Technical Memorandum

To:	Mike Brodie, P.E. Chugach Electric Association	Project:	Eklutna Fish & Wildlife Project
From:	Sean P. Ellenson, P.E. McMillen, Inc.	cc:	
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Subject:	Supporting Data for Cost Effectiveness Model		

Revision Log

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1.0 Introduction

A cost effectiveness model was utilized to compare various alternative protection, mitigation, and enhancement measures proposed by stakeholders as part of the Eklutna Fish & Wildlife Program. To capture the financial considerations of each proposed alternative, the capital costs, operations and maintenance (O&M) costs, and replacement energy costs must be annualized over the 35-year period of the agreement. This memorandum defines the methodology and components of the financial analysis that went into determining the annualized costs and ultimately the estimated ratepayer and taxpayer impacts for each proposed alternative.

2.0 Annualized Costs

To determine the annualized cost of each comprehensive alternative proposed as part of the alternatives analysis process, the components of capital costs, O&M costs, and replacement energy costs were evaluated. The details of this evaluation are presented in the following subsections.

2.1 Capital Expenditures

The estimated capital expenditures for each proposed alternative were based on the class 5 opinion of probable construction costs (OPCC) developed for each measure as part of the Phase 1 engineering design (McMillen, Eklutna Fish & Wildlife Project. Engineering Feasibility Study - Class 5 Opinion of Probable Construction Costs 2023). The estimated costs for each measure are defined in Table 2-1.

Table 2-1. Class 5 OPCC - Cost Summary.

PME Measure		Total Median Cost	Expected Estimate Cost Range Class 5 (-50% to +100%)		
A	Dam Release Modifications	$6,680,000	$3,340,000	to	$13,360,000
B	Siphon Bypass Pipeline	$22,371,500	$11,186,000	to	$44,743,000
C	AWWU Portal Release Facility	$5,546,500	$2,773,000	to	$11,093,000
D	AWWU Pipeline Release Facility	$2,248,300	$1,124,000	to	$4,497,000
E	Bypass Tunnel Release	$76,747,200	$38,374,000	to	$153,494,000
F	Channel Excavation	$569,000	$285,000	to	$1,138,000
G	Lach Q'atnu Creek Re-Route	$1,523,000	$762,000	to	$3,046,000
H	Spillway Modifications - Tainter Gate	$5,574,300	$2,787,000	to	$11,149,000
I	Spillway Modifications - Fixed Wheel Gate	$6,573,500	$3,287,000	to	$13,147,000
J	Gravity Flow Fish Ladder	$16,670,300	$8,335,000	to	$33,341,000
K	Variable Exit Fish Ladder	$17,569,600	$8,785,000	to	$35,139,000
L	Pumped Supply and Slide Fish Ladder	$15,240,200	$7,620,000	to	$30,480,000
M	Trap and Haul Facility	$8,336,200	$4,168,000	to	$16,672,000
N	Floating Surface Collector	$57,557,000	$28,779,000	to	$115,114,000
O	Fish Exclusion Barrier	$3,125,600	$1,563,000	to	$6,251,000
P	Replacement Dam	$113,344,500	$56,672,000	to	$226,689,000
Q	Lakeside Trail Improvements	$373,600	$187,000	to	$747,000
R	AWWU Maintenance Road Crossings	$2,941,500	$1,471,000	to	$5,883,000
S	Physical Habitat Manipulation	$1,469,200	$735,000	to	$2,938,000

A comprehensive alternative proposed by a stakeholder, owner, or interested party combines the individual costs of each measure for a combined estimated capital cost. It shall be noted that at the level of design presented in phase 1 engineering these costs carry an accuracy range of -50% to +100%, which will be further refined as part of further phases of engineering design. A summation of capital costs for an example comprehensive alternative proposed as part of the Fish & Wildlife Program is presented in Table 2-2.

Table 2-2. Example Comprehensive Alternative Cost Summary.

PME Measure	Capital Cost
AWWU Portal Release Facility:	$5,547,000
AWWU Maintenance Road Crossings:	$2,942,000
Lakeside Trail Improvements:	$374,000
Comprehensive Capital Cost:	$8,863,000

To annualize the cost of the capital expenditures over 35 years, a discount rate is applied to take into account the time value of capital costs spread over the 35-year program. The discount rate utilized by the Hydro Project owners for assessing future cash flows is equal to 5%. In addition to the discount rate applied for assessing future cash flow, the Regulatory Commission of Alaska (RCA) sets a Times Interest Earned Ratio (TIER) which must be applied on assessing future interest payments as part of the equation for setting utility rates. The TIER is only applied to assess capital cost cashflow for Chugach Electric Association (CEA) and Matanuska Electric Association (MEA) and is currently set at 1.75x and 1.60x, respectively.

To assess the responsibility of these costs per Project Owner, the annualized capital costs must vary based on the TIER and ownership of the project by entity. The breakdown of project ownership for capital costs associated with the Project is presented in Table 2-3 based on the comprehensive alternative discussed within this section. The 35-year annualized cost variation based on the required TIER is presented in Table 2-4. The annualized cost for the purposes of ratepayer impacts based on project ownership by utility is presented in Table 2-5.

Table 2-3. Project Ownership - Capital Expenditures.

Entity	Ownership
Chugach Electric Association	64.29%
Matanuska Electric Association	16.67%
Municipality of Anchorage	19.04%

Table 2-4. 35-Year Annualized Capital Costs with Varied TIER.

Description	35-Year Annualized Cost
Capital Cost	$8,863,000
35-Yr Annualized Cost; 1.75x TIER	$819,000
35-Yr Annualized Cost; 1.60x TIER	$760,000
35-Yr Annualized Cost; No TIER	$541,000

Table 2-5. 35-Year Annualized Capital Costs by Owner.

Entity	35-Year Annualized Cost
Chugach Electric Association	$527,000
Matanuska Electric Association	$127,000
Municipality of Anchorage	$103,000

2.2 Operations and Maintenance Annualized Costs

The estimated O&M costs for each proposed alternative were based on estimates developed for each measure as part of the Phase 1 engineering design (McMillen, Eklutna Fish & Wildlife Project. Engineering Feasibility Study - Class 5 Opinion of Probable Construction Costs 2023). The estimated O&M costs for each measure are defined in Table 2-6.

Table 2-6. O&M Cost Summary.

PME Measure		O&M Cost
A	Dam Release Modifications	$565,500
B	Siphon Bypass Pipeline	$664,300
C	AWWU Portal Release Facility	$196,300
D	AWWU Pipeline Release Facility	$196,300
E	Bypass Tunnel Release	$210,600
F	Channel Excavation	$0
G	Lach Q'atnu Creek Re-Route	$19,500
H	Spillway Modifications - Tainter Gate	$32,500
I	Spillway Modifications - Fixed Wheel Gate	$32,500

PME Measure		O&M Cost
J	Gravity Flow Fish Ladder	$604,500
K	Variable Exit Fish Ladder	$657,800
L	Pumped Supply and Slide Fish Ladder	$813,800
M	Trap and Haul Facility	$200,200
N	Floating Surface Collector	$1,773,200
O	Fish Exclusion Barrier	$37,700
P	Replacement Dam	$299,000
Q	Lakeside Trail Improvements	$0
R	AWWU Maintenance Road Crossings	$0
S	Physical Habitat Manipulation	$0

A comprehensive alternative proposed by a stakeholder, owner, or interested party combines the individual costs of each measure for a combined estimated O&M cost. A summation of O&M costs for an example comprehensive alternative proposed as part of the Fish & Wildlife Program is presented in Table 2-7.

Table 2-7. Example Comprehensive Alternative Cost Summary.

PME Measure	Capital Cost ($)
AWWU Portal Release Facility:	$196,300
AWWU Maintenance Road Crossings:	$0
Lakeside Trail Improvements:	$0
Comprehensive O&M Cost:	$163,800

To annualize the cost of the O&M expenditures over 35 years, an annual increase is applied to consider the increasing price of labor and materials over time. The escalation is based on historical trends for the utilities and is equal to an annual increase of 3% per year.

To assess the responsibility of these costs per Project Owner, the annualized O&M costs vary based on the ownership of the project by entity and is equal to the ownership breakdown of the capital costs of the project, as presented in Table 2-8. The 35-year annualized cost including annual escalation is equal to $345,000/yr based on the comprehensive alternative proposed as part of the Fish & Wildlife Program. The annualized cost for the purposes of ratepayer impacts based on project ownership by utility is presented in Table 2-9.

Table 2-8. Project Ownership – O&M Expenditures.

Entity	Ownership
Chugach Electric Association	64.29%
Matanuska Electric Association	16.67%
Municipality of Anchorage	19.04%

Table 2-9. 35-Year Annualized O&M Costs by Owner.

Entity	35-Year Annualized Cost
Chugach Electric Association	$221,800
Matanuska Electric Association	$57,500
Municipality of Anchorage	$65,688

2.3 Replacement Energy Annualized Costs

The estimated replacement energy costs for each comprehensive alternative are based on the hydropower operations model developed as part of the Year 1 study results (McMillen 2023). For the comprehensive alternative proposed as part of the Fish & Wildlife Program the replacement energy is based on reduced flow to the Eklutna Power Plant as a result of flow releases into the Eklutna River. The proposed release regime is presented in Table 2-10.

Table 2-10. Eklutna River Flow Release by Month.

Month	Flow Rate (cfs)
Jan	27
Feb	27
Mar	27
Apr	27
May	34
Jun	40
Jul	40
Aug	40
Sep	40
Oct	40
Nov	35
Dec	27

Modifying reservoir and powerhouse operations to release the proposed flow regime into Eklutna River results in an average annual decrease of generation of 15,725 MWh/yr. To determine the value of energy losses from the Eklutna Power Plant the value of the replacement energy within MEA and CEA's system was studied. In the case of both utilities, any energy lost from the facility would be replaced by one of the multiple natural gas generation facilities located in the local system.

The value of energy produced from a natural gas generation facility is directly tied to the price of natural gas. In June 2023 the local provider of natural gas, Enstar Natural Gas Company LLC, presented to the RCA a range of gas prices expected in 2026. The price of gas ranged from a low of $12.20 per thousand cubic feet (MCF) to $13.90/MCF with a median expected value of $13.05/MCF. Using the median expected gas price, the Project Owners performed a production cost model run of energy generation on the Railbelt system utilizing GenTrader®, an energy portfolio modeling software, to determine a forecasted price of energy from natural gas generation sources of $84.65/MWh. Based on the median price of replacement energy, an initial cost of replacement energy during Year 1 was determined to be $1,330,000.

To annualize the cost of the replacement energy over 35 years, an annual increase is applied to consider the increasing price of gas over time. The escalation is based on historical trends for the utilities and is equal to an annual increase of 1% per year. Considering the annual increase in energy costs, the 35-year average annualized cost of replacement energy is equal to $1,593,000/Yr.

To assess the responsibility of these costs per Project Owner, the annualized replacement energy costs vary based on the ownership of the project by entity as presented in Table 2-11. The annualized cost for the purposes of ratepayer impacts based on project ownership by utility is presented in Table 2-12.

Table 2-11. Project Ownership – Replacement Energy Costs.

Entity	Ownership
Chugach Electric Association	64.29%
Matanuska Electric Association	35.71%
Municipality of Anchorage	0%

Table 2-12. 35-Year Annualized Replacement Energy Costs by Owner

Entity	35-Year Annualized Cost
Chugach Electric Association	$1,024,000
Matanuska Electric Association	$569,000
Municipality of Anchorage	$0

2.4 Comprehensive Cost Summary

After determining the individual annualized costs of each sub-component by utility ownership structure, the overall annualized cost per comprehensive alternative is combined to assess impacts to each Project Owner. The combined annual costs by utility are presented in Table 2-13.

Table 2-13. 35-Year Annualized Cost Summary.

Entity	35-Year Annualized Cost
Chugach Electric Association	$1,772,800
Matanuska Electric Association	$753,500
Municipality of Anchorage	$168,700

3.0 Ratepayer & Taxpayer Impacts

Each of the utilities is a member-owned not-for-profit cooperative of which rate schedules are set by the RCA based on annual expenses for O&M, capital expenditures, labor, and debt service if applicable. The Municipality of Anchorage must fund expenses through the collection of property taxes on an annual basis. The annualized costs associated with ownership of this project will have direct impacts to member utility rates and property taxes for households residing in the Anchorage area. The energy rate increases based on annual expenditures are 0.3% and 1.12% per $1,000,000 spent for CEA and MEA, respectively. On a property tax basis, the Municipality of Anchorage must increase property taxes by 0.03 mils per $1,000,000 spent, with 0.03 mils being defined as a $3 increase in property tax per year per $100,000 in property value. A summary of the ratepayer and taxpayer impacts based on the example comprehensive alternative is presented in Table 3-1.

Table 3-1. Summary of Ratepayer and Taxpayer Impacts.

Entity	Ratepayer / Taxpayer Impacts
Chugach Electric Association	+0.53%
Matanuska Electric Association	+0.84%
Municipality of Anchorage	0.0051 mils $0.51/$100k

4.0 References

McMillen. 2023. *Eklutna Fish & Wildlife Project. Engineering Feasibility Study - Class 5 Opinion of Probable Construction Costs.* https://eklutnahydro.com/documents/.

—. 2023. *Hydropower Operations Modeling Study Report.* https://eklutnahydro.com/documents/.