Eklutna River Restoration Project

Pump Station Alternative – Project Description

(April 4, 2024 by Don Spiegel, GV Jones & Associates)

Pump Station Alternative – there may be a need for an alternative, or an adder, to the Recommended AWWU Portal Project for various reasons as follows:

- The recommended Portal Release Alternative is a "single straw" into Eklutna Lake. The operation and thus success of the alternative relies on 35-year old infrastructure to be 100% available. The suggested mitigation for the "single straw" option is use of an existing gated opening at the base of the Eklutna Dam spillway structure that would allow Eklutna Lake water (or some ponded water when the Lake level is below the gated opening) to flow into the Eklutna River. Project documentation has stated that the pond may be capable of supplying up to 12 hours of water. The gate will be controlled to open when the Eklutna Water Project infrastructure is unavailable. This is a questionable concept because the bottom elevation of the opening is Elevation 852. Eklutna lake is below Elevation 852 six months out of the year and thus the gate cannot provide reliable water during that period.
- The last mile of the Eklutna River between the downstream bottom of Eklutna Dam and the AWWU Portal facility is not part of the restoration zone.
- The AWWU Portal release may impact the ability of AWWU to operate at the original design capacity of the Eklutna Water Project.

This Pump Station Alternative is intended to work independent of, or in tandem with, the Portal Release Alternative. The Pump Station Alternative consists of construction of one reinforced concrete cylinder pump station adjacent to Eklutna Lake near the Eklutna Dam and with a discharge to the pond and stream that routes water to the gate at the base of the spillway structure.

Facilities that comprise the Pump Station Alternative are as described below and as are shown on the attached figures. For an overall view of the proposed Pump Station Alternative, see Figure 1.

<u>1. Intake Crib</u>

- Type of Structure. The structure should consist of a screening arrangement anchored to a precast concrete base. The precast concrete base can be set on the Lake bottom via barge and the screen can be anchored to the precast concrete base by divers. The screen itself should be a framed Type 316 stainless steel fabrication with 1.5 inch spacing, horizontal and vertical, between slats. Type 316 stainless steel chain link fencing material anchored to the Type 316 stainless steel frame can be used for this function.

- Structure Size. The Type 316 stainless steel screen crib should measure 8 feet long by 6 feet wide by 6 feet high. The open area for water would include the front face of the crib (nominally 6' x 6' = 36 sf) plus the two sides (nominally 2 x 8' x 6' = 96 sf). At a 40 cfs flow rate, the nominal approach velocity to the crib would be 40 / 36 + 96 = 0.30 feet per second which is an acceptable velocity in terms of fish exclusion. The crib top may want to be plated so that debris cannot easily enter the crib from the top.
- Connection To Suction Pipe. The 36" diameter suction pipe could be flanged and gasketed to the back side of the screen crib making it water tight and structurally sound. Special detailing of this connection will be required.

2. Suction Pipe

- Type and Size of Pipe. The suction pipe should be bell and spigot reinforced concrete drainage pipe, ASTM C 76 or equal. The pipe should be 36 inches in diameter and the pipe should be installed in the Lake via barge at the low water level time of year (May and June). It also should be installed at an approximate 0.1 to 0.125 percent slope with the downward slope going back to the Cylinder Pump Station. This will help route and control water as the pipe continues on land when it leaves the Lake portion of the run.
- Length of Pipe. It is expected that the pipe length will be about 2,500 feet in length but this needs confirmation with bathymetry data for the Lake bottom.
- Buoyancy Concerns. The pipe should be filled with water as it is placed so that no buoyancy issues are created. The weight of the concrete pipe itself may be enough to eliminate buoyancy concerns but this needs to be thought about and sequenced properly.

3. Cylinder Pump Station

- Depth of Pump Station. The cylinder pump station must be low enough to allow gravity supply with Lake water at low lake level yet high enough to allow personnel and equipment access into the cylinder from the grade above (see Figure 2 for an enlarged view). The pump station bottom Elevation 800 is set based on a 0.1 to 0.125 slope of the raw water pipe from the Intake Crib. The pump station top Elevation 880 is set based on the existing grade near the pump station location. The bottom portion of the pump station cylinder should be constructed during the low water level time of year (May and June) up to perhaps Elevation 840 to 850. The top portion of the cylinder pump station can be constructed later in the summer but should be constructed such that Lake water does not overtop the top of wall at any time. The pump station should be a reinforced concrete cylindrical structure. See Figures 3 and 4 for details of the Cylinder Pump Station.
- Type/Size of Pumps. Three wet pit submersible pumps should be used as shown on Figure 3. Each pump should be rated 6,000 gallons per minute at a discharge head of approximately 45 feet (from low water surface elevation of 820 to the discharge elevation

of approximately 860; plus some dynamic losses). The resulting motor for this condition is approximately 100 horsepower in size. No on-line spare pump is required for outage periods although having a shelf spare pump stored on the site might be a wise investment.

- Pump Discharge Piping. Each pump should have its own individual discharge pipe, 18-inches in diameter. The piping should be ductile iron pipe for strength and longevity.
- Removal of Pumps. A removable cover should be provided over each pump that would help facilitate removal of the pump via a crane for maintenance.

4. Pump Station Discharge Routing

The three discharge pipes should exit the pump station cylinder and discharge flow onto a reinforced shotcrete pad that then routes the water into an existing pond. This pond is adjacent to the location of the Cylinder Pump Station and typically has some water in it even during low lake level periods. A ground survey of the pond and the ground that separates the pond from the stream that runs to the upstream face of the Eklutna Dam is needed so that effective routing of the pump station discharge can occur. It is thought that there is a slight downward slope in the stream from the pond to the dam face which has a gated exit through the dam at an invert elevation of 852. If the slope is not consistently downward, or if the slope is not well formed in the stream, improvements to the stream slope and side berms should be implemented

5. Access Road to Cylinder Pump Station

A 20-foot wide, gravel or asphalt, access road should be constructed for construction needs as well as later operations and maintenance needs. The road will be at approximate elevation 880. The routing should match the alignment of existing trails so as to disturb as few trees as necessary. A preliminary routing of the road is shown on Figures 1 and 2. This routing overlaps existing trails as much as possible

6. Electrical Supply

A new three phase power supply will be required to power the Cylinder Pump Station. Three phase power, at 13.47 KV, is available along Eklutna Lake Road at the Eklutna Water Treatment Facility approximately six miles away. Single phase power is available from the Eklutna Water Treatment Facility to Eklutna Lake. This single phase power supply is mounted on wooden poles along Eklutna Lake Road. It is possible that the extension of three phase power to the Cylinder Pump Station could also be mounted on these wooden poles.

It is suggested that an Electrical Building be constructed adjacent to the Cylinder Pump Station to house all electrical and instrumentation equipment. Housing the electrical equipment inside the Pump Station Building increases maintenance and operations issues with the equipment, so a separate building is suggested. For reliability and redundancy reasons, it is suggested that two transformers, 13.47 KV primary to 480 volt secondary be provided and arranged in a Main-Tie-Main arrangement. Normal operation would be for one transformer to feed two 100 horsepower pumps with the other transformer feeding the third 100 horsepower pump and miscellaneous single phase station and grounds needs. Each pump should be powered with 480 volt Variable Frequency Drives or, at a minimum, with solid state soft starters to limit starting current in-rush. In addition, a manual transfer switch to connect a portable generator to the station should be provided in case of long-term power outages. It is anticipated that the Electrical Building would measure approximately 16 feet by 20 feet and that the building would be of CMU construction with a steel joist and metal deck roof. A preliminary electrical single line diagram is presented as Figure 5.

The emergency generator could be portable or could be permanent and is expected to be about 300 KW in size. The engine would be a diesel engine and thus would require some on-site storage of diesel if permanent placement is selected.

7. Gate System Improvements

At the Eklutna Dam outlet structure, a manual drainage gate allows release of water from the base of the dam. The invert elevation of the is gate is El. 852. It is important to motorize this gate in order to add some flexibility in operation for water to reach the Lower Eklutna River. Also, it is possible that construction of a weir structure upstream of the gate, with a second operable gate, could provide some storage of water coming from the Cylinder Pump Station. This storage of water could then be used to provide continuous water downstream of the dam should the pump station be out of service for short periods of time (say for a few hours).