

**Scoping Report for the
Glen Canyon Dam Proposed Temperature Control Device
Environmental Assessment**

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INTRODUCTION AND BACKGROUND

In 1994, the U.S. Fish and Wildlife Service issued a reasonable and prudent alternative for Glen Canyon Dam operations that required Reclamation to determine the feasibility of implementing a selective withdrawal program for Lake Powell. After spending several years compiling information how a temperature control device (TCD) might be built and operated to allow warmer water to be released downstream, in 1999 Reclamation released a draft environmental assessment (EA). Based on comments received on the EA, Reclamation did not finalize the assessment, nor begin work on the monitoring plan recommended by many of the individuals and organizations who responded to the draft EA. Instead, Reclamation initiated additional analyses. Using information gathered during these years of investigations, and following the advice of Science Advisors (Baron and others 2003) and the Adaptive Management Work Group (AMWG) of the Glen Canyon Dam Adaptive Management Program (GCDAMP), Reclamation has begun a new National Environmental Policy Act (NEPA) compliance process and proposal to complete the feasibility assessment by building and testing an experimental two-unit TCD.

Differences between the New and Old Proposals

The TCD design proposed in the 1999 EA was limited in use to a relatively full reservoir. With the continuing drought and decreasing elevation of Lake Powell, Reclamation engineers designed a more flexible TCD that could operate at a wide range of reservoir elevations. In addition to this design change, today both Reclamation and stakeholders in the GCDAMP more fully understand the complexity of ecological (and socioeconomic) interactions that may occur within the Colorado River ecosystem with the warming of dam releases, including changes in productivity of the fishes, foodbase, enhancement of conditions for certain diseases and parasites, and increased negative effects of non-native fish on native fish. Due to uncertainties concerning the outcome of warming dam releases, Reclamation believes that testing a two-unit pilot or experimental TCD through the GCDAMP is the most fiscally and environmentally suitable approach to complying with the Service's recommendation to investigate the feasibility of temperature control at Glen Canyon Dam. In other words, building and testing a two-unit TCD would be the final step in complying with the 1994 reasonable and prudent alternative for Glen Canyon Dam operations.

SCOPING PROCESS

Following a risk assessment conducted by Science Advisors to the GCDAMP (Baron and others 2003) and a recommendation to proceed from the AMWG, Reclamation began scoping for a new EA at a public lecture held at the Carl Hayden Visitor Center in Page, Arizona, on February 12, 2004. Approximately 50 individuals attended the session and five expressed interest in being added to the mailing list. On Feb. 23, 2004, a scoping letter for the proposed two-unit pilot TCD was mailed to all federal, state, local agencies, Indian tribes and persons who might be affected by or have

interests in modifications to the penstocks at Glen Canyon Dam. The scoping letter was posted to the GCDAMP web site. An announcement of the start of the NEPA process was made at a meeting of the AMWG in Phoenix, AZ on March 2-3, 2004. Stakeholders and the public were encouraged to respond to Reclamation with their concerns, alternatives and issues. In addition, a Reclamation representative attended the annual meeting of the Grand Canyon River Guide Association at Lees Ferry, AZ and encouraged the guides to submit their concerns or issues to Reclamation. Reclamation has accepted letters, emails, phone calls, etc. through July 8, 2004.

SCOPING RESULTS

As of July 9, 2004, 50 letters, facsimiles, emails or phone calls from tribes, agencies, organizations or individuals were received by Reclamation. Another 277 form letters from Living Rivers and Waterkeeper Alliance members were received. The letters, facsimiles, and emails included some 298 individual comments expressing expectations regarding the TCD proposal, concerns over its potential effects on the environment, concerns over relationships between the TCD and ongoing dam operations, identification of specific resources, topics or issues that Reclamation should study, alternatives or other ways to meet proposal objectives, NEPA process, and study design or methods for predicting environmental effects of the TCD. To synthesize the results of scoping, each of the 298 comments was rephrased as a question and the questions were classified by issue (Table 1). These issues will be addressed in the EA. The questions were paraphrased to identify duplicates and are presented in Tables 2-16. These questions will be forwarded to an interdisciplinary team that Reclamation will be assembling to answer the questions and write the EA.

Table 1. Issues Raised During Scoping.

Alternatives
Aquatic resources, especially endangered native fish
Baseline
Construction and engineering
Costs of construction and TCD operation
Dam safety
Decision-making and NEPA compliance process
Drought in relation to the TCD and reservoir elevations
Entrainment of non-native species
Endangered Species Act compliance
Hydropower
Maintenance of Glen Canyon Dam
Non-native fish
Operations of Glen Canyon Dam
Public health and safety
Socioeconomics, especially related to trout fishery

Study design or experimental design
Trout and the trout fishery
Water quality

Alternatives to the TCD Proposal

A question raised repeatedly during scoping was whether the purpose of the proposed two-unit TCD should be narrowly defined as compliance to fulfill the U.S. Fish and Wildlife Service’s reasonable and prudent alternative to evaluate the feasibility of warming waters below Glen Canyon Dam or whether the purpose should be more broadly construed as removing jeopardy for endangered Colorado River native fish and assisting in recovery. In response to scoping and in consideration of tiering, incorporation by reference, and other environmental assessments and other environmental impact statements which are being or will be prepared that may be related to but are not part of the TCD feasibility proposal, Reclamation is beginning to write a purpose and need chapter for the EA. It is anticipated that the scope will be narrowly defined as complying with the feasibility analysis required by the Service, which will fulfill one of the elements of the Service’s jeopardy opinion.

Table 2 presents additional questions raised about alternatives to the two-unit TCD proposal. Questions about engineering design for the TCD are listed separately, but different engineering designs might be alternatives that Reclamation should consider in the EA.

Table 2. Questions about Alternative Actions.

Could solar power be used to warm the water?
How much warming would be accomplished by operating 2 to 8 TCD units in comparison with lowered reservoir levels from drought?
What are the alternative methods to increase water temperatures to assist the endangered fish and improve survival of the species?
What are the opportunities for altering dam releases, changing current dam operations, removing the dam?
What are the opportunities for returning to a natural hydrograph?
What is the full range of alternatives to warm the water below the dam?
Would decommissioning, lowering the reservoir, or increasing sediment meet project purpose and need?
Would increasing sediment disadvantage hunt-by-sight predators of native fish; what about using spike flows to assist native fish?

Relevant Issues to Be Analyzed In the EA

One of the purposes of scoping is to identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental

review. The relevant issues identified through the scoping process are listed in a series of tables below.

Table 3. Questions about Aquatic Resources, including Native Fish.

What are the impacts of the TCD on aquatic resources including foodbase, nutrients and carbon?
What are the impacts of the TCD on non-native fish, including carp and striped bass?
What is the impact on native fish, especially humpback chub populations?
What are the impacts of the TCD on native fish in the Colorado River from Glen Canyon Dam to Lake Mead and in tributaries, including those on the Hualapai Reservation?
What are the impacts of the TCD on native fish when combined with diseases, predators or parasites?
What are the impacts of the TCD on speckled dace, bluehead sucker, flannelmouth sucker in Spencer Creek and tributaries?
What is the experimental design for monitoring impacts to the aquatic community?
What are the impacts of the TCD on the aquatic community when combined with lower reservoir levels in Lake Powell?
What are the benefits to humpback chub of warming the water with a 2-unit TCD compared to an 8-unit TCD?
What is the likelihood of incidental take of chub?
What is the relationship between warmer water benefiting non-native fish and removal of jeopardy from humpback chub?
Will an 8-unit TCD be built to warm waters over a range of reservoir elevations and increase flexibility while allowing for fewer risks for the endangered fish?
How will the population and health of the humpback chub and other native fish be affected by the warmer water and how will this be monitored?
How will interactions of native fish, non-native fish and other aquatic species be affected by the TCD?
What are the impacts of the TCD on the ecosystem, especially native fish but including northern leopard frog?

Many of the comments or questions received during scoping related to “baseline,” but the term baseline was used in three different ways. NEPA analyses require that the agency establish a baseline by describing the relevant affected environmental and socioeconomic resources as they now exist. For example, one of the questions listed in Table 4 is “What data on public health and safety will be included in the baseline?” This is clearly a NEPA issue, so Reclamation will ensure that public health and safety is described in the affected environment section of the EA.

Baseline was also used in an Endangered Species Act (ESA) section 7(a) (2) compliance framework. The environmental baseline is an analysis of the effects of past

and ongoing factors leading to the current status of an endangered species, its habitat and ecosystem within the action area. Baseline does not include the effects of the action under review in the consultation, but it does include state, tribal, local, and private actions already affecting the species or that will occur contemporaneously with the consultation. Unrelated federal actions affecting the same endangered species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are federal and other actions within the action area that may benefit listed species or critical habitat. Several comments received by Reclamation relate to environmental baseline for ESA consultation.

Yet another way that baseline was used was in the environmental monitoring sense; i.e., a change can only be measured as a deviation from some baseline or original condition. Table 4 lists questions about baseline and experimental design. All of these questions can be listed under the individual resource categories as well as baseline; likewise all of the issues listed in Table 1 will appear in the baseline or affected environment section of the EA.

Table 4. Questions about Baseline and Experimental Design.

What are the opportunities for returning to a natural hydrograph and of using the natural hydrograph as the baseline?
What bioenergetic data will be included in the baseline and what is the experimental design for monitoring bioenergetic changes?
What data on hydropower generation and marketing will be included in the baseline and what is the experimental design for monitoring changes in hydropower?
What data on hydropower generation and marketing will be included in the baseline and what is the experimental design?
What data on Lake Mead water quality will be included in the baseline and what is the experimental design for monitoring changes in Lake Mead water quality?
What data on native fish will be included in the baseline and what is the experimental design for monitoring changes in native fish?
What data on native fish will be included in the baseline and what is the experimental design including geographic controls such as Cataract Canyon?
What data on public health and safety will be included in the baseline and what is the experimental design for monitoring changes in public health and safety?
What data will be included in the baseline and what is the experimental design?
What is the baseline for temperature, biological and physical features from which changes will be measured?
Will data from low steady summer flows in the year 2000 be included in baseline?

Table 5. Questions about TCD Costs, Construction or Engineering and Dam Safety.

What are the costs of building, operating, maintaining the TCD and monitoring its effects?
What are the costs of maintaining the TCD, especially for generator bearings, stators, transformers?
What are the funding sources for the TCD?

What is the impact of TCD on experimental flows?
What is the impact of TCD on planned maintenance and repair?
What is the schedule for construction of the TCD?
What are the dam safety and security risks of the TCD?
How will the TCD affect the lifespan of the dam and reservoir?
Is current wicket gate timing correct so as not to exceed recommended penstock operating pressures if the TCD were installed?
What are reservoir elevational constraints for the TCD?
What are the impacts on the dam and infrastructure, especially generator bearings and stators, transformers?
What are the proposed engineering actions related to TCD?
What is the TCD design and operating plan?
What are the impacts of TCD on planned maintenance and repair and experimental flows?
What is the relationship between TCD construction, operation and planned maintenance and repair on all 8 units?
Will flow rate or operations need to be increased for transformer cooling?

Table 6. Questions about Decision-making.

How will decisions be made about whether the two-unit TCD experiment is a failure and should be terminated or if it a success and the other 6 units should be built?
How will operational constraints impact the value of the TCD over both the short and long-term?
Who (what disciplines) will determine the thermal thresholds and TCD operations?

Table 7. Questions about Drought and the TCD.

What are the effects of drought on the TCD's efficacy in warming water for endangered fish?
What is the operating plan if drought persists with and without TCD?

Table 8. Questions about Endangered Species Act Compliance.

Are modifications to all 8 units necessary for compliance with the biological opinion?
What is the relationship between warmer water benefiting non-native fish and removal of jeopardy from chub?
What is the status and plan for ESA compliance given new data on the chub and razorback sucker?
What is the status and plan for ESA compliance, especially with respect to incidental take?
What is the status and plan for ESA consultation, including compliance with

existing reasonable and prudent alternatives?
What is the status and plan for consultation with the Service regarding TCD and endangered native fish?
What is the status and plan for compliance with existing RPAs?

Table 9. Questions about Hydropower.

What are the impacts on hydropower and what are the cumulative impacts on hydropower since 1989?
What are the projected losses in power revenues due to head loss from the TCD?
What are the impacts on hydropower of operating the TCD at different reservoir levels?

Table 10. Questions about NEPA Process and Compliance.

How can an EA be prepared for only 2 units when the purpose of the federal action is to decide whether to build and operate the other 6 units?
What are the impacts of the TCD on tribal traditional cultural properties and what are the plans for tribal consultation?
What are the long-term and cumulative impacts?
What are the plans to consult with Southern Nevada Water Authority?
Where is more information available?
Why this is not considered a major federal action (construction project) with significant potential to affect the environment, i.e., why is an EIS not being prepared?
Why isn't there better public notice of the TCD NEPA process?
Why not extend the scoping period?
Why was a Federal Register notice not published?

Table 11. Questions about Non-native Fish.

What are the impacts of the TCD on non-native fish, especially Stripped bass below Diamond Creek?
What is the experimental design for monitoring trout and non-native fish?
What are the plans to control non-native fish in the LCR and other tributaries?
What are the impacts of the TCD on the trout fishery when combined with drought, diseases, predators or parasites?
What are the plans to control non-native fish that may thrive in the warmer water?

Table 12. Questions about Glen Canyon Dam Operations.

How will the 2 unit TCD be operated in conjunction with the other 6 units when all are installed?
How will the TCD be operated and under what constraints or limitations? Will it be managed to meet specific temperature thresholds?
What are the operational constraints on use of the TCD, especially with respect to cavitation, reservoir levels and drought?
What are the proposed annual operating plans for the TCD, including timeline?
What are the water hammer analyses for the TCD?
What is the operating plan if the turbines cannot be used?
What is the relationship between temperature increase and equipment efficiency as related to TCD?

Table 13. Questions about Public Health and Safety.

What are the impacts of the TCD on public health and safety?
What is the experimental design to monitor impacts on public health and safety?

Table 14. Questions about Study Design and Experimental Plan.

What are the impacts of the TCD on the ecosystem and what is the experimental design?
What is the experimental design to monitor changes in fish diseases, predators or parasites?
What is the overall experimental plan and monitoring plan?

Table 15. Questions about the Trout Fishery.

What is the potential for entrainment of non-native fish and undesirable species and how will it be prevented?
What are the impacts of the TCD on the trout fishery, especially jobs and income?

Table 16. Questions about Water Quality.

What is the impact on water quality in Lake Mead, especially for carbon dynamics, algae growth, and trihalomethane?
What is the impact of the TCD on costs for treating drinking water for southern Nevada?
What is the impact on water quality in Lake Mead, especially drinking water and chlorine treatments for southern Nevada?
What is the impact on water quality in Lake Mead, especially for alternative discharge locations?
What is the impact on water quality in Lake Mead, especially for annual thermal dynamics, mixing, thermocline development, sediment transport and

stratification?
What is the impact on water quality in Lake Mead, especially for modeling phosphorus and temperatures at the Narrows?
What is the impact on water quality in Lake Mead, especially for nutrient loading dynamics, and phosphorus?
What is the impact on water quality in Lake Mead, especially for perchlorate dynamics?
What is the impact on water quality in Lake Mead, especially for phosphorus and algae and wastewater return flow credits?
What is the impact on water quality in Lake Mead, especially for temperature, phosphorus, algae, chlorophyll?
What is the impact on water quality in Lake Mead, especially increase in nutrients and organic carbon from algae?
What is the impact on water quality in Lake Mead, especially the limnology?
What is the impact on water quality in Lake Powell and downstream?
What is the impact on water quality in Lake Powell, especially for carbon, metals, nitrogen?
What is the impact on water quality in Lake Powell, especially for introduction of biological or physical factors from upper reservoir levels?
What is the impact on water quality in Lake Powell, especially for thickness of epilimnion, hypolimnion and thermocline areas?
What is the impact on water quality in the tailrace of Glen Canyon Dam and downstream through Lake Mead?

References Cited

Baron, J., V. Dale, L. Gunderson, A. Howard, D. Hulse, J. Kitchell, J. Loomis, M. Palmer, R. Parker, D. Robertson, D. Schwartz, J. Watkins, and D. Garrett. 2003. Evaluating a Glen Canyon Dam temperature control device to enhance native fish habitat in the Colorado River: a risk assessment by Adaptive Management Program Science Advisors. July 2003.