Final Report:
Cultural Resource Program Assessment

26 June 2000

The Cultural Program of the Grand Canyon Monitoring and Research Center (GCMRC) convened a Protocol Evaluation Panel (PEP) as called for in the GCMRC's operational plan. In addition, the Bureau of Reclamation co-sponsored this PEP. The Bureau of Reclamation operates Glen Canyon Dam and is the lead federal agency responsible for compliance with Section 106 of the National Historic Preservation Act (NHPA). In 1994, a Programmatic Agreement (PA) was developed by the Advisory Council on Historic Preservation with the following parties: Bureau of Reclamation, National Park Service, Arizona State Historic Preservation Office, Havasupai Tribe, Hopi Tribe, Hualapai Tribe, Kaibab Paiute Tribe, Navajo Nation, San Juan Southern Paiute Tribe, Shivwits Paiute Tribe, and Zuni Pueblo. The Havasupai Tribe and the San Juan Southern Paiute Tribe have not yet signed the PA.

The PEP was structured to address four topical areas: monitoring and compliance, archaeology, Native American issues, and geomorphology. Overall recommendations were developed by the full panel, based on the results of subpanel reports on the four topical areas. This report begins with a summary listing of the recommendations of the full panel. The body of the report consists of an Introduction where the panel goals are defined. Next, the "Key Issues and Recommendations" that were identified by the full panel are discussed. The reports prepared by each subpanel are also included. The key issues section is intended to provide sufficient context and content for policy makers to grasp the panel's overall assessment, however, the subpanel reports contain additional discussion that should be of use to program personnel. Appendix A provides brief professional biographies of all panel participants. Appendix B outlines two illustrative examples. Appendix C is a list of acronyms. Panel members are listed here by subpanel:

Monitoring and Compliance Subpanel
- Lynne Sebastian, Coordinator
- David Cole
- James Collins
- Mark Druss
- Thomas F. King
- Michael Trimble

Archaeology Subpanel
- Paul R. Nickens, Coordinator
- Michael Berry
- William H. Doelle
- Betsy L. Tipps

Native American Issues Subpanel
- Joe Watkins, Coordinator
- Rebecca Tsosie
- David Vader
- Jacilee Wray

Geomorphology Subpanel
- Joel Pederson, Coordinator
- Michael Blum
- Kyle House

Final Report Compiler
- William H. Doelle

Summary of Panel Recommendations

The panel has developed eleven recommendations for the cultural program. Three of those recommendations are separated out as "core recommendations." The eight supporting recommendations elaborate on the core recommendations. All eleven recommendations are listed here briefly, and they are discussed further in the "Key Issues and Recommendations" section of the report.

Three Core Recommendations

Complete and adopt a Historic Preservation Plan (HPP) as a top priority

Expand Native American involvement at multiple levels

Improve coordination and integration of a complex program

Eight Supporting Recommendations

Refine the definition of the Area of Potential Effect (APE) for the PA program

Prepare a systematic evaluation of historic properties for the PA program

Reassess geomorphology research priorities

Redefine the cultural resource monitoring programs

Develop an integrated historic properties treatment plan for the PA program

Develop a cultural resource database plan

Expand public outreach and education activities

Improve cultural resource contracting procedures

Introduction

The majority of the Protocol Evaluation Panel (PEP) participated in a 224-mile Colorado River trip through the Grand Canyon from March 6-12, 2000. Then, on March 13 and 14, PEP members attended meetings that addressed the cultural resource program and included both public and closed sessions. During the closed sessions, panel members defined issues as a full group and in break-out sessions by subpanel. There was time to discuss the planned contents of this report on March 14, and on March 15 the four subpanel coordinators and the overall report assembler remained in Flagstaff and wrote a rough draft of this report. All panel members reviewed the rough draft, and their comments were incorporated into a Preliminary Draft report. That report drew comments from nearly half the panel and was used as a basis for a Final Draft report. Several more issues were raised in the final round of comments, and they were incorporated into this Final Report.

The overall PEP was asked to look at the strengths and weaknesses of the cultural resource program. They were also asked to identify appropriate management objectives for the program and to recommend areas for improvement and to suggest ways to increase integration between programs. In its FY2001 Monitoring and Research Plan, the GCMRC lists the following expectations for this PEP:

> The PEP will assess the GCMRC activities relative to the Management Objectives and Information Needs of the AMP. PA activities will be assessed relative to the stipulations of that program to meet legal compliance by Reclamation. Finally the PEP will evaluate the coordination between the programs.

Unfortunately, this concise statement of expectations was not discovered by the report compiler until the Final Draft was being prepared. At that point it was not feasible to undertake a full reorganization of the report. Instead, an attempt was made to clarify which elements of the assessment apply to the GCMRC, which apply to the PA program, and which are applicable to both programs.

While the panel did assemble a list of program strengths and weaknesses, they are presented with minimal discussion. Recommended actions take these strengths and weaknesses into account in the section titled “Cultural Resource Program Key Issues” which is the core of this report. Furthermore, the individual subpanel reports contain more detailed discussions of these issues.

Program Strengths

Aspects of the cultural resource program have been operating since the early 1990s. Many developed out of the research and assessment process related to preparation of the Environmental Impact Statement for the operation of Glen Canyon Dam.

1) There is a good archaeological inventory for the Colorado River corridor. Most of the

sites have been photographed, mapped, and otherwise recorded by the appropriate specialists, often through multiple visits. Detailed contour maps have been prepared for many sites, and a few sites have been tested or have received limited data recovery programs.

2) Geologist Richard Hereford and several colleagues have completed descriptive studies of the alluvial stratigraphy and geomorphology along portions of the river corridor that provide a good physical framework on which additional research can build.

3) The tribal involvement program has established a good base level of participation that can serve as framework for strengthened interaction and improved government-to-government relations.

4) The Monitoring and Remedial Action Plan (MRAP) called for in the Programmatic Agreement met its intended purpose as an interim document to aid in the development of a Historic Preservation Plan (HPP).

5) The cultural resource programs have resulted in the hiring and training of a good staff that has strong local expertise and logistical skills.

6) The program appears to have good physical resources (offices, computers, field equipment, etc.).

Program Weaknesses

The weaknesses of this program are interrelated and are cause for concern. First, the program lacks clarity of mission and vision for the future. This is evident at several levels in both the GCMRC and the PA aspects of the program. The lack of a completed HPP and the lack of an archaeological research design are symptoms of this problem.

Second, because the overall mission of the program is not clear, the program appears to have stalled in place. In addition, there is not an effective division of responsibility and labor between program participants. There is duplication of effort in some areas and missed opportunities in others.

The program's strengths provide a foundation upon which to build. However, the weaknesses must be overcome if the cultural program is to achieve its legal mandates. Beyond that minimum necessity, there is an opportunity to make scientific contributions and to create much greater public value if these weaknesses are addressed effectively. The PEP has identified a number of key issues as part of the evaluation process. Those issues are discussed and specific recommendations are made in the spirit of constructive comment and critique.

Key Issues and Recommendations

The rationale for all cultural resource activities derives from federal laws, regulations, and policies. The monitoring and compliance subpanel provides a thorough review and provides recommendations in nine different areas. The other subpanels identified many issues that overlapped with these basic concerns. In fact, the substantial agreement between panel members with very different areas of expertise strengthens the recommendations that have been developed through this review process.

The eleven issues drew the most attention from panel members have been grouped into two sets. First and foremost is a set of three core recommendations. The remaining eight recommendations relate to issues that must be addressed in order to carry out the three core recommendations. The core recommendations are presented first, followed immediately by the eight supporting recommendations.

Core Recommendation #1: Complete and Adopt a Historic Preservation Plan (HPP)

The purpose of an HPP is to define program goals, specify general procedures, and provide a framework within which a dynamic preservation program can be implemented. The need for this plan derives directly from the 1994 Programmatic Agreement, which called for completion of an HPP by December of 1994. The failure to complete this document more than six years past the deadline is symptomatic of the lack of coordinated effort and cooperation that limits the effectiveness of the PA program.

The HPP is a high-level document that defines the relationships between the diverse consulting parties and lays out how the management of historic properties is to be accomplished. The HPP should be supported by a series of subsidiary documents. Minimally, the recommended subsidiary documents for the HPP are: Research Design, Monitoring Plan, Traditional Cultural Properties Plan, Historic Properties Treatment Plan, Public Involvement Plan, Native American Consultation Plan, and Cultural Resources Database Plan. An outside consultant might best undertake several plan components, whereas other components could be the primary responsibility of the BOR or NPS. In Appendix B an illustrative example of how responsibilities could be divided in preparing these documents is provided.

The PEP recommends that an outside consultant be hired to prepare a Draft HPP that is developed in close consultation with the BOR, NPS, and the involved Native American groups (the Tribes). GCMRC should also participate in this process. The consultant would serve as an independent "third-party." They would focus on creating a framework for effective long-term management of the diverse cultural resources of the Grand Canyon. Areas of responsibility would be explicitly defined and, where responsibilities overlap, practical approaches to division of financial and implementation responsibility would be negotiated.

While the overall HPP is being drafted, other parties should pursue preparation of the subsidiary plan elements along the general lines outlined in Example 1 in Appendix B. The PEP specifically recommends contracting for the Research Design component. BOR and NPS should develop a plan for completing the other components.

The central importance of this planning document cannot be overemphasized. It is for that reason that it is recommended that the above "two-track" approach be adopted. Progress needs to be made simultaneously on the master document and the subsidiary documents.

Core Recommendation #2: Expand Native American Involvement

The subpanels identified multiple areas for increased involvement of Native Americans. These issues relate to both the GCMRC and the PA program.

Native American trust issues have not been addressed adequately to date. It is recommended that individual Memoranda of Understanding (MOUs) be developed with each participating tribe.

There is a need for a Native American Consultation Plan. Such a plan involves more than just improved coordination—though that is an expected outcome and benefit. It requires the federal agencies and the tribes to agree to a process for communicating, coordinating, resolving differences, acknowledging roles and responsibilities, and establishing government-to-government relationships.

Tribal representatives made it clear that their concerns are broad, and that those concerns extend beyond archaeology and cultural resources to include issues such as water quality, recreation, plants, and animals. The consultation plan recommended above is one channel for addressing these broader issues. The HPP (see next paragraph) will also address Native American consultation and involvement.

Development of the HPP should include procedures for more direct involvement of Native Americans in the various activities and programs. Native American representatives expressed a desire to be actively involved in designing programs and creating plans rather than being limited to a passive role of commenting on documents or plans that others have prepared.

The importance of the Grand Canyon to multiple Native American tribes or nations was expressed clearly by the tribal representatives who participated in the field visits and the public sessions. There is broad concurrence across the panels that the entire Grand Canyon is appropriately considered a Traditional Cultural Property (TCP). It is recommended that all involved agencies accept the designation of the entire canyon as a TCP that is eligible for inclusion in the National Register of Historic Places.

As a practical means to promote integration of the tribal monitoring programs with the other GCMRC monitoring activities and with the PA program, increased face-to-face interaction must occur. The current Socio-cultural Program Coordinator is one resource to facilitate this process. She could encourage smooth information flow by hosting meetings with tribal representatives on a quarterly basis (or other appropriate interval) to convey project information and obtain tribal feedback. This informal interaction is in addition to the formal procedures that will be outlined in the Tribal Consultation Plan.

Core Recommendation #3: Improve Coordination of a Complex Program

This issue has two components: creating a commitment to a unified program and provision of sufficient personnel to achieve such integration.

The PEP was asked to address two separate programs, the PA program and the GCMRC program. In general we have followed that request. However, there is a strong perception by the PEP that cross-agency conflict is a serious threat to the long-term success of this program. Furthermore, the lack of integration of these partly overlapping programs reduces effectiveness and raises costs. Therefore, it is recommended that the BOR, NPS, and GCMRC commit to a realistic and creative approach that explores the interests of the various parties to see how they can be satisfied in mutually complementary ways. Similarly, compliance agencies such as the Advisory Council and the Arizona SHPO need to support the development of creative solutions to the complex issues of this program.

The HPP will be the context in which these solutions are crafted. It is recommended that an outside consultant or consultant team assist in preparing the HPP. However, as the agencies with legal responsibilities under Section 106 and Section 110 of the NHPA, the BOR and NPS must play active roles in the preparation of these plans. The GCMRC should also participate in this process. There are areas where GCMRC capabilities can be used to meet both their mission while contributing directly to the PA program. For example, the areas of database and long-term monitoring have strong potential as GCMRC contributions. Similarly, BOR and NPS must be willing to divide responsibility for program tasks according to their legal responsibilities and to their capabilities.

The need for sufficient personnel commitment to this program must also be addressed. The PA program, in particular, has suffered from a lack of full-time personnel in leadership roles. Neither BOR nor NPS has a full-time senior researcher coordinating this program. Given the need to develop the HPP and a series of supporting documents, it is critical that BOR increase its personnel allocation to this program, at least during the process of creating these key guiding documents. The GCMRC has a full-time person heading the Socio-cultural Program. There needs to be close coordination between BOR, NPS, and GCMRC in the upcoming planning process. This report makes several recommendations regarding potential for division of labor and responsibility between these parties. However, it is essential that each party work closely to minimize overlap

and maximize cooperation in developing the processes that will be written into these essential planning documents and in their implementation.

Supplementary Recommendations that Support the Core Recommendations

Eight additional recommendations have been developed that support the three core recommendations of the panel. These additional recommendations are components of developing the HPP and of expanding Native American involvement. They are presented in a rough chronological order related to HPP development and implementation rather than in a priority order. All are related to the ultimate success of this program.

Refine the Definition of the Area of Potential Effect (APE)

Because the PA addresses BOR's and NPS's on-going Section 106 and Section 110 responsibilities within the Area of Potential Effect (APE) for dam operations, both effects from dam operations and recreational use on historic properties are to be considered. So long as the Glen Canyon Dam is in operation and so long as the Glen Canyon National Recreation Area and the Grand Canyon National Park allow recreational activities to occur, both agencies will have ongoing responsibilities. The HPP that must be developed jointly by BOR and NPS pursuant to the PA is the vehicle by which both agencies address their respective impacts to historic properties.

Substantial discussion of how the APE had been defined previously in relation to potential flood release levels of Glen Canyon Dam served to highlight many difficulties with a flow-based definition. The geomorphologists provided a more practical definition that can be mapped, ties to potential impacts from Glen Canyon Dam flow releases, and is directly related to the presence and condition of many cultural resources within the canyon corridor—especially archaeological sites. It is recommended that:

> the Area of Potential Effect (APE) of dam operations be defined as the full extent of mainstem Holocene sedimentary deposits along the river corridor. Holocene deposits of this kind, as mapped for select parts of Grand Canyon (Hereford, 1996; Hereford et al., 1998) consist of: a) Colorado River alluvium arranged as a flight of inset terraces and underlying fill deposits; b) aeolian deposits that originate by deflation of Colorado River alluvium that is transported and emplaced elsewhere in the river corridor; and c) fluvial and debris flow deposits of tributary debris fans as well as colluvium that interfingers and buries other Holocene deposits along the river corridor.

It is important to note that this is the area where *potential for effects* is considered—it does not mean that the Bureau of Reclamation or the National Park Service is responsible for every effect on cultural resources in that area. It merely defines the area where such effects—direct and indirect effects as well as Section 110 responsibilities—are considered for this specific federal undertaking.

Prepare a Systematic Evaluation of Historic Properties

The Grand Canyon as a whole is of great cultural importance to the tribes of the area and is identified as such in tribal origin and migration traditions. The Grand Canyon also contains many specific areas of historic and cultural importance to the tribes because of their association with traditions, their perceived spiritual power, and the roles they play in traditional subsistence, medicine, land use, and relationships between humans and the natural world. The historic significance of these areas, as well as that of the entire canyon, can best be addressed in land management by regarding the Grand Canyon as a whole as eligible for inclusion in the National Register of Historic Places. This is an unfinished task that should be addressed as a very high priority.

One the other hand, for archaeological sites there exists a good inventory and determinations of eligibility have been completed. What is lacking is a systematic assessment of the *relative* value of these National Register-eligible historic properties. To accomplish this task, an archaeological research design is an essential tool. The vast majority of eligible properties are eligible under criterion D, their potential to contribute information regarding history or prehistory. Therefore, a research design is the basis for evaluating the relative information potential of these National Register-eligible properties. Furthermore, a research design provides justification for the kinds of archaeological data collected during monitoring and can help ensure that the full range of significant archaeological resources is being considered. Native Americans have also expressed a desire to contribute to the definition of research goals. A research design should guide decisions as to which sites that are being damaged or threatened with impacts merit treatment through data recovery.

The unique environmental setting of the Grand Canyon, its importance to Native Americans, its international recognition as a natural and cultural landmark, and its potential to address a broad range of potential research issues all demand that any archaeological research conducted within the canyon be guided by a broadly conceived, professional research design. The design should also incorporate and integrate the rich body of relevant geomorphic and paleoclimatic research accomplished in the Greater Southwest. Regionally, it is necessary to place the cultural resources of the Grand Canyon in the broader context of southern Colorado Plateau prehistory from the Paleo-Indian through the Historic periods. Such a document is currently lacking.

In order to ensure that an appropriately broad expertise is represented within the research design, it is recommended that a national-level procurement be issued and that the selected contractor work closely with all of the current interest groups to create a strong guiding document for this program. A peer review panel should be involved in the contractor selection and review of the draft research design.

Once the research design is in place, it should be possible to implement the site-by-site assessment process. No additional fieldwork should be required to complete this assessment.

Reassess Geomorphology Research Priorities within the GCMRC Cultural Program

The cultural program of the GCMRC has funded a substantial amount of geomorphological research related to the so-called "Hereford hypothesis" or "base-level hypothesis." Review of the geological work related to this hypothesis by the geomorphology subpanel raises questions about its utility as a management principle. That utility had been based on the belief that spike flows might be able to deposit sediment that would serve to reduce erosion rates along river-based drainages. For example, Balsom and Larralde (1996:156) conclude: "The results [of the 1994 spike flow], however, substantiate the concept advanced in the GCDEIS that high flows can be used as a management tool for system-wide stabilization of cultural resources." The geomorphology subpanel disagrees with this view and concludes that more research regarding this hypothesis is probably not merited at present. They suggest that, as a practical management approach, there should be an assumption that erosion will continue to be a long-term process that will affect the archaeological sites within the APE. Trying to pursue the quantification of those dam-related effects as distinguished from "natural" erosional effects is not deemed a cost-effective research endeavor. The geomorphology subpanel found the modeling study by Weile on flood-related deposition to be important to the physical program of the GCMRC, however, they felt that further funding of it by the cultural program of GCMRC was inappropriate because of its dependence on the Hereford hypothesis. Instead, future geomorphological research funding should be tied into the overall archaeological/historical research design. The GCMRC needs to ensure that there is mutual awareness of research issues and information sharing between geomorphologists working on cultural program issues and those working in the GCMRC physical program. Furthermore, working regularly and closely with qualified geomorphologists is essential in the monitoring program and for developing and implementing the historic properties treatment plan. A senior geomorphologist should be included as a regular and active member of the team.

Redefine the Cultural Resource Monitoring Programs

Monitoring of archaeological sites has been a major activity of the PA program to date. That monitoring has documented substantial erosional impacts and a lesser degree of visitor impacts on many of the archaeological sites within the river corridor. In many cases treatment responses have been developed based on this information. These responses have included: archaeological data recovery of individual eroding features, construction of erosion control devices, closure of archaeological site areas to visitors, restriction of access to portions of some archaeological sites by blocking trails and managing vegetation, and in many cases no action beyond continued monitoring.

The PEP recommends that the monitoring program be reoriented to contribute information to: 1) prioritize historic properties for treatment decisions and 2) evaluate the effectiveness of treatment options such as check dams or restriction of access to sites. In the future, monitoring should be used in a much more focused and quantitative manner to document progressive erosion at sites where preservation measures have not yet been implemented, to assess the effectiveness of particular protection measures, and to ensure

that the effects of visitor activities remain below a threshold that causes long-term damage. The intensity of monitoring is likely to decline substantially in the future as many sites are judged to not meet research priorities and others are addressed through data recovery. Archaeological monitoring should be guided by a very specific research or management design; it should not just be a long-term, standard activity.

In addition, there are tribal programs for monitoring cultural resources of interest to tribes/nations. Many of the Native American concerns relate to plant and animal resources, for example, and it is appropriate to establish baseline conditions for these resources and to monitor the effects of Glen Canyon Dam flow regimes and other potential impacts in order to determine when corrective intervention is needed. Furthermore, there is substantial potential to coordinate the different kinds of monitoring activities that are going on within the Grand Canyon. Increased sharing of information and responsibilities between Native American monitoring programs and other monitoring activities by the National Park Service or the GCMRC should be actively pursued.

Given these overall goals, a monitoring plan needs to be developed that summarizes effects to all National Register-eligible historic properties on a property by property basis using existing monitoring data. The plan should also establish a revised monitoring approach and methodology. Data categories, data collection and site recording techniques, and database management issues all need to be addressed in the monitoring plan. This monitoring plan would guide the future conduct of monitoring. Summary information on the current status of each historic property from all monitoring activities should be the basis for treatment decisions outlined in the treatment plan.

Prepare a Cultural Resource Database Plan

At present archaeological data are being managed by Northern Arizona University (NAU) through a cooperative agreement with NPS. Tribal information is being gathered, however, it is not clear if it is being incorporated into the GCMRC database. Not all tribal data may be appropriate for maintenance in a database, however, information related to plants, animals, or physical resources that are less sensitive should be part of the GCMRC database. Brief review of the NAU database maintained for the Park Service indicated that the relational database capabilities of the database program were not being utilized. Furthermore the ability to link the data from field observations with other physical and environmental data through a Geographic Information System (GIS) application could be used at only a rudimentary level.

Given the responsibility of the GCMRC for long-term monitoring and for ecosystem modeling, it seems essential and highly appropriate that the GCMRC take on the role as the centralized data repository for cultural resource information. Clearly NPS needs access to these data as well. The current database needs are being addressed via subcontract, so a shift to the GCMRC would in essence represent a shift in subcontractors. NPS access should be possible via a secure Internet connection or some other data sharing strategy. Even data entry and updating by NPS should be possible if that is desired. Both security and general technology are such that data sharing between

parties with a "need to know" (e.g. NPS, BOR, GCMRC, and tribes) should be easy and safe. These issues can be addressed within the database plan.

Develop an Integrated Historic Property Treatment Plan

Thus far decision-making regarding treatment of archaeological sites has been guided by information from the archaeological monitoring program and has been largely ad hoc. To act without an overall, long-term framework is inappropriate. There is a substantial body of information that has been accumulated through the monitoring program. That information can be used in conjunction with the archaeological research design, and in consultation with Native American communities to develop an integrated historic property treatment plan.

Erosion control measures have been used as treatment options at several historic properties within the Grand Canyon corridor with variable results. The NPS has substantial experience working with the Zuni Site Stabilization program, and it is recommended that they should implement site protection measures with regular and continuing input from a senior geomorphologist. A similar approach might be possible with the site-specific elements of the traditional cultural landscape.

Realistic assessment of the effectiveness of erosion control measures is essential. Discussion of the APE above noted that because of the sediment-starved conditions created by the dam, some portion of the erosion that occurs within the APE is attributable to the operation of the Glen Canyon Dam. However, it is next to impossible to point to an exact location or specify an exact amount of erosion that is attributable to dam operation. If erosion control is not effective or appropriate as a treatment option, then data recovery may be appropriate if the site has sufficient research potential. Furthermore, Native American concerns need to be addressed. Because erosion is a cumulative, long-term process, it is recommended that data recovery should occur early, not late, in the treatment program. It is recommended that a contractor selected through a competitive bid process implement a multi-phase data recovery program. Appendix B presents an illustrative example of some of the major steps to developing and implementing a treatment program.

Expand Public Outreach and Education Activities

The tribal programs have involved outreach efforts through various participation or educational activities related to tribal monitoring activities. Within the PA program only limited outreach related to archaeological sites has been undertaken. Thus far, public involvement has targeted narrow audiences, with little effort to reach the general public.

The FY2001 budget for the GCMRC does include a small allocation for public outreach. It is recommended that the Public Involvement Plan, which will be a component of the HPP, include both the PA activities and the work of the GCMRC.

Improve Contracting Procedures

Both the PA program and the GCMRC need short-term and medium-term access to additional labor and expertise. This can best be accomplished through contracting for those services. Several panels stress the need for access to regional and national levels of expertise. Use of competitive bidding processes that are widely advertised and that eliminate any possibilities for conflict of interest by reviewers are strongly recommended. Furthermore, Native American involvement will be an appropriate requirement to write into Requests for Proposals (RFPs) in many cases. In general, sole-source contracting or special set-asides are not recommended.

Monitoring and Compliance Subpanel

The Monitoring and Compliance Subpanel consisted of: Lynne Sebastian (Coordinator), Dr. David Cole, Dr. James Collins, Dr. Mark Druss, Dr. Thomas F. King, and Dr. Michael Trimble.

The Bureau of Reclamation (BOR), the National Park Service (NPS), and the Grand Canyon Monitoring and Research Center (GCMRC) have shared and individual responsibilities under federal law. This review concerns their responsibilities under the Grand Canyon Protection Act and the National Environmental Policy Act, as described in the Record of Decision (ROD) for the Operation of Glen Canyon Dam EIS, and the National Historic Preservation Act (NHPA), as addressed by the referenced Programmatic Agreement (PA). The PA covers not only Section 106 responsibilities, but Section 110 responsibilities under NHPA as well. The agencies also have trust responsibilities relative to Native American tribes that crosscut compliance with all three laws.

Issue 1. Trust Responsibilities

BOR, NPS, and GCMRC, as well as the Western Area Power Administration (Western), have trust responsibilities to Native American tribes that include consultation but also involve wider issues. These responsibilities are currently addressed in an unsystematic fashion; they should be addressed broadly and systematically.

Recommendation:
BOR, NPS, GCMRC, and Western should develop individual MOUs with the Hualapai Tribe, the Hopi Tribe, the Navajo Nation, the Southern Paiute Consortium, and the Pueblo of Zuni (Tribes) addressing trust responsibilities and the management of the Grand Canyon. These MOUs should cover not only consultation about cultural resources but also all other components of the Adaptive Management Program.

Issue 2. The Historic Preservation Plan

The PA requires BOR and NPS to develop, in consultation with the other parties to the PA, a Historic Preservation Plan (HPP). The HPP is the cornerstone for making and carrying out management decisions for historic properties, coordinating efforts of various agencies in their compliance with the above referenced statutes and requirements, and incorporating historic property management needs into the Adaptive Management Program.

Although BOR and NPS have attempted to meet this requirement, their efforts have not been successful, at least in part because of some of the issues discussed below. Many of the problem issues identified throughout this PEP document, however, have arisen precisely because of the absence of an HPP. BOR and NPS have shared stewardship

responsibilities for managing historic resources with Grand Canyon; they must resolve their differences and complete the HPP in order to carry out those responsibilities.

The existing draft of the HPP, in combination with the tribal traditional cultural properties studies, provides a good context for understanding historic resources and historic preservation needs in the canyon. The document must be expanded to provide specific strategies for managing historic properties along the Colorado River Corridor.

Recommendations:

- The HPP must be developed in consultation with the other signatories to the PA, and the Tribes should be active participants in the HPP process. The responsibility for developing the HPP, however, and the ultimate decisions about its direction and content rest with BOR and NPS; the agencies should accept that responsibility and move forward to complete the plan.

- As noted in the Archaeology Subpanel section, the HPP need not be a lengthy document. It should include an overall strategy for managing historic properties, and it should incorporate by reference specific tactical plans for management, monitoring, and treatment (see Archaeology Subpanel, Issue #2 for additional discussion).

- Tactical plans developed in support of the HPP should be designed in consultation with the signatories to the PA.

- The HPP should include provisions and timeframe for periodic reevaluation of monitoring, management, and treatment plans.

- The HPP needs to address integration with other planning and management efforts (Park GMP, Adaptive Management process, etc.)

Issue 3. Area of Potential Effect

The underlying cause for many of the compliance-related issues, problems, and disconnects is the lack of agreement as to what constitutes the Area of Potential Effect (APE) for dam operations (the undertaking). A great deal of time and money has been spent attempting to resolve this issue through geomorphological research, but no conclusion has been reached. Although the views of the other parties should be considered, ultimately BOR has the authority to make this decision. The lack of a defined APE is delaying and confusing other aspects of the compliance process, including the critical HPP. BOR should make an immediate determination as to what the APE is, so that the compliance efforts can move forward.

Recommendations:

- We suggest the following working assumptions to guide the BOR decision:

1. The undertaking is the operation of the dam.

2. The Grand Canyon has clearly been eroding for a very long time; it is not reasonable to suggest that all erosive effects to historic properties in the Canyon are a consequence of dam operation.
3. It is also clear that operation of the dam creates sediment deprivation in the downstream system.
4. Sediment deprivation ultimately increases erosion, but it does not appear that there is a timely, cost-effective means of demonstrating exactly what the erosive effects of dam operation are or where they are taking place.
5. To minimize adverse effects of the undertaking, BOR is attempting, through an Adaptive Management program, to operate the dam so that the degree and effects of sediment deprivation on the downstream system are minimized.
6. It appears that no mode of dam operation can completely ameliorate the effects of sediment deprivation on downstream erosion rates; therefore some undetermined amount of erosion caused by dam operation is adversely affecting historic properties eligible for the National Register of Historic Places.

- Rather than continue time-consuming, expensive efforts to define the APE by determining exactly which erosive effects on historic properties are attributable to dam operation, we recommend that BOR identify an APE that is inclusive, that covers all foreseeable dam operating parameters, and that can be mapped easily. Our recommendation would be that the APE be defined as the extent of Holocene deposits.

- It is important to note that the APE is the area of potential effects. Definition of an inclusive APE does not mean that BOR must accept responsibility for every adverse effect to historic properties within the APE. Many factors beyond BOR's control, including natural erosion and visitor impacts, are affecting historic properties within that area. The APE simply maps the physical space within which BOR will consider the effects of its undertaking and make decisions about possible treatment measures..

- The APE also defines the area within in which both BOR and NPS will meet their Section 110 responsibilities, as required by the PA. The HPP should specifically address these responsibilities.

Issue 4. Identification of Historic Properties

The PEP has raised a larger issue involving the need for centralized and integrated data management. In that regard, we would argue for a centralized database of information regarding identified historic properties – archaeological sites and place-specific elements of the traditional cultural landscape

Recommendations:

- All cultural resource data, including identification, monitoring, and treatment activities for particular sites need to be linked; the use of relational databases is strongly recommended.

- Cultural resource data need to be integrated with and benefit from data produced by other programs within the monitoring function of the GCMRC.

- The HPP should provide for integration of historic properties identified in the future into monitoring and management programs.

Issue 5. Evaluation of Historic Properties

Determinations of eligibility have been completed for the archaeological sites identified within the Colorado River Corridor, although re-evaluation of these determinations may be in order after the research design has been completed. The issue of the National Register eligibility of the identified traditional cultural places still needs to be resolved, however. In particular, BOR and NPS, in consultation with Tribes and SHPO, must resolve the issue of eligibility of the whole canyon as a TCP. If the whole canyon is recognized as an eligible property, then determinations need not be pursued for specific places that are elements of that property, and attention can be focused on managing water releases in such a way as to maintain the cultural value of the canyon.

Recommendations:

- There appears to be a great deal of information to support the identification of the canyon as place of great cultural significance to multiple tribes, including specific associations under Criteria A and B of 36 CFR 60.4.

- Individual elements that contribute to the eligibility of the entire canyon as a traditional cultural property should continue to be identified and monitored to determine the effects of dam operation on these specific places.

- By determining the canyon as a whole to be an eligible property, BOR and NPS will have a good mechanism for considering tribal concerns about effects on plants, animals, minerals, water and other resources. These natural elements would be character-defining features of an eligible property.

- The HPP should include provisions for evaluation of newly identified properties.

Issue 6. Monitoring

A great deal of monitoring seems to be taking place, but it is not part of a unified plan. Neither is the monitoring leading logically to the development of the HPP or to incorporation into the Adaptive Management decisions. Monitoring (a tactic) has been substituted for management (a strategy). This has turned the process on its head and is counterproductive.

Recommendations:

- NPS, BOR, and GCMRC, in consultation with Tribes, should develop a unified long-term monitoring plan (tactics) for archaeological sites and TCP elements. This plan should be a supporting element of the HPP (a series of interlinked

strategies) and reflect the responsibilities and authorities of the parties under the PA, the ROD, and the GCPA.

- Monitoring should have two purposes: 1) Once the HPP is in place, monitoring should be designed to permit NPS to assess the effectiveness of long-term management strategies established in the HPP. 2) Monitoring should be used by BOR to evaluate the effects of different flow regimes on archaeological sites, native plants, and other resources directly affected by changing water levels and gain and loss of sediment. In other words, monitoring should be designed and organized to serve as the basis for periodic quantitative evaluations of effect of dam operations, effectiveness of erosion control methods, and development of treatment plans.

- Frequency of monitoring should be based on a geomorphological predictive model, specific tribal concerns, degree and type of previous impacts, likelihood of visitation, location relative to high-flow events, etc.

- Previously collected monitoring data should be evaluated to determine its usefulness as baseline information for the monitoring plan in the HPP.

- The data base of eligible archaeological sites and place-specific elements of the traditional cultural landscape should include quantifiable information on all types of effects identified through monitoring by NPS, Tribes, and others.

Issue 7. Evaluation and Treatment of Effects

A great deal of information is being generated about the condition of historic properties, but it does not seem to be used systematically to evaluate the forces or activities that are impacting individual sites with a view toward prevention or treatment. To date, no overall strategy for treatment of historic properties has been developed. Although some salvage of data and some efforts to stem erosion have been carried out, these have been limited in scope and have not been part of a unified, coherent program of positive management and treatment.

Recommendations:

- Based on existing data from the monitoring program and tribal concerns, NPS in consultation with BOR and Tribes should establish a baseline condition assessment for all known historic properties within the APE, identifying the previous damage and on-going threats.

- This assessment should be included in the database of historic properties recommended above and updated under the provisions of the monitoring plan.

- Based on these assessments, NPS and BOR, in consultation with Tribes, should develop a treatment plan for eligible archaeological sites and for elements of the

traditional cultural landscape. This plan would be a supporting element of the HPP.

- We assume that for most properties the treatment plan would indicate that no treatment was needed. For some properties, however, erosion control measures, stabilization, or better visitor management might be indicated. Although in situ preservation is always the preferred alternative, in situations where this is not feasible, data recovery should be considered.

- The treatment plan should be site specific and prioritized, based on the nature and severity of existing and projected effects, archaeological research importance, traditional cultural values, interpretive potential, and other values and parameters.

- BOR and NPS, in consultation with Tribes, should develop a research design and data recovery plan for the Canyon Corridor archaeological district. These would be supporting documents for the HPP, and would be used to guide data recovery as part of the overall treatment strategy.

- We recommend that the GCMRC fund research on potential erosion control measures and evaluate the effectiveness of erosion control measures currently being used. This research should identify erosion control measures that could reasonably be adopted, especially considering the potential for wilderness designation.

- Assuming that the canyon as a whole is found to be an eligible traditional cultural property, the treatment plan should address any overall impacts to the canyon from operation of the dam and include consultation with Tribes about possible treatment measures.

- BOR should assume financial responsibility for treatment of direct impacts of dam operation on historic properties, that is, direct effects from variable flow levels, terrace erosion, etc. Because operation of the dam is contributing to some limited, but unquantifiable extent to erosion impacts to historic properties within the APE, we recommend that BOR address these indirect effects by contributing either a negotiated percentage or a negotiated fixed sum of funding toward the costs of other treatment measures carried out under the HPP each year.

- Once the data recovery portion of the treatment plan has been implemented, BOR could withdraw from day to day management, monitoring, and treatment decisions. Routine activities under the provisions of the HPP could be carried out by the GCMRC on behalf of BOR or by NPS. Periodic reevaluation of the HPP and supporting documents would continue to be the responsibility of the BOR and NPS, however.

- NPS in consultation with Tribes should develop a plan for addressing visitor impacts on historic properties. This plan should include a matrix of desired

actions to protect properties; leaving sites to the elements should not be the only management response. The plan should address overall impacts to the canyon as well as site-specific impacts.

Issue 8. Wilderness designation

Since the 1970s, the National Park Service has repeatedly recommended that most of Grand Canyon National Park be designated as wilderness, under the auspices of the Wilderness Act of 1964. Until Congress acts on these recommendations, most of the park, including the Colorado River corridor, is to be managed as "potential wilderness." Park Service management policies state that potential wilderness areas must be protected from activities that endanger or alter their natural, primitive character.

Wilderness designation has implications for treatment and management options for historic properties. Wilderness is to be managed such that "the imprint of man's work is substantially unnoticeable." This suggests that engineering solutions to erosion problems should be the minimum necessary to effectively control loss of valuable resources. While this does not preclude engineering, a "minimum tool" analysis is required. Erosion control solutions should also be as visually unobtrusive as possible. Finally, on-site interpretation of cultural resources should be avoided.

Recommendation:
Address the potential for wilderness designation in the HPP.

Issue 9. Other Section 106 responsibilities

Although this review was focused on BOR's Section 106 responsibilities for the operation of the dam, the panel feels that the GCMRC and NPS have Section 106 responsibilities that should be addressed as well. Additionally, Western's role with respect to Section 106 needs clarification. The physical, biological, and cultural research and monitoring projects that the GCMRC funds and carries out may be undertakings as defined in 36 CFR 800. NPS, likewise, has Section 106 responsibilities for the backcountry and river visitation permits that it issues.

Recommendation:

- The Section 106 responsibilities of the GCMRC, NPS, and Western should be clarified and addressed as part of development of the HPP.

Archaeology Subpanel

The Archaeology Subpanel of the Cultural PEP Panel included the following personnel: Dr. Paul Nickens (Coordinator), Dr. William Doelle, Ms. Betsy Tipps, and Dr. Michael Berry. All subpanel members participated in the river trip, the public presentations, and closed panel workshop meetings. Based on subpanel participation in these activities, several discussions with agency and tribal personnel directly involved in the Grand Canyon Cultural Resources Program, and review of the extensive documentation that has resulted from nearly ten years of agency and tribal cultural resource efforts, the subpanel identified several issues that should be addressed to improve the archaeological program.

General Archaeology Subpanel Comments

The Archaeology Subpanel offers the following general comments on the Grand Canyon program. Issues and recommendations that lay out more specific guidelines for improving the program are listed in the next section.

With respect to the overall program, there is an apparent lack of program integration between the various cultural resources programs being carried out by the Grand Canyon Monitoring and Research Center (GCMRC), the Bureau of Reclamation (BOR), the National Park Service (NPS), and the tribes/nations. This lack of integration and data sharing has reduced the effectiveness of some programs and resulted in some lost research opportunities. It has also resulted in some duplication of effort, which consumes funding needlessly, but may also negatively affect the resource we are trying to protect. For example, Austin and Osife (1996:178) note that "monitoring by multiple groups" appears to be impacting some sites. The fact that the GCMRC and current BOR/NPS programs 1) were established as separate entities under the Glen Canyon Dam Environmental Impact Statement (GCDEIS), the Programmatic Agreement (PA), and the existing legal framework, and 2) have different overall missions (e.g., long-term monitoring versus compliance) has probably contributed to the disconnect between programs. These are minor hurdles, but they must be overcome to meet the spirit of the cultural program envisioned by the GCDEIS and PA.

With respect to the GCMRC Research Program, the subpanel notes the plan to contract for preparation of historic contexts in the FY2001 budget. In reviewing the FY2001 budget, however, the subpanel questions whether the amount budgeted for development of the contexts and completion of consultation among PA participants to evaluate and prioritize cultural resources for appropriate treatment measures is sufficient to adequately complete this important task. Furthermore, this is a task that needs to be coordinated with the overall HPP and research design development. Postponing this task until the next fiscal year is advised.

With respect to the BOR/NPS Monitoring and Compliance Program, the subpanel observes that the NPS laid out a specific and consistent strategy (or vision) for dealing with cultural resources beginning with the very first work initiated under the GCDEIS as

well as in the GCDEIS itself. The basic tenets of this vision, many of which carried into the subsequent MRAP, have been consistently applied through all subsequent work. Project personnel have closely followed this vision. This has resulted in: 1) an organized and consistent approach to the work; 2) project personnel being able to realize or make significant progress to most stated project goals, and 3) the collection of an impressive set of baseline data regarding cultural properties in the APE. There has been substantial continuity of personnel between the original inventory and the monitoring, as well as during the monitoring. This has resulted in consistency in data collection techniques and the resulting descriptive data. Most likely, it has also improved the overall quality of qualitative observations regarding site elements, age, and condition. An important result has been that good baseline data have been collected in a consistent and organized manner. The work completed to date is certainly appropriate for the identification phase and early stages of a long-term monitoring program.

Although the consistent strategy applied to date has had many positive effects on the cultural program, it has not been consistently updated and has become (is becoming?) a program liability. The relatively modest goals originally espoused for cultural resources have been achieved (e.g., documenting the frequency, nature and type, locations, and conditions of the cultural properties) and work being conducted under the MRAP appears to have become routine. There is no long-term vision or strategy to guide the program to the next phase. Without this vision and strategy, and appropriate documents to implement it, the program appears to have stalled in place. The subpanel believes that it is time to "move ahead," as was envisioned in the PA by completion of an HPP.

The monitoring program thus far has been implemented with good intentions but has generated few substantive results. Many of the problems can be traced back to the original Programmatic Agreement (PA) and the Monitoring and Remedial Action Plan (MRAP). The assumptions and procedures contained in these documents apparently never have been questioned by those responsible for conducting the work. Yet, neither the PA nor the MRAP was framed with reference to a comprehensive archaeological or geomorphological research design. Indeed, such a research design still does not exist. The Historic Preservation Plan (HPP) was supposed to fill this void, however versions to date fall well short of the goal.

If the MRAP is going to be in place much longer (more than three months), it should be revised to include collection of new types of data and participation by other parties, such as Native Americans. The BOR and tribes/nations should be equal partners with the NPS in identifying what sites are monitored and how the monitoring is done. There should also be a stipulation that requires biannual updates if the plan will be used more than two more years. Some of the original requirements could be relaxed to allow more flexibility in who does the work, participation by Native Americans and other new personnel, and the monitoring to be conducted by entities other than the NPS if that becomes desirable.

The program needs to move beyond the phase of just collecting baseline data on site condition. Current activities, such as monitoring, should continue at some level, but new goals need to be set and achieved. Examples of new goals include quantifying rates and

forms of erosion; identifying research potential lost or threatened as a result of dam-related impacts; and establishing long-term research goals as a foundation for determining the types of data that should be collected by future monitoring, mitigation, and other treatment actions. Completing the HPP and a research design would help this happen. Fresh perspectives and new ideas need to be incorporated through new leadership, consulting arrangements with outside researchers, or a combination of these. All project participants need to be receptive to change.

The continuity of personnel has had and will continue to have many beneficial results. However, it may have limited the infusion of new ideas that could enhance the program. In addition, the small group of people that has been doing the monitoring for a number of years will not be able to continue forever. Efforts should be made to bring in and train new personnel who could add vitality to the program and, at some point, carry the program forward.

Archaeology Subpanel Issues and Recommendations

Issue #1: The complex coordination needs of the PA Program and the GCMRC's Cultural Resources Program require a fully dedicated Cultural Program Manager.

Review of the documentation and interviews with various individuals involved in the program indicated that several federal agencies, tribes, a university, and the GCMRC have varying and often cross-cutting roles in both the NHPA (through the Programmatic Agreement) and GCMRC efforts, as mandated by the GCPA. In the case of the federal agencies, there is no single manager that is fully dedicated to the program, and no individual manager that is involved in both of the cultural programs. The present structure has led to both coordination and integration problems. In addition, lines of communication are sometimes unclear. The participating tribes, who stated a desire for a single point-of-contact in the larger cultural program, highlighted this aspect.

Recommendation: Identify a Cultural Program Manager to coordinate the diverse elements of the overall cultural program. This Program Manager would have primary responsibility for integrating the NHPA and GCPA programs and for coordinating with undertakings of the Cultural Program of the GCMRC. This Program Manager could provide a clearly defined point of contact for tribes and the various agency cultural programs. This position should be filled by a full-time senior researcher.

Issue #2: Many years of cultural resource activities (inventory, evaluation, and some treatment) have been undertaken, however, the programmatic documents necessary to provide guidance and structure for the cultural program are not yet in place.

Although mandated for completion within a few months after formalization of the 1994 Programmatic Agreement, the cultural resource historic preservation plan has not been completed. As stated in the PA, the HPP is necessary to guide efforts for long-term management of all cultural resources in the Grand Canyon River Corridor District and is to be developed in consultation with all parties to the PA. Further, the HPP would

integrate the NHPA Section 106 and 110 responsibilities and establish consultation and coordination procedures, long-term monitoring and mitigation strategies, and management mechanisms. The subpanel believes that failure to complete this document over the past five years has resulted in lack of structured guidance for the overall cultural resource program. Some consequences of this problem noted by members of the subpanel include: 1) the lack of research accomplishments since the initial field survey in the early 1990s; 2) the PA program has stalled in place and needs to be updated and move ahead with treatment options; 3) a need to involve new personnel with new ideas and fresh perspectives; 4) a need to retool the monitoring program to collect quantitative data that more clearly indicate rates of erosion, the severity of the damage, effects on site integrity, eligibility, and research potential; and (5) the program getting ahead of itself in recommending data recovery when there is no research design to guide the assessment of what is important.

Recommendation: Completion of the Historic Preservation Plan must be given the highest priority because the HPP is legally mandated and it will become the central guiding document for this entire program. The HPP document need not be lengthy. It should be a concise statement of the requirements, goals, and objectives of the integrated cultural resource program that is supported by a suite of programmatic documents or plans that provide specific details of how the requirements will be completed. These supporting plans or elements could include the following:

- Research Design
- Monitoring Plan
- Traditional Cultural Properties Plan
- Historic Property Treatment Plan, including a NAGPRA component
- Public Involvement Plan
- Native American Consultation Plan
- Cultural Resources Program Database

Completion and implementation of the programmatic guidance documents should include provisions for regular evaluation and updating of the plans as monitoring and treatment activities are completed.

Finally, The HPP and all tactical plans that are prepared in support of the programmatic document should be subjected to outside peer review.

Issue #3: Tribal involvement is an important component of developing the key guiding documents and to the subsequent implementation of archaeological monitoring, stabilization, and data recovery projects.

While tribes have been involved in many ways through the PA activities and through some research programs, the subpanel believes that it is necessary to effect a more encompassing consultation and involvement process within the archaeological components of the larger cultural resources program. The general consultation situation is

described more completely in the Native American Subpanel discussion, but the Archaeology Subpanel notes a specific need within the archaeological activities.

Recommendation: Opportunities for direct tribal involvement in all aspects of the archaeological program should be expanded. This involvement should include, for example, more active participation by tribes in the design and implementation of archaeological research designs and plans, field monitoring programs, and treatment of archaeological properties. An example of potential integration between archaeological and tribal data would be increased use of ethnographic information for assessing site function and use of archaeological sites and features (e.g., function(s) of the ubiquitous roasting features found in the canyon).

Recommendation: In its FY2001 work plan, the GCMRC outlines the concept for a Cultural Resources Task Group "to assist the GCMRC in the development of a more integrated program that incorporates Native American perspectives." This concept should be expanded to include all activities in the Cultural Resource Program (i.e. those derived from both NHPA and the GCPA mandates).

Issue #4: Lack of a consensus definition of the Area of Potential Effect (APE) makes the determination of project effects and identification of agency responsibilities very difficult.

Throughout the PEP evaluation process, there was some uncertainty about the exact definition of the APE as it relates, in this case, to identification of impacts to individual archaeological properties, and proposed treatments. In that the definition of the APE may have different consequences for cultural resources than other resources, discussion by the full PEP concentrated on this issue and resulted in a recommended solution.

Recommendation: The Bureau of Reclamation should adopt a definition of the APE that can be readily mapped and demarcated on the ground. The outline and rationale for such a definition is provided in the report from the Geomorphology Subpanel and is summarized in the key issues discussion of the PEP report.

Issue #5: There is a need to integrate the multiple monitoring programs that are occurring in the Grand Canyon corridor to the fullest extent possible.

It is apparent that several monitoring efforts are ongoing within the Grand Canyon corridor, including those mandated by both NHPA (and the PA) and the GCPA. Within the Cultural Resources Program, monitoring of archaeological sites has been completed on an annual basis since 1992. Individual tribal programs, including activities for ethnobotanical resources and traditional cultural places, as well as archaeological sites have completed separate monitoring efforts. Within the GCMRC Biological and Physical Programs, other monitoring efforts occur regularly. At present, there is no integration of these various monitoring efforts, neither within the cultural program itself nor between the cultural and other programs, even though there is considerable overlap in the types of resources being monitored under separate conditions.

Recommendation: The Cultural Resources Program should actively seek ways to promote integration of the cultural resource monitoring programs currently being conducted by the National Park Service and those being completed under individual tribal programs. In addition, mechanisms should be identified and implemented to integrate the cultural monitoring efforts with those being conducted by other GCMRC programs.

Issue #6: The archaeological database currently maintained by Northern Arizona University (NAU) is inadequate to meet program needs.

Although not an exhaustive examination, brief review of the existing cultural resources database, currently maintained at Northern Arizona University, found it to be generally inadequate. There are two major problems with the current cultural resources database implementation.

First, the RCMP database maintained at Northern Arizona University for cultural resources is obsolete in design. Microsoft Access is the database application employed by NAU for this purpose. Modern relational database (RDB) concepts can be implemented readily via Access, however, the current design is a rather cumbersome "flat file" model reminiscent of 1960s mainframe approaches. The full capabilities of Access are not being utilized. The main advantages of sound RDB design are a) ease of long-term management and b) elimination of redundancy.

Second, we question the utility of the current arrangement of off-site database maintenance and management. A database should be a dynamic, integral part of the ongoing research project; capable of being frequently queried in search of data patterning and new research questions. That interactive process does not appear to be operant. Rather, the data are gathered by the primary researchers and handed-off to the database manager to be "archived."

Recommendation: GCMRC, NPS, and BOR should critically reevaluate the current operation and maintenance of the cultural resources database at NAU, and consider integrating it with the GCMRC database management system now under development. This system employs a powerful Oracle RDB and the GCMRC plans to maintain a professional IT staff to manage it. This move will significantly strengthen integration of the cultural resources data with all the other classes of information being gathered and coded. The only problem with this recommendation is the uncertainty expressed in fiscal year 2000 Monitoring and Research Plan regarding Oracle RDB implementation and professional staffing. If these issues result in significant development delays, then certain interim measures should be taken.

First, the existing Access database should be professionally redesigned as an RDB. It then could be populated by a one-time conversion utility. Such a change in structure will both improve current utility and facilitate the eventual integration with the GCMRC Oracle database. Second, expansion of database capabilities should also be explored. For example, photographic images could be scanned and added as BLOB fields in the database and GIS data could be incorporated via ARCVIEW.

An immediate port to the Oracle system is the preferred solution. The interim approach of rewriting the Access database represents a viable fallback option. Whichever path is taken, it is imperative that the primary cultural resource investigators become active users of the system and make it an organic aspect of the research.

Issue #7: Reevaluation, modification, or expansion of certain Cultural Resource Program activities.

Subpanel review of the various components of the archaeological aspects of the cultural resources program revealed several areas where mechanisms for improvement can be suggested. The more important of these are as follows:

- Chronometric Dating: Questions were raised about the utility and cost effectiveness of focusing on radiocarbon dating for post-Archaic archaeological remains, given the availability of regional comparative cross-dating sequences (e.g., ceramics). It was also noted that there is a current backlog of undated radiocarbon samples.

  Recommendation: The research design and data recovery plans should include additional consideration of the dating strategy (ies) to include other options.

- Archaeological Sites Monitoring: The ongoing monitoring of archaeological sites is providing longitudinal information on the condition of the sites, however, the interaction between site condition and the impacting agents is not being fully recorded or evaluated. In other words, it is also necessary to quantitatively monitor the impacts themselves, as well as the cultural context. Field reviews of a few sites currently being monitored under this strategy revealed that little information is being collected on physical processes occurring within the site boundaries. For example, rates of erosion on individual gullies/arroyos and other forms of erosion are not being quantified. In order to evaluate the actual loss of archaeological data over a span of time, this information is critical. In turn, once the rate of impacts and associated pending loss of archaeological data are known, it is possible to prioritize endangered resources and to program necessary mitigative activities. A significant component of this shift in monitoring philosophy requires the archaeologists performing the monitoring activities to identify and relate to the research geomorphologists the kinds of data that they need to understand rates of erosion and the corresponding impacts to cultural features and data.

  Recommendation: A review of the data categories employed in the archaeological sites field monitoring protocol should be completed. Recently, changes have been proposed to the field data collection forms within the NPS. These proposed revisions should be formulated through integrated discussion with the other PA partners, the GCMRC, and the geomorphological component to arrive at a strategy that will result in the documentation of both the physical condition of the resource and quantify changes to the integrity of that resource. The emphasis should be on identification of onsite rates of erosion in the geomorphological or sedimentary contexts. Specifically,

a trained geomorphologist (M.A. degree or higher) should accompany all archaeological site monitoring trips so that the important interaction between physical impacts and resource degradation and loss can be better defined.

Further, Native Americans monitoring programs and the archaeological monitoring program can be better integrated.

- Total Station Mapping: The RCMP has mapped numerous sites using a total station, thus creating excellent baseline data. Some sites or portions of sites have been remapped with the intention that these data can be used to identify the locations, extent, rates, and volume of erosion at a later time. The total station mapping program has been recently terminated, although both the RCMP and the outside reviewers from SWCA (Neal and Gilpin 2000) believe it should be continued.

  Recommendation: The archeology subpanel believes that the repeat total station mapping has further potential for monitoring sites of high research value or sites where there is a need for better understanding of erosion processes. Consideration of reinstituting this mapping should be part of the research design, monitoring plan, and treatment plan development.

- Future Visitor Related Research: The RCMP overview report suggests research to clearly define "how the dam's operations affect the frequency of visitor impacts in the river corridor" (Leap et al. 2000:10-1). While this research can be tied to one of the objectives of the cultural resources program set forth in the GCDEIS, it is unlikely that it will be possible to reach a definitive conclusion. Treatment options will be delayed while the studies are being undertaken.

  Recommendation: Funding should be spent on other, more worthwhile activities such as completion of guiding documents for the project. The BOR and NPS should make an arbitrary decision regarding the percentage of visitor damage being caused by dam operations and fund the monitoring, recordation, treatment, and management actions to curtail the damage, on a percentage basis. A suggested allocation would be one-third BOR and two-thirds NPS.

- Archaeological Site Preservation Treatments: Based on field observations and workshop discussions, the archaeological site/arroyo protection strategy is essentially focused on a single approach, i.e. check dams and other gradient enhancing and water flow retarding features. While only a small sample of the arroyo protection features were examined, it is apparent that the results are mixed, and that the current success ratio cannot be quantified. Some bioengineering techniques have been utilized, mainly in the form of cacti transplants.

  Recommendation: The archaeological site stabilization and protection effort should be expanded to identify additional strategies and technologies that might be compatible with the site preservation goals in the canyon. This could include not only other types of gully and arroyo stabilization, but also other forms of compatible

materials and techniques. It is further recommended that other experts be consulted in this regard, such as soil scientists or geomorphologists with erosion control backgrounds, so as to expand the range of stabilization activities. In all instances, follow-up monitoring of erosion control features should be conducted in such a manner as to be able to assess the overall effectiveness of different techniques in differing settings.

- Archaeological Site Data Recovery: Due to the lack of a completed HPP, research design, and historic property treatment plan, data recovery activities that have been implemented to date have been essentially reactive and handled on a piecemeal basis. They have focused almost entirely on salvaging artifacts and features that are in danger of being eroded away or destroyed by flooding. While some important data are being obtained through this approach (such as radiocarbon, flotation, and pollen samples), the excavations are never extensive enough to put the artifacts or feature into the larger site context. This severely limits the nature and extent of interpretations that will ever be possible. However, in a well-written research design, this information will most likely be very important to many different research questions. Furthermore, because there is no research design to guide data collection, there is no way to know if the right samples and right kinds of data are being collected. Some of the samples and data being collected may not be relevant; it's possible that other relevant information is being overlooked. If the current approach is continued indefinitely, data recovery may occur at all of the features at a site, but there will be no way to put the parts and pieces together to produce substantive research results. The results will consist of a series of descriptions that cannot be articulated into the larger research context.

  Recommendation: The program needs to adopt a proactive strategy to data recovery activities. This should begin with the development of an overall research design and an HPP at the earliest possible date. All data recovery efforts should be preceded by the development of a site-specific treatment plan that includes a site-specific research design tying the work to the larger, overall research design. Excavations should always be of sufficient areal extent to define the larger context of what is being recovered. All work should be directed at producing substantive research results.

- Sample Backlog and Data Analysis: The archeology subpanel noted that there have been various salvage operations that have not been formally written up. In addition, numerous samples collected during various salvage operations have not been processed, analyzed, or written up.

  Recommendation: There should be a high priority on processing relevant samples, analyzing the results of the various salvage operations, and writing these up in formal testing, salvage, or data recovery reports. The results from these data should be incorporated into the research design to assist in preparing questions to be addressed by future data recovery efforts.

- Public Education and Interpretation: More emphasis should be placed on understanding and interpreting the Grand Canyon corridor archeology for the benefit of the public. This is one of the critical components of Section 106, the legal trigger for the work that is being done. Various program documents discuss public outreach efforts and these have, in general, been useful. However, their focus has been on describing the program rather than interpreting the archeology for public benefit. More emphasis should be placed on conveying research results to the public. An area that seems to be lacking is the direct provision of information to canyon users, such as private river running parties and passengers on commercial trips. There are obviously concerns about giving information that would direct people to sites, thus increasing trailing, artifact collection, and general erosion, but many people will find the sites anyway and are less likely to cause damage if they understand the importance of the sites and have information on appropriate behavior.

  Recommendation: Although the park (GRCA) provides canyon users with information on archeological sites, the PA program needs to develop public information that can be used to familiarize canyon users with what is being done and learned by the PA program, including research results. This information should be provided directly to canyon users such as members of private river running parties and passengers on commercial raft trips. This would also be an excellent opportunity to educate canyon users on site etiquette.

- Improvements in the Contracting Process: Within the context of a reasonable budget (not just low bid), fair, open competition usually results in the best possible product and results. Issues raised concerning the past contracting efforts include improperly constituted proposal review panels, reviewers being asked to evaluate proposals outside their field of expertise, and relevance of some past contracted efforts to specific needs of the cultural program.

  Because various Native American nations/tribes desire to be involved in research design development and implementation of various projects, there have been suggestions that future work be directly sole-sourced to the contract divisions of various Native American nations/tribes. There have also been suggestions that future work be sole-sourced to on-call contractors. Due to the complexity of the overall Grand Canyon project and the specific expertise required, these actions might not be appropriate.

  Recommendation: Whenever any cultural resource work is going to be contracted out by the GCMRC or the BOR, the work should be bid competitively through the request-for-proposals (RFP) process, as announced through the Commerce Business Daily (CBD), rather than sole-sourced under existing work-order contracts or to cultural resources contracting divisions of various Native American groups. The Native American tribes and nations with an interest in the Grand Canyon have a legitimate concern that they should be involved in research design development and ongoing research, but this does not necessarily mean they are or are not the organization that will do the best job. One way to afford equal bidding opportunity

but still incorporate Native American viewpoints would be for the scope of work to require Native American participation as part of the project. This would give Native American contractors an advantage in the bidding process, but not one that is insurmountable for other qualified bidders.

An outside panel of independent reviewers should review all proposals submitted by potential contractors. These reviewers must be independent. They should not have any financial or employment association with any of the companies, tribes/nations, or organizations submitting a bid. In addition, all reviewers should have expertise specific to the proposals they are evaluating (e.g., persons with archeological expertise evaluating archeological proposals, persons with geomorphology expertise evaluating geomorphology proposals). These simple guidelines should ensure a fair competition, the best possible work and work products, that only qualified researchers are selected to undertake the projects.

- Outside Reviews of the Cultural Resources Program: The enabling language of the GCMRC calls for independent reviews of the program. At least one such review has been conducted in which the reviewing firm was in fact reviewing work completed by other principals within the same firm (Neal and Gilpin 2000), thereby representing a potential conflict of interest.

  Recommendation: Truly independent parties should conduct all future evaluations. None of the individuals or companies/organizations doing the outside review should have any ties to any of the work being evaluated.

Native American Issues Subpanel

The Native American Issues Subpanel (NAIS) of the PEP was comprised of Joe Watkins (Coordinator), David Vader, Jacilee Wray, and Rebecca Tsosie. Additionally, four tribal representatives -- Brenda Drye (Southern Paiute), Loretta Jackson (Hualapai), Robert Begay (Navajo), and Anthony Lucio (Zuni) -- accompanied those Panel members who participated on the river trip. These representatives answered questions posed by members of the PEP as well as offered their observations concerning programs that are already in place. The NAIS was tasked with evaluating the cultural resources program conducted in the river corridor by the Grand Canyon Monitoring and Research Center (GCMRC), the Bureau of Reclamation, and other federal agencies, with specific emphasis on the involvement of identified Tribes and related tribal issues and concerns.

The NAIS addressed the same general issues as the rest of the PEP, including program strengths, weaknesses, and recommendations. In addition, the subpanel also focused on the following questions relating to the treatment of archaeological properties:

1. What measures are recommended for site protection and preservation?
2. For impacted sites, what is the best course of action? Should sites of value mostly for their information potential be treated by full-scale data recovery or should individual features and artifacts be excavated as they are exposed?
3. At what threshold should sites or features be recommended for treatment?
4. In making treatment decisions, what compromises should be made between informational value (Criterion D) and the value of the sites to living communities (Criterion A or B)?

While recognizing that the tribal groups who are participating in the Programmatic Agreement have additional concerns that are peripheral (but related) to the programs examined in this document, the following issues have been identified. Recommendations are presented following discussion of tribal and Native American Issues Subpanel perspectives on these issues. Tribal concerns rarely are applicable only to a single issue, but generally crosscut many issues. The Native American Issues Subpanel recognizes that certain aspects of the following recommendations may currently exist within GCMRC programs, but the absence of fully developed and integrated programs lessens their effectiveness.

Strengths of the Program

The NAIS recognized several strengths within the cultural programs conducted by the GCMRC within the river corridor. These strengths include data gathering, the quality of personnel from the Tribes, the GCMRC, and the agencies, and the recognition of the inherent interest of the Tribes in the corridor program.

Personnel: One of the strongest aspects of the current program is the quality of the staff from the representative Tribes, the GCMRC, and the key agencies involved in the

program. There is a strong element of general respect, ability, and teamwork amongst the parties. This "team" element provides the basis for expanded future involvement and cooperation. The existing staff members are generally qualified to conduct current programs and implement future initiatives.

Data Gathering: Perhaps one of the strongest aspects of the Program is the development of baseline data for the cultural resources within the corridor. These resources (archaeological, traditional cultural properties, ethnohistorical, wildlife, and geomorphological data) form the guideline information for evaluating current projects, studies, metrics, and cooperative efforts. The information compiled is a major contribution to the understanding of the cultural environment of the Grand Canyon.

Recommendation: The PA Program and the GCMRC should continue to develop baseline data for those areas where such information is lacking. However, data collection should be pursued to meet explicit information needs defined by the program, not simply as an ongoing activity.

Recognition of Tribal Interests: The GCMRC and the federal agencies involved in the Program have recognized the inherent interests of the Tribes in many of the undertakings and initiatives within the corridor. This recognition is generally referenced in key documents such as the Programmatic Agreement, the Program funding priorities, and the direct involvement of the Tribes. Recognition is also included in the activities undertaken by the GCMRC in data gathering, public outreach, and general support. The direct involvement of representatives of the Tribes as primary participants is key to the future success of the Program.

Weaknesses of the Program

Although the program has included specific Tribes and tribal representatives in the scheme of projects, studies, and various undertakings, there is a lack of focus on or recognition of the inherent federal trust responsibility by the GCMRC and by the federal agencies responsible for the PA program. The unique government-to-government relationship that exists between Tribes and the federal government is somehow lost or given secondary status to the specific and discrete interests of individual federal agencies and program objectives and activities. The lack of a clear statement of the fiduciary trust responsibility or a specific agency or individual responsible for overseeing the incorporation of this responsibility in the program is a major problem in achieving any recognizable and required tribal participation and influence on the program objectives.

Sovereignty: The PA Program parties, including the GCMRC, the Bureau of Reclamation, and the National Park Service fail to adequately acknowledge the Tribes' status as sovereign nations and their implicit trust relationship with and responsibilities to the Tribes. The tribal representatives participating in the river corridor trip felt the federal agencies involved in implementing the programs have never explicitly acknowledged the special sovereign relationship that exists between the agencies and the tribes.

Recommendation: The GCMRC and all federal agencies involved in river corridor programs should develop Memoranda of Understanding with the tribes involved that outline the trust responsibilities between the federal agencies and the tribal governments. The MOUs should become part of the PA and should meld each federal agency's Indian policy into one overarching statement. Additionally, the GCMRC and PA Program should more fully specify and integrate legal mandates such as the following: the White House Memorandum entitled "Government-to-Government Relations," dated April 29, 1994; the American Indian Religious Freedom Act of 1978; and Executive Order 13007, "Access to Sacred Sites."

Consultation Plan: The lack of a comprehensive consultation plan that outlines an agreed upon process for tribal involvement weakens the prospects of building trust and facilitating communication. Tribal members noted that they felt the GCMRC and the PA Program participants were interested less in tribal concerns and comments than in gaining tribal approval of particular actions. The NAIS noted that current consultation efforts appeared to be ad hoc rather than programmatic. Without a specified consultation plan, these efforts are largely left to field personnel rather than to the appropriate hierarchy of the agencies.

Recommendation: The GCMRC and the PA Group should develop, in conjunction with the tribes, a formal consultation plan with the tribal governments. This plan involves more than just improved coordination—though that is an expected outcome and benefit. It requires the federal agencies and the tribes to agree to a process for communicating, coordinating, resolving differences, acknowledging roles and responsibilities, and establishing government-to-government relationships. Furthermore, the plan should seek to integrate all aspects of the program, including the final Historic Preservation Plan and the Programmatic Agreement.

Native American Liaison: In addition to the lack of an overarching statement of recognition of the federal trust responsibility, there is no dear individual or office specifically designated as a point of contact responsible for assuring Native American issues and interests are given the attention they merit. The lack of such an individual or specific office burdens the field staff with assuring that the federal agency trust responsibilities are fully incorporated into the program. The office of Tribal Liaison should be a recognizable element of the Technical Work Group, as well as the Adaptive Management Working Group. Without the Tribal Liaison position, there is neither visibility nor accountability regarding Tribal issues and interests in the programs. The establishment of such a position would also foster personal and agency trust in the program.

Tribal representatives noted their frustration concerning their inability to determine which of the various federal agencies involved in the river corridor program were responsible for the management of a particular resource. The tribes (as well as some of the other scientists) were unable to identify the particular points of contact in relation to specific sites within the river corridor. For example, they were unsure which federal agency was responsible for particular sites within the corridor, because the lack of an easily defined

"Area of Potential Effect" created the uncertainty of whether the Bureau of Reclamation, the National Park Service, or the GCMRC was responsible under Section 106 of the National Historic Preservation Act, Section 110 of the same Act, or the Grand Canyon Protection Act. The absence of an easily definable contact point for tribal representatives makes it more difficult for tribal representatives to respond to situations along the river corridor of concern to them. The necessity to respond to three or more offices concerning a single situation taxes already strained tribal budgets. Such a single contact would make it easier for tribes to communicate with the correct program concerning issues of relevance to them, facilitate the integration of tribal concerns into the programs, and ensure that the tribes are notified of potential problems before they become major issues. Additionally, such a liaison would help increase integration between the programs by ensuring that tribal concerns are adequately addressed as part of the development, implementation, or review of GCMRC programs.

Recommendation: The PA Program or the GCMRC should establish a Native American Liaison within the GCMRC to act as the contact point for both tribal groups and federal agencies involved in the project, recognizing the regulatory limitations within the office.

Native American Concerns: A major weakness appears to be the failure of the PA Program and the GCMRC to adequately integrate Native American concerns into their programs. The tribal representatives continually reiterated that they feel slighted within the process and that their concerns are rarely more than merely acknowledged. Tribal representatives feel they have not been provided the opportunity to participate meaningfully in the development of research designs within programs that the GCMRC or the PA Program have undertaken. In terms of archaeology, for example, the tribal representatives feel that too often research questions developed by archaeologists are redundant within a regional context in that the same sorts of questions have been asked at excavations across the Southwest. They feel that tribal participation in the research design process would make archaeology more relevant to tribes. In other instances the tribes noted that they feel they are only being asked to watch what other groups are doing in the river corridor rather than actively participating as equal partners in the research. Tribal representatives voiced uncertainty regarding the information they were providing. In a couple of instances, tribal representatives were unsure what the federal agencies were doing with the reports on the monitoring programs, and were unsure whether their information was needed, recorded, or integrated within the scientific baseline data.

Tribal representatives were nearly unanimous in their wishes that archaeological sites be left to the forces of nature and not protected or excavated. The Hopi, however, wished it to be known that they also differentiated between “natural” effects—such as the erosion that has affected the Grand Canyon for millennia—and “human-caused” effects such as those caused by the introduction of the Gen Canyon Dam into the regional setting. The former should be allowed to continue to erode archaeological sites, for example, whereas the latter should be prevented or mitigated. The Southern Paiute representative noted that tribal thoughts relating to archaeological sites were that such sites were not to be disturbed, and that doing so subjected the person to possible harm. The Navajo and Zuni representatives felt that all possible types of site protection should be exhausted before

archaeological testing or excavation was conducted. They noted that tribal concerns were rarely given consideration equal to scientific concerns, and that the tribes had lost fights to prevent excavations in the past. The Zuni and Navajo representatives suggested that tribal representatives should actively participate in any testing and/or excavations conducted as part of these programs and that tribal archaeology programs (the Zuni Cultural Resource Enterprise or the Navajo Nation Historic Preservation Department) be allowed to conduct the excavations since they felt it necessary that tribal perspectives be included within archaeology programs.

Tribal representatives asked that the Native American Issues Subpanel emphasize that the Grand Canyon has meaning to them beyond the mere occurrence of archaeological sites within the area. Almost all aspects of the natural world within the canyon impact the tribes. Water rights, mineral resources, plants, animals, recreation, and water quality are just a short list of items with which the tribes are concerned. Additionally, the tribes deem it necessary that the GCMRC understand that issues concerning the location of tribal boundaries within the Canyon are an integral part of the tribes' involvement in the Canyon.

The tribes are also concerned with the dissemination of scientific data on sites of a special nature to them. As the Hopi presenter noted, some information is so secret that it was never meant to be shared with uninitiated people, with women, or with people outside of a particular tribe or clan. The scientific monitoring of such special sites also introduces an external element of concern to them.

Recommendation: The PA Program and the GCMRC, working in conjunction with the tribal representatives, should develop a programmatic approach to fully integrating tribal, Technical Work Group, and scientific concerns in the development of research questions to ensure that tribes are provided sufficient notification of program actions, adequate opportunity to participate in developing research questions, equal consideration for participating in the research process, and opportunities to bid on contracts to carry out research.

The Broad Nature of Tribal Concerns: The Native American Issues Subpanel also recognized that there exists a misconception that tribal concerns are only within the realm of archaeology. The existence of places within the river corridor thought to be the location of tribal or clan origins illustrates the cosmological and philosophical implications in considering these sites as merely of archaeological importance. Additionally, while archaeological issues are indeed of importance to the tribes, they are concerned that other programs within biology, botany, hydrology, recreation, educational interpretation, public administration, fisheries management, and other such programs are closed to them.

Recommendation: The PA Program and the GCMRC should develop internship programs that would place qualified Native American students in all aspects of the GCMRC's management, including but not limited to archaeology, botany, biology, educational outreach, interpretation, geography, geomorphology, hydrology, public administration,

recreation, and so forth. Such programs could either be developed in conjunction with an existing program (such as the Environmental Biology Program at Arizona State University) or as a new program within the GCMRC.

Program Integration: There appears to exist inadequate integration between the various programs within the GCMRC. Tribal representatives and the members of the Subpanel noted that it appeared that the research carried out by one aspect of the program—terrestrial biology, for example—was done without integrating adequately another, related subdiscipline such as ethnobotany. While this might not necessarily be the case, it appeared so in the field and in conversations with others. Perhaps the artificial subdivision of the various programs into social or physical sciences, for example, has contributed to this misconception. If so, it should be addressed in a way to make it apparent to stakeholders and outside reviewers alike.

Recommendation: The GCMRC should reexamine the manner in which it develops research programs to fully integrate the various subfields into scientific programs that crosscut the social and physical sciences to the maximum extent possible.

Inadequate Planning: The lack of an articulated plan for carrying out the objectives of the programs within the GCMRC makes integration of the research capabilities of the various programs more difficult than necessary.

Recommendation: The GCMRC should develop and implement a Five-Year Plan that integrates all GCMRC programs into a truly interdisciplinary research program, rather than continuing to operate as four single programs as is currently the situation.

Geomorphology Subpanel

The Geomorphology subpanel consisted of: Dr. Joel Pederson (Coordinator), Dr. Michael Blum, and Dr. Kyle House. The subpanel was asked to evaluate and make recommendations on two main topics: First, recommend how geomorphic and geoarchaeological research may be applied in ways not currently being done in the program. Second, address "the erosion problem", which involves definition of the Area of Potential Effects (APE) and determination of the role of Glen Canyon Dam operations on erosion of deposits containing or underlying cultural sites.

Need for an Overall Research Design to Define Geomorphic Questions

An overall cultural/archaeological research design and its associated research questions are needed. The applications of geoarchaeology to these research goals, beyond "the erosion question," will naturally follow. The Methodological Research section in Chapter VII of the June 1997 draft of the Historic Preservation Plan (HPP) frames geomorphic research as involved in understanding the formation of the archaeological record as well as the erosion of that record (p. 66-67). In regards to formation of the archaeological record, the draft plan states that,

> "Areas of interest include the underlying processes that have formed the cultural landscape, an enhanced understanding of the dynamics that cause erosion, the effect of prehistoric floods and droughts on the archaeological record of site occupation, the tempo and reasons for site abandonment and reoccupation, and research into the ways that people and fluvial and aeolian geomorphology have interacted to create archaeological sites."

A subsequent statement of research interests in the erosion of sites espouses interest in both basic research on the long-term context provided by the fluvial sedimentary record of the river corridor as well as applied research on understanding the recent increase in erosion and its relation to dam operations.

We perceive that all geomorphic research in the cultural program thus far has concentrated on just this last goal of understanding recent erosion of sites and its relation to dam operations. This work, in turn, has been focused on testing only a single set of hypotheses that derive from the work of geologist Richard Hereford and his colleagues and have been referred to as the "Hereford hypothesis." Though generalized, we strongly encourage the adoption of research goals such as those included in the draft HPP. Geomorphic research would be very useful for understanding, for example, the relation of prehistoric flooding to site occupation, the degree of involvement of aeolian processes in site preservation, and the potential involvement of geomorphic processes in site abandonment. Such archaeologically driven research questions may be particularly usefully studied in Grand Canyon where the recent sedimentary and climatic records are well known relative to much of the rest of the Southwest.

Overview and Analysis of "The Erosion Question"

Grand Canyon is a denuding landscape, and erosion is inevitable. The sedimentary system is supply-limited by its very nature, but Glen Canyon Dam has made it increasingly sediment-starved, and thus erosion rates must be increasing at some scale and dam operations must contribute to the spatial and temporal variability in rates of erosion of deposits along the river corridor.

Members of the subpanel believe that there has been an overly narrow focus, adoption, and reliance on the "base-level" hypothesis developed by Hereford et al. (1993) throughout the program and its related entities. This has driven geomorphic research in the program, and has become an underlying assumption evident in documents such as research reports and the annual Monitoring and Research Work Plan. The study to develop a geomorphic model to predict erosion of archaeological sites within the canyon by Thompson and Potochnik (2000) took the original untested Hereford base-level hypothesis a step further by speculating that aeolian activity resulting from deflation of high-elevation flood deposits also plays a critical role in inhibiting gully formation and erosion of related archaeological sites. We believe that this situation is problematic in that the original hypothesis has not yet been tested and is somewhat flawed conceptually. Therefore, building a model on the original hypothesis, and relying upon its derivative concepts is inappropriate and in many ways unscientific. We recommend that decisions and action to preserve sites or recover cultural data should no longer await results of geomorphic research, although further research on erosion of sites is warranted.

As it now stands, the broad "base-level restorative hypothesis" adopted by Thompson and Potochnik (2000) seems to include three distinct processes: (A) complete or partial inundation and burial of gullies by alluvium during high discharges; (B) gully filling/mantling by aeolian deposits derived from flood alluvium; and (C) regrading of channels, by aggradation in this case, in response to a temporary rise in local base level (decrease in local channel gradient) by the formation of buttressing terraces—this is described by Hereford et al. (1993) in non-process terms as the temporary prevention of gullies from attaining their lower base level at the Colorado River. The treatment and adoption of process C ("the original base-level hypothesis") has been confused and vague, and it is inconsistently called upon to either cause (by its absence) or inhibit (by its presence) gully erosion. Only B and C potentially link increased erosion on older, higher terraces to a lack of flood discharges and dam operations at lower stages. Some degree of gully inundation and burial by alluvium (process A) on low terraces is well established, but neither the original base-level (C) nor the derivative aeolian (B) hypotheses have been adequately tested (see below).

Testing these ideas may or may not be tractable within the scope of a continued 2-year research effort, though broader research on the topic would be useful. We suggest that it would be more objective and fruitful to avoid couching the research in an awkward, single hypothesis-driven structure and instead focus on the more general and archaeologically important questions of, "what is causing this increase in erosion" and "is the rate of increase unprecedented in the recent geological record?" The answer to the

first question has been provided in part answered by the program's research to date, and a complete answer may be important for full development of a predictive equation for the susceptibility of sites to erosion—something that may be important for its utility outside Grand Canyon as well. A study based upon testing, analysis, and comparison of eroding and non-eroding sites in similar settings along the river corridor is warranted.

Finally, all discussion and research on erosion focuses only on the loss of high flows due to the presence and operation of Glen Canyon Dam. However, dam presence and dam operations also serve to raise the base flow and average flow components considerably, which ultimately may be as important to the "base level" arguments as the loss of high flows. It seems equally likely that gullies are ultimately trying to cut down to some average "base level", which in pre-dam times would have been lower in elevation than today's artificially raised level.

APE Definition

We recommend that the Area of Potential Effect (APE) of dam operations be defined as the full extent of mainstem Holocene sedimentary deposits along the river corridor. Holocene deposits of this kind, as mapped for select parts of Grand Canyon (Hereford 1996; Hereford et al.1998) consist of: a) Colorado River alluvium arranged as a flight of inset terraces and underlying fill deposits; b) aeolian deposits that originate by deflation of Colorado River alluvium that is transported and emplaced elsewhere in the river corridor; and c) fluvial and debris flow deposits of tributary debris fans as well as colluvium that interfingers and buries other Holocene deposits along the river corridor.

Definition of the APE in this manner does not rely on demarcation of a river stage that is thought to represent maximum dam releases and/or prescribed spike flows, which will, in fact, be highly variable as flows are modified downstream. Rather, use of these deposits for APE definition has the advantages of clear recognition through geomorphic mapping, potential geomorphic process linkages with dam operations, and clear linkages with the archaeological record, as defined below.

Holocene deposits provide the fundamental context for studies of the archaeological record. In short, they provide the record of linkages between the landscape and cultural activities, as well as formation and preservation of the record itself. Partly because these deposits can possibly be modified by dam operations (see below), the cultural record will continue to be modified, and these deposits will continue to play the paramount role in decisions that pertain to mitigation of destructive processes or preservation of specific sites. Definition of the APE on the basis of Holocene deposits will facilitate development of an archaeological research design, as well as management of cultural resources in a manner not readily accomplished if the APE were defined on the basis of river stages that bear no relationship to the boundaries or context of past human activities.

The geomorphic and stratigraphic studies of Hereford and others provide the framework around which definition of the APE can proceed. Though the entire river corridor has not been mapped as yet, key areas have been completed, and a geomorphic and stratigraphic

framework has been developed. Higher terraces in Hereford's scheme, his "striped alluvium" and "alluvium of Pueblo II age," generally reside outside elevations that can be inundated (by definition as terraces) during the time period of dam operation, whereas the "mesquite" terraces may be inundated during high-magnitude dam releases. Nevertheless, sediments that comprise Holocene deposits are mobile (readily eroded or modified), in sharp contrast to the bedrock canyon walls and/or the coarse, somewhat-cemented Pleistocene deposits of the river corridor. As a result, Holocene deposits have the potential to be influenced by dam operations through a number of geomorphic processes. These include possible increased erosion rates due to propagation of gully headcuts that are initiated by sapping or undercutting in response to fluctuating dam releases. Conversely, erosion rates may possibly be reduced by: (a) inundation and filling of gullies on those lower terraces that contain cultural sites; (b) possible (still hypothetical) aeolian deposition and burial of higher surfaces following deflation of alluvium emplaced during high dam releases; and (c) possible (still hypothetical) regrading of gully channels to local, temporary base levels provided by deposits of high-magnitude flows.

Monitoring Efforts

Enstatement of a yearly total station remapping program of key sites, simple field monitoring with erosion stakes, and potential use of photogrammetry can provide much-needed information on rates of gully lengthening and enlargement and resultant site degradation. The latter option (as presented by Mark Manone at the conference) may be used in conjunction with field methods in identifying the timing and nature of erosion events and prioritization of sites.

Erosion Prevention Measures

Existing efforts to reduce erosion by emplacement of checkdams are elegant and non-intrusive, but are, in effect, just stopgap measures that do not fundamentally address the basic problem of running water flowing over steep slopes. Larger-scale bed coarsening, or engineering solutions such as drainage diversion and tiling, would be more effective at decreasing rates of gully erosion and may not require frequent maintenance. However, these types of "hard" solutions may be inappropriate given the views of the tribes and given the context of a national park that is to be managed as a wilderness area.

Development of Geomorphic Research Scopes and the Competitive Bidding Process

The development of an improved archaeological research design that explicitly incorporates geoarchaeology and geomorphology is critical for effectively drafting RFPs that will result in research that best fits the needs of the Cultural Resource Program.

In the spirit of the June 1997 draft of the Historic Preservation Plan, there are a number of key geomorphological issues that should be addressed, and which would have particular relevance to understanding the cultural record. The most fundamental of these would be the development of a more in-depth and process-based conceptual framework for: (a) processes of terrace evolution and erosion, and thus erosion of cultural sites, (b) the

relative importance of fluvial, aeolian, and colluvial deposition within individual terrace units, and (c) deposition of older Holocene deposits by the Colorado River, considering that the fluvial system that deposited the "ap" and "sa" units may have been fundamentally different than the heavily-studied modern river system. Other issues would fall out as a natural byproduct of the development of a detailed archaeological research plan. However, these basic data would provide critical information for evaluation of the landscape context/paleogeography during time periods of human activity, and at individual sites, as well as critical context for evaluation of formation and preservation of the archaeological record as a whole. A natural byproduct of these efforts would be a greatly increased understanding of paleohydrology, paleoenvironments, and environmental change within Grand Canyon.

The subpanel members also believe that the quality of research supported by the program would benefit from broader dissemination of the availability of research funding to qualified scientists. An effort to make RFPs more visible and accessible outside of the current program "loop" is needed. We recommend that the current RFP process be expanded to include broad-based archaeology- and geology-specific publications and list-servers. Examples that would reach an appropriate and broad geoarchaeological and geomorphological community might be publications such as *GSA Today* and *EOS*, and the electronic listserver entitled "geomorphlist".

Comments on Thompson and Potochnik's Study

The report represents a large effort to do a variety of research. Ultimately, however, the document suffers from a research design that attempts to accomplish too much. One of the strengths of the report is that in spite of the limited availability of historic photographs, it is fairly well established that gullying has increased in the past several decades. However, a number of weaknesses have emerged in our reading of the report, examination of the field context, and subsequent discussions.

- The original model for fluvial deposits along the river corridor by Hereford et al. (1996a, 1996b, 1998), and subsequently the Thompson and Potochnik report, lack a process-based conceptual framework for fluvial deposition, terrace formation, and subsequent terrace evolution due to both erosional and depositional processes outside of the debris-fan environment. Though the authors may be relying upon the model developed for the modern river (e.g. Schmidt and Graf [1990]), the depositional processes and environments for those mainstem deposits that make up each stratigraphic unit, beyond general interpretations of fluvial, colluvial, or aeolian, are not specifically stated.

- There is no recognition that the progressive downcutting and lateral migration of the river channel that results in the downward-stepping flight of terraces as well as the terrace risers/scarps are fundamental to all subsequent processes of landscape evolution, including gullying.

- There is an inherent recognition apparent in the Introduction, Methods, and in the predictive model that gully erosion is driven by up-drainage controls. Yet throughout the document the authors fail to make clear that the base-level hypothesis describes processes that *offset* erosion, not *drive* it.

- References to, and familiarity with, the existing literature on hillslope processes and gully formation is lacking. Referencing is focused on work done by Hereford's group in the Canyon.

- The latter part of the Introduction, and other text in the document, seems to favor verification of the base-level hypothesis.

- There is a conceptual reliance upon stream or arroyo concepts of gully erosion and dynamics rather than hillslope-oriented concepts. Based on our field observations, much of the gully erosion of concern occurs in situations where channel slopes may be an order of magnitude steeper than classic arroyos in the Southwest.

- Testing the climatic hypothesis may be nearly impossible given the spatial variability of precipitation and the lack of precipitation data from the immediate study localities. In spite of this, we suggest that the researchers show that increased precipitation amount/intensity is probably driving increased erosion in the past two decades (p. 51), as previously suggested by Hereford et al. (1993). Yet they then seem to dismiss this correlation by saying that if climate were driving episodically increased erosion, "little of the alluvial terraces with cultural remains would be left in Grand Canyon." This is particularly faulty reasoning because it is unfalsifiable, and it may well be that very little of the record *is* left. Based on our examination of field relationships, it seems that terrace remnants along the river corridor have a large colluvial component and high preservation potential because of their position in the landscape. Much of the original genetically related body of alluvium, with its related archaeological sites, is most likely already gone.

- The two tests of the base-level hypothesis presented in this report do *not* identify or determine the viability of a base-level regrading mechanism (like process A above). Instead, it seems to be assumed that some unspecified mechanism exists to physically connect upslope erosion to local base-level change at the gully foot, and then work focuses simply on whether or not sand bars have been present at the foot of gullies through time. There is only one piece of anecdotal evidence, from a different researcher in a location not studied in this report, of potential gully backfilling by temporarily high base level—otherwise this mechanism is not addressed. This is a fundamental flaw given the implicit intent of the investigation.

- The Cataract Canyon comparison is faulty because: 1) It is not made explicit how or why the geomorphology of Cataract Canyon is similar to the Furnace Flats reach of Grand Canyon (where most sites are), and there seems to be evidence that Cataract Canyon is steeper/narrower. 2) All mapped terrace deposits in Cataract Canyon, including the one identified as equivalent to the "ap" unit of Grand Canyon, are

inundated by annual flood flows, whereas the "sa" and "ap" terraces in Grand Canyon, in all but a few speculative and extreme cases, are not. In fact, the great deal of work done in Cataract seems to show only that gullies are infilled when inundated by flood flows (process A above). No evidence is cited for the base-level regrading mechanism (process C) necessary to extend processes above the flood line, and because the terraces of archaeological interest in Grand Canyon are not inundated by pre-dam flood flows, comparison of these two reaches is invalid.

- It seems to be agreed that Hortonian (infiltration-excess) overland flow is the process responsible for most erosion. Therefore, the relation of infiltration rates to precipitation rates should be the focus of study, rather than the misleading conceptual model of terraces as "sponges" and the untested assumption that 25mm/hr is the threshold precipitation intensity. Water storage capacity of sediment is not important in this case, but infiltration rates are.

- No test of the aeolian restorative process (B) is given, only an inventory of sites where aeolian deposits are present.

Modeling of Flood-related Deposition (Weile Research Project)

This research is clearly important for the physical program of GCMRC. However, application of this research to the cultural resources program appears to be entirely dependent upon the validity of the original base-level hypothesis. Because of this, further funding of this research by the cultural program is not recommended.

Summary of Recommendations and Main Comments

1. An archaeological research design is badly needed. When adopted, this will serve to drive the development of more detailed geoarchaeological and geomorphic research questions. The potential for such research in Grand Canyon is very high.
2. The geomorphologic hypotheses used in attempts to link erosion of sites to dam operations have been unclear, and the original base-level hypothesis is as-yet untested.
3. The APE should be defined as Holocene deposits along the river corridor, including Colorado River alluvium, interfingering or overlying hillslope and debris fan deposits, and genetically related aeolian deposits. This definition is more practical than a given river stage, and it is more intellectually consistent since it also serves as the landscape context for the cultural resources along the Colorado River corridor.
4. The "erosion question" may be resolved by further research, which will be important for answering archaeological questions, monitoring activities, or site vulnerability estimates. Also, though the existing geomorphological and stratigraphic framework is a good place to start, there remains a need for fundamental process-based research on the record of landscape evolution during the culturally relevant time period.
5. Quantifying the vulnerability of specific sites may be completed with validation, testing, and refinement of the equation derived in the Thompson and Potochnik (2000) report.

6. Erosion rates can be monitored relatively easily, and rates should be monitored for sites with archaeological significance, as defined by the research plan.
7. Erosion rates may be reduced more effectively if certain larger-scale methods are used, but this is contingent upon Native American views and national park policy.

References Cited

Austin, Diane E. and Cynthia Osife
1996 "Southern Paiute Consortium Study of the Impacts of the 1996 Glen Canyon Dam Beach/Habitat Building Test Flow." In *Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996*, edited by Janet R. Balsom and Signa L. Larralde, pp. 159-179. Grand Canyon National Park, Arizona, and USDI Bureau of Reclamation, Upper Colorado Region, Salt Lake City, UT.

Balsom, J.R., and S. Larralde, eds.
1996 *Mitigation and Monitoring of Cultural Resources in Response to the Experimental Habitat Building Flow in Glen and Grand Canyons, Spring 1996*. Grand Canyon National Park, AZ and Upper Colorado Region, Bureau of Reclamation, Salt Lake City.

Hereford, R., Fairley, H. C., Thompson, K. S., and Balsom, J. R.
1993 *Surficial Geology, Geomorphology, and Erosion of Archeological Sites along the Colorado River, Eastern Grand Canyon, Grand Canyon National Park, Arizona*. U. S. Geological Survey Open-File Report 93-517.

Hereford, R.
1996 *Map Showing Surficial Geology and Geomorphology of the Palisades Creek Area, Grand Canyon National Park, Arizona*. U. S. Geological Survey Map I-2449.

Hereford, R., Thompson, K. S., Burke, K. J., and Fairley, H. C.
1996 Tributary Debris Fans and the Late Holocene Alluvial Chronology of the Colorado River, Eastern Grand Canyon, Arizona. *Geological Society of America Bulletin* 108:3-19.

Hereford, R., Burke, K. J., and Thompson, K. S.
1998 *Quaternary Geology and Geomorphology of the Nankoweap Rapids Area, Marble Canyon, Arizona*. U. S. Geological Survey Map I-2608.

Leap, Lisa M. et al.
2000 *Grand Canyon Monitoring Project 1992-1999: Synthesis and Annual Report FY99*. Grand Canyon National Park and Northern Arizona University, Flagstaff, AZ.

Neal, Lynn A. and Dennis Gilpin
2000 *Cultural Resources Data Synthesis Within the Colorado River Corridor, Grand Canyon National Park and Glen Canyon National Recreation Area, Arizona*. SWCA, Inc., Environmental Consultants, Flagstaff, AZ.

Schmidt, J. C. and Graf, J. B.
1990 *Aggradation and Degradation of Alluvial Sand Deposits, 1965 to 1986, Colorado River, Grand Canyon National Park, Arizona*. U.S. Geological Survey Professional Paper No. 1493: U.S Geological Survey, Washington D.C., 73 p.

Thompson, K. S. and Potochnik, A. R., eds.
2000 *Development of a Geomorphic Model to Predict Erosion of pre-Dam Colorado River Terraces Containing Archaeological Resources*. SWCA Cultural Resources Report No. 99-257, prepared for Grand Canyon Monitoring and Research Center by SWCA, Inc., Environmental Consultants, Flagstaff, AZ.

Appendix A: Brief Professional Biographies of Panel Members

All panel members are listed in alphabetical order. Their subpanel affiliation is indicated first, and then a brief biographical sketch is provided.

Michael S. Berry, Archaeology. Ph.D. Anthropology, University of Utah 1980. Staff Archaeologist for Utah State Trust Lands Administration

Michael Blum, Ph.D., Geomorphology. Associate Professor of Geosciences, University of Nebraska-Lincoln. Professional interests in fluvial geomorphology and sedimentology, climate and sea-level change, and geoarchaeology. Field experience includes West Texas, U.S. Gulf Coastal Plain, lower Mississippi Valley, North Africa, Western Europe, U.S. Great Plains, Greenland, and Alaska.

David Cole, Ph.D., Monitoring and Compliance. Research Biologist, Aldo Leopold Wilderness Research Institute, Rocky Mountain Research Station, Forest Service, U.S. Department of Agriculture. Professional interests are in the planning and management of wilderness.

James Collins, Ph.D., Monitoring and Compliance. Department of Biology, Arizona State University. Professional interests are in ecology, evolutionary biology, and statistics.

William H. Doelle, Ph.D., Archaeology. President of a for-profit contract research firm and Executive Director of a nonprofit archaeological research and educational organization. Professional interests are in past demography of the Greater Southwest, archaeological preservation, and public involvement.

Mark Druss, Ph.D., Monitoring and Compliance. Archaeologist, Environmental Affairs Department, Idaho Power Company. Directs cultural resources activities in connection with dam relicensing, construction, and operations. Professional interests include relationship between environmental change and cultural change.

Kyle House, Ph. D., Geomorphology. Research Geologist, Nevada Bureau of Mines and Geology, University of Nevada, Reno. Specialist in fluvial geomorphology, paleohydrology, and Quaternary geology. 10-years of research experience in the geomorphology and Quaternary histories of rivers, washes, and piedmonts in Arizona and Nevada.

Thomas F. King, Ph. D., Monitoring and Compliance. Consultant, educator, writer in cultural resource policy and practice. Recent pertinent publications: *Cultural Resource Laws and Practice: an Introductory Guide* (Altamira Press 1998) and *Federal Planning and Historic Places: the Section 106 Process* (Altamira Press 2000).

Paul R. Nickens, Ph.D., Archaeology. Senior Research Scientist, Pacific Northwest National Laboratory, and Adjunct Faculty, Bureau of Applied Research in Anthropology, University of Arizona. Professional interests include technologies and strategies for monitoring natural and human-caused impacts and in place protection of archaeological sites.

Joel Pederson, Ph.D., Geomorphology. Process Geomorphology, Assist. Prof., Utah State University. Specialize in hillslope geomorphology and sedimentology, landscape response to climate at short and long geologic time-scales, and the late Cenozoic landscape development of the Colorado Plateau and Grand Canyon.

Lynne Sebastian, Ph.D., Monitoring and Compliance. Independent consultant specializing in historic preservation planning, training, and problem solving. An archaeologist specializing in the American Southwest, Dr. Sebastian is a former State Historic Preservation Officer and currently serves as an adjunct Assistant Professor in the Department of Anthropology, University of New Mexico.

Betsy L. Tipps, Archaeology. Independent consultant specializing in archeological and ethnographic research; senior principal investigator and project manager for a private contract research firm. Professional interests include the Archaic and Protohistoric periods of the western U.S. Author of multiple NPS publications on southern Utah prehistory and co-producer of a video on Navajo lifeways.

Michael K. Trimble, Monitoring and Compliance. Chief Curator of Archaeology, US Army Corps of Engineers. Director of the Corps of Engineers Curation and NAGPRA Program. Major responsibilities include Native American consultation, implementation of national curation program, and design and management of curation programs.

Rebecca Tsosie, Native American Issues. School of Law, Arizona State University.

David Vader, Native American Issues. Native American Coordinator, US Army Corps of Engineers, Omaha District. Representative of the Omaha District Commander responsible for ensuring agency meets its federal trust responsibilities through consultation and coordination with 28 Tribes in the Missouri River basin.

Jacilee Wray, Native American Issues. Anthropologist, Olympic National Park. Professional interests are in historic preservation, ethnohistory, and associations traditional groups have to national parks.

Joe Watkins, Native American Issues. Agency Archeologist for the Anadarko Agency of the Bureau of Indian Affairs. Professional interests are American Indian-Archaeologist relations, repatriation issues among tribal groups, and ethics in American archaeology and anthropology.

Appendix B

Two Illustrative Examples

Example 1: Development of a Historic Preservation Plan

To illustrate the processes involved in developing and implementing the HPP, two examples have been developed. In each case, a brief numbered sequence of major steps is identified. The purpose is to try to clarify the general discussion in the main body of the report with a more specific example.

1. BOR selects a single consultant or small consultant team with extensive experience in historic preservation law and practice. Regional expertise and a general familiarity with the Grand Canyon program are desirable, but not essential. The consultant works closely with BOR, NPS, GCMRC and the Tribes to define the elements to be addressed in the HPP, to map out areas of compliance responsibility between agencies, to identify areas of financial responsibility between agencies, and to create a framework for long-term task performance and interaction. Refinement of the list of subsidiary documents that support the HPP would also be accomplished early in this process, because development of several plan documents should occur concurrent with preparation of the general HPP.

2. Research Design. The BOR should conduct a competitive bid to hire a contractor with strong local, regional, and theoretical-methodological expertise. Geomorphological expertise and Native American involvement are essential components of the research design team. A draft research design should be prepared for review by BOR, NPS, GCMRC, the Tribes, outside peer reviewers, ACHP, and SHPO.

3. Monitoring Plan. The research design contractor should work with NPS and GCMRC to develop an integrated monitoring plan. The level of monitoring for archaeological sites is expected to drop substantially in the future. Also the Native Americans involved with monitoring cultural resources in the Grand Canyon should participate in developing this overall monitoring strategy.

4. Database Plan. GCMRC should work with NPS and the research design consultant to create a database plan. This should result in the transfer of the existing database to the GCMRC. When the research design has been finalized, the assessment of historic properties should be carried out (see Example 2 below).

5. Native American Consultation Plan. BOR, NPS, GCMRC, and the Tribes must work directly together in order to establish an agreed upon process for communicating, coordinating, resolving differences, acknowledging roles and responsibilities, and establishing government-to-government relationships.

6. Traditional Cultural Properties Plan. Participating tribes will need to prepare this document in coordination with BOR and NPS. It may be advisable to involve a consultant in preparing this plan (or plans).

7. Public Involvement Plan. GCMRC and NPS could take the lead in developing a coordinated program of public information and outreach. Some implementation responsibilities could be incorporated into specific contract requirements, for example, for an archaeological data recovery contract.

8. Historic Properties Treatment Plan. This process is outlined in greater detail in Example 2 below. For creating the HPP, only a general process is needed. The implementation of the Historic Properties Treatment Plan will take place over time (see Example 2).

9. When the above component documents and the draft of the overarching HPP are complete, a fine-tuning of the master document and the subsidiary documents should take place. Areas of responsibility that were overlooked or incompletely addressed initially would be dealt with. Refinement of allocations of responsibility would also be undertaken. At the end of this process, the documents would be considered "final." They would be subject to ongoing review and refinement with the passage of time.

Example 2: Development and Implementation of a Treatment Program

l. Create a database that includes all known archaeological sites and site-specific elements of the traditional cultural landscape.

2. Using the results of the monitoring to date, evaluate the condition and existing threats to each property. Where possible, project the future threats.

3. Based on the research design, evaluate the research importance of each site.

4. Based on research importance, existing threats, projected threats, and tribal concerns, divide the sites into management categories: no treatment needed, monitor with frequency X or Y or Z, implement visitor management program, implement erosion control program, high priority for data recovery, secondary priority for data recovery, no treatment warranted (that is, high threat, low data potential, no tribal concerns about preserving in situ).

5. At that point, the high priority data recovery sites would be subject to data recovery based on the research design. Sampling strategies would be appropriate in terms of focusing on a sample of sites and/or on sampling only those portions of larger sites that are threatened.

6. Subsequent to the data recovery program, the research design would be refined and the secondary priority sites would be re-evaluated to determine if any additional data recovery was warranted.

7. The final step would be to fine-tune the research design, to re-evaluate the assignment of sites to management categories based on the results of the data recovery, and to establish the monitoring plan and develop criteria under which monitored sites would be slated for data recovery as their condition changes in the future (presumably only the really high data-potential sites would be so selected).

8. BOR would have high financial responsibility for the initial data recovery phase (75%?), less for the second phase (50%?), and still less for any future data recovery (25%?).

Appendix C: Alphabetical List of Acronyms

ACHP – Advisory Council on Historic Preservation
AMP – Adaptive Management Program
APE – Area of potential effect
BOR – Bureau of Reclamation
CBD – *Commerce Business Daily*
FTE – Full-time equivalent
GCDEIS – Glen Canyon Dam Environmental Impact Statement
GCMRC – Grand Canyon Monitoring and Research Center
GCPA – Grand Canyon Protection Act
GIS – Geographic Information System
GLCA – Glen Canyon National Recreation Area
GRCA – Grand Canyon National Park
HPP – Historic Preservation Plan
MOU – Memorandum of Understanding
MRAP – Monitoring and Remedial Action Plan
NAGPRA – Native American Graves Protection Act
NAIS – Native American Issues Subpanel
NAU – Northern Arizona University
NHPA – National Historic Preservation Act
NPS – National Park Service
PA – Programmatic Agreement
PEP – Protocol Evaluation Panel
RCMP – River Corridor Monitoring Project
RDB – Relational Database
RFP – Request for Proposals
ROD – Record of Decision
SHPO – State Historic Preservation Office(r)
TCP – Traditional Cultural Property
Western – Western Area Power Administration