February 16, 2024
sent via email

Dear Eklutna Hydroelectric Program Development Team,

Please accept the attached reports as comments on the Draft Fish and Wildlife Program for the Eklutna Hydroelectric Project.

The Anchorage Assembly has had concerns about unaddressed issues in the Draft Wildlife Program (AR 2024-40, As Amended), and therefore enlisted a consultant to research and report on those issues. The attached executive summary and full report were completed by Mr. Donald Spiegel with GV Jones & Associates, Inc.

Mr. Spiegel was retained to review the concept of providing Eklutna Lake water to the Eklutna River from an AWWU Portal Release Facility from both engineering and operations viewpoints. Mr. Spiegel is uniquely qualified to serve in this role due to his experience in the planning, design, construction and operation of water supply projects, his 45 years of experience on Water Supply and Water Treatment Engineering projects, and his five years of experience as Project Engineer and Lead Field Engineer on the design, construction and startup of the Eklutna Water Project.

Mr. Spiegel's review of project documentation for the AWWU Portal Release Facility coupled with his historical knowledge of the Eklutna Water Project identified significant project issues as are detailed in the attached reports.

Sincerely,

Christopher Constant

Assembly Chair Christopher Constant
District 1, North Anchorage

Assembly Vice Chair Meg Zaletel
District 4, Midtown

Attachments:
1. Executive Summary for Project Issues Paper
2. Project Issues Paper

EXECUTIVE SUMMARY

Eklutna River Restoration Project

Project Issues Paper

GV Jones & Associates, Inc.

1200 E 76th Ave

Anchorage, AK 99518

Author: Donald Spiegel, P.E.

(February 14, 2024)

About the Author and the Author's Role:

Mr. Donald Spiegel has 45 years of experience on Water Supply and Water Treatment Engineering projects. He has a Bachelor's Degree and a Master's Degree in Environmental Engineering and has been involved with projects around the world with costs ranging from $5M to almost $5B. Mr. Spiegel was retained to review the concept of providing Eklutna Lake water to the Eklutna River from an AWWU Portal Release Facility from both engineering and operations viewpoints. Mr. Spiegel is uniquely qualified to serve in this role due to his experience in the planning, design, construction and operation of water supply projects but also based on his five years of experience as Project Engineer and Lead Field Engineer on the design, construction and startup of the Eklutna Water Project. Mr. Spiegel's review of Project documentation for the AWWU Portal Release Facility coupled with his historical knowledge of the Eklutna Water Project resulted in the identification of significant Project Issues as are detailed in this Project Issues Paper.

Executive Summary

The first Eklutna Hydroelectric Project was constructed in the late 1920's by Anchorage Light and Power Company. In 1950, the Federal Government, through the United States Bureau of Reclamation (USBR), proposed raising the original dam to create a larger lake that could provide more electric power to Southcentral Alaska. This Project, called the Eklutna Hydroelectric Project, was completed in 1955. In 1967 the Alaska Power Administration (APA) was established and all responsibility for the operation and maintenance of the Eklutna Hydroelectric Project was transferred from the USBR to APA. In 1991, the Federal Government agreed to sell its interest in the Eklutna Hydroelectric Project to a trio of local electric utilities: (1) Municipality of Anchorage dba as ML&P at a 53.33% share; (2) Chugach Electric Association at a 30.0% share; and (3) Matanuska Electric Association at a 16.67% share. As part of this 1991 Agreement, the new "Project Owners" agreed to develop and propose a program to protect, mitigate damages to, and enhance fish and wildlife impacted by the original Federal Hydroelectric Project. The program would necessitate the development of a year-round release of water to the Eklutna River. Ownership of the Eklutna Hydroelectric Project was officially transferred from the Federal Government to the new Project Owners on October 2, 1997.

In 2019, the Project Owners began a consultation process to discuss alternatives for providing year-round release of water and periodic channel maintenance flows from Eklutna Lake into the Eklutna River. This resulted in a three-year effort to study alternatives and to consult with environmental stakeholders. The study's selected alternative consists of construction of a new isolation valve structure and a new river release structure located adjacent to the Anchorage Water and Wastewater Utility (AWWU) Eklutna Water Project (EWP) Portal Valve Shaft approximately one mile below the Eklutna Dam. This alternative, called the AWWU Portal Release Facility, relies on use of existing AWWU infrastructure. The selected alternative, however, creates policy and infrastructure issues for AWWU that are discussed herein.

The review provided in this Project Issues Paper that follows this Executive Summary contains the following sections:

1. Introduction
2. Project Definition for the AWWU Portal Release Facility
3. Governance Issues
4. Description of the Eklutna Water Project Facilities
5. Eklutna Water Project Raw Water System Hydraulics
6. Review of AWWU Portal Release Project Facilities

Review of Project documentation for the AWWU Portal Release Facility coupled with the Author's historical knowledge of the EWP resulted in the identification of significant Project Issues as follows:

Issue #1 is a Governance Issue. The Project Owners represent the power production interests for the Project. Information exchange and dialogue with State and Federal resource agencies and some environmental interests have also occurred but little engagement from the water supply interests (specifically AWWU, but also the Alaska Department of Environmental Conservation, ADEC) appear to have taken place. In the documentation to date, there is no mention of future expansion plans of EWP facilities nor the certainty of emergency shutdowns and inspection/maintenance shutdowns of EWP facilities. In addition, there is no discussion of the present condition of the Intake Valve Shaft nor the Portal Valve Shaft which are both 35 years old. Expansion of the Eklutna Water Treatment Facility (EWTF) would severely limit the ability to divert water from the AWWU Portal Release Facility both in terms of time-of-year and likely in flow. And shutdown of EWP facilities, which will continue to occur, would stop the flow to the Eklutna River entirely. If AWWU facilities are to be used as part of the solution for providing year-round flow to the Eklutna River, dialogue and engagement with AWWU and ADEC are critical to ensure the long-term health and safety of the Anchorage Public Water System (PWS). ADEC will likely be interested in why a Public Water System is also being used as a River Restoration System.

Issue #2 is an Opportunity Cost Issue. The EWP was originally designed and constructed to serve a PWS demand of 70 mgd – which is 108.5 cfs. The EWP piping, both raw water and treated water, were designed and constructed for the 70 mgd system flow; the EWTF was designed and constructed for a plant flow of 35 mgd to more closely match the PWS demands at the time of construction. The EWTF, however, was designed and is configured to allow easy expansion to 70 mgd. No mention of the future expansion of the EWTF to 70 mgd is acknowledged in the AWWU Portal Release Facility documentation to date. The need to expand the EWTF in the future could occur for a number of reasons, including: (1) population increase particularly North of the Anchorage Bowl; (2) diminishing groundwater supply due to contamination from PFAS, de-icing compounds, arsenic and/or other contaminants; and (3) possible decrease in Ship Creek supply due to water rights issues and creek flows during certain times of the year (military and maintaining minimum creek flows have priority over the AWWU use). To forego the opportunity to expand the EWTF to 70 mgd, and thus to forego expansion of the AWWU PWS in the planned manner that has existed for over 30 years, must be considered a significant policy decision for the MOA. To supply future drinking water from a source other than Eklutna Lake would certainly increase the cost of water in Anchorage significantly in the future.

Issues #3 (Scheduled Maintenance) and #4 (Emergency Maintenance) are Public Relations Issues. The EWP raw water facilities, including the Intake Valve Shaft and the Portal Valve Shaft have mechanical, electrical, and instrumentation and control equipment that require periodic maintenance work that necessitates scheduled shutdown of the EWP. These scheduled shutdowns can last days or longer depending on the maintenance needs. In addition, the raw water facilities have automatic and manual emergency shutdown capabilities in case of damage due to earthquake, terrorism, or vandalism that also result in long outage times. Draining and refilling raw water facilities can add significant time to these shutdowns, whether scheduled or emergency. It must be understood that use of the AWWU Portal Release Facility does not provide

a 100% certain year-round water supply to the Eklutna River. Scheduled maintenance shutdowns as well as periodic emergency shutdowns will continue to occur and discharge of water to the Eklutna River during these events will stop. The resulting impact to fish spawning habitat and the fish population itself will be of major public interest, potentially manifesting as negative public opinion towards MOA in general and AWWU specifically. Simply stated, the AWWU Portal Release Facility does not provide the year-round release of water to the Eklutna River as is portrayed in Project documentation to date.

Author's Opinion. In the documentation to date for the AWWU Portal Release Facility, Eklutna Water Project facilities have not been represented correctly in terms of capacity and operation. The Eklutna Water Project should be considered a project of 70 mgd (108.5 cfs) capacity and the operation of EWP facilities must consider scheduled and emergency shutdowns that can last from a few days to many weeks. Adjustment for these considerations and more detailed and consistent engagement of AWWU and ADEC personnel must occur as soon as possible to ensure the long-term health and safety of the Anchorage Public Water System. As a result of the mistaken assumptions about the EWP, it is concluded that the proposed AWWU Portal Release Facility cannot provide adequate Eklutna River restoration flows nor can it provide year-round water without interruption. Thus, it is the Author's opinion that the AWWU Portal Release Facility as currently configured is fatally flawed and other Eklutna River Restoration alternatives, or additional complementary facilities, should be studied further.

END OF EXECUTIVE SUMMARY

PROJECT ISSUES PAPER

Eklutna River Restoration Project

GV Jones & Associates, Inc.

1200 E 76th Ave

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Author: Donald Spiegel, P.E.

(February 14, 2024)

About the Author and the Author's Role:

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Executive Summary -- Under Separate Cover

1. Introduction

The first Eklutna Hydroelectric Project was constructed in the late 1920's by Anchorage Light and Power Company. In 1950, the Federal Government, through the United States Bureau of Reclamation (USBR), proposed raising the original dam to create a larger lake that could provide more electric power to Southcentral Alaska. This Project, called the Eklutna Hydroelectric Project, was completed in 1955. In 1967 the Alaska Power Administration (APA) was established and all responsibility for the operation and maintenance of the Eklutna Hydroelectric Project was transferred from the USBR to APA. In 1991, the Federal Government agreed to sell its interest in the Eklutna Hydroelectric Project to a trio of local electric utilities: (1) Municipality of Anchorage dba as ML&P at a 53.33% share; (2) Chugach Electric Association at a 30.0% share; and (3) Matanuska Electric Association at a 16.67% share. As part of this 1991 Agreement, the new "Project Owners" agreed to develop and propose a program to protect, mitigate damages to, and enhance fish and wildlife impacted by the original Federal Hydroelectric Project. The program would necessitate the development of a year-round release of water to the Eklutna River. Ownership of the Eklutna Hydroelectric Project was officially transferred from the Federal Government to the new Project Owners on October 2, 1997.

The Project Owners have recognized that as the holder of significant water rights in the Eklutna Basin and as the operator of the existing hydroelectric facilities that substantially control the use and elevation of that water in Eklutna Lake, it is the responsibility of the Project Owners to provide water in the Eklutna River for the protection, mitigation and enhancement of fish and wildlife habitat. As a result, the Project Owners have committed to provide year-round instream flows to the Eklutna River.

2. Project Definition for the Eklutna River Release Facility

In 2019, the Project Owners began a consultation process to discuss alternatives for providing year-round release of water and periodic channel maintenance flows from Eklutna Lake into the Eklutna River. This resulted in three-years of effort to study alternatives and to consult with environmental stakeholders. The study began in March 2019 and continues today. The study's selected alternative consists of construction of a new isolation valve structure and a new river release structure located adjacent to the Anchorage Water and Wastewater Utility (AWWU) Eklutna Water Project (EWP) Portal Valve Shaft approximately one mile below the Eklutna Dam. This alternative, called the AWWU Portal Release Facility, relies on use of existing AWWU infrastructure. The selected alternative, however, creates policy and infrastructure issues for AWWU that are discussed herein.

AWWU owns, operates and maintains the EWP which supplies the Municipality of Anchorage (MOA) with approximately 90% of its drinking water. The EWP consists of raw water facilities (Lake Diversion Tunnel and Pipeline Segment P-4), the Eklutna Water Treatment Facility (EWTF), and treated water facilities (Clearwell and Pipeline Segments P-3, P-2 and P-1). Due to the location and elevation of the EWTF, high quality drinking water is supplied by gravity via 23 miles of treated water piping to the Anchorage Bowl. The hydraulic head from the treatment facility location pushes water as far South as Service High School and Potter Marsh in the Anchorage Bowl. There are turnouts along the treated water pipeline to the Anchorage Bowl for current and future drinking water supply to the Village of Eklutna, Joint Base Elmendorf & Richardson, and the communities of Peters Creek, Chugiak, Birchwood and Eagle River.

On the raw water portion of the EWP, the Portal Shaft is the terminus structure of the Lake Diversion Tunnel. The Lake Diversion Tunnel is approximately 8,600 feet long and six (6) feet in diameter and connects the original Eklutna Hydropower Plant tunnel to EWP Pipeline Segment P-4. The AWWU Portal Release Facility is proposed to be constructed immediately upstream of the EWP Portal Shaft. An isolation valve structure would be constructed, and a short section of existing piping would be replaced, to divert a portion of flow to the River Release Structure.

As presented for the AWWU Portal Release Facility alternative description, operation of the Eklutna River Release Facility is anticipated to be as follows:

- Normal Flow Release: Flow releases into the Eklutna River will vary seasonally with a winter flow of 27 cubic feet per second (cfs); which is equivalent to 17.5 million gallons per day (mgd) and a summer flow of 40 cfs (25.8 mgd) .
- Periodic Channel Maintenance Flow Release: Maintenance Flow releases will occur in 3 out of every 10 years and will require a maximum release of 80 cfs (51.6 mgd) from the Eklutna River Release Facility combined with additional release from the Eklutna Dam.

3. Governance

Overall governance; creating the framework for finance, contracting, construction, long-term operation and maintenance, and the resulting day-to-day decision making, for any project that uses water from a multipurpose lake or reservoir; can be complicated and onerous. This Eklutna Hydroelectric Project is no different. When year-round flows in the Eklutna River are realized, Eklutna Lake will be used as a source for: (1) public water system supply, (2) environmental protection, mitigation and enhancement, and (3) power production. Due to the potential of conflict over water appropriations and Project operations, particularly in dry years and during emergency events, governance for a project must be discussed and codified early. Governance can take the form of a Joint Powers Authority in which all of the interests have representation on a Governing Board but, at a minimum, a Memorandum of Understanding (MOU) between the

interests should be developed and signed to establish representation, decision making authorities and dispute resolution processes.

Ownership. To date, the Project Owners have been defined as MOA dba as ML&P, Chugach Electric and Matanuska Electric. These three Owner entities represent the power production interests for the Project. In addition to Owners, other stakeholders in this Project include Environmental and Water Supply interests. To date, several state and federal resource agencies and environmental organizations have been consulted to inform the Project's planning effort on issues related to the environmental protection, mitigation and enhancement progress of the Project. However, the water supply interests have had minimal involvement with the Project to date. This is evident from discussions and assumptions about the use of Eklutna Water Project facilities, especially with regards to future expansion and the certainty of scheduled and emergency shutdowns of EWP facilities.

Operations Philosophy. As part of any governance structure or MOU developed for operation of a **future river release facility**, it is imperative that an Operations Philosophy for Eklutna Lake be developed and agreed to by not only the Owner but also Environmental and Water Supply stakeholder interests as soon as possible. There is potential for conflict with Water Supply Stakeholders, especially with regards to future expansion of the EWTF, that must be discussed and resolved prior to the adoption of any Project alternative. In addition, scheduled shutdowns for inspection or repair of EWP infrastructure as well as emergency shutdowns will occur and have the potential to adversely impact the interests of Environmental stakeholders of the Project. Both of these issues are discussed further in Section 4 below.

Operations and Maintenance (O&M) Entity. It is important to agree on the O&M entity for any **future river release facility** as soon as possible. The O&M identity decision should be codified in the MOU and should be timed such that the selected O&M entity is part and parcel of the engineering planning, design and construction efforts that will precede its long-term O&M responsibilities.

PROJECT ISSUE # 1 is a Governance Issue – There is a need for a governance structure for ownership entities that requires regular engagement of all stakeholder parties with interests in the River Release Project: (1) Water Supply, (2) Environmental Protection, Mitigation and Enhancement, and (3) Power Production. The Project Owners only represent the power production interests for the Project. Information exchange and dialogue with State and Federal resource agencies and some environmental interests have also occurred but little engagement from the water supply interests (specifically AWWU, but also the Alaska Department of Environmental Conservation, ADEC) appear to have taken place. In the documentation to date, there is no mention of future expansion plans of the EWTF nor the certainty of inspection/maintenance shutdowns and emergency shutdowns of Eklutna Water Project facilities. In addition, there is no discussion of the present condition of the Intake Valve Shaft nor the Portal Valve Shaft which are both 35 years old. Expansion of the EWTF would severely limit the ability to divert water from the AWWU Portal Release Facility both in terms of time-of-year

and likely in flow. And shutdown of EWP facilities, which will continue to occur, would stop the flow to the Eklutna River entirely. If AWWU facilities are to be used as part of the solution for providing year-round flow to the Eklutna River, dialogue and engagement with AWWU and ADEC are critical to ensure the proper operation and long-term health and safety of the Anchorage Public Water System (PWS). ADEC will likely be interested in why a Public Water System is also being used as a River Restoration System.

4. Description of Eklutna Water Project Facilities

The EWP has supplied high quality drinking water to the community for over 35 years. The EWP was engineered and constructed between 1982 and 1988 with operations of the entire project commencing in the Summer of 1988. As stated earlier, AWWU owns, operates and maintains the EWP which supplies the MOA with approximately 90% of its drinking water. The EWP was planned such that high quality potable water produced by it could be distributed to the Anchorage Bowl by gravity without intermediate pumping. It also provides the ability to supply potable water to Eagle River and the Northern Communities between the treatment plant location and the Anchorage Bowl.

Intake. The EWP begins in Eklutna Lake with a shared intake facility. The intake provides water to both the EWP and the Eklutna Hydrpower Plant. The intake structure itself is located near the north shore of the lake approximately one (1) mile east of the dam and is fed by an excavated inlet channel approximately 100 feet wide and 700 feet long. The excavated channel is at the lake bottom and leads to a reinforced concrete box structure, open and protected by trashracks on its top, front and both sides. The trashrack portion is about 23 feet wide by 20 feet high by 22 feet long. The overall length of the structure is about 42 feet. The structure invert elevation is about Elevation 794 and the top is at approximate Elevation 814. Two important items to be aware of for the Intake:

- It is important to maintain submergence on the intake structure top so as to not entrain air into the flow to the EWP or the Eklutna Hydropower Plant. Air in the flowstream must be vented properly and can be problematic for downstream facilities. The Eklutna Hydropower Plant currently operates to maintain a minimum lake elevation at approximate Elevation 820.
- At lower lake levels during late spring and early summer months (say late April early July), the intake structure itself is often visible from the North shore of the Lake illustrating how little submergence can be present at the structure.

Intake Valve Shaft. The EWP is connected to the pre-existing 9-foot diameter tunnel that feeds the Eklutna Hydropower Pant. To construct the water supply for the EWP, a section of the pre-existing tunnel was removed and a new steel tee was placed to allow diversion of a portion of the water from the Eklutna Hydropower Tunnel to the new EWP Tunnel. A short section of new tunnel piping was then installed as part of the EWP to route water from the new Tee section to an Intake Valve Shaft.

The Intake Valve Shaft is a circular structure from bottom invert elevation of approximately 786 to a top of cylinder elevation of 913. A square structure sits on top of the circular bottom and extends upward to approximate Elevation 930. The Intake Valve Shaft houses the following:

- Mainline steel piping, 54 inches in diameter.
- Mainline Emergency Shutoff Valve (Ring Follower Valve with hydraulic operator) – in an emergency condition this valve can shutdown the entire downstream EWP.
- Mainline Isolation Valve (Butterfly Valve with hydraulic operator) – during normal operation, this valve can shutdown the entire downstream EWP.
- Smaller bypass piping and valving that allows the piping downstream of the above two mainline valves to be refilled from the upstream tunnel connection in a controlled and proper manner.
- Sump pump system including a sump pump discharge into the 54" mainline pipe.
- Pressure sensing lines upstream and downstream of the Ring Follower Valve to ensure informed operation of Eklutna Water Project facilities.
- Emergency high flow meter and transmitter which can alert Eklutna operations to a downstream pipeline break and can be used to shutdown flow to the downstream EWP. The signal from this meter is alarmed and monitored closely by operators at the EWTF.
- Intake Valve Shaft Flood Alarm which can alert operators at the EWTF to a pipeline break within the Intake Valve Shaft or myriad possible structural or mechanical problems at the Intake Valve Shaft. Water inside the Intake Valve Shaft can match Eklutna Lake level depending on the physical alarm condition.
- All electrical and other instrumentation (such as Eklutna Hydropower Tunnel Pressure, ventilation status, etc.) necessary for the proper operation and remote monitoring of the Intake Valve Shaft.

Two important items to be aware of for the Intake Valve Shaft:

- There are at least sixteen smaller pipe connections to the mainline 54" pipe and valves; many of those connections have corrosion present and may not have been operated for some time. All of the mechanical, electrical and instrumentation items listed above require periodic maintenance and inspection which often requires scheduled shutdown of the EWP that can last days, weeks, or longer depending on the maintenance needs. Draining and refilling time must be considered in all maintenance shutdowns. It is imperative that a Condition Assessment be performed and required maintenance activities identified and conducted for all mechanical, electrical, and instrumentation items in the Intake Valve Shaft as part of the Portal Release Facility work. It must be understood that use of the AWWU Portal Release Facility to provide year-round water to the Eklutna River is not a 100% certain water supply as periodic maintenance shutdowns will continue to occur.
- The Intake Valve Shaft has mechanical equipment, electrical supply and instrumentation and controls that shutdown the entire EWP under emergency conditions. An emergency

condition could manifest as a result of a major earthquake, failed downstream infrastructure, terrorism or vandalism attacks or simple error when working on electrical and instrumentation circuits. Emergency shutdowns have occurred in the past and will occur again in the future. Again, it must be understood that use of the AWWU Portal Release Facility to provide year-round water to the Eklutna River is not a 100% certain water supply as emergency shutdowns will continue to occur.

Lake Diversion Tunnel. Downstream of the Intake Valve Shaft is the Lake Diversion Tunnel which is approximately 8600 feet long and six (6) feet in diameter. The interior was inspected via robotic camera within the past few years and was found to be in good condition. Similar future inspections will be required. The inspections require that the EWP be shutdown and drained to allow entry of the robotic camera and to not distort the video recording.

As with the Intake Valve Shaft, it must be understood that use of the AWWU Portal Release Facility to provide year-round water to the Eklutna River is not a 100% certain water supply as periodic inspection shutdowns of the Lake Diversion Tunnel will continue to occur.

Portal Valve Shaft. The Lake Diversion Tunnel ends at the Portal Valve Shaft. The Portal Valve Shaft is a rectangular structure from bottom invert elevation of approximately 776 to a top of elevation of approximately 811. The Portal Valve Shaft houses the following:

- Mainline steel piping, 54 inches in diameter
- Mainline Isolation Valve (Butterfly Valve with hydraulic operator) – during normal operation, this valve can shutdown the entire downstream EWP.
- Smaller bypass piping and valving that allows the piping downstream of the above mainline isolation valve to be refilled from the upstream Lake Diversion Tunnel in a controlled and proper manner.
- Sump pump system including a sump pump discharge into the 54” mainline pipe.
- Emergency high flow meter and transmitter which can alert the operators at the EWTF to a downstream pipeline break and can be used to shutdown flow to the downstream EWP. The signal from this meter is alarmed and closely monitored by operators at the EWTF.
- Portal Valve Shaft Flood Alarm which can alert operators at the EWTF to a pipeline break within the Portal Valve Shaft or myriad possible structural or mechanical problems at the Portal Valve Shaft.
- All electrical and other instrumentation (such as Lake Diversion Tunnel Pressure, ventilation status, etc.) necessary for the proper operation and remote monitoring of the Portal Valve Shaft.

Two important items to be aware of for the Portal Valve Shaft:

- There are at least eight smaller pipe connections to the mainline 54” pipe and valve; many of those connections have corrosion present and may not have been operated for some time. All of the mechanical, electrical and instrumentation items listed above require periodic maintenance which often requires scheduled shutdown of the EWP that can last

days, weeks, or longer depending on the maintenance needs. Draining and refilling time must be considered in all maintenance shutdowns. It is imperative that a Condition Assessment be performed and required maintenance activities identified and conducted for all mechanical, electrical, and instrumentation items in the Portal Valve Shaft as part of the Portal Release Facility work. It must be understood that use of the AWWU Portal Release Facility to provide year-round water to the Eklutna River is not a 100% certain water supply as periodic maintenance shutdowns will continue to occur.

- The Portal Valve Shaft has mechanical equipment, electrical supply and instrumentation and controls that shutdown the entire EWP under emergency conditions. An emergency condition could manifest as a result of a major earthquake, failed downstream infrastructure, terrorism or vandalism attacks or simple error when working on electrical and instrumentation circuits. Emergency shutdowns have occurred in the past and will occur again in the future. Again, it must be understood that use of the AWWU Portal Release Facility to provide year-round water to the Eklutna River is not a 100% certain water supply as emergency shutdowns will continue to occur.

Raw Water Pipeline (P-4). Raw Water Pipeline Segment P-4 extends from the Portal Valve Shaft to the Eklutna Energy Recovery Station located on the EWTF site. The pipeline is approximately 6.2 miles in length and is routed in the Eklutna River Valley, exiting the river valley on a fairly steep incline to a plateau that is approximately 3,000 feet east of the EWTF site. Approximately 52% of the Segment P-4 pipeline is 60 inches in diameter with approximately 48% at 54 inches in diameter. An Air-Vacuum and Air-Release Valve Vault is located on the top plateau near the treatment facility at the high point of the Segment P-4 pipeline. The Air-Vacuum and Air Release assembly requires a water elevation of approximately Elevation 730 to have the float seat properly with no chatter. As discussed in Sections 4 and 5 below, the impact of the AWWU Portal Release facility on downstream EWP piping and facilities has not been discussed in any AWWU Portal Release Facility documentation to date.

Eklutna Energy Recovery Station. The Eklutna Energy Recovery Sation (EERS), located on the EWTF site, serves as the pressure and flow control structure for the downstream EWTF. The EERS houses a hydraulic turbine/electric generator that recovers energy from the water flow from the lake. The turbine was sized to recover the energy at lower plant flows; up to about 41 mgd – which is equal to 63.5 cfs. Higher flows were observed during start-up and plant testing but the turbine is nameplated at 41 mgd. Adjacent to the turbine in the EERS is a full capacity sleeve valve capable of supplying 70 mgd (108.5 cfs) – to the downstream treatment facility. The EERS and and the downstream EWTF were designed to be easily expanded from its original treatment capacity of 35 mgd (54.25 cfs) to an expanded future capacity of 70 mgd (108.5 cfs). At 70 mgd, the turbine would still run at 41 mgd and the sleeve valve would run at the difference of 29 mgd. Should the turbine be out of service for any reason, then the sleeve valve would operate at the full 70 mgd. All mechanical, electrical and instrumentation and control systems are in place today to allow operation of the EERS at 70 mgd.

Eklutna Water Treatment Facility. The limiting factor for operation of the EWP at a continuous flow of 70 mgd is the treatment process capacity at the EWTF. The EWTF was designed originally for a treatment capacity of 35 mgd to more closely match the PWS demands at the time of construction. The original design of the facility, however, provided the means to easily and inexpensively double the capacity when needed in the future. Some of the features designed and constructed in the 1980's for later use at the time of expansion are as follows:

- Raw Water System (all the facilities described above) were designed and constructed for a flow of 70 mgd. The EERS was designed to preferentially use the hydraulic turbine for energy recovery while also providing a secondary water passage with a sleeve valve. The sleeve valve can either add water to the turbine flow for future conditions or serve as a full flow bypass of the turbine. Section 5 below discusses the hydraulic design of the raw water system.
- The EWTF was designed and constructed with easy expansion in mind as follows:
    - Hydraulic channels have knock-out panels to allow easy connection of future hydraulic channels
    - Personnel access corridors have knock-out panels to allow easy connection of future personnel access corridors
    - Concrete joints have protected structural dowels and waterstop where future concrete structures will adjoin.
    - Process piping was extended and valved/capped for connection to future unit processes
    - All chemical storage spaces were designed for a plant flow of 70 mgd
    - Waste stream handling for waste filter backwash water was sized for a plant flow of 70 mgd, including recycle pumping
    - Waste stream handling for sedimentation basin solids was sized for a plant flow of 70 mgd, including recycle pumping.
    - The Treated Water Clearwell (treated water storage) located on the EWTF site was sized to accommodate a plant flow of 70 mgd. The Clearwell capacity is 15 million gallons and is well within industry norms for the future 70 mgd treatment facility capacity.
- The treated water system, the piping system from the treatment facility that parallels the Glenn Highway and enters the Anchorage Bowl adjacent to the Ship Creek Water Treatment Facility, is sized for 70 mgd. Treated Water Pipeline Segments P-3, P-2 and P-1 were sized to flow a total of about 25 to 30 mgd to the Village of Eklutna, Joint Base Elmendorf & Richardson, and the Northern Communities of Peters Creek, Chugiak, Birchwood and Eagle River. The remaining flow of 40 to 45 mgd is the flow available for use in the Anchorage Bowl.

PROJECT ISSUE #2 is an Opportunity Cost Issue. The EWP was originally designed and constructed to serve a PWS demand of 70 mgd (108.5 cfs). The EWP piping, both raw water and treated water, were designed and constructed for the 70 mgd system flow; the EWTF was

designed and constructed for a plant flow of 35 mgd to more closely match the PWS demands at the time of construction. The EWTF, however, was designed and is configured to allow easy expansion to 70 mgd. No mention of the future expansion of the EWTF to 70 mgd is acknowledged in the AWWU Portal Release Facility documentation to date. The need to expand the EWTF in the future could occur for a number of reasons, including: (1) population increase particularly North of the Anchorage Bowl; (2) diminishing groundwater supply due to contamination from PFAS, de-icing compounds, arsenic and/or other contaminants; and (3) possible decrease in Ship Creek supply due to water rights issues and creek flows during certain times of the year (military and maintaining minimum creek flows have priority over the AWWU use). To forego the opportunity to expand the EWTF to 70 mgd, and thus to forego expansion of the AWWU PWS in the planned manner that has existed for over 30 years, must be considered a significant policy decision for the MOA. To supply future drinking water from a source other than Eklutna Lake would certainly increase the cost of water in Anchorage significantly in the future.

It should be noted that if the EWP retains its originally planned 70 mgd (108.5 cfs) capacity, the flow releases from the AWWU Portal Release Facility may not accommodate the stated operational flows for the facility:

- Normal Flow Release: Flow releases into the Eklutna River will vary seasonally with a winter flow of 27 cfs and a summer flow of 40 cfs. **The 40 cfs flow in summer may not be available depending on lake level. Currently Eklutna Lake is operated below Elevation 850 during spring and most summer months which coincides with high water demands in the AWWU system. The original hydraulic design condition for the EWP provides 70 mgd of flow to the EWTF at the low lake level of Elevation 820. If additional water is released from the Portal Release Facility with lake Elevation at 820, it is likely that the EWTF cannot receive its 70 mgd design capacity. As lake levels increase from Elevation 820, some water can be provided by the Portal Release Facility. System hydraulics must be evaluated at 70 mgd to fully determine the flows available at the Portal Release Facility at varying lake levels with due consideration of the air/vacuum system at the high point along the P-4 pipeline.**
- Periodic Channel Maintenance Flow Release: Maintenance Flow releases will occur in 3 out of every 10 years and will require a maximum release of 80 cfs from the Eklutna River Release Facility combined with additional release from the Eklutna Dam. **The 80 cfs flow cannot be accommodated if the EWP is operating at 70 mgd (108.5 cfs).**

PROJECT ISSUES #3 (Scheduled Maintenance) and #4 (Emergency Maintenance) are Public Relations Issues. The EWP raw water facilities, including the Intake Valve Shaft and the Portal Valve Shaft have mechanical, electrical, and instrumentation and control equipment that require periodic maintenance work that necessitates scheduled shutdown of the EWP. These scheduled shutdowns can last days or longer depending on the maintenance needs. In addition, the raw water facilities have automatic and manual emergency shutdown capabilities in case of damage due to earthquake, terrorism, or vandalism that also result in long outage

times. Draining and refilling raw water facilities can add significant time to these shutdowns, whether scheduled or emergency. It must be understood that use of the AWWU Portal Release Facility does not provide a 100% certain year-round water supply to the Eklutna River. Scheduled maintenance shutdowns as well as periodic emergency shutdowns will continue to occur and discharge of water to the Eklutna River during these events will stop. The impact to fish spawning habitat and the fish population itself will be of major public interest, potentially manifesting as negative public opinion towards MOA in general and AWWU specifically. Simply stated, the AWWU Portal Release Facility may not be sufficient to provide the year-round release of water to the Eklutna River as is portrayed in Project documentation to date.

5. Eklutna Water Project Raw Water System Hydraulics

For conversations going forward concerning the AWWU Portal Release Facility, it is important to have an understanding of the raw water system hydraulics from Eklutna Lake to the EERS located on the EWTF site. As stated above, the EWP was designed and constructed as a 70 mgd water supply. The EWTF was designed and constructed at 35 mgd, with capability for easy and economical expansion to 70 mgd in the future. The raw water system, consisting of the Lake Diversion Tunnel, Pipeline Segment P-4 and the EERS was designed for a system flow of 70 mgd to match the future expanded treatment facility capacity.

Critical elevations considered in the original hydraulic design of the raw water system were: (1) Eklutna Lake Level (assumed to be Elevation 850 as average level and Elevation 820 as low level); and (2) the hydraulic grade line at the Air-Vacuum and Air Release Valve Vault on Pipeline Segment P-4 (required to be approximate Elevation 730). The hydraulic headloss between the Intake Valve Shaft and the Air-Vacuum and Air Release Vault is approximately 80 feet at a flow of 70 mgd. This allows the 70 mgd flow to barely satisfy the needs of the Air-Vacuum and Air Release Facility on Pipeline Segment P-4 when Lake Level is Elevation 820. Any additional headloss in the system created by flows for the AWWU Portal Release Facility at low Eklutna Lake levels could be problematic for EWTF operations. As Eklutna Lake levels increase above the assumed low level of Elevation 820, more water becomes available for release at the AWWU Portal Release Facility but it will not be in accordance with the stated operational flows for Eklutna River Restoration Project and the releases could be intermittent depending on hydrologic conditions.

PROJECT ISSUES – See Project Issues # 2, 3 and 4 in Section 4 above.

6. Review of Eklutna River Release Facilities

In a quick review of the concept design for the AWWU Portal Release Facility, some items to consider are:

- Replacement Piping at the Lake Diversion Tunnel connection will take some time to construct and will require shutdown of the EWP. The pipeline segment that would be removed is set in concrete slurry as bedding and would require additional time and effort to remove.

- Redundant Energy Dissipating Valves (Sleeve Valves) should be provided to ensure uninterrupted flow to the river should this AWWU Portal Release Facility alternative move forward.
- Electrical Supply at the Portal Facility is single phase, the sleeve valve actuators must be coordinated for this and may need to have DC actuators with battery supply for emergency closing. The controls for the valves should establish a control loop whereby desired flow and actual flow are compared and adjusted as necessary.
- Instrumentation and Control; SCADA Communications. Valve position, valve control, upstream pressure and discharge flow must be communicated back to the EWTF so the operators understand what is occurring on the raw water system.

PROJECT ISSUES – See Project Issue #1 in Section 3 above. A governance structure necessitating involvement of AWWU Operations and Engineering staff is critical for the success of the River Restoration Project and to ensure operation of any facility that connects to the EWP does not impact the supply of potable water to the PWS. The comments above are illustrative of the type of comments that should be expected from any review of facilities that connect to the existing PWS.

END OF PROJECT ISSUES PAPER