

# Eklutna Hydroelectric Project

## Supporting Information Document



April 2024

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## Attachments

- Attachment A. Consultation Record
- Attachment B. Final Summary of Study Results
- Attachment C. Supporting Data for Cost Effectiveness Modeling
- Attachment D. Draft AWWU Agreements
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- Attachment G. Public Comment Summary and Analysis
- Attachment H. Comparison to Existing Conditions
- Attachment I. Design Documentation Reports

## Terms, Acronyms, and Abbreviations

1991 Agreement	1991 Fish and Wildlife Agreement
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOT&PF	Alaska Department of Transportation and Public Facilities
AEA	Alaska Energy Authority
AF	acre-feet
AL&P	Anchorage Light & Power
APU	Alaska Pacific University
ARRC	Alaska Railroad Corporation
AWWU	Anchorage Water and Wastewater Utility
CEA	Chugach Electric Association, Inc.
cfs	cubic feet per second
CIAA	Cook Inlet Aquaculture Association
Draft Program	Draft Fish and Wildlife Program
EPA	Environmental Protection Agency
EUOC	Enterprise and Utility Oversight Committee
FERC	Federal Energy Regulatory Commission
Final Program	Final Fish and Wildlife Program
ft	feet
Governor	Governor of Alaska
IHN	Infectious Hematopoietic Necrosis
IIP	Initial Information Package
MEA	Matanuska Electric Association, Inc.
MGD	million gallons per day
MOA	Municipality of Anchorage
MW	megawatt
NMFS	National Marine Fisheries Service
NVE	Native Village of Eklutna
OHA	Office of History and Archaeology
OPCC	Opinion of Probable Construction Costs
Parties	CEA, MEA, MOA, NMFS, USFWS, and the State of Alaska
PME	protection, mitigation, and enhancement
Project	Eklutna Hydroelectric Project
Project Owners	CEA, MEA, and MOA
Proposed Final Program	Proposed Final Fish and Wildlife Program
RCA	Regulatory Commission of Alaska



resource management agencies	USFWS, NMFS, ADFG, ADEC, and ADNR
RM	river mile
State	State of Alaska
State Parks	ADNR Division of Parks and Outdoor Recreation
TCF	The Conservation Fund
TEK	Traditional Ecological Knowledge
Transaction Date	October 2, 1997
TU	Trout Unlimited
TWG	Technical Work Group
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

## 1.0 Introduction

The Eklutna Hydroelectric Project (Project) is located in Southcentral Alaska, approximately 30 miles northeast of downtown Anchorage near the Native Village of Eklutna (NVE). The federal government completed construction of the Project in 1955. Decades later, Chugach Electric Association (CEA), Matanuska Electric Association (MEA), and the Municipality of Anchorage (MOA) (collectively the “Project Owners”) agreed to purchase the Project and entered into a Purchase Agreement with the federal government in 1989. Shortly thereafter, concerns were raised about the Project’s potential impacts on fish and wildlife and a desire to avoid federal regulation. This led to the execution of a binding agreement in 1991 (referred to as the “1991 Agreement”) amongst the Project Owners, National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the State of Alaska (collectively the “Parties”) that requires the Project Owners to (1) study the Project’s impacts to fish and wildlife, (2) develop proposals for the protection, mitigation, and enhancement of fish and wildlife affected by the development of the Project, (3) consider the impact of fish and wildlife measures on electric rate payers, municipal water utilities, recreational users and adjacent land use, and (4) identify available means to mitigate these impacts. The Project Owners must repeat this process every 35 years and it replaces regulation by the Federal Energy Regulatory Commission (FERC). The sale of the Project was authorized by U.S. Congress in 1995, and the Project was sold to the Project Owners in October 1997.

Per the 1991 Agreement, the Project Owners were required to initiate this process no later than 25 years after the sale of the Project. Since the Project was sold in October 1997, the Project Owners were not required to initiate this process until October 2022. In order to allow meaningful consultation process and adequate time for a comprehensive analysis, the Project Owners initiated the process in March 2019, more than three years early. After several years of study and consultation with all interested stakeholders detailed in the Supporting Information Document, the Project Owners issued a Draft Fish and Wildlife Program (Draft Program) as required in the 1991 Agreement in October 2023. The Project Owners met with the Parties and NVE several times from December 2023 through March 2024 to attempt to resolve differences. They also held six public meetings in January 2024 to solicit public comments. After considering all comments received, and giving due weight to the recommendations and expertise of the Parties and NVE, the Project Owners have developed this Proposed Final Fish and Wildlife Program (Proposed Final Program) for submittal to the Governor.

Accordingly, the Project Owners are excited for the next phase of the Project. The Proposed Final Program includes the following:

- Construction of the Eklutna River Release Facility and establishment of year-round instream flows in the Eklutna River;
- Automation of the existing outlet gate at the dam to provide periodic channel maintenance flows in the Eklutna River;
- Construction of eight new bridges along the Anchorage Water and Wastewater Utility (AWWU) access road to enable AWWU's access to critical infrastructure year-round following the establishment of instream flows;
- Payment to Chugach State Park for lakeside trail repairs;
- Establishment of a Committee to oversee implementation of the Monitoring and Adaptive Management Plan;
- Funding to conduct monitoring studies in the Eklutna River throughout the 35-year program;
- Funding for physical habitat enhancement in the Eklutna River based on the monitoring results;
- Procedures for the Committee to adaptively manage the flow regime in the Eklutna River based on the monitoring results;
- Provisions for banking water in Eklutna Lake and potentially increasing the water budget for instream flows in the future;
- Potential installation of a fixed wheel gate to accommodate higher inflows in the future and/or allow higher channel maintenance flows if needed; and
- Potential installation of upstream and downstream fish passage facilities that meet specific criteria.

Approval of the Proposed Final Program will enable the Project Owners to implement these significant fish and wildlife measures at the Project, while simultaneously protecting the municipal water supply and continuing to provide low cost, renewable energy to Southcentral Alaska. The Project Owners anticipate the Governor's issuance of a Final Fish and Wildlife Program (Final Program) by October 2024.

This Supplement Information Document sets forth in a single document a description of the Project, its components and operations, the requirements of the 1991 Agreement, and a detailed summary of process and considerations leading to the Proposed Final Program. This

document also provides a guide to the large quantity of supporting information gathered and prepared by the Project Owners through the process that began in 2019. Some of that information is presented in text, tables, and figures in this Supporting Information Document or Attachments, while other information is referenced, hyperlinked, and made publicly available on the Project website ([www.eklutnahydro.com](http://www.eklutnahydro.com)). All such information is incorporated in the Proposed Final Program by reference.

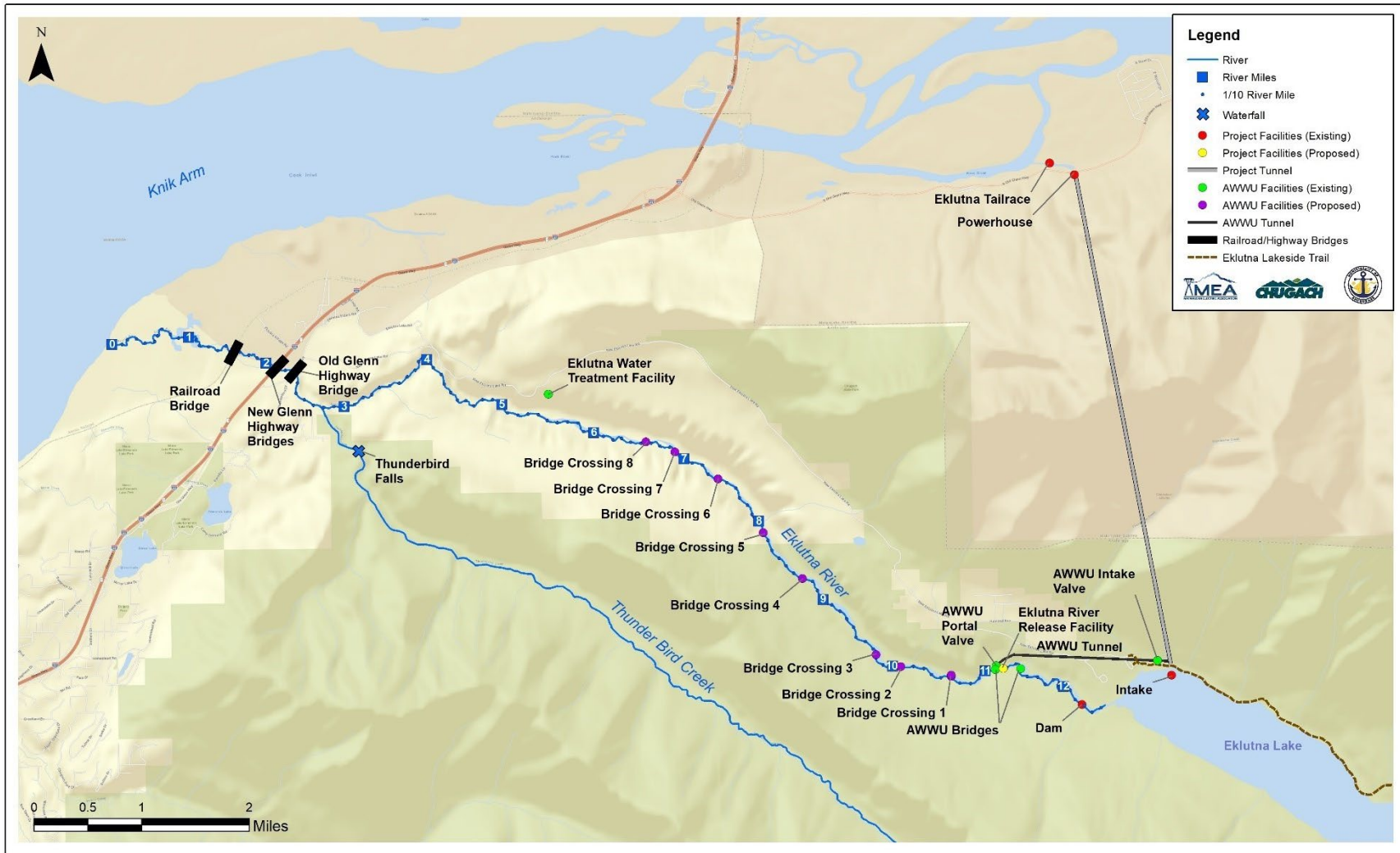


Figure 1-1. Existing and Proposed Infrastructure.

## 2.0 Existing Project Facilities and Operations

The 40-megawatt (MW) Project is located in Southcentral Alaska, approximately 30 miles northeast of downtown Anchorage near the Native Village of Eklutna (NVE). The U.S. Bureau of Reclamation (USBR) constructed the Project in 1955, which included rehabilitation of the old dam at the outlet of Eklutna Lake. The rehabilitated dam was damaged in the 1964 earthquake, at which point a new and taller embankment dam was constructed just downstream. This new dam (the existing dam) is an earth and rockfill structure 815 feet long and 41 feet high with a rectangular concrete spillway that runs through the dam.

Eklutna Lake (the Project reservoir) is approximately seven miles long and one mile wide and is located within Chugach State Park. The lake is the source of water for the Project. The reservoir also provides almost 90 percent of the domestic water supply for the Municipality of Anchorage to the Anchorage Water and Wastewater Utility (AWWU) through the Project intake. Typically, the reservoir fills during the summer months from snow and glacial melt and is drained during the winter months to generate power. The reservoir is generally at its lowest elevation in May and peaks in September.

The Project facilities and operation are designed to minimize release of water to the Eklutna River from the existing dam by capturing runoff during late spring/summer and taking that water out of the storage reservoir/Eklutna Lake over the course of the year and sending it through the powerhouse located on the Knik Arm. The Project water right entitles the Project Owners to operate the Project to fully utilize the water in Eklutna Lake for hydroelectric power production, except for the water that may be diverted for public water supply. The Project also provides other important benefits to electric customers including spinning reserve, frequency and voltage regulation, load following, and firming up electric generation from intermittent renewables. Additionally, the Project tailrace below the powerhouse provides a popular put-and-take Chinook and coho fishery. This fishery is public and handicap accessible.

Figure 1-1 above shows the Project location, legislative boundary for Chugach State Park, and the current extent of anadromy in the Eklutna River. The existing hydro project facilities are shown as red dots, an old hydropower project constructed in 1929 is represented by purple dots, and other non-project features such as the Eklutna Lake Campground, Eklutna Tailrace Day-Use Fishing Access Site, AWWU Water Treatment Plant, and NVE are represented by green dots. Other AWWU infrastructure shown in the figure includes the AWWU tunnel, portal valve, and buried pipeline. All three bridges in the lower river are also shown in Figure 1-1.

## 2.1 Existing Project Facilities

The Project consists of several components that allow water from Eklutna Lake to be diverted through a 4.5-mile-long tunnel to the powerhouse and eventually discharged into the Knik River for the purpose of power generation. The Project facilities and AWWU water supply infrastructure that is connected to Project facilities are briefly described below. More detailed information on Project facilities is provided in the IIP document available on the Project website ([www.eklutnahydro.com](http://www.eklutnahydro.com)).

### 2.1.1 Dam and Spillway

The existing dam is located approximately 1,400 feet downstream of the natural outlet of Eklutna Lake. It is an earth and rock fill embankment dam with a crest length of 815 feet, a crest width of 30 feet, and a crest elevation (EL.) of 891 feet<sup>1</sup>. The crest of the dam is finished with crushed rock material to form a stable road surface (Figure 2-1). An ungated overflow spillway is incorporated within the middle of the dam. The spillway crest is EL. 871 feet and the crest length is 18 feet. The dam allows for storage of water in Eklutna Lake for use throughout the year for power generation. The dam also prevents water from flowing into the Eklutna River unless the lake level exceeds the spillway crest elevation and water “spills” from the lake into the river via the spillway (see Section 2.2.3).



**Figure 2-1. Dam crest and ungated overflow spillway, looking north.**

There is a natural glacial moraine at the outlet of Eklutna Lake. When the lake level is below the crest of the moraine (EL. 860 feet), a pond is created between the moraine and the current dam (Figure 2-2). The water level in the pond is not monitored; however, the pond level can

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<sup>1</sup> Multiple vertical survey datums are reported in and around the main features of the Project. Throughout this document, the elevation datum that shall be used is the “local datum” tied to the crest of Eklutna Dam. Engineering documentation and design drawings, as presented in Attachment I utilizes the NAVD88, GEOID12B datum for consistency purposes throughout all of the Project Features, which is offset from the Local Datum by approximately 3.6-feet.

differ from the lake level by up to 30 feet in an average year. A small tributary entering the pond approximately 400-ft upstream of the dam keeps the water level steady in the pond when the lake is disconnected from the dam, with a small outflow leaving the pond and entering Eklutna Lake.

There is a 30-inch by 30-inch drainage outlet gate in the base of the spillway crest at El. 852 feet that was designed to drain the pond when water becomes trapped there during late fall or early winter. At the time, it was thought that this water would cause detrimental frost action against the toe of the current dam and at the spillway inlet. However, no detrimental frost action has been observed, and the gate is currently not used for this purpose. This cast iron gate was replaced in 2021 with a stainless-steel gate to allow for study flow releases that same year.



Figure 2-2. Pond between the natural glacial moraine and existing dam in May 2020.

### 2.1.2 Reservoir

Eklutna Lake is a natural lake formed by the retreating Eklutna glacier. It is approximately 7 miles long, one mile wide, and 200 feet deep at its deepest. The natural lake elevation is El. 850 feet.



The current dam raises the water level of Eklutna Lake by 21 feet to a maximum regulated lake level of El. 871 feet (the elevation of the spillway crest). At this elevation, the lake has a surface area of 3,420 acres. The minimum regulated lake level is El. 814 feet, which provides an active storage capacity of 174,800 acre-feet. Storage between the spillway crest (El. 871 feet) and the dam crest (El. 891 feet) is an additional 72,800 acre-feet.

### **2.1.3 Intake**

The intake is located on the north shore of Eklutna Lake approximately one mile east of the dam. Water is diverted from the lake through an inlet channel 100 feet wide and originally about 720 feet long excavated at the lake bottom (the original intake structure and portions of the original intake conduit damaged in the 1964 earthquake remain in the intake channel). The intake channel leads to the intake structure, which consists of a rectangular reinforced concrete box structure, open and protected by trash racks on its top, front, and both sides. Elevation of the invert (i.e., the base elevation of the intake) is El. 793.6 feet.

### **2.1.4 Tunnel and Surge Tank**

A 4.5-mile-long tunnel through Goat Mountain conveys water from the intake to the penstock. The tunnel is a circular, concrete-lined pressure tunnel with a 9-foot inside diameter. The tunnel terminates in a surge chamber located directly over the tunnel prior to entering the project penstock. The surge tank is used to dampen pressure surges within the conveyance during operation.

### **2.1.5 Penstock**

Extending from the surge tank at the end of the tunnel is the penstock, which conveys water to the power plant turbines. The overall length of the penstock is about 1,088 feet. The penstock is a variable-diameter (91-, 83-, and 75-inch-outside-diameter) welded and coupled steel pipe encased in concrete in a tunnel extending from the surge tank to the power plant. At the powerplant, the penstock bifurcates into two 51-inch-diameter 23-foot-long branches, which are connected to the spiral cases of the turbines. A 66-inch butterfly valve is installed in each penstock branch upstream from the turbines to provide means of dewatering the turbines for servicing or maintenance. These valves also serve as emergency shutoff valves in the event of damage to the turbines.

### **2.1.6 Power Plant and Switchyard**

The Eklutna Power Plant (Figure 2-3) is located on the Old Glenn Highway. It houses two vertical-shaft Francis-style hydroelectric generating units with an installed nameplate capacity

of 44.4 MW. The switchyard equipment, consisting of the power circuit breakers, disconnecting switches, and main buses, is on the roof of the Eklutna Power Plant.



Figure 2-3. Eklutna Power Plant.

### 2.1.7 Tailrace

Water discharged from the turbines in the Eklutna Power Plant enters a 209-foot-long tailrace conduit through which the water is conducted under the Old Glenn Highway to a 2,000-foot-long open tailrace channel which discharges into the Knik River (Figure 2-4). The channel has a top width of about 75 feet, a bottom width of 25 feet, and a depth of about 12 feet 6 inches.



Figure 2-4. Fisherman at the Eklutna Tailrace.

### 2.1.8 AWWU Connection to Project Tunnel

A water supply project was constructed in 1988 to supply water to Anchorage from Eklutna Lake (Eklutna Water Project). It is now the main source of drinking water for the Anchorage service area. The Eklutna Water Project diverts Eklutna Lake water from the Project tunnel to a diversion tunnel that connects to a buried pipeline. Water flows by gravity through the one-mile-long diversion tunnel and the approximately six-mile-long buried pipeline down the Eklutna River valley to a 750-kW energy recovery station at the Eklutna Water Treatment Plant (see Figure 1-1).

A portal valve at the intersection of the AWWU tunnel and pipeline, located approximately one mile downstream of the existing dam, is used to shut down the pipeline for emergency or maintenance purposes. The pipeline drain valve is located approximately six miles downstream of Eklutna Dam. AWWU maintains an access road that roughly parallels the pipeline and crosses the riverbed in a series of bridges and fords. After treatment, water flows by gravity through a 23-mile-long buried pipeline to the distribution system. This system supplies water to the Anchorage service area, from Eklutna Village to Potter Marsh in South Anchorage. Approximately 10% of the water diverted from Eklutna Lake provides up to 90% of the public water supply for the Municipality of Anchorage. The remaining 90% of water diverted from Eklutna Lake is used for power production.

### 2.1.9 Water Rights

When the Project was originally authorized in the Eklutna Project Act of 1950,<sup>2</sup> Congress also created a federal reserved water right in Eklutna Lake and its tributaries for the purposes of operating the Project. Under federal and state law, the Project's water right dates back to December 31, 1954, when the Project began operations.<sup>3</sup>

Later, after Alaska statehood, the then-federal owner of the Project, the Alaska Power Administration (APA), applied for a Certificate of Appropriation from the State of Alaska in order to comply with newly-created state law. This permanent Certificate of Appropriation (Certificate) was originally granted in 1973 and is now referred to as "ADL 44944." As subsequently amended, ADL 44944 mirrors the federal reserved water right and authorizes the Project Owners to use any and all of the natural inflow to Eklutna Lake for hydroelectric power generation subject to other terms of the Certificate.

In 1984, MOA sought to use Eklutna Lake for public water supply. Typically, under Alaska law, such a new use would be disallowed due to the senior water right of the APA, but Alaska law

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<sup>2</sup> Public Law 81-628, 64 Stat. 383 (1950).

<sup>3</sup> ALASKA STAT. § 46.15.050(b) (2022).

also permits the use of Alaska waters for public water supply even where there are prior appropriators given the importance of maintaining a sufficient water supply.<sup>4</sup> Such use is referred to as “preferred use”.<sup>5</sup> In acknowledgement that such preferred use can burden or harm a prior appropriator (water right holder), Alaska law requires that such use be subject to compensation in order to minimize such burden or harm.<sup>6</sup> Accordingly, the MOA and the then-owner (APA) entered a long-term compensation agreement entitled “Agreement for Public Water Supply and Energy Generation from Eklutna Lake, Alaska” dated February 17, 1984, that expires in 2025 (Water Supply Agreement).

Further, MOA and APA worked with Congress to amend the *Eklutna Project Act* to include the additional public water usage of the Eklutna Lake that was otherwise reserved for the purposes of the Project.<sup>7</sup> MOA also obtained a 40-year permit to appropriate water from the State of Alaska to utilize water from Eklutna Lake, referred to as “LAS 2569.” LAS 2569 expires on December 31, 2025, and may be replaced with a certificate of appropriation subject to the continuing obligation to compensate the holder of ADL 44944 (the Project Owners).

Upon the sale of the Project to the Project Owners in October 1997, the federal reserved water right and ADL 44944 were conveyed to the Project Owners in a quitclaim deed<sup>8</sup> and the Water Supply Agreement was assigned to by the Project Owners.<sup>9</sup>

### 2.1.10 Land Ownership and Management

Land ownership and management in the Project area are shown below in Figure 2-5. A majority of the land adjacent to the Eklutna River was once owned by the federal government and due to a number of Alaska Native Claims Settlement Act conveyances, is now owned by Eklutna, Inc. Such ownership includes the area where the lower dam on the Eklutna River was once located, and which Eklutna, Inc. subsequently removed.

Notable exceptions to this Eklutna, Inc. area ownership today remain, however, including that: (1) the land around the AWWU portal valve is owned by BLM, and (2) the land surrounding the Eklutna Dam is owned by the State of Alaska. When the Eklutna Dam was built, this land

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<sup>4</sup> ALASKA STAT. § 46.15.150 (2022).

<sup>5</sup> ALASKA STAT. § 46.15.150 (2022). “Preferred use” is further defined under Title 11 of the Alaska Administrative Code Section 93.230, which provides: “Preferred use status allows the use of water for a preferred use when adequate water is not available from the same source to supply all lawful appropriators.”

<sup>6</sup> ALASKA ADMIN. CODE tit. 11 § 93.240 (2023).

<sup>7</sup> Public Law 98-552, 98 Stat. 2824 (1984).

<sup>8</sup> “Quitclaim Deed, Federal Reserved Water Right Under the Eklutna Project Act of 1950, 64 Stat. 382, As Amended, Including State of Alaska Water Rights Certificate of Appropriation (Amended) ADL 44944”, dated October 2, 1997.

<sup>9</sup> Assignment and Transfer of Agreement for Public Water Supply and Energy Generation from Eklutna Lake, Alaska, as Supplemented, dated October 2, 1997.

surrounding the Eklutna Dam was still owned by the federal government, but when the Project was transferred to the Project Owners in 1997, the federal government gave the Project Owners a perpetual right-of-way to access this land for operating the Project (serial number AA-70133) so long as the Project exists.<sup>10</sup> When that same land was subsequently transferred by the federal government to the State of Alaska in 1998, such transfer was subject to AA-70133.<sup>11</sup> AWWU also has all necessary rights-of-way to access and operate its facilities adjacent to the Eklutna River, including the AWWU portal valve, access road, and buried pipeline.

A majority of the land adjacent to Eklutna Lake is also owned by Eklutna, Inc. but is managed by ADNR as part of Chugach State Park.

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<sup>10</sup> UNITED STATES DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, RIGHT-OF-WAY GRANT, Serial Number AA-70133 (September 15, 1997).

<sup>11</sup> United States of America Patent No. 50-2019-0080.

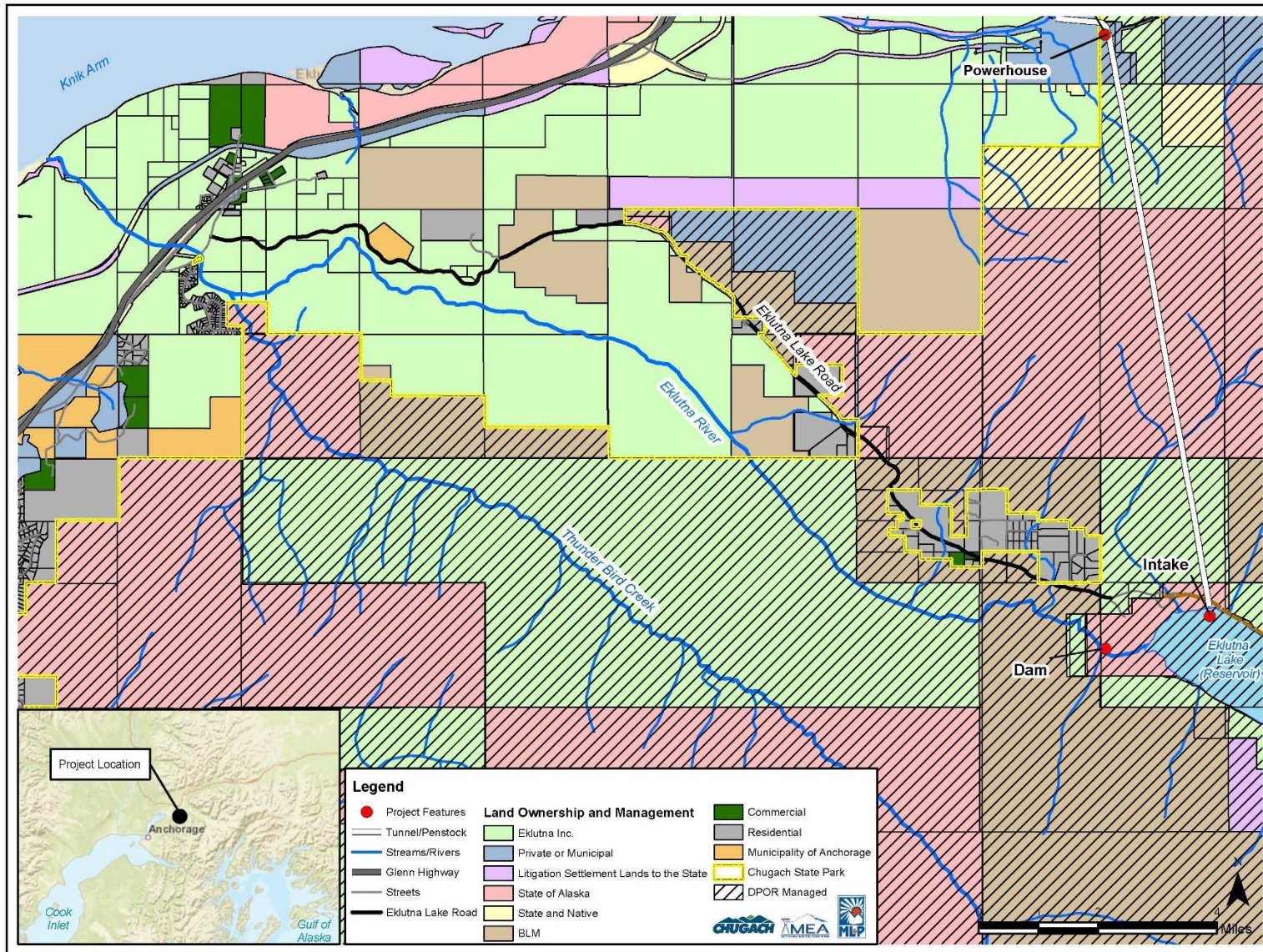


Figure 2-5. Land Ownership and Management in the Project Area.

## 2.2 Existing Project Operations

The Project Owners operate the Project to provide firm, low-cost, renewable energy. Project-generated renewable energy offsets approximately 72,500 metric tons of CO<sub>2</sub> equivalent each year and can be used to regulate other renewable energy sources like wind and solar in the future. The Eklutna Dam allows storage of spring and summer runoff for power generation in the winter when it is needed most.

### 2.2.1 Reservoir Operations

Typical operation of the Project is to fill the reservoir during the summer and drain it during the winter months. The Project operators try to refill the reservoir as much as possible without spilling, and the extent of winter drawdown is based on power requirements and the operator's estimates of the winter snowpack. The lake level is generally at its lowest elevation in May and then peaks in September. As shown in Figure 2-6, the lake level is drawn down below the natural lake level (El. 850 feet) for about six months out of the year, and below the crest of the natural glacial moraine (El. 860 feet) for about 9 months out of the year.

The lake level increases as a result of inflows (mostly glacial melt) and is drawn down by operation of the tunnel/penstock system. Assuming no inflow, the lake can be drawn down by approximately four inches per day when the Eklutna Power Plant is generating at max capacity (660 cfs). Water conveyance can be closed at the lake intake structure by closing the intake bulkhead gate or by closing the turbine wicket gates or the turbine inlet valves within the powerhouse.

Flow through the Eklutna Power Plant is the primary means of controlling the water level in Eklutna Lake. In addition, the 30-inch by 30-inch drainage outlet in the base of the spillway (see Section 2.1.1) is controlled by a manually operated slide gate conduit and can release up to 190 cfs (with reservoir at the spillway crest). Operation of the spillway slide gate is checked on an annual basis and the operating mechanism lubricated.

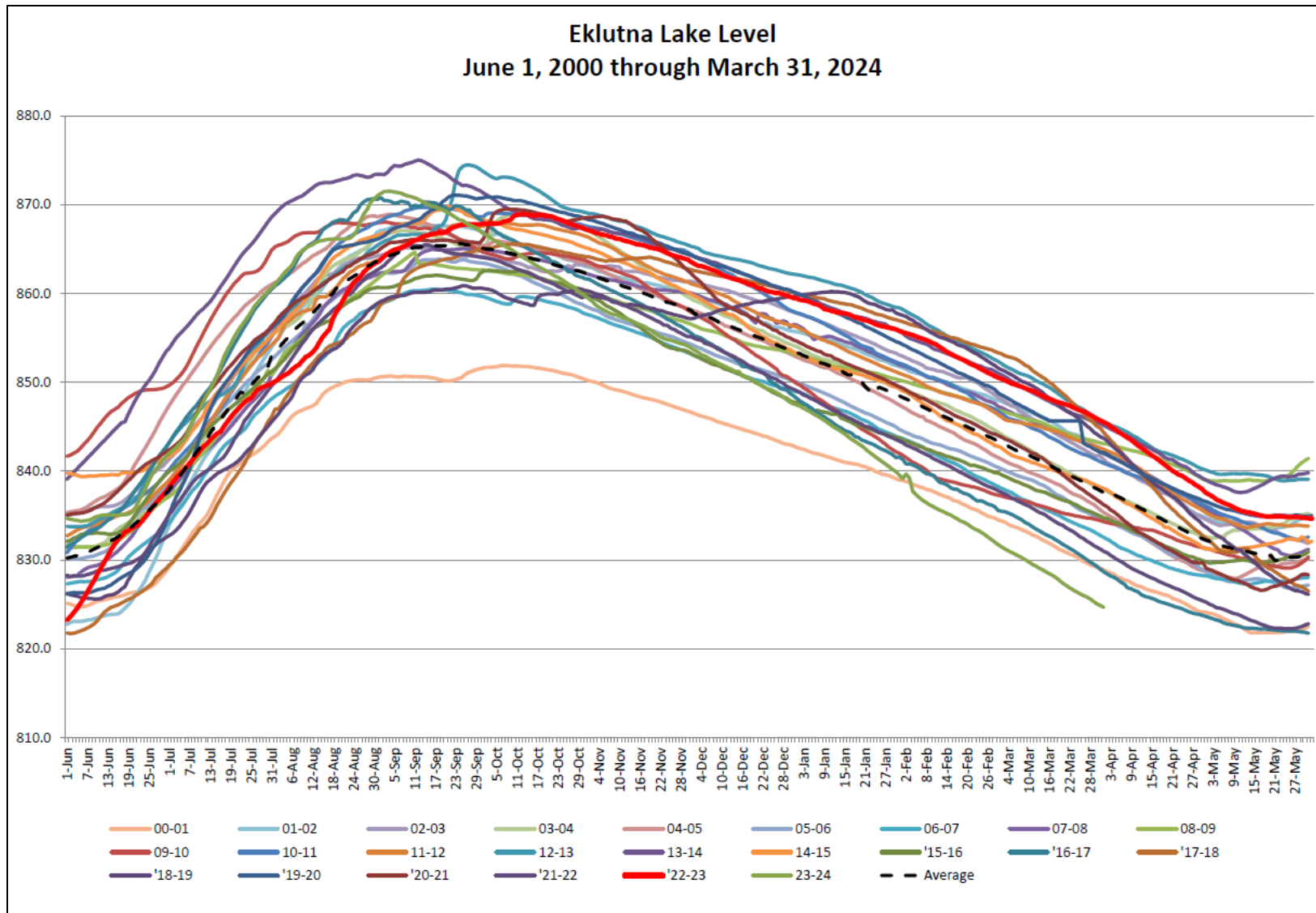
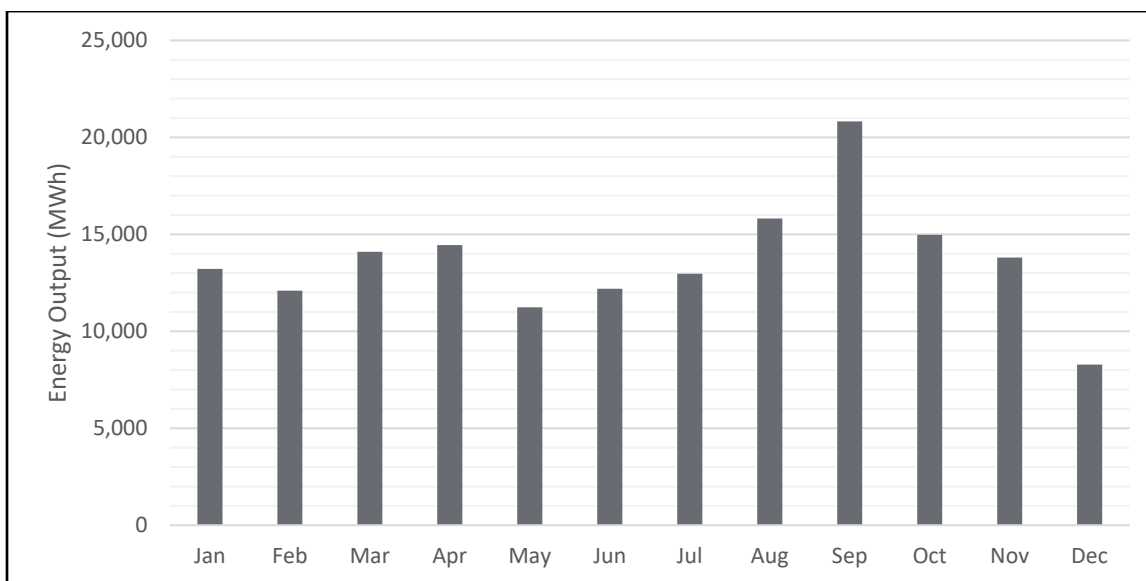


Figure 2-6. Eklutna Lake Level from June 1, 2000, through March 31, 2024.



## 2.2.2 Energy Generation and Cost of Power

The Project produces nearly 6% of the Project Owners' combined total generation portfolio, approximately 44% of MEA's renewable generation portfolio, and approximately 25% of CEA's renewable generation portfolio. The Project is consistently the lowest-cost resource for power in the Railbelt (i.e., the inter-connected transmission line system that runs from Fairbanks to Homer) and is necessary for MEA to meet their power capacity reserve reliability standard requirements. The average monthly energy generation output of the project is presented in Figure 2-7.



**Figure 2-7. Eklutna Power Plant Average Monthly Energy Output.**

One of the other major benefits of the Project is increased grid reliability through diversification of fuel for generation. With an uncertain future regarding natural gas supply and costs, hydropower plays an important alternate energy source if there is an interruption to the availability of natural gas. In addition, Project generation offsets approximately 72,500 metric tons of CO<sub>2</sub> equivalent each year.

The Project's value is underscored by the difficulty in locating replacement generation of similar characteristics. CEA and MEA are looking to add renewable resources to meet their respective clean energy goals, and they are grappling with considerable unknowns such as how renewable generation resources and the necessary new transmission lines for such resources can be contracted, permitted, financed, constructed, interconnected, and integrated with the existing Railbelt electric system. The cost of energy storage, integration, and regulation of intermittent generation resources adds considerable complexity and cost.

### 2.2.3 Spill Events

Spill occurs when water flows from Eklutna Lake into the Eklutna River via the ungated spillway (El. 871 feet). Since the spillway is ungated, the Project operators cannot control spill. Ten spill events have occurred since the existing dam was constructed in 1965. Table 2-1 summarizes the historical data and calculated values for each of these spill events.

**Table 2-1. Summary of Spill Events at Eklutna Dam from 1965 to 2023.**

Year	Spill Period	Duration (Days)	Peak Lake Level Elevation (ft)	Average Lake Level Elevation (ft)	Peak Spillway Flow (cfs)	Average Spillway Flow (cfs)	Total Volume Spilled (AF)
1967	9/20 – 10/11	22	872.99	-	160	-	-
1977	8/15 – 9/26	43	874.60	-	396	-	-
1981	8/15 – 9/23	40	873.50	-	226	-	-
1989	9/5 – 10/7	33	873.73	872.40	259	107	7,018
1990	9/12 – 9/27	16	872.31	871.78	85	43	1,370
1995	9/21 – 10/20	30	877.62	874.40	1,022	426	25,356
1997	8/19 – 10/31	74	875.51	873.33	561	242	35,591
2012	9/23 – 10/19	27	874.52	873.10	383	188	10,055
2013	8/9 – 10/1	54	874.99	873.18	464	201	21,567
2023	9/1 – 9/8	8	871.51	871.36	18	10	157

The highest lake level elevation ever recorded in Eklutna Lake was 877.62 feet on September 25, 1995. At this elevation, the flow through the spillway was calculated to be 1,022 cfs. The longest spill event at Eklutna Dam occurred in 1997 and lasted for a total of 74 days. The calculated total volume of water spilled during this time was 35,591 acre-feet.

## 3.0 Requirements of the 1991 Agreement

The 1991 Agreement is the guiding document that the Project Owners have followed during development of the Proposed Final Program and is available [here](#) on the Project website for reference. The Project Owners recognize that there is a high level of interest in the Eklutna River and are committed to meeting their obligations as outlined in the 1991 Agreement. The overarching goal of the Project Owners is to provide the information that will allow the Governor to make an informed decision with regard to the Final Program.

The main focus of the 1991 Agreement concerns protection, mitigation of damages to, and enhancement of fish and wildlife (including related spawning grounds and habitat) affected by hydroelectric development of the Eklutna Project. It specifies that the Project Owners are responsible for the consultation, study, and implementation provisions called for in the 1991 Agreement.

### 3.1 Procedural Requirements

The 1991 Agreement required the Project Owners to fund and conduct studies to examine and quantify, if possible, the impacts to fish and wildlife from the hydroelectric development of the Project. The studies were also designed to examine and develop proposed protection, mitigation, and enhancement (PME) measures to address those impacts. This examination also had to consider the impact of fish and wildlife measures on electric rate payers, municipal water utilities, recreational users, and adjacent land use, as well as available means to mitigate those impacts.

Per the 1991 Agreement, the study plans had to be developed by the Project Owners in consultation with the USFWS, NMFS, the Alaska Department of Fish and Game (ADFG), the Alaska Department of Environmental Conservation (ADEC), and the Alaska Department of Natural Resources (ADNR), collectively the “resource management agencies.” The study plans had to include a schedule for the consultation, comment, and decision making required by the 1991 Agreement to be adopted by the Parties<sup>12</sup> in consultation with the Governor. Prior to implementation of the studies, the Parties had to review the study plans and concur with their scope of work. The Project Owners were required to seek input from the resource management agencies and other interested stakeholders as the studies progressed and provide the resource management agencies with an opportunity to comment on the Draft Study Reports. All comments and responses had to be included in the Final Study Reports.

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<sup>12</sup> The Parties to the 1991 Agreement as it pertains to the Eklutna Hydroelectric Project are CEA, MEA, MOA, NMFS, USFWS, and the State of Alaska.

After the Final Study Reports were prepared, the Project Owners were required to prepare a Draft Summary of Study Results and a Draft Program. The Draft Program had to include the PME measures recommended by the Project Owners and set a tentative schedule for their implementation. The Project Owners were required to provide the resource management agencies with an opportunity to comment on the Draft Summary of Study Results and the Draft Program and/or provide recommendations. If the resource management agencies' comments or recommendations differ from those of the Project Owners, the Project Owners had to attempt to resolve such differences giving due weight to the recommendations, expertise, and statutory responsibilities of the resource management agencies.

Once comments and recommendations had been received, the Project Owners were required to hold at least one public meeting each in Anchorage and the Matanuska Valley to receive public comment on the Draft Summary of Study Results, the Draft Program, and the comments and recommendations of the resource management agencies. The Project Owners were required to prepare a summary and analysis of all comments received, develop a Proposed Final Program, and prepare an explanatory statement describing the basis for the Proposed Final Program. All of this information must be provided to the Parties and the Governor.

The Parties then have 60 days to submit written comments on the Proposed Final Program, and any alternative recommendations for the protection, mitigation, and enhancement of fish and wildlife resources, to the Governor. The Project Owners then have 30 days to submit written reply comments to the Governor. The Governor is required to review the Proposed Final Program as well as any comments or recommendations for alternative PME measures while giving equal consideration to:

1. Efficient and economical power production
2. Energy conservation
3. The protection, mitigation of damages to, and enhancement of fish and wildlife (including related spawning grounds and habitat)
4. The protection of recreational opportunities
5. Municipal water supplies
6. The protection of other aspects of environmental quality
7. Other beneficial public uses
8. Requirements of State law

Based on his review and consideration, the Governor is required to establish a Final Program that adequately and equitably protects, mitigates damage to, and enhances fish and wildlife resources (including affected spawning grounds and habitat) affected by the Project. The Project Owners are required to implement the Final Program established by the Governor. Pursuant to the 1991 Agreement and APA Asset Sale Act, the Governor's decision regarding the provisions of the Final Program is reviewable and enforceable by the Parties in the U.S District Court for the District of Alaska.

### **3.2 Schedule Requirements**

The 1991 Agreement gives deadlines for specific milestones in the consultation, program development, and implementation processes. These deadlines, listed below, are all relative to the date on which ownership of the Project was officially transferred from the Federal government to the current Project Owners (October 2, 1997). This date is referred to as the Transaction Date.

- Initiate the consultation process no later than 25 years after the Transaction Date (October 2, 2022)
- Issuance of the Final Program by the Governor at least 3 years prior to implementation (October 2, 2024)
- Begin implementation of the Final Program no later than 30 years after the Transaction Date (October 2, 2027)
- Complete implementation of the Final Program no later than 35 years after the Transaction Date (October 2, 2032)

The Project Owners are required to repeat the process called for in the 1991 Agreement on a recurring basis every 35 years, beginning within 25 years of the time implementation of the Final Program has been completed for the prior consultation process. In addition, the Project Owners are required to repeat the process called for in the 1991 Agreement prior to undertaking any major structural or operational modifications substantially affecting water usage or fish and wildlife at the Project.

## 4.0 Compliance with the 1991 Agreement

The Project Owners have fully met the procedural and schedule requirements of the 1991 Agreement to date. In fact, the Project Owners have gone well beyond the requirements of the 1991 Agreement in terms of consultation, documentation, and analysis of alternatives. In terms of schedule requirements, the Project Owners began the process more than three years prior to the prescribed initiation date. The following sections describe the efforts undertaken by the Project Owners to date to comply with the 1991 Agreement and highlight the efforts that have gone beyond the requirements.

### 4.1 Early Consultation

The 1991 Agreement states that the Project Owners shall consult with the USFWS, NMFS, ADF&G, ADEC, and ADNR regarding the development of study plans and that “the consultation process shall be initiated no later than 25 years after the Transaction Date,” (i.e., October 2, 2022).

The Project Owners began the consultation process in 2019, three years earlier than required by the 1991 Agreement. Recognizing the high level of public and tribal interest in the Project, the Project Owners did not limit consultation to the five federal and state agencies identified in the 1991 Agreement, but they reached out to many other entities with an interest in the Project. Their consultation efforts included in-person meetings, quarterly calls and newsletters, technical work groups, and involvement of interested stakeholders in the alternatives analysis process. A summary of consultation undertaken by the Project Owners is included in Attachment A; early consultation efforts are highlighted below.

#### 4.1.1 Initial Consultation Meetings

In March and April of 2019, more than three years earlier than required by the 1991 Agreement, the Project Owners conducted in-person initial consultation meetings with multiple agencies and interested stakeholders. In total, the Project Owners met with 14 agencies and interested stakeholders as part of their initial consultation efforts, including:

- National Marine Fisheries Service (NMFS)
- U.S. Fish and Wildlife Service (USFWS)
- Alaska Department of Fish and Game (ADFG)
- Alaska Department of Environmental Conservation (ADEC)

- Alaska Department of Natural Resources (ADNR), including:
  - Division of Mining, Land, and Water
  - Division of Parks and Outdoor Recreation (State Parks)
  - Office of History and Archaeology (OHA)
- Alaska Department of Transportation & Public Facilities (ADOT&PF)
- Alaska Railroad Corporation (ARRC)
- Anchorage Water and Wastewater Utility (AWWU)
- U.S. Army Corps of Engineers (USACE)
- Eklutna, Inc.
- Native Village of Eklutna (NVE)
- The Conservation Fund (TCF)

After these initial consultation meetings, the Project Owners identified additional interested stakeholders and consulted with them as appropriate, including Cook Inlet Region, Inc. (CIRI), Cook Inlet Aquaculture Association (CIAA), The Alaska Center, Trout Unlimited (TU), the Alaska Energy Authority (AEA), the Alaska Institute for Climate and Energy (ALICE), staff from Alaska Pacific University (APU), the Anchorage Watershed and Natural Resources Advisory Commission (WNRC), and the U.S. Bureau of Land Management (BLM).

Some entities, while interested in the Project, declined to participate in the consultation process, including the U.S. Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), National Weather Service (NWS), and the Anchorage Waterways Council.

#### **4.1.2 Group Stakeholder Meeting**

During the initial consultation meetings, several entities requested a follow-up group meeting to promote technical discussion amongst the agencies and interested stakeholders. In response to those requests, the Project Owners conducted an in-person follow-up group meeting on July 16, 2019. Discussion topics included a review of the contact list and existing information gathered to date, updates on on-going data collection by others, an overview of current Project operations, discussion regarding the initial comments and concerns of agencies and interested stakeholders, and next steps.

### **4.1.3 Project Website**

In 2019 the Project Owners developed and launched a Project website, [www.eklutnahydro.com](http://www.eklutnahydro.com). The purpose of this website is to provide information on the efforts being undertaken by the Project Owners to comply with the 1991 Agreement, including background information, the Project schedule, Project updates, reference and final documents, frequently asked questions, and a contact form.

### **4.1.4 Quarterly Update Calls**

During the July 2019 Group Stakeholder Meeting, it was suggested that the Project Owners conduct quarterly calls to update the agencies and interested stakeholders on Project activities. The Project Owners conducted the first quarterly update call in November 2019, and since that time, have continued to conduct these calls approximately every three months.

### **4.1.5 Anchorage Assembly**

In February 2020, the Project Owners were invited to give a brief presentation to the Anchorage Assembly at a work session regarding the Eklutna River. The Project Owners have continued to provide subsequent updates to the Anchorage Assembly's Enterprise and Utility Oversight Committee on a quarterly basis. All of the presentations that have been given to the Anchorage Assembly are available [here](#) on the Project website.

### **4.1.6 Native Village of Eklutna**

Eklutna Village is located near the mouth of the Eklutna River. The historical and current presence of the Eklutna Dena'ina in the area is described in the IIP. The Project Owners first met with NVE as part of their initial consultation efforts (Section 4.1.1) and have continued to engage with NVE throughout this process.

In April 2020, NVE requested formal recognition as a consulting government, with their Land and Environment Department analogous to other governmental signatories, for purpose and processes of the 1991 Agreement applicable to the Project. In a May 2020 letter to the Project Owners, NVE recognized that amending the 1991 Agreement may entail substantial time and effort, and as an alternative invited a joint letter from the Project Owners to the effect that the Project Owners will act in good faith to help mitigate impacts to the Eklutna River and that the Project Owners will recognize NVE as a consulting government on a basis comparable to the governmental signatories to the 1991 Agreement.

In June 2020, the Project Owners responded to NVE's request by committing to a review and participation framework that ensures information NVE and its members share regarding the



Eklutna River and development of the Fish and Wildlife Program is appropriately considered and addressed. This includes:

- Providing significance and due weight to NVE's expertise throughout the development of the Fish and Wildlife Program
- Recognizing and including traditional ecological knowledge (TEK) in the review and development of the study plans and Fish and Wildlife Program
- Working with NVE to schedule additional meetings with the goal of hearing input from NVE and its members (one after the study program is completed and another following the development of the Draft Program) and coordinating with NVE on developing the agenda items for these meetings
- Recommitting to sharing all study plans, data, reports, and comments directly with NVE when developed to seek feedback
- Submitting an NVE-specific comment summary to the Governor for consideration along with the Project Owners' Proposed Final Program (see Section 4.12)

The Project Owners' letter also stated: "We value the unique perspectives of NVE's members regarding the Eklutna River, and we also understand that NVE is primarily interested in the presence of both water and salmon in the lower Eklutna River. While we are contractually and legally bound by the terms of the Agreement, please know that if the process set forth in the Agreement bears out the release of water from Eklutna Lake and the addition of salmon into the Eklutna River as part of the Fish and Wildlife Program, we will be prepared to support it."

Since then, NVE has been involved in all four Technical Work Groups (TWGs) (see Section 4.3), the alternatives analysis (see Section 4.5), and attempts to resolve differences (see Section 4.8). The Project Owners have also met with the NVE Tribal Council on several occasions, including meetings with the Boards of Directors for both CEA and MEA and the Anchorage Assembly.

#### **4.1.7 Project Newsletter**

In December 2020, the Project Owners published their first Project newsletter. These newsletters provided a status update regarding the Project Owners' efforts to comply with the 1991 Agreement and next steps. They have been issued quarterly and are all available [here](#) on the Project website.

## 4.2 Initial Information Package

Although not required by the 1991 Agreement, the Project Owners developed an Initial Information Package (IIP) document. The IIP established a baseline of existing information and informed the study planning process required by the 1991 Agreement. The Draft IIP was distributed to stakeholders in March 2020 for review and comment. The Project Owners received comments from NMFS, ADNR, ADOT&PF, NVE, TCF, TU, ALICE, and two members of the public. The Project Owners revised the document based on comments received and issued the Final IIP in September 2020. The Draft and Final IIP and all comments received are available [here](#) on the Project website. All reference documents used to develop the IIP are available [here](#).

## 4.3 Technical Working Groups

In April 2020, a Technical Working Group (TWG) focused on aquatic resources was established to solicit technical input throughout study planning, implementation, and reporting. In October 2021, three more TWGs were established to address other resource areas, including the Terrestrial TWG, Cultural TWG, and Recreation TWG. Table 4-1 shows the entities that participated in each of the TWGs.

**Table 4-1. Technical Working Group Members.**

Entity	Aquatics	Terrestrial	Recreation	Cultural
Native Village of Eklutna	x	x	x	x
Alaska Department of Fish and Game	x	x	x	
ADNR Chugach State Park			x	
ADNR Office of History and Archaeology				x
U.S. Fish and Wildlife Service	x	x		x
National Marine Fisheries Service	x			
Trout Unlimited	x		x	
Alaska Pacific University	x	x		
Project Owners	x	x	x	x

The TWGs met regularly to assist in study planning and review technical information developed by the study program and by others. A total of 28 TWG meetings were held during the study program (see Attachment A).

## 4.4 Study Program

The 1991 Agreement required the Project Owners to fund studies to examine and quantify, if possible, the impacts to fish and wildlife from the Project. Per the 1991 Agreement, the studies had to examine and develop proposed PME measures to address those impacts. This examination had to also consider the impact of potential fish and wildlife measures on electric rate payers, municipal water utilities, recreational users, and adjacent land use, as well as available means to mitigate these impacts.

Beginning in 2020, the Project Owners consulted with the TWGs regarding the development of a comprehensive, 2-year study program implemented in 2021 and 2022. During that same time period, several other entities were also conducting studies in the Eklutna watershed. These studies included:

- Aquatic habitat monitoring conducted by ADFG, originally under an agreement with Eklutna Inc., then under a new agreement with TU. These study results were shared with the Project Owners.
- Sediment transport monitoring at the highway and railroad bridges conducted by Eklutna, Inc. These study results were shared with the Project Owners.
- Adult salmon spawner surveys conducted by NVE. The data collected in 2021-2022 were shared with the Project Owners.
- Minnow trapping in the lower Eklutna River conducted by NVE. The data collected in 2021-2022 were shared with the Project Owners.
- Habitat assessment of the East and West Forks of Eklutna Creek conducted by NVE. This study has not been completed yet.
- Stream gaging in the East and West Forks of Eklutna Creek conducted by APU. The data from this ongoing effort is publicly available.
- State-wide pumped hydro study conducted by AEA. This study has not been made publicly available.
- Pumped hydro system flow analysis and animation conducted by ALICE in coordination with NVE. This analysis has not been completed yet.
- Formal TEK assessment of the historic and cultural importance of the Eklutna River conducted by NVE in partnership with TU. This assessment has not been completed yet.

The Project Owners coordinated with each of these entities during study planning regarding relevant study methods, monitoring locations, etc. When available, the Project Owners incorporated the results of these other studies in their study reports. Of note, NVE shared their fish survey and habitat study data with the Project Owners, which were included in the Fish Species Composition and Distribution Study Report and the Eklutna Lake Aquatic Habitat and Fish Utilization Study Report (see Section 4.4.2).

#### **4.4.1 Early Study Efforts**

In May 2020 the Project Owners acquired LiDAR, aerial imagery, and spherical video of the entire Eklutna River as well as the northeastern shoreline of Eklutna Lake along the lakeside trail. The spherical video is available at <https://biglook360.com/eklutna/>.

In July 2020, the Project Owners conducted a site reconnaissance with ADFG staff to support study planning efforts. The Aquatics TWG met on July 23, 2020, to review the observations made during the site reconnaissance and to kick-off the study planning process. This meeting included initial discussions regarding the planned Instream Flow Study (see Section 4.4.2), potential study methods, and associated challenges with providing study flow releases.

In August 2020, the Project Owners conducted an initial condition assessment of the drainage outlet gate at the base of the spillway to determine if it could be used to provide study flow releases into the Eklutna River for the planned Instream Flow Study. In the same month, the Project Owners also established several monitoring transects and installed scour monitors in the Eklutna River in advance of any potential unplanned spill events to allow for subsequent data collection that could benefit the study program. There were no spill events in 2020; however, the established transects and scour monitors were later utilized during the Geomorphology and Sediment Transport Study (see Section 4.4.2) to assess erosion and sediment transport through the Eklutna River downstream from Eklutna Lake and to help calibrate the sediment transport model.

The final Eklutna River LiDAR and aerial imagery report, spillway and drainage outlet inspection report, geomorphology monitoring plan and transect locations are all available [here](#) on the Project website.

#### **4.4.2 Year 1 Study Planning**

Based on this early work, the Project Owners developed a Proposed Study Program Framework and presented it to Aquatics TWG on September 3, 2020. This meeting included discussion regarding how study efforts would occur over a two-year period, the goals and objectives, general study area, proposed methods for each study, the study plan outline, and the study planning schedule.

Draft Study Plans were distributed to the Aquatics TWG on October 26, 2020, for review and comment. The deadline for written comments was November 25, 2020. The Project Owners received comments from NVE, ADFG, USFWS, NMFS, TU, APU staff, and a member of the WNRC. Two meetings were held with the Aquatics TWG on November 30, 2020, and December 21, 2020, to review and address the Aquatics TWG's comments on the Draft Study Plans.

The Project Owners revised the Draft Study Plans based on the comments received, and the Revised Draft Study Plans were distributed to the Aquatics TWG on January 18, 2021, for review and comment. The deadline for written comments on the Revised Draft Study Plans was January 29, 2021.

Since several of the Aquatics TWG's comments on the Draft Study Plans were questions related to the operational capabilities of the Project, the Project Owners decided to start developing the proposed hydro operations model early and presented the preliminary modeling results to the Aquatics TWG at a meeting on January 26, 2021, to help inform the Aquatics TWG's comments on the Revised Draft Study Plans. The Project Owners also addressed additional clarifying questions from the Aquatics TWG at the January 2021 meeting in advance of the comment deadline.

The Project Owners received comments from ADFG, NMFS, TU, and APU staff and revised the study plans again based on comments received. As required by the 1991 Agreement, the Proposed Final Study Plans were distributed to the Parties on February 24, 2021, for review and concurrence on the scope of work.

A meeting amongst the State agencies involved in the Project was held on February 25, 2021, to determine how the State of Alaska, as a party to the 1991 Agreement, would concur on the scope of work in the study plans. The State agencies determined that it would be most appropriate for the Commissioners of each State agency (ADFG, ADEC, ADNR, and ADOT&PF) to sign a letter stating that they concur on the scope of work in the study plans, and then the Project Owners would send those concurrence letters to AEA, the Governor's representative, with the Proposed Final Study Plans for review and feedback.

The Project Owners received concurrence letters from all of the state and federal agencies, including the NMFS, USFWS, ADFG, ADEC, ADNR, and ADOT&PF. The State agency concurrence letters and the Proposed Final Study Plans were sent to AEA as the Governor's representative for review and feedback; however, the Project Owners did not receive any additional feedback from AEA. Each version of the Year 1 Study Plans, all comments received, and each of the concurrence letters are available [here](#) on the Project website.

Studies initiated in 2021 included the following:

- **Instream Flow Study** – informed how much habitat would be created by a range of potential flows for various species (Chinook, coho, sockeye) and life stages (spawning and rearing).
- **Geomorphology and Sediment Transport Study** – informed what peak flows might be needed in conjunction with year-round instream flows.
- **Fish Species Composition and Distribution Study** – identified what fish species were present in the Eklutna River, what habitat they were utilizing, and when.
- **Water Quality Study** – monitored various water quality parameters (temperature, dissolved oxygen, pH, turbidity, nutrients, etc.) in both the Eklutna River and Eklutna Lake.
- **Macroinvertebrate Study** – assessed the baseline community of aquatic organisms at three locations in the Eklutna River.
- **Stream Gaging** – collected continuous flow data at various points in the Eklutna River and select tributaries to Eklutna Lake.
- **Lake Aquatic Habitat and Fish Utilization Study** – examined the presence and health of fish in Eklutna Lake, as well as the availability of potential spawning habitat around the lake shoreline and in its tributaries.
- **Lakeside Trail Erosion Study** – identified areas along the Eklutna Lakeside Trail that were experiencing shoreline erosion and the potential causes.
- **Hydro Operations Model Development** – allows the assessment of different potential operational scenarios for the hydroelectric project.
- **Existing Infrastructure Assessment** – evaluated the condition and hydraulic capacity of downstream infrastructure, including the AWWU infrastructure, railroad bridge, and highway bridges.

One of the major components of the year 1 study program was the need to conduct study flow releases for both the Instream Flow Study and the Geomorphology and Sediment Transport Study. With the current infrastructure, the drainage outlet gate at the base of spillway in the dam is the only mechanism for providing controlled flow releases from the lake into the river. However, this gate had not been used regularly, and upon inspection, it was determined that the gate needed to be replaced. The Project Owners were able to design, procure, permit, and

install the new drainage outlet gate during the summer of 2021 before the planned study flow releases in the fall of 2021, which ranged from 150 cfs to 25 cfs over 3 weeks.

It should be noted that in 2018, a different dam (non-operational since 1955) was removed from the lower stretch of the Eklutna River by Eklutna, Inc. After the removal of this lower dam, a significant portion of the sediment wedge that had accumulated behind the lower dam for decades was left in the river. During year 1 study planning, some TWG members requested a flushing flow as part of the study program to flush the remaining sediment from behind the lower dam site. It was determined that this flushing flow was not necessary for study purposes. However, the Project Owners did commit to evaluating the need for conducting a higher calibration flow as part of the second study year.

In June 2021, before the study flow releases, the Project Owners organized a site visit with the Aquatics TWG (Figure 4-1) to identify and establish transect locations. A total of 30 transects were established throughout the river for the Instream Flow Study in relatively stable areas of the river that were not likely to change significantly as a result of the study flow releases. Additional transects were established throughout the river for the Geomorphology and Sediment Transport Study in relatively dynamic areas of the river that were more likely to change significantly as a result of the study flow releases.



**Figure 4-1. Site Visit with the Aquatics TWG in June 2021.**

In preparation for study flow releases, the Project Owners requested consent and waiver of liability from the principal landowners downstream of the dam for any damage that may result from the potential movement of Eklutna Inc.'s sediment wedge during the planned study flow

releases. The principal downstream landowners include Eklutna, Inc., ADOT&PF, ARRC, and the MOA/AWWU. Among them, only the MOA/AWWU consented and waived such potential liability.

#### 4.4.3 Year 1 Study Reporting

The Project Owners held a series of TWG meetings in November 2021 to discuss the preliminary results of the year 1 studies. Draft year 1 study reports were distributed to the TWGs and other interested parties (including AWWU) in February 2022 for review and comment. The Project Owners received comments on the draft study reports from ADFG, NMFS, and AWWU. The study reports were then revised and finalized based on comments received. The year 1 study reports and all comments received are available [here](#) on the Project website.

#### 4.4.4 Year 2 Study Planning

Based on observations made after the study flow releases and the preliminary results from the first year of studies, the Project Owners revised the Study Program Framework for year 2 and presented it to the TWGs during the November 2021 TWG meetings. As stated above, these meetings included discussions regarding preliminary results from year 1 (if applicable), what studies were being proposed for year 2 (Table 4-2), and the goals, general study area, and proposed methods for each study.

**Table 4-2. Year 2 Study Program.**

Studies Continued from Year 1 (2021)	Studies Initiated in Year 2 (2022)
Instream Flow Study	Engineering Feasibility and Cost Assessment
Geomorphology and Sediment Transport Study	Hydropower Valuation Study
Fish Species Composition and Distribution Study	Wetland and Wildlife Habitat Study
Lake Aquatic Habitat and Fish Utilization Study	Terrestrial Wildlife Study
Water Quality Study	Recreation Study
Stream Gaging	Cultural Resources Study
	<i>LiDAR and Ortho Imagery Acquisition</i>

Following their commitment in 2021, the Project Owners evaluated the need for a higher calibration flow in 2022. However, based on the data collected in 2021, it was determined that reasonably reliable models could be developed using the collected data, and that a higher calibration flow in 2022 was not necessary for study purposes.



The Draft Year 2 Study Plans were distributed to the Parties and TWGs on February 11, 2022, for review and comment. The deadline for written comments on the Draft Year 2 Study Plans was March 11, 2022. The Project Owners received comments from NVE, USFWS, NMFS, ADFG, ADEC, OHA, TU, and TCF.

A series of TWG meetings were held in March 2022 to address substantive comments on the Draft Year 2 Study Plans that required further discussion. The Project Owners then revised the study plans based on comments received and distributed the Proposed Final Year 2 Study Plans to the Parties on April 1, 2022, for review and concurrence.

The Project Owners received concurrence letters from each of the state agencies. The NMFS and USFWS also provided concurrence letters but only concurred with 10 of the 12 study plans. The federal agencies did not concur with the Geomorphology and Sediment Transport Study Plan or the Instream Flow Study Plan due to their uncertainty about the Project Owners ability to model higher flows without a significantly higher calibration flow.<sup>13</sup> The Project Owners documented this area of non-agreement and distributed the Proposed Final Year 2 Study Plans and State concurrence letters to AEA as the Governor's representative for review and feedback; however, the Project Owners did not receive any additional feedback from AEA. Each version of the Year 2 Study Plans, all comments received, and each of the concurrence letters are available [here](#) on the Project website.

It should be noted that although it was not included in the Year 2 Study Plans, the Project Owners also conducted a winter flow analysis to determine the range of flows that would be needed to promote favorable ice conditions. These study results were presented to the Aquatics TWG in March 2023 (see Section 4.4.6).

#### **4.4.5 Year 2 Interim Reporting**

The Project Owners held a series of meetings with the Aquatics TWG in September, October, and November 2022 to present the preliminary year 2 study results and potential engineering solutions (PME measures) for providing year-round instream flows, periodic peak flows, and fish passage both into and out of the lake. During those meetings, the Aquatics TWG determined which potential engineering solutions should be advanced to phase 1 engineering, which involved the development of 5% conceptual designs and Class 5 Opinion of Probable Construction Costs (OPCC) for each PME measure. The preliminary study results, potential PME measures, and all comments received are available [here](#) on the Project website.

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<sup>13</sup> The Project Owners acknowledge the uncertainty associated with any modeling effort. And after reviewing the modeling results, both federal agencies have confirmed the validity of both models.

The proposed PME measures and those that were advanced to phase 1 engineering are shown below in Table 4-3.

**Table 4-3. Proposed PME Measures.**

Proposed PME Measures	Phase 1 Engineering
Year-round flow releases from the existing dam (RM 12)	Yes
Year-round flow releases from the existing dam (RM 12) and excavate the lake outlet	Yes
Year-round flow releases from a new siphon (RM 12)	Yes
Year-round flow releases from a new bypass tunnel (RM 11.5)	Yes
Year-round flow releases from the existing AWWU portal valve (RM 11)	Yes
Year-round flow releases from the existing AWWU pipeline (RM 5.5)	Yes
Reroute Lach Q'atnu Creek back into the Eklutna River	Yes
Groundwater pumping downstream of the existing dam	No
Channel maintenance flows with existing overflow spillway	Yes
Channel maintenance flows with a new radial gate	Yes
Channel maintenance flows with a new fixed wheel gate	Yes
Upstream fish passage with a fish ladder (gravity flow)	Yes
Upstream fish passage with a fish ladder (variable exits)	Yes
Upstream fish passage with a fish ladder (pump station and slide)	Yes
Upstream fish passage with trap and haul	Yes
Downstream fish passage with a spill event	Yes
Downstream fish passage with a floating surface collector	Yes
Downstream fish passage with a rotary screw and guide nets	No
Downstream fish passage through the existing intake	No
Trapping facility with hatchery spawning, rearing, and release	No
Physical habitat enhancement	Yes
New AWWU bridges	Yes
Lakeside trail improvements	Yes

The Project Owners held another Aquatics TWG meeting in February 2023 to present the preliminary 2D modeling results for the river. It was during this meeting that USFWS proposed a nature-like fishway that would go around the existing dam and NVE proposed dam replacement as potential PME measures. The Project Owners held two meetings with USFWS and NVE in March 2023 to discuss both options further. The Project Owners also had several subsequent meetings with Eklutna, Inc. to discuss details of the potential replacement dam.

Ultimately, the stand-alone nature-like fishway was not advanced, but the potential replacement dam was advanced through phase 1 engineering as quickly as possible.

#### **4.4.6 Year 2 Study Reporting**

Draft year 2 study reports and phase 1 engineering deliverables were distributed to the TWGs and other interested parties in March 2023 for review and comment. The Project Owners also held a series of TWG meetings in March 2023 to review and discuss the study results. The Project Owners received comments on the draft study reports from ADFG, ADNR, and USFWS. The study reports were then revised and finalized based on comments received. The year 2 study reports and all comments received are available [here](#) on the Project website.

#### **4.4.7 Summary of Study Results**

In addition to the individual study reports, the Project Owners developed a Draft Summary of Study Results as required by the 1991 Agreement. This document was distributed in October 2023 with the Draft Program (see Section 4.7). The Project Owners did not receive any comments on the Draft Summary of Study Results. The Final Summary of Study Results is provided in Attachment B.

### **4.5 Alternatives Analysis**

The purpose of the alternatives analysis was to evaluate the costs, benefits, and impacts of a range of comprehensive alternatives (which may consist of multiple PME measures) in a consistent manner. This process was not required by the 1991 Agreement; however, the Project Owners felt that it was necessary to bridge the gap between study reporting and issuance of a Draft Program.

Based on the study results, the Project Owners made a commitment early in the alternatives analysis process to provide year-round flow releases into the Eklutna River as part of their Proposed Final Program. Based on this commitment, the primary objectives during the alternatives analysis were to determine how to release water into the Eklutna River and how much water to release for both year-round flows and periodic channel maintenance flows while considering estimated costs and potential impacts.

The alternatives analysis helped to narrow down the list of comprehensive alternatives by removing those that either did not provide a significant benefit, or where multiple alternatives provided similar benefits, those that were more costly could be removed from consideration. The following subsections detail the method of analysis, participation in the process, the purpose of each alternatives analysis meeting, and the comprehensive alternatives that were ultimately evaluated.

#### 4.5.1 Cost Effectiveness and Incremental Cost Analysis

To help inform decision making, a cost effectiveness and incremental cost analysis was conducted to assess the relative benefits and costs of comprehensive alternatives. This method of analysis is an industry standard, developed by the USACE to compare environmental outputs and the economic costs of alternative plans for environmental restoration or mitigation projects. The cost effectiveness analysis compares the annual cost of a proposed alternative with the ecological lift it provides to help identify the least cost alternatives for a given level of environmental benefits.

The ecological lift used as a basis for comparison was the improvements in spawning and rearing habitat for Chinook, coho, and sockeye salmon that would result from providing flow to the Eklutna River, adding fish passage into and out of the lake, changing operation of the lake levels to provide additional lakeshore spawning habitat, or some combination of these measures. The specific gains in habitat were determined using the models that were developed as part of the Instream Flow Study and the results from the Lake Aquatic Habitat and Fish Utilization Study.

To determine the costs of each proposed alternative, the total capital costs, operations and maintenance costs, and replacement energy costs were combined and annualized over 35 years with appropriate escalation factors as described in Attachment C.

#### 4.5.2 Participation

In March 2023, the Project Owners reached out to the Parties, the TWGs, and other stakeholders regarding their interest to participate in the alternatives analysis process. The following entities participated in one or more of the alternatives analysis meetings.

- Alaska Energy Authority (AEA)
- Alaska Department of Fish and Game (ADFG)
- Alaska Department of Natural Resources (ADNR)
  - Water Section
  - Chugach State Park
  - Office of History and Archaeology (OHA)
- National Marine Fisheries Service (NMFS)

- U.S. Fish and Wildlife Service (USFWS)
- Native Village of Eklutna (NVE)
- Eklutna, Inc.
- Anchorage Water and Wastewater Utility (AWWU)
- Trout Unlimited (TU)
- The Conservation Fund (TCF)
- Project Owners

### 4.5.3 Meetings

The Project Owners held a series of five meetings between April and August 2023 for the alternatives analysis. The general discussion topics for each meeting are summarized below, and the presentations from each meeting are available [here](#) on the Project website.

#### 4.5.3.1 Meeting 1

The first alternatives analysis meeting was held on April 6, 2023. At this meeting, seven potential year-round instream flow levels were presented to the group. When developing these potential flow levels, the Project Owners considered the minimum flows needed for upstream migration through the canyon reach, the flows that provide the maximum amount of spawning habitat for Chinook and coho salmon below the dam, the range of flows that would optimize overwintering habitat, and the hydraulic limitations of the proposed PME measures. Corresponding channel maintenance flows for each potential flow level were also presented. The Project Owners also described how the cost effectiveness and incremental cost analysis would be conducted. At the end of the meeting, participants were invited to submit any potential comprehensive alternatives to the Project Owners within two weeks so they could be evaluated before the next meeting. A request form was provided to participants that allowed them to select one of the seven identified flow regimes (or write in a different flow regime) and any combination of the PME measures that were advanced through phase 1 engineering.

After the first meeting, the Project Owners received 33 comprehensive alternatives from eight entities (including the Project Owners). These alternatives were comprised of various flow regimes and PME measures, including flow releases from the existing dam (with and without fish passage), a replacement dam, a new bypass tunnel, the existing AWWU portal valve, or the existing AWWU pipeline. Alternatives also included periodic channel maintenance flows with uncontrolled spill or with a fixed wheel gate. None of the alternatives included the

siphon, rerouting Lach Q'atnu Creek, the radial gate, gravity flow fish ladder, the fish ladder with a pump station and slide, or trap and haul. The Project Owners conducted a cost effectiveness and incremental cost analysis for all 33 comprehensive alternatives.

#### **4.5.3.2 Meeting 2**

The second alternatives analysis meeting was held on May 17, 2023. At the beginning of the meeting, the conceptual design and cost estimate for the replacement dam (proposed by NVE in March 2023) were presented to the group. The sediment transport modeling results for each of the proposed channel maintenance flows were also presented. The Project Owners then reviewed the results of the cost effectiveness and incremental cost analysis for each of the 33 comprehensive alternatives that were submitted for evaluation. During the meeting, the group decided to discard the alternatives that involved flow releases from the existing AWWU pipeline (RM 5.5) or a new bypass tunnel because they did not make sense from a cost benefit perspective. Participants were then invited to revise their alternatives based on the information provided and resubmit them for analysis and discussion at Meeting 3.

After the second meeting, the Project Owners received 36 comprehensive alternatives from eight entities (including the Project Owners). Three of the entities had no changes to their alternatives, but five entities submitted revisions, including the Project Owners. The Project Owners conducted a cost effectiveness and incremental cost analysis for all 36 comprehensive alternatives.

#### **4.5.3.3 Meeting 3**

The third alternatives analysis meeting was held on June 14, 2023. In response to questions during the previous meeting regarding the feasibility and benefits of fish passage, the Project Owners began this meeting with a review of the downstream fish passage options/challenges and the documented fish habitat in Eklutna Lake and its tributaries. The Project Owners then presented the revised results for each of the revised alternatives. At the end of the meeting, participants were asked to consider the information presented and submit their preferred alternative(s) for analysis and discussion at Meeting 4.

After the third meeting, the Project Owners received 12 preferred alternatives from seven entities (including the Project Owners). Most entities provided one preferred alternative; however, some entities provided more than one preferred alternative (see Section 4.5.4). The Project Owners conducted a cost effectiveness and incremental cost analysis for all 12 preferred alternatives.

#### 4.5.3.4 Meeting 4

The fourth alternatives analysis meeting was held on July 12, 2023. In response to a question from ADFG during the previous meeting regarding potential velocity barriers, the Project Owners presented modeling results for a range of higher flows (80 to 350 cfs) in the canyon reach. It was concluded that these higher flows would not create a barrier to upstream fish migration in the canyon reach. The Project Owners then presented the revised results for each of the preferred alternatives. The total present value of annualized costs (capital, O&M, and replacement energy) for each alternative ranged from \$44 million to \$385 million over the 35-year program. Potential impacts to CEA and MEA ratepayers and MOA taxpayers were also reviewed, along with results of the cost effectiveness and incremental cost analysis. During the meeting, TCF proposed a hybrid flow release alternative, releasing flows from the existing dam in the summer and the AWWU portal valve in the winter. The Project Owners committed to evaluating this alternative and discussing it at the next meeting. For the remainder of the meeting, the Project Owners reviewed the potential effects, both positive and negative, of the preferred alternatives on other resources including wetlands and wildlife, public water supply, and recreational use and facilities.

#### 4.5.3.5 Meeting 5

The fifth and final alternatives analysis meeting was held on August 9, 2023. The meeting began with a discussion on the potential effects, both positive and negative, of the preferred alternatives on cultural resources. The Project Owners then presented their evaluation of the hybrid flow release alternative that was proposed by TCF in the previous meeting. This alternative ultimately had the same impacts to reservoir operations as releasing flows from the dam year-round and therefore was not advanced any further. The Project Owners then discussed potential adaptive management strategies and proposed using water budgets for both year-round instream flows and periodic channel maintenance flows. A water budget establishes a total amount of water available for release into the Eklutna River each year; adjustments can be made to the flow regime as long as the total volume of water to be released does not exceed the water budget. The remainder of the meeting was an open discussion regarding potential monitoring efforts. At the end of the meeting, the Project Owners invited participants to revise and resubmit their preferred alternatives if needed.

#### 4.5.4 Preferred Alternatives

After the fifth meeting, the Project Owners received 12 preferred alternatives from eight entities (including the Project Owners). Most entities provided one preferred alternative; however, some entities provided more than one preferred alternative. The following subsections detail the components of each entity's preferred alternative(s).

#### 4.5.4.1 Infrastructure Modifications

The infrastructure modifications proposed by each entity for their preferred alternative(s) are shown below in Table 4-4. If an entity provided more than one preferred alternative, then their alternatives were labeled in descending order of preference.

**Table 4-4. Infrastructure Modifications for Preferred Alternatives.**

Entity	Instream Flows	Channel Maintenance Flows	Upstream & Downstream Fish Passage	Other
NMFS <sup>1</sup>	AWWU Portal Valve	Fixed Wheel Gate	None	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
	Replacement Dam	Fixed Wheel Gate	Variable Exit Fish Ladder <sup>2</sup> & Floating Surface Collector	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
USFWS Alt A	Replacement Dam	Fixed Wheel Gate	Variable Exit Fish Ladder <sup>2</sup> & Juvenile Bypass Gate <sup>3</sup>	Physical Habitat Enhancement New AWWU Bridges Lakeside Trial Repairs
NVE	Replacement Dam	Fixed Wheel Gate	Variable Exit Fish Ladder <sup>2</sup> & Spill	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
TCF	Replacement Dam	Fixed Wheel Gate	Variable Exit Fish Ladder <sup>2</sup> & Spill	None
USFWS Alt B	Existing Dam	Fixed Wheel Gate	Variable Exit Fish Ladder & Floating Surface Collector	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
TU	Existing Dam	Fixed Wheel Gate	Variable Exit Fish Ladder & Spill	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
USFWS Alt C <sup>4</sup>	Existing Dam	Fixed Wheel Gate	None	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
USFWS Alt D <sup>4</sup>	AWWU Portal Valve	Fixed Wheel Gate	None	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs



Entity	Instream Flows	Channel Maintenance Flows	Upstream & Downstream Fish Passage	Other
ADFG Alt A <sup>5</sup>	AWWU Portal Valve	Fixed Wheel Gate	None	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
ADFG Alt B <sup>5</sup>	AWWU Portal Valve	Fixed Wheel Gate	None	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
ADNR Parks	AWWU Portal Valve	Existing Gate	None	Physical Habitat Enhancement New AWWU Bridges Lakeside Trail Repairs
Project Owners	AWWU Portal Valve	Existing Gate	None	Physical Habitat Manipulation New AWWU Bridges Lakeside Trail Repairs

1 NMFS's preferred alternative involved implementing the AWWU portal valve and fixed wheel gate as an immediate action (within 5 years as required by the 1991 Agreement), followed by the replacement dam and fish passage as long-term actions to be implemented after the implementation period specified in the 1991 Agreement.

2 The conceptual design for the replacement dam included a variable exist fish ladder with a nature-like entrance for upstream fish passage.

3 The conceptual design for the replacement dam included a juvenile bypass gate for downstream fish passage.

4 USFWS alternatives C and D were only if public and financial support for alternatives A and B could not be obtained.

5 ADFG alternatives A and B had the same infrastructure modifications but different flow regimes.

#### 4.5.4.2 Year-Round Instream Flow Regimes

The year-round instream flow regimes proposed by each entity for their preferred alternative(s) are presented below in Table 4-5.

**Table 4-5. Year-Round Instream Flow Regimes for Preferred Alternatives.**

Entity	Flow Releases (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NMFS <sup>1</sup>	75	75	75	75	75	160	160	160	160	160	75	75
USFWS Alt A	75	75	75	75	75	160	160	160	160	160	75	75
NVE <sup>2</sup>	65	65	65	65	160	255	350	350	150	150	108	65
TCF <sup>2</sup>	60	60	60	60	100	180	180	180	180	100	60	60
USFWS Alt B	75	75	75	75	75	160	160	160	160	160	75	75
TU <sup>2</sup>	61	61	61	61	134	206	206	206	134	61	61	61

Entity	Flow Releases (cfs)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
USFWS Alt C	75	75	75	75	75	160	160	160	160	160	75	75
USFWS Alt D <sup>1</sup>	75	75	75	75	75	160	160	160	160	160	75	75
ADFG Alt A	35	35	35	35	50	65	80	80	57	57	46	35
ADFG Alt B	31	31	31	31	41	50	60	60	48	48	39	31
ADNR Parks	27	27	27	27	34	40	40	40	40	40	34	27
Project Owners	27	27	27	27	34	40	40	40	40	40	34	27

<sup>1</sup> Given the infrastructure selected for the NMFS alternative and USFWS Alt D (the AWWU portal valve), the preferred flow regimes shown for these alternatives are not technically feasible.

<sup>2</sup> The NVE, TU, and TCF preferred alternatives include additional releases from the dam for downstream fish passage in April – June, which is not reflected in the instream flow regime presented.

#### 4.5.4.3 Channel Maintenance Flow Regimes

The channel maintenance flow regime proposed by each entity for preferred alternative(s) are presented below in Table 4-6.

**Table 4-6. Stakeholders’ Preferred Channel Maintenance Flows.**

Entity	Flow (cfs)	Duration (Hrs)	Recurrence (Yrs)
NMFS	700	72	3 of 10
USFWS Alt A	700	72	3 of 9
NVE	700	72	Annually
TCF	600	72	3 of 10
USFWS Alt B	700	72	3 of 9
TU	400	72	3 of 10
USFWS Alt C	700	72	3 of 9
USFWS Alt D	700	72	3 of 9
ADFG Alt A	400	72	3 of 10
ADFG Alt B	325	72	3 of 10
ADNR Parks	220	72	3 of 10
Project Owners	220	72	3 of 10

#### 4.5.4.4 Cost Benefit Summary

Each of the preferred alternatives were analyzed as part of the cost effectiveness and incremental cost analysis. A summary of the total annualized costs and present worth of each preferred alternative for the 35-year program is presented below in Table 4-7 and Figure 4-2.

**Table 4-7. Cost Summary for Stakeholders' Preferred Alternatives.**

Entity	Capital Cost (\$M) <sup>1</sup>	O&M Cost (\$M)	Replacement Energy Cost (\$M)	35-Year Annualized Cost (\$M)	35-Year Present Worth (\$M)
NMFS	170.8	1.7	4.9	23.5	385
USFWS Alt A	158.7	1.7	4.9	22.4	366
NVE	122.9	0.3	8.4	21.1	346
TCF	118.1	0.3	6.9	18.9	310
USFWS Alt B	88.6	2.1	5.2	17.7	289
TU	28.9	0.6	7.2	13.5	221
USFWS Alt C	18.0	0.5	5.2	8.7	142
USFWS Alt D	16.9	0.2	2.0	4.3	70
ADFG Alt A	16.9	0.2	2.0	4.3	70
ADFG Alt B	16.9	0.2	1.7	3.8	63
ADNR Parks	8.9	0.2	1.3	2.7	44
Project Owners	8.9	0.2	1.3	2.7	44

<sup>1</sup> Capital costs are based on Class 5 OPCC's and carry an expected accuracy range of -50% to +100%.

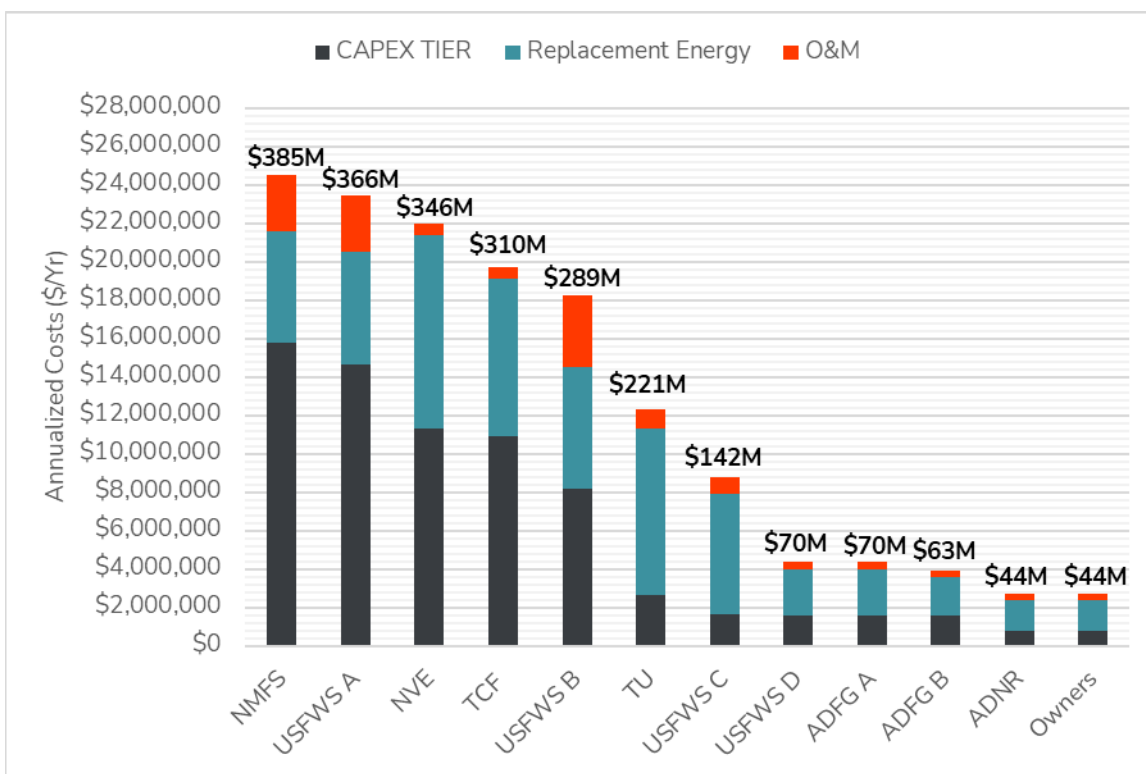


Figure 4-2. Comparison of Annualized Costs and Present Worth for Preferred Alternatives.

The associated ratepayer/taxpayer impacts are presented in Table 4-8. The supporting data for the cost effectiveness modeling is provided in Attachment C.

Table 4-8. Ratepayer/Taxpayer Impacts for Preferred Alternatives.

Entity	Ratepayer Impacts		Property Tax Increase	
	CEA	MEA	MOA	
	(%)	(%)	(mils)	(\$/100k)
NMFS	+ 4.73%	+ 5.81%	0.076	\$7.63
USFWS Alt A	+ 4.53%	+ 5.45%	0.072	\$7.21
NVE	+ 4.24%	+ 6.10%	0.046	\$4.62
TCF	+ 3.80%	+ 5.29%	0.045	\$4.46
USFWS Alt B	+ 3.53%	+ 4.66%	0.052	\$5.23
TU	+ 2.38%	+ 4.11%	0.016	\$1.60
USFWS Alt C	+ 1.70%	+ 2.96%	0.011	\$1.13
USFWS Alt D	+ 0.84%	+ 1.31%	0.008	\$0.81
ADFG Alt A	+ 0.84%	+ 1.31%	0.008	\$0.81

Entity	Ratepayer Impacts		Property Tax Increase	
	CEA	MEA	MOA	
	(%)	(%)	(mils)	(\$/100k)
ADFG Alt B	+ 0.76%	+ 1.13%	0.008	\$0.81
ADNR Parks	+ 0.53%	+ 0.84%	0.005	\$0.51
Project Owners	+ 0.53%	+ 0.84%	0.005	\$0.51

The models developed as part of the Instream Flow Study and the results of the Lake Aquatic Habitat and Fish Utilization Study were used to quantify habitat gains for three species (Chinook, coho, and sockeye) and two life stages (spawning and rearing). A summary of the habitat gains for each preferred alternative is presented below in Table 4-9.

**Table 4-9. Summary of Habitat Gains for Stakeholders' Preferred Alternatives.**

Stakeholder	Habitat Gains (Acres)				
	Chinook Spawning	Coho Spawning	Sockeye Spawning	Chinook Rearing	Coho Rearing
NMFS	3.9	4.0	3.0	15.5	22.8
USFWS Alt A	3.9	4.0	3.0	15.5	22.8
NVE	3.1	3.6	2.5	21.0	31.0
TCF	3.8	3.9	2.7	19.0	28.1
USFWS Alt B	4.9	5.0	4.0	19.1	28.2
TU	4.7	5.0	4.2	18.2	27.1
USFWS Alt C	2.0	2.1	1.1	19.1	28.2
USFWS Alt D	1.5	1.2	0.5	12.6	18.5
ADFG Alt A	1.6	1.6	1.2	8.7	12.7
ADFG Alt B	1.5	1.6	1.2	7.7	11.6
ADNR Parks	1.5	1.6	1.2	6.3	9.9
Project Owners	1.5	1.6	1.2	6.3	9.9

To further assess each preferred alternative, the incremental costs were analyzed to determine the annual spending per acre of habitat gained in the river and lake. This exercise helps to inform the consequences of increasing unit costs to achieve additional habitat gains. A summary of the incremental costs is presented below in Table 4-10.

**Table 4-10. Incremental Costs Per Acre of Habitat for Preferred Alternatives.**

Entity	Incremental Cost (\$/Yr/Acre)				
	Chinook Spawning	Coho Spawning	Sockeye Spawning	Chinook Rearing	Coho Rearing
NMFS	\$1,800,000	\$1,700,000	\$2,300,000	\$400,000	\$300,000
USFWS Alt A	\$6,000,000	\$5,900,000	\$7,800,000	\$1,500,000	\$1,000,000
NVE	\$5,700,000	\$5,600,000	\$7,500,000	\$1,400,000	\$1,000,000
TCF	\$7,100,000	\$6,100,000	\$8,800,000	\$1,000,000	\$700,000
USFWS Alt B	\$5,200,000	\$5,100,000	\$7,300,000	\$1,000,000	\$700,000
TU	\$2,900,000	\$2,700,000	\$3,200,000	\$700,000	\$500,000
USFWS Alt C	\$4,400,000	\$4,100,000	\$7,900,000	\$500,000	\$300,000
USFWS Alt D	\$2,700,000	\$2,700,000	\$3,600,000	\$500,000	\$300,000
ADFG Alt A	\$2,500,000	\$2,400,000	\$3,200,000	\$500,000	\$300,000
ADFG Alt B	\$1,800,000	\$1,700,000	\$2,300,000	\$400,000	\$300,000
ADNR Parks	\$1,800,000	\$1,700,000	\$2,300,000	\$400,000	\$300,000
Project Owners	\$1,800,000	\$1,700,000	\$2,300,000	\$400,000	\$300,000

## 4.6 AWWU Agreements

After the alternatives analysis, the Project Owners initiated conversations with AWWU in August 2023 to ascertain if AWWU would be willing to allow for potential the use of its infrastructure to release water into the Eklutna River. These conversations concluded with a confidential binding term sheet in October 2023, pursuant to which the Project Owners and AWWU agreed to: (1) broad commercial terms to allow for the construction, interconnection, and operation of the Eklutna River Release Facility and transportation of water for instream flows if the AWWU portal valve alternative was included in the Final Program approved by the Governor; (2) negotiate three definitive contracts elaborating upon such terms prior to the submission of the Proposed Final Program to the Governor:

- A **Water Facilities Interconnection Agreement** to govern the rights and responsibilities of the Project Owners and AWWU with respect to the construction of the Eklutna River Release Facility and eight AWWU bridges over the Eklutna River that will be needed for year-round access to AWWU infrastructure;
- A **Long-Term Water Transportation Agreement** to govern the rights and responsibilities of the Project Owners and AWWU with respect to the transportation of

water from Eklutna Lake, through AWWU infrastructure and the Eklutna River Release Facility, and into the Eklutna River; and

- A **Public Water Supply Agreement** to replace a 1984 agreement between AWWU and the Project Owners governing AWWU's compensation for and use of the Project Owners' water rights to provide drinking water to AWWU customers from Eklutna Lake that expires in 2025.

In March 2024, the Project Owners and AWWU reached agreement on final drafts of these documents, which are provided in Attachment D. While these agreements themselves have not yet been signed by the parties, the parties have signed an amendment to the binding term sheet agreeing that the substantive terms of such documents are complete, provided that certain technical and procedural exhibits will still need to be finalized. The Project Owners and AWWU further agreed that they will execute the agreements upon (1) the approval of the Governor of a Final Program including the use of AWWU facilities as set forth in the Proposed Final Program, (2) the approval by the Anchorage Assembly to the extent necessary for the MOA to execute and perform under the agreements; and (3) any necessary MEA and CEA board approvals.

The binding term sheet and amendment are available [here](#) on the Project website.

#### **4.6.1 Water Facilities Interconnection Agreement**

The negotiated terms of the Water Facilities and Interconnection Agreement are summarized below.

- The Project Owners shall be responsible for the design, engineering, permitting, constructing, and testing the Eklutna River Release Facility and AWWU Bridges, and shall do such work in compliance with prudent industry standards.
- The proposed design for the Eklutna River Release Facility as developed by the Project Owners must be approved by AWWU.
- The Project Owners shall bear all the costs associated with constructing the Eklutna River Release Facility and will provide certain workmanship and other warranties with respect to the Eklutna River Release Facility for one year after commercial operation.
- AWWU shall provide access to the necessary land and AWWU facilities within its control to allow for such work. The Project Owners shall be responsible for obtaining any necessary third-party approvals for land access, with AWWU assistance.

- After the Eklutna River Release Facility is commercially operable, legal title to a certain portion of the Eklutna River Release Facility including the portions necessary for isolating AWWU's pipeline segment shall pass to AWWU. Legal title to AWWU bridges shall also pass to AWWU.

#### **4.6.2 Long-Term Water Transportation Agreement**

The negotiated terms of the Long-Term Water Transportation Agreement are summarized below.

- Beginning upon the commercial operation of the Eklutna River Release Facility and for at least 35 years thereafter, AWWU shall transport water belonging to the Project Owners upon request through AWWU's facilities to the Eklutna River Release Facility to be released into the Eklutna River.
- Under no circumstance shall AWWU be required to deliver water in such a way that will inhibit its ability to deliver a daily flow rate of at least 41 million gallons per day (MGD) to the downstream Eklutna Water Treatment Facility or to exceed the hydraulic capacity or design criteria of the AWWU facilities.
- The parties shall together develop detailed operating procedures before the beginning of the term which will be regularly updated throughout the term.
- As with the Water Facilities Interconnection Agreement, AWWU shall provide access to the necessary land and AWWU facilities within its control to allow for these water transportation services.

#### **4.6.3 Public Water Supply Agreement**

The negotiated terms of the Public Water Supply Agreement are summarized below.

- As partial consideration for the services and access to AWWU infrastructure being provided by AWWU pursuant to the Water Facilities Interconnection Agreement and the Long-Term Water Transportation Agreement, the Project Owners have agreed to make available and allow AWWU to continue to interconnect the Eklutna Water Treatment Facility to the Project infrastructure, to use certain of the Project Owners' facilities, and to use a portion of the Project Owners' water rights, up to 41 MGD, all for the public water supply through October 2060.
- In 2055, AWWU will have an option to obtain by transfer of title from the Project Owners' a portion of their first priority water rights up to 41 MGD at no cost to AWWU other than documentation and approvals.



- AWWU shall pay significantly reduced compensation to the Project Owners for associated reductions in electric energy generation.
- The Project Owners will remain responsible for Eklutna Lake reservoir operations and shall operate the reservoir in such a way that the projected allocations of water to AWWU are available upon request at a flow rate of 41 MGD.
- The Project Owners recommit to take no action regarding Eklutna Lake that has the effect of reducing the quality or increasing the turbidity of the lake water or otherwise allow any other action that might have the effect of reducing its suitability for use as a source of public water supply.

#### 4.7 Draft Fish and Wildlife Program

Per the 1991 Agreement, the Project Owners distributed a Draft Program (with the Draft Summary of Study Results) to the Parties in October 2023. Both documents were also provided to NVE.

In the Draft Program, the Project Owners proposed to utilize the existing AWWU water supply infrastructure to provide a robust year-round base instream flow regime to 11 out of 12 miles of the Eklutna River and benefit all four species of salmon that are currently observed spawning in the lower river, while implementing measures to protect the public water supply and minimizing impacts to ratepayers, taxpayers, carbon emissions, and recreation. The proposed flows were determined based on modeling results and were designed to optimize habitat gains while minimizing the costs of replacement energy. The Draft Program also proposed periodic peak flows to maintain downstream fish habitat, construction of eight new bridges for the AWWU water supply access road, a funding commitment for monitoring studies, and an adaptive management framework. Due to the significant costs, impacts, and uncertainty regarding the viability of introducing anadromous species above the Project dam, no fish passage related facilities or changes in operations were proposed at that time.

The Parties and NVE had 30 days to review and provide comments to the Project Owners. The Project Owners received comment letters from ADFG, ADNR, NMFS, USFWS, NVE, and Eklutna, Inc. The Draft Program, Draft Summary of Study Results, and all comments received are available [here](#) on the Project website. Responses to comments on the Draft Program are provided in Attachment E.

In their comment letter dated December 4, 2023, NVE proposed a new alternative that involved the removal of Eklutna Dam “within ten years when sufficient renewable power generation is available to offset the lost power generation from dam removal.” In response to this letter, the Project Owners committed to evaluate dam removal in further detail. A

memorandum documenting this evaluation is provided in Attachment F. This alternative was not selected for the Proposed Final Program for reasons described in Section 4.12.2.

#### **4.8 Attempt to Resolve Differences**

Per the 1991 Agreement, the Project Owners were required to attempt to resolve differences with the Parties giving due weight to their recommendations, expertise, and statutory responsibilities. The Project Owners held individual meetings with each of the Parties in December 2023 to discuss their comments on the Draft Program. The Project Owners continued to meet with the Parties through April 2024 and made substantive changes to the proposed program based on these discussions.

The Project Owners also met with NVE in December 2023 to discuss their comments on Draft Program and underlying interests. NVE declined to meet with the Project Owners again until March 2023, at which point the Project Owners presented the substantive changes to the program that had been negotiated with the Parties. Subsequent to this meeting, NVE proposed a new alternative that still involved the removal of Eklutna Dam by 2034 once 40 MW of replacement renewable energy is secured. In addition, NVE's new proposal also included the construction of a pump station that would pump water from deep in Eklutna Lake to the pond upstream of Eklutna Dam, and then release water from the dam into the river year-round. This alternative was not selected for the Proposed Final Program for reasons described in Section 4.12.3.

#### **4.9 Public Meetings**

After meeting with the Parties and NVE in December 2023 to attempt to resolve differences, the Project Owners were required to hold at least two public meetings, one in Anchorage and one in the Matanuska-Susitna Valley. The Project Owners ultimately held six public meetings, two in Anchorage, two in Palmer, and two in Eagle River. For each location, one meeting was held in the afternoon and one in the evening. All six meetings were held in January 2024 and were an open house format with a brief presentation followed by an opportunity for participants to meet with the Project Owners and their subject matter experts, ask questions, and submit comments. Members of the public had an opportunity to submit both written comments to the Project Owners using the comment forms provided at the public meetings or electronically via the Project website or email. Members of the public also had an opportunity to record their verbal comments at the public meetings.

The public comment period was open from October 27, 2023, when the Draft Program was issued, through February 19, 2024, one month after the last public meeting. The Project Owners received a total of 1,672 public comments, including 1,299 form letters. Individual

comments primarily addressed dam removal and the Draft Program, with comments supporting and opposing both dam removal and the Draft Program essentially evenly split. All of the form letters called for removal of Eklutna Dam; however, most of these form letters were from out of state. The Public Comment Summary and Analysis is provided in Attachment G.

#### **4.10 Proposed Final Fish and Wildlife Program**

After five years consultation, study, and analysis, the Project Owners are excited to submit their Proposed Final Program to the Governor. The Project Owners believe that the Proposed Final Program substantively protects, mitigates, and enhances fish and wildlife impacted by the Project, while balance costs and potential impacts to municipal water supply and recreation. The primary components of the Proposed Final Program are summarized below.

- Construction of the Eklutna River Release Facility adjacent to the AWWU portal valve and establishment of year-round instream flows in the Eklutna River.
- Automation of the existing outlet gate at the dam to provide periodic channel maintenance flows in the Eklutna River.
- Construction of eight new bridges along the AWWU access road to enable AWWU's access to critical infrastructure year-round following the establishment of instream flows.
- Payment to Chugach State Park for lakeside trail repairs.
- Establishment of a Committee to oversee implementation of the Monitoring and Adaptive Management Plan.
- Funding to conduct monitoring studies in the Eklutna River throughout the 35-year program.
- Funding for physical habitat enhancement in the Eklutna River based on the monitoring results.
- Procedures for the Committee to adaptively manage the flow regime in the Eklutna River based on the monitoring results.
- Provisions for banking water in Eklutna Lake and potentially increasing the water budget for instream flows in the future.

- Potential installation of a fixed wheel gate to accommodate higher inflows in the future and/or allow higher channel maintenance flows if needed.
- Potential installation of upstream and downstream fish passage facilities in the future if specific criteria are met.

Approval of the Proposed Final Program will enable the Project Owners to implement these significant fish and wildlife measures at the Project, while simultaneously protecting the municipal water supply and continuing to provide low cost, renewable energy to Southcentral Alaska. A comparison to existing conditions is provided in Attachment H. The Design Documentation Reports (DDRs) are provided in Attachment I.

#### 4.10.1 Anticipated Benefits to Fish and Wildlife

Based on modeling results, the default flow regime should create significant new spawning and rearing habitat for salmon in the Eklutna River. The expected spawning and rearing habitat gains for Chinook and coho salmon are presented in Table 4-11.

**Table 4-11. Chinook and Spawning and Rearing Habitat Gains.**

Criteria	Chinook Habitat		Coho Habitat	
	Spawning	Rearing*	Spawning	Rearing*
Baseline Habitat (Acres)	0.7	11.8	2.5	14.7
Total Habitat with Proposed Base Flows (Acres)	2.2	18.1	4.1	24.6
Percent Gain	209%	53%	65%	67%
% of Maximum Available Habitat Below the AWWU Portal Valve	96.5%	n/a	99.6%	n/a
% of Maximum Available Habitat in the Eklutna River	81.7%	n/a	83.7%	n/a

\*The % of maximum available habitat is not shown for Chinook or coho rearing habitat because the flow needed to achieve maximum rearing habitat for both species appears to be higher than the range of flows that was modeled.

The spawning habitat curves for Chinook and coho salmon habitat downstream of the AWWU Portal Valve are presented in Figure 4-3. Spawning and rearing habitat gains are presented graphically in Figure 4-4 and Figure 4-5, respectively.

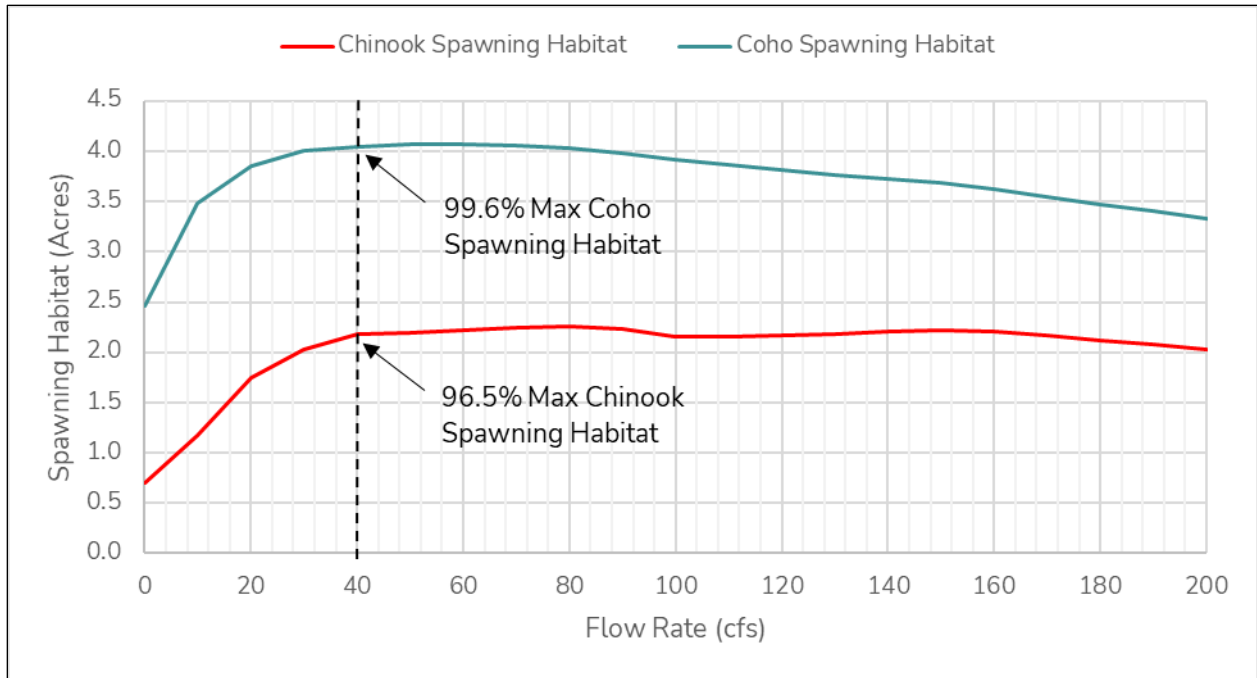


Figure 4-3. Spawning Habitat Curves for the Eklutna River below the AWWU Portal Valve.

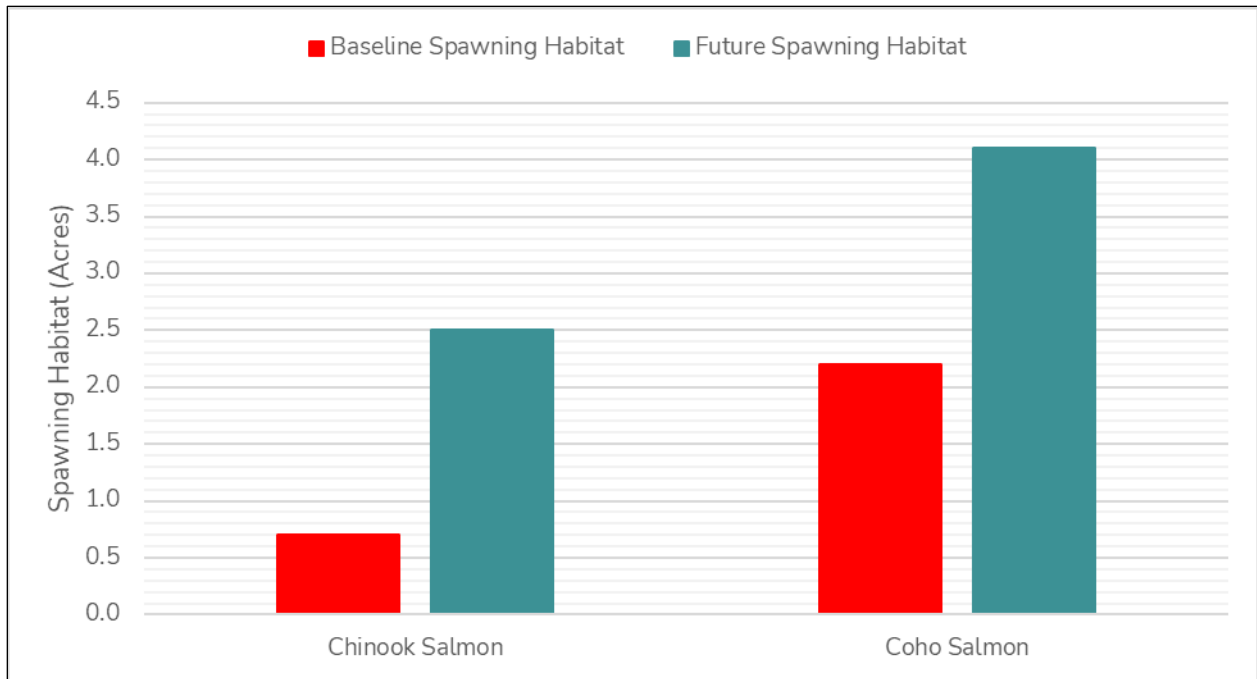
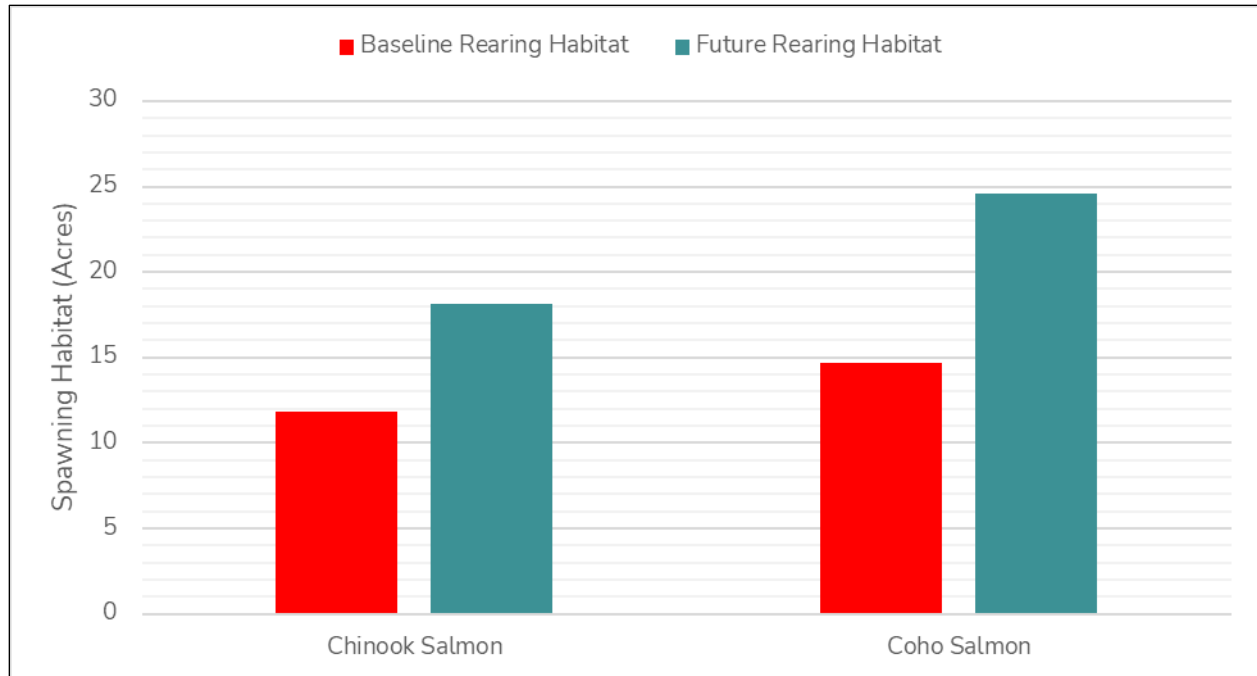


Figure 4-4. Spawning Habitat Comparison, Baseline vs. Future Flow Conditions.



**Figure 4-5. Rearing Habitat Comparison, Baseline vs. Future Flow Conditions.**

Additional habitat gains for pink and chum salmon are expected to be similar to the prior two species but were not quantified as part of the study program. While these flow releases may also create potential spawning habitat for sockeye in the river, they are unlikely to create rearing habitat for sockeye since sockeye typically rear in lakes. Therefore, the potential spawning habitat for sockeye in the river is not shown. It should be noted that the limited reopener for fish passage (Section 4.2 of the Proposed Final Program) creates the opportunity to benefit sockeye in the future. Increased flow and salmon abundance will also directly or indirectly benefit several ecologically and/or culturally important wildlife species, including:

- Bears, especially brown bears (direct foraging)
- Moose (increased plant nutrients and forage; however, moose could also be negatively impacted as a result of increased bear densities)
- Wolves (direct foraging and potentially higher prey base)
- River otters and mink (direct foraging)
- Beavers (beaver dams would also create salmon rearing habitat)
- Piscivorous birds
- Marine mammals

#### 4.10.2 Anticipated Costs

A Class 4 OPCC with an accuracy range of -30% to +50% was developed for the capital improvements proposed in the Proposed Final Program. Both the capital costs and the O&M costs for the proposed improvements increased from the Class 5 OPCC in part due to modifications to the design that were requested by AWWU. Due to uncertainties whether the fixed wheel gate PME measure will be implemented in the future, the costs are broken out into total program costs with and without the fixed wheel gate.

The costs for implementing the Proposed Final Program will be distributed among the Project Owners based on their ownership percentages and long-term power purchase agreements that modify allocations of costs related to the 1991 Agreement. The resulting allocations are as follows:

- CEA is responsible for 64.29% of all costs, including Capital Costs, O&M Costs, and Replacement Energy Costs.
- MEA is responsible for 16.67% of the Capital Costs and O&M Costs, and 35.71% of Replacement Energy Costs.
- MOA is responsible for 19.04% of the Capital Costs and O&M Costs but does not incur any Replacement Energy Costs.

The total anticipated costs for the Project Owners to implement the Proposed Final Program are presented below in Table 4-12.

**Table 4-12. Cost Summary for the Proposed Final Program.**

Cost Description	Value
<b>Capital Costs</b>	
ERRF Capital Cost (\$)¹	\$10,106,130
Dam Outlet Modifications Capital Cost (\$)¹	\$769,373
AWWU Bridges Capital Cost (\$)¹	\$4,558,256
Lakeside Trail Repairs (\$)	\$234,000
Monitoring Program Cost (\$)	\$450,000
Physical Habitat Enhancement (\$)	\$350,000
Fixed Wheel Gate (\$)¹ <i>if implemented</i>	\$4,015,100²
Subtotal Capital Costs w/o Fixed Wheel Gate (\$)	\$16,467,759
Subtotal Capital Costs w/ Fixed Wheel Gate (\$)	\$20,482,860

Cost Description	Value
<b>O&amp;M Costs</b>	
ERRF O&M Cost (\$/Yr)	\$227,500
Dam Outlet Modifications O&M Cost (\$/Yr)	\$88,400
Subtotal O&M Costs (\$/Yr)	\$315,900
<b>Replacement Energy Costs</b>	
Average Annual Energy Reduction (MWh)	15,749
Replacement Energy Costs (\$/MWh)	\$84.65
Replacement Energy Cost (\$/Yr)	\$1,333,188
<b>Annualized Costs w/o Fixed Wheel Gate</b>	
Total Annualized Cost (\$/Yr)	\$3,555,527
CEA Share of Total Annualized Cost (\$/Yr)	\$2,360,729
MEA Share of Total Annualized Cost (\$/Yr)	\$897,638
MOA Share of Total Annualized Cost (\$/Yr)	\$297,160
Estimated Present Value of Total Annualized Costs (\$)	\$58,218,000
<b>Annualized Costs w/ Fixed Wheel Gate</b>	
Total Annualized Cost (\$/Yr)	\$3,898,161
CEA Share of Total Annualized Cost (\$/Yr)	\$2,599,245
MEA Share of Total Annualized Cost (\$/Yr)	\$955,068
MOA Share of Total Annualized Cost (\$/Yr)	\$343,848
Estimated Present Value of Total Annualized Costs (\$)	\$63,828,000 <sup>2</sup>

<sup>1</sup> Capital costs at this level of design have an expected accuracy range of -30% to +50%.

<sup>2</sup> The Project Owners' maximum commitment to the fixed wheel gate is \$10M, which would raise the Program's capital costs to about \$26.5M and its 35-year present value to \$72.2M.

Each Project Owner will be responsible for paying its proportionate share of the costs associated with implementing the Final Program. It is too early to determine whether and when such costs will be recovered in rates because any rate recovery will be determined through a rate-setting regulatory process before the Regulatory Commission of Alaska (RCA). Similarly, it is premature to estimate that the costs incurred by the MOA will exceed its revenues under its long-term power purchase agreements such that the MOA will have to raise taxes. Assuming that all such costs are passed directly through as increases to rates and taxes, however, the maximum ratepayer impacts for each utility and potential tax implications of these annualized costs are summarized in the following table.



**Table 4-13. Summary of Ratepayer Impacts for Proposed Program.**

Fish and Wildlife Program w/ Fixed Wheel Gate	
Cost Description	Value
CEA Rate Impact	+0.78%
MEA Rate Impact	+1.07%
MOA Property Tax Impact	.010 mils <sup>1</sup>

<sup>1</sup> 1 mil is \$100 per \$100,000 of taxable property value.

#### 4.10.3 Implementation Schedule

The schedule for the remainder of the consultation process and implementation of the Final Program is outlined below in Table 4-14.

**Table 4-14. Remaining Consultation Process and Implementation Schedule.**

Entity	Milestone	Deadline
Parties	Provide comments to the Governor	June 24, 2024
Project Owners	Provide responses to the Governor	July 24, 2024
Governor	Issues the Final Program	October 2, 2024
Project Owners	Feasibility study for the fixed wheel gate	October 2, 2027
Project Owners	Begin implementation	October 2, 2027
Project Owners	Complete implementation (establish instream flows)	October 2, 2032
Project Owners	Reallocation of any additional inflows to the reservoir	October 2, 2042 <sup>1</sup>
Committee	Limited reopener for the fixed wheel gate	October 2, 2042 <sup>1</sup>
Committee	Limited reopener for fish passage	Any time after October 2, 2042 <sup>1</sup>
Project Owners	Reallocation of any additional inflows to the reservoir	October 2, 2052 <sup>1</sup>
Project Owners	Repeat the process called for by the 1991 Agreement	October 2, 2057

<sup>1</sup> These dates may change based on the actual date instream flows are established.

##### 4.10.3.1 Review and Comment Period

The Parties will have 60 days to submit written comments on the Proposed Final Program and any alternative recommendations to the Governor. The Project Owners will then have 30 days to submit written responses to the Governor.

#### 4.10.3.2 Final Fish and Wildlife Program

The Governor shall review the Proposed Final Program, supporting information, comments, and any alternative recommendations. The Governor shall attempt to reconcile any differences between the Parties, giving due weight to the recommendations, expertise, and statutory responsibilities of the resource management agencies and the Project Owners. In order to ensure that the Project is best adapted for power generation and other beneficial public uses, the Governor is required by the 1991 Agreement to give equal consideration to:

1. Efficient and economical power production
2. Energy conservation
3. The protection, mitigation of damages to, and enhancement of fish and wildlife (including related spawning grounds and habitat)
4. The protection of recreational opportunities
5. Municipal water supplies
6. The preservation of other aspects of environmental quality
7. Other beneficial public uses
8. Other requirements of State law

Based on his review, the Governor shall establish a Final Program that adequately and equitably protects, mitigates damages to, and enhances fish and wildlife resources affected by the Project. The Project Owners anticipate the Governor's issuance of a Final Program no later than October 2, 2024.

#### 4.10.3.3 Additional Requirements to Implementing the Final Program

After the Governor's issuance of the Final Program in October 2024, the Project Owners will have three years to achieve the following additional requirements that are preconditions to the Project Owners' ability to implement the Final Program. Should any of these requirements fail to be achieved, the Project Owners may not be able to execute the Final Program.

- **AWWU Agreements:** As described in Section 4.6, the Project Owners and AWWU have reached agreement on the final drafts of all three agreements provided in Attachment D. The Project Owners and AWWU will execute these agreements upon (1) the approval by the Anchorage Assembly to the extent necessary for the MOA to

execute and perform under the agreements; and (2) any necessary MEA and CEA board approvals.

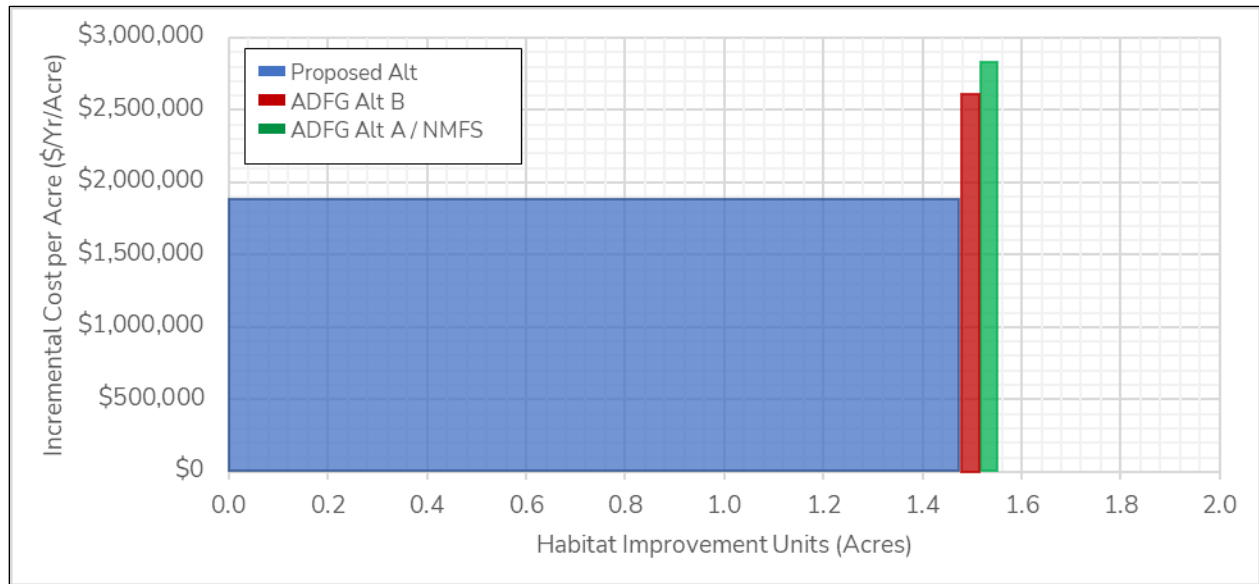
- **Water Right:** As described in Section 2.1.9, the Project Owners' current Certificate of Appropriation (ADL 44944) allows the Project Owners to use any and all of the natural inflow to Eklutna Lake for hydroelectric power generation, except that which is used for public water supply (up to 41 MGD). Therefore, in order for the Project Owners to intentionally release water into the Eklutna River for the purposes of creating fish habitat, ADNR must amend the current water right to allow for such use.
- **Land Rights:** As described in Section 2.1.10, the proposed Eklutna River Release Facility is located within AWWU's easement on BLM land that's managed as part of Chugach State Park. Therefore, the Project Owners anticipate that various land rights (rights of way, easements, etc.) will be required for both temporary and permanent infrastructure related to constructing the Eklutna River Release Facility. The Project Owners will also evaluate the need for any land rights that may be needed for both temporary and permanent infrastructure related to constructing the new AWWU bridges. Chugach State Park is responsible for obtaining any approvals that might be needed for the lakeside trail repairs. The Project Owners do not need any additional land rights for automation of the existing gate at the dam.
- **Dam Safety:** Per ADNR, the Project Owners will be required to update the current O&M manual for Project and seek approval from ADNR to maintain compliance with state dam safety regulations. Automation of the existing gate at the dam may also require a Certificate of Approval to Modify the Dam from ADNR. If the fixed wheel gate is implemented, the Project Owners will work closely with the State Dam Safety Engineer throughout design and construction to ensure compliance with all regulations.
- **Historic Properties:** Per ADNR, the automation of the existing gate at the dam would likely not be considered an adverse effect to the historic property. The Project Owners will seek concurrence from the State Historic Preservation Officer (SHPO) on this determination. If the fixed wheel gate is implemented, the Project Owners will consult with the SHPO at that time regarding a new determination of effect.
- **Permits:** The Project Owners will work with the relevant entities to determine if any other permits may be required and will seek to obtain such permits as needed.

#### 4.11 Measures Not Selected for the Proposed Final Program

This section presents alternative means of mitigating Project impacts that were identified by others and evaluated during the alternatives analysis process described in Section 4.5.

### 4.11.1 Higher Flow Releases from the AWWU Portal Valve

Of the 12 preferred alternatives, five included using the AWWU portal valve to deliver flow into the Eklutna River. Three of these preferred alternatives proposed flow regimes higher than that of the Project Owners' Proposed Final Program. The increased flows are technically feasible to be released at the AWWU portal valve and provide increased habitat; however, the incremental gains in habitat are minor and result in significantly larger incremental unit costs, as presented in Figure 4-6.



**Figure 4-6. Incremental Cost Comparison – AWWU Portal Release Facility.**

An additional means of analyzing the incremental gains of higher flow releases from the AWWU portal release facility is to quantify habitat improvements as a function of the maximum spawning habitat in the river. The Proposed Final Program year-round flow release enhances 82% of maximum spawning habitat for Chinook and 84% of the maximum spawning habitat for coho. In comparison, the higher flow release alternatives from the Eklutna River Release Facility have minor gains of approximately 1% - 3% of Chinook spawning habitat and 0.2% - 0.3% of coho spawning habitat. A comparison of the habitat change as a percentage of maximum available riverine habitat is presented in Table 4-15.

**Table 4-15. Habitat Gains Comparison – AWWU Portal Release Facility.**

Comprehensive Alternative	Chinook		Coho	
	Flow Rate in July/Aug (cfs)	Habitat Gain (% of Max River Habitat)	Flow Rate in Sep/Oct (cfs)	Habitat Gain (% of Max River Habitat)
Selected Alternative	40	82%	40	84%
ADFG Alt B	60	83%	48	84%
ADFG Alt A	80	85%	57	84%

**4.11.2 Flow Releases from the Existing AWWU Pipeline**

The AWWU pipeline segment P-4 runs along the Eklutna River from RM 5.5 to RM 11.0. Similar to the design of the Eklutna River Release Facility at the AWWU portal valve, an alternative was originally proposed to build a river release structure on the existing pipeline at or near RM 5.5, to take advantage of additional pipeline pressure resulting in a more compact facility. This location would have also eliminated the need to improve upstream AWWU road fords. This alternative was ultimately not selected as a preferred alternative due to the significant reduction in habitat that would benefit from releases. A summary of the gains in habitat if the preferred flow regime is released at the AWWU portal valve rather than RM 5.5 is presented in Table 4-16.

**Table 4-16. Habitat Gains Comparison – AWWU Pipeline Release Facility.**

Description	Chinook Spawning	Coho Spawning	Chinook Rearing	Coho Rearing
Habitat Gains (Acres) with AWWU Portal Releases	1.5	1.6	6.3	9.9
Habitat Gains (Acres) with AWWU Pipeline Releases	0.3	0.8	3.3	4.7
Incremental Cost (\$/Yr/Acre) for AWWU Portal Releases	\$1,833,000	\$1,696,000	\$428,000	\$273,000
Incremental Cost (\$/Yr/Acre) for AWWU Pipeline Releases	\$8,486,000	\$3,594,000	\$860,000	\$601,000

#### 4.11.3 Flow Releases from a New Bypass Tunnel

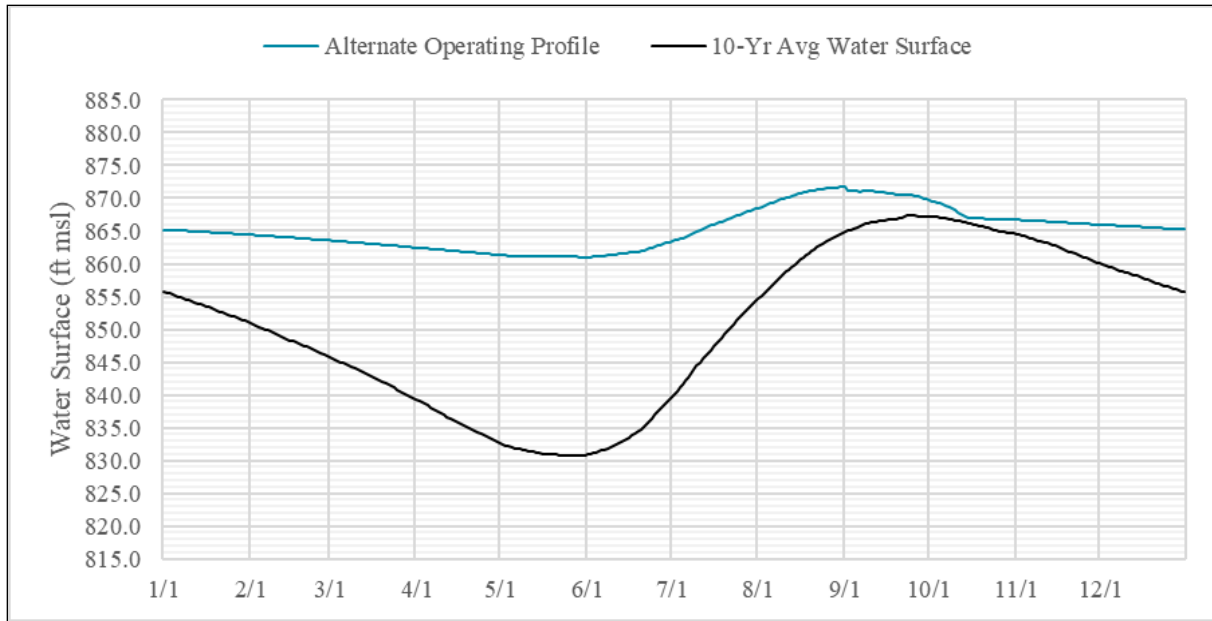
As an alternative to the Eklutna River Release Facility at the AWWU portal valve, which utilizes the existing AWWU diversion tunnel, an alternative was brought forth to construct a new bypass tunnel in parallel to the existing AWWU tunnel complete with a river release facility at RM 11.5. This alternative was ultimately not selected due to the substantial capital costs to provide the same environmental benefits as using the AWWU portal valve. A comparison of the new bypass tunnel with the AWWU portal valve is presented in Table 4-17.

**Table 4-17. Habitat Gains Comparison – New Bypass Tunnel Release Facility.**

Description	Chinook Spawning	Coho Spawning	Chinook Rearing	Coho Rearing
Habitat Gains (Acres) with Portal Releases	1.5	1.6	6.3	9.9
Habitat Gains (Acres) with New Bypass Tunnel	1.5	1.6	6.3	9.9
Incremental Cost (\$/Yr/Acre) for Portal Releases	\$1,833,000	\$1,696,000	\$428,000	\$273,000
Incremental Cost (\$/Yr/Acre) for New Bypass Tunnel	\$5,373,000	\$5,037,000	\$1,279,000	\$814,000

#### 4.11.4 Flow Releases from the Existing Dam

A measure that was included in three of the 12 comprehensive alternatives proposed by stakeholder groups was to modify the existing dam to release water into the river continuously. In doing so, operations of the reservoir would need to change substantially from current operations. In an average year, the water surface elevation fluctuates from EL. 867.0 ft (local datum) to EL. 830.0 ft with the ability to draw down to EL. 814 ft if necessary. Releases year-round at the existing dam would require the reservoir to remain above EL. 861 ft to maintain connectivity with the existing outlet gate at the dam. A representation of the proposed reservoir operation if flow releases were made at the existing dam compared to current operations is presented in Figure 4-7.



**Figure 4-7. Water Surface Elevation Comparison – Existing Dam Releases.**

This alternative was ultimately not selected due to the elimination of over 80% of the reservoir storage from being utilized for power generation purposes. Due to the reduction of inflows throughout the winter and the need for maintaining the reservoir above El. 861 ft for river release purposes, the powerhouse is unable to operate for up to eight months of the year. This results in a substantial loss of power generation when grid demand is highest, violates power capacity reserve requirements throughout the winter for MEA, and presents an unacceptable risk to the Project Owners.

#### **4.11.5 Lach Q'atnu Creek Reroute**

A proposal to provide year-round natural flows into the Eklutna River included the re-route of Lach Q'atnu Creek from its current path into Eklutna Lake to a location approximately 1,000 feet downstream of Eklutna Dam. Stream gauging records of the creek as part of the study program revealed negligible inflows in the winter (<1 cfs) with daily mean flow rates >10 cfs for about 30 days in the summer. Engineering challenges with the proposed reroute of the creek involve the risk of channel migration through the alluvial fan over time and the encroachment onto private property in the vicinity of the proposed alignment. For these reasons the cost associated with the re-routing combined with the risk of impacting private property deemed this alternative unsuitable for further analysis and was excluded from all preferred alternatives.

#### **4.11.6 Channel Maintenance Flows with Uncontrolled Spill**

Intentionally spilling water through the existing overflow spillway was considered for providing periodic channel maintenance flows to the Eklutna River. However, this PME measure was ultimately not selected because of the inherent risk associated with an uncontrolled spill event. In addition, it would require the reservoir to be raised above EL. 871 ft which would cause more erosion of the lakeside trail and would limit the time of year when channel maintenance flows could be provided.

#### **4.11.7 Channel Maintenance Flows with Radial Gate**

The Project Owners considered adding a radial gate on top of the existing overflow spillway in order to provide controlled spill for periodic channel maintenance flows. However, this PME was ultimately not selected because it would still require the reservoir to be raised above EL. 871 ft which would cause more erosion of the lakeside trail and would limit the time of year when channel maintenance flows could be provided.

#### **4.11.8 Channel Maintenance Flows with Fixed Wheel Gate**

During the consultation process, several stakeholders requested that the existing overflow spillway be replaced with a fixed wheel gate because either (1) climate change may cause inflows to the reservoir to increase significantly, which may increase the likelihood of future spill events, and a fixed wheel gate will allow the Project Owners to better manage those future spill events, or (2) while modeling results show that the default channel maintenance flow regime will maintain spawning gravels in the wetted reach of the Eklutna River, future monitoring may show that a higher magnitude channel maintenance flow that exceeds the combined hydraulic capacity of the existing outlet gate and the Eklutna River Release Facility may be warranted. Replacement of the existing overflow spillway with a new fixed wheel gate was evaluated during the study program and alternatives analysis and the Project Owners determined that it was not warranted at this time due to the need to perform additional design analysis to confirm whether significant dam safety concerns might exist, and the need for future monitoring of habitat conditions under the proposed flow regime. Recognizing that the fixed wheel gate might be warranted in the future, however, the Project Owners will continue to investigate the fixed wheel gate and will construct it if certain criteria are met.

#### **4.11.9 Fish Passage**

The Traditional Ecological Knowledge (TEK) from NVE indicates that there was a sockeye salmon run in Eklutna Lake before the lower dam was constructed in 1929. However, in a 2011 report, the USACE stated “It is doubtful that significant numbers of sockeye salmon ever spawned in the Eklutna River drainage because suitable spawning area upstream of the lake is



limited and water quality in the lake would likely have limited opportunities for spawning in the littoral zone of the lake. Fully 80 percent of the water entering Eklutna Lake comes from two glacial streams that would not be conducive to the consistent survival of sockeye salmon from egg to fry, and the remaining spawning area would not be sufficient to support large numbers of spawning anadromous salmon. In addition, the physical limnology studies of Eklutna Lake suggest that the turbidity in Eklutna Lake during much of the year is not conducive to significant primary production.”

A separate study was conducted by Loso et al. to try to determine “whether there was an anadromous salmon run into Eklutna Lake prior to 1929” by using marine derived nutrients (MDN) as a biochemical marker in lake sediment. The study found that there was no significant difference in the composition of sediment layers from before and after 1929. However, a sensitivity test was conducted to assess the possibility that a small salmon run may have gone undetected by the isotopic analysis. It was determined that “a salmon run of up to 1,000 per year, and potentially as many as 15,000 per year, would be possible without noticeably altering the measured isotopic composition of the sediments in Eklutna Lake.” Therefore, the results “provide no evidence that such runs occurred, but do not preclude the possible existence of a relatively small sockeye fishery in Eklutna Lake before 1929.”

During the consultation process, several stakeholders requested that upstream fish passage of adult salmon into Eklutna Lake and downstream fish passage of juvenile salmon out of Eklutna Lake be evaluated. All fish passage measures proposed by the Project Owners and other stakeholders were evaluated during the study program and alternatives analysis (see Section 4.5). All of the volitional upstream fish passage measures that were evaluated either (1) would have significant impacts to the hydropower project (i.e., would reduce the storage capacity of the reservoir by approximately 40% or would require the Project powerhouse to be shutdown throughout the winter when energy is needed most), or (2) are cost prohibitive (the estimated present worth for the stakeholders’ preferred alternatives that included volitional fish passage ranged from \$221M to \$385M including capex, operations and maintenance, and replacement energy). In addition, there are still significant concerns regarding the effectiveness of all the downstream fish passage facilities studied (i.e., low attraction flow velocities and/or the inability to operate the downstream fish passage facilities while the lake is frozen over). Therefore, fish passage measures are not proposed at this time. The lake study results and justification for the exclusion of each measure from the Project Owners’ Proposed Final Program are presented in the following subsections.

Nonetheless, the Project Owners recognize that fish passage may become feasible in the future and that fish passage is important to NVE and the federal resource management agencies. The Project Owners have therefore included a limited reopener for fish passage in the Proposed Final Program.

#### 4.11.9.1 Lake Studies

Much of the Eklutna Lake shoreline is steep, bouldery, or characterized by fine silt and grasses. The remaining shorelines that could be accessed during the study program (above the waterline) contained ~1.5 acres of potential habitat for lakeshore-spawning ocean-run salmon such as sockeye.

Most tributaries to Eklutna Lake are too steep to provide significant spawning or rearing habitat for ocean-run salmon. The only lake tributaries with accessible low-gradient habitat suitable for the migration and spawning of ocean-run salmon are the East and West Forks of Eklutna Creek where an estimated 0.77 – 3.61 acres of potential spawning habitat was documented based on water depth and substrate size. A small tributary to the West Fork of Eklutna Creek adds between 0.02 – 0.24 acres of potential spawning habitat.

Low water transparency (caused by high turbidity) and low nutrients levels in Eklutna Lake correlate with low levels of chlorophyll a (an indirect indicator of primary production). The low algal biomass within Eklutna Lake likely corresponds to low zooplankton densities (secondary production) and appears to be a limiting factor (i.e., food resource) for fish production in the lake, especially for the resident kokanee population.

A majority of the spawning kokanee collected from Eklutna Lake have Infectious Hematopoietic Necrosis (IHN) and were smaller (4.5-6.5 inches) than those reported in many other lake systems (10–12 inches). The kokanee in Eklutna Lake also differ from other kokanee in their low fecundity (only 20-30 eggs), lack of sexual dimorphism, and lack of spawning color that is typical of the species (Figure 4-8). These are likely an indication of low nutrient concentrations and limited food sources in the environment, and may indicate that Eklutna Lake, in its existing condition, may not provide productive potential rearing habitat for large populations of ocean-run salmon.



Figure 4-8. Typical spawning Kokanee in Eklutna Lake (left) vs. other lake systems (right).

It has been theorized, but not studied, that if fish passage was provided into Eklutna Lake, the spawning salmon would bring enough marine derived nutrients with them. However, high turbidity in Eklutna Lake would still limit light penetration. The high turbidity in the lake is caused by runoff from the retreating Eklutna Glacier. Like the Eklutna Glacier, the nearby Skilak Glacier is also retreating. Elevated runoff from the retreating Skilak Glacier produces more silt (i.e. turbidity), blocking sunlight, reducing the euphotic zone, and diminishing zooplankton densities. The result is fewer zooplankton (e.g. copepods) available as a food resource for juvenile sockeye. Research by ADFG in 2004 showed that the average weight of juvenile sockeye in Skilak Lake was almost half of what was typical. If a critical summer weight size isn't achieved, overwinter survival of juvenile sockeye will be poor and at some point, will have a substantial impact on sockeye returns. As the Eklutna Glacier retreats further, we can expect a similar trend of increasing turbidity in Eklutna Lake as well.

It also important to note that no adult sockeye were observed spawning in the lower river during the 2-year study program. Therefore, any attempt to establish a sockeye salmon run in the Eklutna watershed would either rely on sockeye straying from other river systems or intentional stocking efforts.

#### **4.11.9.2 Upstream Fish Passage**

##### **Gravity Flow Fish Ladder**

The gravity flow fish ladder measure includes the construction of a new technical fishway at the existing Eklutna Dam. The fish ladder would be of the weir and orifice or vertical slot style with an entrance below the dam and exit at fixed elevation on the upstream side of the dam. For proper function, the water surface elevation of the lake must maintain relatively constant during spawning season, resulting in the inability to utilize any of the reservoir storage for power generation purposes. For this reason, this alternative was not included in any of the preferred comprehensive alternatives.

##### **Variable Exit Fish Ladder**

The variable exit fish ladder measure is included in three of the 12 comprehensive alternatives proposed by stakeholders. The design and construction are similar to the gravity flow fish ladder measure; however, the exit includes a series of gates corresponding to varying water surface elevations which allow for approximately 15-feet of reservoir fluctuation. While allowing for some operational flexibility and continued hydropower generation, this alternative being combined with the existing dam structure for flow releases still requires the hydroelectric powerhouse to be offline throughout the winter, when power demand is the

highest. For this reason, the variable exit fish ladder and release through the existing dam was not included as part of the Project Owners' Proposed Final Program.

### **Fish Ladder with Pumped Water Supply and Slide**

The fish ladder with pumped supply and slide measure includes the construction of a new technical fishway at the existing Eklutna Dam with a chute or slide to return fish to a lower water surface elevation within the lake. The fish ladder would be of the weir and orifice or vertical slot style with an entrance below the dam and exit at a false weir located at the dam. Water from the lake would be pumped continuously over the weir during spawning season providing attraction flow for salmon. From the false weir, migrating adults would fall into a chute or slide and enter Eklutna Lake at a reduced water surface elevation. While this alternative allows for operations of the reservoir for power supply purposes, the reliance on pumps for providing flow to the ladder presents a significant risk. Additionally, this method of fish passage has little to no precedence at existing dams. For these reasons this measure was not included in any of the stakeholder comprehensive alternatives.

### **Trap and Haul**

A trap and haul facility was proposed for analysis early on by the Project Owners to be combined with either the AWWU Portal Release or AWWU Pipeline Release measures. The proposal included the addition of a false weir, holding pond with crowder, and lift to transport migrating adults to a truck for transport to Eklutna Lake. While this measure would allow the Project Owners to maintain current reservoir operations and operate the powerhouse year-round, it was ultimately not selected as part of the Project Owners' Proposed Final Program due to the lake studies concluding that Eklutna Lake has little to no productivity potential and would likely not support a healthy fishery as evidenced by the condition of kokanee residing in the lake. In addition, this upstream fish passage option received no support from any of the stakeholders.

#### **4.11.9.3 Downstream Fish Passage**

### **Spill**

One measure proposed for allowing downstream passage of out-migrating juvenile salmonids is to release a significant flow from the dam via a new spillway gate, or by uncontrolled release over the existing spillway from April through June. While this approach is viable, due to the size, depth, and layout of Eklutna Lake, a spill event on the order of 300-500 cfs would provide very low attraction velocities within the lake itself, resulting in substantially reduced efficacy of downstream passage. Additionally, the volume of water released in a spill event of this magnitude for a duration of up to 3 months results in a significant portion of the reservoir

annual inflow volume being utilized for downstream passage rather than for power generation purposes. For these reasons spill was not proposed for downstream passage as part of the Project Owners' Proposed Final Program.

### **Floating Surface Collector**

To preserve water for power supply purposes, an alternate method for downstream passage was proposed, consisting of a floating surface collector located at or near the intake or the lake outlet. This floating barge structure would consist of guidance screens and attraction flow pumps moving approximately 500 cfs through the screens to attract and capture migrating juveniles. A primary concern with the usage of floating surface collector for downstream passage is that the barge must operate in ice-free conditions. At Eklutna Lake, ice breakups typically occur in May to June, which results in the floating surface collector being inoperable for 50%-70% of the theorized outmigration window. Additionally, as presented in the cost estimate summary, these structures have substantial capital and operating expenses. For these reasons, the floating surface collector was not included as part of the Project Owners' Proposed Final Program.

### **Other Downstream Passage Measures**

During the Aquatics TWG meeting on November 9, 2022, two other downstream fish passage measures were discussed: 1) volitional downstream fish passage through the existing intake, and 2) trap and haul downstream fish passage utilizing a rotary screw trap and guide net. However, after preliminary evaluation, it was determined that neither of these measures would have a high success rate; therefore, neither measure was selected by the Aquatics TWG for further evaluation.

#### **4.11.10 Trapping Facility with Hatchery Spawning, Rearing, and Release**

During the Aquatics TWG meeting on November 9, 2022, the concept of a trapping adult salmon at the flow release point, spawning the adult salmon and rearing the juvenile salmon at a hatchery, and then releasing the juvenile salmon back into the Eklutna River. This method would likely result in a higher survival rate which would accelerate the salmon population growth in the river. However, the Aquatics TWG strongly opposed the idea of a hatchery; therefore, this measure was not selected by the Aquatics TWG for further evaluation.

#### **4.11.11 Replacement Dam**

The base of the existing Eklutna Dam is located on a depositional shelf approximately 200-ft higher in elevation than the deepest portion of Eklutna Lake and approximately 60-ft higher in elevation than the intake elevation for the power tunnel. As described in Section 4.11.4,

providing continuous releases to the Eklutna River from the existing dam significantly curtails power generation and reduces the active storage volume of the reservoir by over 80%. An alternative proposed to reduce restrictions on reservoir operations while providing year-round hydroelectric generation involves the excavation of the depositional shelf at the existing dam and construction of a replacement dam in its place. The excavation would require construction of a channel approximately 20-ft deep, 50- to 350-ft in width, and 1-mile in length resulting in removal of approximately 550,000 cubic yards of material. The replacement dam would have an overall height of approximately 56-feet and incorporate a spillway and fish passage structures.

This alternative would restrict the minimum reservoir operating elevation to El. 840 ft, removing approximately 40% of the storage capacity of the reservoir. While this allows operation of the Eklutna Power plant year-round in an average water year, it requires some operational restrictions and reduces flexibility in hydropower generation seasonally.

The replacement dam is included in four of 12 comprehensive alternatives proposed by stakeholder groups. While the replacement dam concept continues to allow hydroelectric generation year-round, the cost of this measure and loss of reservoir capacity are the primary reasons it is not included within the Project Owners' Proposed Final Program. Dependent on the measure chosen for downstream fish passage, the replacement dam alternatives range from a capital cost of approximately \$120M to \$180M<sup>14</sup> which results in a significant additional burden on ratepayers and taxpayers. A summary of the costs of the replacement dam alternatives compared to the Project Owners' AWWU portal valve alternative is presented in Table 4-4.

**Table 4-18. Cost Comparison Summary – Replacement Dam.**

Entity	Alternative Measure	Capital Cost (\$)	Annualized Cost (\$/Yr)	CEA Rate Impact (%)	MEA Rate Impact (%)	MOA Tax Impact (\$/100k)
Project Owners	AWWU Portal Valve	\$20,482,860	\$3,898,161	0.78%	1.07%	\$1.03
TCF	Replacement Dam	\$118,129,000	\$19,776,000	3.81%	5.31%	\$4.46

<sup>14</sup> The cost estimate for the replacement dam measure was developed in close coordination with Eklutna Inc. and has a median construction cost of \$113M with a class 5 estimate range of \$57M to \$220M. Following development of the original estimate, Eklutna Inc. had recommended a few revisions to the costs including providing a new location for material disposal which resulted in a potential cost savings of approximately \$25M. The revision falls within the price range of the original estimate and will be considered if the design of this measure is advanced.

NVE	Replacement Dam	\$122,853,000	\$22,006,000	4.24%	6.10%	\$4.62
USFWS Alt A	Replacement Dam	\$158,719,000	\$23,483,000	4.61%	5.50%	\$7.48
NMFS	Replacement Dam	\$177,833,000	\$25,465,000	4.91%	5.89%	\$8.32

## 4.12 NVE Comment Summary

As stated in their June 2020 letter to NVE, the Project Owners committed to submitting an NVE-specific comment summary to the Governor for consideration along with the Project Owners' Proposed Final Program.

### 4.12.1 Dam Replacement – NVE's First Preferred Alternative

In July 2023, NVE identified the replacement dam as their preferred alternative (see Section 4.5.4). NVE's preferred year-round instream flow regime was 350 cfs in July and August, 150 cfs in September and October, and 65 cfs throughout the winter. NVE's preferred channel maintenance flow regime was 700 cfs annually. Channel maintenance flows would be provided through a fixed wheel gate and upstream fish passage would be provided through a fish ladder (both consistent with the conceptual design of the replacement dam). Downstream fish passage would be provided through spill.

As described in Section 4.11.11, the replacement dam was not selected by the Project Owners primarily because of the associated costs and the 40% reduction in storage capacity for the reservoir.

### 4.12.2 Dam Removal – NVE's Second Preferred Alternative

Following the publication of the Draft Program, NVE proposed a new preferred alternative that requires removal of Eklutna Dam and decommissioning of the Project. NVE stated the following in their comment letter dated December 4, 2023:

“To meaningfully meet the purpose of the Agreement, NVE proposes an alternative solution – removing the Eklutna Lake dam within ten years when sufficient renewable power generation is available to offset the lost power generation from dam removal.”

NVE's second preferred alternative proposal contained no analysis of costs or risks of removing the Project dam or replacing its energy and capacity. In response to the letter, the Project Owners engaged engineers and hydrologists to conduct a high-level analysis of the

technical risks and cost implications associated with the removal of the Project. This investigation evaluated the effects that an unregulated river hydrograph may have on infrastructure on or adjacent to the Eklutna River downstream of the existing dam, summarized the costs associated with dam removal and decommissioning of Project infrastructure, investigated potential mitigation measures where necessary to address such risks, and analyzed the use of other comparable renewable energy sources to determine how to offset the lost generation from the Project. A memorandum documenting this analysis and the results is included in Attachment F.

The dam removal analysis revealed that if the Project were removed and the expected stream flows were allowed to flow unregulated down the Eklutna River, AWWU's water pipeline infrastructure would be at significant risk and the New Glenn Highway bridges and Alaska Railroad bridge would need to be replaced. Note that this analysis was limited to large public infrastructure and did not include an assessment of negative effects (or potential liabilities) arising from the inundation of lands on downstream landowners during high water flood events, including Eklutna, Inc. and NVE. Additionally, the assessment showed that mitigating the risks to the downstream infrastructure and replacing the Project energy and capacity with firm renewable energy would cost more than \$500 million in total known costs in 2034 dollars.

Ultimately, given (1) the likely adverse impacts to the municipal water supply and downstream infrastructure, including the buried AWWU pipeline, New Glenn Highway bridges, and railroad bridge, (2) the cost of replacing the Project's capacity and energy generation, (3) the Project Owners' overall renewable energy goals, and (4) the dwindling natural gas supply in Cook Inlet, the Project Owners determined it would not be prudent or rational for the Project Owners to include dam removal in the Proposed Final Program.

#### **4.12.3 Pump Station and Dam Removal – NVE's Third Preferred Alternative**

On April 9, 2024, NVE proposed a new alternative still centered on the removal of Eklutna Dam "by 2034." However, in addition to all the costs and risks that would be created by dam removal outlined in Section 4.12.2 and Attachment F, NVE's third alternative also included additional requirements to obtain "40 MW of replacement renewable energy" within 10 years and the obligation to construct and operate an alternative Eklutna River Release Facility through the construction of a pump station that would pump water from Eklutna Lake to the small pond upstream of Eklutna Dam, and then release water from the dam into the river year-round (see Section 4.8). This pump station would remain in place and operating after the dam is removed to ensure that AWWU can maintain its full withdrawals and, if necessary, keep the river watered during dry winter months. NVE's third alternative also proposed other Program elements, such as creation of an earnings fund reserve, amending the 1991 Agreement to



delay its process and implementation, and including NVE as a permanent member of the Monitoring and Adaptive Management Committee.

As with its second preferred alternative, NVE's third preferred alternative proposal contained no analysis of costs or risks to the Project Owners or any other entity. The Project Owners acknowledge that NVE's proposed pump station is a viable alternative to the proposed Eklutna River Release Facility from an engineering perspective, and the Project Owners actually studied and considered variations of the pump station alternative during early analysis of all potential alternatives that were identified. Ultimately, however, the idea was not advanced as a preferred alternative because the pump station depends on the proper functioning of a powered mechanical system; if that powered mechanical system fails, the consequence could be catastrophic to the downstream fish populations and habitat that would depend on future flow releases. The Project Owners' proposed Eklutna River Release Facility does not depend upon a powered mechanical system to provide instream flows; rather it requires only gravity. Unlike the pump station, if there is a power outage for an extended time (which is somewhat likely given its location), then the Project Owners' Eklutna River Release Facility would continue to function by simple gravity flow from the river release valve. The Project Owners know of no instream flows established at any hydroelectric project in the U.S. that depends upon the proper functioning of a powered mechanical system to convey water, especially one in a remote location with complex supporting infrastructure.

The Project Owners expect that the capital costs of the pump station would significantly exceed the \$10 million of estimated capital costs for the proposed Eklutna River Release Facility. The Project Owners disagree with NVE's statement that the \$8.4 million capex figure developed for the siphon alternative as part of phase 1 engineering is reflective of what the pump station would cost. The pump station would be significantly more expensive due to the cost of the deep wet well excavation and boring of the intake pipe as proposed. Additionally, the Project Owners expect that the operational and maintenance costs of the pump station would far exceed the proposed Eklutna River Release Facility as the pumps require a continuous energy draw to operate and the emergency generator would need regular servicing and maintenance. The new access road construction, distribution line, and electrical building required by the pump station, all to be located so close to the state park recreation and campground facilities, may raise potential sound and aesthetic concerns.

Furthermore, the Project Owners do not believe that the proposal to provide power to the pump station using the existing system's 12.47 KV single-phase line on wooden poles would be adequate. A more robust distribution system would need to be erected at a much higher expense. Seven miles of 3-phase distribution lines in that territory would cost roughly \$2 million. Finally, the Project Owners estimated that NVE's pump station alternative would not accommodate channel maintenance flows allowed under the Proposed Final Program.

Consequently, the Project Owners determined it would not be prudent or rational for the Project Owners to agree to the costs and risks of NVE's third preferred alternative (dam removal starting in 2034, 40 MW of replacement renewable energy, and the pump station). With all due respect to NVE, the Project Owners must observe prudent utility practices and our obligations to our member-ratepayers. The Project Owners also reject the need for fund reserve and ability to amend the 1991 Agreement without Congressional approval. The Project Owners did agree to name NVE as a permanent member of the Committee as set forth in Section 3.1 of the Proposed Final Program.

## Attachments

- Attachment A. Consultation Record
- Attachment B. Final Summary of Study Results
- Attachment C. Supporting Data for Cost Effectiveness Modeling
- Attachment D. Draft AWWU Agreements
- Attachment E. Responses to Comments on the Draft Program
- Attachment F. Dam Removal Assessment
- Attachment G. Public Comment Summary and Analysis
- Attachment H. Comparison to Existing Conditions
- Attachment I. Design Documentation Reports