UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

February 4, 2021

Municipality of Anchorage
Matanuska Electric Association, Inc.
Chugach Electric Association, Inc.
P.O. Box 196300
Anchorage, Alaska 99519

RE: Comments on the Eklutna Hydroelectric Project REVISED Draft Study Plans

Dear Ms. Henderson, Mr. Zellers, and Mr. Brodie:

The 1991 Fish and Wildlife Agreement (1991 Agreement) requires the Eklutna Hydroelectric Project ("Project") owners to develop and propose a Fish and Wildlife Program to protect, mitigate damages to, and enhance fish and wildlife impacted by the development of the Project, to be reviewed by the resource management agencies, the public, and the Governor of Alaska. To facilitate the development of the Fish and Wildlife Program, the Project owners are required to fund studies to examine impacts to fish and wildlife from the Project. The study plan must be developed by the Project owners in consultation with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, and three state agencies. In accordance with the 1991 Agreement, the Project owners presented a Revised Draft Study Plan to the resource agencies on January 18, 2021. We provide the attached comments based on our review of the revised studies proposed for the first study year.

In the last five years, significant progress has been made toward the goal of returning several species of salmon to the Eklutna River between the Thunderbird confluence and the Upper Eklutna Dam. These significant achievements include: the removal of the 65-foot lower dam; more sediment from behind the lower dam has move downstream than initially anticipated; a few coho have migrated above the old dam site; and agreement on the studies to examine project impacts and ways to remediate those impacts to fish and wildlife is close to completion.

The Project owners, the Native Village of Eklutna, and the resource agencies would like to return salmon to the entire 11 miles of the Eklutna River while maintaining low-cost electricity generation for Alaskan communities connected to the rail belt electrical grid, a goal stated in the 1991 Agreement.

While this revised draft study plan improves on the October 2020 draft study plan, many study details still need to be finalized in consultation with the technical work group (TWG). We urge the Project owners to allow for sufficient time for the TWG to provide meaningful feedback

following each TWG meeting. The owners are reaching out to interested downstream parties including Eklutna Inc., Alaska Department of Transportation and Public Facilities, and the Alaska Railroad. We request more transparency regarding their thoughts and comments on the study plan and planning process. We believe this transparency will allow for a more efficient and collaborative adoption of the Fish and Wildlife Program once the study results are available for review and will help avoid any last minute concerns with the Fish and Wildlife Program.

Please contact Sean Eagan at sean.eagan@noaa.gov or by phone at 907-586-7345 if you have any questions.

Sincerely,

for

James W. Balsiger, Ph.D.
Administrator, Alaska Region

Attachment 1: National Marine Fisheries Service Comments on the Eklutna Hydroelectric REVISED Draft Study Plan

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National Marine Fisheries Service Comments on the
Eklutna Hydroelectric Project REVISED Draft Study Plans
February 4, 2021

Based on our review of the Eklutna Hydroelectric Revised Draft Study Plan (RDSP) provided by the Utilities, we offer the following RDSP comments.

List of Study Comments

3.0 Global Comments (GC)

RS-GC 1 We recommend a table/schedule of all the items where the Utilities will consult with the Technical Work Group (TWG) prior to study implementation and the approximate month that consultation will take place. Some study decision have ramifications on other studies. There is a logical order to study design decisions; schedule a sufficient number of TWG meeting and time between meetings so that order can be followed.

RS-GC 2 We appreciate the Utilities sharing stakeholder comments including those from Anchorage Water and Wastewater Utility. We recommend the Utilities, Alaska Department of Transportation and Public Works, and Alaska Railroad's comments also be shared publically. A process design to promote the greatest public good should not allow the views of some players to remain private.

RS-GC 3 The Eklutna River will not be restored to its original condition before the City of Anchorage existed. This process would benefit from identifying a smaller river in Alaska that hosts a healthy Chinook population with similar percentage of the watershed covered by a glacier and similar turbidity challenges. That system could be evaluated for its low winter flows, spawning flows, rearing habitat flows, and occasional channel maintenance flows. This information will inform the process about

the flows that may be required to bring back Chinook. This is not an independent study, but rather a task within another study.

RS-GC 4 The RDSP uses the word "model" for an array of items from schematics on a single sheet of paper to calibrated computer models. The study plan should use "analysis" to refer to all sediment transport and instream flow data collection and analysis done prior to building the two HEC-RAS models; and use "low-flow calibrated model" once the data from the three 2021 calibration flow (150, 75, 25 cfs) has been used to calibrate the model. Once a calibration flow has been released that actually moved the cobbles Chinook use for spawning in 30% of the reaches, then refer to it as sediment transport models capable of modeling the creation and maintenance of spawning habitat. Once the consultants have completed all steps, only then should the Utilities present the results to the stakeholders and governor as useful tools for understanding Chinook and sockeye salmon habitat.

"Module" should refer to subroutines in a computer model that can feed data to each other without direct human intervention. The Eklutna study relies on independent models which work together to help decision makers; the word "module" is inappropriately applied to independent models.

3.1 **Instream Flow Study (IF)**

HEC-RAS instream model calibration is a crucial step in the modelling process. The Utilities have outlined an acceptable plan to accomplish calibration. We agree with the change to first release the 150 cfs calibration flow.

RS-IF 1 **Re-creating a digital channel model:** We understand the reasoning behind releasing the "flushing flow" last, however, the consultants will need to adjust the digital channel cross sections once that flushing flow has been released. The Utilities must re-engage the TWG and explain which cross section will be resurveyed to return the digital channel to its former level of precision. Not all channel cross sections will change following the flushing flow, however, a significant number will change. "Cross section" and "transect "are used interchangeably in the RDSP and in our comments

RS-IF 2 **Functionality of the Model above the Calibration Flows:** The RDSP states HEC-RAS instream flow model is accurate up to five times the highest calibrated flow. In undammed rivers where high water marks were not recorded during earlier high water events, high flow calibration is not an option. In Eklutna River's case there is a dam above the study area that can provide higher flows. Especially after a flushing flow, we cannot support the claim that the model will be a useful tool above three times the highest calibrated flow. The flushing flow itself can and should be used as a calibration flow.

If returning Chinook to the seven miles between the dam sites is a goal, then we need HEC-RAS and PHABSIM models that have been calibrated in the 500 to 1,000 cfs range. This does not mean the Utilities will release this much water in the future, however, we do need to understand the potential future habitats that the Utilities are choosing to forgo to avoid raising utility rates.

RS-IF 3 **Flow Duration**: The 150 cfs flow and the fall flushing flow serve dual purposes of both altering the channel and calibrating the two models. Duration is important and we are supportive of the seven days suggested for the 150 cfs and the 24 hours suggested for the flushing flow. The 75 cfs and 25 cfs flows will not substantially change the channel geometry and could be of a shorter duration.

RS-IF 4 **Precision of Flow Release:** We are not concerned that the calibration flows are exactly at 150 cfs, 75 cfs, or 25 cfs. The modelers should know the flow at which the stages and velocities at the cross sections were measured. The methods should state whether the discharge volume modeled is based on hydraulic calculations from the opening size created by the 30" by 30" gate or technicians in the river taking flow measurement. We recommend field measurements be collected 1 - 3 miles above the old dam in a safe, stable channel location. This is approximately half way between the Thunderbird confluence and the existing dam. If the study design will average between measured discharges at many cross sections, the methods should be clearly defined.

RS-IF 5 **Cross Section Selection and TWG Consultation:** The TWG has less expertise in HEC-RAS model development than the modelers; however, the TWG has significantly more knowledge of the Eklutna River over the last two decades. We once again emphasize that the TWG must be consulted both on the initial proposed cross section locations, and again if additional cross sections needs to be surveyed, or one or more of the initial transects will not be used in the model. "Cross section" and "transect "are used interchangeably in the RDSP and in our comments.

RS-IF 6 **Deliberate Transect Selection:** While the response in Appendix A of the RDSP indicates the consultants think "random" is a defensible way to select model transect locations, the text directly above indicate a deliberate process. Please resolve this discrepancy.

RS-IF 7 **Two Dimensional (2D) River Models:** We agree that developing a 2D model for any reach would not be beneficial before completing the flushing flow. Once the flushing flow has been released, re-surveying and re-calibrating the 1D model is a higher priority. The 2D model of a short reach where there is juvenile rearing habitat will only function if the 1D model above and below it is correctly calibrated. We recommend developing the timeline of TWG meetings and time for the modelers to develop, calibrate and run a 2D model such that the results would be available to inform the final plan.

RS-IF 8 **Habitat Suitability Index (HSI) and Habitat Suitability Criteria (HSC):** While the response indicates how HSI and HSC have been used in the past, ultimately they seem like very similar index curves used to provide quantitative (0 - 1) relations between an environmental variable and habitat suitability for a species. HSC seems to provide habitat suitability based on variables derived from HEC-RAS flow models such as depth and velocity. Bottom substrate and perhaps turbidity would be derived from a sediment transport model. The models outlined

for this project will not provide other important habitat variables including temperature, upwelling and cover. Please be precise about which environmental variables will be used to define habitat suitability, what methods/models produced those environmental variables, and why those variables were chosen over other variable that affect fish habitat.

RS-IF 9 **HSC and HSI Curves Derived for Susitna Studies:** An integrated suite of models producing accurate pictures of future habitat suitability was not accomplished during the Susitna studies. Of the dozen models detailed in the study plan, few were correctly calibrated or functioned even as standalone models. If you plan to rely on HSC/HSI curves derived from literature, use HSC/HSI curves derived for studies that were actually finished and produced generally agreed upon final products.

The RDSP indicates the use of indexes derived for Susitna studies and that "models will be developed as appropriate". Please clarify these statements. This HSC/HSI topic will need its own TWG meeting

RS-IF 10 **Upwelling Areas:** PHABSIMS or similar models must include upwelling both when predicting where Sockeye will spawn on the lake margins and which side channel habitat the juvenile Chinook will use as rearing habitat. In areas not likely to produce either of these types of habitat, upwelling could be eliminating as a variable defining habitat quality. In rivers inundated with fines, upwelling keeps spawning gravels clean and eggs aerated when the river is turbid.

RS-IF 11 **Rearing Habitat:** It is not yet possible to know where side channel rearing habitat will exist. Once these potential areas have been identified, the Utilities should engage the TWG to ensure the models can accurately predict whether this habitat will be maintained over time. Wetted perimeter is a habitat metric that indicates whether side channels and sloughs have sufficient water for juvenile rearing. At least three factors are needed to correctly model habitat in sloughs and side channels:

a. Spatially close cross sections with high levels of vertical precision in areas where one would expect to have side channel rearing habitat. The model can then better predict when water will enter and exit the side channels and sloughs. This costly level of detail is not needed for the whole 11 miles, but is important in areas with the potential become usable side channels.

b. An understanding of accretion and groundwater flows that might add water to the side channels and sloughs once the river drops.

c. An understanding of how fast the water level in a slough drops once the river water surface is lower than the lowest point in the slough. The slough bottom may be formed by a fine clay layer (aquitard) which could hold water and juvenile salmon for many weeks.

RS-IF 12 **HSC and HSI are Qualitative:** While the HSC model provides a numeric relationship between environmental variables and habitat quality, both models rely on a suite of qualitative decisions some of which are based on salmon habitat preference in non-glacier systems.

RS-IF 13 **Gaining versus Loosing Reaches:** The 25 cfs calibration flow may help delineate loosing reaches if the field technicians can measured discharge precisely. If this is a study goal, it should be stated as such.

During rain events, the seven miles below the dam are certainly gaining reaches. If it is important to know how much water these reaches gain during a typical rain event (storm of similar or greater rainfall happened four times a summer) from the intermittent tributaries, one of the calibration runs needs to happen during a typical rainstorm. Clearly delineate how you will determine if the various small intermittent tributaries contribute enough water to change habitat suitability. If it is simpler to consider their water contributions to the Eklutna as insignificant, we can support that approach.

RS-IF 14 **PHABSIM Based on Likely Future Channel Geometry**: Ensure that the depth and velocity information fed into PHABSIM comes from the post flushing flow channel geometry and HEC-RAS model runs. Once the flushing flow is released, the relative quantities of different types of fish habitat (spawning, rearing, etc.) will likely be relatively stable through the decades even if the exact location of that habitat changes. The Eklutna River will still be a regulated river and objectives to maintain those levels of habitat could be included in the management plan.

RS-IF 15 **Flushing Flow Definition:** The RDSP vaguely defines "flushing flow" in the IFS chapter as a flow to move sediments in the channel and then it states "is further defined" in the GSTS." There is not a clear definition of "flushing flow" in the GSTS.

RS-IF 16 **Meso-habitat:** Agreement by the TWG on meso-habitats ideally happens after preliminary fieldwork, but before a large monitoring array is put in place to measure calibration flows. Please describe the summer 2021 timeline that allows adequate time for all steps.

3.2 Geomorphology/Sediment Transport Study (ST)

We appreciate the operations models presented by Sean Elleson on 1/26/2021 that illustrated the amount of forethought and forgone power generation providing a flushing flow will require. His presentation demonstrated that there is an extremely narrow timing window each August – September when the Utilities can successfully release a flushing flow at a reasonable cost. Releasing flushing flow within two months of that narrow window causes costs to increase greatly. From December 1 through approximately May 30, releasing a flushing flow is not possible with the current infrastructure.

RS-ST 1 **Metrics for a Flushing Flow:** The RDSP does not state the magnitude of a flushing flow but implies it will be defined as range of flow for 24 hours once the effects of 150 cfs calibration flow in 2021 have been analyzed. In Elleson's operational model (2021), he held the flushing flow at the midpoint in the range for 24 hours. An alternative metric could be once the operators attain the minimum flow in that range, the flushing flow will be considered complete if the operators hold the average value for 24-hours or release a defined number of acre-feet while remaining above the range's lower value. For example, if the flows remain above the minimum flow in the range for a defined number of days, however the utility is unable to hit the average value, then the Utilities can quit forfeiting potential power, bring the generators back on line, and have completed their obligation under the study plan. Details would be worked out in a TWG meeting.

RS-ST 2 **Flow that Disrupts/Mobilize the Armor Layer**: While most stakeholders agree in concept that this is one definition of a flushing flow, those same stakeholders could walk the channel post flushing flow and disagree if enough of the armor lay was disrupted to make those gravels available to salmon for spawning. A more quantifiable metric such as 75 percent of the sliding bead scour monitors show 3 inches or more depth of scour would lead to greater stakeholder agreement that the flushing flow met the objective. Scour as measured by bead scour monitors is a biased metric as installing those sliding bead monitors compromises the armor layer.

RS-ST 3 **Differential Fines Smaller than 2 mm:** The response table suggest the studies will not differentiate these size classes because it is not standard practice. The Eklutna River often runs chalky white. Clay sized particles are more likely to smother eggs and imbed cobbles than silt or sand particles. At least one and ideally several size bins smaller than 2 mm should be differentiated if understanding spawning habitat is a study goal.

RS-ST 4 **Water Removal is Largest Factor:** While many factors have altered the sediment transport processes in the Eklutna River, the removal of 95 percent of the water is the single largest factor.

RS-ST 5 **Understanding Sediment Sources using Changes Between the 2016 and 2020 LiDAR:** We support quantifying the change in sediment quantity on the alluvial fans but caution against assuming the 2016 to 2020 average volume change represents the average annual sediment input of the alluvial fans either in the past or in the future.

RS-ST 6 **Separate the Analysis of Surface and Sub-surface Substrates:** Provide separate analysis of surface substrate from subsurface substrate. Most previous sediment sampling effort over the years only measured the surface particles. Various studies recorded the surface substrate differently, as some parties record the surface veneer of fines (NVE 2020) while ADFG pushed that veneer of fines aside and recorded the larger particle underneath.

RS-ST 7 **Goal 3**: **Provide Tools for Estimating Future Sediment Transport**. The Utilities need estimates of future incision, aggradation, and scour rates under various future flow

regimes. Simply providing tools will not help decision makers.

RS-ST 8 **Sediment Transport Complexity:** Sediment transport varies between rivers because different rivers react differently to similar inputs and the mathematical computations do not fully replicate physical processes (Cui 2019, Mathias 2020). The northern hemisphere has other rivers that often flow supersaturated with glacial fines. We recommend using models that have been proven to work on rivers with similar sediment loads.

3.3 River Fish Species Composition and Distribution Study (FD)

RS-FD 1 **Which Species are Present:** This detailed study of what species are currently present does not address the appropriate question for the Eklutna River. Especially in the eight miles above the Thunderbird confluence, there are presently few anadromous fish. The goal is to predict what species could be there in the future, and in what quantities, under different flow regimes and different actions to recreate complex channels. The Appendix 1 response that future conditions will be dealt with in the Instream Flow Study is an oversimplification.

RS-FD 2 **Coho Run Timing:** To document the coho run, field technicians need to be available to conduct weekly foot surveys through November 30. In many Alaskan rivers coho run through November. While the ice cover present during some survey weeks in late October and November may force the technician to skip that week, the ice on the Eklutna River no longer just arrives in October makes all future spawning surveys impossible.

3.4 Macroinvertebrate Study (MI)

We have no further comments on the RDSP's Macroinvertebrate study.

3.5 Water Quality (WQ)

RS-WQ 1 **River Turbidity:** River turbidity is the most important water quality parameter to fish in the Eklutna River and changes considerably between days and along the river channel.

We recommend placing at least one continuously recording (hourly) turbidity meter in the river. This will allow the TWG to understand how often the river flips back and forth between fine sediment saturated and decently clear. The 3 - 5 day turbidity monitoring stints detailed in the RDSP will lack context if the general summer turbidity pattern of the river is not understood.

RS-WQ 2 **River Temperatures:** Temperature is also an important water quality parameter. The temperature measurements need a 0.5 degrees Celsius level of precision. While temperatures do not appear to be a limiting factor now in the Eklutna River, establishing baseline temperatures is important.

RS-WQ 3 **Have the USGS Install and Maintain a Gage above the Thunderbird Confluence**: A single USGS gage station could record 15-minute values for

discharge, turbidity and temperature in most months and would be invaluable as a point of reference for these episodic sampling events described in the study plan. Additionally, USGS discharge measurement are rarely questioned in legal disputes.

3.6 Stream Gaging Study (SG)

RS-SG 1 **Short Gage Records:** Gaging a site for 18-months provides little information. The gage on the lower Eklutna River above the Thunderbird confluence should be continue for at least five years as this will tell us whether the 18-month study period had abnormally high or low discharge and temperature values. When dividing water between competing uses it is important to be as certain as possible about the amount water that will be available. The accretion water available in the 8 miles below the dam is now being added to the mix, however water allocated for salmon habitat is an additional use. Similarity the Lach O'atnu Creek Gage should also be continued for five years. While it may be possible to present mostly complete study results to decision makers and the governor in late 2023, these fundamental discharge measurements should be continued.

RS-SG 2 **Public Availability of Gage Data**: Our preference would be for the gage data to be posted weekly June 1 through November 15 and then monthly the rest of the year. Posting data initially with a provisional tag is preferable to waiting until it is passes QA\QC review. Failing to regularly visit the discharge gage and review the discharge data the first summer often leads to multiday gaps in data record. If too many gaps occur in the gage record, a third or fourth year of gaging will be required. Not every gage visit to download discharge data needs to include gage maintenance or rating curve calibration activities.

RS-SG 3 **USGS Discharge Gage**: The RDSP suggests waiting until after the studies are complete to contract with the USGS for gaging of even a single site. We disagree with this approach because compliance with minimum flows to support fish habitat is likely to be based on a USGS gage site. USGS will not incorporate prior data collected by the Utilities into their gage record. Eklutna hydropower and municipal water is a complicated operation with many players and complex water rights. Involving USGS in gaging a single location from the outset will lessen legal costs in the future. The USGS will be display the data live and permanently archive it on the USGS water data site (https://waterdata.usgs.gov/nwis).

RS-SG 4 **Suitable Discharge Measuring Locations for the Accretion Study**: Field staff should not be looking for suitable stream gage locations during a release event. Appropriate locations should be identified prior to the event.

3.7 Lake Aquatic Habitat and Fish Utilization Study (AH)

RS-AH 1 **Methods for Task 1:** We recommend the study plan use fewer fish sampling methods so the results are more repeatable results. The more sampling methods employed, the harder it is to run valid statistical analysis of change. If fish distribution survey

documents four resident species, and overlook one less common one, that may affect management decisions. If there is potential for a state or federally listed resident species the consultant should use methods that are most likely to record it. The RDSP comment responses table did not address this comment.

3.8 Lakeside Trail Erosion Study (TE)

We have no comments on the Lakeside Trail Erosion Study.

3.9 Hydro Operations Modeling Study (HO)

RS-HO 1 **Hydro Data Years Selected:** A fundamental shift in the weather has occurred in central Alaska the last 30 years (Thoman 2019, Mauger 2016). Using the entire available hydrologic record assuming hydrographic stationarity is not aligned with current state of knowledge (Milly, 2008). We do not support using any rainfall/temperature data prior to 1990.

RS-HO 2 **Operations Model and Potential Flushing Flows**: Running the operations models based on average rainfall and reservoir levels was an excellent first step (Elleson 2021). We recommend expanding this work to look at the specifics of rainfall patterns in each of the last 10 summers and then determine in how many of those years the Utilities could have met the flushing flows objective.

RS-HO 3 **Flushing Flows Based on Single Atmospheric River Events**: Calculate the peak flushing flow that would have been achieved and potential energy forfeited had the Utilities shut down both turbines on September 28, 2019 and initiated a spillway release for four days. A similar September 15 to October 30, fall rain event is likely to happen in 2021, 2022 or 2023. Assuming the reservoir is full on September 15, what 72-hours rainfall total at the Eklutna dam combined with what snowline is required to hit various flushing flow targets? This is not a request for climate modeling; use the rainfall data from storms in the Sept 15 – October 30 window in the last decade as the study storm population.

3.10 Infrastructure Assessment Study (IA)

RS-IA 1 **Bridges' Susceptibility to Scour**: Study the Glenn Highway and railroad bridges' susceptibility to scour because these studies build stakeholder confidence that a flushing flow will not compromise critical infrastructure. Even though these structures are not part of the hydropower infrastructure, these studies must be completed during the summer of 2021. Scour studies are more in depth than the studies outlined in the RDSP that just determine the hydraulic capacity of the bridges.

RS-IA 2 **Temporarily Connecting the Lake and the Forebay:** Investigate whether a 3-foot diameter temporary pipe could connect the Eklutna Lake and the forebay pond without compromising the historical integrity of the original dam. This would extend the 30" x 30" gate's ability to provide sustained flow releases.

References

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