

Glen Canyon Dam Adaptive Management Program FY 2003 Bottom-line Funding Needs

I. PROGRAM ADMINISTRATION

A. ADAPTIVE MANAGEMENT WORK GROUP¹

1.	Personnel Costs	173,000
2.	AMWG Member Travel Reimbursement	10,000
3.	Reclamation Travel	17,000
4.	Facilitation Contract	25,000
5.	Other	<u>11,000</u>
	Subtotal.....	236,000

B. TECHNICAL WORK GROUP²

1.	Personnel Costs	81,000
2.	TWG Member Travel Reimbursement	10,000
3.	Reclamation Travel	18,000
4.	TWG Chair Reimbursement	25,000
5.	Other.....	<u>2,000</u>
	Subtotal.....	136,000

C. SCIENCE ADVISORS³

Program Manager		<u>0</u>
	Subtotal.....	0

D. COMPLIANCE DOCUMENTS⁴

1.	Biologist (0.25 fte).....	21,000
2.	Travel.....	<u>5,000</u>
	Subtotal.....	26,000

E. TEMPERATURE CONTROL DEVICE⁵

F. CONTRACT ADMINISTRATION⁶

1.	Contract Specialist (0.25 fte).....	<u>25,000</u>
	Subtotal.....	25,000

II. TRIBAL CONSULTATION

A. Cooperative Agreements with Tribes⁷

1.	Hopi Tribe	80,000
2.	Hualapai Tribe	80,000
3.	Navajo Nation	80,000
4.	Pueblo of Zuni	80,000
5.	Southern Paiute	<u>80,000</u>
	Subtotal.....	400,000

B. River Trip Logistical Costs to GCMRC⁸

1.	Hopi Tribe	15,000
2.	Hualapai Tribe	15,000
3.	Navajo Nation	15,000
4.	Pueblo of Zuni	15,000
5.	Southern Paiute	<u>15,000</u>
	Subtotal.....	75,000

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III. PROGRAMMATIC AGREEMENT FOR CULTURAL RESOURCES

A. WORK PLAN ACTIVITIES

1. Curation, Archival, and NAGPRA Plans ⁹	25,000
2. Reclamation Administrative Costs ¹⁰	50,000
3. Geomorphological Effect Study with GCMRC ¹¹	163,000
4. Monitoring Costs ¹²	40,000
5. Contract for Treatment Plan ¹³	200,000
6. Public Involvement Plan ¹⁴	<u>20,000</u>
Subtotal.....	498,000

IV. EXPERIMENTAL FLOW FUND¹⁵569,000

V. SCIENTIFIC ACTIVITIES^{16, 17}

A. TERRESTRIAL ECOSYSTEM ACTIVITIES

1. Monitoring & Inventory of Terrestrial Resources ¹⁸	320,000
a. Tribal Participation	125,000
2. Monitoring Kanab Ambersnail ¹⁹	64,000
3. Kanab Ambersnail Taxonomy (Year 1) ²⁰	20,000
4. Terrestrial Research ²¹	50,000
5. Holocene Mapping ²²	160,000
6. Implementation of GCMRC HPP & PEP Activities ²³	50,000
7. Terrestrial Mapping and Inventory	<u>180,000</u>
Subtotal.....	969,000

B. AQUATIC ECOSYSTEM ACTIVITIES

1. Phyto-benthic Monitoring ²⁴	227,000
2. Monitoring Downstream Fish ²⁵	760,000
3. Monitoring Lees Ferry Trout ²⁶	140,000
4. Native and Non-native Fish Interactions Research ²⁷	70,000
5. Ongoing Population Genetics of Humpback Chub ²⁸	0
6. IWQP Downstream Activities ²⁹	150,000
7. IWQP Lake Powell (O&M Funding) ³⁰	<u>300,000</u>
Subtotal.....	1,647,000

C. INTEGRATED TERRESTRIAL & AQUATIC ECOSYSTEM ACTIVITIES

1. Monitoring Fine-grained Sediment Storage ³¹	450,000
a. Adopt-a-Beach with Integration Report	10,000
b. Beach Monitoring (continuation of NAU work)	75,000
2. Monitoring Streamflow & Fine Sediment Transport ³²	625,000
3. Monitoring of Coarse-grained Sediment ³³	135,000
4. Modeling Reach-averaged Sand Bar Evolution ³⁴	180,000
5. One-dimensional Fine Sediment Routing Model ³⁵	145,000
6. Conceptual Modeling of Coarse-grained Sediment ³⁶	102,000
7. One-year Evaluation of In-Situ Continuous Monitoring of Suspended-Sediment Transport ³⁷	80,000
8. Installation of Automated Pump Samplers ³⁸	50,000
9. Advance Warning for Paria River Sediment Inputs ³⁹	30,000

Glen Canyon Dam Adaptive Management Program FY 2003 Bottom-line Funding Needs Continued

10. Annual High-Elevation Measurements of Sand Storage at NAU Sites ⁴⁰	15,000
11. Tribal Training, Science/Tribal Perspectives Integration/ Tribal Interns ⁴¹	20,000
12. Cultural Resources Data Management ⁴²	20,000
13. Cultural Resources Synthesis and Status Report ⁴³	5,000
14. Recreational Effects to Cultural and Biological Resources ⁴⁴	<u>20,000</u>
Subtotal.....	1,962,000

D. PROTOCOL IMPLEMENTATION

1. PEP/PA stipulated public outreach/involvement plan ⁴⁵	20,000
Subtotal.....	20,000

E. NEW ACTIVITIES

1. Decision Support System Development ⁴⁶	150,000
Subtotal.....	150,000

G. MANAGEMENT AND BUDGET

1. Administrative Operations and Support ⁴⁷	1,450,000
2. I.T. Program Support ⁴⁸	
a. DBMS.....	109,000
b. GIS	145,000
c. Library	80,000
d. Survey.....	117,000
e. System Administration	233,000
f. Aerial Photography	230,000
g. LIDAR for Monitoring (Multi-spectral, Digital Orthophotography).....	200,000
3. Public Outreach Activities	75,000
4. Independent Review Panels	235,000
5. Unsolicited Proposals	100,000
6. AMWG/TWG Requests	50,000
7. In-house Research.....	25,000
8. Logistics (Costs not assigned to Projects).....	<u>275,000</u>
Subtotal.....	3,324,000

TOTAL FY 2003 BUDGET ----- 10,037,000

FY 2003 FUNDING REQUESTS

AVAILABLE FUNDS	III. AMOUNT
CRSP Power Revenues	\$ 8,263,000
DOI Tribal Funding Appropriations	\$ 475,000
O&M – IWQP Lake Powell Studies	\$ 300,000
USGS Appropriations	\$ 999,000
TOTAL	\$10,037,000

GLEN CANYON DAM ADAPTIVE MANAGEMENT PROGRAM
Final Draft
Project Blurbs for FY 2003

¹ Adaptive Management Work Group (AMWG). This includes personnel costs required to administer the Adaptive Management Program (AMP), travel funds to reimburse members/alternates for attendance at AMWG, ad hoc, and other meetings, and a facilitation contract for meeting management and/or special ad hoc assignments.

² Technical Work Group (TWG). This includes personnel costs needed to administer the TWG, travel funds to reimburse members/alternates for attendance at TWG, ad hoc, and other meetings required in the completion of AMWG/TWG assignments, as well as reimbursement for the TWG Chairperson.

³ Science Advisors. At this point in time it is not known what work or funds may be needed, however, the AMP will provide support for science activities in accordance with FACA rules and regulations.

⁴ Compliance Documents. This covers funding for preparation of compliance documents for AMP-proposed actions in order to comply with ESA, NEPA, and NHPA.

⁵ Temperature Control Device. Temperature Control Device environmental compliance, preconstruction design, and construction costs are covered by appropriated funds.

⁶ Contract Administration. These are Reclamation personnel costs needed to administer the AMWG facilitation, TWG Chairperson, and Programmatic Agreement contracts.

⁷ Cooperative Agreements with Tribes. Each of the five tribes with demonstrated interests in the effects of Glen Canyon Dam operations on resources of tribal concern will continue to be funded through cooperative agreements. These agreements are for \$80,000 per tribe (or consortium of tribes) and the agreements are designed to cover salary, benefits, travel, and indirect costs to enable an official tribal representative to attend meetings of the Adaptive Management Program and to inform themselves and tribal governments on the AMP activities, issues, and proposals.

⁸ River Trip Logistical Costs to GCMRC. Each of the five tribes is allocated \$15,000 to monitor resources of tribal concern and to report back to the AMP and the Secretary regarding the observed effects of dam operations or other management actions. The funds are transferred from the federal agencies within the AMP to Reclamation to the GCMRC to pay for river guides, boats, fuel, food, etc.

⁹ Curation, archival, and NAGPRA plans. Completion of the historic preservation plan requires that curatorial issues under 36 CFR 79 and archival issues under the Federal Records Act will be resolved in the public interest. These plans will most likely be written by PA signatories, although procurement or assistance may also be utilized to obtain the written plans. The plans will describe how the PA signatories and AMP

members will work cooperatively for the preservation of, and provision of long-term access to archeological and historical collections, records and reports generated through the AMP and PA. The curation and archival plans will explain how colleagues, students and others will be encouraged to make responsible use of museum collections, records, and reports in their research as one means of preserving the in situ archeological record and of increasing the care and attention given to that portion of the archeological record which has been transformed into museum property, reports, and associated records.

Several different plans or reports must be prepared in compliance with the Native American Graves Protection and Repatriation Act. These plans may be prepared by PA signatories, although it is anticipated that contracts or agreements will be necessary to complete the tasks. It is also anticipated that the funds listed here may not be sufficient to cover the costs of finalizing these plans.

¹⁰ Reclamation Administrative Costs. A total of \$50,000 has been projected to cover salary, benefits, travel, and indirect costs of administering the PA program.

¹¹ Geomorphological Effect Study with GCMRC. Depending upon the results of the geomorphology workshop planned for FY01, it may be reasonable and feasible to conduct specific geomorphological investigations into locating or mapping the effects of dam operations on historic properties. This project, which is jointly funded with GCMRC, is contingent upon the workshop.

¹² Monitoring Costs. The Protocol Evaluation Panel (PEP) for cultural resources called for a revised monitoring program and plan. Preparation of the plan will be a joint project with GCMRC in FY02, and implementation of the plan will begin in FY03. Costs are not precisely calculated given uncertainties about the work that will be conducted.

¹³ Contract for Treatment Plan. Once the research design is complete and the values of the historic properties are explicitly defined, and once the direct and indirect effects of dam operations are more precisely mapped or identified, then it will be necessary to resolve adverse effects of dam operations on properties eligible to the National Register. This resolution and the proposed mitigation measures will be described in a treatment plan that will be contracted.

¹⁴ Public Involvement Plan. As part of the treatment plan and the overall planning effort, the PA signatories and the AMP need to reach out to and participate in cooperative efforts with others interested in the cultural resources in the Colorado River ecosystem. any publics exist for cultural resources and archeology, including students, lawmakers, government officials, journalists, Native Americans and members of other ethnic, religious and cultural groups who find in the archeological record important aspects of their cultural heritage. If these individuals and groups are not directly involved in the treatments planned for cultural resources, then the plan should focus on how knowledge gained from investigations within the CRE will be distributed to as wide an range of interested publics as possible.

¹⁵ Experimental Flow Fund. Experimental Flows are a key part of the Adaptive Management Program. These funds cover monitoring and research activities required for doing experimental flows in an effort to improve our understanding of ecosystem processes. It's anticipated these funds could be carried over from year-to-year and accumulate to such a level that an experimental test flow could occur.

¹⁶ Scientific Activities. Project descriptions and budget estimates have been built using information from current and draft information needs, recommendations contained in PEP reports, and existing monitoring and research activities that have been funded as multi-year projects. It is expected that as the revision to existing information needs and the AMP Strategic Plan is completed, the details for a given project may be revised. We believe the bottom-line budget figure presented here is a reasonable estimate of the funds needed for FY 2003 given existing information.

¹⁷ Project costs include contract costs, salaries for GCMRC staff, logistics, GIS and survey support, and other operational costs.

¹⁸ Monitoring & Inventory of Terrestrial Resources & Tribal Participation: Integrated biological monitoring linking birds, foodbase and vegetative structure on reach and river-wide scale, using bird patch as minimum unit. Also linking hydrology to vegetation composition change and developing minimum sampling scheme for long-term monitoring.

-- Tribal Participation: One year continuation of work begun in FY 2001 and continued in FY 2002. All five participating tribes to work with biologists on terrestrial monitoring to incorporate tribal perspectives within biological monitoring project.

¹⁹ Monitoring Kanab Ambersnail: Measuring and estimating population status of snails at Vaseys Paradise. Includes measurement of habitat. Logistics support for supplemental population surveys included.

²⁰ Kanab Ambersnail Taxonomy (Year 1): First year of multi-year project to resolve taxonomic issues associated with *Oxyloma* complex.

²¹ Terrestrial Interactions Research: Unidentified research depending on information needs and strategic planning.

²² Holocene Mapping: Continuation of approved work for FY 2002 to document Holocene deposits within the Canyon. Project purpose is to define the area potentially affected by dam operations relative to sediment deposits, cultural and recreational resources. Implements a cultural PEP recommendation. Scale of project defined by existing information and feasibility based on scoping meeting held early in FY 2002.

²³ Cultural Resource Monitoring Plan: Implementation of GCMRC portion of HPP and PEP specified integrated Monitoring Plan that was developed during FY 2002 by BOR and GCMRC. Monitoring Plan specifies articulation between AMP cultural programs.

- ²⁴ Phyto-benthic Fast-response Monitoring: Data collection and analysis of algae, benthos and drift to measure response to operations. Emphasis may be in Glen Canyon and in association with gauging stations in Grand Canyon. Program is under review and development.
- ²⁵ Monitoring Downstream Fish: Data collection and analysis of fish populations in the mainstem and Little Colorado River. Request is for 4 LCR trips and 6 mainstem trips that include 2 trips for estimates of trout (rainbow, brown) and 3 trips to develop native fish abundance estimates and for synoptic surveys to detect distribution changes.
- ²⁶ Monitoring Lees Ferry Trout: Population estimates for Lees Ferry trout fishery including proportion stock density and condition factor of fish.
- ²⁷ Native and Non-native Fish Interactions Research: Projects are not currently defined, but may include predator-prey interactions, competition, and bioenergetics model development. Dependent on information needs.
- ²⁸ Ongoing Population Genetics of Humpback chub: The third year of project to examine the relationships of mainstem and LCR humpback chub. Results will be incorporated into monitoring efforts and compliance issues associated with HBC.
- ²⁹ IWQP Downstream Activities: Water quality monitoring downstream within the intention of expansion of parameters measured as per PEP recommendations. Monitoring plan is under development.
- ³⁰ IWQP Lake Powell: Water quality monitoring of reservoir, includes monthly and quarterly sampling and incorporation of modeling effort into monitoring program. Monitoring plan is under development consistent with PEP recommendations as indicated in [Response to Comments](#) document.
- ³¹ Monitoring of Fine-Grained Sediment Storage: This project is designed to annually assess the spatial distribution of sand- and finer-sized material stored within the main channel of the Colorado River ecosystem; specifically related to storage in eddy complexes and main-channel pools. Monitoring data shall reflect the relative changes in total volume of sediment and grain-size distribution within a subset of representative reaches throughout the ecosystem, with emphasis on the first 100 miles below the dam. These data support information needs on the state of the available fine-sediment supply in the system subject to influence of dam operations. Related elements of this project include documenting changes in high-elevation sand storage (above 25,000 cfs) related to available campable areas, evolution of sand bar grain-size distribution, changes in the spatial distribution of channel-bed substrates, changes in the number and size of return-current channels within eddy complexes (backwater habitats) and changes in the size of pre-dam river terraces.
- ³² Monitoring Streamflow and Fine-Sediment: This project provides data on streamflow and suspended-sediment transport on the gaged tributaries that provide fine-sediment to

ecosystem (influx), and on suspended-sediment transport through critical reaches of the main channel of the Colorado River ecosystem (efflux). It has one research component related to advancing development of a protocol for tracking the fine-sediment budget in real time through a variety of integrated and remotely sensed input data.

³³ **Monitoring Coarse-Grained Sediment:** This project provides data on tributary inputs of coarse sediment introduced by debris flows annually, and information about how these inputs change the geomorphology of the main channel settings where sand storage, recreational, food base and fisheries resources exist.

³⁴ **Modeling Reach-averaged Sand Bar Evolution:** This project provides numerical model simulation for sand bar responses to a range of dam operations under historical sediment-supply conditions within all representative geomorphic reaches in the ecosystem

³⁵ **One-dimensional Fine Sediment Routing Model:** This project results in a numerical simulation for routing sand inputs from the Paria and Little Colorado Rivers, downstream through main channel storage settings below Glen Canyon Dam, including eddy complexes and main channel pools. The simulation uses modeled information on sand inputs, in combination with predictions of travel time and historical and model-derived local conditions of sand bar deposition and erosion.

³⁶ **Conceptual Modeling of Coarse-Grained Sediment Inputs:** This project relates ongoing impacts of coarse-sediment inputs to the evolution of the geomorphic framework of the Colorado River ecosystem, under current dam operations, over periods ranging from decadal to centennial time scales. The project specifically examines simulation related to local and system-wide changes to the main channel thought to influence fine-sediment storage, related physical habitats and food base dynamics.

³⁷ **One-year Evaluation of In-Situ Continuous Monitoring Of Suspended-Sediment Transport:** One-year evaluation of in-situ instrumentation aimed at tracking continuous suspended-sediment transport (reach-scale export) between Glen Canyon Dam and Diamond Creek using laser-diffraction technologies (LISST). Initial evaluation will be conducted using installation of LISST-25 instrument at the Grand Canyon stream gage. Grain-size and concentration data for suspended sediment conditions derived from LISST will be verified using the daily-to-weekly samples collected as part of long-term monitoring. This evaluation will be conducted in collaboration between the GCMRC and the WRD of USGS. (Includes purchase of customized LISST-25 instrumentation).

³⁸ **Installation of Automated Pump Samplers:** Installation of Automated Pump Samplers at Moenkopi Wash, Lower Marble Canyon, Grand Canyon and Diamond Creek Stream gages intended to obtain additional needed suspended-sediment data at key main channel sites for use in tracking monthly fine-sediment mass balance by geomorphic reach. This strategy also requires additional funding needed to support stage/discharge monitoring at the Lower Marble Canyon stream gage. These samplers are needed owing to the very remote nature of main channel locations where insufficient sediment samples are

currently obtained to track monthly sediment export. These devices could eventually be used to verify additional LISST instruments if that technology proves to be successful.

³⁹ Advance Warning for Anticipating Paria River Sediment Inputs: This consists mostly of hardware required for instrumentation of the Upper Paria River watershed so that sediment inputs to the main channel of the Colorado River can be better anticipated. The need for this system relates to a desire by managers to have sufficient lead time to allow high flows from Glen Canyon Dam to be released during or immediately following large sand inputs. This network would likely provide from 12-18 hours of advance notice before large Paria River floods reach the main channel.

⁴⁰ Annual High-Elevation Measurements of Sand Storage at NAU Sites: Currently, these measurements are scheduled to occur on a biennial basis. This project proposes to collect these data on an annual basis.

⁴¹ Tribal Training, Science/Tribal Perspectives Integration/Tribal Interns: Follow-on workshops for tribal training, science/tribal perspective integration workshop implementation, and use of tribal student interns. Purpose of work is to increase tribal participation within AMP for project development and implementation.

⁴² Cultural Resources Data Management: Implementation of Data Base Plan recommended by cultural PEP and specified in the HPP and approved in FY 2002 plan. Implements consolidation and transfer of data to GCMRC for access by AMP.

⁴³ Cultural Resources Synthesis and Status Report: Incorporates data and reports developed by AMP cultural representatives to provide a general synthetic knowledge gained from projects and integrated across resource areas. Developed in-house by GCMRC with collaboration with AMP cultural representatives. Project provides current information within SCORE report.

⁴⁴ Recreational Effects to Cultural and Biological Resources (New Work): New project that identifies and assesses recreational impacts to significant cultural and biological resources in Glen and Grand Canyons. Responds to concerns about commercial boats in Glen Canyon and tribal concerns within Grand Canyon.
Estimated Cost: \$ 20,000.

⁴⁵ PEP/PA stipulated public outreach/involvement plan: Development of public outreach and involvement plan as stipulated in the PA agreement and recommended by the cultural PEP. New work that will be jointly funded by the BOR and GCMRC.

⁴⁶ Decision Support System Development: GCMRC provides objective, scientific information to the AMWG for use in making recommendations to the Secretary of the Interior regarding the effects of dam operations on the Colorado River ecosystem (CRE). In support of this effort, GCMRC is developing: (1) a conceptual (i.e., computer) model of the CRE, (2) a detailed map of the CRE, (3) GIS overlays for the CRE, and (3) an integrated Oracle database of research on the CRE. Missing from this equation is the

decision-support system (DSS) overlay that can act to integrate these various efforts and support the AMWG in examining various management actions / policy changes that they may wish to recommend to the Secretary.

⁴⁷ Includes salaries for GCMRC staff not otherwise assigned to project costs.

⁴⁸ Includes contract costs, salaries for GCMRC staff, logistics support, and other operational costs not otherwise assigned to project costs or administrative operations and support.