

**Hypothesis-driven Monitoring of the  
CALFED/CVPIA Sponsored Gravel  
Augmentation on the Lower Mokelumne  
River**

**Gregory B Pasternack**

# Final Selection Panel Review

Not Recommended

*Amount Sought:* \$705,052

*Fund This Amount:* \$0

Brief response to comments received:

As an update to the comments below, the ERP received a letter from the applicant addressing many of the technical comments. We acknowledge that one technical reviewer's comments were inappropriate and apologize for those comments. However, the final decision of the selection panel remains the same. The ERP has made prior investments supporting gravel evaluations on other rivers of higher priority. The selection panel noted that this proposal was rated as "medium" for regional importance, which reflects the importance of the Mokelumne River in priority. The Mokelumne is not viewed as a high priority river by ERP and the selection panel. We note that the selection panel was remiss in not making this point more clearly in the earlier comments.



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To the CALFED ERP Proposal Selection Review Panel:

I would like to provide feedback concerning the review of the proposal I submitted for funding consideration entitled, "Hypothesis-driven Monitoring of the CALFED/CVPIA Sponsored Gravel Augmentation on the Lower Mokelumne River". The purpose of this feedback is to provide clarifying comments for the public record. The personal attacks written by one external technical reviewer were shocking. They are inconsistent with both the spirit of merit-based evaluation and the facts of the PI's track record in community involvement, professional involvement, and scientific publication.

The selection panel's summary review paragraph includes several sentences that are factually incorrect. The next 4 paragraphs present clarifying comments drawing only on proposal materials that demonstrate the facts of the situation.

The panel stated that the "model" used in the proposal is "unvetted and non peer-reviewed". This claim is false. In fact, the proposal cites 5 peer-reviewed scientific articles about SHIRA. In that formal review process, each article was reviewed by 2-3 independent, anonymous scientists as well as a scientific editor governing the publications. Informally, each article has also been reviewed by several colleagues in the disciplines of ecology and hydrology, including graduate-student advisory committees, where applicable. As a matter of public record SHIRA is at present the most scientifically peer-reviewed framework for spawning habitat rehabilitation in existence.

The summary paragraph claims that the SHIRA framework is not applicable to other streams within CALFED's domain. This claim is false. In fact, the proposal states that SHIRA has already been used on the Trinity and Yuba Rivers as well as Mokelumne River, so the applicability is already demonstrated. The universal laws of physics that are incorporated into the mechanistic model used in SHIRA apply to all regulated river reaches at the base of dams in California. If one identified a situation in which a different model would work better than the FESWMS model used thus far, the modular nature of SHIRA illustrated in the proposal allows for the substitution of whatever mechanistic model the design/evaluation team desired to use. Thus, the modular nature of SHIRA and the use of adaptive management, as reported in the proposal, preclude the possibility of non-transferability.

The summary paragraph claims that there is no clear connection to key species of concern to the CALFED/ERP program. This claim is false. Priority 3 of the ERP draft Stage 1 plan for the San Joaquin region calls for improved rearing and spawning habitat for chinook salmon in San



Joaquin tributaries, of which the Mokelumne is one. Similar priorities have been stated by ERP for the entire Central Valley. The proposal addresses exactly this priority- it includes monitoring of chinook spawning, spawning habitat quality, and chinook rearing. The proposal goes further and aims to use monitoring data to develop a framework for predicting habitat and utilization heterogeneity, which one technical reviewer notes is an important remaining question to address with monitoring data.

The summary paragraph claims that there is no connection (clear or otherwise) to the bigger picture of gravel restoration efforts across the landscape or the Central Valley. The claim is false. The proposal presents a hierarchical framework for conceiving of gravel restoration for any stream and then implements that framework for both restoration design and again for evaluation. Two technical reviewers specifically applauded this aspect of the proposal. Furthermore, this proposal is the first of any document related to gravel augmentation in the Central Valley to show evidence demonstrating that as much as 50% of the gravel volume placed into a stream may be lost due to in situ processes. The significance is that the current methods CALFED is using to evaluate gravel restoration outcome do not account for this process and thus are unlikely to correctly identify and interpret project fate.

The summary paragraph claims that it is unclear how the monitoring data produced would be useful to resource managers. This claim is false. Included in the proposal is a letter of support from the resource manager responsible for the lower Mokelumne River, EBMUD, indicating that they support the proposal. The proposal states that EBMUD has used the monitoring data collected so far as well as the SHIRA framework to implement their gravel restoration projects in 2001, 2002, 2003, and 2004. It also states that EBMUD has used the sediment budget reported in the proposal as a guide to its future gravel augmentation volumes. Thus, the monitoring data already is of use to the resource manager and their letter indicates that they will continue to use the products of our monitoring activities.

Of the 3 external technical reviews, two report minimal criticism of the proposal. These two state that the work is well justified and the hypotheses clearly explained. Contrary to the first sentence of the review panel paragraph, one states that "methodologies proposed are appropriate and proven to meet the study's objectives", while the other states that "data collection procedures and timing are reasonable given project goals." Both of these reviewers find that the proposed budget is fully justified, with one even noting that the cost of the RTK GPS is fully justified by the high-resolution monitoring data that will result. Both state that the PI is fully qualified to perform all aspects of the project, especially with the aid of a PhD biologist and PhD geomorphologist in the form of 2 postdoctoral researchers included in the proposal.

In sharp contradiction to the general consensus, one external technical reviewer blasts the PI personally and nuked the proposal. Many claims made by this reviewer are false. Seven of these are carefully refuted below. Other claims by this reviewer are highly problematic, but are too numerous to address point by point. Shockingly, the reviewer included many highly personal attacks that were highly inappropriate. The PI has collaborated with many scientists, resource managers, and stakeholders locally, nationally, and internationally. The PI was awarded a special Certificate of Appreciation by the Maryland Department of Natural Resources for outstanding research, management assistance, and knowledge transference. He was also awarded a special recognition for research and community involvement by the stakeholder group Otter Point Creek Alliance.

First, the reviewer claims that there is an undisclosed cost of \$173,000 for macroinvertebrate analysis. This claim is false. The proposal states that a **biologist** with a PhD will be hired for the 3-



year study. Table 2 in the proposal illustrates that the field sampling and laboratory analysis of the macroinvertebrates will be performed by the post-doctoral biologist. Thus, no such undisclosed cost associated with sending out samples for external analysis at \$200 per sample exists.

Second, the critical reviewer claims that the PI has not taken prior criticisms seriously and has ignored external input, specifically with regard to incorporating biological monitoring into the proposal. This claim is false. This proposal includes the most extensive biological monitoring program for any spawning habitat rehabilitation project on a regulated river in the Central Valley of California. The proposal states that a PhD biologist will be directly involved in biological monitoring in this project, including monitoring of spawners, redds, juveniles, and macroinvertebrates at rehabilitation sites. Also, EBMUD has submitted a letter of support for the proposal in which they state that they will share all of their monitoring data for use in this project. Their monitoring data is listed in Table 1. As indicated in the proposal, Dr. Joe Merz, a fish biologist at EBMUD has been a collaborator with the PI in developing and evaluating SHIRA and would continue in this capacity. Thus, two PhD biologists will be involved in the proposal along with the PI and 1 PhD geomorphologist. The PI himself has published articles on ecology in journals ranging from *Wetlands* to *Canadian Journal of Fisheries and Aquatic Science*, and is widely recognized as an interdisciplinarian.

Third, the critical reviewer states that the modeling results have not been validated. This claim is false. Every 2D hydrodynamic model of pre- and post- project conditions ever run on the Mokelumne River has been field validated, with examples of this presented in the proposal, notably on page 10 where model uncertainties are presented. Two peer-reviewed scientific journal articles cited in the proposal (Pasternack et al., 2004 and Wheaton et al., 2004) present independent model validation data. In terms of spawning habitat predictions, Figure 14 of the proposal is a direct test and validation of the 2D model's predictions of habitat quality: as stated in the proposal, 95% of redds are located on points predicted to be medium and high quality habitat. Shear stress predictions by the model have been field validated by measuring vertical velocity profiles (see page 10). Even eddy viscosity has been field validated. So there is no variable used in the model that has not been validated through direct field-based testing.

Fourth, the critical reviewer directly and personally attacks the PI's scientific integrity by stating that the PI ignores uncertainty and model limitations and blindly advocates for his approach. This claim is false. On page 10 of the proposal a paragraph presents the results of analysis of model uncertainty and error propagation. Obviously, all approaches have limits and uncertainties. The proposal reports in the prior-studies section that through extensive monitoring, data analysis, and modeling, the PI has made an extensive effort to quantify sources and magnitudes of uncertainty. The proposal aims to take this even further with highly detailed analyses at 3 spatial scales. However, no matter how much work is done, uncertainty cannot be exterminated, but management must move forward. SHIRA uses adaptive management as an aid to handling uncertainty.

Fifth, the critical reviewer cites the problem of "attractive nuisance" of gravel restoration projects and claims that data results on this topic are not presented. This claim is false. On page 10 there is a paragraph dedicated to this issue that presents both data and a citation to a peer-reviewed scientific journal article co-authored by the PI that addresses this issue.

Sixth, the critical reviewer cites project lifespan as the most critical question and states that an assessment of long-term vs. short-term benefits for projects is clearly warranted in the proposal. Exactly such an assessment is in fact proposed. The proposal offers a hierarchical framework for monitoring geomorphic changes over three spatial and temporal scales for 3 additional years (bringing the total dataset to 10 years). This is the most that can be achieved given that the PSP calls



for a maximum of 3 years of monitoring. If completed, this would be the highest-resolution 10-year monitoring dataset ever collected for a gravel placement project.

Seventh, the critical reviewer states that the proposal does not directly monitor scour. This claim is false. The proposal states that painted tracer cores will be used to monitor scour. This method has already been used on the Mokelumne and is widely published elsewhere as an effective approach to quantifying scour. Scour chains are suggested, but contrary to the reviewer's claim they do not isolate scour from fill, since both processes can occur simultaneously. DEM differencing is at least as valid as scour chains for this reason. The tracer cores do isolate the effects because filled sediment will not be painted, and thus are distinguishable.

As a final point, I note that there are two errors in the prior-phase funding review. First, as a co-PI on the CALFED project entitle, "McCormack-Williamson Tract Restoration Planning, Design and Monitoring Program I", I independently submitted my final report to CALFED and published it on the internet for the public within the contractual period, whereas the review only notes that the entire final report of all components was submitted to CALFED 16 months late. Second, the review claims that I underestimated the budget of the initial SHIRA demonstration project funded by CALFED by \$42,000. This claim is false. The truth is that there was a discrepancy between federal and state overhead rates, which created a misunderstanding. I offered to move forward with the reduced award, but Gonzalo Castillo of CALFED requested that I perform additional work, including high-flow 2D modeling of the Mokelumne River in support of potential pulse flow releases. On the basis of performing that additional work and developing a comprehensive outreach website, I accepted the additional \$42,000 to augment the project.

In summary, I appreciate the opportunity to address the outcome of the proposal review process in the public record. I hope that my comments will be thoroughly considered, even if the funding decision remains unchanged. I believe that it is a loss to CALFED that the only independent, academic, and peer-reviewed adaptive management experiment for restoring Central Valley gravel-bed streams will now be terminated due to lack of funding.

Sincerely,

A handwritten signature in black ink that reads "Gregory Pasternack". The signature is fluid and cursive, with the first name being particularly prominent.

Dr. Gregory Pasternack  
Associate Professor  
Department of Land, Air, and Water Resources

# Initial Selection Panel Review

Not Recommended

*Amount Sought:* \$705,052

*Fund This Amount:* \$0

Brief explanation of rating:

There is a lack of detail in describing the methodologies. The monitoring data produced would be useful to other scientists, but it is not clear how, or even if it would be useful to resource managers or stakeholders. Another concern expressed by both the selection and technical panels is the focus on an unvetted, non-peer reviewed model. There were also concerns about the applicability of the results to gravel augmentation projects in other streams. All recommend unbiased 3rd party evaluation of the SHIRA model. In addition, all concurred the proposal should include collaboration with a team of fish ecologists. There is no clear connection to key species of concern to the CALFED/ERP program, and no connection to the bigger picture relative to gravel restoration efforts across the landscape or the Central Valley.

# Technical Panel Review

*Technical Review Panel's Overall Evaluation Rating:*

Adequate

## Explanation Of Summary Rating

The panel thought this was a solid proposal to monitor the effects of gravel augmentation with the added benefit of using the data to test models. Because of this dual purpose, some tasks seem primarily designed to yield interesting and fundamental data that may not be directly relevant to evaluating the efficacy of the specified restoration efforts. The main weakness of the model was the lack of attention paid to the biological monitoring and it was recommended that the PI collaborate with a team of established fish ecologists. If this work provides an important data set for improving predictive models, this may be very beneficial to river restoration projects in general, if not necessarily to these efforts in particular.

## Goals And Justification

The project will determine whether gravel augmentation has worked in restoring sediment transport continuity below Camanche Dam on the Lower Mokelumne. The proposal's conceptual model is that the gravel augmentation, directed by the results from computer modeling, will improve fish habitat. The proposal clearly lists 3 sets of hypotheses, organized according to spatial scale: reach, pool-riffle units, and hydraulic unit). The hypotheses generally address important issues regarding gravel augmentation although some were identified as being somewhat trivial (e.g., "the longitudinal distribution of of the fish community may reflect specific values of slope, Shield's stress, etc."). Although the Calfed PSP was for projects that involve monitoring, proposals such as this one are useful because they treat the restoration



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project like a big experiment.

### Approach

The approach should be able to determine the nature and extent of the restoration's geomorphological impacts. Much work has already been done in the area and this project will build upon that and complement it. The PIs provide an example of a past mistake in gravel placement and propose an explanation for why it didn't work and how it could be improved. Not only will this project provide useful monitoring data, but it will also test a conceptual/numerical model. The technical panel noted, however, that the PI has used the model extensively and that a third party may be more appropriate to evaluate it. We think that if the model does prove to work correctly, it could be an important tool for resource managers and decision makers. Whereas the geomorphological aspects of the proposal are solid, significant weaknesses were identified in the biological-monitoring portion of the proposal. In general, the biological monitoring was neither well described nor supported. Few details were given on the plan for surveying macroinvertebrates. The panel strongly encourages the PI to collaborate with an experienced team of fish ecologists.

### Feasibility And Likelihood Of Success

The project is well-documented and appears technically feasible. The panel particularly appreciated the detailed description of the tasks (e.g., the tracer gravel study). It was clear that the PIs have already invested a significant amount of time thinking about how exactly they plan to carry out their work. The project proposes to monitor and evaluate stream restoration at 3 different scales, thus providing important information on three different sets of inter-related processes. Neither the regional panel nor the environmental compliance panel identified impediments to the project.

### Performance Measures

At the reach scale, the project proposes to compare sediment transport processes and fish habitat between 3 reaches

## Technical Panel Review

subjected to different 'treatments.' Whether the sample size is sufficient to make statistically robust determinations is an open question, however previous monitoring may help to extend the record enough to deal with this problem. At the riffle scale, the project will use repeat surveys to determine whether constructed riffles are stable. This approach will directly evaluate whether the construction of engineered riffles is a worthwhile task, regardless of their habitat suitability; this is a fundamental question that needs to be answered. At the hydraulic unit scale, the spatial correspondence of topographic and hydraulic features with the distribution of fish and bugs will be assessed. The panel thought, however, that present understanding of these spatial relationships is not sufficient to be able to look at these kinds of data and determine whether the conditions are reverting back to a 'normal' state. Determining whether engineered boulders and LWD are serving their purpose, however, would be useful, particularly if the data can be used to improve flow models.

## Products

In general, it seems that the results of this work would be mainly useful to other scientists. In other words, the data will be fairly technical and will require interpretation. The project links with other activities as stated. UC Davis will be heavily involved as well as NGO's. In addition, this project will provide two undergraduates with practical experience and will fund a post-doctoral student. Public non-academic outreach will be via a website. 'Appropriate' data will also be available through the website. The PI has a good record of publishing in peer-reviewed journals and this will likely be the main outlet for project results. However, few of the PI's publications relevant to this project are in top-tier journals and it appears that the SHIRA model has not been fully vetted by others in the field.

## Capabilities

The PI is a geomorphologist who specializes in sediment transport and has worked well with more biologically-oriented

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scientists. To augment the team's experience in aquatic ecology, he will hire a post-doc. However, the technical panel felt that the proposal should be submitted as a collaborative effort with established fish ecologists. The PI's performance record suggests that he will be able to complete the geomorphological tasks as detailed.

## Budget

The PI requests \$57k for a Trimble RTK-GPS. We are fairly certain that this is full price. Trimble offers an educational discount of ~50%. At \$57k, this purchase would be difficult to justify (cheaper to rent), however, with the discount, it could be more palatable. Also, at the risk of micromanaging the budget, \$2600 seems like a lot for a couple of dry suits and waders.

## Regional Review

The regional review gave this proposal a "medium" ranking because they wondered whether the specific findings of this work would be applicable to evaluating or designing gravel restoration efforts elsewhere. In addition, the regional review felt that this was more of a research project. The technical panel challenged this aspect of the regional review. However, the technical panel felt that a properly-designed model will be sufficiently general such that it can be applied in other areas where values for the relevant input parameters can be constrained.

## Administrative Review

There were no red flags from the prior-phase funding, environmental compliance, or budget reviews. The budget review did highlight a number of issues that will need to be addressed, including a need for greater budget detail and the need to correct outdated values for overhead costs.

**Additional Comments**

# Delta Regional Review

*Delta Regional Panel's Overall Ranking:*

Medium

## Summary:

It was not clear just how applicable the specific findings of this work would be to evaluating or designing gravel restoration efforts elsewhere. The lack of reference to the large volume of gravel restoration work being done elsewhere in the Central Valley was a concern; this could have been a positive addition as this proposal could be filling in some knowledge gaps. Overall this proposal appears to be more of a research effort than a monitoring effort where results could be compared to a baseline condition.

## 1. Applicability To ERP Goals And Regional Priorities.

Restoration of salmonid spawning habitat as a means to increase salmonid populations and the processes they depend on is an important goal of both CALFED and CVPIA. Various gravel augmentation and restoration activities have been undertaken by the CVPIA AFRP and CALFED ERP in this regard in the lower Mokelumne River and other Central Valley rivers over the past five years. This proposal will continue the development of the SHIRA adaptive model by expanding the geomorphological data collection and analysis and ties this information to biological data being collected concurrently. Thus this proposal does meet many ERP goals and regional priorities.

This proposal not only monitors the response of two big R species to restoration activities, but will lead to further refinement of a tool that can be used to guide future gravel augmentation/restoration efforts. Both CALFED and CVPIA have invested considerable funds in the restoration of spawning habitat in the lower Mokelumne River. This proposal will continue the monitoring and assessment of these investments; however, much of this work seems to be more research than

monitoring.

## 2. Links With Other Restoration Actions.

This proposal focuses on understanding the response of the lower Mokelumne River to a series of gravel augmentation activities over the past five years. Thus, it will be examining effects of both individual restoration efforts and their cumulative effect on the limited geographical area of the lower Mokelumne River. The proposal does not link its work with that being done in other rivers within the CALFED action area, nor does it appear to use information gathered from these other efforts in its analysis. The continued refinement of the 2-D model and SHIRA framework will provide a tool for guiding the planning and design of future restoration efforts, a means to identify the high-value variables for evaluation of these restoration efforts and a process to determine if additional variables need to be investigated. Other 2-D models are currently in use and it would have been helpful to see how the model proposed here compares.

## 3. Local Circumstances.

There are no local circumstances that will impact or limit this proposal.

## 4. Local Involvement.

This proposal is an extension and expansion of the working relationship between UCD and EBMUD. Involvement of the local scientific (academic, NGO and agency) communities will be accomplished via the actions identified; however beyond that, communications with stakeholders and the public will be very limited. Experience has shown that a web site is not the best communication tool for these groups. Local involvement could be enhanced by coordinating with similar restoration efforts in other rivers within the Central Valley.

## Delta Regional Review

### 5. Local Value.

This proposal will be directly useful to managers and decision-makers when it comes to evaluating existing gravel augmentation and designing/implementing future salmonid spawning restoration efforts. When viewed from the larger context of overall ecosystem restoration, this proposal addresses only a very small part of the factors that affect Chinook salmon and steelhead trout and the contribution of this effort to overall improvements in these big R populations will be difficult to demonstrate. This investigation will be extremely useful at the smaller river reach level with decreasing usefulness as the area is expanded.

### 6. Other Comments:

Absent from this proposal is a clear description on how a manager or policy-level decision-maker could use the information generated. The collections and presentation of scientific information is a worthy goal, but agency directors need information in a form they can digest that they can use to address the current, near-term and long-term issues before them. It is not clear who will provide the oversight and QA/QC for the biological parts of this work. It would have been highly desirable if this proposal had included the evaluation of large woody debris and boulders. It was a concern that results would not be fully available until 2008.

# External Technical Review #1

## Goals And Justification

The proposal is very well written and identifies many important monitoring actions for testing the adequacy of spawning gravel placement using the SHIRA approach. Although the author relies too heavily on familiar but vague buzzwords in an overly verbose text, the goals and objectives are clearly presented and internally consistent. Given the large investment in the SHIRA approach to manipulating spawning gravels on the Mokelumne River, monitoring and testing of the approach is long overdue and should be a priority for the program. Unfortunately the author has not taken prior criticisms seriously so there is a genuine concern about his ability to objectively test the approach and present unbiased results. It would be much more credible to have an independent third-party develop and test the adequacy of this controversial approach.

The biggest downfall of the approach is over-reliance and faith on modeling results that have not been validated. A good modeler will state the limitations and assumptions of their efforts. Unfortunately the author does not provide this information and combined with the strong sale's pitch of an over-confident author, there is a dangerous likelihood of advocating unrealistic expectations and misinformed management decisions. It is vital that an honest assessment of limitations, assumptions, and expected error terms in the modeling effort be stated in an upfront and transparent manner. It is evident that the author has become overly attached to his approach and may not be able to objectively test its adequacy for meeting restoration goals. The photographs and text that indicate the 'persistence' of high quality spawning habitat are one example of overstated successes of the SHIRA approach. These assessments of one year post-placement of clean gravels does not equal persistence of high quality habitat and does not provide information on previous (i.e., older) SHIRA projects on the Mokelumne River that are currently clogged with fine sediment, compacted, and heavily colonized by aquatic vegetation. Criticisms of the



## External Technical Review #1

gravel placement projects by other scientists who claim them to be 'attractive nuisances' deserves attention and testing. Table 1 indicates the availability of water quality (e.g., permeability, dissolved oxygen, and hyporheic temperature) and embryo tube data. If these data are available for SHIRA sites it should be presented. If is not available, it should be collected and the rate of change tracked through the project's life span. Accurately predicting depth and velocity does not equate to an assessment of habitat quality, it is only a description of topographic form.

The most critical question to address for the SHIRA approach is the lifespan of the constructed spawning areas and how this compares with other, less expensive methods of gravel augmentation. The proposal does attempt to address the project lifespan question but it does not make the critical comparison with other augmentation methods. It is obvious that SHIRA provides immediate habitat creation that other augmentation methods cannot. What is not clear is how quickly these short-term benefits diminish with time or what unexpected side effects might occur (for example, over-engineering of riffles resulted in the loss of high quality spawning sites at pool tailouts due to backwater effects and this would not have happened with other less intrusive augmentation methods). If flows are insufficient to mobilized the placed gravels, spawning gravel quality will deteriorate in the immobile bed (due to filling of interstitial pore-spaces with fine sediment and organics, colonization by aquatic macrophytes, and declining levels of dissolved oxygen and permeability). If flows are adequate to mobilize the placed gravel, active river processes have not been restored so the restoration program may be locked into the long-term expense of continuously rebuilding these areas. An assessment of long-term vs. short-term benefits is clearly warranted.

The lack of adequate testing of the SHIRA approach relies on the author's assertion that testing of model predictions in design scenarios is not possible. Although this is a true statement it should not prevent the author from comparing empirical observations of implemented designs with predicted outcomes. This empirical test is essential if the approach is

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to be critically evaluated. Testing needs to go beyond basic comparisons of depth and velocity, and proceed to validate or falsify predictions of scour, habitat suitability, etc.

### Approach

The proposal builds upon previous monitoring and restoration actions and has incorporated some adaptive learning when unanticipated outcomes have been observed. Overall the monitoring activities will provide a significant contribution to the restoration effort by testing an expensive and controversial approach to spawning gravel placement. In the opinion of the reviewer the monitoring would best be performed by an independent third party and would include comparisons of SHIRA sites and sites where other augmentation techniques have been used (if such sites are available). Ideally the lessons learned from how the SHIRA sites function over time and the testing of model predictions will allow decision-makers to identify whether this approach is successful in the long-term and worth the investment.

### Technical Feasibility

The project is fully documented and technically feasible, with the notable exception of some methodological inadequacies and budgeting constraints discussed in other sections.

### Performance Measures

Of the ten proposed hypotheses for monitoring and testing, three have technical and logistical constraints that need to be addressed. The two biologically-based assessments of invertebrates (hypothesis 3.d, task 3.4) and juvenile fish use (hypothesis 3.e, task 3.5) are poorly developed, and empirical tests of model predicted scour (embedded in several hypotheses) is inadequate.

The invertebrate sampling strategy employs a huge sampling effort that is not accounted for in the budget and will likely result in > \$170k of over-expenditures (see budget review section for details). Because invertebrate production has not

## External Technical Review #1

been identified as a limiting factor for fish and it is not a top ranked priority for the restoration project, this portion of the study should be omitted unless matching funds can be secured.

Juvenile salmonid use of constructed habitat is of interest but the methods are not adequate. It is widely accepted that snorkel observations cannot be used to determine the precise location of individuals because the presence of the observer alters the behavior of the organism. Underwater videography using mobile booms is a more appropriate method. Implicit in the observational approach is the assumption that habitat use equals habitat quality. What needs to be evaluated is the effect of habitat use on survival and fitness. Methods for this portion of the study should be revised or the section should be omitted.

Testing model predictions of scour depth is a critical knowledge gap, unfortunately the author does not propose to measure scour directly. Using DEM differencing to test for changes in topography will integrate scour, fill, and compaction/settling of placed gravels so scour depth cannot be isolated and quantified. It is strongly recommended that scour chains be used to directly measure scour and provide the necessary data to meet the objectives. Relying on model predictions that have never been validated is not an appropriate test.

Performance measures are stated in the proposal but they are too vague to be useful. For example, 'bedload transport' will be used as a performance measure for hypothesis 1.a. The author provides no insight into how much transport will equate to the re-initiation of a conveyor belt of coarse sediment. 'Habitat creation', 'biotic and abiotic data' and other unspecified values for vague terms are used throughout the document and do not provide adequate information for critically evaluation. All performance measures should be revised.

Hypothesis 1.b, task 1.6 also suffers from an inconsistent and poorly defined use of 'fish community' as a response measure.

## External Technical Review #1

The specific aspects of a fish community that are of interest (or have available data) are never stated and the implied aspects are inconsistent. One portion of the text suggests that community 'assemblage' will be the response variable, while another section suggests community 'size and structure'. The exact response variable needs to be identified, evaluated for its adequacy and the availability/quality of existing data that is needed to address the question.

### Products

The author has demonstrated an ability to provide information in a format that is useful to managers and other decision-makers. Data accessibility on the website is a strong contribution but caution should be taken in the rush to provide immediate access and thereby circumvent the peer-review process. Unfortunately the author does not take criticism or questioning in a constructive manner so input from other scientists has often been ignored.

Data handling, storage, and dissemination procedures are well planned and provide adequate access.

### Capabilities

The author has demonstrated a skilled use of hydrodynamic models, a familiarity with the restoration program, and an ability to complete past projects. Unfortunately the ecological components of the proposal have not been well developed and lack the necessary expertise to propose sound methods and response variables. Having an aquatic ecologist or fisheries biologist on the proposal team would greatly enhance the ability of the research to address pertinent questions in an effective manner.

### Budget

The budget requested for this project is extremely large. This is primarily due to the broad scope of the project; however, a substantial amount (\$57,000) is requested for the purchase of an RTK GPS system. While an RTK can be extremely useful for

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high-resolution surveying it is most useful for acquiring topographic data over long distances that are not well referenced with existing benchmarks. Because the author is working in very short stream reaches with repeated monitoring (and presumably an existing array of benchmarks), a total station survey will produce the same results (equivalent precision, accuracy, and time expenditure) for a small fraction of the cost. This purchase is not justifiable. If the need for a RTK can be shown, the equipment can be rented at a reasonable cost.

Task 3.4 (hypothesis 3.d) proposes to use benthic macroinvertebrate sampling to test habitat heterogeneity. The sample size was not explicitly stated but the author proposes to use bi-weekly sampling for six months, resulting in approximately 12 sampling periods per year. The author describes a stratified random sampling scheme of four distinct habitats. The number of replicates per strata is not stated but due to the high degree of natural variation in benthic invertebrate sampling lets assume that a minimum of six samples per strata will be collected at each sampling period. The author indicates that taxonomic ID and other laboratory processing of the samples will be necessary. At a minimum this will cost \$200 per sample (conservative cost estimate from the Utah State bug lab), this will result in a minimum of:

4 strata \* 6 replicates = 24 samples per visit \* 12 visits per year = 288 samples/year \* 3 years = 864 samples \* \$200 per sample for laboratory processing = ~\$173k in undisclosed costs

# External Technical Review #2

## Goals And Justification

The proposal identifies the restoration outcomes and presents goals and objectives in a clear manner. The proposal covers a broad conceptual framework that integrates hydrology, geomorphology and ecology. The author presents fundamental conceptual relationships well using both visual aids and text (primarily using references to supporting documents). Hypotheses are well structured (3 tiers) and readable. The author could have spent more time justifying hypotheses relative to knowledge gaps, more closely identifying how the hypotheses complement and improve upon prior research. However, the overall innovation is well conveyed.

## Approach

The author presents sufficient information on the broad structure and methodology to indicate that intended data and analysis will result in answers to research hypotheses. A particular strength of this proposal is that it builds upon a strong ongoing data set and past research in the study area. The author presents past findings and indicates how the current objectives build upon prior work. The author clearly acknowledges that the contributions of this research need to be placed within the constraints of the topical and environmental context of the study. However, he conveys that the general nature of the methods and overall research design are of utility and that, particularly given similar ongoing studies (Trinity and Yuba Rivers), this research will contribute to regional generalizations that will benefit future CALFED (and other) efforts in river habitat rehabilitation. Examples of particular contributions from this study include: (1) assessment of whether redds prefer natural to constructed spawning habitat (is gravel augmentation useful?), (2) evaluation of the spatial and temporal fate of constructed spawning habitats (is it worth it to build them?), and (3) examination of the benefits of SHIRA and its scientific approach (how and where do we build them?) Answers to these

## External Technical Review #2

questions address research gaps and provide decision-makers with practical information needed to determine whether to, and how to, implement a gravel augmentation project.

### Technical Feasibility

This is an ambitious project requiring major data collection, analysis, and integration of project components. However, the author appears to be familiar with all of the technical needs, is hiring supporting expertise where needed (ecologist, geomorphologist), and is building on an ongoing project with established research relationships. He has also requested the substantive funding over a significant time frame (3 years) required to address the project objectives.

### Performance Measures

Data collection procedures and timing are reasonable given project goals. The proposal addresses each task specifically addressing how tasks are related to hypothesis testing. The rationale for particular procedures is briefly address is most instances (primarily by citation), but this component of the proposal could have been improved. Data analysis appears to be consistent with the fundamental conceptual hydrogeomorphic and ecological framework, as well as the specific objectives. The monitoring and evaluation aspects are well described in the text, supplemented by tables and figures, and provides sufficient information for the reader to feel that the performance of the gravel augmentation project (with respect to project objectives) can be assessed.

### Products

Based on the products of his previous work (that he is building on in this proposal), the project will lead to substantial useful information to scientists (numerous peer-reviewed publications and professional presentations), and resource managers/other decision makers (professional reports, SHIRA web site, and regional community, agency, and organizational involvement.) The proposal clearly states that all data will be made available on the SHIRA web site. Reports

## External Technical Review #2

and research articles which cite the web site should help to promote access to the data. Given the clear project design and past research publication success from the previous study that this one is building on, peer-reviewed publication is highly likely.

### Capabilities

The PI appears to have the scientific expertise and local experience needed to manage this project. He has appropriately requested other team members that will complement his skills (ecologist, geomorphologist) and provide the foundation necessary for this hydrogeomorphic assessment of aquatic habitat. Only the PI has been identified to date, but his performance record clearly indicates that he can complete this project.

### Budget

Although the budget requested is substantial, it reflects the ambitious scope of this project. Specific tasks are identified, with associated labor time and cost, and unusually expensive equipment items (Trimble RTK GPS) are well justified given the high spatial resolution needed to accomplish project goals.



# External Technical Review #3

## Goals And Justification

The proposal presents a great deal of background as justification for the proposed work. Restoration actions to be monitored are in place and have been thoroughly documented. Proposed monitoring will greatly increase the volume of knowledge from previous restoration actions. Hypotheses are clearly stated and are well justified with voluminous background data. Previous studies cited in the proposal further add to justification of the work.

## Approach

Methodologies proposed are appropriate and proven to meet the study's objectives. The history of work performed in the study area will complement work proposed. Areas used for Chinook spawning below valley rim dams, such as this proposed work area, are critical for maintaining and enhancing production of protected and commercially important species. Results from the proposed work should aid future projects in designing restoration actions in other California watersheds. Results from the proposed work may be used to assess the need for gravel augmentation and if so, will provide empirical and theoretical information that will aid in the design of such projects. Those benefitting from the include decision-makers assessing the need for stream bed augmentation projects, and for funding agencies and organizations.

## Technical Feasibility

Methods proposed are technically feasible and are well outlined in the proposal. The project is multi-scalar; each scale has specific, justified objectives. Methodologies proposed are proven.

## **Performance Measures**

Data collected by the proposed monitoring will indeed allow evaluation of the restoration actions being monitored. The restoration actions were well documented so that their impacts may be measured as part of this monitoring proposal. Data collected will be of interest to fisheries and geomorphology professionals and students, and proposed presentations of data will be well received, I suspect. Proposed work will adequately assess the performance of the restorations actions being monitored, and will result in data applicable to other watersheds in California and further abroad. Rationale for the performance measures are fully justified with supporting material included in the proposal and the many studies cited.

## **Products**

Data collected as part of this project will be used by resource managers, funding agencies, and researchers for similar restoration actions in the future in this and other watersheds. The data will support stream bed augmentation where appropriate and will assist in future project design. The proposed work will also provide real world examples for students, likely increasing interest in resource management. I suspect data will be of high quality and will be very valuable to a variety of audiences. Data will be disseminated through well respected public forums, including oral presentations at professional conferences, university seminars, and university courses. Data will also be published in professional journals adding to the growing body of knowledge.

## **Capabilities**

The project's team is led by well respected members of the research community. Resources for successfully completing proposed work are readily available to the team. The PI is very familiar with the project sites.

## External Technical Review #3

### **Budget**

To the best of my knowledge and experience, the budget appears to be reasonable.

### **Additional Comments**

The proposal was very well prepared with ample supporting material and clear goals and methodologies.

# Budget Review

1. Does the proposal include a detailed budget for each year of the requested support?

Yes.

If no, please explain:

COMMENTS: 1. IDC rate is at 25% 2. Does not charge IDC on equipment, but charges IDC for supplies & expendables 3. Review supplies & expendables & equipment listed - ensure no duplicative charges w/ OH/IDC items

Budget Detail/Administrative Overhead Fees - Budget detail combines the labor rates with the direct overhead rate. The labor rate, benefits and indirect rate should be itemized in the format provided by the PSP to enable reviewers to better evaluate and ensure that proposed labor rates are comparable to state rates.

If proposal is funded, a detailed list of items included in the indirect cost rate should be provided by the grantee. Grantee must provide itemized and detailed information included and charged as part of Indirect Rates (IDC) charges.

Note: No overhead or indirect rate charges on the equipment purchases should be allowed as part of the budget that shall be funded as a result of this PSP.

2. Does the proposal include a detailed budget for each task identified?

Yes.

If no, please explain:

COMMENTS: Need add'l info.

Tasks & Deliverables - Grantee must provide detailed info for all work including subcontractor work for each specific task, services, and work to be performed with the appropriate & corresponding deliverables or end product for each task(s) and/or sub-tasks. Costs associated with each task & deliverable should be evaluated based on what is considered to be

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## Budget Review

**reasonable costs for performing similar services.**

3. Are project management expenses appropriately budgeted?

**Yes.**

If no, please explain

**COMMENTS: 1. Proj Mgmt \$\$ charges 15 to 20% &has escalation for each year 2. Review budget careful prior to award for rates &escalation**

4. Does the proposal clearly state the type of expenses encompassed in indirect rates or overhead costs? Are indirect rates, if used, appropriately applied?

**Yes.**

If no, please explain

**COMMENTS: 1. Note: special rate of 10% for Resources Agency agreements was revoked 2003 2. Current IDC rate is 25% for all state agencies except Food &Ag**

**Budget Detail/Administrative Overhead Fees - Budget detail combines the labor rates with the direct overhead rate. The labor rate, benefits and indirect rate should be itemized in the format provided by the PSP to enable reviewers to better evaluate and ensure that proposed labor rates are comparable to state rates.**

**If proposal is funded, a detailed list of items included in the indirect cost rate should provided by the grantee. Grantee must provide itemized and detailed information included and charged as part of Indirect Rates (IDC) charges.**

**The Grantee should charge a reduced indirect cost rate to the state for services that will be subcontracted by the grantee. (Researching SCM Section 3.06 B).**

5. Does the budget justification adequately explain major expenses? Are the labor rates and other charges proposed reasonable in relation to current state rates?

**Yes.**

## Budget Review

If no, please explain:

**COMMENTS: 1. Note escalation is applied to multiple labor categories for each year 2. If awarded, &time/year ctr is executed funds may change REVIEW CAREFULLY**

6. Are other agencies contributing or likely to contribute a share of the projects costs?  
**No.**

7. Does the applicant take exception to the standard grant agreement's terms and conditions?  
If yes, are the approaches the applicant proposes to address these issues a reasonable starting point for negotiating a grant agreement?  
**Yes.**

If no, please explain:

**COMMENTS: 1. Multiple exceptions - need careful review prior to award**

**Contract Language Exceptions - Proposals submitted by grantees which identify exceptions to State of California's standard contract language provisions as provided in the 2004 PSP; and/or submit alternative contract language in lieu of the State's standard contract language should be carefully reviewed prior to awarding grant funds. Review will initially be conducted by the funding agency's contract office and referred to the legal department as needed.**

8. Are there other budget issues that warrant consideration?  
**Yes.**

If yes, please explain:

**COMMENTS: 1. All budget issues already noted**

Other comments:

**SUPPLEMENTAL COMMENTS: 1. Proposal will need some rework before it can be a final SOW/agreement 2. Budget detail for labor categories need format revised to for clarity 3. Most deliverables are reports (very general) and will be completed**

Budget Review

on 36th month of agreement. Does not provide time for funding agency review or approval. 4. Need more detail on deliverables/reports by task/subtask

END OF REVIEW

# Environmental Compliance Review

1. Is compliance with California Environmental Quality Act (CEQA) required for this project?

**Yes.**

2. Is compliance with National Environmental Policy Act (NEPA) required for this project?

**No.**

3. Does this project qualify for an Exemption or Exclusion under CEQA and NEPA, respectively?

**No.**

Comments

Possibly, there was not enough detail to accurately identify which CEQA document would be required. NEPA could be required if the project needs Federal approval of a permit. Since steelhead is a federally threatened species, and may be impacted the applicant should consult with NOAA fisheries to determine exactly what will be required of them.

4. Did the applicant correctly identify if CEQA/NEPA compliance was required?

**No.**

Comments

Yes and No. The applicant stated that EBMUD has a 1600 in place for gravel augmentation and the associated tasks are covered until 2008. The number of the Streambed Alteration Agreement (SAA) was not disclosed on the checklist. The SAA would have required a CEQA document and the applicant states this proposal's monitoring is covered by that CEQA document. The title and number of the CEQA document was not disclosed.

5. Did the applicant correctly identify the correct CEQA/NEPA document required for the project?

**No.**

Comments:

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## Environmental Compliance Review

**Please see comment above for #4.**

6. Has the CEQA/NEPA document been completed?

**Yes.**

7. If the document has not been completed, did the applicant allot enough time to complete the document before the project start date?

**Does not apply.**

8. If the document has not been completed, did the applicant allot enough funds to complete it?

**Does not apply.**

Comments:

**Again, I am not sure the current CEQA document covers the tasks associated with this proposal. See comment #4.**

9. Did the applicant adequately identify other legal or regulatory compliance issues (Incidental Take permits, Scientific Collecting permits, etc.) that may affect the project?

**No.**

Identify those additional permits that may be needed by this project:

**Electroshocking practices will require consultation with NOAA Fisheries for steelhead and a Scientific Collecting Permit may be required for macroinvertebrate collections.**

10. Does the proposal include written permission from the owners of any private property on which project activities are proposed or, if specific locations for project activities are not yet determined, is it likely that permission for access can be obtained?

**Does not apply.**

11. Do any of these issues affect the project's feasibility due to significant deficiencies in planning and/or budgeting for legal and regulatory compliance or access to property?

**No.**

Comments:

**The applicant states that EBMUD will most likely conduct the fisheries work and they may have permits in place and if not,**

Environmental Compliance Review

I anticipate no major obstacles.

# Prior-Phase Funding Review #1

List the other CALFED or CVPIA grants received by this applicant for which your agency manages contracts:

<b>Project Title</b>	McCormack-Williamson Tract Restoration Planning, Design and Monitoring Program I
<b>CALFED Contract Management Agency</b>	USFWS
<b>Amount Funded</b>	556200
<b>Date Awarded</b>	1999/01/01
<b>Project Number</b>	99-B193

3. Have negotiations about contracts or contract amendments with this organization proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?

**Yes.**

4. Are the status, progress, and accomplishments of the organization's current CALFED or CVPIA project(s) accurately stated in the proposal?

**Yes.**

5. Has this organization made adequate progress towards these project(s)' milestones and outcomes, without unreasonable divergences from project schedules or poor-quality deliverables?

**No.**

University of California, Davis (UCD) was the cooperating organization for the above referenced contract. The technical work conducted, as described in the scope, was excellent and much of the information produced by this contract has been disseminated through briefings, talks, and meetings. However, the final report was not received until 16 months after the expiration of the contract, due to re-analyzing of data and modifications of the final report.

6. Is the applicant's reporting, record keeping, and financial management of these projects satisfactory?

**Yes.**

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Prior-Phase Funding Review #1

7. If this application is for a next phase of a project whose contract your agency currently manages, will the project(s) be ready for next-phase funding to monitor and evaluate project outcomes in fiscal year 2005/6, based on its current progress and expenditure rates?

**Yes.**

## Prior-Phase Funding Review #2

List the other CALFED or CVPIA grants received by this applicant for which your agency manages contracts:

<b>Project Title</b>	Linked Hydrogeomorphic-ecosystem Models to Support Adaptive Management: Cosumnes-Mokelumne Paired Basin Project
<b>CALFED Contract Management Agency</b>	NFWF
<b>Amount Funded</b>	1546016
<b>Date Awarded</b>	1999/01/01
<b>Project Number</b>	99-NO6

3. Have negotiations about contracts or contract amendments with this organization proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?

**No.**

**Previously funded projects required negotiation between UCD, NFWF and CALFED to resolve Rights In Data issues.**

4. Are the status, progress, and accomplishments of the organization's current CALFED or CVPIA project(s) accurately stated in the proposal?

**Yes.**

5. Has this organization made adequate progress towards these project(s)' milestones and outcomes, without unreasonable divergences from project schedules or poor-quality deliverables?

**Yes.**

6. Is the applicant's reporting, record keeping, and financial management of these projects satisfactory?

**No.**

**Invoices are good. Delays in fiscal quarterly report due to the project staff not having access to full financial data.**

7. If this application is for a next phase of a project whose contract your agency currently manages, will the project(s) be ready for next-phase funding to monitor and evaluate project

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Prior-Phase Funding Review #2

outcomes in fiscal year 2005/6, based on its current progress and expenditure rates?

**Yes.**

Other comments:

**NFWF was the contract manager for 99-N06, which is complete.  
FWS is the contract manager for the gravel demonstration  
project.**

## Prior-Phase Funding Review #3

List the CALFED or CVPIA funded phases of this project for which your agency manages contracts:

<b>Project Title</b>	Demonstration Project to Test a New Interdisciplinary Approach to Rehabilitating Salmon Spawning Habitat in the Central Valley
<b>CALFED Contract Management Agency</b>	USFWS
<b>Amount Funded</b>	299393
<b>Date Awarded</b>	2002/01/01
<b>Lead Institution</b>	University of California at Davis
<b>Project Number</b>	113322G003

List the other CALFED or CVPIA grants received by this applicant for which your agency manages contracts:

3. Have negotiations about contracts or contract amendments with this organization proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?

**Yes.**

**Initial budget underestimated by \$42,000.**

4. Are the status, progress, and accomplishments of the organization's current CALFED or CVPIA project(s) accurately stated in the proposal?

**Yes.**

5. Has this organization made adequate progress towards these project(s)' milestones and outcomes, without unreasonable divergences from project schedules or poor-quality deliverables?

**Yes.**

6. Is the applicant's reporting, record keeping, and financial management of these projects satisfactory?

**Yes.**

**Their quarterly reporting is exemplary.**

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Prior-Phase Funding Review #3

7. If this application is for a next phase of a project whose contract your agency currently manages, will the project(s) be ready for next-phase funding to monitor and evaluate project outcomes in fiscal year 2005/6, based on its current progress and expenditure rates?

**N/A**