Proposal Reviews

#23: Sources, Transport Mechanisms, and Environmental Fate of Heavy Metals and Fine Sediments Associated with Large-Scale Hydraulic Mining in the Humbug Creek Watershed

California Department of Parks and Recreation, Gold Mines Sector

Research and Restoration Technical Panel Review	
Sacramento Regional Review	
External Scientific Review	#1 #2 #3 #4
Environmental Compliance	
Budget	

Research and Restoration Technical Panel Review:

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

Proposal Number: 23

Applicant Organization: California Department of Parks and Recreation, Gold Mines Sector

Proposal Title: Sources, Transport Mechanisms, and Environmental Fate of Heavy Metals and Fine Sediments Associated with Large-Scale Hydraulic Mining in the Humbug Creek Watershed

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	**This proposal is a plan to develop a study and as such lacks the true detail and hypotheses to properly conduct the necessary research. It is strongly recommended that the PIs partner with an Hg expert and resubmit a proposal that fully integrates key Hg cycling concepts that address relevant questions regarding Hg cycling at the study sites. What is missing is the justification and documentation for the amount of money asked, who will be responsible for interpreting and writing up the data and what are their qualifications. A more focused, process directed, approach would be more cost-effective.**
-Above average	
-Adequate	
XNot 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?

   The goals and objectives of this project, however preliminary, are clearly stated. The goal of the work is to reduce the volume of sediment and Hg presumed to be released from contaminated sediments in Humbug Creek. The authors do not define certain endpoints, e.g. impacting the environment is not satisfactory what levels/rates will be considered significant and how will these be established. Developing a very well defined set of specific goals will greatly assist in managing the project properly. The hypotheses are somewhat general, due to the fact that this proposal contains a plan to develop a project dealing with mercury cycling in a contaminated set of sites. A project of this size, with a large monitoring component can easily get off track one must keep sampling efforts directly focused on these specific goals. Certain goals are reasonably well developed (e.g. sediment transport assessment) but others (e.g. biotic impacts) are poorly handled. The overall concept is quite

timely as Hg contamination from historical gold mining continues to be an important issue in the source and receptor sites (the South Yuba River, the Delta, and San Francisco Bay).

There is little argument that methylated Hg species represent a potential threat, and that historic gold mining practices have led to localized Hg contamination. Though historic Hg impacts in this area were massive on any scale, its interesting that current effects may be less evident. Why this is the case, i.e. what natural processes converge to mitigate MeHg accumulation seems to be, or should be, a fundamental question. Although a conceptual model is presented, in a proposal such as this, where the PIs have little hands-on experience in Hg-related field and laboratory experience, it neither presents new hypotheses nor builds on experiences at the current sites.

Some specific questions could have been addressed in development of a conceptual model. For example: what do upstream and downstream frog habitats suggest; what percent of the study area is vegetated; how extensive is soil cover in the area and how much of it has been disrupted by logging, mining, roads, etc.; what are the other hard rock mines (gold only?), how many are there, how extensive are their tailings; and number of tributaries? In other areas, old tailings along the stream banks often contribute more to the problem than the mine pits. In the mercury toxicology model, an arrow is needed out of the methyl mercury box to a box with a proposed bioaccumulation model for Humbug CreekWhat is the proposed bioaccumulation and trophic transfer model for Humbug Creek and what are the likely indicator species?

When complete, a study that addresses the above points will certainly yield results that would better improve our understanding of Hg from direct sources and downstream effects.

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?

Reviewers are in many respects told by the proposal authors to not challenge the approach, that any number of competent contractors could carry out the standard research plan. Given that only a very incomplete description of the standard study approach is presented in the proposal, it leaves one with more questions than answers. The proposal is in many ways a proposal to create a proposal unfortunately that leaves much to the imagination. This proposal would have certainly been strengthened by teaming with an established Hg biogeochemist to establish the research plan. In their poorly-referenced discussion section, the authors correctly identify some of the main questions regarding methyl mercury formation and transport, but they never propose a set of objectives that directly evaluate the reasons for production and transport. They present more of an assessment of concentrations. Targeting a specific process might be more useful in the long run, in that the outcomes would be more transferable to other impacted environments. A very large sum of money is proposed to be spent on new data collection - some of which appears to be similar to past collections.

The description of Effects Assessment is particularly lean. How are the uptake studies performed, what trophic levels, what species? The authors continually refer to Hg speciation (are reviewers to infer that speciation always means total and methyl Hg? If so, in ignoring other important species (e.g. Hg0), you are limiting the ability to develop mechanistic models. Other metals (selenium is even mentioned on the title page) are tangentially mentioned what level of effort is directed here and why. The education and community relations aspects of the proposal are well thought out and stand as a great example of holistic environmental education. I would however recommend that citizen involvement in certain aspects of the data collection (as suggested in the proposal) be limited to the true experts.

The concept of the approach is a good one, but the devil is in the details. For example, objective 3, assess threats to the local ecosystem is done by finding an indicator species and addressing habitat and population. How does that relate to the site of methylation, the food web of the area and factors enhancing bioaccumulation? It is difficult to determine solutions for a problem unless you understand the processes that are important and key transformation sites.

The scope of the field science and assessment is very broad and it seems very unlikely that even the worlds best contractor could satisfactorily address these multi-faceted issues in a very complex, impacted environment, in the proposed time frame (at most two and typically just one field season). These systems are likely to very heterogeneous with respect to the underlying important mechanisms regulating methylation and just identifying and mapping specific zones (to say nothing of actual rate measurement) is a major effort. Year-to-year variability could also significantly bias extrapolated measurements, and obviously any study that at its core depends on just one primary field season will potentially be affected more. In practical terms it will be very difficult (based upon just this one study) to link success probability to a given restorative strategy.

The proposal is short on specifics, indicating that these measures will be detailed in a project performance evaluation plan to be prepared at a later date. The general measures that are discussed dovetail with the project goals, but more valuable and useful measures could be presented if more specific goals were developed (as mentioned earlier). Without a detailed work plan in place (and to review), its difficult to specify (or comment on) performance measures. In a project of this type, performance will likely be synonymous with completeness (again back to the work plan), and scientific rigor or design will play a secondary role.

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?

   Useful products may be likely, but not in the current form. The listed products and outcomes are numerous and some useful (mercury hazards map, erosion process map, water quality report, EIR etc.). An integration and interpretation of other extant data is not apparent. In fact this particular effort should be a pre-requisite to full scale work plan design. With proper revision and direction from Hg experts, this could be a nice project with specific management implications.

   The PIs have vast experience in planning and delivering management results from a project. As a plan, the proposal is very well written. As a scientific study, it has major weaknesses. The PIs do not have the infrastructure on site to carry out the detailed Hg work. They would need to subcontract both analyses and modeling.

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

   This is an extremely expensive project for one that does not have a clear-cut research plan. Four months and $42,000 is a lot to develop a sampling plan. Because a sampling plan is not worked out yet and the number of samples that will be submitted for analyses is unknown it is difficult to fully answer this question. The ~500,000 amount asked for an effects assessment seems like a lot of money for sampling and analyses in a study area with ~ 7 river miles. Overall, 1.8 million dollars is too much to request to generate a mercury hot spot map, erosion hazards map, water quality report, an EIR, restoration suggestions proposal, and community education.

A not insignificant portion of the project/budget is also devoted to assessing and cataloging State Parks infrastructure and resources that might be impacted by remediation efforts. It would seem that much of this effort could/should be conducted under current or future State Parks mandates, without additional CALFED funds.

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?

   MEDIUM Proposal is to conduct studies at Malakoff Diggings mine site to determine magnitude of off site impacts of sediment and mercury, determine significant sources at the mine, develop control alternatives and conduct public outreach program. Most of this work should wait completion of work to determine the magnitude of off site impacts. If not significant, no need to proceed with other study tasks.

   The proposal indicates that virtually nothing is known about sediment/mercury loads from the mine or the off-site impacts of these discharges. If this is the case, the logical sequence of activities would be as follows: 1. Determine if off-site impacts are significant. 2. If yes, conduct site characterization to determine principal sources of mercury and sediment. 3. Based on results of #2, develop remediation alternatives. 4. Conduct cultural resource assessment and public information program in conjunction with the alternatives evaluation and select best alternative. 5. Implement remediation action. This proposal includes steps one through 4. It seems prudent to do #1 first and if the answer if no, there is no need to proceed to steps 2, 3 and 4.

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?

   Need to comply with Section 106 of the National Historic Preservation Act.

Miscellaneous comments:

None

Sacramento Regional Review:

Proposal Number: 23

Applicant Organization: California Department of Parks and Recreation, Gold Mines Sector

Proposal Title: Sources, Transport Mechanisms, and Environmental Fate of Heavy Metals and Fine Sediments Associated with Large-Scale Hydraulic Mining in the Humbug Creek Watershed

Overall Ranking: **-**Low **X**Medium **-**High

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

Proposal is to conduct studies at Malakoff Diggings mine site to determine magnitude of off site impacts of sediment and mercury, determine significant sources at the mine, develop control alternatives and conduct public outreach program. Most of this work should wait completion of work to determine the magnitude of off site impacts. If not significant, no need to proceed with other study tasks.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   Site characterization (determining mercury and sediment sources at the mine) and assessment of off-site impacts will be done using feasible and appropriate study methodology. Site reclamation (i.e. controlling the sources of mercury and sediment) may or may not be feasible, however that is not the principal focus of this project.

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

   XYes **-**No

   How?

   Project addresses the issue of sediment and mercury loading to the ecosystem (in this case, to Humbug Creek and SF Yuba River). This issue is discussed under PSP Sac Region Restoration Priority #7.

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

   XYes **-**No

   How?

   This is a site specific investigation and not directly linked to other restoration or planning projects (other than the overall effort to reduce mercury and sediment loading to the Bay/Delta ecosystem).

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

XYes **-**No

How?

This is a site specific, single issue problem and project on State Parks land. It does not require involvement of local communities or multi-stakeholder group. The education/outreach task does attempt to involve and inform Park users.

Other Comments:

The proposal indicates that virtually nothing is known about sediment/mercury loads from the mine or the off-site impacts of these discharges. If this is the case, the logical sequence of activities would be as follows:

1. Determine if off-site impacts are significant. 2. If yes, conduct site characterization to determine principal sources of mercury and sediment. 3. Based on results of #2, develop remediation alternatives. 4. Conduct cultural resource assessment and public information program in conjunction with the alternatives evaluation and select best alternative. 5. Implement remediation action.

This proposal includes steps one through 4. It seems prudent to do #1 first and if the answer if no, there is no need to proceed to steps 2, 3 and 4.

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **23**

Applicant Organization: **California Department of Parks and Recreation, Gold Mines Sector**

Proposal Title: **Sources, Transport Mechanisms, and Environmental Fate of Heavy Metals and Fine Sediments Associated with Large-Scale Hydraulic Mining in the Humbug Creek Watershed**

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:

<u>Excellent:</u> outstanding in all respects;
<u>Good:</u> quality but some deficiencies;
<u>Poor:</u> serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**This is a good proposal and I would like to see the mercury and sediment budget for Humbug Creek completed. Thus, this proposal should be funded at some level but more documentation is needed to justify the amount of money requested. 100% of the money requested in this proposal is for services and consultants. What is missing for me as a reviewer is the justification and documentation for the amount of money asked, who will be responsible for intrepreting and writing up the data and what are their qualifications.**
XGood	
-Poor	

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

   Yes. The ultimate goal stated in this proposal is to reduce the volume of sediment and mercury (presumed present) that is released into Humbug Creek. The hypothesis that fine grained sediment negatively effects fish and frog habitat in Humbug Creek is sound and consistent with the goal of reducing sediment input into Humbug Creek. The hypothesis that Malakoff Diggings, a large hydraulic mine, and several tunnels containing mining debris, are major contributors to mercury problems in fish in the South Yuba River and furthur downstream is logical and consistent with the goal of reducing sediment and mercury input

into Humbug Creek. This proposed study is timely as it relates to ongoing mercury studies in the the South Yuba River, the Delta, and San Francisco Bay. Methyl mercury contamination is clearly important as it negatively impacts aquatic ecosystems and ultimately human health.

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?

   This proposal is justified because mercury problems in fish exist downstream and fine-grained sediment is known to cause problems in fish and frog spawning grounds. Even though mercury is found in downstream fish with levels over the FDA threshold, two or three preliminary mercury analyses from Humbug Creek would strengthen the justification for the extensive mercury sampling budget. The conceptual model is excellent for mercury but less informative on the potential sediment sources and transport for the study area. While it is likely that mercury hot spots will be found in the area and the removal of mercury contaminated sediment will reduce the amount of mercury and sediment input into Humbug Creek, the removal of mercury contaminated sediment may not alleviate the sediment problem in Humbug Creek. Because of the emphasis placed on overall sediment reduction in this proposal, I think, a longer review of previous work on sediment discharge into Humbug Creek (albeit 20 yrs. old) is needed, along with a summary of what is known to date on fish and frog populations and habitat in Humbug Creek (current references). This would help a conceptual model for potential sediment sources, sediment transport, and effect on spawning grounds in Humbug Creek. While Malakoff diggings covers over 20% of the study area and is likely a major source of sediment, a brief discussion of the extent of other fine-grained sediment sources should be included. If there is a space limit, more discussion on this and less on the history of hydraulic mining. For example: what do upstream and downstream frog habitats suggest; what percent of the study area is vegetated; how extensive is soil cover in the area and how much of it has been disrupted by logging, mining, roads, etc.; what are the other hard rock mines (gold only?), how many are there, how extensive are their tailings; and number of tributaries? In other areas, old tailings along the stream banks often contribute more to the problem than the mine pits. In the mercury toxicology model, an arrow is needed out of the methyl mercury box to a box with a proposed bioaccumulation model for Humbug CreekWhat is the proposed bioaccumulation and trophic transfer model for Humbug Creek and what are the likely indicator species?

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 general approachs to meeting the objectives of the proposal are sound. As stated in the proposal, many of the procedures are standard for large environmental consulting firms. What is lacking is an estimate of the number of samples and analyses that will be needed to adequately address the objectives and what level of interpretation will be needed to meet the objectives.

   While the elimination of mercury hot spots is essential, even low level chronic loading of mercury can be a problem. How will the levels of sediment and mercury reduction will be determined to ensure success of indicator species?.

   This proposal really only mentions mercury speciation and grain size for the source characterization. With so much emphasis on mercury, at least the sampling techniques, methods, and analytical instruments that will be used for the various mercury analyses should be mentioned. Will the mercury analyses be conducted on the same grain size fractions, which

fractions, etc.

I think other source characterization techniques may have to be used in addition to those mentioned to fully assess sediment sources in the Humbug Creek watershed.

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?

   I believe that the products listed in the proposal are feasibile and can be achieved. I do not think there is full documentation for the level of knowledge and cost of achieving the products.

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?

   All except for interpretive scientific manuscripts.

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?

   Most of the products listed will be useful (mercury hazards map, erosion process map, water quality report, EIR etc.). I am less sure of the value of the other interpretive outcomes of the data as it requires extra funding in the proposal. An additional $200,000 of funding is asked for the feasibility and design study that will require data interpretation and detailed evaluations so that potential actions to restore habitat can be presented.

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 think the level of education and qualifications of the co-PI's should be included. At least their job titles and level of responsibility. Also, any of the products they've produced in the last five years that relate to this study.

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

   Four months and $42,000 is a lot to develop a sampling plan. Because a sampling plan is not worked out yet and the number of samples that will be submitted for analyses is unknown it is difficult to fully answer this question. The ~500,000 amount asked for an effects assessment seems like a lot of money for sampling and analyses in a study area with ~ 7 river miles. Overall, 1.8 million dollars is too much to request to generate a mercury hot spot map, erosion hazards map, water quality report, an EIR, restoration suggestions proposal, and community education.

Miscellaneous comments:

Some funding should be given to determine mercury concentrations and speciation in Malakoff Diggings and the Humbug Creek watershed. If the Malakoff Diggings pit and tunnels in the area are methyl mercury hot spots, then funding for a sediment and mercury budget for Humbug Creek is essential to sorting out the mercury problems downstream.

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **23**

Applicant Organization: **California Department of Parks and Recreation, Gold Mines Sector**

Proposal Title: **Sources, Transport Mechanisms, and Environmental Fate of Heavy Metals and Fine Sediments Associated with Large-Scale Hydraulic Mining in the Humbug Creek Watershed**

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:

<u>Excellent:</u> outstanding in all respects;
<u>Good:</u> quality but some deficiencies;
<u>Poor:</u> serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**This proposal is a plan to develop a study and as such lacks the true detail and hypotheses to properly conduct the necessary research. It is strongly recommended that the PIs partner with an Hg expert and resubmit a proposal that fully integrates key Hg cycling concepts that address relevant questions regarding Hg cycling at the study sites.**
-Good	
XPoor	

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

   The goals and objectives of this project, however preliminary, are clearly stated. The hypotheses are somewhat general, due to the fact that this proposal contains a plan to develop a project dealing with mercury cycling in a contaminated set of sites. The overall concept is quite timely as Hg contamination from historical gold mining continues to be an important issue in the source and receptor sites.

2. **<u>Justification.</u>** 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?

When complete, a study such as this will certainly yield results that would better improve our understanding of Hg from direct sources and downstream effects. Although a conceptual model is presented, in a proposal such as this, where the PIs have little hands-on experience in Hg-related field and laboratory experience, it neither presents new hypotheses nor builds on experiences at the current sites.

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?

   It is difficult to evaluate the approach and the potential success of a project that is itself a plan to develop a project. In a sense, this proposal has an unfair advantage over other proposals that set forth specific hypotheses about trace metal cycling and present a detailed set of hypotheses and methodologies to test them. I see no advantage to their approach except that it skirts the process of peer review that CALFED has established for evaluation. As such, I dont feel that it can be evaluated as a full proposal.

   This proposal would have certainly been strengthened by teaming with an established Hg biogeochemist to establish the research plan. In their poorly-referenced discussion section, the authors correctly identify some of the main questions regarding methyl mercury formation and transport, but they never propose a set of objectives that directly evaluate the reasons for production and transport. They present more of an assessment off concentrations. I am somewhat surprised by the fleeting reference at the conclusion of the proposal to Tetra Tech and modeling efforts. It almost seems like the proposed work is a large series of data collections and at the end, the data would be handed off to the premier Hg modeling agency in hopes of a solution. Where the PIs erred is that they should have written this proposal with Tetra Tech from the beginning. The folks there certainly could have helped design a tight monitoring-research project that would target sampling to answer key Hg cycling questions.

   The concept of the approach is a good one, but the devil is in the details. For example, objective 3, assess threats to the local ecosystem is done by finding an indicator species and addressing habitat and population. How does that relate to the site of methylation, the food web of the area and factors enhancing bioaccumulation? It is difficult to determine solutions for a problem unless you understand the processes that are important and key transformation sites.

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?

   This project has a low likelihood of success in its present form. Most of the first year will end up be a planning year. The timeframe is too short to pay dividends in its current form.

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?

   In all fairness, the presentation of the set of performance measures was what you would look for. The process of understanding one level before proceeding to the next in the list would be a wise approach with proper planning and implementation. A strict QA/QC plan should have been

added, though.

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 may be likely, but not in the current form. With proper revision and direction from hg experts, this could be a nice project with specific management implications.

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 PIs have vast experience in planning and delivering management results from a project. As a plan, the proposal is very well written. As a scientific study, it has major weaknesses. The PIs do not have the infrastructure on site to carry out the detailed Hg work. They would need to subcontract both analyses and modeling.

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

   This is an extremely expensive project for one that does not have a clear-cut research plan. Obtaining exact costs of analyses and modeling efforts would have strengthened the ability to truly evaluate the proposal.

Miscellaneous comments:

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **23**

Applicant Organization: **California Department of Parks and Recreation, Gold Mines Sector**

Proposal Title: **Sources, Transport Mechanisms, and Environmental Fate of Heavy Metals and Fine Sediments Associated with Large-Scale Hydraulic Mining in the Humbug Creek Watershed**

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:

<u>Excellent:</u> outstanding in all respects;
<u>Good:</u> quality but some deficiencies;
<u>Poor:</u> serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**The proposal is exceptionally vague with inadequate development of a proposed plan of work. The problem being addressed is potentially important (but even that was inadequately demonstrated). If this site is a significant source of mercury and sediment in the basin, then there would be merit in supporting just the study design development component of the project.**
-Good	
XPoor	

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

   The goal of the project is to determine restorative actions that will reduce the amount of sediment and mercury being released from an abandoned hydraulic mining site. The problem being addressed is timely, but it would have been useful to have an assessment of the significance of this watershed as a source of sediment and mercury in the whole Bay/Delta watershed. The hypotheses to be tested are "to be developed." This is a major weakness of this proposal.

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?

   A conceptual model is presented, but there is no clear outline of how it will be applied to accomplish the stated goals. This proposal is essentially requesting a blank check. The first objective is to prepare a study design and project plans. That is what a proposal is supposed to do. If this area is an important source of mercury and sediment in the Bay/Delta watershed, then it might be reasonable to fund just the preparation of the study design and project plans.

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 not well developed. There is one entire page of questions, but no clear plan for how these questions will be answered or what is the priority for answering the questions.

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 is impossible to assess the feasibility of the proposed work since the proposal is so vague. It appears that they are trying to answer too much and have not given adequate attention to prioritizing the research efforts. The authors assert that this is just a "characterization and feasibility assessment effort" (p. 14) and that all methods are well established and there are plenty of people who can do this type of work. This reviewer is unconvinced that the team has demonstrated the ability to design an appropriate sampling scheme and to synthesize the data generated so that a restoration plan can be developed.

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?

   It appears to me that the first performance measure is to figure out what should be done. That needs to be done before a proposal of this magnitude is written.

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?

   A restoration plan appears to be the ultimate product, but it is not at all clear that a workable plan will result from the proposed project.

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?

   This is impossible to assess because it appears that this work will be put out for bid and consultant will be hired. Since this reviewer has no idea whether the consultants are qualified, the capability of the applicants cannot be assessed.

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

   As I said above, there is an argument to be made for funding only the study design part of the proposal. This would have to include identifying the group of consultants that will actually accomplish the research. It appears that the funding for this is about $42,000.

Miscellaneous comments:

External Scientific: #4

Research and Restoration External Scientific Review Form

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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**
-Excellent	**The overall goal of the work is laudable, however Im not convinced that the strategy outlined will achieve the stated goals and provide the scientific basis with which to reliably identify and implement remediation strategies. Assessment was hindered by the lack of detail in several key areas. A more focused, process directed, approach would be more cost-effective.**
XGood	
-Poor	

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

   The hypotheses are quite general, but do serve to frame the science thinking behind the proposal points that are nearly lost in bulk of the narrative. Hypothesis (2) is obviously the most challenging one to address. I suspect the project will add to our observational database of Hg pools and to a lesser extent fluxes, but whether it will take us to the point where we feel that we can confidently manipulate a natural environment to mitigate MeHg formation is much less certain. This is an enviable goal, however, the project as currently conceived will struggle to effectively address it. The authors do not define certain endpoints, e.g. impacting the environment is not satisfactory what levels/rates will be considered significant and how will these be established. Developing a very well defined set of specific goals will greatly

assist in managing the project properly. A project of this size, with a large monitoring component can easily get off track one must keep sampling efforts directly focused on these specific goals. Certain goals are reasonably well developed (e.g. sediment transport assessment) but others (e.g. biotic impacts) are poorly handled.

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?

   There is little argument that methylated Hg species represent a potential health threat to a certain segment of the population, and that historic gold mining practices have led to localized Hg contamination. Though historic Hg impacts in this area were massive on any scale, its interesting that current effects are maybe less evident. Why this is the case, i.e. what natural processes converge to mitigate MeHg accumulation seems to be, or should be, a fundamental question. The discussion of current effects (and therefore justification) is perfunctory and given the level of current research I would think that the justification should be more developed. A not insignificant portion of the project/budget is devoted to assessing and cataloging State Parks infrastructure and resources that might be impacted by remediation efforts. It would seem that much of this effort could/should be conducted under current or future State Parks mandates, without additional CALFED funds.

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?

   A significant body of work in the specific area of the proposed study has either been completed or is in progress. This proposal does not appear to build upon those efforts or attempt to synthesize and present a more focused, directed approach with past studies as a guide. A very large sum of money is proposed to be spent on new data collection - some of which appears to be similar to past collections. If the system is healing, are uncertain mitigation approaches justified will we make things worse? Targeting a specific process might be more useful in the long run, in that the outcomes would be more transferable to other impacted environments. We (the reviewers) are in many respects told by the proposal authors to not challenge the approach, that any number of competent contractors could carry out the standard research plan. I guess I dont quite agree with that assessment, and given that only a very incomplete description of the standard study approach is presented in the proposal, it leaves one with more questions than answers. The proposal is in many ways a proposal to create a proposal unfortunately that leaves much to the imagination. The description of Effects Assessment is particularly lean. How are the uptake studies performed, what trophic levels, what species? The authors continually refer to Hg speciation (are we to infer that that always means total and methyl Hg?) If so, in ignoring other important species (e.g. Hg0), you are limiting your ability to develop mechanistic models. Other metals (selenium is even mentioned on the title page) are tangentially mentioned what level of effort is directed here and why. The education and community relations aspects of the proposal are well thought out and stand as a great example of holistic environmental association. I would however recommend that citizen involvement in certain aspects of the data collection (as suggested in the proposal) be limited to the true experts.

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 scope of the field science and assessment is very broad and it seems very unlikely that even the worlds best contractor could satisfactorily address these multi-faceted issues in a very complex, impacted environment, in the proposed time frame (at most two and typically just one field season). These systems are likely to very heterogeneous with respect to the underlying important mechanisms regulating methylation and just identifying and mapping specific zones (to say nothing of actual rate measurement) is a major effort. Year-to-year variability could also significantly bias extrapolated measurements, and obviously any study that at its core depends on just one primary field season will potentially be affected more. In practical terms it will be very difficult (based upon just this one study) to link success probability to a given restorative strategy.

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 proposal is short on specifics, indicating that these measures will be detailed in a project performance evaluation plan to be prepared at a later date. The general measures that are discussed dovetail with the project goals, but more valuable and useful measures could be presented if more specific goals were developed (as mentioned earlier). Without a detailed work plan in place (and to review), its difficult to specify (or comment on) performance measures. In a project of this type, performance will likely be synonymous with completeness (again back to the work plan), and scientific rigor or design will play a secondary role.

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 listed products and outcomes are numerous and comprehensive. One product that I do not see is an integration and interpretation of other extant data. In fact this particular effort should be a pre-requisite to full scale work plan design.

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?

   Im familiar with a large body of environmental Hg-cycling research, but do not recognize the proposal applicants as having published or worked in the general area of trace metal chemistry. Few if any relevant literature citations of either their own work or others are cited. This is to some extent consistent with their proposed role as project managers, leaving the science decisions to the awarded contractors. The proposal does reflect an acceptable level of general understanding of Hg-cycling related issues, however, the proof of true capability is in the details and little if any are presented. I cannot honestly comment on the applicants abilities as managers. The applicants have assembled an impressive team of federal, state and NGO players, and the potential represented there, is a strong point of the proposal.

   Contractor selection is critical, for I do not believe that there are many scientists who can properly carry out the proposed work. Tetra Tech (who I assume has the inside track) is certainly a respected player in this field. Their environmental modeling skills are exemplary, though models are only as good as the data you feed them, and its impossible to comment on the capabilities of sub-contractors performing the actual field process measurements.

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

   I will reiterate that without detailed work plans its difficult to determine if the budget is reasonable and adequate. The physical process components and community relations components of the overall project seem to be the most developed and here the proposed funding is reasonable. The source characterization, and in particular the effects assessment components are poorly detailed so cost effectiveness is hard to judge. Over ½ million dollars is devoted to effects assessment with little or no description. Directing this level of funding toward one or two key environmental processes using a combination of manipulative field and laboratory approaches would likely be more cost-effective. Im afraid there will be a significant dilution of resources in the current assessment approach. Is there a long-term funding commitment to maintain the permanent flow gauging stations?

Miscellaneous comments:

Environmental Compliance:

Proposal Number: 23

Applicant Organization: California Department of Parks and Recreation, Gold Mines Sector

Proposal Title: Sources, Transport Mechanisms, and Environmental Fate of Heavy Metals and Fine Sediments Associated with Large-Scale Hydraulic Mining in the Humbug Creek Watershed

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

   XYes **-**No

   If no, please explain:

   There is federal funding for this project thus NEPA compliance is necessary.

   Need to comply with Section 106 of the National Historic Preservation Act.

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

   XYes **-**No

   If no, please explain:

   No budget or timeline specified for permits or environmental documentation.

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

   -Yes **X**No

   If yes, please explain:

   Need to comply with NEPA and National Historic Preservation Act.

   Scientific Collecting permit will be enough as long as no listed species are collected.

Other Comments:

Budget:

Proposal Number: 23

Applicant Organization: California Department of Parks and Recreation, Gold Mines Sector

Proposal Title: Sources, Transport Mechanisms, and Environmental Fate of Heavy Metals and Fine Sediments Associated with Large-Scale Hydraulic Mining in the Humbug Creek Watershed

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

   XYes -No

   If no, please explain:

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

   XYes -No

   If no, please explain:

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

   XYes -No

   If no, please explain:

4. Are appropriate project management costs clearly identified?

   XYes -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?

   XYes -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?

   XYes -No

   If no, please explain:

7. Are there other budget issues that warrant consideration?

-Yes **X**No

If yes, please explain:

Other Comments:

in the budget justification, the indirect costs proposed by State Parks is a 10% fee on all other costs to civer the internal costs associated with the management of project funds.