

Proposal Reviews

#66: TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH

Environmental Science Associates

Initial Selection Panel Review

Research and Restoration Technical Panel Review

Bay Regional Review

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Environmental Compliance

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Initial Selection Panel Review:

CALFED Bay-Delta 2002 ERP PSP Initial Selection Panel Review

Proposal Number: 66

Applicant Organization: Environmental Science Associates

Proposal Title: TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH

Please provide an overall evaluation rating.

Explanation of Recommendation Categories: Fund

- **As Is** (a proposal recommended for funding as proposed)
- **In Part** (a proposal for which partial funding is recommended for selected project phases or components)
- **With Conditions** (a proposal for which funds are recommended if the applicant contractually agrees to meet the specified conditions)

Consider as Directed Action in Annual Workplan (a proposal addressing a high priority action that requires some revision followed by additional review prior to being recommended for funding)

Not Recommended (a proposal not currently recommended for funding-after revision may be considered in the future)

Note on "Amount":

For proposals recommended as Fund As Is, Fund In Part or Fund With Conditions, the dollar amount is the amount recommended by the Selection Panel.

For proposals recommended as Consider as Directed Action in Annual Workplan, the dollar amount is the amount requested by the applicant(s).

Fund	
As Is	-
In Part	-
With Conditions	-
Consider as Directed Action	-
Not Recommended	X

Amount: **\$0**

Conditions, if any, of approval (if there are no conditions, please put "None"):

none

Provide a brief explanation of your rating:

A lot of good data could come from this study but it is not obvious how this project will relate to restoration of these systems and how the proposed model to be developed can be used for channel construction. More justification is needed in this area. There was a weak discussion of the systems model and the biogeochemistry aspect of the proposal was also weak. The proposal needs to justify how studying channels that may form naturally will benefit restoration. The team is qualified and should consider resubmitting a revised proposal in the future if the above concerns can be addressed.

Research and Restoration Technical Panel Review:

CALFED Bay-Delta 2002 ERP PSP Research and Restoration Technical Panel Review Form

Proposal Number: 66

Applicant Organization: Environmental Science Associates

Proposal Title: TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH

Review:

Please provide an overall evaluation summary rating:

Superior: outstanding in all respects;

Above Average: Quality proposal, medium or high regional value, and no significant administrative concerns;

Adequate: No serious deficiencies, no significant regional impediments, and no significant administrative concerns;

Not Recommended: Serious deficiencies, significant regional impediments or significant administrative concerns.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
-Superior	A lot of good data could come out of the intensive study relating abiotic processes in low-order channels to the biotic community. However, the applicants did not convince the panel that, for the purposes of designing a restoration model that can be applied in the field by construction crews, it would serve the intended purpose. More justification is needed here regarding this issue. The physical forces driving the formation of low-order channels might be a better focus and we suggest that the applicants resubmit such a proposal after rethinking the end-use application of the model. The panel feels that the team proposing the work is a good mix of academics, agency scientists, and consultants and is a strong team for doing a revised project. Many reviewers felt that these low-order channels form on their own. They didnt convince us that this research would actually drive actual restoration design in the field.
-Above average	
XAdequate	
-Not recommended	

1. **Goals and Justification.** Does the proposal present a clear statement of goals, objectives and hypotheses? Does the proposal present a clear justification and conceptual model for the project?

Goals. The goals and objectives are stated clearly. This project is primarily a research project although they are developing a plan for a future restoration pilot project. The focus is on low-order tidal channels and associated marsh and the abiotic and biotic processes that determine their structure and function. They will identify the hydrological, biogeochemical, and geomorphological processes associated with these channels and then link the vegetation, invertebrate, and bird communities with them. They will develop an ecological process and spatial model which will be used to develop a restoration design model for creating and

linking low-order channels to higher order channels. They will develop a restoration plan for a pilot demonstration project to be carried out in a later Phase 2.

Linkages between the data collection/modeling and the restoration plan are unclear.

The research is important and needed.

Justification. Large-scale restoration projects generally don't deal with these small channels. They focus on elevation and high-order channels. Two at-risk species require low-order channels, marsh thistle and California clapper rail.

They state that it is critical to understand and describe the physical controls dominating lower-order channel presence and perseverance. The study would increase our understanding of tidal marsh structure and function.

The project as a restoration project as opposed to a research project might be better if focused on understanding the formation processes of low-order tidal channels.

They present conceptual models diagrammatically which is nice.

A reviewer states that it may be best to restore proper elevations and tidal prisms and let lower order creeks evolve over time, that attempts to create these are short-lived due to sedimentation.

A second reviewer feels that channel density may be more important than channel order.

The conceptual model is described and well documented except some linkages are weak, e.g. associations between small creeks and at risk species are not documented with any references.

2. **Likelihood of Success (Approach, Feasibility, Capabilities and Performance Measures).** Is the project likely to succeed based on the approach, feasibility and project team capabilities? Are the proposed performance measures adequate for measuring the project's success?

Approach. They will be identifying the key hydrological, biogeochemical, and geomorphological processes of lower-order channels and then correlate these to plant and animal communities. To do this they will be intensely measuring a multitude of variables too long to list here. They will focus on ecological processes affecting structure and function associated with first and second order channels. Their overall goal is to develop an ecological process and spatial model, which they will then use to develop a restoration design model for linking lower-order to higher-order channels. The goal of the design model is to restore low-order tide channels at an accelerated rate. It would have been helpful if the applicants had speculated about some scenarios about just how this might be accomplished in the field during the construction process.

These investigators could do a good job of measuring all the parameters that they propose to do. But how will that information be used? Our concern is whether or not the end product will result in a method that can be practically applied to restoration design. We feel certain that lower order channels are important ecologically to the plant and animal communities and are confident that they would demonstrate that. These small channels provide the means by which animals access the rich marsh surface. Our big question is will it be practical economically, however, for construction firms to build lower order channels into created or restored marshes. What methods and equipment would be necessary to do this? It may be a better approach to focus on the physical parameters that result in the formation of lower order channels. What are the forces driving channel formation? All the biotic measurements (and many of the biogeochemical

measurements) at this stage may be unnecessary or premature. So rather than linking a suite of abiotic measurements to the biotic ones, focus on what drives the low-order channel formation. Hydrology, sedimentation, elevation, slope, soil characteristics, etc. would be important places to start. Measurement of some of these parameters they include in their proposal but it might be appropriate if the whole direction of the proposal is redirected.

A few sampling questions and comments: Plant productivity will be measured by measuring photosynthesis (how many samples?). Then they say vegetation studies will be limited to measuring the dead material in winter. Something is amiss here. How will they measure dead vegetation removal and decomposition? How many samples? An estimate of the number of vegetation transects would be nice. Will sedimentation be quantified on the marsh surface and if so how? How many water quality samples? We are surprised they haven't already identified the study sites. An approximate number of invertebrate survey locations would have been nice. How frequent are the bird surveys? We trust the investigators to do the sampling appropriately but our questions of how many samples and how frequent the sampling are needed to evaluate whether or not the budget is justified. One last question on sampling why aren't any fish in the tidal channels being sampled?

A reviewer feels that the biogeochemical process section is weak and should be linked to vegetation and invertebrates via measurements of redox potential and soil salinity. It is also stated that the CANOCO analysis is not appropriate as being applied to this project design. Also they have ignored the underground component of the plants.

Another reviewer feels that the collection of all the various constituents is not fully justified, e.g. carbon flux measurements. More details on sampling design related to the channel network are needed and disturbance history.

Another reviewer says the approach is based on a strong science framework of careful observation and modeling, then experimentation and model validation.

Local studies on low order tidal channels have been published but not cited (See Collins et al. 1987).

Feasibility. The study as they present it is feasible. Our question is the usefulness of the outcome (see comments above). They will be studying channels down to 20-50 cm in width. These channels are likely important to the biotic community and we feel that they will be able to demonstrate that, but we wonder about the practicality of trying to make these in the construction process, which we presume would be the end-application of this research. Exactly how mechanically would it be done and how expensive would it be? There's no use spending nearly \$2 million to come up with a design only to be unable to ever put it into practice on a large scale.

A reviewer feels that unaltered reference sites in this mosquito-ditched marsh will be difficult to find.

Another reviewer questions whether when dikes are broken and the introduced tidal flows change the whole dynamic this background data collected will be irrelevant.

Approach is carefully laid out documenting all methods.

Capabilities. The applicants appear well qualified from the information provided in the proposal.

A reviewer states that Dr. Callaway is the greatest strength of this proposal.

Another reviewer states that the team has many years of experience designing and performing interdisciplinary research.

Performance Measures. Performance will be evaluated by successful data collection, model generation, and delivery of timely reports.

3. **Outcomes and Products.** Will the project advance the state of scientific knowledge in general and/or make an important contribution to the state of knowledge of the Bay-Delta Watershed? For restoration proposals, is the project likely to contribute to ecosystem restoration or species recoveries in a significant way? Will the project produce products useful to decision-makers and scientists?

Products will include the data and models contained in a series of reports. There will be products of value coming from the monitoring program in that linkages between low order channels and the biotic community will be intensively studied. Parameters measured in the water column will also be linked to channel size. We are not confident that a design model showing the importance of low-order channels will be able to be practically applied to actual marsh construction in a cost-effective manner. It would have been valuable to have some estimates from construction engineers as to how much it would cost to build such channels.

4. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

The budget seems extraordinarily high.

One reviewer states that the budget is ludicrous and is [taking] CalFed to the cleaners. The project manager alone is \$219K. A reviewer states that the most reasonable figure is the subcontract to Dr. Callaway for \$45K.

A second reviewer concurs stating that the budget is too high for the work proposed with an overwhelming amount going to salary or services/consultants without justification. A third reviewer states that the budget is high for a focused project that will restore no acreage. However the science is needed and will be connected to a pilot study.

5. **Regional Review.** How did the regional panel(s) rank the proposal (High, Medium, Low)? Did the regional panel(s) identify significant benefits (regional priorities, linkages with other activities, local involvement) or impediments (local constraints, conflicts with other activities, lack of local involvement) to this proposal? What were they?

Rank = Low

The reviewer feels these tidal channels form naturally so the study is not needed. Applicants have support from DWR, DFG, and USFWS who will help identify study sites and who have collecting permits. The reviewer feels this project is not necessary to proceed with restoration projects in Suisun Marsh since these channels form naturally. The applicants say this project would complement a project funded in 1999 and would use vertebrate data gathered in other CalFed projects. The project has the support of the Suisun Marsh Restoration Team (DWR) and would be coordinated with SMC and other Suisun CalFed projects.

6. **Administrative Review.** Were there significant concerns about the proposal with regard to the prior performance, environmental compliance and budget administrative reviews? What were they?

Prior Performance no reviews

Environmental Compliance The reviewer states that they would need a scientific collecting permit, 2081 permit, and a listed plant permit. Installation of gauges, etc. may require CESA and FESA permits, a 1600 agreement and corresponding CEQA and NEPA documentation. Some species are fully protected no take.

The applicants state that since this project is restricted to research, CEQA/NEPA and other regulatory requirements do not apply. And they say members of the project team hold scientific collection permits (p.11).

The reviewer states that no environmental compliance task is listed in the work schedule (Table 2) or in the budget summary, however the budget justification identifies some.

These do not impair the feasibility of the project.

Budget no problems according to budget reviewer

Miscellaneous comments:

External Scientific Review. 2 Excellent, 2 Good (1 is Good-Poor), 1 Poor

Bay Regional Review:

Proposal Number: 66

Applicant Organization: Environmental Science Associates

Proposal Title: TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH

Overall Ranking: Low -Medium -High

Provide a brief summary explanation of the committee's ranking:

The panel believes this study is not necessary to proceed with ecosystem restoration since the features to be studied are something that form naturally as a result of tidal processes, particularly in areas like Suisun Marsh where most restoration sites are fairly deeply subsided.

1. Is the project feasible based on local constraints?

Yes -No

How?

Applicants state they have significant support from DWR, DFG, and USFWS, who have promised to help them identify study sites in Suisun Marsh, and that members have scientific collecting permits from DFG. The proposed work in this phase is research only, and so environmental compliance is not required.

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

-Yes XNo

How?

The panel believes that this project would not be useful for restoration projects in Suisun Marsh. The panel believes this study is not necessary to proceed with ecosystem restoration since the features to be studied are something that form naturally as a result of tidal processes, particularly in areas like Suisun Marsh, where most restoration sites are fairly deeply subsided

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

Yes -No

How?

The applicants state that it would apparently complement Understanding Tidal Restoration Processes and Patterns funded in 1999, which addresses larger-scale restoration processes than this proposed study. However, see #2, above. It would use vertebrate data being

gathered by other CALFED projects in Suisun (unspecified).

4. Does the project adequately involve local people and institutions?

Yes -No

How?

The proposed project has the support of the Suisun Marsh Restoration Team (DWR), and would be coordinated with SMC and with CALFED projects in Suisun.

Other Comments:

None

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **66**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH**

Conflict of Interest Statements:

I have no financial interest in this proposal.

XCorrect

-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

NONE

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;

Good: quality but some deficiencies;

Poor: serious deficiencies.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
X Excellent	I rate this proposal high because it has integrated disciplines but also modeling to discover what sustains and creates small scale hydrology in tidal marshes. This information will provide strong support for new restoration techniques aimed at creating small creeks for at risk species. It weakness is that no wetlands are directly restored in Phase I, but it may support a large project(s) after Phase II.
-Good	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

The project goal appears to be to develop the science and techniques to sustain and restore small-scale tidal creeks in support of at risk species. The goal would be realized in two phases. The first phase will identify and model the processes that create and maintain low order creeks in tidal marshes where two at risk species are found. In the second phase, the team will use the model to design and test pilot experiments to support small creeks and use the result to inform management. The objectives for phase one follow the goal, and each has hypotheses developed as questions in Table 1. An overarching hypothesis frames the entire effort: understanding small tidal creeks will help us restore this habitat type for at risk species. The reseach is important and needed, as many restoration plans are getting

underway. The plan fulfills several of CALFEDs ERP goals and restoration priorities and will provide useful information.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Because all sorts of human modifications have destroyed small-scale hydrology in the Delta, and small creeks are associated with at risk species, this work could be very valuable. The conceptual model is described and well documented, except some of the linkages are weak. Specifically, the associations between small creeks and at risk species are not documented with any references. One of the strengths is a diagram of the conceptual model (Figure 4). The selection of project scale is appropriate.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

The approach is based on a strong science framework of careful observation and modeling (Phase I), then experimentation and model validation (Phase II). It is presented clearly and diagramed in Figure 3 to show how it supports the CALFED restoration program. This research will generate new information and likely, new ways to sustain and restore small-scale hydrology in tidal marshes.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

The approach is carefully laid out, documenting all the methods to be used, at least in general terms. The approach coupling observation, experimentation and modeling has proven to yield excellent information. The scale appears to be reasonable.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

The performance measures are largely administrative, including the computer model and report completion. Once a design and experiment are developed for Phase II, performance measures will be created, as outlined in the final paragraph of the Approach section.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

The products expected from this project are largely reports (processes, modeling, experimental restoration plan), and a model that could be spun off to other uses for restoration in the Delta. In the next phase, interpretive outcomes are likely from monitoring of the pilot experiments.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

A large consulting firm has teamed up with university scientists and agency personnel to form an impressive research group. This team has many years of experience designing and performing interdisciplinary research in marshes and complex modeling. They will have the tools and support for success.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

The budget is high for a focused project that will directly restore no acreage. However, the science is needed and will be connected to a pilot study (next phase). Further, this is really a senior research team with much experience.

Miscellaneous comments:

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **66**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH**

Conflict of Interest Statements:

I have no financial interest in this proposal.

Correct
 Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

Connection to co-applicant/subcontractor:

I am co-author of a book chapter in preparation on California coastal wetlands with John Callaway. I had no knowledge of this proposal or its preparation, and have no financial connection to the proposal.

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;

Good: quality but some deficiencies;

Poor: serious deficiencies.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
-Excellent	There are elements of this project which would provide useful scientific data to CALFED. Weaknesses in the sampling design and inadequate justification of the model preclude an excellent rating. It is difficult to say if this is a GOOD MINUS or POOR PLUS proposal. If science were the only criteria, I would say it is a GOOD MINUS. When the budget is factored in it is clear that a POOR rating is warranted. CALFED should fund high quality proposals that will help achieve priority objectives for a REASONABLE expenditure of taxpayer dollars. This project does not have the potential to yield information so useful that it justifies this expense.
-Good	
XPoor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

Goals and objectives are clearly stated. The over-arching goal is to develop an integrated restoration model based on a synthesis of hydrological, biogeochemical, and geomorphological processes that affect and interact with vegetation. Five objectives are presented relative to this goal. In summary, the applicants propose to identify key hydrological, biogeochemical, and geomorphic processes of first order tidal creeks; correlate them to vegetation structure and invertebrate communities. This work will result in a model which will be tested in a future phase of the project.

The applicants do not state testable hypotheses to support their goals.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Elements of this proposal would provide a better understanding of tidal marsh structure and function, particularly with regard to the important first order tidal creeks. The tasks which collect important hydrologic, biogeochemical, and geomorphological data relative to vegetation and invertebrate community structure would be a significant contribution to our knowledge of reference marsh systems. Some published work to date (i.e. Sanderson et al. 1999) has been cited as relevant to our understanding of vegetation structure relative to tidal channels, but in fact this research was based on limited sampling in a small portion of one marsh for only one field season and does not reflect the true pattern of the entire marsh. We certainly have a need for more comprehensive studies by experienced researchers.

The applicants present a diagrammatic conceptual model which links the general processes mentioned with ecosystem level processes. A second model provides details of how individual sampling components link to specific processes at the ecosystem level.

The selected research level of approach is justified for this project. The applicants propose to test their model in a pilot scale restoration effort in a future phase. The information generated by this proposal will be useful for restoration planning and monitoring, and it may aid in our understanding and interpretation of tidal marsh evolution as marshes are restored. The problem may lie in the objective to link this information to a model, which will be used to construct low order tidal creeks. Many individuals with restoration experience in this Estuary believe from experience with past failures that it is better to restore proper elevations and tidal prism, and then let these lower order tidal creeks evolve over time. The applicants have not justified why this particular model is needed.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

The basic premise that this important descriptive data be applied to a future demonstration project creating low order channels in tidal marsh is problematic. While this approach has yielded some success in coastal lagoon wetland such as in Southern California, it is not likely a sound restoration approach in the San Francisco Estuary. Our outflow, tidal regimes, and sedimentation processes are quite different here. It is well established that hydrology drives the geomorphic development and functioning of restored wetlands. Experience from the history of restoration efforts in this region indicates major tidal inlets, tidal prism, and elevation factors are critical. The general impression from past efforts is that low order channels are best left to develop on their own. These will be the most sustainable systems and creek networks over time.

Attempts to create the low order tidal creeks are typically short-lived due to sedimentation processes and improper landscape position. The biggest failures in restoration we have seen to date stem from attempts to over-engineer these systems. Current thinking indicates we have to allow TIME, and the distribution and sinuosity of small low order tidal creeks will evolve.

With this thinking in mind, the model as proposed may not be justified until further research is done regarding the best approaches to hydrologic components of restoration are determined. Should we create entire tidal channel networks, or should we let the finer details of these networks evolve over time? This is an important question to test rather than jumping to low order creek creation as a given end point objective.

The biogeochemical processes section of the proposal is weak. The applicants propose to evaluate water quality constituents through depth profiles with a field meter. Data from piezometers will also be measured with probes. These parameters are only part of the story. If the applicants intend to relate these data to vegetation and invertebrate community structure, they need to include parameters such as redox potential and soil salinity on an elevational gradient from the tidal creek. These key biogeochemical factors are the most highly correlated with vegetation and invertebrate community structure and they have been overlooked. For this important reason, the biogeochemical component of this study is extremely weak.

Agricultural runoff is mentioned as a factor influencing the outcome of this study. Tertiary treated wastewater discharges and urban runoff discharges into Suisun Marsh channels may have an equally important effect on channel water quality.

The hydrologic and sedimentation measures suggested will also reveal information about the creek channel but will not allow for complete correlation with vegetation and invertebrate community structure. Wetland hydroperiod measured as depth and duration of flooding will need to be measured on an elevational gradient to relate these factors to the project objectives.

The applicants propose to use CANOCO to evaluate vegetation data from transects perpendicular to channels. CANOCO is a powerful multivariate statistical technique for direct gradient vegetation community analysis, but certain assumptions and patterns must be met before the technique is employed. It is a form of multivariate regression. The transects must be randomly selected. The applicants propose tandem transects within specific locations suggesting placement may not be random. Specifically, the statistical model underlying CANOCO requires that the species abundance or frequency is a unimodal function of position along the gradient. It is not possible to choose the appropriate multivariate technique prior to preliminary examination of field collected data. In many cases, plant species occurring in Suisun tidal marshes do not occur in a unimodal position along gradients, and CANOCO is not appropriate. Pre-selection of CANOCO as the analysis tool is premature and suggests the applicants are not familiar with the requirements of this technique.

CANOCO is gaining popularity, but cases of misapplication and misinterpretation of the technique are common. The results from CANOCO suggest correlations between parameters, but do not reveal underlying causative effects. The applicants have proposed its use to link vegetation structure to process, and this will not do the job. These descriptive techniques will provide more quantitative correlations, but controlled experiments will be necessary to link pattern with process. The applicants have not included methods to fully achieve their objectives.

The applicants have not justified why they intend to measure plant productivity through expensive and labor intensive photosynthetic measurements rather than biomass measurements, or stem diameter and density correlations with biomass. They have ignored the fact that the

majority of plant productivity in the tidal marshes is the underground component of biomass, and have not suggested standard sampling methods to assess this component. The limitation of productivity sampling to dead plant material in winter doesn't make any sense when they say photosynthetic measurements will be used. The vegetation evaluation component of this proposal is weak.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

It will be difficult to find reference sites that will generate realistic data on tidal creek function, since the majority of low order tidal creeks in Suisun tidal marshes have been altered by historic mosquito ditching. The applicants have not identified specific sites where it will actually be feasible to conduct this study. They have also not mentioned potential permitting constraints that will be in place to protect endangered species while this intensive study is conducted.

The approach is well documented, but key parameters of biogeochemical and hydrologic function have been omitted. The link of important data collection on tidal creeks, to a model for creating tidal creeks is not substantiated. The applicants should consider whether creation of low order creeks is a better approach than natural evolution of low order creeks.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

The applicants contend that performance can be evaluated by quantifying the successful collection of data and generation of models, as well as timely production of contract deliverables. These are reasonable measures.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

The applicants have planned a schedule with preliminary and final reports that will result from the project. They do not propose any additional interpretive displays or presentations for resource managers or the general public.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

Niall McCarten, the project manager has a good track record of botanical census work in the San Francisco Estuary. Dr. McCarten has strong botanical skills, and has experience in project management as a consultant. Dr. McCarten does not have recognized expertise in tidal hydrology, biogeochemistry, or hydrogeomorphology which are the focus of this study.

Dr. John Callaway is a recognized expert in tidal marsh restoration, and particularly in tidal marsh hydrology. Dr. Callaway is involved as a minor subcontractor in this study based on budget allocations. In my view, the greatest strength of this proposal is the inclusion of Dr. Callaway.

The other project participants are affiliates of the primary consulting firm, and none of them have significant direct experience in tidal marsh ecology. However, this collaborative team has the right expertise to do the work. The project team for this application is huge, and the size and expense seem out of proportion to the data collection and model development objectives as proposed. If all of these people actually run around in the sensitive reference marsh it will not be a good thing.

8. Cost/Benefit Comments. Is the budget reasonable and adequate for the work proposed?

The weakest part of this proposal is the budget. This project is asking for close to \$2 million for a two year study which involves limited data collection and model development. The evaluation of functions associated with tidal creeks would be a valuable contribution, but I am not convinced we need this model or that creek construction makes sense in this Estuary. These concerns aside, the project appears to be way over-budgeted. In my opinion, this project is another example of attempts to take CALFED to the cleaners. If CALFED were to ask a University research group to scope this same question and meet the objectives, I estimate the budget would come in at approximately 20 to 25% of what these consultants have requested. Other consultant generated proposals to CALFED have presented reasonable budgets. There is no reason they can't all do this and still turn a profit. This budget is ludicrous. The project manager alone will receive \$218,700 in salary for the two years, and he has submitted multiple proposals to CALFED with the potential to be earning these rates on all of them simultaneously. The most reasonable figure in the budget is the \$45,525 allocated to Dr. Callaway on subcontract. The soils analyses can be done much more economically. Plant and soil field equipment budget items appear to be over-inflated. The entire budget is well out of line for the work proposed.

Miscellaneous comments:

- no additional comments -

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **66**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH**

Conflict of Interest Statements:

I have no financial interest in this proposal.

Correct

Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;

Good: quality but some deficiencies;

Poor: serious deficiencies.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
-Excellent	The monitoring plan (Tasks 1-4) is technically feasible and has a high likelihood of success. These components will provide a wealth of baseline data that will be useful for later restoration studies. However, the analysis and linkage between the component parts is weaker. Also of concern is the the integrated restoration design model. Specifically, the background data and modeling on Suisun Marsh is on its existing configuration. Removing dikes and reintroducing stronger tidal flows will completely change the whole dynamic. This background data may be completely irrelevant other than to later document the later change in the system. The budget is quite high and could be pared back.
XGood	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

The overall goal of the project is to develop an integrated restoration model and restoration plan for lower-order tidal channels in Suisun Marsh. Most of the project's objectives deal with the extensive monitoring and data collection of hydrological, biogeochemical and geomorphological processes that affect and interact with vegetation in the Suisun tidal marsh system. Of particular interest is the role of the first and second order drainage

channels in marsh ecological function. The main focus is on this monitoring and data collection in the present marsh system with the hope that it will inform the development of a future restoration plan. There is a reasonable consistency between the various objectives but I am unsure how the planned monitoring/data collection and modelling will ultimately inform the restoration plan. The proposal does not clearly make these linkages (more on this below).

The rationale behind this restoration is that Suisun marsh as well as other marshes in the S.F. Bay-Delta region are tidally restricted due to extensive diking. Though it is not extensively discussed in this proposal, I presume that there are plans to remove dikes and reintroduce more natural tidal flows to the Suisun marsh. The question of marsh restoration is timely and important in San Francisco Bay as well as elsewhere around the country and the world.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

One of the justifications for this project is the potentially important role that low order channels play in tidal salt marshes. These features are ubiquitous in natural salt marshes and serve as a critical interface between the marsh and neighboring estuarine systems. The proposal states that "It is critical to understand and describe the physical controls dominating lower-order channel presence and perseverance." I concur with this statement and the need for further research in this respect. The overall conceptual model is sound but is weak on the explicit role of tidal channels. The conceptual model could be strengthened by including factors concerning the channel density, which may be more important than the channel order. In tidally restricted marshes, I would expect that the channel density is lower and that upon tidal flow reintroduction, there will be a proliferation of new channels and an increase in channel drainage density.

The overall phased approach appears justified. This project is for Phase I of a two phase project. This phase is to collect the background environmental/ecological data to help develop a restoration plan. Phase II would be to implement the restoration plan. The selection of Suisun Marsh seems appropriate as this is a site of ecological importance, as well as the site of previous ecological research.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

This project would generate an incredible data base of background information concerning the daily operations of a tidal marsh. A full suite of water quality parameters would be collected. While this effort could provide useful baseline environmental data, the collection of all the various constituents is not fully justified, i.e., the carbon dioxide flux measurements. I am also unclear how all the measurements will be integrated to elucidate marsh biogeochemical processes, i.e., nutrient fluxes and transformations. My comments are similar on the water flow measurements. One of the stated objectives is to "identify geomorphological processes unique to lower order channels and potentially unique to Suisun Marsh due to agricultural runoff." Nothing in Task 2 addresses this objective (and I assume it should). The proposal does not provide needed details on the sampling design in relation to the channel network. This is a critical omission. How many channels of what orders and where in the larger marsh system will be sampled?

The proposed monitoring in Tasks 1 & 2 would then be synthesized into a hydrodynamic model. I am unaware of such detailed micro-network modeling. This component could provide some interesting insights. On page 5, the proposal discusses the selection of two small study sites of one acre or less and an incredibly detailed modeling of the marsh micro-networks. I am unsure how the sampling for Task 1 and 2 fit with the detailed modeling of micro-channel networks. It would seem more appropriate to design the sampling to at this scale to explicitly calibrate and validate the modeling effort.

Task 4 on the Structure of Biotic Communities appears straight forward. My major concern relates back to the sampling design. one sub-question to relate biotic structure to disturbance history. However, no mention is made of explicitly designing the sampling to include sites of varying disturbance history. More is needed in this respect (what is the disturbance and times since diturbance).

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

The monitoring plan (Tasks 1-4) is technically feasible and has a high likelihood of success. These components will provide a wealth of baseline data.

The analysis and linkage between the component parts is weaker. The proposal sets out an ambitious series of questions in Task 5. I am not confident the investigators will be able to answer these questions, especially those related to ecological processes (e.g., annual nutrient rtransformation and cycling within channels and vegetation). Also of concern is the the integrated restoration design model. Specifically, the background data and modeling on Suisun Marsh is on its existing configuration. Removing dikes and reintroducing stronger tidal flows will completely change the whole dynamic. This background data may be completely irrelevant other than to later document the change in the system . For example, how lower order tidal channels function in the present system may completely change under a different tidal regime. And does this tell you where you want to go, what to target for? Is there a target system that the investigators are shooting for that can be compared against the Suisun Marsh? or is Suisun marsh the reference site that the investigators are trying to emulate? The proposal is unclear in this respect.

The list of scientific literature citations documented in the proposal is quite limited.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

The performance measures are quite limited in scope.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

Products will be the reports, data sets and models. These data sets will likely be of interest to the larger research community if they are properly documented (i.e. metadata), of which no mention is made.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

I am not familiar with the specific track record of the applicants and can not comment. However, the research team assembled appears to be qualified to undertake the proposed research. It represents a mix of public agencies, private consultants and academic institutions. Project management itself will be a big task but there is someone specifically tasked to handle this component. The proposal does not explicitly discuss the infrastructure and other aspects of support. I assume each investigator is responsible for handling the necessary infrastructure. More could be stated in this respect.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

This project comes with a hefty price tag. An overwhelming portion of the budget is going to salary or services/consultants. Some of these costs appear quite high (e.g., \$198,000 to B. Bauer) without adequate justification. Some of the salary costs also appear high.

A lot of equipment costs are included as Direct costs.

While this is an ambitious project, the overall budget seems to be too high for the work proposed.

Miscellaneous comments:

External Scientific: #4

Research and Restoration External Scientific Review Form

Proposal Number: **66**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH**

Conflict of Interest Statements:

I have no financial interest in this proposal.

Correct

Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;

Good: quality but some deficiencies;

Poor: serious deficiencies.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
-Excellent	I would rank this proposal between low good and high poor. A lot of good data could come out of the intensive study relating abiotic processes in low-order channels to the biotic community. However, the applicants did not convince me that, for the purposes of designing a restoration model that can be applied in the field by construction crews, it would serve the intended purpose. I believe that the physical forces driving the formation of low order channels would be a better focus and would suggest that the applicants resubmit such a proposal after rethinking the end-use application of the model.
<input checked="" type="checkbox"/> Good	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

The goals and objectives are stated clearly. This project is primarily a research project although they are developing a plan for a future restoration pilot project. The focus is on low-order tidal channels and associated marsh and the abiotic and biotic processes that determine their structure and function. They will identify the hydrological, biogeochemical, and geomorphological processes associated with these channels and then link the vegetation, invertebrate, and bird communities with them. They will develop an ecological process and

spatial model which will be used to develop a restoration design model for creating and linking low-order channels to higher order channels. They will develop a restoration plan for a pilot demonstration project to be carried out in a later Phase 2.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

Large-scale restoration projects generally don't deal with these small channels. They focus on elevation and high-order channels. Two at-risk species require low-order channels, marsh thistle and California clapper rail.

They state that "it is critical to understand and describe the physical controls dominating lower-order channel presence and perseverance".

I think the project as a "restoration" project as opposed to a "research" project might be better if focused on understanding the formation processes of low-order tidal channels.

They present conceptual models diagrammatically which is nice.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

They will be identifying the key hydrological, biogeochemical, and geomorphological processes of lower-order channels and then correlate these to plant and animal communities. To do this they will be intensely measuring a multitude of variables too long to list here. They will focus on ecological processes affecting structure and function associated with first and second order channels. Their overall goal is to develop an ecological process and spatial model, which they will then use to develop a restoration design model for linking lower-order to higher-order channels. The goal of the design model is to "restore low-order tide channels at an accelerated rate". I would like to have had the applicants speculate about some scenarios about just how this might be accomplished in the field during the construction process.

I'm confident that these investigators could do a good job of measuring all the parameters that they propose to do. But how will that information be used? My concern is whether or not the end product will result in a method that can be practically applied to restoration design. I feel certain that lower order channels are important ecologically to the plant and animal communities and I'm sure they would demonstrate that. These small channels provide the means by which animals access the rich marsh surface. I doubt that it will be practical economically, however, for construction firms to build lower order channels into created or restored marshes. What methods and equipment would be necessary to do this? What I think would be a much better approach would be to focus on the physical parameters that result in the formation of lower order channels. What are the forces driving channel formation? All the biotic measurements (and many of the biogeochemical measurements) at this stage I believe are unnecessary or premature. If the marsh is constructed in such a way that low-order channels form on their own then I feel confident that the animals and plants will come ("Build it right and they will come" as Steve Broome once said at an ERF conference). So rather than linking a suite of abiotic measurements to the biotic ones, focus on what drives the low-order channel formation. Hydrology, sedimentation, elevation, slope, soil characteristics, etc. would be important places to start I would think. Measurement of some of these parameters they include in their proposal but I think

the whole direction of the proposal needs to be rethought.

A few sampling questions and comments: Plant productivity will be measured by measuring photosynthesis (how many samples?). Then they say vegetation studies will be limited to measuring the dead material in winter. Something is amiss here. How will they measure dead vegetation removal and decomposition? How many samples? An estimate of the number of vegetation transects would be nice. Will sedimentation be quantified on the marsh surface and if so how? How many water quality samples? I'm surprised they haven't already identified the study sites. An approximate number of invertebrate survey locations would have been nice. How frequent are the bird surveys? I trust the investigators to do the sampling appropriately but my questions of how many samples and how frequent the sampling are needed to evaluate whether or not the budget is justified. One last question on sampling - why aren't any fish in the tidal channels being sampled?

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

The study as they present it is feasible. My only question is the usefulness of the outcome (see my comments above). They will be studying channels down to 20-50 cm in width. These channels are likely important to the biotic community and I'm sure they will be able to demonstrate that, but I wonder about the practicality of trying to make these in the construction process, which I presume would be the end-application of this research. Exactly how mechanically would it be done and how expensive would it be? There's no use spending nearly \$2 million to come up with a design only to be unable to ever put it into practice on a large scale.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

Performance will be evaluated by successful data collection, model generation, and delivery of timely reports.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

Products will include the data and models contained in a series of reports. There will be products of value coming from the monitoring program in that linkages between low order channels and the biotic community will be intensively studied. Parameters measured in the water column will also be linked to channel size. I'm not confident that a design model showing the importance of low-order channels will be able to be practically applied to actual marsh construction in a cost-effective manner. It would have been valuable to have some estimates from construction engineers as to how much it would cost to build such channels.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

The applicants appear well qualified from the information provided in the proposal.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

The budget seems extraordinarily high. Also, as evident from my earlier comments, I question whether the information obtained can be practically applied in the field.

Miscellaneous comments:

External Scientific: #5

Research and Restoration External Scientific Review Form

Proposal Number: **66**

Applicant Organization: **Environmental Science Associates**

Proposal Title: **TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH**

Conflict of Interest Statements:

I have no financial interest in this proposal.

Correct

Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

NONE

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;

Good: quality but some deficiencies;

Poor: serious deficiencies.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
<input checked="" type="checkbox"/> Excellent	The proposal is well thought out and will provide an important data set that will enhance the field of marsh restoration. Additionally, if successful, the project will provide tools that will aid CALFED and other agencies in designing marsh restoration projects designed to enhance threatened and endangered species. Additionally, the design tool will help agencies evaluate the likelihood of project success when considering a marsh restoration as a mitigation project.
<input type="checkbox"/> Good	
<input type="checkbox"/> Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

The goals are well thought out and succinctly laid out within the proposal. The authors have thought out how each component of the proposal fits together and the data required to address each goal. The problem presented is timely. Marsh restoration is presently more of an art than a science. It is true the community knows a lot about individual systems within the marsh. However, we still know very little concerning how these components fit together. The proposed project provides an important step in broaden this understanding. This is an important topic for CALFED and for the restoration community in general. Data obtained in this proposal will be applicable to restoration projects outside of the San Francisco Bay

area.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

The project provides clear justification for the proposed research. The authors appear to have a firm grasp of existing literature and the difficulties in working in the marsh environment. The proposal clearly states the purpose of obtaining the extensive data set is to develop a model to assist in restoration design. While any design model can be misapplied, that is an inherent difficulty with these types of tools. It is best to have a tool developed from a sound set of data so that it is well grounded. This will occur with this project if the proposal goals are achieved.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

The approach to the project is well thought out. The only aspect of the approach that is inferred and not spelled out is obtaining data between lower and higher order channels. Since the project proposes to conduct statistical analyses to discriminate data by location I have assumed that the data collection program will obtain a background set along 3 order channel. This should be verified by CALFED. This project will broaden our knowledge concerning the complex relationships that exist between Flora, Fauna, and the small scale hydrodynamics that occur in the upper marsh regions.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

The project is technically feasible and the project has a high likelihood of success. The scale of the project is appropriate for the research objectives.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

The project will obtain the data required to develop the management model. The data collection and analysis will provide the basis for model development. Therefore, the goodness of the model will depend upon the quality of the data obtained. The proposal outlines the steps that will be completed to obtain high quality data. While a QA/QC plan was not included as part of the proposal (not usually included in a proposal) one will be developed prior to commencing field data collection.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

The data alone is a worthwhile and important product of this proposal. Additionally, the model will provide an important tool for the aiding the design of similar marsh restoration projects.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

The resumes of each of the researchers is appropriate for the task to be completed. The team has been selected to provide a high likelihood of success.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

The budget is appropriate for the scope of work. The time allocated to the tasks within the proposal appear to be adequate to accomplish the task.

Miscellaneous comments:

NONE

Environmental Compliance:

Proposal Number: 66

Applicant Organization: Environmental Science Associates

Proposal Title: TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH

1. Are the legal or regulatory issues that affect the proposal identified adequately in the proposal?

-Yes No

If no, please explain:

If vegetation sampling involves take of plant material, the project would require one of the following: Native non-listed plant: Scientific collecting permit Listed plant: 2081 permit + scientific collecting permit Seed collection, listed plant: Plant research permit.

Installation of gauges and benthic sampling may require obtaining CESA and FESA permits, a 1600 agreement and corresponding CEQA and NEPA documentation. No take of DFG fully protected species.

2. Does the project's timeline and budget reflect adequate planning to address legal and regulatory issues that affect the proposal?

-Yes No

If no, please explain:

No: Timeline Yes: Budget

No task for environmental compliance has been itemized in Table 2 (work schedule) or the Budget Summary. However, the Budget Justification identifies part of 15% of \$218,700 for project environmental compliance.

3. Do the legal and regulatory issues that affect the proposal significantly impair the project's feasibility?

-Yes No

If yes, please explain:

Other Comments:

Budget:

Proposal Number: 66

Applicant Organization: Environmental Science Associates

Proposal Title: TIDAL HYDROLOGY, BIOGEOCHEMISTRY, AND BIOTIC STRUCTURE AND FUNCTION OF LOW-ORDER CHANNELS IN SUISUN MARSH

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

Yes -No

If no, please explain:

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

Yes -No

If no, please explain:

3. Does the proposal clearly state the type of expenses encompassed in indirect rates or overhead costs?

Yes -No

If no, please explain:

4. Are appropriate project management costs clearly identified?

Yes -No

If no, please explain:

5. Do the total funds requested (Form I, Question 17A) equal the combined total annual costs in the budget summary?

Yes -No

If no, please explain (for example, are costs to be reimbursed by cost share funds included in the budget summary).

6. Does the budget justification adequately explain major expenses?

Yes -No

If no, please explain:

7. Are there other budget issues that warrant consideration?

-Yes No

If yes, please explain:

Other Comments:

information well defined in the budget summary and justification