To: ARCF_SEIS@usace.army.mil
Cc: PublicCommentARCF16@water.ca.gov
Subject: Comments Regarding American River Common Features (ARCF) 2016 Draft Supplemental Environmental Impact Statement/Subsequent Environmental Impact Report (SEIS/SEIR) – December 2023 Report and Appendices; Specific Comments Pertaining to Hydrology, Erosion, etc.
9 February 2024

Dear US Army Corps of Engineers (USACE) and Dept. of Water Resources (DWR) Comment Recipients:

The extensive comments detailed below focus on the Lower American River projects of the draft SEIS/SEIR, particularly Contracts 3B, 4A and 4B, and were generated and vetted, after careful review of all available documents, by a team of qualified active and retired civil engineers, an emeritus CSUS professor, PhD in Biological Sciences, and a UCD PhD candidate in the history of Sacramento Valley flood control. The comments herein were further vetted by an attorney.

In brief, our findings are that the level of riparian habitat and recreational access destruction from rip-rap revetment, rebadged as launchable rock toes, trenches, and planting benches, that is proposed in Contract 3B (including the associated Urrutia mitigation site, ARMS, and also Contracts 4A and 4B due to lack of supporting information) **is not justified by the evidence or the reasoning in the available supporting documentation.**

Though the comments contained herein are primarily focused on the lack of, or out-of-date, data and inadequate erosion and hydrological analysis, our comments reflect a broader legal and ethical context. In fact, the Wild and Scenic River Act (WSRA), CEQA and NEPA demand a different approach entirely - one that preserves the Outstandingly Remarkable Values, in this case Recreation and Fisheries, of the Lower American River, and more specifically provides alternative plans for SEIS/SEIR contract elements, such as C3B, that preserve these attributes. Neither the current, 2023 SEIS/SEIR, nor the 2016 GRR upon which it is based, adequately explores known alternative targeted approaches to erosion control such as biotechnical techniques, herein defined as nature-based bank protection, which retain the majority of trees and other riparian habitat qualities. No resources were invested in developing a true biotechnical-based plan as an alternative to what is proposed in C3B. This is inconsistent with CEQA/NEPA requirements (see, e.g., CEQA Guideline 15126.6(a)).

Our findings and comments are presented here in the form of an executive summary with reference to detailed sections to follow.

Executive Summary

- Rip-rapped banks will cut off river access for many American River Parkway recreational users, will eliminate numerous beloved small beaches and swimming areas, and will destroy the ability of people to enjoy the wildlife, trees, shade and beauty that the forest currently supports (Part 1-1).
- Removing over 500 trees, as proposed in American River Erosion Contract 3B South, will lead to a substantial loss of shade, which could lower the survival rate of various species of salmonids (Steelhead and Chinook Salmon) (Part 1-2). This loss of shade will

also harm recreationalists that currently use the shade to avoid summer heat and to enjoy beaches and swimming areas.

- USACE has not explored alternative, less destructive measures due to lack of data and contradictory information and claims (Part 1-3).
- USACE's own panel of experts recommended USACE take more soil samples in order to map out erosion resistant banks. We ask that USACE follow that recommendation before doing any work on this part of the river (Part 1-4).
- Failing to map out areas of the river which do not need erosion protection is inconsistent with the state and federal Wild and Scenic River Acts, as well as the American River Parkway Plan, which calls for any erosion measures to minimize impacts to vegetation, and to protect, enhance and expand the Parkway's native willow, cottonwood, and valley oak-dominated riparian and upland woodlands that provide important shaded riverine aquatic habitat (SRA), seasonal floodplain, and riparian habitats. We therefore ask that USACE make targeted, data-driven proposals that are consistent with state and federal law. (Part 1-5).
- Rip rapped banks, such as the launchable rock toes and trenches the Corps proposes to install, will not only eliminate trees, but also will stifle future tree growth (Part 1-6).
- The planting benches the Corps proposes will not provide meaningful mitigation because they will likely collapse when the launchable rock trenches and toes eventually launch, causing significant long-term impacts to salmonid habitat as well as recreational and aesthetic resources (Part 1-7).
- Studies show that the large trees USACE will remove to install their launchable features provide highly effective armoring against the flow velocities of a 200-year flood event. By removing trees, USACE may make us less safe (Part 1-9).
- Modern advanced modeling that was not available in 2016 shows that trees protect banks by redirecting the energy of a river towards the center of its channel. Removing these trees may exacerbate erosion and make us less safe (Part 1-10).
- Cutting the riparian forests along SARA Park will likely increase the possibility of catastrophic levee failure. Historically, catastrophic levee failure during great floods happened much more often where riparian forests had been thinned or clear-cut (Part 1-11).
- From an engineering perspective there is incomplete and inadequate documentation to support a project with such destructive impact on natural resources. This includes inadequate site-specific erosion data and bore hole data and testing (Part 2 A).
- The documents for the project have been found to be sporadic in the identification of erosion, and outdated in that sometimes the experts were basing their assessments of levee risk on pre-slurry wall status rather than taking into account the levee protection afforded by the 60' to 70' slurry walls completed in the levees of this reach by 2015, and further, the priority designations are based on out of date survey information, out of date hydrology modeling, and assessed on too broad of a geographic scale (Part 2 B).
- The SEIR and 2016 GRR upon which it is based misrepresent data with inconsistent reasoning and flawed analyses. The analysis shows zero chance of seepage in the levees of Contract 3B and 4B under 200-year flood protection events. The probabilistic analysis of potential for levee failures under different flood velocities is based on levees before slurry cut-off walls were installed. USACE's very own analyses suggest bank

protection is adequate or that current data is inadequate and more testing and surveys are needed (Part 2 C).

- We ask that the uppermost four, river left (south side), erosion control subcomponents be removed from C3B (the Launchable Toe below Rogue River to Waterton, and then working upriver from around RM mile 9.5: Launchable Trench below upper Rogue River, Launchable Toe below upper Rogue River, and Launchable Toe below Larchmont Park/Rio Bravo). We further ask that the Launchable Toes on river right (north side) between Kadema and Howe also be removed from C3B. Furthermore, because access via Larchmont Park would no longer be necessary, we ask that it be removed from consideration as a staging area and also, because they will no longer be necessary, that any upper access ramp behind Rio Bravo be removed, and that truck access via the Mayhew Drain be removed from the project as well. We ask that all heritage oaks be retained and protected (Part 2 Summary).
- USACE needs to develop a plan that preserves or enhances the vegetative cover, and protects the riparian trees, especially those trees providing canopy cover and shade. That can be achieved with careful data collection and analysis, updated hydrology modeling, and focused and carefully thought-out erosion repair. By using less destructive, biotechnical methods, the forest and habitat between the project and the levee can be protected. Any placement of rock should be limited to protecting the toe of the bank and protecting the root structure of any trees being undercut by erosion, and emplaced by light equipment that does not destroy the vegetative cover of the riparian habitat. Any rock at the toe and extending into the channel should be limited to cobble, rather than quarried rip-rap, and covered in gravel to support anadromous fish (Part 2 Summary).
- Finally, USACE needs to provide all data collected and reports produced in support of this project for independent professional review (Part 2 Summary).

Part 1 Resource Impacts

1. **Rip-rapped banks will cut off river access for many American River Parkway recreational users, will eliminate numerous beloved small beaches and swimming areas, and will destroy the ability of people to enjoy the wildlife, trees, shade and beauty that the forest currently supports.** If “Bank Protection” allows for sharp/angular rip-rap to be placed at the water’s edge, continuing at any length up the riverbank, this will stifle *primitive river access* for fishing, boating, wading, nature-viewing, etc. Figure 3.5.2-9 in the SEIS displays “bank protection/riverbank protection” for nearly the entirety of Larchmont Community Park, only stopping on the west end of the park, where rip-rapped banks already cut off user access.(A) The 2023 SEIS/SEIR makes no mention of beaches or swimming areas even though the launchable rock toe in front of Larchmont Park would remove at least two beaches. Cutting off access to these long-used primitive river access points will be in violation of the state and federal Wild and Scenic River Acts (which require, e.g., that agencies protect and enhance the recreational values of the Lower American River), as well as the American River Parkway Plan Goal/Policy 8.16.(B) The section of the American River Parkway adjacent

to Larchmont Community Park is an extremely popular water access point, with many social trails leading down to the river. The American River Parkway Plan even lists 3 official pedestrian levee access points in the area between Sara Park and the east end of Larchmont Community Park.(C)

Example of launchable rock toe near Sac State

A beach in front of Larchmont Community Park that will be made inaccessible by the Launchable Rock Toe. USACE has not addressed lost beaches due to launchable features.

A beloved beach in front of Larchmont used for launching canoes, fishing, swimming, and watching the sunset.

a. ARCF Comprehensive SEIS/SEIR and Appendix B (Detailed Analyses), 2023, Figure 3.5.2-9, 3-36.
b. American River Parkway Plan, 2008. Goals and Policies, Public Access and Trails, 8.16, pg 126 - *"A variety of primitive and developed fishing access points shall continue to be maintained."* https://regionalparks.saccounty.gov/Parks/Documents/Parks/ARPP06-092617_sm.pdf
c. American River Parkway Plan, 2008. Area Plans - Sara Park, pg 174.

2. **Removing over 500 trees, as proposed in American River Erosion Contract 3B South, will lead to a substantial loss of shade, which could lower the survival rate of various species of salmonids (Steelhead and Chinook Salmon). This loss of shade will also harm recreationalists that use the shade to avoid summer heat and to enjoy beaches and swimming areas.** Although the proposed 3B South plan does involve mitigation efforts to replant some of the numerous trees that will be lost, you simply cannot mitigate for the mature canopies that exist between Watt Avenue and Larchmont Community Park–these canopies take many decades or even centuries to develop. Removing the trees that are thriving in the proposed construction footprint could have devastating effects on fish populations and sport-fishing alike. In a study

published by the US Department of Agriculture and the US Forest Service, scientists found that “stream temperatures are far more sensitive to changes in shade than to changes in either air temperature or stream discharge.”(A) Because water temperature is known to have drastic effects on salmon’s ability to migrate for spawning, and the survivability of their eggs/fry, a project like USACE’S 3B will put unnecessary stress on fish. In a report prepared for the National Oceanic and Atmospheric Association (NOAA), it was determined that “[s]tudies of the migration timing and survival of adult Chinook support the notion that high water temperatures can limit migration success,” and that “[t]emperature ranges above optimal may cause fish to cease migration.”(B) If one of the goals is fostering a healthy fishery and ensuring the success and survival of species of interest, like the Chinook Salmon, then the cutting and removal of acres of mature shade-providing trees along the riverbank would be the exact opposite of what is needed. Goal/Policy 3.11 of the American River Parkway plan states: “***Agencies managing the Parkway shall identify, enhance and protect: areas where maintaining riparian vegetation will benefit the aquatic and terrestrial resources; current shaded riverine aquatic habitat.***”(C) In addition to the stress introduced by the potential loss of canopy, the installation of a large amount of rip-rap in place of the existing trees and natural bank undercuts will only further stress these sensitive fish populations. A study presented by the Habitat and Enhancement Branch of Fisheries and Oceans-Canada recognized that “riprap reduced habitat complexity and diversity, important to survival, growth, migration, and reproduction of salmonids,” and that "[n]egative effects of rip-rapped streambanks can include a loss of riparian vegetation, resulting in a loss of nutrients and food sources, decreased future LWD (large woody debris) recruitment, and reduced shade, and a decrease in habitat diversity.”(D) This seems to be in direct contrast with the American River Parkway Plan.

a. “*Shading Out Climate Change: Planting Streamside Forests to Keep Salmon Coo*l”, Science Findings, June, 2020. “Steve Wondzell, a research ecologist with the USDA Forest Service’s Pacific Northwest Research Station, conducted a study on the upper Middle Fork of eastern Oregon’s John Day River. By using computer modeling, he and colleagues found that adding shade was the single most effective way to cool the water and preserve habitat for salmon into the future. With enough added shade, they found that future water temperature in the river could be cooler than today, even as air temperatures warm.” https://www.fs.usda.gov/pnw/sciencef/scifi228.pdf
b. “*The Influence of In-stream Habitat Characteristics on Chinook Salmon (Oncorhynchus tshawytscha)*”, David Bergendorf, November 2002. https://www.webapps.nwfsc.noaa.gov/assets/11/7389_10232012_174142_Bergendorf2002.pdf
c. American River Parkway Plan, 2008. Goals and Policies, Aquatic Community Policies, 3.8, 3.11, pg 18
d. "*Streambank Protection with Rip-rap: An Evaluation of the Effects on Fish and Fish Habitat*", J.T. Quigley and D.J. Harper, 2004 https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/285541.pdf

3. **USACE has not explored alternative, less destructive measures due to contradictory information and claims.** USACE's current measures are slated to bulldoze 522 trees in the area of Contract 3B South.(A) According to the letters USACE wrote to concerned citizens in 2016: "The proposed bank protection and launchable rock trench measures are the only two possible measures that could address the significant erosion problem on the American River. Other measures were eliminated from consideration because the river velocities render them infeasible. More information on the erosion problem on the American River can be found in the Erosion Protection Appendix to the GRR."(B) This claim that river velocities render biotechnical and bioengineering and woody alternatives infeasible is inconsistent with USACE's own publicly released technical documents, including the one they cite in the above claim, the Erosion Protection Report (ERP). In the ERP, a panel put together by the Corps agreed that there was a high degree of variability in bed materials. For this reason, the panel believed that "more borings should be collected to assure continuity of various layers."(C) Yet for the south side of the Lower American River, the Corps' geotechnical report only analyzed soil samples from mile 3.9.(D) SARA Park is located between river miles 9 and 11, and the geotechnical report noted that unlike other areas of the project study, this area contained "hard material" that was "erosion resistant." Thus, their report concluded that between river miles 7 and 11, "significant scour below this erosion resistant material/surface is not anticipated."(D.1) In other words, USACE's own erosion protection report and geotechnical report (which the agency cites to justify eliminating less destructive measures) state that there are stretches of river in the project footprint where the bed materials are resistant to erosion at anticipated high-water velocities. USACE has not adequately explored how biotechnical and bioengineering alternatives may reinforce these already erosion-resistant materials and minimize losses to vegetation while assuring compliance with the goal of 200 year flood protection.
    a. https://waterforum.org/wp-content/uploads/LARTF-Dec-2023-Slides.pdf, slide 26.(for the 500 trees)
    b. ARC Final EIS-EIR - Jan 2016 (Updated May 2016), Appendix F-Public Involvement, p. 7.
    c. ARCF GRR Appendix C Attachment E Erosion Protection Analysis. https://www.spk.usace.army.mil/Portals/12/documents/civil_works/CommonFeatures/Documents/GRR/ARCF_GRR_AppendixC_AttachmentE.pdf, p. 17.
    d. ARCF GRR Appendix C Attachment C Geotechnical Report. https://www.spk.usace.army.mil/Portals/12/documents/civil_works/CommonFeatures/Documents/GRR/ARCF_GRR_AppendixC_AttachmentC.pdf, p. 13.
        i. "Modeling results indicate that for all the flows simulated the shear stress in the reach with locally exposed hard material (between RM 7 and RM 11) is below the critical stress for erosion of moderately resistant materials (clay and cemented sand with silt). Therefore, significant scour below this erosion resistant material/surface is not anticipated." (p. 24)
    e. Geotechnical Report, 2016 GRR, Figure 10-1, Appendices Page 705
        i. "As no seepage and stability deficiencies exist, no further improvements are recommended."

10.1 ARN REACH A – AMERICAN RIVER NORTH – U9 LM 1.32

The without project conditions analyses includes the WRDA 1996/1999 cutoff wall and met criteria for both seepage gradients and slope stability factors of safety. As no seepage and stability deficiencies exist, no further improvements are recommended. Figure 10-1 displays steady state seepage and landside slope stability results for analyzed flood frequencies.

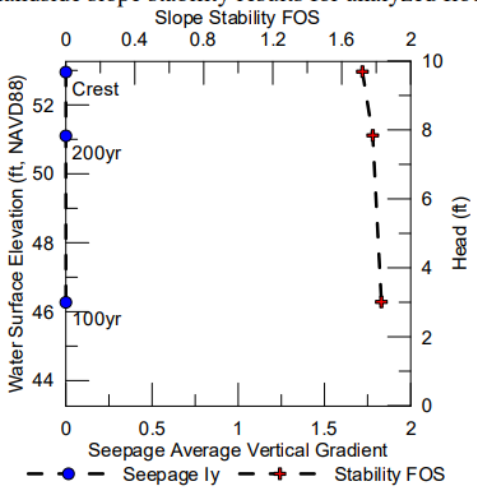

Figure 10-1: ARN Reach A U9 LM 1.32 Without Project Analyses Results

10.2 ARN REACH E – ARCADE CREEK NORTH – U7 LM 0.90

4. **USACE's own panel of experts recommended USACE take more soil samples in order to map out erosion resistant banks. We ask that USACE follow that recommendation before doing any work on this part of the river.** The experts from West Consultants understood that for USACE to properly prioritize work, they would need "systematic and justifiable criteria for site stabilization." For that to be achieved, USACE would need to collect more borings due to a "high degree of variability in the bed materials." Thus, experts recommended USACE collect more borings "to assure continuity of various layers," and they warned USACE that "interpretations made of connecting the dots between borings could be erroneous." More borings could help USACE avoid needless devastation by mapping out "the horizontal and vertical location of the scour resistant clay" in the Lower American River.
    a. "Attachment E Erosion Protection Report," in *American River Watershed Common Features General Reevaluation Report* (December 2015), 15-17.
        i. "Systematic and justifiable criteria for site stabilization will be useful not only for prioritizing work but also to rationalize projects to the public and decision makers. (Status: Criteria for site stabilization and prioritization will need to be completed in the future)."
        ii. "Based on input presented to the panel, there is a high degree of variability in the bed materials. Interpretations made of connecting the dots between borings could be erroneous. More borings should be

collected to assure continuity of various layers. Additionally, this refinement in detail needs to be accounted for in the stratigraphic model."

iii. "The horizontal and vertical location of the scour resistant clay should be clearly identified and mapped as these materials can impact both vertical and lateral erosion potential of the river. Existing geophysical studies may help with this task and should be identified (see recommendation on consolidating data below). (Status: An initial phase of geologic mapping and 3-dimensional stratigraphic modeling has been completed using existing data as well as data generated for the ARCF GRR study. The level of detail included in the current mapping and modeling is sufficient to support planning level recommendations and conclusions but further refinement could be of benefit depending on the level of certainty required in understanding the locations of this geologic unit)."

5. **Failing to map out areas of the river which do not need erosion protection is inconsistent with the state and federal Wild and Scenic River Acts, as well as the American River Parkway Plan. We therefore ask that USACE make targeted, data-driven proposals that are consistent with state and federal law.** The Wild and Scenic River Acts require that the Lower American River's recreational and fishery values be protected and enhanced. In addition, the American River Parkway Plan requires agencies to "protect, enhance and expand the Parkway's native willow, cottonwood, and valley oak-dominated riparian and upland woodlands that provide important shaded riverine aquatic habitat (SRA), seasonal floodplain, and riparian habitats." The Plan further requires that "erosion control projects" be designed "to minimize damage to riparian vegetation and wildlife habitat." Protecting, enhancing, and minimizing damage includes avoiding harmful work that is unnecessary. We can only know how to minimize impacts if we develop an intimate and ever updating map of the river and its varied geologic neighborhoods. Only with careful detail can we use the appropriate tools in the appropriate places and thereby ensure protection of the River's values. Installing rock trenches and toes that destroy riparian forest along miles of the American River Parkway is like blindly smashing the walls and floors of your home with a sledgehammer in order to kill the ants. Even if erosion resistant materials still need some protection, USACE has inadequately explored how to use biotechnical or bioengineering methods to address both safety and forest protection.
6. **Rip rapped banks, such as the launchable rock toes and trenches the Corps proposes to install, will not only eliminate numerous trees, it will also stifle future tree growth**. Studies of rip-rapped streams in places ranging from Oregon to Wyoming and Connecticut have found that overhead bank cover can decline by up to 80% on rip-rapped banks, and even more than half of century later reduce tree cover by almost a third. USACE has insufficiently explored how well trees will grow on planting benches.
    a. David Reid and Michael Church, 2015. Geomorphic and Ecological Consequences of Riprap Placement in River Systems. Journal of the American Water Resources Association. https://onlinelibrary.wiley.com/doi/epdf/10.1111/jawr.12279

b. T.A. Wesche, C.M. Goertler, and C.B. Frye, 1987. Contribution of Riparian Vegetation to Trout Cover in Small Streams. North American Journal of Fisheries Management. http://library.wrds.uwyo.edu/wrp/87-14/87-14.pdf.
    i. A study of several Wyoming streams found that overhead bank cover was 57-80% less on rip-rapped banks after two years.
c. B. Dykaar and P. Wigington, 2000. Floodplain Formation and Cottonwood Colonization Patterns on the Willamette River, Oregon. Environmental Management.https://link.springer.com/article/10.1007/s002679910007.
    i. Rip-rapped banks correlated with a dramatically reduced number of cottonwood trees on the Willamette River.
d. D.M Thompson, 2002. Long-Term Effect of Instream Habitat-Improvement Structures on Channel Morphology Along the Blackledge and Salmon Rivers, Connecticut. Environmental Management. https://pubmed.ncbi.nlm.nih.gov/11815827/.
    i. Found that 60 years after rip-rapping, tree growth was 30% less along the rip-rapped banks of the Blackledge River, Connecticut
e. Will Russell and Sayaka Terada, 2009. The Effects of Revetment on Streamside Vegetation in Sequoia Sempervirens (Taxodiaceae) Forests. Madroño. https://www.jstor.org/stable/pdf/41425806.pdf.
    i. “The results of this study support the hypotheses that revetment negatively impacts both vegetation and stream bank morphology. Species richness, vegetation cover, and tree recruitment were highest where there was no revetment compared to where revetment was intact on all three study sites.” (p. 78)

7. **The planting benches the Corps proposes will not provide meaningful mitigation because they will likely collapse when the launchable rock trenches and toes eventually launch, causing significant long-term impacts to salmonid habitat as well as recreational and aesthetic resources.** Launchable rock features, according to the Corps Geotechnical Report on the American River Common Features Project, are expected to eventually launch. When they do launch, they are expected to take down with them the overlying soil. In their 2021 Biological Opinion, the National Marine Fisheries Service noted that the launching of a toe rock “is likely to result in the loss of some of the mitigation planting bench.” They also noted that “the lack of durability of this mitigation is concerning and that “it cannot be accurately determined at what future time this planting bench will be damaged from launchable rock.” Because of the possibility that the launchable rock could damage the planting bench, “the overall benefit of the mitigation becomes less certain.” NMFS assumed that though there would “be some temporal benefits,” there would not be “new habitat created and maintained permanently.”(B) Planting benches are a significant form of mitigation USACE is employing for Contract 3B South. According to the 2023 SEIS/SEIR, planting benches are supposed to allow for sites “to be revegetated and used for onsite mitigation for riparian habitat and salmonid habitat.” (p. 3-41) On page 4.1-33 and 4.1-34, planting benches are considered part of “mitigation measure veg-2: retain, protect, and plant trees on site.” Planting benches specifically would “be used where practicable to

minimize impacts on fish and wildlife species." (4.1-34) With this mitigation measure, USACE has deemed loss of vegetation which provides shade and habitat to fish significant in the short term but in the long term "less than significant under CEQA." (3.4-11 and 3.4-12) Planting benches are also used to address American River Parkway Plan policy 3.7 to provide habitat for fish. But if the launchable features are expected to launch, and if launching damages the planting benches, then they cannot be considered a measure that will make long-term impacts to fish and wildlife less than significant. USACE also does not indicate whether or not planting benches themselves will erode. As USACE noted on page 9 of its 2016 Final Environmental Impact Statement/Report: "Both the Sacramento River and the American River are confined by levees and have very little sediment in the water. Additionally, on the American River, Folsom Dam blocks sedimentation from upstream sources. Therefore, the energy of the flow tends to erode riverbanks and levees" (C) As none of the erosion measures address the process which causes riverbank erosion itself (the lack of sediment in the water due to the Folsom Dam), it would have to be assumed that the erosion forces would be turned to the planting benches themselves. USACE should consider how much the planting benches will erode, and how that will affect their long-term viability as mitigation for losses to salmonid habitat, wildlife habitat, and aesthetic values. Though USACE has agreed to monitor the performance of planting benches for a period of 8-10 years, they have not addressed how erosion will affect these planting benches over the course of the 50-year expected lifetime operational of the project. Even if USACE has plans to restore planting benches after launchable features have damaged them, they have not adequately explained how periodic damage to planting benches is consistent with the ability of vegetation to return to its previous mature state. In other words, if planting benches are continually damaged by launchable rock, the trees will never grow to the size they were before the installation of the features and the damage to the aesthetic and habitat resources of the Parkway will be long-term and significant.

a. ARCF GRR Appendix C Attachment C Geotechnical Report. https://www.spk.usace.army.mil/Portals/12/documents/civil_works/CommonFeatures/Documents/GRR/ARCF_GRR_AppendixC_AttachmentC.pdf
    i. "To protect against waterside erosion in areas where a waterside berm exists, a launchable rock trench may be constructed. This is accomplished by placing rip-rap a certain distance on the waterside slope and excavating a trench at the waterside toe, or where the waterside slope meets the berm. Rip-rap is then placed in the trench and then **covered with random fill**. As the waterside berm erodes, **it will eventually** reach the launchable rock trench. At this point, the undermining action of the erosion event and **soils surrounding the trench** will allow for the riprap contained in the trench to "launch" into the void created adjacent to the trench." p. 12
b. NMFS Biological Opinion—May 12, 2021. https://www.spk.usace.army.mil/Portals/12/documents/civil_works/CommonFeatures/WRDA16/Documents/ARCF_Biological-

Opinion_NMFS_12MAY21.pdf?ver=7EAHWCBfLnXcDAZvxDcArA%3d%3d, p. 80.

i. “Another form of rock protection being used is launchable toe rock. This rock, while buried mostly under the planting benches, is also designed to launch to protect the levee from scour. The launching of this type of stone is likely to result in the loss of some of the mitigation planting bench. As this bench is being created to offset the loss of habitat and create some relief habitat among riprap, it is of high value in a system that is so constrained by levees already. As these benches are being constructed to offset the impacts of habitat loss, the lack of durability of this mitigation is concerning. As it cannot be accurately determined at what future time this planting bench will be damaged from launchable rock, the overall benefit of the mitigation becomes less certain. It is assumed that there will be some temporal benefits, but not new habitat created and maintained permanently.”

c. American River Watershed Common Features General Reevaluation Report, Final Environment Impact Statement/Environmental Impact Report, December 2015, Revised May 2016.

i. “Both the Sacramento River and the American River are confined by levees and have very little sediment in the water. Additionally, on the American River, Folsom Dam blocks sedimentation from upstream sources. Therefore, the energy of the flow tends to erode riverbanks and levees.” p. 9

8. **Studies show that the large trees USACE will remove to install their launchable features provide highly effective armoring against the flow velocities of a 200-year flood event. By removing trees in areas that don't need erosion protection, USACE may make us less safe.** The large trees (oaks, cottonwoods, ash, white alder, and black walnut) USACE plans to remove in order to install the launchable rock toes and trenches protect the bank against the scouring forces of the river. This is an area (Contract 3B South) with well-established, self-renewing vegetative armoring provided by the existing root network and relatively impervious to erosion at flow velocities less than 8 ft per sec expected in a 160,000 cfs, or 200 year flood event. Table 4-4 in the Erosion Protection Report suggests that vegetation such as class A turf grass can withstand flows up to 8 ft per second. Rood et al (2014) found that mature riparian trees are even superior to grass and recommended that “riparian forests should be conserved to provide bank stability and to maintain an equilibrium of river and floodplain dynamics.”

a. Rood, S. B., Bigelow, S. G., Polzin, M. L., Gill, K. M., and Coburn, C. A. (2015). Biological bank protection: trees are more effective than grasses at resisting erosion from major river floods. *Ecohydrol.*, 8: 772–779. Doi: 10.1002/eco.1544.

9. **Modern advanced modeling also shows that trees protect banks by redirecting the energy of a river towards the center of its channel. Removing these trees may exacerbate erosion and make us less safe.** Because of large trees, the water along the river banks in this part of the river during a storm is stagnant. It does not move fast enough to scour the banks. Kevin Flora and Ali Khosronejad found that at the cross-sections of three locations of the American River, trees significantly reduce velocity flow

along both banks, while increasing velocities in the center of the channel.(A) Empirically, this is confirmed by a photo showing a dog wading in the waters (see picture) along the riverbank in front of Larchmont Park during the 80,000 cfs high water mark in 2017. This empirical evidence is further confirmed by velocity contour maps provided by the Sacramento Area Flood Control Agency in a report prepared by MBK Engineers called "The 2017 Lower American River Stream Bank Erosion Report." These velocity contour maps show that during 145,000 cfs flows, the velocity along the banks between River mile 10.5 and 11, an area that encompasses the proposed project footprint in front of Larchmont Community Park, is only expected to be 0-2 feet per second, well below any velocity that could scour the banks.(B) However, if USACE removes large trees to install launchable features, water will move along the banks much faster.

a. Flora Kevin and Ali Khosronejad. 2023. "Uncertainty Quantification of Bank Vegetation Impacts on the Flood Flow Field in the American River California Using Large-Eddy Simulations." *Earth Surface Processes and Landforms*. https://doi.org/10.1002/esp.5745: 7.

b. MBK Engineers, "2017 Lower American River Streambank Erosion Monitoring Report," (April 2018), Appendix B.

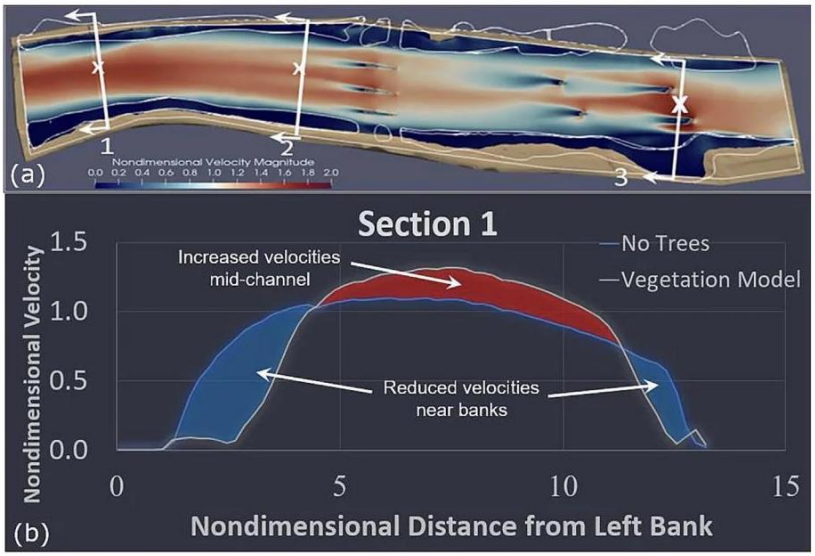

FIGURE 7 Cross-sections were compared along three locations of the American River (a). At Section 1-1, the vegetation model significantly damped out flows along both banks (blue regions) and increased velocities in the centre of the channel (red region) compared to LES without trees (b).


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10. **Cutting the riparian forests along SARA Park will likely increase the possibility of catastrophic levee failure. Historically, catastrophic levee failure during great floods happened much more often where riparian forests had been thinned or clear-cut.** Several studies show that during the two worst floods that ever struck the United States—Mississippi in 1927 and Missouri/Mississippi in 1993— levee failures occurred much more frequently in areas where the forest had been cut down or thinned than in areas with thick and wide tree cover.
    a. O. S. Scheifele, 1928. Protecting River Banks and Levees. The Canadian Engineer.
        i. Observed during the 1927 Mississippi floods that damage to levees was nonexistent where heavy stands of trees grew between the riverbank and levee. The greatest damage was in cleared areas.
    b. J.P. Dwyer and D.R. Larsen, 1997. Value of Woody River Corridors in Levee Protection Along the Missouri River in 1993. Journal of the American Water Resources Association. https://www.researchgate.net/publication/230348698_Value_of_Woody_River_Corridors_in_Levee_Protection_Along_the_Missouri_River_in_1993
        i. A study of a 39 mile long corridor along the Missouri River found that where the width of the forest decreased, the lengths of levee failures increased during the 1993 floods. 88% of levee failures occurred where the riparian forest was less than 300 feet wide.
    c. Stephen B. Allen, John P. Dwyer, Douglas C. Wallace, and Elizabeth A. Cook, 2023. Missouri River Flood of 1993: Role of Woody Corridor Width in Levee Protection. Journal of the American Water Resources Association. https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1752-1688.2003.tb04416.x
    d. Donald H. Gray, 2009. Effect of Woody Vegetation Removal on the Hydrology and Stability of Slopes
        i. cutting of trees on slopes destabilizes levee as roots which previously reinforced the slope decay
        ii. root decay can also lead to the formation of pipes in a slope which promote internal or seepage erosion
            1. the removal of tree canopy results in the loss of interception and evapo-transpiration which tends to promote wetter and less secure slopes (p. 1)

Part 2. Erosion/Engineering

USACE, in their C3B plan, proposes to cut down over 500 trees and bulldoze miles of the south bank of the Lower American River (LAR) riverbank between Watt Avenue and the Mayhew drain. The LAR is designated as a Wild and Scenic River with outstanding values for fisheries and recreation. With so much wildlife habitat and recreational and aesthetic value at stake, one should expect to see ample data in the C3B documentation to support such a destructive proposal. Instead, a review of the supporting documentation shows that 1) there is minimal supporting data, 2) data that USACE claims to support their proposal is not reported or available for independent public review, 3) USACE is misrepresenting existing data and information, and 4) USACE has ignored their own recommendations, provided in the available documentation, that such work is either unnecessary or needs further study.

A. From an engineering perspective there is incomplete and inadequate documentation to support a project with such destructive impact on natural resources. This includes inadequate site-specific erosion data and bore hole data and testing.

1. No erosion data is presented in the SEIS/SEIR specific to the new C3B project. The SEIS/SEIR relies only on archived GRR Geotechnical and Erosion appendices and cited unavailable references, as noted below.
2. The GRR Geotechnical analysis depends on samples obtained from 5 boreholes placed throughout the Sacramento River, Natomas Basin and American River basin. The nearest cited borehole to the C3B project area is over a mile downstream, on the north bank near Howe Avenue.
3. The GRR Geotechnical Report page 25 of 48 (page 709 of the Appendices), claims that soil data was collected in various studies, including subsurface soil collection, soil testing, JET erosion testing, and Erosion Function Apparatus testing on undisturbed samples. USACE should make this data available, along with sampling locations.
4. The GRR Erosion Protection Report states on page 18, Section 1.8.1, that the Sacramento District performed *"a total of 11 vertical soil borings within the American River channel, 29 vertical soil borings on the levee crest and waterside channel bench, and 15 cone penetrometer tests (CPTs) on the waterside channel bench. The URS subsurface investigation included a total of 44 borings, with 24 primary sonic borings and 20 companion air rotary casing hammer (ARCH) borings along the levee crest and waterside bench."* None of this data has been presented in the C3B documentation or is readily available to the public.
5. The C3B documentation refers to geophysical surveys to define project area stratigraphy. However, a basic principle of geophysical surveys is that the data needs to be validated with on-site boreholes. The Erosion Protection Report states *"Extensive drilling has been conducted on the LAR corridor, resulting in high vertical resolution datasets describing the lithology and stiffness of the sediments."* However, the closest documented borehole to the project area is the borehole located at Howe Avenue. As stated above, if additional borehole data is available, USACE needs to make this data available for public review.

B. The project documents are sporadic in the identification of erosion, and outdated in that sometimes the experts were basing their assessments of levee risk on pre-slurry wall status rather than taking into account the levee protection afforded by the 60' to 70' slurry walls completed in the levees of this reach by 2015, and further the priority designations are based on out-of-date survey information, out of date hydrology modeling, and were assessed on too broad of a geographic scale.

Note: the two Fugro maps are particularly crucial for a review of the USACE proposal and to determine whether it is even necessary. For example, in the upper reaches of project 3B, or reach 4-1, south side in particular, there is extensive clay bank hard pan (Pleistocene Fair Oaks Formation) underlying the upper, compacted and vegetatively armored, soils and extending out into the river, protecting both the berms and the base of the slurry wall. This is not documented in the current SEIS/SEIR but is mentioned only in the archived erosion analysis appendix of the preceding 2016 GRR.

Furthermore

• "Modeling results indicate that for all the flows simulated, the shear stress in the reach with locally exposed hard material (between RM 7 and RM 11) is below the critical stress for erosion of moderately resistant materials (clay and cemented sand with silt). Therefore, significant scour below this erosion resistant material/surface is not anticipated. However, this is for general

reach wide trends and local erosion such as at bridge piers may occur. Local scour should be further evaluated during future studies." (Erosion Protection Report, Pg 40).

"Surficial geologic mapping and synthesis of geotechnical data show that the Pleistocene age Fair Oaks formation is exposed in the channel bed and banks locally upstream of Watt Avenue (RM 9.0 to 11.0) and intermittently exposed in the channel bed downstream of Watt Avenue to near RM 6.7 (slightly downstream of the Guy West pedestrian bridge). Prominent outcrops upstream of Watt Avenue occur at RM 10.1 and from RM 9.4 to 9.7." (Erosion Protection Report, Pg 48).

The Fair Oaks Formation appears to be erosion resistant, therefore its location within the stream banks needs to be determined with certainty. With careful data collection and analysis, and focused and strategic erosion repair or control projects (using less destructive methods), protecting the habitat between the project and the levee could be accomplished.

C. The 2023 SEIS/SEIR and 2016 GRR upon which it is based misrepresent data with inconsistent reasoning and flawed analyses. The analysis shows zero chance of seepage in the levees of Contract 3B and 4B under 200 year flood protection events. The probabilistic analysis of potential for levee failures under different flood velocities is based on levees before slurry cut-off walls were installed. USACE's very own analyses suggest bank protection is adequate or that current data is inadequate and more testing and surveys are needed.

1. Particularly in the Geotechnical Report, much discussion is spent on seepage and slope stability. However, Section 10.1 for the analysis at the north bank near Howe Avenue, and Section 10.3 for the analysis on the south bank near Paradise Beach, show that with the 1996/1999 cutoff wall installed, there is no problem with seepage and instability. These are the two areas nearest to Contract 3B work on the south bank above Watt Avenue. This area also has a cutoff wall installed, therefore there is not expected to be any issue related to seepage and slope instability.
2. Section 17.0, Probabilistic Analyses, provides a "probabilistic evaluation" of each index point to evaluate uncertainty in model parameters regarding seepage and slope stability. This section provides graphs of probable levee performance without the project and with the project. Figures 17-1 and 17-2 supposedly show the improvement of performance of the levee at Howe Avenue. However, Figure 17-1 shows the curve without the project also does not include the cutoff wall, whereas Figure 17-2 curve includes the cutoff wall. This is therefore an "apples to oranges" comparison of the need for erosion protection.
3. Section 17.0 portends to apply a "probabilistic analysis" and provides graphs to show the increase in performance of the levees, as if this can be quantified with mathematical precision. However, the analysis itself includes a judgement factor (Geotechnical Report, page 31 of 48): "A judgment based conditional probability function for each analyzed cross-section was based on existing conditions of the levee such as encroachments on the levee slopes, vegetation on the levee slopes and in the vicinity of the levee toes, existing cracks and holes due to animal burrows, erosion of the waterside levee slopes and riverbank, and considering the past history of sand boils or slope failures. Generally, past experience with poor performance at utility crossing and rodent activity indicates the risk of failure is somewhat significant in the analyzed areas." Therefore, the graphs themselves are misrepresentative; engineering judgement and observations are important, but they cannot be quantified and should not be presented as such.

17.1 ARN REACH A – AMERICAN RIVER NORTH – U9 LM 1.32

Borings chosen to be used in probabilistic analyses resulted in a mean blanket thickness value of 15.0 ft with a coefficient of variation of 96, and a mean aquifer thickness of 24.0 ft with a coefficient of variation of 42. The blanket was comprised of predominantly silty sands. The aquifer was made up of poorly graded sand to silty sand, and silty gravel.

The levee embankment contains an existing cutoff wall which mitigates underseepage, through seepage, and slope stability concerns. The without project judgment based probability portion of the curve was comprised mainly of erosion, and encroachments, accounting for 50.0% and 4.0% respectively at the crest. Past performance has indicated significant amounts of erosion of the riverbank, waterside levee slope and foundation. Overall judgment based contributions account for a Pr(f) of 55.3% of the without project combined curve at the levee crest. Figure 17-1 presents the without project conditions combined curve.

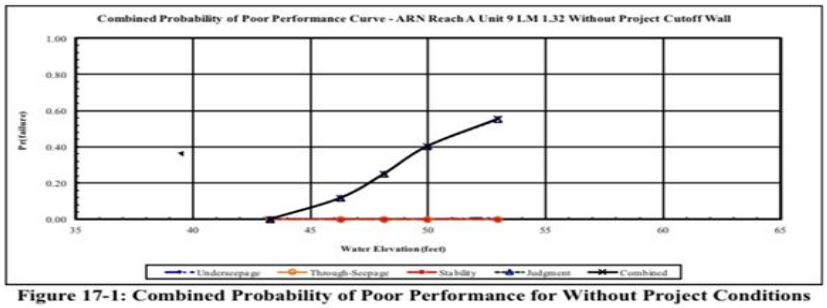


Figure 17-1: Combined Probability of Poor Performance for Without Project Conditions

The remaining probability of failure was primarily attributed to the judgment based failure modes, erosion, which is proposed to be mitigated through the placement riprap erosion protection. With project improvement measures reduce erosion to a Pr(f) of 5.0% at the levee crest. Figure 17-2 presents the with project conditions combined curve.

pg 716, 717

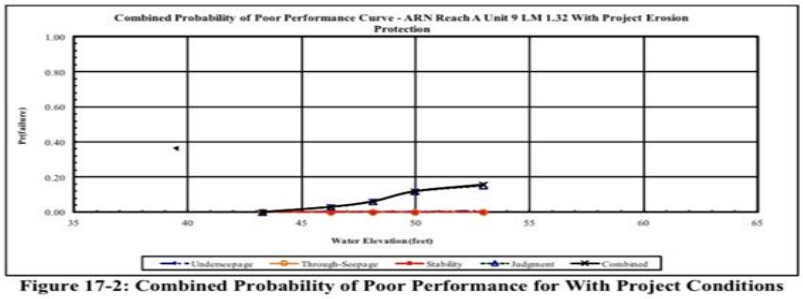


Figure 17-2: Combined Probability of Poor Performance for With Project Conditions

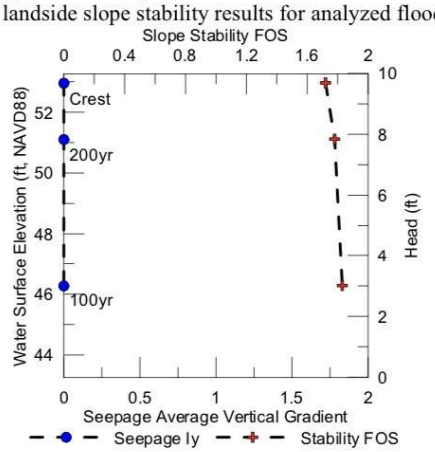
D. USACE Ignoring Recommendations

1. Geotechnical Report, 2016 GRR, Figure 10-1, Appendices page 705, in the text above Figure 10-1, reads: "As no seepage and stability deficiencies exist, no further improvements are recommended." Therefore, the Geotechnical Report refutes the need for erosion protection at Howe Avenue to prevent seepage.

pg 705

10.1 ARN REACH A – AMERICAN RIVER NORTH – U9 LM 1.32

The without project conditions analyses includes the WRDA 1996/1999 cutoff wall and met criteria for both seepage gradients and slope stability factors of safety. As no seepage and stability deficiencies exist, no further improvements are recommended. Figure 10-1 displays steady state seepage and landside slope stability results for analyzed flood frequencies.



Just upstream Home Ave Brdg N. Side

Figure 10-1: ARN Reach A U9 LM 1.32 Without Project Analyses Results

Figure 10-1 2016 GRR Appendices page 705.

2. Erosion Protection Report, pages 14-15, cites the West Consultants, Panel of Experts Findings Report, December 2010 (Panel meeting from October 6-8 & November 16, 2010), and provides several recommendations that USACE does not appear to have followed, or if they have, they have not made public:
   a. "With relatively little effort the existing HEC-6T sediment transport model can be modified to better reflect bed sediment conditions. Results of the model may shed light on vertical stability of the system and could also be used to examine "what-if" scenarios (e.g., stable points such as the gravel plug or clay outcrops are removed). (Status: HEC-6T was modified to reflect improved Erosion Protection Report American River Common Features GRR 15 April 2014 information on bed sediment conditions. However, what-if scenarios have not been conducted to date.)"
   b. *"The horizontal and vertical location of the scour resistant clay should be clearly identified and mapped as these materials can impact both vertical and lateral erosion potential of the river. Existing geophysical studies may help with this task and should be identified (see recommendation on consolidating data below). (Status: An initial phase of geologic mapping and 3-dimensional stratigraphic modeling has been completed using existing data as well as data generated for the ARCF GRR study. The level of detail included in the current mapping and modeling is sufficient to support planning level recommendations and conclusions but further refinement could be of benefit depending on the level of certainty required in understanding the locations of this geologic unit)."* It appears that that detailed mapping of the south bank geology could identify local areas that need erosion protection, as opposed to deploying the destructive launchable trenches and corresponding heavy equipment access.

c. *"Many of the experts viewed the results of the EFA erosion testing program with some doubt or skepticism which points to the need for better characterization of the erodibility of the resistant materials. (Status: Additional EFA as well as JET testing was completed on many samples collected on the channel banks and riverbed. There is a need to study those results, place them in a geologic context, calibrate them based on judgment and any potential scaling effects, and provide guidance on incorporating them into the hydraulic models. This has not been completed)."* It is not clear that this data has been considered in regards to developing a less destructive alternative.

d. "*Many of the experts agreed that existing data is scattered may not be readily available to professionals studying this reach of river. A centralized database should be created to make past studies accessible. (Status: Much of the data has been centralized on the network)."* Apparently USACE has established, or is in the process of establishing, a centralized database, however, that database does not appear to be available for independent professional review.

e. *"Monitoring should continue and possibly be enhanced or extended by various methods. (This has not been completed for this project during the feasibility phase of the study, but should be a component of future efforts)."*

f. *"Systematic and justifiable criteria for site stabilization will be useful not only for prioritizing work but also to rationalize projects to the public and decision makers. (Status: Criteria for site stabilization and prioritization will need to be completed in the future)."* This is the crux of why this letter is needed. It is not clear what rationale and criteria were used by USACE to justify this destructive proposal in what appears to be a stable reach of the river.

g. *"Based on input presented to the panel, there is a high degree of variability in the bed materials. Interpretations made of connecting the dots between borings could be erroneous. More borings should be collected to assure continuity of various layers. Additionally, this refinement in detail needs to be accounted for in the stratigraphic model. (Status: This is true of any such geotechnical model. Additional investigation is deferred to future analysis and design efforts)."* USACE needs to follow this recommendation.

3. Erosion Protection Report, 1.10.1, page 22: *"NHC concludes that there are no actively migrating meander bends on the Lower American River."* Also, *"Annual river surveys show that lateral erosion and bankline shift is occurring on the Lower American River, but on a scale too small to be accurately identified by air photo interpretation."* This statement would indicate that any erosion that is occurring is minor and progressing slowly.
4. Erosion Protection Report, 1.10.2, page 24: *"Modeling results indicate that for all the flows simulated the shear stress in the reach with locally exposed hard material (between RM 7 and RM 11) is below the critical stress for erosion of moderately resistant materials (clay and cemented sand with silt)."* Therefore, at least parts of the south bank are non-erosive. These areas should be clearly delineated.
5. Erosion Protection Report, 7.1, page 70: *Additional efforts are needed in the future to support implementation. These include but are not limited to:*
   a. *• Confirm that portions of the levee not included in Figure 6-3 for new bank protection are designed for the 160,000 cfs design discharge on a site-specific basis,*
   b. *• Develop and implement a site-selection and prioritization process,*
   c. *• Collect data necessary for site-specific analysis of existing bank protection and design of new bank protection,*
   d. *Design the needed rock protection based on site-specific data in accordance with standard engineering practice and USACE guidelines,*
   e. *• Monitor bank protection performance during and after flood events.*

Summary

The south bank of the Lower American River between approximate river miles 9.5 to 11 is heavily vegetated with mature riparian habitat. Unlike other reaches of the LAR further downstream, this area survived the floods of 1986 and 1997 with only minor erosion. Furthermore, as seen in videos taken during the 1997 flood event, the riparian corridor slows the velocity of the river to near zero at the levee and at the banks above the summertime base flow. Therefore, the riparian vegetation is protective of the levee and the banks. Erosion that is occurring is mostly limited to isolated areas at the toe of the bank, near the summertime base flow.

The SEIR/SEIS does not provide any further data or analysis showing that this project is necessary. In fact, implementation of this project is likely to increase water flow velocities near the levee and the bank, resulting in more erosion and instability of these features.

We therefore ask that the uppermost four river left (i.e., south side) erosion control subcomponents be removed from C3B (the Launchable Toe below Rogue River to Waterton and then working upriver from around RM mile 9.5: Launchable Trench below upper Rogue River, Launchable Toe below upper Rogue River, Launchable Toe below Larchmont Park/Rio Bravo). We further ask that the Launchable Toes on river right north side between Kadema and Howe also be removed from C3B. Furthermore, because access via Larchmont Park would no longer be necessary, we ask that it be removed from consideration as a staging area, and also, because they will no longer be necessary, that any upper access ramp behind Rio Bravo be removed, and that truck access via the Mayhew Drain be removed from the project as well. We ask that all heritage oaks be retained and protected.

USACE needs to develop a plan that preserves or enhances the vegetative cover, and eliminates removal of any mature trees. With careful data collection and analysis, and updated hydrology modeling, focused and carefully thought-out erosion repair or control projects could be accomplished that use less destructive, biotechnical methods that protect the riparian habitat. Any placement of rock should be limited to protecting the toe of the bank and protecting the root structure of any trees being undercut by erosion, and emplaced by light equipment that does not destroy the vegetative cover of the riparian habitat. Any rock at the toe and extending into the channel should be limited to cobble, rather than quarried riprap, and covered in gravel to support anadromous fish.

Finally, USACE needs to provide all data collected and reports produced in support of this project for independent professional review.

Thank you,

William Avery
Joshua Thomas
Gerald Djuth
William Brattain

cc: Barbara Rice, National Park Service
Susan Rosebrough, National Park Service
Harry Williamson, National Park Service
Liz Bellas, Director, Sacramento County Regional Parks
KC Sorgen, Sacramento County Regional Parks