Peer Review Processes for Science Activities Affecting the Lake Tahoe Basin
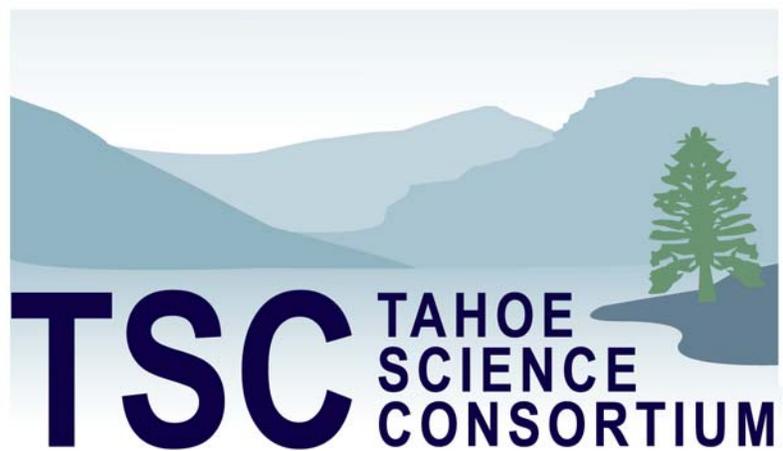
August 27, 2008

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I.   Introduction

Peer review is an objective process used to evaluate proposals for new projects and results from completed projects. The practice of peer review is used in many types of business, technology, and enterprise activities where there is an interest in maximizing cost effectiveness, credibility, and success. Peer review practices are often thought of in the context of science activities; however, rigorous peer review has been a hallmark of the modern scientific method only since the middle of the twentieth century.

The classical definition of a *peer* is "a person who has equal standing with another or others" (American Heritage, 1992). A *peer review*, then, is a review of one or more person's work by others of equal standing. In the sciences, someone of equal standing is generally considered to have an equivalent level of experience and recognized expertise in the research area of interest. Although peer reviews are critical in nature, the process is intended to improve the quality, certainty, and credibility of the work product. Independent peer review is considered one of the best ways to identify oversights, mistakes or flaws in a proposal or completed project. The complexities of scientific endeavors often mean that opportunities for improvement are apparent only to someone with specialized expertise or experience. Thus, allowing others to review the work of their peers increases the probability that strengths will be identified and supported, or that weaknesses will be identified and corrected.

In scientific work, the peer review process is most commonly associated with the publication of manuscripts or journal articles. However, the peer review of research proposals is often a required step in the decision-making processes used to determine and/or direct funding for new science activities. Used in this manner, the review process works to directly increase the confidence of funding decisions. Today, many consider independent and unbiased peer review of both proposed and completed scientific work an essential component of the scientific process. For example, the Federal Office of Management and Budget produced a final bulletin (OMB 2004), which "establishes that important scientific information shall be peer reviewed by qualified specialists before it is disseminated by the federal government."

A.   Principles Guiding Peer Review

The procedures described in this document are based on the principle that effective peer review improves the acquisition, analysis and reporting of scientific information. However, to ensure the credibility of the peer review process itself, the process must be:

- **Unbiased**. Those managing the review process and the reviewers cannot have conflicts of interest that prevent them from providing objective information.

- **Fair and ethical**. All parts of the review process must ensure the fair and ethical treatment of the participants and the products undergoing review.

- **Transparent**. Regular and broadly-disseminated communication about the review process must be shared in a timely manner with all interested parties to ensure a complete understanding of the process.

These are the guiding principles underlying the peer review processes described in this document.

B. Factors Critical to Effective Peer Review

Kostoff (1997) identified eight factors critical to an effective peer review program. These factors are listed below in order of priority. All of the factors must be addressed in order to maintain a successful peer review program on a sustained basis:

1. High-level commitment from the organization(s) requesting the review, to follow processes that will obtain high-quality reviews. It is a waste of effort and funds to conduct a peer review unless senior management: a) supports the time and expense to conduct rigorous reviews, and b) is fully committed to using the review results in subsequent management decisions.

2. Commitment of the review manager or review committee to administer a credible and transparent peer review process. The review manager or committee oversees implementation of the peer review process. This can include development of the review charge or criteria, guiding the questions and discussion in a panel review, synthesizing and summarizing the reviewers' comments, and recommending follow-on actions. Often the review manager has the latitude to select the review process and criteria, and generally has the latitude to select reviewers by a non-random process. The review outcome can be substantially influenced before the process begins, if the review manager or committee does not follow the highest standards in establishing the review process and selecting reviewers.

3. Obtain highly competent and objective reviewers. Each reviewer must be technically competent in his or her subject area, and the competence of the total review group for any specific document should cover the multiple facets of research issues identified in the product submitted for review. In addition, the review group's expertise should not be limited to sub-disciplines of the specific research area under review (which addresses the question of whether the job is being done right), but should be broadened to the area covered by the highest-level objectives of the research (which addresses the question of whether the right job is being done). This will help insure that outmoded but prolific and well-cited research is not promulgated in perpetuity, and that the fresh perspectives of new paradigms are considered equitably.

4. Maximize normalization and standardization across panels and disciplines. For disciplines which have some similarities, use of common reviewers among the panels can provide some degree of standardization.

For very disparate disciplines, some allowances need to be made for the relative strategic value of each discipline to the organization, and arbitrary corrections applied for scoring differences and biases. Even in the case of disparate disciplines, some normalization is possible by having some common reviewers with broad backgrounds evaluating the diverse programs and projects. The use of a technical synthesis panel also can help to normalize the results of individual review panels.

5. Select relevant evaluation criteria. In evaluating basic research proposals, the four main criteria are research merit, research approach, realistic budget, and team quality. The evaluation of research approach and team quality together provides insights into the likelihood of success. Use of a fifth criterion: research relevance is often essential in evaluating applied research proposals.

6. Maintain reviewer anonymity. If honest and frank viewpoints on the intrinsic quality of the research under review are desired, the reviewer must remain anonymous to all but the review manager. Rewards are few for a reviewer making strong negative statements about a proposal (or research paper or program), and resulting retributions and resentments to the reviewer may far outweigh the intrinsic benefits to science of honest and forthright statements.

7. Maintain high ethical standards. Using peers to conduct reviews does present an inherent conflict: peers may be in a position to compete for future research funding or positions. This raises the potential for several ethical conflicts including scientific fraud, scientific misconduct, betraying confidential information, and unduly profiting from access to privileged information. To mitigate ethical conflicts, it is increasingly common to request reviewers to sign documents agreeing to maintain high ethical standards and confidentiality as a condition of their participation in the review process.

8. Be prepared for the full cost of peer review. The true total costs of peer review can be considerable, but tend to be ignored or understated. The major contributor to total cost is the time of all individuals involved in executing the review, including staff and reviewers. There are also costs associated with the synthesis and reporting of review results. Costs must be considered carefully in designing a high quality peer review process.

C. Peer Review Services Provided by the TSC

The Tahoe Science Consortium (TSC) was formed in August 2005 through a memorandum of understanding among research institutions and resource management agencies active in the Lake Tahoe Basin. The purpose of the TSC is to provide environmental managers with well-synthesized scientific findings drawn from research, modeling, and monitoring. The federal Office of Management and Budget authorizes federal agencies "to commission an entity independent of the agency to select peer reviewers and/or manage the peer

review process" in accordance with its *Final Information Quality Bulletin for Peer Review* (OMB 2004). As an entity that operates independently of the agencies funding science activities in the Tahoe Basin, the TSC is well positioned to organize and administer the independent peer review of science proposals and science work products.

The TSC is prepared to work with funding entities to complete the peer review of science proposals using the processes described in this document. Upon request, the TSC also is prepared to administer the peer review of scientific products or technical programs using the processes described in this document. The TSC may require funding to complete requested peer review services. The level of funding will depend on the kind of review and the review approach.

Following models employed by the National Institutes of Health and the Health Effects Institute, the TSC has formed a separate Peer Review Committee (PRC). Although scientists from the member organizations of the TSC may produce work products that could end up in a peer review process administered by the PRC, the TSC will ensure that any peer review processes it administers will be credible, transparent, and unbiased by rigorously applying the processes described below.

D.   Application of the Peer Review Process

In complex ecological systems, such as the Lake Tahoe Basin, where science activities are undertaken to produce information that addresses gaps in knowledge, reduce uncertainty and inform decision-makers, independent and unbiased scientific review can be applied at multiple stages:

The Proposal Stage: The review of proposals for new science is intended to improve the quality of the experimental design associated with the proposed research, monitoring, or adaptive management project..

The Project Stage: The review of products (e.g., reports and manuscripts) from completed projects ensures that analysis and interpretation of data are appropriate and justified based on the work completed and the results of other relevant studies.

The Program Stage: Reviews at this level are intended to provide expert advice and ideas about how to obtain the scientific information that best meets management needs or policy goals and to provide feedback on the quality of the science underpinning program activities.

The remainder of this document describes the review processes the TSC will use to complete independent peer reviews under each stage.

## II.   Peer Review Process for Science Proposals

The management and conservation of complex ecological systems require projects and programs that obtain information to inform decision-making and support management actions.   Funding agencies often use competitive processes or special initiatives to solicit for proposals aimed at obtaining information that addresses gaps in knowledge and reduces uncertainty. Their goal is to fund proposals that are high priority from a programmatic standpoint (i.e., address key uncertainties or knowledge gaps) and high quality from a technical standpoint.

The purpose of the proposal peer review process is to obtain independent and credible evaluations of a proposal's technical merits. Using independent experts to evaluate the technical quality of research and project proposals is standard practice within organizations such as the U.S. Environmental Protection Agency, National Science Foundation, and National Institutes of Health. An objective, technical peer review process is essential to identifying the highest quality proposals and avoiding biases that can result from reviews by a small group of "in-house experts" who might not have the required level of technical background. The collective results of this peer review process are used to generate objective ratings of technical quality for the entire group of proposals.

It is increasingly common to see an independent peer review process embedded in the overall proposal selection process. In addition to informing funding agencies about the technical quality of submitted proposals, the peer review process can help to promote funding decisions that are transparent and fair to all applicants. This section describes the processes for the independent peer review of science proposals received both through an open solicitation (hereafter referred to as a request for proposal or RFP) and through an agency-sponsored special initiative. Overall, the processes are identical with the exception of the steps to determine programmatic relevance.

A.   Review of Science Proposals Received in Response to Requests for Proposals

A multi-staged, independent peer review process is used to evaluate and prioritize science proposals received in response to a request for proposal. Figure 1 provides an overview of the major steps in this process. Details associated with each step are described below.
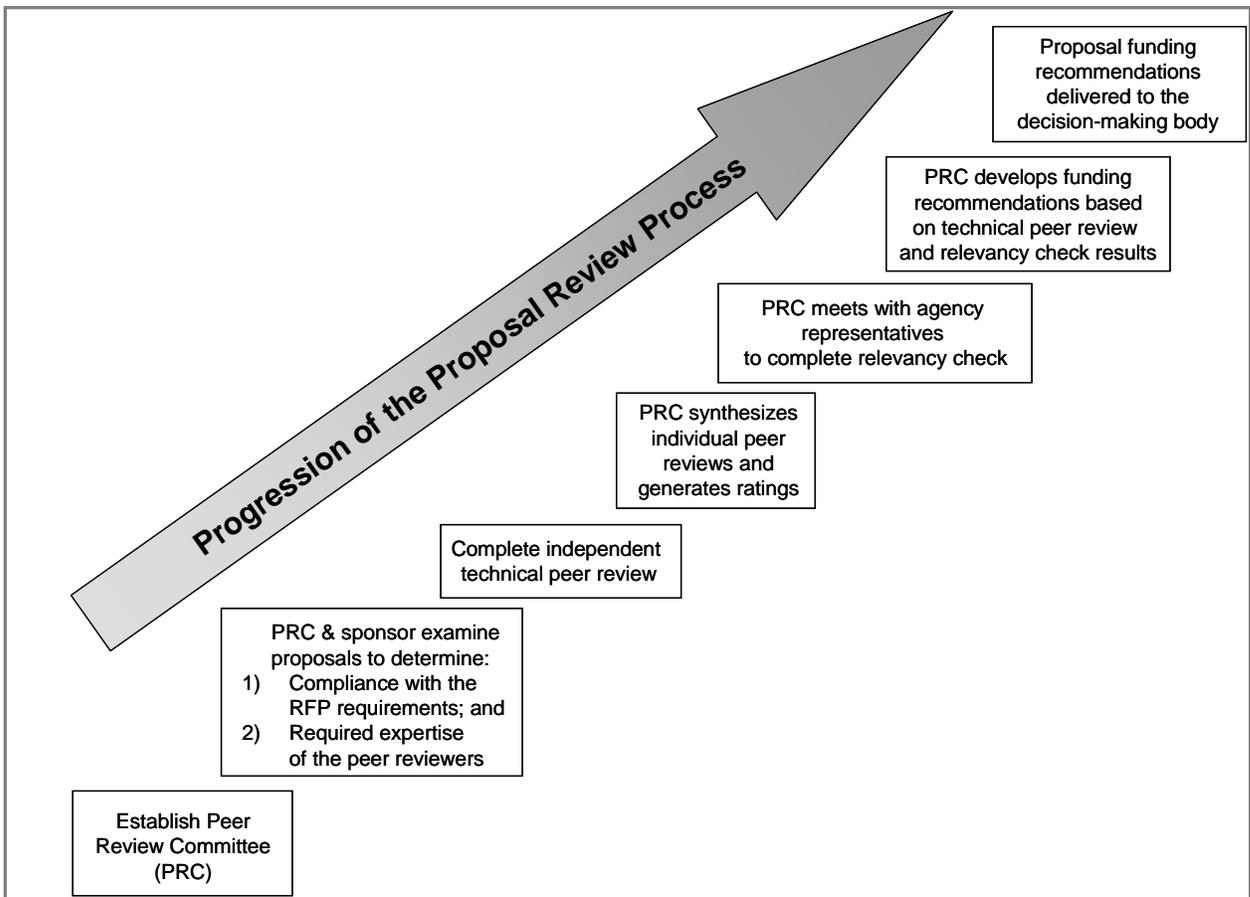
Figure 1. Diagram illustrating the major steps in the peer review process for science proposals submitted in response to an RFP.

(i) <u>Establish a Peer Review Committee (PRC)</u>. The PRC is responsible for overseeing and administering the proposal peer review process. The PRC is composed of the TSC Executive Director and three members of the TSC Committee of Scientists (COS) or their designees. The PRC is a standing committee. The Executive Director is a permanent member of the PRC, while COS representatives will change over time. To avoid conflicts of interest and maintain high ethical standards, PRC members will be required to:

(a) Recuse themselves from involvement in any TSC administered peer review that includes a proposal, work product, or technical program in which they have materially contributed[1].

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[1] A person is considered to have materially contributed to a proposal, work product, or technical program if they: 1) are listed as an investigator or co-investigator, 2) directly contributed to the production of the document undergoing review, or 3) received funding to complete any work that directly contributes to the product undergoing review.

(b) Recuse themselves from the consideration of any proposal submitted from their home institution.

(c) Complete conflict of interest, confidentiality, and non-disclosure forms (Appendix A) for any proposal review they complete.

The PRC will administer the review of science proposals and is responsible for the following tasks:

(a) One or more PRC representative(s) will work with representatives from the agency sponsoring the RFP to examine the submitted proposals to ensure they fulfill all requirements stated in the RFP. This is an administrative step to ensure each proposal contains the information necessary for a thorough peer review. Only proposals fulfilling all RFP requirements will be distributed for external peer review.

(b) The PRC will examine the RFP and the submitted proposals to determine the areas of scientific expertise that must be represented by the peer reviewers. The PRC will select the peer reviewers based on: 1) required expertise, 2) reviewer independence and standing in the scientific community, and 3) reviewer availability. Reviewers may be selected from academia, government or private consulting companies, and may or may not have worked in the Lake Tahoe Basin.

(c) The PRC will establish the technical review criteria. These review criteria will be used by all peer reviewers to evaluate individual proposals. The review criteria will normally include all of the factors listed in Appendix B; however, the criteria may be adjusted depending on details specified in the RFP or in consultation with the sponsoring agency.

(d) The PRC will establish the overall review timeline. The timeline will largely be determined by the number of proposals requiring review and the number of peer reviewers.

(ii) <u>Establish the group of independent peer reviewers and obtain reviews of each proposal</u>. The PRC will develop a list of potential reviewers and contact individuals to confirm their willingness to serve as a peer reviewer. Each proposal will be evaluated by a minimum of three reviewers. The independent technical reviewers must not have a direct affiliation (past or present) with the authors of the proposal(s) they review, or have other associations with the authors that might

raise a conflict of interest issue. All reviewers will be required to sign conflict of interest, confidentiality, and non-disclosure forms (Appendix A). The reviewers also must be knowledgeable about the research area in the proposal; however, to avoid a conflict of interest, they cannot have current involvement in any Lake Tahoe Basin research project. Steps to obtaining the peer reviews are as follows:

(a) The proposals and review criteria will be sent by email or surface mail to the assigned reviewers. The reviewers will complete a critical review of the technical merits of each assigned proposal, using a standardized scoring form based on the review criteria (Appendix B).

(b) Reviewers will return the proposals, the completed review forms, and completed conflict of interest forms to the PRC. Reviewers will be compensated approximately $75 for their time to complete each proposal review.

(iii) <u>Synthesize the individual peer reviews to determine the technical rating of each proposal</u>. The PRC will examine all of the peer reviews to ensure they are complete and supportable. The PRC will calculate an average numerical technical rating using the overall rating values provided by the individual reviewers. Highly divergent reviews (i.e., overall rating values that differ by two or more) will receive additional examination either by the PRC or by another independent reviewer. Once the PRC accepts all of the individual reviews, the average technical ratings will serve as the final technical ratings of all proposals. The final technical ratings will be used to determine whether each proposal receives further consideration or not according to the categories and considerations described in Appendix C. For RFP's that identify multiple research theme areas, the PRC reserves the option to group proposals and the associated ratings by theme area.

(iv) <u>Evaluate proposal relevancy to management and regulatory agency information needs</u>. The proposals passing the technical review step will be forwarded to management and regulatory agency representatives for a relevancy review. Agency representatives will review each proposal and provide written review comments according to the considerations described in Appendix D. Agency representatives will return completed review forms to the PRC. Agency representatives will not receive outside compensation for their reviews.

(v) Synthesize agency reviews to determine the relevancy rating of each <u>proposal.</u> The PRC will calculate an average numerical relevancy rating for each proposal using each agency representative's overall

rating value.   All agency ratings and the average relevancy rating will be entered into a single spreadsheet. These results will be provided to the agency representatives participating in the relevancy review. Agency and PRC representatives will discuss the proposals and associated agency ratings in a meeting generally referred to as the "relevancy check." The purpose of this meeting is to allow agency representatives to clearly communicate their thoughts on the relevancy of individual proposals to the PRC and to each other. Agency representatives may adjust their relevancy scores based on these discussions. The outcome of this meeting is a final set of agency relevancy scores for use by the PRC in developing its funding recommendations. Relevancy check discussions will be led by a PRC representative, who is responsible for ensuring the discussions are balanced, fair, and comprehensive.

(vi) <u>Evaluate technical and relevancy review results to develop funding recommendations</u>. The PRC will evaluate all review results to derive a set of proposals recommended for funding. The Peer review and Agency Relevancy review processes result in a Technical Score (range 1.0 – 5.9) and an Agency Relevancy Score (range 1.0 – 5.9) for each proposal. A Pareto ranking approach (Yapo et al., 1998) is used to evaluate proposals grouped within the same theme (e.g., air quality or climate change) to guide the funding recommendation process. The Pareto approach is useful in objectively evaluating the relative ranking of a group of proposals where two review factors have equal weight. The Pareto ranking approach is described in the following example.

In Figure 2, thirteen proposals (A-M) are plotted based on the corresponding Technical and Agency Relevance Scores resulting from the review process. The Pareto ranking procedure requires an evaluation of each proposal in terms of the Technical and Agency Scores to determine the "dominance" of each proposal. A given proposal is classified as dominated (inferior) if there are any other proposals that have higher values for both the Technical and Agency Scores. Alternatively, a given proposal is classified as nondominated (superior) if there are no other proposals with both Technical and Agency Scores higher than the given proposal under consideration. This concept is highlighted in Figure 2 using Proposal B. Notice that there are no other proposals with both Technical and Agency Scores higher than those for Proposal B (upper right quadrant I). Proposals C and D both have higher Technical Scores than proposal B, but have lower Agency Scores than Proposal B (lower right quadrant II). Similarly, Proposal A has a higher Agency Score than Proposal B, but has a lower Technical Score than Proposal B (upper left quadrant IV). Proposals E-M all have lower Technical and Agency Scores (lower left quadrant III) and are thus dominated by proposal B. As a result of this analysis, Proposal B is determined to be a

nondomiated proposal (also termed a Pareto Rank 1 proposal). A similar analysis of Proposals A, C, and D reveals that these proposals are also nondominated (also Pareto Rank 1 proposals). The Pareto Rank 1, nondominated proposals (A-D) each represents a trade-off between the two criteria used to evaluate the proposals: Technical and Agency Scores. Without using an additional performance measure, none of these proposals can be considered to be "better" or "worse" than any of the other Pareto Rank 1 proposals and each should be considered for funding before any of the remaining dominated Proposals E-M.
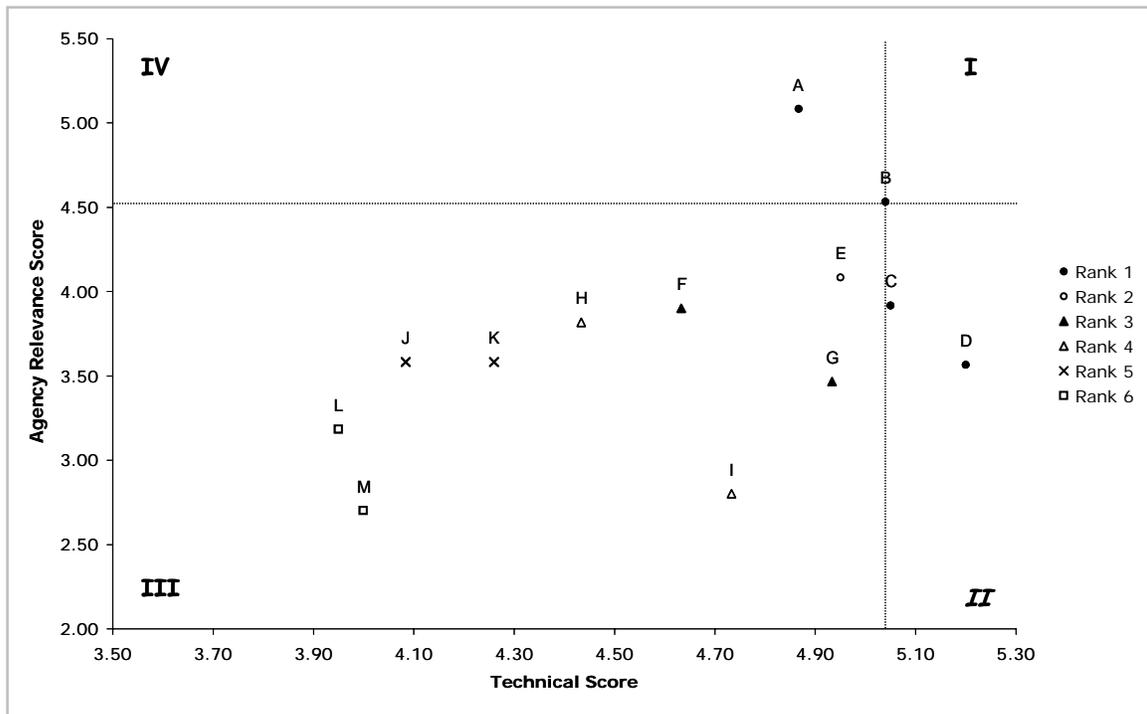
Figure 2. Pareto ranking results for thirteen research proposals evaluated through technical peer review and agency relevancy review.

The Pareto ranking procedure can be continued to determine the dominance of the remaining proposals (E-M) to identify additional proposals for funding consideration after the Rank 1 proposals have been considered. This is accomplished by removing the Pareto Rank 1 Proposals (A-D) and reevaluating each of the remaining Proposals (E-M) for dominance. This analysis reveals that Proposal E is the only nondominated Proposal of the remaining Proposals and is termed a Rank 2 Pareto Proposal. The process can be repeated until all proposals have an associated Pareto Ranking.

(vi) Present proposal funding recommendations. The PRC will present proposal funding recommendations based on the technical peer review results and relevancy check discussions to the agency sponsoring the RFP. Representatives of the sponsoring agency will

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have the opportunity to ask questions about any step in the proposal review process including the relevancy check discussions. The sponsoring agency will use the information provided to adopt its own set of funding recommendations.

B. Review of Science Proposals Received Through a Special Initiative

Special initiatives proposed by individual or collaborating agencies, by their nature, are usually intermittent in character; however, it may be appropriate to conduct an independent peer review of proposals submitted in response to a special initiative to ensure the highest possible science quality. With the exception of the relevancy check, the processes described above for the review of science proposals received through an RFP will be used to review special initiative proposals. Whenever an agency or agencies request the review of special initiative proposals, it is assumed that: 1) the proposed project has already met the necessary relevancy check for that agency, and 2) there is already agreement among the funding agency/agencies that the proposed project will address a high priority need. The Peer Review Committee's responsibility in these circumstances is to administer an independent peer review to evaluate the technical merit of the proposed project. Peer review results will be summarized by the PRC to develop overall ratings, and a funding recommendation will be presented directly to the requesting agency or agencies.

III. Peer Review Process for Science Products

The independent peer review of work products from completed science projects generally follows the same procedures used to review science proposals: the Peer Review Committee (PRC) oversees an independent technical review, followed by the synthesis and reporting of review results. However, since the science products submitted for review may only comprise a portion of the complete product (e.g., technical sections of an environmental impact statement or a regional plan), a review charge must be developed to ensure the peer review focuses on evaluating the technical work and associated results. As with the review of science proposals, the PRC members and independent technical reviewers of science products may not have a direct affiliation (past or present) with the authors of the products they review, or have other associations with the authors that might raise a conflict of interest issue.

Three critical ingredients must exist before a science product review can occur:

1) A well defined product (e.g., a complete report or manuscript or a functioning model with documentation) amenable to review by someone who has relevant expertise, but is not associated with the specific project.

2) A clearly described review charge that documents the scope of the review and reviewer's tasks. Peer review is most powerful when the charge is specific and steers the reviewers to specific technical questions while also directing reviewers to offer a broad evaluation of the product (OMB 2004).

3) A clear understanding of how the review results will be used. Specifically, the agency or entity requesting the review needs to identify in advance of the review, the types of actions that may occur in response to the review. Appropriate actions may include a simple response to comments, revision of the science product to address errors and/or omissions, completion of additional analyses or studies deemed critical to verifying an underlying assumption or addressing remaining uncertainties, reconsideration of the results and conclusions after addressing flaws identified through the peer review, or some combination of these or other actions (OMB 2004).

Independent peer review of completed science products may be obtained from individual scientists via email or surface mail, or as panel reviews (OMB 2004). In a mail review, the product and review charge are sent to selected reviewers, reviews are completed individually, and reviewer's comments are returned for synthesis by the PRC. In a panel review, the selected reviewers are asked to form a review panel that works together to complete a comprehensive review; the panel then provides a single document describing the review results. Panel reviews generally begin by mailing each panel member the review charge and documents for review. Panel members may be asked to participate in a meeting or workshop where they can receive additional information about a project, ask specific questions of the project investigators, or receive other points of view. The panel member's then work together to prepare a single review panel report.

Panel reviews are particularly appropriate for large, multifaceted projects where large uncertainties may exist, or for topics linked to controversial management actions. In both cases (individual review or panel review) the PRC is tasked with overseeing the review process. The PRC also is responsible for examining the review results to ensure they fulfill the review charge before delivering the results to the agency or entity requesting the review.

Compensation for the review of science products will be greater than the compensation for proposal reviews and will vary depending on whether individual reviews or a panel review process is used. Normal compensation for an individual review may range from $200-$2,000/reviewer depending on the length and complexity of the review document and the scope of the review charge. Compensation for each member of a review panel may range from $200-$1,000/day plus travel expenses for their participation in a panel review. Compensation will cover preparation time, panel meeting participation, and panel report preparation.

IV.   Peer Review Process for Technical Programs

The review panel approach described for the peer review of science products will be used to obtain independent peer review of technical programs. Technical programs will generally have a number of products produced through several projects that together comprise the program. The development of technical tools for the Lake Tahoe TMDL and the associated results are an example of a technical program. As with the review of science projects, the review of technical programs requires all three critical ingredients: well defined products, a clear

review charge, and a clear understanding of how the review results will be used. Because of the complexity involved, reviews of technical programs will take longer than the review of a science product. Also, reviewers will need to spend time with those active in the program to gain a complete understanding of the overall program. This may require multiple meetings between the reviewers and those active in the program. PRC members and the independent peer reviewers of a technical program may not have a direct affiliation (past or present) with the program, or have other associations with the program participants that might raise a conflict of interest issue.

Reviews of technical programs are specifically designed to provide expert advice and ideas about how to develop scientific information that best meets the management needs or policy goals, and to provide feedback on the quality of the science underpinning the program activities and results. Reviews of technical programs will not judge policies or the management basis for establishing the program, nor will they provide recommendations for new policies (OMB 2004). Compensation for the review of technical programs will follow the formula used for the compensation of science product reviews.

V. Transparency in the Peer Review Process

An open and transparent review process is critical to the sustained success and credibility of any peer review program (OMB 2004). Effective communication is essential during all phases of a review to ensure transparency in the review process. Details are provided below about the types of information that will be communicated at the initiation of the review, during the review, and at the conclusion of the review.

> (i) <u>Communications at the initiation of the review.</u> Once the Peer Review Committee (PRC) accepts responsibility for administering a review, it will upon request disseminate an announcement identifying the members of the PRC, describing the type of review the PRC will oversee, the major steps in completing the review, and the associated timeline. For proposal reviews, initial communications will include general statistics on the number and topical categories of the proposals received, and results of the administrative review (i.e., the number of proposals meeting the RFP requirements). For the review of science products or technical programs, communications also will include identification of the documents to be reviewed and a description of the review charge.

> (ii) <u>Communications during the review.</u> The PRC is responsible for all communications during the review. Individual reviewers will remain anonymous. Communications during the review will consist of updates on the status of the review.

> (iii) <u>Communications at the conclusion of the review.</u> The PRC is responsible for communicating the final results of any review it

oversees. In all cases, review results will be communicated to the agency or entity that requested the review. For proposal reviews, the PRC will communicate the results of the individual reviews, the results of its rating synthesis, and the funding recommendations developed through the relevancy check. Proposal review results also may be transmitted to the proposal authors. For reviews of science products or programs, the PRC will communicate the results of the individual reviews and its synthesis (in the case of mail reviews) or the final report from the peer review panel.

It is increasingly common for entities to provide communications about a peer review process via an internet web page. Using a web page to disseminate review information has greatly enhanced the ability to provide interested parties with the same information in a timely manner. For example, using electronic review forms that individual reviewers can download and complete on their computer helps contribute to a more efficient process. The TSC intends to make use of web-based tools to identify potential reviewers, disseminate review information, and to support the completion of individual reviews. Regular communication during all phases of a review combined with the dissemination tools available through an internet web page can go a long way to ensuring any review process remains transparent and timely.

VI. Conflict of Interest, Confidentiality and Non-disclosure Rules

Maintaining high ethical standards throughout the peer review process is critical to the overall credibility and success of the review. The National Academy of Sciences defines "conflict of interest" as any financial or other interest that conflicts with the service of an individual reviewer because it could impair the individual's objectivity or could create an unfair advantage for a person or organization (NAS 2003). Thus, a breach of ethics or conflict of interest can arise for several reasons, so care must be exercised to consider all potential sources. The review processes described in this document are patterned after national programs, and similarly the ethic standards and conflict of interest provisions follow those used by the National Institutes of Health. All peer reviews described in this document will use the forms in Appendix A to exclude conficts of interest and ensure confidentiality. All individual reviewers will be required to complete these forms. The peer review processes described in this document require the full integrity of all participants, which is ultimately the basis for maintaining high ethical standards and avoiding conflicts of interest.

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Appendix A

Conflict of Interest, Confidentiality and Non Disclosure Rules and Information for Reviewers[2]

As reviewers themselves are most familiar with their own situations, it is their personal responsibility to: (1) alert the Peer Review Committee (PRC) to any possible conflict of interest situation, whether real or apparent, that may impact the review, and (2) identify and certify on the pre-meeting and post-meeting Conflict of Interest Certification Forms associated with this information sheet, (a) any application where they have a conflict of interest, and (b) that they will not be, and have not been, involved in the review of any application where their participation constitutes a conflict of interest. Reviewers must also certify that they will maintain the confidentiality of the proceedings and associated materials and that they will not disclose to another individual any matter or information related to the review proceedings. In addition, the PRC may determine that a particular situation involves a conflict of interest and require that the potential reviewer not be involved in the review of the application(s) or proposal(s) in question. All reviewers are covered by this information sheet and associated Certification Forms.

There are several bases for a conflict of interest: employment, financial benefit, personal relationships, professional relationships or other interests. If applicable, any one condition may serve to disqualify a reviewer from participating in the review of an application or proposal. A **conflict of interest may be real or apparent.**

The following guidance and definitions, derived from federal regulations governing the Scientific Peer Review of Research Grant Applications and Research and Development Contract Projects (42 CFR Part 52h), will assist you in determining whether you are faced with a real or apparent conflict of interest. The guidance is not all-inclusive, due to the variety of possible conflicts of interest. Therefore, it is important that you should consult the PRC when there is any question about your participation in a review.

GUIDANCE AND DEFINITIONS

A **Conflict Of Interest** in scientific peer review exists when a reviewer has an interest in a proposal that is likely to bias his or her evaluation of it. A reviewer who has a real conflict of interest with a proposal may not participate in its review.

Real Conflict Of Interest means a reviewer or a close relative or professional associate of the reviewer has a financial or other interest in a proposal that is known to the reviewer and is likely to bias the reviewer's evaluation of that proposal as follows:

A reviewer shall have a real conflict of interest if he/she or a close relative or professional associate of the reviewer: (1) has received or could receive a direct financial benefit of any amount deriving from funding a proposal under review; (2) has received or could receive a financial benefit from the applicant institution, offeror or principal investigator that in the aggregate exceeds $10,000 per year; this amount includes honoraria, fees, stock or other financial benefit, and additionally includes the current value of the reviewer's already existing stock holdings, apart from any direct financial benefit deriving from an application or proposal under review: or (3) has any other interest in the proposal that is likely to bias the reviewer's evaluation of that application or proposal.

Regardless of the level of financial involvement or other interest, if the reviewer feels unable to provide objective advice, he/she must recuse him/herself from the review of the application or proposal at issue. The peer review system relies on the professionalism and integrity of each reviewer to identify to the PRC any real or apparent conflicts of interest that are likely to bias the

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[2]Documents in this appendix follow forms and guidelines used by the National Institutes of Health, Office of Extramural Research.

reviewer's evaluation of an application or proposal.

Employment: A reviewer who is a salaried employee, whether full-time or part-time, of the applicant institution, offeror, or principal investigator, or is negotiating for employment, shall be considered to have a real conflict of interest with regard to an application/proposal from that organization or principal investigator. The PRC may determine there is no real conflict of interest or an appearance of a conflict of interest where the components of a large or multi-component organization are sufficiently independent to constitute, in effect, separate organizations, provided that the reviewer has no responsibilities at the institution that would significantly affect the other component.

Financial Benefit: See definition of Real Conflict of Interest above.

Personal Relationships (Relatives): A close relative means a parent, spouse, sibling, son or daughter or domestic partner. A conflict of interest exists if a close relative of a reviewer submits an application or proposal, or receives or could receive financial benefits from or provides financial benefits to an applicant or offeror. In such case, it will be treated as the reviewer's financial benefit.

Professional Associates: Professional associate means any colleague, scientific mentor, or student with whom the peer reviewer is currently conducting research or other significant professional activities or with whom the member has conducted such activities within three years of the date of the review.

Standing Review Group Membership: When a scientific review group meets regularly, a relationship among the individual members exists; therefore, the group as a whole may not be objective about evaluating the work of one of its members. In such a case, a member's application or proposal will be reviewed by another qualified review group to insure that a competent and objective review is obtained.

Longstanding Disagreements: A conflict of interest may exist where a potential reviewer has had longstanding scientific or personal differences with an applicant.

Multi-Site Or Multi-Component Project: An individual serving as either the principal investigator or key personnel on one component of a multi-site or multi-component project has a conflict of interest with all of the applications or proposals from all investigators or key personnel associated with the project. The individual should be considered a professional associate when evaluating applications or proposals submitted by the other participants in the project.

Request For Applications (RFA) Or Request For Proposals (RFP): Persons serving as the principal investigator or key personnel on an application submitted in response to an RFA or on a proposal in response to an RFP are generally considered to have a conflict of interest with all of the applications or proposals submitted in response to the RFA or RFP. However, if no other reviewer is available with the expertise necessary to ensure a competent and fair review, a waiver may be granted by the PRC that will permit an individual to review only those applications or proposals with which he/she has no conflict of interest that is likely to affect the integrity of the advice to be provided by the reviewer.

Appearance Of A Conflict Of Interest means that a reviewer or close relative or professional associate of the reviewer has a financial or other interest in an application or proposal that is known to the reviewer or the PRC and would cause a reasonable person to question the reviewer's impartiality if he or she were to participate in the review. The PRC will evaluate the appearance of a conflict of interest and determine whether or not the interest would likely bias the reviewer's evaluation of the proposal. Where there is an appearance of conflict of interest, but not sufficient grounds for disqualifying the reviewer, the PRC will document: (1) that there is no real conflict of interest; and (2) that, at the time of the review, no practical alternative exists for obtaining the necessary scientific advice from the reviewer with the apparent conflict.

Waivers If no other reviewer is available with the expertise necessary to ensure a competent review, a waiver may be granted by the PRC to allow participation in the review.

CONFIDENTIALITY AND NON-DISCLOSURE OF MATERIALS AND PROCEEDINGS

The applications and proposals and associated materials made available to reviewers, as well as the discussions that take place during review meetings are strictly confidential and must not be disclosed to or discussed with any one who has not been officially designated to participate in the review process. In addition, disclosure of procurement information prior to the award of a contract is prohibited by the Procurement Integrity Act.

CERTIFICATION

All reviewers must certify that they have read the Conflict of Interest, Confidentiality, and Non-Disclosure Rules." The reviewer must certify that, to the best of his/her knowledge, he/she has disclosed all conflicts of interest that he/she may have with the proposal or its authors and he/she fully understands the confidential nature of the review process and agrees: (1) to destroy or return all materials related to it; (2) not to disclose or discuss the materials associated with the review, their evaluation, or the review meeting with any other individual except as authorized by the PRC; (3) not to disclose procurement information prior to the award of a contract; and (4) to refer all inquiries concerning the review to the PRC.

PRE-REVIEW CERTIFICATION FORM
REGARDING CONFLICT OF INTEREST, CONFIDENTIALITY, AND NON-DISCLOSURE FOR REVIEWERS OF SCIENCE PROPOSALS

Name [Last, First]:_____

(Please print)

Address:

Other Employers (if applicable)

Title of Proposal Reviewed: _____

_____

Date(s) of review: _____

Check only one (and provide any comments or explanations on reverse side):

☐   I have read the attached "Conflict of Interest, Confidentiality, and Non-Disclosure Rules and Information for Reviewers" and hereby certify that, based on the information provided to me, **I do not have a conflict of interest in the proposal listed above or the proposal authors.**

OR

☐   I have read the attached "Conflict of Interest, Confidentiality, and Non-Disclosure Rules and Information for Reviewers" and hereby certify that based on the information provided, **I have a conflict of interest in the specific proposal or proposal authors listed above** and hereby recuse myself from the review of this proposal.

Certification

I certify that I have read the attached "Conflict of Interest, Confidentiality, and Non-Disclosure Rules and Information for Reviewers." I certify that to the best of my knowledge I have disclosed all conflicts of interest that I may have with proposals or proposal authors and I fully understand the confidential nature of the review process and agree: (1) to destroy or return all materials related to it; (2) not to disclose or discuss the materials associated with the review, my evaluation, or the review meeting with any other individual except as authorized by the Proposal Review Committee (PRC); (3) not to disclose procurement information prior to the award of a contract; and (4) to refer all inquiries concerning the review to the PRC.

Signature:_____Date:_____

POST-REVIEW CERTIFICATION FORM
REGARDING CONFLICT OF INTEREST, CONFIDENTIALITY, AND NON-DISCLOSURE OF INFORMATION FOR REVIEWERS OF SCIENCE PROPOSALS

Title of Proposal Reviewed: _____

_____

Date(s) of review: _____

A. Confidentiality and Non-Disclosure: I fully understand the confidential nature of the review process and agree: (1) to destroy or return all materials related to the evaluation; (2) not to disclose or discuss the materials associated with the review, my evaluation, or the review meeting outside of that meeting or with any other individual except as authorized by the Proposal Review Committee (PRC); (3) not to disclose procurement information prior to the award of a contract; and (4) to refer all inquiries concerning the review to the PRC.

B. Conflict of Interest For Non-Federal Reviewers: This is to certify that in the review identified above, I did not participate in an evaluation of any application or proposal: (1) from any applicant institution or offeror where I am a full- or part-time salaried employee or where I am negotiating for such employment; (2) from any applicant institution or offeror where I have received or could receive a direct financial benefit in relation to the application or proposal under review or have received or could receive a financial benefit from the applicant institution or offeror or principal investigator valued at $10,000 or more per year that is unrelated to the application or proposal under review; (3) submitted by a close personal relative, a member of my household, or professional associate, or if such person receives financial benefits from or provides financial benefits to an applicant or offeror. If there was an appearance or real conflict of interest, or (4) any application submitted by my former (within the past year) employer I recused myself from the review of the application/proposal or was granted an appropriate waiver.

CERTIFICATION

I fully understand the confidential nature of the review process and agree to confidentiality and non-disclosure (Paragraph A) and certify that in the review above I did not participate in an evaluation of any application or proposal with which I knowingly had a conflict of interest (Paragraph B).

_____
Printed Name

_____   _____
Signature   **Date Signed**

Appendix B

Technical Review Criteria Used for Individual Peer Reviews of Science Proposals and Instructions to Reviewers

Instructions to reviewers:

Please provide a brief written summary of your review findings for each review criterion listed below. Please provide an overall numerical rating of the proposal based on your review. Use the rating definitions below to determine your overall rating. Please do not report numerical ratings with greater than two significant figures. Please provide a brief written justification for your overall rating.

Rating	Definition
5 – 5.9 (Superior)	All aspects of the proposal are clear and well described. All technical review criteria are affirmatively met and there is a high probability of success. No substantive flaws are noted, although some minor errors or omissions may be noted.
4 – 4.9 (Good)	All aspects of the proposal are clear and well described. A majority of the technical review criteria are affirmatively met, although there may be some minor questions related to some aspects of the proposal. Reviewers may identify one substantive flaw, but there is a clear resolution to that flaw. Some minor errors or omissions also may be noted.
3 – 3.9 (Average)	The proposal is sound overall, but some deficiencies are noted. Reviewers may identify up to two substantive critical flaws, and at least half of the technical review criteria are affirmatively met.
2 – 2.9 (Below Average)	The proposal presents a cogent description of the project but serious deficiencies are noted. Reviewers may identify three or more substantive critical flaws, and less than half of the technical review criteria are affirmatively met.
1 - 1.9 (Inferior)	The proposal does not present a cogent description of the project and serious deficiencies are noted. Reviewers may identify three or more substantive critical flaws, and less than half of the technical review criteria are affirmatively met.

Technical Review Criteria:

Goals. Are the goals, objectives, and hypotheses clearly stated and internally consistent? Is the idea timely and important? Does the proposal directly address one or more important research questions targeted by the RFP to which it was submitted?

Justification. Is the study justified relative to existing knowledge? Is the conceptual basis clearly stated in the proposal and does it explain the underlying basis for the proposed work?

Approach. Is the approach well designed and appropriate for meeting the objectives of the project?   Are the results likely to add to the base of knowledge? Is the project likely to generate novel information, methodologies, or approaches?

Feasibility. Is the approach fully documented and technically feasible? Are the underlying assumptions reasonable? What is the likelihood of success? Are the scale, budget, and timeline of the project consistent with the goals and objectives and within the grasp of the authors?

Products. Is the project likely to yield products of value? Are interpretative (or interpretable) outcomes likely from this project? Will the information ultimately be useful to decision makers?

Capabilities. What is the track record of the authors in terms of their past work? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have the infrastructure and other aspects of support necessary to accomplish the project?

Overall Rating. Please provide a numerical score using the rating table and provide a brief justification for your overall rating.

Appendix C

Proposal Rating Categories and Considerations Used by the Peer Review Committee

Average Rating	Interpretation	Further Consideration
5 – 5.9 (Superior)	The proposal received top scores from all reviewers, with an average score ranging from 5 to 5.9. No substantive flaws noted, although some minor errors or omissions may be noted.	Yes. All proposals with an average rating ≥ 5 will be considered in the agency relevancy review.
4 – 4.9 (Good)	The average score from three reviewer's ranges from 4 to 4.9. Reviewers may identify one substantive flaw, but there is a clear resolution to that flaw. Minor errors or omissions also may be noted.	Yes. All proposals with an average rating ≥ 4 will be considered in the agency relevancy review. A recommendation to fund a proposal in this category is contingent upon satisfactory revision to address all technical review comments.
3 – 3.9 (Average)	The average score from three reviewer's ranges from 3 to 3.9. Reviewers may identify up to two substantive critical flaws. Minor errors or omissions also may be noted	Yes/No. Proposals with an average rating ≥ 3 are generally not considered in the agency relevancy review. However, the PRC may opt to include these proposals in the agency relevancy review, depending on the uniqueness of the subject or the number of superior and good proposals receiving further consideration. A recommendation to fund a proposal in this category is contingent upon satisfactory revision to address all technical review comments.
2 – 2.9 (Below Average)	The average score from three reviewers ranges from 2 to 2.9. Reviewers may identify three or more substantive critical flaws. Minor errors or omissions also may be noted.	No. Proposals with an average score <3 will not receive further consideration.
1 – 1.9 (Inferior)	The average score from three reviewers ranges from 1 to 1.9. The proposal does not provide a cogent description of the project. Reviewers may identify three or more substantive critical flaws. Minor errors or omissions also may be noted.	No. Proposals with an average score <2 will not receive further consideration.

Appendix D

Review Criteria Used for Agency Relevancy Review of Science Proposals and Instructions to Reviewers

Instructions to reviewers:
Please provide a brief written summary of your review findings for each review question listed below. Please provide an overall numerical rating of the proposal's relevancy based on your review. Please do not report numerical ratings with greater than two significant figures. Use the rating definitions below to determine your overall rating. Please provide a brief written justification for your overall rating.

Rating	Definition
5 – 5.9 (Extremely Relevant)	**High end of range:** Proposal is extremely relevant based on all of the review criteria, no substantive issues are noted. **Low end of range:** Proposal is extremely relevant based on a majority of the review criteria and highly relevant for other review criteria. No substantive issues noted.
4 – 4.9 Highly Relevant)	**High end of range:** Proposal is highly relevant based on all of the review criteria. One or more substantive issues may be noted for which there is/are clear resolution(s). **Low end of range:** Proposal is highly relevant based on a majority of the review criteria and moderately relevant for other criteria. One or more substantive issues may be noted for which there is/are clear resolution(s).
3 – 3.9 (Moderately Relevant)	**High end of range:** Proposal is moderately relevant based on all of the review criteria. Substantive issues may be noted, but there are clear resolutions to those issues. **Low end of range:** Proposal is moderately relevant based on a majority of the review criteria and of low relevance for other criteria. Substantive issues may be noted and resolutions to those issues may be possible.
2 – 2.9 (Low Relevance)	**High end of range:** Proposal is of low relevance based on a majority of the review criteria and moderate relevant for other criteria. Substantive issues may be noted and resolutions to those issues may be possible. **Low end of range:** Proposal is of low relevance based on all of the review criteria. Substantive issues may be noted and resolutions to those issues may be possible.
1 - 1.9 (Not Relevant)	**High end of range:** Proposal is of low relevance based on all of the review criteria. Substantive issues may be noted and resolution of those issues is considered unlikely or impossible. **Low end of range:** Proposal has no relevance to the information needs of the agency.
No Score	Agency reviewer chooses not to review the proposal. Choosing this option means the reviewer has relinquished their input on proposal relevancy to other agency reviewers.

Proposal Number:_____ Date of Review_____

Agency Providing This Review_____

Agency Need: Does the subject area of this proposal address an issue or information gap of relevance to a management or policy issue your agency is concerned with?

Reviewer Response:

Timeliness: Will the results of this work provide information on a timeline that supports the information needs of your agency?

Reviewer Response:

Products: Does the project propose products that would be useful to your agency? Does the proposal provide means to communicate project results in ways that are useful to your agency?

Reviewer Response:

Engage Agency and Stakeholder Representatives: Does the proposal demonstrate that it was designed in response to agency needs? Does the proposal include provisions to ensure that relevant agency and stakeholder representatives are sufficiently engaged with the project?

Reviewer Response:

Conflict or Redundancy: Would implementation of this project conflict with the implementation of another science or capital improvement project? If so, please describe the conflict. Does the project unnecessarily duplicate another project? If so, please describe the extent to which the proposal is unnecessarily duplicative with other work.

Reviewer Response:

Cost Effectiveness: Do you think the project is a cost-effective way to answer the questions or test the hypotheses posed?

Reviewer Response:

Other Considerations: Please list any other relevant considerations.

Reviewer Response:

Overall Justification Rating: Please provide a numerical score using the rating table and provide a brief justification for your overall rating.

Reviewer Response: