GCD AMP SCIENCE ADVISORS
RAPID RESPONSE REVIEW: A DRAFT REPORT TO THE TECHNICAL WORK GROUP OF THE GLEN CANYON DAM ADAPTIVE MANAGEMENT PROGRAM: RECOMMENDED PROTOCOLS FOR CORE MONITORING OF SEDIMENT

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JUNE 2007

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INTRODUCTION

The GCD AMP Science Advisors are often asked to provide immediate input to a draft AMP science or management document. These comments are provided quickly, normally within a week of the request. Rapid Response Reviews are provided with the assumption that the SAs will be asked to review a final document at a later date. The inputs provided are therefore focused on making sure the document contains all necessary sections, that no significant elements to support the proposal are omitted, and that the presented argument, proposal, plan etc. are well developed, logical, and complete.

This review is of a draft document titled, "A Draft Report to the Technical Work Group of the Glen Canyon Dam Adaptive Management Program: Recommended Protocols for Core Monitoring of Sediment." It was drafted by the Physical Science Group Program Manager of GCMRC: The review was requested on a SA/GCMRC river trip June 1-8, 2007, and was completed the following week June 10-17, 2007

SCIENCE ADVISORS COMMENTS

The presented protocols for core monitoring of sediment within the Colorado River Ecosystem (CRE) were prepared by the GCMRC Physical Science Group in June 2007. They represent the first proposal for core monitoring to be presented by one of the three primary GCMRC programs (i.e., physical, biological and cultural). The following comments by the Science Advisors are presented with this being the first set of monitoring protocols in mind and address both this specific proposal and potentially the core monitoring proposals that will be developed by the other two primary programs.

The proposed sediment monitoring program is designed around four major tasks: (i) continuous monitoring of flow and suspended-sediment flux; (ii) annual ground-based measurements of selected higher elevation sand deposits; (iii) repeat inventories conducted approximately every 4 years of all exposed mid- to higher-level sand deposits within the CRE using remote sensing imagery; and (iv) annual to biennial repeat topographic channel mapping of sediment below the river surface using bathymetric surveys along selected stream reaches (different reaches selected each year on a rotating basis).
The first task involves developing a sediment mass balance for the CRE, as recommended by the 2006 SEDS-PEP III external review panel, using field measurements to develop and test physically-based models. The mass balance will be individually calculated for five stream segments that together completely cover the CRE between river-miles 0 and 226. The second, third, and fourth tasks (collectively known as SED TREND) focus on long-term monitoring of the physical characteristics of sediment deposits throughout the canyon. These tasks utilize data collected from ground surveys of sediment above the river surface, from bathymetric surveys of sediment below the river surface, and from remote sensing.

We start from the premise that many vitally important aspects of the CRE, including aquatic and riparian habitat and geomorphic processes influencing archeological sites and recreational sites, depend on water and sediment dynamics. Adaptive management of the CRE, therefore, requires knowledge of water and sediment dynamics sufficient to support the use of models that predict the response of sediment transport and storage to changes in flow regime and sediment supply. The proposed protocols for core monitoring of sediment represent an acceptable program for continuing to develop this knowledge.

It is our opinion that all four of the major monitoring components are needed to document and understand trends in sediment transport and storage within the CRE and their relationships to other resources. Tasks ii and iii address the most immediate concerns regarding recreational areas, archeological sites, and aquatic and riparian habitat within the CRE. Implementing only these tasks, however, would result in a "black box" approach to sediment dynamics in which changes in sediment storage could be observed but not understood. Lack of understanding of the underlying processes driving observed changes in sediment storage would preclude designing a flow regime or other management strategies to conserve and restore desired characteristics of the CRE.

Adjustments in the implementation of the four major monitoring components in response to the occurrence of BHBFs form an important component of the proposed protocols for core monitoring. BHBFs represent disturbances that allow GCMRC scientists to test their ability to understand and predict the response of the CRE to perturbations. The CRE is a dynamic and

complex system in which continual changes in sediment and water supply create both system-wide and local changes in sediment storage. Multiple BHBFs allow scientists to refine the sediment mass balance and modeling described in the proposed protocols to the level where thresholds and longer-term trends can be predicted in relation to both controlled (e.g., flow regime) and uncontrolled (e.g., climate change, tributary sediment inputs) sources of variability in water and sediment supply. The ability to implement BHBFs depends primarily on sediment inputs from the Paria and Little Colorado River, and the proposed monitoring protocols effectively explain how the four major monitoring components will be implemented under differing time intervals between successive BHBFs.

Information gathered from the proposed sediment monitoring plan will also be a necessary component of the overall adaptive management program. Active adaptive management involves direct manipulation, such as the BHBF experiments. Passive adaptive management utilizes natural variation in ecological processes to help develop understanding of system dynamics. As the Glen Canyon adaptive management program is becoming a combination of both active and passive approaches, it must have a rigorous and continuous monitoring plan in order to capture information for learning, and optimize opportunities for increasing understanding.

The draft report is particularly effective at explicitly stating how each monitoring task links to other resource programs and issues, which is critical given that the data collected on sediment storage and flux will be integral to research and monitoring efforts in the other GCMRC programs. We expect that subsequent monitoring proposals from these programs will include the same level of integration with this sediment monitoring, with other GCMRC programs, and with the conceptual model of the CRE

It is important that the techniques initially established for each of the four major monitoring components be maintained if investigators other than the original GCMRC scientists continue the monitoring work. This need for stability of monitoring techniques appears to be addressed in the proposed protocols. It is also important that the monitoring be long term (i.e., maintained at least beyond 5 years), and this is also addressed in the proposed protocols. We feel that the reporting format described in the proposed protocols, which includes peer-reviewed journal articles and regular reports to TWG and AMWG, is well-designed and should be effective in communicating ongoing results to the greater community

The Science Advisors may not necessarily have to review each additional monitoring proposal, for we are confident of the ability to GCMRC directors to design these monitoring protocols so that they are both stable and intregative. However, it is unclear if the format and approaches presented for sediment monitoring protocols and developed linkages to other resource monitoring will be repeated in core monitoring plans for cultural and biotic resources. If they are, the need for review of these protocols may be minimized.

Some of the above evaluations by the Science Advisors (SAs) can be better determined when the final sediment core monitoring document is submitted for review. The SAs look forward to conducting that in depth review in the near future.