www.waterboards.ca.gov/centralcoast/water_issues/programs/ag_waivers/ag_order.shtml

1.4 Why is the Central Coast Water Board changing the current

1.1 What is the issue?

The Central Coast Water Board must determine how best to regulate agricultural discharges on the Central Coast to directly address the major water quality issues of toxicity, nitrates, pesticides and sediment in agricultural runoff and/or leaching to groundwater so that we achieve desired water quality outcomes that support all beneficial uses. Agricultural discharges (primarily due to contaminated irrigation runoff and percolation to groundwater) are a major cause of water quality impairment. The main problems are:

1. In the Central Coast Region, thousands of people are drinking water contaminated with unsafe levels of nitrate or are drinking replacement water to

avoid drinking contaminated water. The cost to society for treating polluted drinking water is estimated to be in the hundreds of millions of dollars.

2. Aquatic organisms in large stretches of rivers in the entire region's major watersheds have been severely impaired or completely destroyed by severe toxicity from pesticides.

These impairments are well documented, severe, and widespread. Nearly all beneficial uses of water are impacted, and the discharges causing the impairments continue. Immediate and effective action is necessary to improve water quality protection and resolve the widespread and serious impacts on people and aquatic life.

1.2 Why is the issue important?

The Central Coast Region's coastal and inland water resources are unique, special, and in some areas still of relatively high quality. Millions of Central Coast residents depend on groundwater for nearly all their drinking water from both deep municipal supply wells and shallow domestic wells. In addition, the region supports some of the most significant biodiversity of any temperate region in the world and is home to many sensitive natural habitats and species of special concern. These resources and the beneficial uses of the Central Coast water resources are severely impacted or threatened by agricultural discharges. At the same time, the Central Coast Region is one of the most productive and profitable agricultural regions in the nation, reflecting a gross production value of more than six billion dollars in 2008, contributing 14 percent of California's agricultural economy. For example, agriculture in Monterey County supplies

The Central Coast Water Board must focus on those areas of the Central Coast Region already known to have, or be at great risk for, severe water quality impairment. The agricultural industry must implement the most effective management practices (related to irrigation, nutrient, pesticide and sediment management) that will most likely yield the greatest amount of water quality protection, and verify their effectiveness with on-farm data. The Central Coast Water Board must establish a known and reasonable time schedule, with clear and direct methods of verifying compliance and monitoring progress over time so that agricultural dischargers understand when and if they are successfully reducing their contribution to the problems or maintaining adequate levels of protection. We all must adapt to what we learn from measures of progress, so we efficiently and effectively achieve water quality improvement over time. To prevent further water quality impairment and impact to beneficial uses, we must take action now.

Agricultural dischargers enrolled and established farm plans based on education and outreach, and created an industry-led, nonprofit, monitoring program. The current Conditional Waiver, however, lacks clarity and does not focus on accountability and verification of directly resolving the known water quality problems. The conditions of the 2004 Conditional Waiver address all common problems associated with all agricultural operations equally and without specific targets or timelines for compliance. Currently, the Water Board and the public have no direct evidence that water quality is improving

Attachmnebt 2 page 2 Defines Discharge, Dischargers, Farm Plans, Irrigated Lands, Irrigation Return Flow, Low-Threat Discharge, Tailwater, Stormwater Runoff, Subsurface Drainage, Discharge, Discharger, Requirement of Applicable Water Quality Control Plans, Monitoring, Waters of the All Dischargers were required to submit a Farm Plan. Farm Plan must include implementation of practices to address irrigation management, pesticide management, nutrient management, and erosion control to protect water quality. Farm Plan must include schedule for implementation of practices.

erosion control, and aquatic habitat protection. Farm Plan must identify and schedule implementation of practices to eliminate or minimize discharge of waste using best practicable treatment or control. Farm Plan nutrient management plan element must be certified by professional to be protective of water quality. Farm Plan must be updated at least annually. Upon notice by the Executive Officer, Farm Plan must be submitted to the Water Board. Discharger must modify Farm Plan upon notice by the Executive Officer.
Farm Plan must include photo documentation of aquatic habitat.

Arrachment 3 [aye 117. The Farm Plan is an effective tool to identify the management practices that will be implemented to protect and improve water quality and verify compliance with this Order. Elements of the Farm Plan include irrigation management, pesticide management, nutrient management, salinity management, sediment and erosion control, and aquatic habitat protection. Farm Plans also contain a schedule for implementation of practices and an evaluation of progress towards water quality improvement. The development and implementation of Farm Plans was a requirement of the 2004 Order. This Order extends and builds upon that requirement by requiring the submittal of the Farm Plan, upon notice by the Executive Officer, to verify the implementation of management practices focused on priority water quality issues, and by requiring individual monitoring to verify the effective implementation of management practices.

Attachment 3 page 32 13. Farm Water Quality Management Plan (Farm Plan). The Farm Plan is a document that contains, at a minimum, identification of management practices that are being or will be implemented to protect and improve water quality by addressing irrigation management, pesticide management, nutrient management, salinity management, sediment and erosion control, and aquatic habitat protection. Farm Plans also contain a schedule for the effective implementation of management practices and verification monitoring to determine compliance with the requirements of this Order Agricultural activities and other land uses should be conducted to avoid or minimize impacts to wetland and riparian areas.

(schedules, milestones, effluent limits, etc.). Consistent with the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands adopted by the Board in July 2004 (Order No. R3-2004-0117), this Order requires Dischargers to develop and implement a Farm Plan focused on the priority water quality issues associated with a specific operation and the priority water quality issues associated with a specific watershed or subwatershed

Irrigation Management <NEW>

46. The purpose of the irrigation management element of the Farm Plan is to eliminate irrigation runoff and tailwater discharges or reduce their volume to meet water quality standards and maintain existing high quality water using best practicable treatment or control, and to assure compliance with this Order. The irrigation management element of the Farm Plan must include, but is not limited to: a. Detailed map of the ranch area identifying the points where wastes as described in the Order are discharged from irrigated lands and identifying waterbodies receiving the discharge;

b. Type of irrigation system, distribution efficiency and distribution uniformity;

c. Average total water demand per crop;

d. Total water applied per crop;

e. The schedule, duration and frequency of irrigation events;

f. Evaluation of the potential for irrigation runoff and water quality impairment;

g. Evaluation of the potential for percolation of irrigation water below the root zone;

h. Identification of planned irrigation management practices (such as irrigation system and distribution uniformity upgrades, irrigation scheduling, water recycling and tailwater recovery);

i. Schedule for implementation to achieve compliance with this Order including compliance time schedules and interim milestones;

j. Progress towards interim milestones identified in Part H;

Farm Water Quality Management Plan (Farm Plan)

35. Dischargers must develop and implement a Farm Plan. The Farm Plan must identify and focus on the water quality impacts associated with the specific operation and water quality impairments at the watershed or subwatershed, based on water quality data from individual discharge monitoring and/or watershed scale monitoring. Farm Plans must identify the management measures the Discharger is implementing to meet water quality standards, maintain existing high quality water, and achieve compliance with this Order, including any management practice requirements identified in Part E of this Attachment B to the Order, a schedule for implementation and verification monitoring to evaluate progress towards compliance with this Order. Specifically, the Farm Plan must identify management practices the grower is implementing to comply with this Order, including: <CLARIFICATION OF EXISTING>

a. Irrigation Management: Maximize irrigation efficiency and management to effectively eliminate or minimize irrigation runoff and tailwater discharges

using best practicable treatment or control;
b. Pesticide Management: Maximize integrated pest management to eliminate or minimize toxic discharges and discharges of pesticides and herbicides to meet water quality standards using best practicable treatment or control;
c. Nutrient Management: Maximize effective nutrient budgeting and management to eliminate or minimize discharge of nutrients to meet nutrient and biostimulatory water quality standards using best practicable treatment or control;
d. Salinity Management: Maximize salinity management to eliminate or minimize discharge and leaching of salts to meet salt water quality standards using best practicable treatment or control;
e. Sediment and Erosion Control: Maximize sediment and erosion control and stormwater management to eliminate or minimize discharge of sediments and turbidity to meet water quality standards using best practicable treatment and control;
f. Aquatic Habitat Protection: Maximize protection of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat using buffers to minimize degradation of aquatic habitat and impacts to aquatic life beneficial uses using best practicable treatment and control;
36. The Farm Plan must include a schedule to effectively implement management practices to eliminate or minimize discharges of waste and achieve the requirements of this Order and applicable water quality standards, to assure the protection of all actual or designated beneficial uses of waters of the State. <CLARIFICATION OF EXISTING>
37. Dischargers must update Farm Plans at least annually with monitoring and site evaluation results, and specific adjustments in response to any results that measure progress towards water quality improvement and compliance with this Order (e.g., interim milestones identified in Part H). <NEW>
38. Pursuant to Water Code Section 13267, the Executive Officer may, at any time, require Dischargers to submit Farm Plans or specific modifications to Farm Plans.

The Central Coast Water Board also develops water quality standards and implements plans and programs. These activities are conducted to best protect the State's waters, recognizing the local differences in climate, topography, geology and hydrology. As the current Order expires in July 2010, The Central Coast Water Board must immediately determine how best to regulate agricultural discharges on the Central Coast to directly address the major water quality issues of toxicity, nitrates, pesticides and sediment in agricultural runoff and/or leaching to groundwater so that we achieve desired water quality outcomes that support all beneficial uses.

51. Dischargers that discharge irrigation runoff to tile drains must report that discharge in
their NOI. In addition, Farm Plans must describe the tile drain discharges and the

management measures Dischargers will implement to assure the tile drain discharges are in compliance with this Order. Dischargers are encouraged to coordinate the implementation of management practices with other Dischargers discharging to common tile drains, including efforts to develop regional salt and nutrient management plans. The Executive Officer may require additional monitoring and reporting for discharges to tile drains as necessary to achieve compliance with this Order. .

65. The purpose of the erosion control and sediment management element of the Farm Plan is to maximize sediment and erosion control and stormwater management to eliminate or minimize discharge of sediments and turbidity to meet water quality standards using best practicable treatment and control, and to assure compliance with this Order. Dischargers are encouraged to coordinate the implementation of stormwater management practices with other Dischargers in the watershed or subwatershed to maximize water quality protection and reduce costs. The sediment management element of the Farm Plan must include, but is not limited, the following:
a. The identification and implementation of management practices to eliminate or minimize the discharge of sediments by (1) controlling erosion, (2) reducing soil detachment, (3) reducing sediment transport, and (4) trapping sediments.
b. Management practices that will be implemented to achieve the following: (1) maintain crop residue or vegetative cover on the soil; (2) improve soil properties; reduce slope length, steepness, or unsheltered distance; reduce effective water and/or wind velocities;
c. Erosion control management measures that reduce or prevent sheet and rill erosion, wind erosion, concentrated flow, streambank erosion, soil mass

movements, road bank erosion, construction site erosion, and irrigationinduced erosion;
d. Specific stormwater management measures;
e. Schedule for implementation;
f. Progress towards interim milestones identified in Part H;
Aquatic Habitat Protection <NEW>
66. The purpose of the aquatic habitat protection element of the Farm Plan is to maximize protection of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat using buffers to eliminate or minimize degradation of aquatic habitat and discharge of waste, to meet water quality standards and protect aquatic life beneficial uses using best practicable treatment or control, and to assure compliance with this Order. The aquatic habitat protection element of the Farm Plan must include the following:
a. Maps locating and photo documentation of existing perennial, intermittent, or ephemeral streams or riparian or wetland area habitat located on ranch property;
b. Maps and photo documentation of the presence of minimum buffer widths as specified in Table 3, per the time schedule and milestones in Part H;

c. Annual photo documentation that verifies the ongoing protection of existing perennial, intermittent, or ephemeral streams, riparian and wetland area habitats;
d. Identification of management measures implemented to protect or restore aquatic habitat;
e. Implementation of aquatic habitat requirements in Part G, including the development of a *Riparian Function Protection and Restoration Plan, if applicable;*
f. Schedule for implementation;
g. Progress towards interim milestones identified in Part H;

81. **Within 4 years** from the adoption of this Order, Dischargers must document with photo documentation in the Farm Plan, the presence of minimum riparian buffer widths adjacent to perennial and intermittent streams, per the time schedule and milestones in Part H below. Required buffer widths are based on stream tiers and identified in Table 1. Stream tiers are based upon modeled average daily natural flow and identified in Table 2. The buffer width for streams is measured from the top of the bank in each direction. In the case of an existing engineered levee system, the outer bank of the existing levee will be the outer edge of the buffer width. Where existing riparian vegetation width is greater than the riparian buffer widths required in Table 1, the Discharger must protect and maintain the maximum buffer width.

81. **Within 4 years** from the adoption of this Order, Dischargers must document with photo documentation in the Farm Plan, the presence of minimum riparian buffer widths adjacent to perennial and intermittent streams, per the time schedule and milestones in Part H below. Required buffer widths are based on stream tiers and identified in Table 1. Stream tiers are based upon modeled average daily natural flow and identified in Table 2. The buffer width for streams is measured from the top of the bank in each direction. In the case of an existing engineered levee system, the outer bank of the existing levee will be the outer edge of the buffer width. Where existing riparian vegetation width is greater than the riparian buffer widths required in Table 1, the Discharger must protect and maintain the maximum buffer width.

Table 1. Minimum riparian buffer widths for perennial and intermittent streams.

Tier	**Minimum Riparian Buffer Width**	**Modeled Average Daily Natural Flow**
Tier 1	50 feet	1- 15 cfs
Tier 2	75 feet	15 – 50 cfs
Tier 3	100 feet	50 cfs and above

Table 2. Tier 2 and Tier 3 streams. All other perennial or intermittent streams not listed in Table 2 are considered Tier 1. Tiers are based on the National Hydrography Dataset Plus' (NHDPlus) estimated unit runoff mean annual natural flow.

Tier 2 (75 Foot Buffer) Tier 3 (100 Foot Buffer)
Aptos Creek Carmel River (from Pacific Ocean to
Tularcitos Creek confluence)
Arroyo Grande Creek Estrella River (from Salinas River
confluence to Yokum Bend)
Arroyo Seco Pajaro River (from Pacific Ocean to
San Benito River confluence)
Bear Creek Salinas River (from Pacific Ocean to
San Marcos Creek confluence)
Big Sur River San Lorenzo River (from San Lorenzo
River Lagoon at Crossing Street to
Boulder Creek confluence)
Carbonera Creek Santa Maria River (from Pacific Ocean
to 0.9 miles east of Hwy 101)
Carmel River (upstream from Tularcitos
Creek confluence)
Santa Ynez River (from Pacific Ocean
to 5 miles west of Hwy 101 bridge)
Cholame Creek
Cuyama River
Estrella River (upstream from Yokum
Bend)
Little Sur River
Nacimiento River
Old Salinas River Estuary
Pajaro River (upstream from San Benito
River confluence)
Paso Robles Creek
Salinas Reclamation Canal (from
Tembladero Slough confluence to
Natividad Creek confluence)
Salinas River (from San Marcos Creek
confluence to Paso Robles Creek
confluence)
San Antonio River
San Benito River
San Juan Creek
San Lorenzo Creek
San Lorenzo River (upstream from
Boulder Creek confluence)

San Luis Obispo Creek
Santa Maria River (from 0.9 miles east
of Hwy 101 bridge to Cuyama River

confluence)
Santa Rosa Creek
Santa Ynez River (from 5 miles west of
Hwy 101 bridge to Lake Cachuma)
Scott Creek
Soquel Creek
Tembladero Slough
Tequisquita Slough
Waddell Creek
Zayante Creek
82. **Within 4 years** of the Board adoption of this Order, Dischargers must document with
photo documentation in the Farm Plan, the presence of minimum buffer widths of fifty feet as measured from the high water mark for lakes, wetlands, estuaries, lagoons or any other natural body of standing water, as specified in Table 3, per the time schedule and milestones in Part H below.
Table 3. Minimum buffer widths for lakes, wetlands, and estuaries.
Feature Minimum Buffer Width
Lakes, wetlands, estuaries and other
natural body of standing water
50 feet
83. As an alternative to establishing and maintaining minimum buffer widths as required in Tables 1 – 3 above, a Discharger or group of Dischargers may develop and implement a *Riparian Function Protection and Restoration Plan*, as part of the Farm Plan, that demonstrates how all of the following riparian functions are to be restored and protected: (a) Streambank stabilization and erosion control, (b) stream shading and temperature control, (c) chemical filtration, (d) flood water storage, (e) aquatic life support, (f) Wildlife support. The *Riparian Function Protection and Restoration Plan* must be certified by a State registered Professional Engineer or Registered Geologist and include a schedule for implementation, measurable success criteria and a maintenance and monitoring plan. The *Riparian Function Protection and Restoration Plan* must be submitted **within 2 years** of the Board adoption of this Order for approval by the Executive Officer.

S:\Agricultural Regulatory Program\Ag. Order 2.0\February 1 2010 Docs\Final

Set-backs from riparian vegetation are considered necessary to avoid direct impacts to their health and sustainability to shade and moderate water temperatures and related stream pollutuion attenuation

The main benefits of wetland and riparian areas are:
♦ Protecting beneficial uses, all of which protect water, a natural resource.
In turn, water protects beneficial uses such as Wildlife Habitat and Rare, Threatened or Endangered Species.
♦ Supporting 43 percent of Federally threatened and endangered species
♦ Supporting more than 225 species of animals

♦ Protecting headwater streams that protect the wildlife that depend on them
♦ Regulating instream and micro-habitat temperature, and instream oxygen.
♦ Retaining soil due to bank stabilization
♦ Retaining instream habitat features and complexity
♦ Reducing turbidity affecting wildlife habitat
♦ Storing floodwaters that protect downstream natural resources from damage
♦ Protecting other wetland and riparian areas

The following negative impacts result from disturbing or destroying wetland and riparian areas.

♦ The quality of habitat that is removed may be lost forever due to complexity of reconstructing natural habitat.

♦ Many beneficial uses may go unprotected leading to a loss of available water that meets water quality objectives.
♦ Pollution affecting water quality and wildlife habitat can enter water bodies at an accelerated rate.
♦ More plant and wildlife species may be endangered or at risk of extinction.
♦ Temperature and in-stream oxygen regulation will not be moderated.
♦ Habitat complexity that supports aquatic wildlife will not be maintained.
♦ Soil will not be protected and more erosion will occur.
♦ Floods may be more detrimental.
♦ Wetland and riparian areas adjacent to disturbed areas will be exposed and less protected.

Silliman Ranch Partnership

November 21, 2017

U.S. Army Corp of Engineers, San Francisco District
Attn: Mr. Chris Eng, Environmental Manager
1455 Market Street, Suite 1737B
San Francisco, CA 94103-1398

Re: Pajaro River Flood Rick Management Study – Draft Report

Dear Mr. Eng:

I would like to preface my comments with an endorsement of the overall Pajaro River Levee reconstruction and improvement project. My personal and professional priority is to achieve 100-year storm water protection for the City of Watsonville. However, when I study the current Tentatively Selected Plan, as described in the November Update Report, I am compelled to address features that create severe inequities in the overall project with regard to cost sharing and level of protection for similarly situated properties on both sides of the river.

My family has owned the 160-acre farm located at 508 Riverside road since 1852, and the section of levee that protects our farm from the Pajaro River nearly collapsed this winter, requiring significant emergency repairs to bolster the toe of the levee as pictured above.

If this levee failed, the right side of Reach 4 would have been inundated with flood water to the extent illustrated in Plate 44.

My primary request for additional information revolves around Section 3.4.2 Incremental Analysis of the Alternatives with regard to the decision to eliminate the levee improvements on the right side of reach 4 while maintaining the levee improvements on the left side, as described in the modifications to the current TSP in the November Update Report.

027-1 Sec 3.4.2 describes the incremental analysis was conducted “to assess the economic feasibility of each separable element”, in order to avoid “masking the subsidizing of net benefits”…”in locations where urban areas are mixed with agricultural areas.” Yet, it would appear that that method was only applied to the Santa Cruz side, and not the Pajaro side of the Pajaro River main stem.

027-2 Table 3-11 only provides a BCR for the town or Pajaro that includes the upstream agricultural land, yet the right bank of reach 4 is analysed as a separate entity independent of the town of Watsonville. Considering the BCR for Watsonville is nearly four times greater than for Pajaro and surrounding farm ground, I would like to see what the BCR is for Watsonville including the agricultural area on the right side of reach 4.

027-3 Please explain why Alternative 2 appears to be a significantly reduced project scope than Alternative 1, yet the costs outlined in Table 3-2 are higher. I would like to see the BCR for the ring levee around Pajaro separately from the BCR for the agricultural farm ground protected by the new levee on the left side of reach 4.

027-4 I would also like to clearly understand how the federal and local cost share is intended to be apportioned to both counties on either side of the Pajaro because it would appear that Santa Cruz is going to subsidize 100-year flood protection on the Monterey county side, while not receiving equal protection on the Santa Cruz side. Please explain how this proposal justifies protecting the left side of reach 2 and not the right side of reach 4.

027-5 Please also provide an update to Table 3-4 and 3-11, with the modifications outlined in the TSP in the Update Report, with the detail requested above treating both counties with equal levels of protection for the cities and the agricultural lands as separate entities as described in Sec 3.4.2 Incremental Analysis of the Alternatives.

As we have witnessed many times during flood events, and as described in detail in the Appendix report, persistent high-water levels in the main stem and tributaries cause saturation of the earthen levee material, causing collapse where weakness exists. The levees on both sides are of similar condition and the risk of failure is borne somewhat equally
027-6 today. However, if the Monterey levee is new, and constructed with methods and materials that are superior to our existing levees, it is certain that failure, as a result of high water levels, will occur on the Santa Cruz side comprising a shift of 100% of that risk to the Santa Cruz side as a direct result of construction of a superior levee on the Monterey side.

Please provide a thorough, detailed and fact-based analysis to demonstrate that the residents and property owners of Santa Cruz
027-7 County will not be compelled to pay more to subsidize Monterey County while receiving less protection from this important project.

Thank you,

S. John Martinelli
General Manager

Silliman Ranch Partnership
508 Riverside Road (property address)
131 Cutter Drive (business address)
Watsonville, CA 95076

From: Videll F Gonzalez <vfgonz698@sbcglobal.net>
Sent: Thursday, November 9, 2017 8:20 PM
To: CESPNETPB
Subject: [EXTERNAL] Fwd: Pajaro River Levee Upgrade

Follow Up Flag: Follow up
Flag Status: Flagged

-------- Original Message --------
Subject: Pajaro River Levee Upgrade
From: Videll F Gonzalez <vfgonz698@sbcglobal.net>
Sent: 8:13pm, Thursday, November 9, 2017
To: CESPN-ET-PB@usace.mil
CC: To the Army Corps of Engineers:

028-1 Please do the work required to bring the Pajaro River Levee system up to the level of protection needed to prevent more needless suffering through flooding of our communities. Last year due to heavy rains the Salsipuedes Creek required emergency repairs to prevent flooding to homes in this senior community. Our lives, homes and well being depend on on the levee system being capable enough to protect us from future flooding. Please do the work needed to reach that level of protection for all our community that resides in close proximity to the Pajaro River Levee system. Thank you.

Videll F Gonzales
Watsonville CA

From: Galdamez, Ricardo A CIV (US)
Sent: Monday, November 13, 2017 3:07 PM
To: Toland, Tanis J CIV CESPK CESPD (US); O'Halloran, Jaime L CIV USARMY CESPN (US)
Cc: Muha, Andrew T CIV USARMY CESPK (US); Eng, Christopher K CIV USARMY CESPN (US); Burton Evans, Jessica L CIV USARMY CESPN (US); Howells, James A Jr CIV CESPD (US)
Subject: RE: Pajaro: Public Comments (001-008) Received at 8 Nov Public meeting

Jaime: I was about to send you the following additional questions taken during the meeting.

Question from the Public

029-1 Q. (Using the land owner language) What is the formula used to determine why agricultural land is not protected and the town of Pajaro is?

029-2 Q. What is being done to repair the damage caused by the 2016-2017 storms. When will repairs be implemented ?

029-3 Q. The 1955 and subsequent floods could have been diminished if the Culverts under Highway 1 had been properly sized. Is the Corps doing an improvement on those culverts?

029-4 Q. What is being done to remove the "tons" of garbage presently resting on shoals in the middle of the channel?

-----Original Message-----
From: Toland, Tanis J CIV CESPK CESPD (US)
Sent: Monday, November 13, 2017 2:56 PM
To: O'Halloran, Jaime L CIV USARMY CESPN (US) <Jaime.L.O'Halloran@usace.army.mil>
Cc: Muha, Andrew T CIV USARMY CESPK (US) <Andrew.T.Muha@usace.army.mil>; Eng, Christopher K CIV USARMY CESPN (US) <Christopher.K.Eng@usace.army.mil>; Burton Evans, Jessica L CIV USARMY CESPN (US) <Jessica.L.BurtonEvans@usace.army.mil>; Howells, James A Jr CIV CESPD (US) <James.A.Howells@usace.army.mil>; Galdamez, Ricardo A CIV (US) <Ricardo.A.Galdamez@usace.army.mil>
Subject: Pajaro: Public Comments (001-008) Received at 8 Nov Public meeting

Jaime,

Attached are the written comments we received at the 8 Nov 2017 public meeting. I will add them to ProjectWise once a folder is set up.

Tanis

Santa Cruz/Monterey County

FLOOD CONTROL AND WATER CONSERVATION DISTRICT - ZONE 7
AND MONTEREY COUNTY WATER RESOURCES AGENCY

U.S. ARMY CORPS OF ENGINEERS
SAN FRANCISCO DISTRICT
MR. CHRIS ENG
ENVIRONMENTAL MANAGER
1455 Market Street, Suite 1737B
San Francisco, CA 94103-1398

Dear Mr. Eng:

Santa Cruz County Flood Control and Water Conservation District Zone 7 appreciates the opportunity to comment on the draft integrated General Reevaluation Report and Environmental Assessment (GRR/EA) and draft Finding of No Significant Impact (FONSI) for the Pajaro River Flood Risk Management Study. As local sponsors of the Pajaro River Flood Risk Management Project, we appreciate the hard work Army Corps of Engineers' (USACE) staff has invested in the project and the considerable effort required to produce the report and analysis contained within it.

The residents of the City of Watsonville and the Town of Pajaro have been living in fear every winter for over seven decades. Even floods of small magnitude, statistically-speaking, pose a serious threat to public safety, as demonstrated by historic levee breaches and overtopping in 1955, 1958, 1995, and 1998. Levee integrity has been compromised by numerous other historic storm flows that were below the levee crest, including storms in winter 2017 where myriad boils and levee erosion scars were realized.

30-1 At this stage in project history, the success of the Pajaro River Flood Risk Management Project will be measured by its ability to be federally funded and built. Federal funding to proceed through the next project phases, engineering design and construction, will be strongly based on the appropriate calculation of benefits and costs, as well as a design that maximizes project benefit-cost ratio (BCR). Due to the USACE policies that govern how benefits and costs are calculated, Zone 7 is concerned that the BCR, as currently presented in the GRR/EA, will not be competitive and future funding of the project is at risk. Our comments below address these economic considerations and how this inequity will affect the likelihood that USACE will be able to provide public safety to our local communities in the face of ongoing flood threat.

Beyond our overarching concern above, we would like to take this opportunity to provide specific comments to you on the report within the public comment period of October 31, 2017, to November 30, 2017. Below, we have separated our comments into three (3) short topic areas, and provide both general and specific comments on the content of the draft report.

Authority Analysis

Of particular ongoing concern to Zone 7 as a local project sponsor is the outcome of the Authority Analysis and articulation of project authority within the report. Historic floods of 1955 and 1958 demonstrated the insufficiency of the federal facility as constructed in 1949, which led to project authorization in 1966 for flood risk management and facility reconstruction. Our ongoing understanding, based on close partnership, coordination, and conversation with USACE since 1966, as well as legislation, is that our 1966 project authority remains in place and will allow for approval of a Director's Report under the Chief of Engineers discretionary authority and Congressional project authorization provided by Section 203 of the 1966 Flood Control Act.

30-2 Zone 7 would therefore like to see this reflected in the language of the report on page 26, where the current description of project authority is insufficient. Specifically, the language here should mirror section 2 of Appendix C, Draft Real Estate Plan:

"Section 107 of WRDA 1990 provided that the Pajaro River FRM project as authorized by the FCA of 1966 remain authorized. As such, a USACE legal opinion [cite new authority analysis here] was prepared and concluded that: a) the project authorization provided by Section 203 of the Flood Control Act of 1966 remains valid; b) the non-Federal cost share for this project will be set at 25% in accordance with Section 103 of the Water Resources Development Act (WRDA) of 1986 as physical construction as authorized by Section 203 of the 1966 FCA has not yet been initiated; and c) because this project was authorized in 1966 prior to WRDA 1986, Section 902 limits are not applicable."

Furthermore, on page 32, section 1.8, and on page 6 of the Executive Summary, we suggest the following phrase be stricken (pending the outcome of the Authority Analysis currently in-process):

30-3 "…or if warranted through with a new Chief of Engineers Report (Chief's Report) and a new Congressional project authorization."

Benefit-Cost Calculation and Economic Formulation

The success of project funding will be strongly based on appropriate calculation of benefits and costs, as well as a design that maximizes project benefit-cost ratio (BCR). The economic formulation must
30-4 use appropriate assumptions and accounting, and the planning and design phases must allow flexibility so that separable elements may be added as Locally Preferred Plan increments to reduce federal project cost and increase federal project BCR.

Separable Elements. The draft report identifies costs associated with specific features and elements of the project. It may be advantageous to "extract" some of the project elements as separable local elements under a Section 408 process or other appropriate vehicle to reduce costs and therefore
30-5 increase project BCR. An example of this would be non-federal sponsor partnership with California Department of Transportation in addressing bridge reconstruction at Highways 129 and 152. It may also be worthwhile to explore whether such separable elements could be approved for Section 104 credit consideration. Language addressing these concerns should be added to Section 2.6 on page 44, "Other Planning Considerations".

Fragility Curves. The fragility curves for the existing project levees are presented on page 11 of the Draft Geotechnical Appendix, Figure 4. Past levee failures have all occurred at water surface elevations less than 100% loading. This suggests the upper bound curve should include a point at 100% failure at less than 100% loading.

30-6 The description of levee fragility requires a fair representation of reality because it strongly affects benefits calculation and because levee integrity has historically played a primary role in levee failures and public safety. Zone 7 would like to see an adjustment to the fragility curves that is faithful to historic observations, and the non-federal sponsor invites further collaboration in examining historic flow records to help identify the appropriate loading level associated with failure.

Economic Formulation. Our concerns regarding appropriate economic accounting and model formulation are presented below.

30-7

1. On page 32 of the Draft Economic Appendix, section 4.1.3, Table 12 provides somewhat dubious performance statistics. While so-called "freeboard" for the without project condition provides some level of uncertainty in calculating assurance statistics, the assurance values should be uniformly approaching 1% for at least 2% and higher (1% and 0.2%) ACE flows.

30-8

2. Regarding the assessment on page 48 of the Draft Economic Appendix, prevention of flood fighting costs is a legitimate benefit category and should be included in the benefit-cost analysis.

30-9

3. In the existing agricultural economic model as described in the draft report, production loss due to flooding is expected for 1 year. California Code of Regulations require multiple years of fallow in response to flooding. Therefore, 2-3 years of crop production loss is expected and should be incorporated into the agricultural economic model.

30-10

4. The expected damages to the City of Watsonville Wastewater Treatment Plant, recycled water facility, Water Resources Center, Coastal Distribution System, and other associated facilities are not included in the economic analysis. These damages should be included in the benefits calculation.

30-11

5. In section 18 of the Draft Real Estate Appendix, costs of $130M and $192M are listed for the Mainstem and Tributary project costs. These are not consistent with (and are higher than) costs outlined elsewhere in the report.

30-12

6. The draft economic model does not appear to include expected damages that affect the benefits calculation for the Southern Pacific Railroad facility in and near the Town of Pajaro, including the line, switching yard, presence of cars and contents, and how damages could affect the economic distribution of goods coming in and out of Pajaro Valley. These damages should be included in the benefits calculation.

Project Design and Without-Project Description

We provide other specific comments regarding how the project design and without-project conditions are described in the draft report.

30-13

1. On page 2 of the Draft FONSI statement, the text suggests that a ring levee around Orchard Park is included in the TSP (bullet #3 for Salsipuedes and Corralitos Creeks). Optimization has removed the ring levee, so it should not appear in the FONSI letter.

30-14

2. On page 52, section 2.8, bullet 3 suggests 4% ACE protection on the main stem and Salsipuedes Creeks for without project conditions. Current level of protection (without project), as calculated by USACE (2003) is 8% on Pajaro River below Salsipuedes Creek and 10% on Salsipuedes Creek. (As reported in the USACE Pajaro River Flood Risk Management Project General Reevaluation Study Report Synopsis, 23 November 2016.)

30-15

3. On page 76, Table 3-13, for Hydraulic Reach of Right Bank Reaches 5 and 6, the protected EIA lists protection at 4% ACE. This should be 1% ACE.

30-16

4. On page 116, section 4.6.2, under Floodwall Construction, it is suggested that "the construction of a concrete floodwall channel could reduce aquatic habitat and would require the removal of in-channel vegetation." The floodwall itself does not reduce aquatic habitat, unless the floodwall requires removal of vegetation as part of the design. This is not listed as part of the floodwall design.

30-17

5. On page 8 of the Draft Geotechnical Appendix, the text should also list 2017 as an instance of damage from levee through-seepage and under-seepage. This occurred along an extensive section of levee in Reach 4 on the right bank (Santa Cruz County) side, and was addressed by local flood fight efforts at considerable expense to the local sponsor.

Closing

Again, thank you for the opportunity to comment on the draft GRR/EA and draft FONSI. As local sponsors of the project we appreciate the hard work SPN and SPK have invested in the Pajaro River Flood Risk Management project and the considerable effort required to produce the report and analysis contained within it. We will continue to work closely with you, and we look forward to ongoing partnership so that we may collectively design and fund a successful flood risk management project in the Pajaro Valley.

Yours truly,

Dr. Mark Strudley
Flood Control Division Manager
Santa Cruz County Flood Control and
Water Conservation District Zone 7

Yours truly,

, DGM

FOR David Chardavoyne
General Manager
Monterey County Water
Resources Agency

Copy to:

LTC Travis J. Rayfield (San Francisco District, U.S. Army Corps of Engineers)
Thomas Kendall (San Francisco District, U.S. Army Corps of Engineers)
Arijs Rakstins (San Francisco District, U.S. Army Corps of Engineers)
John Presleigh (District Engineer, Zone 7 Flood Control and Water Conservation District)
Zach Friend (Chair, Zone 7 Flood Control and Water Conservation District Board of Directors)
John Phillips (Supervisor, Monterey County)

City of Watsonville

"A Community of Opportunities"

U.S. Army Corps of Engineers, San Francisco District
Attn: Mr. Chris Eng, Environmental Manager
1455 Market St, Suite 1737B
San Francisco, CA 94103-1398

RE: Pajaro River Flood Risk Management Study-DRAFT General Reevaluation Report and Integrated Environmental Assessment Comments

Dear Mr. Eng;
The City appreciates the opportunity to comment on the draft integrated General Reevaluation Report and Environmental Assessment (GRR/EA) and draft Finding of No Significant Impact (FONSI). The proposed Pajaro River Project would provide significant improvements to an aging levee system that was constructed in 1949. The aging levees currently offer our community one of the lowest levels of protections in the State.

1. **Authority Analysis: Confirm the 1966 Authorization.** Of ongoing concern is the outcome of the Authority Analysis and discussion of project authority within the report. Historic floods of 1955 and 1958 demonstrated the insufficiency of the federal facility as constructed in 1949, which led to project authorization in 1966 for flood risk management and facility reconstruction. The City's understanding, based on close partnership, coordination, and conversation with USACE since 1966, as well as legislation, is that our 1966 project authority remains in place and will allow for approval of a Director's Report under the Chief of Engineers discretionary authority and Congressional project authorization provided by Section 203 of the 1966 Flood Control Act.

031-1

The City along with our partner agencies would like to see this reflected in the language of the report on page 26, where the current description of project authority is insufficient. Specifically, the language here should mirror section 2 of Appendix C, Draft Real Estate Plan:

> "Section 107 of WRDA 1990 provided that the Pajaro River FRM project as authorized by the FCA of 1966 remain authorized. As such, a USACE legal opinion [cite new authority analysis here] was prepared and concluded that: a) the project authorization provided by Section 203 of the Flood Control Act of 1966 remains valid; b) the non-Federal cost share for this project will be set at 25% in accordance with Section 103 of the Water Resources Development Act (WRDA) of 1986 as physical construction as authorized by Section 203 of the 1966 FCA has not yet been initiated; and c) because this project was authorized in 1966 prior to WRDA 1986, Section 902 limits are not applicable."

On page 32, section 1.8, and on page 6 of the Executive Summary, strike the following phrase:

031-2

> "…or if warranted through with a new Chief of Engineers Report (Chief's Report) and a new Congressional project authorization."

031-3 **2. The Fragility Curves Do Not Reflect Actual Historical Damages.** The fragility curves for the existing project levees are presented on page 11 of the Draft Geotechnical Appendix, Figure 4. Past levee failures have all occurred at water surface elevations less than 100% loading. This suggests the upper bound curve should include a point at 100% failure and less than 100% loading.

031-4 **3. The Benefit-Cost Ratio (BCR) is Too Low to be Funded by the Corps.** As the proposed project is presented in the draft report, the City has a low confidence in the future fundability of the project. Listed below are areas of critical concern to the City.

The success of project funding will be based on appropriate calculation of benefits and costs, as well as a design that maximizes project benefit-cost ratio (BCR). The economic formulation must use appropriate assumptions and accounting. And the planning and design phases must allow flexibility so that separable elements may be added as Locally Preferred Plan increments to reduce federal project cost and increase federal project BCR.

031-5 **4. Please Include the Value of the City's Wastewater Plant in the BCR.** The value of the City of Watsonville's Wastewater and Recycled Water facilities and associated infrastructure are not adequately captured in the economic benefits calculation. The City of Watsonville's Wastewater facility provides critical services to the residents of City of Watsonville, Town of Pajaro, Freedom and Salsipuedes Sanitary Districts. The Recycled Water facility provides water to Pajaro Valley Water Management Agency in order to protect the critically overdrafted groundwater basin.

The amount of water that is produced for PVWMA accounts for nearly 20% of the coastal pumping to stop seawater intrusion. The loss of both facilities to the community and region would be approximately $100M in infrastructure. This cost does not include the impacts of environmental or public health violations if the facility is out of service.

031-6 **5. Flood Fighting Costs should be Included in the BCR.** The City would like the Army Corps to include the cost and avoidance of risk from flood fighting throughout the winter months, that project non-Federal sponsors and the City have invested in for the safety of our community.

031-7 **6. Replace the Heights of the Floodwalls.** The City has concerns about the height of the levee floodwalls. Within City limits there is a large amount of the population that utilizes the access road at the top of the levees for recreation. While this is a secondary benefit of the single authority project, 8-10 foot levee floodwalls through the center of town will be a public safety issue for residents that will continue to recreate on the access road.

031-8 **7. Consider Not Rerouting Pinto Lake.** In Alternative 5 and 6, p 13, the Corps suggests rerouting Pinto Creek into College Lake. Although this seems to be resolved when reading the economic appendices, the City would like to offer the following insight. The City has been leading the effort to remediate Pinto Lake. Pinto Lake has issues with cyanobacteria harmful algal blooms. Through research with regulatory agencies, UC Santa Cruz, UC Davis and CSU Monterey Bay, these blooms were potentially linked to the deaths of birds and several southern sea otters. This is significant because the blooms are fresh water while sea otters are marine mammals. The pathway Pinto Lake flows out to the ocean is through Pinto Creek, into Salsipuedes below College Lake. Given that College Lake is a source of irrigation water, the City would oppose any effort to route Pinto Creek into College Lake.

031-9 8. Finally, a detail that stands out to staff reviewing the document, on page 36, the orange circle is not encompassing the Town of Pajaro.

We want to thank the Army Corps and senior leadership for their continued persistence and effort on the Pajaro River Risk Reduction Project. Our community is counting on you to carry this project through to construction in the most expedient manner possible, and we are encouraged with the recent progress the Corps has made during the past year.

We welcome any feedback or questions regarding our comments.

Sincerely,

Oscar Rios

Mayor