

Glen Canyon Dam Adaptive Management Program Adaptive Management Work Group Meeting August 16-17, 2023

Wednesday, August 16, 2023

Start Time: 9:30 AM Pacific Standard Time (PST)

Conducting: Wayne Pullan, Acting Secretary's Designee to the Adaptive Management Work Group (AMWG) and AMWG Chair.

Recorder: David McIntyre, SeaJay Environmental, LLC.

Facilitator: Terra Alpaugh, Kearns & West, Inc.

Welcome and Administrative Updates

- **25:40 Introductions and Determination of Quorum [Terra Alpaugh, Kearns & West]** Quorum was reached with 24 members represented.
- **Approval of May 17, 2023, Meeting Minutes [Terra Alpaugh, Kearns & West]** Minor edits were received from California, New Mexico, and Western Area Power Authority (WAPA). Made addition of page numbers, corrected names, changed typos, and acknowledged that Annalise Blum, Deputy Assistant Secretary for Water and Power was introduced. On Page 15 corrected inaccuracy in the way black starts were described. Annalise Blum noted that she is the Deputy Assistant Secretary for Water and Science as opposed to Water and Power. May minutes **approval moved by:** Jessica Neuwerth, CRBC. **Seconded by:** Charlie Farantelli, Wyoming State Engineers Office. The May minutes were approved by consensus.
- **Review of May Meeting Evaluation [Terra Alpaugh, Kearns & West]** Fair amount of positive feedback received on the agenda items, one item that needs to improve is the timeliness of the release of draft meeting minutes.
- **Opening Remarks [Wayne Pullan, AMWG Chair]** Provided opening remarks.
 - The Acting Secretary's Designee to the AMWG introduced Daniel Picard, Deputy Regional Director of the Upper Colorado Region of Reclamation (Reclamation) and the acting Designated Federal Officer to the AMWG, Annalise Blum, Deputy Assistant Secretary for Water and Science, Christina Kalavritinos, Senior Advisor to the Assistant Secretary for Water and Science, and Michael Brain, Principal Deputy Assistant Secretary for Water and Science. Noted that Daniel Picard and Kathy Callister are representing Reclamation.
 - **[Michael Brain, DOI]** Discussed Reclamation's nomination of the Grand Canyon Tribal Monitoring Program for the Environmental Achievement Award and that the nomination was selected Monday to receive this Award. Reclamation also submitted the Program for the Presidential Award for Advancing Environmental Justice. **[Kathy Callister, Reclamation]** Noted that the Zuni were also included in the Tribal Monitoring award and nomination for the Presidential award.
 - **[Wayne Pullan, AMWG Chair]** Wayne asked Ed Keeble to discuss the Grand Canyon National Monument. **[Ed Keeble, GCNP]** President Biden signed proclamation establishing the Ancestral Footprints of the Grand Canyon National Monument last week. This is an effort that many tribal leaders have been promoting for decades and some federal employees as well. The President declared nearly a million acres of BLM and US

Forest Service land as the National Monument which limits future mining activities in those boundaries. The designation honors tribal nations and indigenous people by protecting sacred ancestral places and their history and the scientifically important features within. The president signed the proclamation on the Kaibab National Forest with Red Butte in the background. Ed spent 20 minutes with the President and discussed the work of the AMWG. Discussed water allocation, aridification, and the President was keenly interested in the Colorado River Basin issues.

- **[Wayne Pullan, AMWG Chair]** Went over the many accomplishments of the AMWG – “it’s an impressive list.” This year AMWG has adopted a Non-Native Fish Strategic Plan to respond to invasive fish establishment below the Glen Canyon Dam. A Department of the Interior (DOI) smallmouth bass rapid response charge was finalized and has been signed and rapid response actions are in progress. The Flow Ad Hoc Group (FLAHG) has been tasked with addressing the High Flow Experiment (HFE) protocol. Several National Environmental Policy Act (NEPA) actions are in progress: the Interim Guidelines Supplemental Environmental Impact Statement (SEIS), the Post 2026 EIS and the SEIS for the Long Term Experimental and Management Plan (LTEMP). Discussed the cavitation problems in the bypass tubes. This wrinkle may cause us some concerns as we work on the LTEMP SEIS. The outlet works continue to be available for water releases as needed. Priorities over next two days are approval of a budget and workplan for FY 2024 and recommend the adoption of the proposal regarding revisions to the HFE protocol. Speaking of our mission at large, it’s important for this group to strike a resource balance that considers how we can best manage Glen Canyon Dam for the downstream ecosystem within the constraints of annual deliveries from the Upper Basin to the Lower Basin. Since the last meeting some expressed concerns that hydropower impacts not be dismissed. Want to reiterate that Hydropower resource considerations are an essential part of our work. As part of the resource balance, it is vital that we incorporate tribal perspectives and traditional knowledge into our understanding.
- **AMWG Charter [Bill Stewart, Reclamation]** AMWG charter must be renewed every two years and signed by DOI. Current charter expires in September 2023. Currently being vetted and on schedule to be signed by then.
- **Nominations and Appointments [Bill Stewart, Reclamation]** AMWG appointment and reappointment letters signed. 11 new AMWG members and alternates, 11 old members and alternates. 5 new Technical Work Group (TWG) members and alternates.
- **Action Item Tracking Report [Bill Stewart, Reclamation]:** Provided updates on the following:
 - Monitoring metrics: DOI agencies met last year to review draft report which is still in progress. Report has description of metrics, working on refining and consolidating. Plan for metric reporting another round of regrouping and reporting to TWG. Metrics that are ready for prime time will be discussed at future AMWG meetings.
 - Prioritization of Triannual work plan: Request to review Fiscal Year (FY) 21 through 23 Work Plan. Last year DOI reviewed high priority actions supporting Grand Canyon Protection Action. This information will be used for next triannual work plan for FY 24 through 27.
 - Updates on the five actions identified at last August’s AMWG meeting; 1) Evaluation of HFE under low elevations discussed at 2023 annual reporting meeting and helped develop the need for the HFE protocol revision; 2) Evaluation of downstream resource impacts under low elevation and flows, this is being considered under the Interim Guidelines SEIS; 3) Non-Native Fish Strategic Plan completed and adopted by AMWG

at February meeting; 4) NEPA compliance for operational flexibilities to address nonnative fish, initiated in 2022 as part of an environmental assessment (EA), being moved into SEIS LTEMP; and 5) Planning to evaluate exclusion projects. Will hear update on this later today.

Q&A and Discussion

[Jim Strogon, FFI/TU] Why does low head during release through the bypass tubes cause increased potential for cavitation? **[Wayne Pullan, AMWG Chair]** Will be discussed during presentation.

[Larry Stevens, GCWC] Suggest new AMWG members review mission of the program. **[Bill Stewart, Reclamation]** New members can reach out to Bill or any members of his staff if they have questions.

[Wayne Pullan, AMWG Chair] Introduced Rod Smith from the Office of the Solicitor. Also introduced Andrew Schultz, new chief of USGS Science Center who introduced other USGS staff.

[Wayne Pullan, AMWG Chair] Due to issues with audio went to break.

1:20:00 Break

Basin Hydrology, Water Quality, and Operations

[Heather Patno, Reclamation] PRESENTATION. Provided the status of the Upper Colorado River Drainage Basin storage as of August 10, 2023. Currently in the decreasing storage base flow period. Will continue to decrease till spring 2024 runoff in April. Most reservoirs are full or near full. Lake Powell increased in elevation almost 65 feet this year from minimum to maximum (March to July). This was a significant increase. Upper Colorado Snow Water Equivalent peaked April 7th so did have above average snowpack this year. Drought Response Operations Agreement (DROA) has come into play. Significant decrease in elevation and storage at Lake Powell. Currently in DROA year 2023. Anticipate full recovery of Flaming Gorge by April 30. Blue Mesa anticipates full recovery by December 2023. There is a scheduled steady release planned for August 25th of 10,500 CFS for 72 hours. Will allow NPS to do chemical treatments similar to last year. **[Robert Radke, Reclamation] PRESENTATION.** June 20, 2023, was the last full reservoir sampling event. Outflow around 14 degrees Celsius (°C) and uniform from the dam till the upper end of the reservoir. Comparable situation with Dissolved Oxygen (DO). In June about 6 milligrams per liter (mg/liter) DO. Reservoir was fairly well oxygenated. Turbidity is represented by sediment at the inflow regions and is suspended and pushed down through the reservoir. Total Dissolved Solids (Salinity) was plotted and correlates with the turbidity plume. Last year had a hypoxic plume (DO) just above the penstock elevation. In June there was a similar hypoxic plume above the penstock elevation. These are fairly short lived (approximately 3 months duration). Turbidity in June is closer to the dam, July was biggest value of turbidity and now it's starting to drop off as sediment falls out. Total Dissolved Solids plotted and can see freshwater getting down to the dam in June, July, and August spring inflow. The model errors are warmer at surface, cooler at penstock and just right at bottom. Appears to be issues with boundary conditions and huge inflows that were not in the original base setup on the model.

Q&A and discussion

[Jim Strogon, FFI/TU, Sara Price, CRCN]: What is the latest on DO mitigation strategies for times when poor conditions are anticipated in the river below the dam due to plumes approaching the penstock? **Robert Radke, Reclamation].** Have been looking at options. Back in 2005 had a low plume going through penstock. Tried to run the turbines in a rough zone to cause oxygen entrainment in the water.

Looking at other options run at other reservoirs to alleviate this by various methods of entraining atmospheric air into the water. Staff at Glen Canyon Dam are willing to work with Reclamation to increase DO levels. Running normally see a 0.5 mg/liter increase but would like to get DO to 2mg/liter.

Effects of Low DO and High Temperature on the Trout Fishery

[Bridget Diemer, GCMRC] PRESENTATION. Reservoir elevation really affects temperature of releases. Had the highest temperatures last year since the dam was put in. Big inflow gives us pretty warm temperatures for the height of the reservoir. Last year had 85 days of low DO, this year predict an even higher number of days of low DO. The age of reservoir and the minimum elevation before spring inflow are the dominant control of DO. Bigger spring inflow means less DO. In general, the pattern is that daily average DO is 1 mg/liter higher at Lees Ferry than at the dam. This is due largely to photosynthesis. Currently conditions in Glen Canyon are below the median toxicity level. Bypass release also elevates DO but there are issues with cavitation.

[Josh Korman, Ecometric Research Inc] PRESENTATION Growth rates of rainbow trout have big impacts on population abundance. Temperature and DO are big determinants of this. Fish are smaller and less abundant. Fewer eggs are deposited. April 2019 tagged rainbow trout. July 2019 recaptured and measured the same individuals. Established the growth rate (300-gram fish) to be about 7 grams/month. Sept/Nov (lower temperatures and DO) saw fish lose 10 grams/month. Fish density is the number one determinant of growth. 2023 fish are in good shape going into a low DO year. Currently the population is low, in good condition and dominated by larger fish which are more sensitive to temperature increase.

[David Rogowski, AZGFD] PRESENTATION 13°C optimum temperature for rainbow trout growth. 8-20°C is where they grow. 24°C has a chronic effect. 26°C and higher they die. 5-6 mg/liter optimum DO, less than 4.9 mg/liter reduced growth and <2.5 mg/liter will suffer mortality. Starting to see a switch to a warm water fishery. Back in 1992 almost 100% rainbow trout caught in sampling trips. Around 2015 saw increase in brown trout. Last year started seeing increase in brown trout, smallmouth bass, black crappie, and sunfish. Now about 54% sampled are rainbow trout. Previously these other fish had come through dam and had not spawned. They are now that the water temperature is increasing. Abundance of trout is pretty low level for 2023. Currently hope to have 1 fish per hour but less than that right now. Same for last year. Fish being caught are bigger and in good condition.

[Ryan Mann, AZGFD] PRESENTATION Rainbow trout fishery is very important to local populations. The biggest issues are acute (direct mortality) and chronic threats. Need to sustain rainbow trout while disadvantaging high-risk, warm water non-natives. Management options highlighted in the forthcoming state of practice report are hypolimnetic aeration (bringing up higher DO water from deeper) and turbine aeration (running rough or direct injection of air into the turbines). Other options are aerating weir downstream and Speece cone (might be hard to scale up). All have drawbacks. The use of bypass has not been fully explored. Could address low DO and elevated temperatures. Cost and impact to hydropower resources not addressed yet. We are not meeting the LTEMP goal for trout fishery.

[Terra Alpaugh, Kearns & West] Are you looking for specific feedback from AMWG members on this.
[Ryan Mann, AZGFD] Yes.

Q&A and discussion

[Sara Price, CRCN] On this low DO, is it mostly trout affected? What about smallmouth bass or the native fish?

3:02:12 [David Rogowski, AZGFD] Low DO affects all organisms, but trout are more affected since they are cold water fish. Carp, green sunfish, and smallmouth bass can tolerate lower levels of DO and higher temperatures. **[Ryan Mann, AZGFD]** That's important as we discuss smallmouth bass.

[Ed Keeble, NPS] Do we have a sense if DO on the upstream side of the dam is driving fish away and reducing the risk of invasion. **[David Rogowski, AZGFD]** We have a student at USU looking at how fish are using the forebay area. Gut feeling is there isn't any avoidance. He's looking at how they use different layers of water. **[Ed Keeble, NPS]** Where are we with oxygenating water at turbines I'm curious how evolved the thinking is there. **[Clarence Fullard, Reclamation]** The student is not looking at whether DO in the forebay is a deterrent. It might be worth looking at. The location of fish in relation to penstock intakes is more dependent on depth. The fish are usually in the upper part of the waters. The lower DO interaction could be interesting, but we haven't explored that. The concept of using air injection has been used at other Reclamation facilities. It brings a loss of plant efficiency and is kind of experimental and theoretical. Can do math on the available air to inject to see if it improves DO level. Unknown what the cost is to hydropower is. Unclear is what does a 1 mg/liter DO increase do? Would be a tradeoff on that technology.

[Ed Keeble, NPS] System may be getting complex enough that we need a matrix to show what actions affect what species. We have been focused on smallmouth bass and humpback chub, however there are other fish to consider, and we need to know what the impacts are. **[Nick Williams, Reclamation]** At Glen Canyon Dam we are looking at what we can add across the turbine during generation and what options that might lead to. Air injection options are limited. **[Wayne Pullan, AMWG Chair]** What's our experience with rough zone operations. **[Nick Williams, Reclamation]** In normal operations each generator operates in rough zone, a period of increased vibration. We ramp through that quickly to get to optimal zones. In the past rough zone operations could be mitigated with increased air injections. We've replaced the turbines in the last 20 years, so we don't know what the characteristics look like now. The volume of air we can inject is driven by compressors. We have large ones to operate power plant. We don't have compressors to inject air into the Colorado River.

[Jessica Neuwerth, CRBC] What is the timeline for digging into the technological feasibility and economic impacts of these solutions. **[Wayne Pullan, Reclamation]** Looking for recommendations for that. **[Jessica Neuwerth, CRBC]** Who's taking next steps? WAPA? TWG? **[Wayne Pullan, AMWG Chair]** In reviewing last presentation, I wasn't certain what the future looks like and how bad it could get but we may need to have experts take a look at this and how critical it is and how it fits in with our other goals and priorities and then recommend a path forward. **[Jessica Neuwerth, CRBC]** I like Ed's idea of a matrix for the different fish species. What I heard is that DO is a problem if you have warm temperatures and a high volume of fish in an area. I think it would be helpful to do a risk analysis.

[Jessica Neuwerth, CRBC] It sounds like rainbow trout population is in good condition. Why aren't we seeing a recruitment event. **[David Rogowski, AZGFD]** Unknown. Brown trout are eating juvenile rainbow trout. Higher temperatures and low DO are stressing them out. Their weight for their size is good but recruitment has been poor. **[Josh Korman, Ecometric]** Growing conditions for young fish are also important. There are eggs going into the gravel, why are they not hatching. Brown trout is an issue but the conditions for survival are not great. Maybe the increased water will help. 2008 Spring HFE and 2011 equalization flows did increase baby trout. Saw both of these actions this summer, we'll know more later this year. If you ask any fisheries biologist, they would be concerned about low DO levels.

[Martina Dawley, Hualapai Tribe] Curious about particulates in turbidity. Are there pollutants in those plumes? **[Bridget Diemer, GCMRC]** Have not looked at what makes up turbidity in that plume. It's

likely the sediments that are in the inflow to Lake Powell. Contaminants could come in from the San Juan arm from the Gold King mine spill. **[Ryan Mann, AZGFD]** Request for understanding effects to other fish species and the matrix is a good idea. Impacts on other fish species are well established. Providing cold water downstream of dam is our best method to control warm water fish species.

3:20:45 LUNCH.

4:42:00 Invasive Species Below Glen Canyon Dam Monitoring

[Jeff Arnold, NPS] PRESENTATION Most of last summer at 16°C. Hit that temperature last month. Where sloughs meet has been above 16°C since beginning of June. Electrofishing done twice this summer. Most smallmouth bass caught last year from October to December were in the upper reaches. Electrofishing post HFE (May 1 to 5) only sampled segment A and B. No smallmouth bass in segment A but some in segment B. One night of electrofishing May 31 in segments A and B. Early July electrofishing effort and discovered smallmouth bass young of the year, want to catch them before they migrate towards the main channel. Two weeks ago, collected more smallmouth bass. Likely there have been two successful smallmouth bass spawns there this summer. Grand Canyon National Park electrofishing two weeks ago. Seems like some smallmouth bass heading to main channel. Last night sampled two reaches below the dam above the slough. Unclear if the smallmouth bass caught were from the dam or from the slough. All collected fish preserved for beneficial use. Been catching lot of flannelmouth suckers in lower slough.

[Kerri Pederson, Reclamation] PRESENTATION Goal of the project is to modify slough to prevent warmwater non-native fish establishment. Three phase approach: during Phase 1 the upper slough would be partially drained by excavating a 2-ft wide channel. This would reduce the acreage of the upper slough from 0.3 to 0.1 acres. During Phase 2, a side channel would be excavated to connect both sloughs to the river so that the sloughs would be connected to the river at 8,000 cubic feet per second (CFS) instead of 20,000 CFS. This would allow temperatures in the slough to approximate the main channel. In Phase 3, the lower slough would be narrowed to a width of 80 feet. This would increase the velocity in the slough and reduce shoreline habitat. Could be implemented by phase or all at once. This would be more sustainable than removing non-native fish annually. The habitat modifications are expected to be self-sustaining and require little, if any, maintenance.

[Clarence Fullard, Reclamation] PRESENTATION Been looking at nets and thermal curtains for the last 1.5 years. Contracted with Reclamation Technical Services Center to help develop subject matter expert panel. Selection criteria: Demonstrated effectiveness and deployment time. There are net barriers in the basin already (Highland Lake spillway). Net barrier would need to be in the forebay and need to be 1,000 long and 100 feet deep. Most fish along the sides and that's where the engineering is most challenging. Thermal curtains have been employed previously by Reclamation. Controls temperature and fish. Stops the epilimnetic water from getting entrained and also blocks fish. Requires some O&M. Expect a draft appraisal design on net barrier by end of August. Will include a cost estimate.

Q&A and discussion

[Dan Leavitt USFWS] Will the postage stamp nets be placed randomly or in front of the penstocks or somewhere else? **[Clarence Fullard, Reclamation]** There will be a number of them. Experimental design will inform where they go. Will vary in depth and location.

[Taylor McKinnon, Center for Biological Diversity] When will this be built to prevent entrainment of nonnative fish into the Colorado River through Grand Canyon? **[Clarence Fullard, Reclamation]** Doesn't want to put a date on this. Have to follow Reclamation engineering process which takes time.

[Matt Rice, American Rivers] Will this net require NEPA? **[Clarence Fullard, Reclamation]** 100%.

[Brian Sadler, WAPA] Kerri was showing operations in 1987 with fluctuations pre-Grand Canyon Protection Act. Operations last summer showed the different flows on weekend and what that did to temperatures. Those steady flows on the weekends corresponds to bug flows performed last summer and how that increased temperatures in the slough and other backwaters. Was that your point? **[Kerri Pederson, Reclamation]** Trying to highlight that in the past we had temperatures of 9°C and now we're at 16°C. High temperatures may have had some impact on the bug flows, last year the elevation was lower. Higher temperatures are more conducive to non-native fish becoming established. **[Brian Sadler, WAPA]** WAPA would support all three phases of the slough project. What's the possibility of smallmouth bass spawning outside slough in main stem this year? **[Jeff Arnold, NPS]** Good possibility.

[Charlie Ferrantelli, Wyoming State Engineer's Office] Are costs something you can provide? What is the timeline? **[Wayne Pullan, AMWG Chair]** What we've done is present the engineering side of solutions. Engineering problems are easy, it's the social, cultural, political, financial issues that make these issues complex. **[Michelle Kearns, NPS]** NPS received this report Thursday. Have not reviewed. Will have to go through NEPA. Are there other tools that would contribute to this? It's concerning that main channel is over 16°C and we are finding evidence of spawning.

[Jacob Maase, Hopi Tribe] We've worked on green sunfish slough project since 2017. Glad to see the Phase III project. The Colorado River doesn't begin at the Glen Canyon dam. What will it take to stop stocking certain fish within Lake Powell? That's the problem.

[Erik Stanfield, Navajo Nation] With the slough modifications and exclusion curtain it seems they are being considered together. Can they be viewed as short and long-term solutions. Short term would indicate that something is reversible. The two trenches could be reversed. Knows NPS has concerns over effects. If they are reversible would that minimize the environmental effect.

[Jessica Neuwerth, CRBC] Can you expand on temperature control effect of the curtain? Is it elevation dependent? **[Clarence, Reclamation]** Reservoir stratifies in summer. Warm upper layer and cold lower layer. If you put the thermal curtain out, it'll draw the cold lower layer.

[Jessica Neuwerth CRBC] Last winter did a bunch of electrofishing through that entire downstream between Lees Ferry and the dam. Doing sampling and electrofishing now. How does that compare to what we did in past? Are we planning on a larger effort? **[Jeff Arnold, NPS]** Did electrofishing in June/July. Struggling to get the boatmen. Have funding and are trying to get out every two weeks. Not as intensive as last fall. Trying to get all segments sampled over a 3-month period.

5:42:42 [Julie Carter, AZGFD] AZGFD haven't stocked Lake Powell since 1980s. Stocked rainbow trout in the 1960s and 70s. Unsure about Utah Department of Water Resources.

[Leslie James, CREDA] When working on the strategic plan we always thought there would be a staggered/phased approach to non-native control issue. What are the next steps to have a better understanding of what the NPS needs to do or identify in terms of NEPA? Can the non-native fish EA allow you to shortcut that? What support can AMWG give? Do we report back to TWG? Now that the slough is more urgent, what does AMWG need to do? Do we need an action? **[Ed Keeble, NPS]** Got the report last week and we are currently reviewing. Intent is to create an interagency interdisciplinary team to explore this. We are quickly taking this report into consideration so we can act.

[Wayne Pullan, AMWG Chair] Last summer we released warm water close to the intakes and knew we might entrain smallmouth bass and now we've done that. Before last summer didn't think we had active

spawning. Thought we didn't need to worry about them spawning for another couple of years. Now we have adults spawning in the river. If entrainment was the principal source of smallmouth bass in the river and we didn't need to worry about them spawning in the river, then the thermal curtain and net would be highly critical. However, we need to act since we have spawning in the river. If those actions are effective the curtain is not as important, and we can handle some entrainment. We're in the appraisal stage for the curtain and the net. That's 5 years if we go as fast as we can. The slough is not as complex but needs to be reviewed. It's an option if needed.

[Ed Keeble, NPS] We need to look at the suite of options. The SEIS process is underway and hopefully will be complete and we can use that to act next year. Doing things now like rapid response that is variably successful. It's not a long-term strategy. Will continue that but need to implement other things like cooling the river. This is more a medium term strategy. Need to implement all the options as quickly as we can at the same time. The curtain is a long term solution and the slough short term. The slough won't solve complex actions. Need a multi-faceted stool.

[Wayne Pullan, AMWG Chair] We thought the young of the year would give us an extra year. We thought we could wait for a Record of Decision (ROD) from the smallmouth bass SEIS until spring 2025, however, we need to be ready to do something next year. Need to get to a ROD in spring 2024. That's our reality. That NEPA effort will be a very heavy lift.

[Heather Whitlaw, USFWS] Can't wait till spring 2025. The urgency is the result of what we've learned in the Upper Basin with humpback chub and smallmouth bass. We know that if smallmouth bass establish in Grand Canyon, it's a huge threat to humpback chub. USFWS will commit to consult so we can get to ROD by Spring 2024.

[Matt Rice, American Rivers] The stakes are so high (no less than the potential future for species). Three years ago didn't find smallmouth bass in main stem. Last year we found a handful. Just in one sampling this year we found hundreds. Will there be tens of thousands next year if we fail to act?

[Heather Whitlaw, USFWS] We don't know for sure on the numbers. There is invasive species science for invasive fish in rivers. We can tap into this and model a range of outcomes. We do know when these species escape their rate of growth is exponential. Don't know the specifics but it will happen.

[Charles Yackulic, GCMRC] Last year we didn't know the number of fish till September. We'll know how much is happening outside slough in a month or two. Next year likely will be 15 to 20 % chance there will be an increase. If it's dryer it'll be worse. Can still have something in slough in a marginal condition. Will start next year in a better place in terms of elevation but it can get bad quickly.

[Jim Strogon, FFI/TU] Question related to public awareness and transparency. My understanding is there are a lot of dead carp in slough. Is that from the chemical treatments or from the nets? **[Jeff Arnold, NPS]** Last couple weeks of July and first week of August don't remember seeing dead carp. Had little mortality from nets. **[Jim Strogon, FFI/TU]** We need to be transparent about what we're doing and why. As we look at different options, we don't want to spring this on public. Need to keep them informed of the need for the actions and the options we are considering so there is less opposition.

[Brian Sadler WAPA] Reemphasize that the slough will be an issue even if we cool temperatures in the main stem. Slough will be above 16°C even if the main stem is cooler. If we have a spring deadline, then slough has to be part of it or this will continue no matter what we do in the main stem.

[Kelly Burke, GCWC] Concerned on near-terms actions because of how the smallmouth bass invasion started in the Yampa and didn't seem to be an issue based on numbers of fish and then they blew up.

We're focusing on the Glen Canyon reach and slough. Last year temperatures got higher sooner than expected along with this plume that affected the DO and other things. It's been a year and we're still hearing from NPS they don't have what they need for rapid response. Need to start looking at main stem to see where smallmouth bass that have left the slough are spawning. [Ed Keeble, NPS] We have purchased equipment and we've had some glitches as we implemented rapid response, but we are implementing rapid response in Grand Canyon. Have not found fish in the Grand Canyon. Thus, focusing on the Glen Canyon area.

GCDAMP Tribal Liaison Update

6:10:34 [Zach Nelson, Reclamation]. Reclamation nominated the Grand Canyon Monitoring Team for the DOI Environmental Achievement Award. This award is for exemplary actions in conserving and helping the environment and cultural resources. Tribes and agencies have been monitoring the Grand Canyon for 25 years. Have developed an amazing database of how resources are used and protected. Much of this is specific to unique tribal resources and the Grand Canyon Protection Act. Also nominated for the Presidential Advancing Environmental Justice Award. This award is still pending. Award is more about the recognition of the effort to understand the resources and continue to keep the Grand Canyon a special place for everyone. Working on Programmatic Agreement (PA) stipulations, particularly with the Zuni, on a path forward helping fish on the reservation in exchange for some of our actions on the Colorado River. Also proceeding with cultural sensitivity training (CST) and making great strides.

Break

Q&A and Discussions

FY 2024 Budget and Work Plan Recommendations

[Erik Skeie, State of Colorado, TWG Budget Ad Hoc Group (BAHG) Chair] PRESENTATION.

Triannual work plan is a 3-year process. In February decided to do an interim year process due to the smallmouth bass and the SEIS for short term operations at Lakes Powell and Mead. Since there was not time to do this in February at the AMWG meeting we decided to do an interim year type of process and take 2023 and copy it to 2024 with limited changes. April 2023 TWG meeting received the go ahead to do this. The BAHG convened in May 2023. Two important dates associated with this process: June is when BAHG had to provide recommendations to TWG, TWG adopts and includes any changes plus giving BAHG any additional homework to do. August is when AMWG decides to move forward on TWG recommendations or provide our own input.

[Seth Shanahan, SNWA, TWG Chair] Seth introduced the budget motion to the AMWG. TWG recommends the AMWG recommend for approval to the Secretary of the Interior (SOI), the FY 2024 budget as shown on the budget worksheets presented to the TWG on June 15, 2023, with the following additional guidance:

TWG recommends that any lethal management activity performed under the Glen Canyon Dam Adaptive Management Program (GCAMP) work plan complies with the 2017 PA for the LTEMP and the NPS 2019 Expanded Non-Native Aquatic Species Management Plan PA. TWG recommends that the GCMRC and Reclamation coordinate on Project N elements for FY 24 with the TWG before the August AMWG meeting.

If funds become available, the TWG recommends those funds are used to fund the work items listed below in order of priority:

Priority 1: Short Term Rapid Response Under the Invasive Species Strategic Plan- Invasive Fish Species Below Glen Canyon Dam

Priority 2: Continue Project Element G.6 Juvenile Chub Monitoring West

Priority 3: Continue sampling on two sub-reaches for Project Element H.2 Experimental Flow Assessment of Trout Recruitment

Priority 4: Continue project elect C.3, Riparian Vegetation Predictive models and synthesis

Priority 5: Other additional requests identified in the GCMRC FY 24 Table.

[Bill Stewart, Reclamation] Bill reviewed the budget for FY 24. Total annual budget FY 24 is \$11.36M, 80% to GCMRC, 20% to Reclamation for the AMWG, TWG, Program Management, Endangered Species Act (ESA) Compliance, Management Actions, and cultural resources.

6:46:51 [Andrew Schultz, GCMRC]. GCMRC 2024 budget derived from 2023. Total \$9.1M. Currently about \$159,000 short for FY 24. Project N will be zeroed out. Will be talked about and reworked so that will reduce the shortfall about \$30,000. Unspent funds at close of FY 23 likely \$750,000 to \$1M. Stems from overhead difference and leftover from prior fiscal years. If these funds become available will look at BAHG recommended projects such as Cooperative Agreement cost increases and additional GCMRC requests not covered by prior adjustments.

Q&A and discussion

[Jessica Neuwerth, CRBC] Are we are on appropriations this year, will that continue? **[Kathy Callister, Reclamation]** We are on appropriations, looks like we'll be on appropriations for FY24. Were on appropriations for FY 23 as well. **[Jessica Neuwerth, CRBC]** I remember hearing when we first switched to appropriations that funding source doesn't provide for inflation. In the past we had 3% inflation. Is that not occurring with appropriations? Is that a problem? **[Kathy Callister, Reclamation]** Have not received an increase in 4 years. Been steady at \$11.36M. We do work in requests for additional money. Not guaranteed we'll get increases. Challenge is we're on a three-year planning budget cycle. Currently looking at FY 26 starting this fall and don't know what inflation will be.

[Erik Stanfield, Navajo Nation] I saw a line item of \$217,000 for socioeconomic research. **[Lucas Bair, GCMRC]** That is a socioeconomic monitoring and research project that includes brown trout monitoring in cooperation with NPS and AZGFD and includes modeling and some other aspects.

[Stewart Koyiyumptewa, Hopi Tribe] How are remote sensing overflights done. **[Joel Sankey, GCMRC]** Back in May 2021 we contracted remote sensing overflight for high spatial resolution hyperspectral imagery for the whole river corridor from the Dam to Lake Mead. Now looking at that imagery to see changes in land cover and riparian vegetation, the river channel and river sediment deposits. **[Stewart Koyiyumptewa, Hopi Tribe]** Who is that data available to? **[Joel Sankey, GCMRC]** The datasets from this overflight will be made publicly available by USGS and previous overflight data has already been published.

7:00:01 [Terra Alpaugh, Kearns & West] Pulled up the proposed motion and read through it. It tracks closely with what TWG approved. The text in red was added yesterday and distributed. Terra asked for suggested edits. **[Larry Stevens, GCWC]** Provided edits.

[Heather Whitlaw, USFWS] Regarding the paragraph added in red which said, "be moved into the priorities listed below". Which priorities are we talking about? **[Leslie James, CREDA]** Reviewed the

next sentence below the red text, TWG didn't want to be prescriptive about where this would go but decision makers would decide where in these priorities it would go.

[Martina Dawley, Hualapai] What number priority would that be in the list below? **[Terra Alpaugh, Kearns & West]** Are you referring to where Project N funds would go? I think Leslie said it would go wherever it's deemed necessary. **[Sara Price, CRCN]** I thought everything went to Priority 1. If there is excess money, and Priority 1 could not take it all, it could it go to Priority 2 or how is it decided how this is divided up? **[Bill Stewart, Reclamation]** The challenge with pinpointing a specific priority is that if you look at Priority 1 that's rapid response which can mean a lot of different things. That might not be the best spot. Thus, Priority 2 might be better. **[Sara Price, CRCN]** Who has decision making authority? **[Bill Stewart, Reclamation]** That's a conversation for GCMRC and their staff. **[Sara Price, CRCN]** If we approve the motion how would it be implemented? Like the idea of being able to spread it over different priorities. Want assurances it'll do what we want it to do. **[Bill Stewart, Reclamation]** Given this might not be the only amount of money we get, there may be additional cost savings that come up in FY 24. **[Andrew Schultz, GCMRC]** There could be wording to make this better. We want Project N money to go into the priority list but I'm not sure I'm the best person to divide it up. Don't have a cost yet for rapid response do we or the timing? **[Bill Stewart, Reclamation]** Correct, don't have that or the elements. Don't know exactly where this funding would fit in.

[Ed Keeble, NPS] Suggested to amend language to say "in priority order to the maximum extent practicable. At future AMWG meetings Andrew will report back to AMWG how these funds are being allocated."

[Wayne Pullan, AMWG Chair] Project N funds were defined as funds that have become available. Wayne wants to see a small group rewrite those two paragraphs to clarify prioritization and resolve this issue. Mentions that Project N funds are one source of funds and are intended to be disbursed in the same way. **[Leslie James, CREDA]** The intent was that if any funds become available anywhere then here is a priority list. Suggest we say, "The AMWG recommends that GCMRC Project N funds (\$29,574) become available funds." Then say in the next line that "If funds become available." so that if any funds become available, they go down in this order. Would that work? **[Sara Price, CRCN]** I think so. If this really is a guidance document and we're saying if we have excess funds apply them in this order, then maybe we have BAHG or Andrew report back.

[Wayne Pullan, AMWG Chair] Do people feel there is a need for more clarity? **[Sara Price, CRCN]** With Leslie's change I like it. **[Kristen Johnson, ADWR]** Seth's language in chat is helpful. **[Seth Shanahan, SNWA, from chat]** Replace "be moved into" with "be available to fund the priorities: **[Kristen Johnson, ADWR]** Liked where Terra was going with the funds available clause, very clean. Now it's clear but it wasn't clear before. **[Leslie James, CREDA]** We were trying not to add too many words, but I think now with the revisions it's what we intended. **[Wayne Pullan, AMWG Chair]** Do we need to put the amount in? **[Ed Keeble, NPS]** Don't need to put the amount in if you have reporting out which accounts for the funds and provides transparency. **[Wayne Pullan, AMWG Chair]** Delete the piece in red? **[Leslie James, CREDA]** Take the dollars in parentheses out.

[Seth Shanahan, SNWA] Would naturally be reported on as part of the budget process. **[Sara Price, CRCN]** Yield to Seth. Don't need to make it more cumbersome. Appreciate the clarity. **[Wayne Pullan, AMWG Chair]** Are we good? **[Stewart Koyiyumtewa, Hopi Tribe]** Feels like Priority 1 and 2 get all the funding while Priority 4 will get none. **[Wayne Pullan, AMWG Chair]** Do you think we need to change the language to reflect that. **[Stewart Koyiyumtewa, Hopi Tribe]** Yes.

[**Terra Alpaugh, Kearns & West**] Thoughts from others. Think Stewart would move Priority 4 to a higher level or an equal distribution of money. [**Stewart Koyiyumptewa, Hopi Tribe**] It's listed in order so Priority 4 will always be towards the bottom and not get any attention. [**Wayne Pullan, AMWG Chair**] Stewart is not wrong. Important to remember this is a one year motion. Doesn't affect future years. Any additional funds will be spent on smallmouth bass rapid response. Recommends that if Stewart feels that strongly about 4th priority, we look at increasing funding in priority for that in the Triannual Work Plan for FY25-27. [**Stewart Koyiyumptewa, Hopi Tribe**] That is adequate.

[**Edward Wemytewa, Zuni Tribe**] Will there be midterm equitable distribution depending on funding? [**Wayne Pullan, AMWG Chair**] We could do that. Maybe divide any additional funding on pro rated basis based on what's in the FY 24 budget for those items. [**Andrew Schultz, GCMRC**] Scopes for these are different. Not sure equitable fully applies to scope of the project.

[**Kathy Callister, Reclamation**] So that I'm clear, these are projects already funded in triannual workplan for FY 21 to FY 23. Since we are adopting FY 23 budget for FY 24 and making some changes to those priorities, I'd like to know who prioritized these.

[**Seth Shanahan, SNWA**] The TWG prioritized these. Took a lot of discussion, it was a struggle for TWG as it is for AMWG. TWG representatives came to consensus on this. Priority 1 is the first priority. Given that concern it's the most important thing. Divvying up things in an equitable way might be challenging. Everyone thought these were the top priority items.

[**Kelly Burke, GCWC**] We've had language like this in previous budget motions.

[**Shana Rapoport, CRBC**] Are we all of understanding that vegetation work is funded through other portions of the budget and Priority 4 is an additional proposed project?

[**Andrew Schultz, GCMRC**] Had a question on whether Priority 4 is new work or an expansion of existing work. It's to fund additional fieldwork cut from the previous budget. It's not a new project. Its new work related to what is already being done.

[**Charles Yackulic, GCMRC**] Priorities 2 -4 were in the workplan in FY 21 and FY 22. When we thought we had this big overhead it was cut from FY 23 and then that overhead didn't happen. Those priorities did happen this year since they were the same priorities put forth by the BAHG last year with extra funds since overhead was lower.

[**Terra Alpaugh, Kearns & West**] This language structure has been used before. It sounds like Priority 1 is large enough that even if there is additional money it could swallow any additional funds. Thus priorities 2 to 5 would not get any extra money. There will be another triannual work plan process starting and you could advocate for increased funding for these priorities for FY 25. Question is can you live with that structure for this or are you advocating for an equitable adjustment? So, priority approach or an equitable split approach? [**Edward Wemytewa, Zuni Tribe**] If we build houses do we want one complete house or 4-5 partial houses? [**Stewart Koyiyumptewa, Hopi Tribe**] I'm comfortable with this. [**Erik Stanfield, Navajo Nation**] Generally agree with sentiment Stewart is expressing. Just looks like it prioritizes the fish work at the bottom. For the record might like to see a shift in FY 25 and in the future. [**Kelly Burke, GCWC**] The scale of the projects is different. If we could agree an evaluation of how much money is available and what difference it would make to the projects. Might be only able to make one small house which doesn't do much. We should add one line discussing this.

[**Wayne Pullan, AMWG Chair**] Are we getting close? [**Jessica Neuwerth, CRBC**] There is some disagreement in priorities, but there is value in having this clarity. Gives guidance to GCMRC and

Reclamation. Seems like there will be some flexibility with this. I'm comfortable with language as it currently stands.

7:35:45: Budget motion to approve by Kristen Johnson, ADWR with the caveat that we need to put the missing "The" in front of Department of the Interior in Priority 1. **Seconded by:** Sara Price, CRCN. There were no objections. Approved by consensus. See Attachment A.

[Terra Alpaugh, Kearns & West] Note to note taker to record an explicit ACTION item to review the priorities in the Triannual Work Plan process, specifically Priority 4.

NEPA updates (LTEMP SEIS, Interim Guidelines SEIS, Post 2026),

[Rod Smith, DOI Solicitor's Office] PRESENTATION Last fall concerned about reaching critical elevations with Lake Powell and Lake Mead. Kicked off process to revise guidelines within the 2026 timeframe. Did scoping and issued the Draft EIS. The hydrology improved and the lower division states developed a conservation-based proposal and the upper division states recommended it be evaluated. Reclamation pulled the Draft EIS. Working on new analysis. You will see a Revised Supplemental Draft EIS this fall with full comment meetings. Hope to have a Final EIS and ROD in early 2024 to get us through 2026.

[Russ Callejo, Reclamation] Public scoping period finished yesterday. Received over 20K comments. Mostly form letters. Received hundreds of individual letters. After scoping summary report will transition to alternative development phase. After March 2024 will start the Draft EIS. Hope to publish Draft EIS in December 2024. Want to develop new guidelines to take us beyond 2026. Need a Final EIS and ROD by August 2026 for operations in 2027. With respect to alternatives development have established an Integral Technical Education workshop. Our next meeting on this is Sept 20th. Last week Reclamation's Commissioner hosted the initial post 2026 Tribal State Group meeting which is designed to discuss post 2026 topics throughout the development of the next guidelines.

[Kathy Callister, Reclamation] The first two EISs are looking at annual releases. The LTEMP SEIS will be focusing on sub annual (daily, hourly, monthly) releases. In August of last year had SOI designee undertake the smallmouth bass EA. We were not comfortable we could get to a FONSI so in February 2023 SOI designee recommended we transition to an EIS to address those flows. At the last few AMWGs heard concerns with sediment accounting window. If we're doing an EIS for smallmouth bass, then we should also look at the sediment accounting window. Got a directive from the FLAHG to make recommendation on sediment accounting window. We are officially moving forward with the review of the LTEMP SEIS. Bringing a contractor on board to assist with the SEIS. The LTEMP SEIS will focus on two concerns. 1) Flows to disadvantage smallmouth bass and other non-native warm water fish and 2) sediment accounting window for HFE protocols. Priorities are to get the contractor and working on the NOI. Once scoping comments are received will start the Draft SEIS. Targeting late spring / early summer 2024 for the ROD. This is an extremely expedited process. Want a ROD so we can take action in time.

[David Brown, GCRG] What issues/concerns led the decision makers to believe the smallmouth bass EA could not achieve a FONSI? **[Rod Smith, DOI Solicitor's Office]** Lot of public interest in the smallmouth bass. There were a number of comments about the range of alternatives and what should we do about Issues with power customers. That made us think this was better off as an EIS.

[Leslie James, CREDA] Heard the word flows a couple of times. Is this SEIS going to address control of smallmouth bass or flows? **[Kathy Callister, Reclamation]** Will be similar to what we proposed with smallmouth bass EA. **[Leslie James, CREDA]** Aren't we ignoring other tools that could be used to smallmouth bass under this NEPA effort? **[Rod Smith, DOI Solicitor's Office]** Great point, that is the

kind of input we want. How does what we are doing now fit into that short-term, long-term middle-term paradigm? Don't know that we have a perfect answer but that's a question we need to consider. We know more now than we did in 2026 about all things LTEMP. However, do want to keep this targeted, once guidelines are in place in 2026, we'll have time to discuss this more.

[Leslie James, CREDA] Does additional NEPA need to be done for Rotenone treatment? **[Ed Keeble, NPS]** All covered.

[Sara Price, CRCN] Curious on the environmental compliance companion pieces to the SEIS, familiar with where we are in Lower Basin but where are we in Upper Basin with the Draft Biological Assessment and is it in tandem with the Lower Basin? **[Heather Whitlaw, USFWS]** In the hiatus time after the withdrawal of the draft document have been coordinating with upper and lower basins on both MSCP and adaptive management program. On track to get both Biological Assessments at the same time. Working to ensure Biological Assessments cover both. **[Rod Smith, DOI Solicitor's Office]** Similar concept for post 2026 with Biological Assessments. They need to travel in parallel but envision a similar approach.

[Jacob Maase, Hopi Tribe] Request a 30-day review for tribes. 15 days is not adequate.

[Nick Williams, Reclamation] Cavitation is formation of water vapor cavities or bubbles that collapse back to a liquid phase. That implosion of the small bubbles is damaging to surfaces. Occurs when the static pressure of the liquid falls below the vapor pressure of the liquid. Occurs whenever water is moving fast. That happens with pumps or ship/boat propellers. At Glen Canyon, static pressure is determined by reservoir elevation. At a high enough water elevation water moves at 75 feet/second. Water in homes moves a few feet per second. Water in penstocks is at 20 feet/second. As that water moves that fast the pressure decreases, and the static pressure falls below the vapor pressure. Water vapor cavities formed in the April HFE at bends in the pipes. The water enters the outlet works horizontally, goes 50 to 60 ft, drops at 45 degrees, and then bends back to horizontal. That is where we observe the cavitation. At a lower water reservoir elevation, you can form these, and it occurs at bends in pipes. Bends create a localized difference in velocity and pressure. The 1965 report addressed this. Potential for this was known. Either need more pressure from higher elevation or need to lower velocity at the outlet works. This keeps the pressure higher.

Q&A and Discussions

[Jessica Neuwerth, CRBC] Timeline for recoating tubes? **[Nick Williams, Reclamation]** Solicitation is out but will take several months to procure and two months per outlet works. Eight months total. Don't know for sure. **[Jessica Neuwerth, CRBC]** Will that limit future cavitation? **[Nick Williams, Reclamation]** Coating doesn't prevent cavitation. It protects metal from corrosion. Always have two outlets ready to release water.

[Sara Price, CRCN] Recognizing this is reservoir elevation dependent. How different was the 1960 elevation than our elevation during the HFE?

[Nick Williams, Reclamation] 1960 report was about 30 feet lower. Back then they were releasing water to get power plant online. Lake Powell held constant to refill Lake Mead.

[Sara Price, CRCN] How soon did they discover cavitation in the 60s? **[Nick Williams, Reclamation]** Not sure how long it took. Damage we had was minor and we could use it now. But did observe pitting and removed some of the coating. Over time that's an issue. **[Sara Price, CRCN]** What was HFE elevation? **[Becky Bryant, Reclamation]** 3,525 or so.

[Jessica Neuwerth, CRBC] You said that one solution is to dial down the release. Goal of an HFE is to release as much as possible. Any idea how much? **[Nick Williams, Reclamation]** Don't know right now. Have done lower HFEs in the 1990s and 2021 but this is first one we've done at this low of an elevation. All the others were at elevations where cavitation was not a concern.

[Heather Whitlaw, USFWS] What about the logistics of recoating four tubes at two months apiece when we want to use outlet works in June of next year? Don't want to trip over each other. **[Nick Williams, Reclamation]** Will review schedule with operational requirement or needs. Will do one at a time. Will pause as needed for operational approval.

Public Comments

[John Weisheit] Four outlet tubes are 100 feet below penstocks. Depth of penstocks only 30 feet. Sounds like it would harm penstocks more than outlet. What's the condition of the penstocks at the curve? **[Nick Williams, Reclamation]** Velocity through penstocks is much lower than velocity through outlet works. The drop in pressure occurring doesn't lead to cavitation in penstocks.

From Teo Melis in the chat:

https://www.usbr.gov/tsc/techreferences/hydraulics_lab/pubs/manuals_monographs.html . See Falvey 1990 - Engineering Monograph 42 "Cavitation in Chutes and Spillways". The frontispiece of the Falvey report shows a great example of cavitation erosion in 1983 at GCD.

Thursday, August 17, 2023

Start Time: 8:30 AM PST

Conducting: Wayne Pullan, AMWG Chair.

Recorder: David McIntyre, SeaJay Environmental, LLC.

Facilitator: Terra Alpaugh, Kearns & West, Inc.

40:28 Welcome and Administrative

[Wayne Pullan, AMWG Chair] Welcomed everyone back.

Introductions and Determination of Quorum [Terra Alpaugh, Kearns & West] Roll call taken and a quorum reached with 20 members represented.

GCMRC update on Spring 2023 HFE and other Activities

[Paul Grams, GCMRC] **PRESENTATION** Planned HFE was 72 hours at 39,500 CFS. Observed discharge at Lees Ferry was 66 hours at 39,000 to 40,000 CFS. Lots of inflows from tributaries so by time it was at Diamond Creek it was up to 45,000 at River Mile 165. Didn't use straight LTEMP accounting window. Special circumstances. HFE design based on sediment accumulated in previous year. Sediment accumulation beginning July 2022. Preliminary HFE results were higher sand concentrations in mid Marble Canyon with slightly coarser sand. Sand concentration is higher in the central Grand Canyon. Larger than normal Pariah River floods starting next week which increases the likelihood of a fall HFE trigger.

[Joel Sankey, GCMRC] **PRESENTATION** Total number of Type 1 cultural sites has decreased since 1973. Archaeological sites within aeolian dune field downstream from a river sand bar that gets sand from the sand bar is the ideal preservation scenario. Three ways to increase aeolian supply of river sourced sand. Two ways have to do with experimental flow releases; one has to do with HFEs and the other has to do with lowering dam releases. The third is minimizing vegetation on sandbars that blocks aeolian sand. Question is whether removal of riparian vegetation barriers allows for an increase in aeolian sand and preservation in place (LTEMP goal).

Q&A and Discussion

[Stewart Koyiyumptewa, Hopi Tribe] This experiment is for protection of cultural sites. Like to see those on your slides so we can really see if it's working. [Joel Sankey, GCMRC] Can't disclose locations of sites as per direction of NPS who manage the sites. Can show site specific examples at annual meeting. [Ed Keeble, NPS] If tribal members have an interest NPS can share directly.

[Larry Stevens, GCWG] What is the best time for HFE? [Joel Sankey, GCMRC] Spring is windiest, summer is next windiest. Ideal time is as early as possible in spring.

[Martina Dawley, Hualapai] Stated that you learned at a conference you are the only ones doing this experiment. You should not disregard indigenous methods and experimentation and this type of preservation. People have been living in the Grand Canyon for a long time. There has to be evidence the people living there were working with the environment to maintain preservation. That would help since we are stakeholders as well. Like to see you not discount indigenous methods.

[Stewart Koyiyumptewa, Hopi Tribe] Don't understand the science behind the method. Taking plants and vegetation away is opposite of what I'm used to. If you are just taking away invasives that is okay. If

there are other plants tribes used in these areas, we should look at this again. Like you to work with tribes on this so we are not clearing everything out. **[Joel Sankey, GCMRC]** Like to engage with you on this. There are opportunities to make changes to this experiment to not only keep the sites buried but to also retain desired vegetation communities.

[Larry Stevens, GCWC] You mentioned grain size increased because you waited for spring HFE. Did the grain size increase matter much? Did we lose anything by waiting? **[Paul Grams, GCMRC]** Not that we can tell. Will do another survey in October. That will be after they've eroded a bit. Doubt it will make a lot of difference. **[Larry Stevens, GCWC]** So didn't lose too much by waiting except that grain size is slightly coarser.

1:22:23 Recommendation from the Technical Work Group regarding revisions to the HFE protocol

[Wayne Pullan, AMWG Chair] Not that long ago we requested this work be done. Thanks to all engaged in this. Discussed in meetings prior to August. Held a special TWG meeting last week to update the protocol. Passed a consensus motion earlier in August.

[Seth Shanahan, SNWA] Given this directive back in February 2023, TWG established a FLAHG to form a proposal. Submitted outline to AMWG in May 2023. Had a special TWG meeting to review HFE protocol. Were successful in August to pass a consensus motion. Reviewed the motion: "The TWG accepts the proposal to amend the HFE Protocol and Other Considerations and moves to forward it to the AMWG to meet the directive given at the Feb 15, 2023 Meeting". This document identifies some HFE protocols that were acceptable to the TWG.

[Paul Grams, GCMRC] **PRESENTATION** on the background of this proposal. HFEs were missed in 2015, 2021 and 2022 due to non-native fish and low Lake Powell elevations. HFE triggers increase in sand bars during periods of frequent HFEs. Sandbars decreased during 2021 and 2022. Need to rethink triggering mechanism. Three things required for successful HFEs 1) need sand in system 2) need right grain size and 3) HFE magnitude, duration and frequency are great enough to move sand. HFE magnitude controls how high you can build a sandbar. HFE duration maximizes the period of those elevated sand concentrations. Frequency is needed to rebuild the deposits that erode between HFEs. Sediment accounting period based on the Pariah River. Inputs are from July to December. Fall HFE window is ideally designed to take advantage of these. Spring HFE window considers other inputs. This is most important when we have high winter releases. Lower releases require us to accumulate sediment all winter. Then we have one accounting period with two implementation windows.

[Charlie Ferrantelli, Wyoming State Engineers Office] Was there a purpose in the LTEMP for having two different periods? **[Paul Grams, GCMRC]** When you have high winter releases which is typical. When the reservoir is fuller than it was you tend to have higher operations in the winter. Less advantageous to do an HFE in the spring. When the protocol was built high winter releases were the norm. **[Charlie Ferrantelli, Wyoming State Engineers Office]** How is zeroing it out advantageous? **[Paul Grams, GCMRC]** There wasn't a motivation to make it possible to do it in the spring. In 2008 it was observed the spring HFE had some benefits to the trout fishery at Lees Ferry. Concern it would cause the trout population to increase, move downstream and interact with chub. Good sediment and low desire to do spring HFE pushed everyone to doing a fall HFE. Was not easy to do in the spring. **[Rod Smith, DOI]** With windows resetting it's a conservative way to ensure you're not eroding the sand that is there. Always have a positive sand balance. **[Charlie Ferrantelli, Wyoming State Engineers Office]** If we do

go and do an SEIS and there is some reason to zero it out, is there an intent? **[Paul Grams, GCMRC]** Intention is to do HFEs as soon after inputs as possible. What is your priority? Fall implementation is best for best sand conditions but there are other considerations.

[Paul Grams, GCMRC] Looking at the reach from the Pariah River to River Mile 61. Measure sand inputs from the Pariah and make estimates for tributaries. Have a gauge at 61 that is analyzing samples of sand concentrations every 15 minutes calibrated against physical samples. The inputs minus outputs is what is left on the river bottom. That's what is used for HFE planning. Accounting period is the time period over the mass balance. Could calculate the mass balance for any period they want.

[Stewart Koyiyumptewa, Hopi Tribe] Where does the Marble Canyon end on your map and the Grand Canyon start? **[Paul Grams, GCMRC]** At the Little Colorado River Confluence.

[Paul Grams, GCMRC] PRESENTATION Here's what we triggered if we triggered in November. Using this 1-year accounting window approach what duration HFE can we run in November and what duration HFE can we run in Spring? Planning and Implementation (P&I) Team will look at this information in Sept/October and decide if we are implementing HFE in November or April. We could do this in November and April. The difference is the exports that happen over the winter. Conditions are typically better in November, but you can still do it in the spring. Might get inputs over winter. If so, you can rerun the models in March and may be able to do a better HFE in Spring. LTEMP analysis expected Fall HFE is 77%. Actual observed from 2012 to 2022 was 73%. Implemented were 5 of the 11 HFEs so 45%. For Spring HFE, LTEMP expected 5 of 20 years, reality was none triggered. Winter inputs have turned out to be less than historical and less than predicted in LTEMP analysis. We have not done the exact same analysis that LTEMP did, that will be done in SEIS. We have done a post hoc analysis of 2012 to the present. Would have the same 8 out of 11 years that were actually triggered with the fall accounting. So, every year we had a trigger following the LTEMP accounting we have a trigger following the one year sediment accounting. In those we could do either fall or spring. This proposed change would allow us to do fall and spring but it's up to P&I Team. Only 3 of 11 years would have enough sediment where you could do both. If you decide to do spring, you cannot do fall.

[Larry Stevens, GCWC] Hydrologists rely on this for floods, ecologists recognize that timing matters a lot. Bringing our process up to speed with eco and hydro considerations of the timing, magnitude, and frequency of flooding is us stepping forward. We've made a major step forward beyond our internal biases. Springtime floods are the right kind of floods for the Colorado River Ecosystem.

[Brian Sadler, WAPA]. Did you discuss how the tech team would work in making these decisions in fall versus spring? In past years Fall HFE we released a lot more water so we're working with Reclamation to pull that water volume from early spring. So, spring HFEs where that water comes from is very important. **[Paul Grams, GCMRC]** That's a good reason to go this route. You can do a lot more planning and decide when you want to implement it. **[Sinjin Eberle, American Rivers]** We did discuss it.

[David Brown, GCRG] Heard a lot of discussion on inputs and high winter flows are something we (WAPA) controls. Can Brian explain decisions behind high winter flows and what may have changed recently in terms of the winter flow regime and outputs from the dam. **[Brian Sadler, WAPA]** Need more data to give you a complete answer. During DROA period Reclamation has made decisions through that process to reduce volumes early in the water year which has reduced winter volumes. Historically in

determining monthly winter volumes in the LTEMP process, it wasn't part of the LTEMP process but these higher demands in winter and summer relate to the value of energy in those months.

[Wayne Pullan, AMWG Chair] On the rollover, is sediment that has been in the system for a year as available for transport as more recent sediment? **[Paul Grams, GCMRC]** It'll be coarser grained. Not as ideal but that might be a reason to see how long of a rollover makes sense. In 2008, sediment accumulated over a couple of year period went into that HFE. It was successful.

[Wayne Pullan, AMWG Chair] We discussed the concern in 2015 about trout. What's the state of our understanding of that now? **[Charles Yackulic, GCMRC]** In 2015 issue was green sunfish, they are everywhere in the Grand Canyon now in low numbers, but they have been increasing last 5 to 7 years. Not enough abundance to be affecting humpback chub yet. Pretty bad on AZ streams and rivers on native fish. Taken off with warmer temperatures. Colorado rivers might not be so bad. Spring 2008 had good rainbow trout response. We'll know soon this fall if later spring HFE is good or bad. Concerns in past about late HFE effects on rainbow trout. 1996 spring HFE was good for rainbow trout. Early spring HFE is better than later.

2:02:06 [Sinjin Eberle, American Rivers] PRESENTATION Discussed how proposal was developed. FLAHG was charged with working with GCMRC to draft an outline and full proposal for amending the HFE protocol and consider the information developed by GCMRC. Reviewed the activities to get to this point. An outline was presented at the April TWG. An update was provided in June. Reviewed the proposed changes.

[Seth Shanahan, SNWA] One element that was requested but that isn't there is the compliance element. Could not reach any consensus and also it seems like Reclamation is already addressing that.

[Heather Whitlaw, USFWS] Where is discussion for rollover in the document? **[Sinjin Eberle, American Rivers]** Section 5 page 11.

[Leslie James, CREDA] You're correct there is not a suggested change to the P&I Team as outlined in LTEMP. There is a concern about timing of decision making. That is not specifically addressed in LTEMP. For everyone on the P&I Team this proposal provides flexibility, it doesn't provide flexibility to decide to do an HFE in a week. Very important P&I Team makes decisions timely.

[Wayne Pullan, AMWG Chair] With respect to Leslie's comment, how does this extend the runway for decision making? This proposal seems to have the potential for us to decide earlier. **[Rod Billerbeck, NPS]** Right now with a fall HFE you start looking at the numbers and things can change weekly. If lucky then you get three weeks. If we had a longer window, we would not be so compressed into a short time period. **[Seth Shanahan, SNWA]** An element of the decision framework is what date works? Come fall you can potentially recommend not to do a fall HFE because you're going to do a spring HFE, and you can do months of planning. Lots of opportunities for flexibility.

[Sinjin Eberle, American Rivers] Paul's chart show's you'll have a good chunk of sand. **[Wayne Pullan, AMWG Chair]** By being able to consider spring we'll know what water year we'll have. **[Sinjin Eberle, American Rivers]** This year was a good example as we got a huge late snow. So, we had the opportunity and the sand from the last two years. The maintenance window enabled this also. **[Seth**

Shanahan, SNWA] Lot of concern this past fall due to so many unknowns. We were not certain where we'd be for critical elevations. Kept us from recommending a fall HFE. This allows for a better decision.

[Erik Stanfield, Navajo Nation] Will recommendation process remain the same? Thinking about consultation and tribal participation. **[Sinjin Eberle, American Rivers]** No changes. **[Kathy, Callister, Reclamation]** Also addressed in the LTEMP PA in coordination and consultation on experiments.

[Kevin Garlick, UMPA] If you have the longer term to view this it seems like Reclamation can look at its maintenance and have more time to ensure that all generators are available which would increase the HFE size. **[Sinjin Eberle, American Rivers]** Adds a lot more flexibility.

[Martina, Dawley, Hualapai] Where does the experiment affect Diamond Down? How does that fit into the HFE? These all look like predictions. Where does that fall? **[Paul Grams, GCMRC]** The dynamics of sand in that reach are being studied. Should not be a change from fall to spring. **[Martina Dawley, Hualapai Tribe]** Seems like there is a lack of research in that area. Is the focus from Lees ferry to Diamond Down? **[Paul Grams, GCMRC]** Correct that is where the focus has been, but we do know it builds sand bars on Diamond Down. **[Martina Dawley, Hualapai Tribe]** When I talk to our natural resources, game and fish and our corporation they want to know where Diamond Down fits since it seems to be always left out. **[Paul Grams, GCMRC]** We have a study there but no results yet. Started in 2021 looking at reach near Columbine Falls once they get the data analyzed.

[Sara Price, CRCN] I think I understand purpose of broadening the accounting window. What was original intent of separating them? **[Paul Grams, GCMRC]** It was a combination of concerns with doing them in Spring that followed the 2008 HFE. Back in 2012 fall made more sense. Started optimizing for the fall. Two window methods currently optimize for doing them in the fall. Original intent of LTEMP was to do them in spring when we had later winter/early spring sediment inputs. Did not have them the first 11 years. Have started to see different conditions now. **[Sara Price, CRCN]** So reason for favoring fall HFE was to take advantage before the spring runoffs so that you're doing HFE at end of the season and you have the lowest inflow. **[Paul Grams, GCMRC]** In terms of hydrology, that was not a factor in this at all. **[Sara Price, CRCN]** Why does sand erode in winter? **[Paul Grams, GCMRC]** Typical LTEMP pattern was high fluctuating flows over winter. That was the norm before changing conditions in the last few years.

[Brian Sadler, WAPA] It's the high monthly volumes that are the bigger factor in eroding sand. **[Charles Yackulic, GCMRC]** Important context to remember was we were coming off 2008 spring HFE and there were a lot of rainbow trout. Concern about the impacts of rainbow trout on humpback chub and non-native EA and concerns about removal. Since then, learned that rainbow trout are not doing well and not affecting humpback chub. That was part of context not to have spring HFEs. **[Paul Grams, GCMRC]** Fall HFE was relatively simple to implement. Didn't want P&I Team to have to decide something complicated. Don't want them to decide between fall and spring. Now it's worth it. That flexibility was not desired back then.

[David Brown, GCRG] Now realizing LTEMP forecast not panning out. Spring HFE was never going to occur. Now we've had a spring HFE. This is a clear demonstration of adaptive management. We're recognizing through science that we need to be changing things to improve the decision-making criteria. I think there was a lot of concern about Diamond Down and navigation in the river from Diamond Down. If there were more spring HFEs it might be able to create a more navigable channel from Diamond Down.

[Larry Stevens, GCWC] If we step back, we are passing through phases of perception about the system. Perceptions of how high flows can benefit native and non-native species. Everything we do is all a best guess. This is active adaptive management and probably the best adaptive management program in the world. Realizing we have bias in the system, and we are correcting them.

[Leslie James, CREDA] The group had a lot of discussion as one change is to extend to June. Without a lot of analysis which needs to be done, from an initial gut feel we have concerns about June. We all know June is hot. Why extend into June? **[Sinjin Eberle, American Rivers]** Fish and invertebrate life benefit the most in June. We had a season of water from spring runoff and now we know how much water is going to be there to do this. The last thing is it extends the aeolian season to benefit cultural preservation. **[Paul Grams, GCMRC]** If those go forward then can combine and have an HFE bypass in April and a smallmouth bass bypass in June then do one in June. If smallmouth bass goes away, then P&I Team will be looking at tradeoffs and having that flexibility makes sense. **[Leslie James, CREDA]** What we always look at from a hydropower standpoint is not just when you perform HFE but months you are pulling water from. **[Sinjin Eberle, American Rivers]** Another one is that going into the summer recreation season in May and June would provide fresh new beaches. The June issue and the rollover issue were the things we discussed the most. **[Ed Keeble, NPS]** June is when reservoir is highest and that is when natural flooding occurs.

[Terra Alpaugh, Kearns & West] Pulled up what is definitely being recommended and what is being recommended for analysis. This will be further analyzed in the SEIS. Document is very clear about wanting these tradeoffs analyzed. Motion language needs massaging. Are you comfortable making motion to the SOI or do we need more discussion?

[Martina Dawley, Hualapai Tribe] Want to emphasize it doesn't specifically state it leads directly to Diamond. Down. Like to have Diamond Down included in future research. **[Terra Alpaugh, Kearns & West]** How can we address that particular request in the context of motion. **[Seth Shanahan, SNWA]** Need to acknowledge in the EIS that impacts of that area are considered. Then we'd know what the impacts are. **[Martina Dawley, Hualapai Tribe]** Just wanted to confirm that is what's happening. We support that.

[Charlie Ferrantelli, Wyoming State Engineers Office] Regarding impacts to rainbow trout. Curious if GCMRC or anyone else feels comfortable looking at that as some sort of impact due to this different accounting period so that the SEIS is not more vulnerable? Want to keep it as condensed as possible. **[Charles Yackulic, GCMRC]** We can look at that. Need to talk to some others about the rainbow trout fishery. Think we have a decent understanding of what might go on. The actual HFE disturbs eggs that have been laid and then there is a couple week period with no food and then the food base is rejuvenated. March HFEs are good for rainbow trout since you are not disturbing eggs. Concerns with June HFE are that we are disturbing older fish.

[Leslie James, CREDA] We're right on a topic that will be part of a SEIS along with smallmouth bass. In the context of the HFE protocol I've had concerns that given the short time folks had to pull together smallmouth bass we would like to suggest time to get the fisheries biology people to look at alternatives for smallmouth bass. Trout and smallmouth bass biologists need to talk about this. **[Charles Yackulic, GCMRC]** Part of the reasoning is you have smallmouth bass or brown trout which are limiting recruitment of rainbows. Lots of things happening are not good for rainbow trout. Open to discussing

smallmouth bass again but did spend five months last year on a smallmouth bass task force and had multiple agencies involved. Model used is developed from Green River smallmouth bass populations. **[Leslie James, CREDA]** Moving to an EIS from an EA so we need a robust range of alternatives for SEIS. Moving into a much different framework. **[Rod Smith, SOI]** Whether it's warm or cold water fish or Diamond Down, all that comes into play in the SEIS process. If this goes live and we're doing it and planning HFE there is another relook at all the site specific conditions. Any new issues will be considered in the NEPA document and during implementation.

[Sara Price, CRCN] My understanding is we are looking at this proposal and we've discussed how to analyze this whether in a NEPA document or on its own. This particular motion is to move the protocol forward for consideration and analysis. Assume there would be a separate decision on how this occurs. Does it come back to us, or do we need to have that conversation here first?

[Wayne Pullan, AMWG Chair] If AMWG approves and it goes forward to SOI, it will be important for this to be included in the LTEMP SEIS. **[Sara Price, CRCN]** Is it a given that if moved forward then it does get included in the smallmouth bass SEIS? **[Wayne Pullan, AMWG Chair]** It will be included, might have some changes when it becomes an alternative. It will have the approval of AMWG behind it. **[Sara Price, CRCN]** It sounds like it might be worth having a discussion on that process, what the complications are, and what the concerns might be. **[Wayne Pullan, AMWG Chair]** We can discuss the NEPA process. **[Sara Price, CRCN]** I don't know if I have a strong feeling as to whether the accounting protocol and smallmouth bass need to be together or separate. I am concerned about seeing the smallmouth bass piece move forward. Less concerned if it's together or apart. Heard various concerns about whether they stay together or separate. **[Wayne Pullan, AMWG Chair]** We've discussed this among the federal agencies. Due to the urgency of the smallmouth bass effort, Kathy and Bill say they can keep these together and meet the schedule. Intent is to keep them together.

[David Brown, GCRG] Agree it seems premature to say how this would be taken into a NEPA context. Concerned about the Purpose and Need and Range of Alternatives getting very big. Smallmouth bass needs to happen as well as HFE protocol. Seems like a different discussion. This is a consideration but maybe not an approval. Approval is a federal thing that needs to be analyzed in NEPA.

2:57:43 Break

3:19:25 [Wayne Pullan, AMWG Chair] Become clear that we need to reconsider triggers for HFEs. We asked in February for an analysis of how we might change things. This is what we asked for from the FLAHG and TWG. They prepared recommendations that incorporate affected resources and things to be considered if implemented. Does AMWG want to give this to the SOI to consider? These recommendations are things to be considered if they are to be implemented. Would be part of smallmouth bass and changes to HFE NEPA document. Will be an opportunity for input from everyone.

[Terra Alpaugh, Kearns & West] Reviewed the AMWG Motion Language. See attachment B

[Terra Alpaugh, Kearns & West] Further edits? (There were none). Final language is below:
The Adaptive Management Work Group (AMWG) accepts the Proposal to Amend the High-Flow Experiment Protocol and Other Considerations to meet the Directive given at the February 15, 2023, AMWG meeting, and recommends it to the Secretary for inclusion in the LTEMP SEIS process. **Kristen Johnson, ADWR: Moves** to forward recommendation to SOI for inclusion in the

LTEMP SEIS with precise language on screen. **Matt Rice, American Rivers: Seconds.** No one opposed. Motion approved.

Basin Fund Presentation

[Rodney Bailey, WAPA] PRESENTATION WAPA is one of four federal power marketing administrations under the DOE. WAPA has 57 powerplants in their purview. Operated by Reclamation, the USACE, or the IBWC. They generate power and WAPA markets it. Responsible for 17,000 miles of transmission line. The CRSP is one of five regions within WAPA. CRSP is responsible for water storage projects along the Colorado River or its tributaries. Glen Canyon Dam is their biggest resource (75% of generation). Revenues received go to both WAPA and Reclamation. CRSP maintains 2,300 miles of transmission line. WAPA provides dispatchable energy. There are approximately 38 balancing authorities throughout the west. WAPA operates four of them. When we have to replace the generation that is lost it's often with a fossil fuel product. When WAPA loses generation it has a huge impact on the electric grid through increased prices, blackouts and rolling brownouts. CRSP transmission was built as a wheel and spoke. Basin Fund important to maintain this transmission system. 1956 CRSP Act established the Basin Fund. The Basin Fund doesn't receive appropriations. It's funded by power revenues.

[Brian Sadler, WAPA] PRESENTATION Basin Fund unique within WAPA. The Basin Fund is separate from normal appropriations. The Desert Southwest Region is different from CRSP. Have to maintain a balance in fund to operate. WAPA was created in 1977 when the DOE was created. Formerly part of Reclamation. Replacements are capital expenditures, e.g., transformers at bottom of Glen Canyon Dam. Money is given to Reclamation to do the actual work. This cost goes into their rate and is collected back from customers over many years. Have to pay Treasury back for initial loan. Non reimbursable program has been a great solution for many years. Used to have \$30M of interest due annually. Return requirements are significantly lower now. Purpose of the Basin Fund is to operate and maintain CRSP. Returns occur when available funds are in excess of operating needs. Have not had any funds in excess of operating needs for a while now. Some critical Basin Fund requirements: Reclamation and WAPA O&M expenses are \$117M in 2023. Aging infrastructure requires \$99M capital expenditures planned in FY 24 - 26. Can we reimagine the Experimental Fund and Budget? Are there alternative funding sources? Want a solution to smallmouth bass issue but concerns about flow actions previously proposed as it would significantly affect the Basin Fund and our ability to continue to administer the Colorado River Storage Project. Want to look at all the tools to address smallmouth bass. The slough? Want to help but WAPA has legal requirements they must fulfill.

Q&A and Discussion

[Matt Rice, American Rivers] Is the Basin Fund statutorily prohibited from receiving appropriations?

[Brian Sadler, WAPA] Under the CRSP Act, we shall operate without further appropriations. However, Congress can do whatever they want. They did authorize some funds to be used under the BIL, but those funds must be returned. The time frame is not clear but understood we will need to return funds after the drought.

[David Brown, GCRG] WAPA is in a tough spot, but others are too. Two questions: I didn't quite follow the gas station analogy (3 gas stations in town and 2 go down so only one left to provide gas). Can WAPA take on NEPA actions to change some underlying operational requirements and commitments? Seems like very dire circumstances for WAPA in next decade. **[Rodney Bailey, WAPA]** There are a lot of generators right now, but a lot of fossil fuel generators are now offline and more fossil fuels are dropping off and being replaced by renewables. New generation is not coming soon enough to replace them. **[David Brown, GCRG]** So there is less supply of dispatchable power as fossil fuel and hydropower is retired? There are lots of challenges in CA but battery storage and other technologies

should be helping. Our energy portfolio is transforming. Hydropower is unique and there are less of those types available.

[Larry Stevens, GCWC] Question about figure that showed a concentration of energy users was along Wasatch Front in UT. Is the Wasatch front regulating energy flow through the system? Are there other customers besides your firm customers drawing on your resources? **[Rodney Bailey, WAPA]** Those red dots are municipalities, but they are only part of the customer base. Look at all the colored polygons on the map to see all our customers - co-ops, tribes, among others.

[Stewart Koyiyumptewa, Hopi Tribe] Navajo Generating Station is closed and has no revenue. When Hopi started monitoring in the 90s, the outlook was good, but our monitoring budget has not changed. Trying to raise funding to participate in this program. Hoping you will end on a good note with more money coming in so you can provide more funds for monitoring programs, but it looks like we'll be in the same rut. **[Rodney Bailey, WAPA]** Not opposed to funding some studies that need to go on but need to discuss how much money that is and how we do that. We cannot fully fund everything that is going on with this program.

[Greg Mehojah, BIA] Given discussion of fossil fuel coming offline, is WAPA looking at diversification of any kind with renewables? **[Rodney Bailey, WAPA]** One issue that we have is we don't have authority to build. We can contract long term PPAs for our customers. Working with customers to see if they are interested in WAPA going out and making a long term purchase. Did send RFI out to see who wants to sell energy. Got 25 responses. Most are solar and most take 3-4 years for construction. **[Greg Mehojah, BIA]** Presume you could go to Congress to get permission to expand what you are allowed to build and operate? Seems like there is enough uncertainty to do this. **[Rodney Bailey, WAPA]** WAPA cannot do it themselves. Someone else has to do it. Another challenge is that WAPA has fixed costs that are recovered on a per unit basis. The less generated the more it costs. Trying to keep costs low and sell as much as possible to keep rates down. Costs will likely increase due to inflation. If rates get too high, then out of business.

[Christina Noftsker, NMISC] Does WAPA have authority to build additional transmission lines?

[Rodney Bailey, WAPA] We do but we don't have a requirement. We don't have load growth responsibilities. We have enough transmission for the generation we have.

[Sheri Farag, CREDA] Can you talk about WAPA contractual obligations and the role of those contracts and your rate and how that fits with the Basin Fund? **[Rodney Bailey, WAPA]** WAPA has 30-year contracts that end next year. The next set will go through 2057. They establish contractual obligations. Under the current rate we have some flexibility. It's based on what it can generate. Rates are cost based including interest and repayment. Includes repayment of irrigation projects and ability of irrigators to repay.

4:32:13: LUNCH

5:33:33 [Terra Alpaugh, Kearns & West] Terra reviewed the agenda for the afternoon.

Federal Agency Updates

- **USGS: Andrew Schultz** GCMRC fieldwork below Glen Canyon Dam is ongoing and will wrap up after mid-summer lull. Terrestrial vegetation monitoring is going on now and riparian vegetation monitoring starting right after. Water quality and sediment monitoring now with sand

bar monitoring in October. September to November we have five humpback chub and three trout monitoring efforts. Doing modeling support for NEPA with Reclamation. Staffing ongoing.

- **USFWS: Heather Whitlaw** Introduced Deb Williams who is the special assistant to the Assistant Regional Director for the Colorado River. She is a liaison between Reclamation and USFWS. Ramping up Colorado River program and hiring folks. The humpback chub recovery team is working steadily. USFWS published a proposal to delist Apache trout due to recovery efforts. Well on our way to recovery. Lots of cooperation with White Mountain Apache Tribe. Lots of success with humpback chub population numbers. We can delist species due to recovery.
- **Reclamation: Kathy Callister** Staffing update. Lots of NEPA updates are going on. Adaptive management program hired three biologists including a deputy project manager (Jeremy Hammen) which was held by Clarence Fullard. Clarence has moved to the water quality and salinity group.
- **NPS: Ed Keeble** NPS working with several cooperating agencies will do chemical treatment to control invasive fish in Glen Canyon National Recreation Area. Section 106 consultation and planning completed for emergency actions. Included 2019 Expanded Non Native Aquatics Species management plan EA and FONSI. Tribal consultation occurred. Site visit to Slough with Zuni October 4. The Zuni are pressing for preventative solutions. Reclamation issued report on Grand Canyon slough and NPS is reviewing and assembling an IDT to look at this. Did six electrofishing trips last fall and identified 345 smallmouth bass in Glen Canyon National Recreation Area. This year both parks have been assembling personnel and equipment to continue this. Have \$500,000 this year for that. Spring 2023 initiated efforts to eradicate these fish. USFWS provided staff and NPS provided money. Found 589 smallmouth bass in Grand Canyon and none detected in Grand Canyon proper.
- **BIA: Greg Mehojah** His letter was signed today.
- **WAPA:** Pass
- **DOI Solicitor's Office, Rod Smith:** Quick update on LTEMP litigation. In 2019 three NGOs sued the DOI saying the LTEMP was wrong in respect to climate change. They want an SEIS even if climate change had been done directly. Ultimately prevailed in District court and it was appealed to 9th Circuit. Federal brief filed last month. Appellate brief to be filed Sept 22. Might be couple more AMWG meetings before we know anything.

[Wayne Pullan, AMWG Chair] Asked Michelle to update everyone on the slough.

[Michelle Kearns, NPS] NPS team has been tasked with looking at opportunities in places they could exploit. Since 2021 NPS has been working with USACE to address infrastructure. Have a commitment from them, a Regional General Permit 6, they have done a lot of work under. Given the extensive analysis Reclamation did with their proposed modifications and others the application process under NWP 27 or an individual permit could be initiated immediately and USACE would be receptive to whatever path NPS would like to pursue. As they are establishing this interdivisional tiger team, they will be working that at Glen Canyon.

[Larry Stevens, GCWC] That's great news the USACE is willing to move forward. Strongly encourages the NPS to move as swiftly as possible. Has been three plus years to address this while the work could be done in weeks. Sorry it takes so long to solve a simple problem.

[Wayne Pullan, AMWG Chair] Important to remember that any construction on the Colorado River will be controversial. Slough will take some time. Have had conversations among DOI agencies about NEPA work for the slough and does it need to be combined with LTEMP. Don't think it will expedite things.

Doing them separately has independent value. Since we are taking on triannual workplan like to simplify that effort so as to spend as few resources as possible and still generate a good product. Need to keep making progress in non-fish areas. Cannot afford to lose ground. Congress passed the Infrastructure Reinvestment Act. Upper Basin allocated \$500M. Reclamation expended about \$17M for short term conservation projects (Bucket 1). Bucket 2 is for longer term conservation projects involving infrastructure work. Looking at Bucket 3. Think about projects that might be eligible for Bucket 3 funding. In the preliminary stages of putting programs together but we will know more in the fall.

[Kristen Johnson ADWR] Are Buckets 1 and 2 Lower Basin only? **[Wayne Pullan, AMWG Chair]** Buckets 1 and 2 are both Upper and Lower Basin and Bucket 3 will be as well. **[Kristen Johnson ADWR]** So the Lower Colorado System Efficiency and Conservation Program? **[Wayne Pullan, AMWG Chair]** They were allocated a bigger chunk than the Upper Basin was. **[Kristen Johnson ADWR]** Is there a call for proposals out for these buckets? **[Wayne Pullan, AMWG Chair]** Bucket 1 was out, and we funded projects in advance of the irrigation season. It wasn't Lower Basin amounts of water. Evaluating Bucket 1 to see if we extend it for a year but focus is Bucket 2.

6:04:00 Stakeholder Updates

States:

[Kristen Johnson, ADWR] A seven state letter was submitted in response to the scoping notice on Tuesday. Will share with anyone. Arizona also signed onto the Lower Basin letter with California and Nevada. Also, ADWR submitted its own Lower Basin letter speaking for the state. Implementation of an ICS framework should be considered and renegotiated, and Reclamation should implement a review under the 417 process for beneficial use in both the Upper and Lower basins.

[Julie Carter, AZGFD] No update.

[Jessica Neuwerth, CRBC] Finalized several scoping letters. Primary point of the seven states letter was that the states are committed to producing a basin states alternative for the EIS. Bucket 2 is wrapping up. Lots of folks in California are interested in Bucket 2 funding and are also seeking funds under Bucket 1. California on track to create 400,000 AF in wet water. Committed to doing this for next four years.

[Michelle Garrison, CWCB] Ditto on Kristen's comments. There was an Upper Division States' letter through the UCRC and letter from Colorado commenting on SEIS. UCRC put together a pilot program for 2023 using those funds we just discussed. UCRC received 80 applications and are moving forward. System conservation occurring in Upper Basin and lessons learned from UCRC is coming in December.

[Christina Noftsker, NMISC] Participated in Upper Basin states UCRC comment letter and the seven states letter for the Post 2026 EIS and submitted a New Mexico only letter. On the system conservation pilot program, we contracted with Navajo Agricultural Products Industry for 39 different fields for a total of 2,641 acres of fallowing. Total conserved water use is approximately 4,000 AF. Will stay in Navajo reservoir. Working with The Nature Conservancy (TNC) to place 20,000 AF of Jicarilla Apache water that is stored in the New Mexico strategic water reserve. As part of San Juan Implementation and Recovery Program interested in improving habitat for Colorado pike minnow and razorback sucker in the San Juan Basin. In coordination with Reclamation leased water was released this spring (June 13-15) with 15,000 AF released and 5,000 AF remaining to test monitoring equipment.

[Sara Price, CRCN] Submitted letters on the Post 2026 EIS and submitted letters under CRCN letterhead targeting concerns and interests on hydropower generation and the desire/interest/need for full

impact analysis on hydropower generation. This is Laura Dye's last AMWG meeting as she is moving to USGS.

[Betsy Morgan, Colorado River Authority of Utah] Will be represented at the AMWG in future by Amy Haas. Laura will be the alternate. Utah did submit its own letter. In July Senators Romney and Hickenlooper sponsored the Reauthorization Bill for the Upper Colorado River and San Juan Recovery Program to extend the authorizations for the programs for seven years. Also, in July Senator Bennet introduced amendments to the Salinity Control Act to reduce reimbursable cost share requirements due to funding imbalance caused by reduced hydro power production. Senator Romney co-sponsored this legislation as well. With the SCPP Utah had pretty robust participation even with slow start. Utah projects represented 40% of total anticipated conserved consumptive use of all Upper Basin projects. Agreements being verified. Second round occurring this week.

[Mel Fegler, Wyoming] Wyoming submitted its own letter. Working with other six basin states and upper basin to lay groundwork for Post 2026 guidelines as well as the other upper basin states to develop projects and plans to use the BIL allocation funds. Welcoming the Colorado River Advisory Committee that begins meeting in September. Participating in SCPP projects.

[Wayne Pullan, AMWG Chair] Congress didn't authorize Bucket 1 till December. Upper Basin states did a great job getting people signed up.

6:16:00 Tribes:

[Stewart Koyiyumptewa, Hopi Tribe] Not present.

[Martina Dawley, Hualapai Tribe] Nothing

[Erik Stanfield, Navajo Nation] Also submitted letter on scoping and thanks to Reclamation for submitting tribal monitoring nomination.

[Edward Wemytewa, Zuni Tribe] Had our river trip August 4 with NPS and had classroom conversation that brought a lot of things to forefront. Need to renew planning and conversations and how they move forward. In that conversation we realized we need to have internal conversations and how we deal with the Zuni cultural enterprise that oversees the river trip. Will improve our commitment to how we deal with the educational processes for our children and how we plan our river trips and be inclusive of tribal members. In our work with AMWG we are talking to Reclamation and NPS about how we can settle our concerns with fish in Colorado River so that we can see benefits on the New Mexico side. Would like to talk to NPS and Reclamation about ideas for addressing lethal fish removal. Earlier this year I was lead in conversation to support the nomination of Grand Canyon to be part of National Monument. Governor and Lt Governor took lead in last month. When Secretary Haaland came and when President Biden came Zuni were represented as well. Feel like we have a strong foot in Arizona.

[Daniel Bullets, Southern Paiute Consortium]. Thanks for nomination, no other updates.

NGOs:

[Larry Stevens, GCWC] GCWC has worked across scale last 25 years. Provided comments on scoping. Hope they are well received as protection of Grand Canyon is an internationally important issue. Colorado River passes through one of the most iconic national parks in the world. Recently sent picture of riparian restoration efforts with Grand Canyon National Park and Glen Canyon National Recreation Area. The collaborative project with the NPS has taken a landscape of dead and dying tamarisk and it is gradually becoming a healthy, native riparian forest. We recommend restoring native riparian habitat

from Glen Canyon Dam downstream to Paria Beach. GCWC also played a fairly substantial role in the recent monument designation to create a buffer around the Grand Canyon.

[Sinjin Eberle, American Rivers] American Rivers submitted their own letter as well. Participating with Reclamation on Integrated Technical and Educational Work Group. Getting more media since listed Colorado River through the Grand Canyons as the most endangered river. In National Geographic, Outside Magazine, Washington Post and spots on CNN.

[Grand Canyon River Guides] Not present.

[Jim Strogon, FFI/TU] It was the foresight of the White Mountain Apache Tribe years ago to engage in protection actions that were critical to delisting of the Apache trout. In addition to USFWS it was hard work by AZGFD and Julie Carter. Also, contributions by TU.

Federal Power Purchasers:

[Leslie James, CREDA.] Ditto on letters. Because we represent power customers in both basins, we walk a fine line. One common thing is the link between hydro power and water. Submitted supportive brief on environmental litigation in 9th Circuit. Submitted comments on foundational documents since we are partners in the Upper Colorado Endangered Fish Recovery Program. Involved in the legislation on that. In midst of a WAPA rate case. CRSP Firm Electric Rate Case. Working with Reclamation and WAPA to keep rates at lowest possible costs. Many WAPA customers are in most impoverished areas of country.

[Kevin Garlick, UMPA] Thank you. Nothing further.

Technical Work Group Chair Report

6:29:50 [Seth Shanahan, TWG Chair] If you're surprised by anything from TWG then you need to meet with your TWG member to ensure you are briefed. Seth and Michelle Garrison were reelected chair and vice chair; Jeremy Hammen is Reclamation vice chair. One topic not discussed today that was discussed at TWG is what was purpose of the Bug Flows Experiment. Bug Flows had an increase in EPT %. Trying to create a risk community of practice. Want to share information with the community. There is no formal warning system in the Grand Canyon to communicate risks. Another project of interest is water falls in reservoirs which is related to tracking the development of nickpoints in the sediments of declining reservoirs. TWG tracks most closely the Pearce Ferry rapid nickpoint. Also, the one at Paiute Falls in the San Juan River. TWG received an update on willow flycatcher and clapper rail surveys. Did not detect Southwestern willow flycatcher. Reviewed next TWG meeting agenda items.

Q&A and Discussion

[Brian Sadler, WAPA] Can TWG take on Bucket 3? **[Wayne Pullan, AMWG Chair]** October meeting will coincide with information on Bucket 3.

[Larry Stevens, GCWC] Considering the slough and its current configuration, it would be good to look at slough prior to 1965. Prior to that time the slough may just have been a sandbar. If NPS is trying to manage natural conditions, it might want to see what that natural condition actually was. **[Kathy Callister, Reclamation]** Thank you.

Public Comment

[Lynn Hamilton, Executive Director of Grand Canyon River Guides in Flagstaff] Some of you may have heard John Dillon make previous comments before. He is the executive director of GCROA. They represent the 16 river concessionaires. They take 20,000 people down annually. Provides jobs and tens of

millions of dollars to local economy. Really support HFE. Only tool to rejuvenate sand bars in the Grand Canyon. Timing this year was perfect. Plenty of people right now enjoying the Colorado River. Very important to move LTEMP forward. The smallmouth bass crisis is evolving but at a certain point it holds the fate of the humpback chub. Could be very serious ramifications for smallmouth bass in Grand Canyon. Encourage anyone with concerns to provide mitigation measures.

[Alicyn Gitlin, Sierra Club Grand Canyon Chapter] Very encouraged to hear we are treating this holistically and not as a series of segments. Hope that it's more than language. Like to see good work come out of this and like to hear urgency coming out of Colorado River Ecosystem. Like to protect all the values. Don't want to see just urgency behind smallmouth bass and LTEMP SEIS. Want to see it behind the slough and the thermal curtain.

Wrap Up

[Wayne Pullan, AMWG Chair] Thanks to Terra for her hard work. What a remarkable thing that our experience, our loyalties and our capabilities and expertise have brought us together. We are responsible for condition of Grand Canyon and the Colorado River. Thank you.

6:59:17 Meeting adjourned at 2:50 PM PST

AMWG Members, Alternates, and Leadership

Wayne Pullan, BOR, Acting Secretary's Designee
Daniel Picard, BOR, Designated Federal Officer
Kathy Callister, Reclamation, Alternate
Christina Kalavritinos, DOI
Annalise Blum, DOI
Ed Keeble, NPS
Michelle Kearns, NPS, Alternate
Julie Carter, AZGFD
Brian Sadler, WAPA
Shane Capron, WAPA, Alternative
Greg Mehojah, BIA
Jacob Maase, Hopi Tribe
Stewart Koyiyumptewa, Hopi Tribe, Alternate
Martina Dawley, Hualapai Tribe
Carrie Cannon, Hualapai Tribe, Alternate
Richard Begay, Navajo Nation
Erik Stanfield, Navajo Nation, Alternate
Daniel Bulletts, Southern Paiute Consortium
Edward Wemytewa, Zuni Tribe
Arden Kucate, Zuni Tribe, Alternate
Jim Stroger, FFI/TU
Rod Buchanan, DOI
Kristen Johnson, ADWR, Alternate
Jessica Neuwerth, CRBC
Shana Rapoport, CRBC, Alternate
David Brown, GCRG
Michelle Garrison, CWCB,
Emily Zmak, CWCB, Alternate
Sara Price, CRCN
Laura Dye, CRNC, Alternate
Leslie James, CREDA
Sheri Farag, CREDA/SRP, Alternate
Christina Nofsker, NMISC
Betsy Morgan, CO River Authority of UT, Alternate
Amy Haas, CO River Authority of Utah
Charlie Ferrantelli, WY State Engineers Office
Mel Fegler, WY State Engineers Office, Alternate
Larry Stevens, GCWC
Kelly Burke, GCWC, Alternate
Matt Rice, American Rivers
Sinjin Eberle, American Rivers, Alternate
Kevin Garlick, UMPA
Cliff Barrett, UMPA, Alternate
Heather Whitlaw, USFWS

Federal Staff

Tara Ashby, Reclamation
Heather Patno, Reclamation
Robert Radke, Reclamation
Bill Stewart, Reclamation
Jeremy Hammen, Reclamation
Matt O'Neill, Reclamation
Margaret Digiorno, Reclamation
Melynda Roberts, Reclamation
Russ Callejo, Reclamation
Scott Vanderkooi, GCMRC
Ted Kennedy, GCMRC
Helen Fairley, GCMRC
Andrew Schultz, GCMRC
Joel Sankey, GCMRC
Paul Grams, GCMRC
Maria Dent, GCMRC
Drew Eppehimer, GCMRC
Bryce Mihalevich, GCMRC
Deb Williams, USFWS
Dan Leavitt, USFWS
Jess Newton, USFWS
David Ward, USFWS
Alex Pivarnik, Reclamation
Brian Hines, Reclamation
Teo Melis, Reclamation
Zach Nelson, Reclamation
Nick Williams, Reclamation
Becky Bryant, Reclamation
Matthew Alinsod, Reclamation
Kerri Pedersen, Reclamation
Rudy Keedah, BIA Navajo Region
Kate Behr, GCMRC
Lindsay Hansen, GCMRC
Eric Reichard, GCMRC
Thomas Gushue, GCMRC
Charles Yackulic, GCMRC
Lucas Bair, GCMRC
Lauren Tango, GCMRC
Erica Byerley, GCMRC
Bridget Deemer, GCMRC
Melissa Trammell, NPS
Bud Fazio, NPS
Emily Omana Smith, NPS

Other GCDAMP Members and Interested Parties

Seth Shanahan, SNWA
David Brown, GCRG
Annalise Porter, SNWA
Josh Korman, Ecometric
Bill Persons, FFI/TU
Ted Rampton, CREDA
Terra Alpaugh, Kearns and West
David McIntyre, SeaJay Environmental
Annalise Porter, SNWA
Erik Skeie, Colorado
Alyx Richards, UCRC
Lynn Hamilton, GCRG
Craig Ellsworth, WAPA
Ryan Mann, AZGFD
David Rogowski, AZGFD
John Fennell, AZGFD
Kurt Dongoske, Pueblo of Zuni

Lori Taitano, CREDA/SRP
Colleen Cunningham, NMISC
Dave Foyken, AZGFD
Alicyn Giffin, Sierra Club
Eric Balken, Glen Canyon Institute
Jen Pelz, Grand Canyon Trust
Emily Halvorsen, CO Attorney General's Office
Hunter Kennedy, University of Chicago
Joshua Randall, CAP
Sara Larsen, UCRC
Bill Persons, FFI/TU
Rodney Baily, WAPA
Emily Higuera, ADWR
Eric Skie, CWCB
Morgan Ross, Environmental Defense Fund
Taylor McKinnon, Center for Biological Diversity

Acronyms and Abbreviations

°C – degrees Celsius

ADWR – Arizona Department of Water Resources

af – acre-feet

AMWG – Adaptive Management Work Group

AZGFD – Arizona Game and Fish Department

BAHG – Budget Ad Hoc Group

BIA – Bureau of Indian Affairs

CFS – cubic feet per second

CRBC – Colorado River Board of California

CRCN – Colorado River Commission of Nevada

CREDA – Colorado River Energy Distributors Association

CWBC – Colorado Water Board of Colorado

CRMMS – Colorado River Mid-term Modeling System

CST – cultural sensitivity training

CWCB – Colorado Water Conservation Board

D.O. – dissolved oxygen

DOI – (U.S.) Department of the Interior

DROA - Drought Response Operations Agreement

EA – environmental assessment

EIS – environmental impact statement

ESA – Endangered Species Act

FFI – Fly Fishers International

FLAHG – Flow Ad Hoc Group

FY – Fiscal Year

GCDAMP – Glen Canyon Dam Adaptive Management Program

GCMRC – Grand Canyon Monitoring & Research Center

GCRG – Grand Canyon River Guides

GCWC – Grand Canyon Wildlands Council

HFE – High Flow Experiment

LCR – Lower Colorado River

LTEMP – Long-term Experimental and Management Plan

maf -million-acre-feet

m/s – meters per second

mg/liter – milligrams per liter

MOA- memorandum of agreement

NEPA – National Environmental Policy Act

NGOs – non-governmental organizations

NMISC – NM Interstate Stream Commission

NOI – Notice of Intent

NPS – National Park Service

O&M – operations & maintenance

PA – Programmatic Agreement

P&I – Planning and Implementation

PBR – Paria to Badger Rapid

PST – Pacific Standard Time

Reclamation – Bureau of Reclamation

ROD – Record of Decision

SEIS – supplemental EIS

TNC – The Nature Conservancy

TU – Trout Unlimited

TWG – (GCDAMP) Technical Work Group

TWP – Triennial Work Plan

UCR – Upper Colorado River

UDWR – Utah Division of Water Resources

UMPA – Utah Municipal Power Agency

USFWS – U.S. Fish & Wildlife Service

USGS – United States Geological Survey

WAPA – Western Area Power Administration

Attachment A: Budget and Work Plan Motion

The Adaptive Management Work Group (AMWG) recommends for approval to the Secretary of the Interior, the Fiscal Year 2024 budget as shown on the budget worksheets presented to the AMWG on August 16, 2023, with the following additional guidance:

The AMWG recommends that any lethal management activity performed under the Glen Canyon Dam Adaptive Management Program (GCDAMP) Work Plan complies with the 2017 Programmatic Agreement for Long Term Experimental Management Plan and the National Park Service 2019 Expanded Non Native Aquatic Species Management Plan Programmatic Agreement prior to implementation of that action.

The AMWG recommends that GCMRC Project N funds become available funds as described below.

If funds become available, which will include Project N funds, the AWMG recommends those funds are used to fund the work items listed below in order of priority:

Priority 1 -Short Term Rapid Response Under the Invasive Species Strategic Plan – Invasive Fish Species Below Glen Canyon Dam: A Strategic Plan to Prevent, Detect and Respond was adopted by the AMWG on February 16th, 2023. Should short term response be necessary in FY24 under this Strategic Plan, the Department of the Interior should prioritize available funds outside of the GCDAMP. If other funding sources have been exhausted, the Department of the Interior may consider use of the Reclamation C.5 Experimental Management Fund and the C.6 Native Fish Conservation Contingency Fund. Such actions that may require use of these funds must be coordinated with the AMWG as proposed in the Strategic Plan and Budget Ad Hoc Group process.

Priority 2 – Continue Project Element G.6, Juvenile Chub Monitoring-West

Priority 3 – Continue sampling at two sub-reaches for Project Element H.2, Experimental Flow Assessment of Trout Recruitment.

Priority 4 – Continue Project Element C.3, Riparian Vegetation Predictive models and synthesis

Priority 5 – Other Additional Requests identified in the GCMRC FY24 Table.

Attachment B: HFE revision protocol motion

The Adaptive Management Work Group (AMWG) accepts the Proposal to Amend the High-Flow Experiment Protocol and Other Considerations to meet the Directive given at the February 15, 2023, AMWG meeting, and recommends it to the Secretary for inclusion in the LTEMP SEIS process.