Historical Context Investigation of the Establishment, Development, and Evolution of Hydroelectric Power in the Juneau Goldbelt Hydroelectric Power Development Historic District - JUN-1116

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in the 1980s. Today, all that remains of this facility are its concrete foundation, its water wheels, and the carcasses of its stripped generators.

The Alaska Gastineau Mining Company 1909-1934

The creation of the Alaska Gastineau Mining Company was another effort to achieve an economy of scale by consolidating mining holdings. Beginning as an effort to buy up the placer mining claims in the Silver Bow Basin, it allowed for the creation of the Perseverance Mine in 1885. Needing outside investors, the Alaskan Eastern Company was formed in 1888, which extended a road to the mine that year (Stone and Stone 1980:38). This allowed for the construction of a 10-stamp mill, but this was destroyed in an 1895 avalanche. Unable to rebuild, the holdings were eventually purchased by the Alaska Perseverance Mining Company. This company, under the leadership of William Sutherland, drove a 2,400-foot long adit, the Alexander Crosscut, to access the ore body, and constructed a 100-stamp mill near its portal in 1907 (Stone and Stone 1980:38:). Partly owned by an English investment company, a business structure not allowed in Alaska, then considered an American overseas possession, the company was sued by the U.S. Government in 1910. This led to the formation of an American owned company in 1911, the Alaska Gastineau Mining Company that retained Sutherland at its head. Sutherland developed an ambitious plan to turn the Perseverance Mine into a world class operation, with an anticipated gold production that would eventually exceed that of Treadwell. This entailed the construction of a 1,500-stamp mill on the shore of Gastineau Channel that was connected to the mine by a two-mile long tunnel that went under Mount Roberts (Stone and Stone 1980:38). He was able to buy up many of the nearby claims, but was thwarted in his efforts by Louis Schackleford and Bartlett "Bart" L. Thane (see Fig. 12), who managed to purchase many of the intervening claims (Stone and Stone 1980:29). After Sutherland's death in 1911, Thane managed to convince the stockholders to hand over the management of the Alaska Gastineau Mining Company over to him.

Thane, recognizing the potential of Sutherland's plan, sought new investors, which he found with the New York banking firm of Hayden, Stone and Company, and the Utah copper magnate Daniel C. Jackling (see Fig.13), who through the holding company of the Alaska Gold Mines Company, subsumed ownership of Alaska Gastineau. Their plans for the development of the ore body were novel and daring. As envisioned by Sutherland, they connected the Perseverance Mine to the coast with the 10,497-foot long Sheep Creek Adit. At its portal near Sheep Creek they would build a mill whose original design capacity was 6,000-tons of ore a day. The mill design differed than the others currently in operation in the region in that it did not use stamps, but rather used rollers to crush the rock down to a concentrate that would be smelted in California (Stone and Stone 1980:41-47).

Figure 12. Bartlett "Bart" L. Thane, general manager - Alaska Gastineau Mining Company (photo: Alaska State Library P87-2398).

Figure 13. Daniel L. Jackling, vice president - Alaska Gold Company (photo Stone and Stone 1980:42).

Alaska Gastineau began construction of its mill in 1913 (Redman 1988:31). To provide power, Alaska Gastineau began constructing an arched concrete dam and hydroelectric plant on Salmon Creek that same year. The dam was completed in 1914, and was supplying year-round power to Alaska Gastineau the next year.

As originally envisioned, the Salmon Creek powerplant was designed to accommodate all the electrical needs of Alaska Gastineau's new mill, but expansion of the mill's potential capacity, which eventually reached approximately 12,000 tons a day, quickly outpaced the Salmon Creek facility's ability to supply enough electricity (Redman 1988:51-53). As a result, Thane began looking for additional power sources, which he found at Upper Annex Lake on the west shore of Taku Inlet. When finished in February 1916, it allowed the Alaska Gastineau to nearly double its power generation capacity (Stone and Stone 1980:47).

Unfortunately, Alaska Gastineau's ambitious plans were not equaled by the quality of the ore being mined. Expecting to recover approximately $1.75 of gold per ton of ore, assays conducted in 1916 revealed that the ore was averaging $1.19 per ton (Redman 1988:53). The resulting profit of $0.23 per ton was more than offset by the payments servicing the company's debt. The following year, there were avalanches that disrupted the use of the Sheep Creek Tunnel, problems with power transmission line from Annex Creek, and labor shortages that prevented them from opening new sections of the mine in search of higher grade ore (Redman 1988:54; Whitehead 1983:23, 26). Added to this were mine cave-ins that allowed surface water

into the mine, which moistened the ore, resulting in a significant reduction of the efficiency of the mill's rollers (Stone and Stone 1980:53-54). The overall unprofitability of the company continued until May 1921 when the company announced that it was going to close the mine (Redman 1988:55). The mine shut down on June 2, 1921, and much of the machinery in the mill was dismantled and sold (Redman1988:56).

Alaska Gastineau's hydroelectric plants continued to operate after the mine's closure. Thane planned to use this power to develop a wood-pulp industry in the Juneau area, but these plans did not come to fruition (Stone and Stone 1980:54). The company continued to produce electricity at its Salmon Creek and Annex Creek facilities, selling the power to AEL&P and the Alaska Juneau Mining Company until 1934, when the latter company bought all of Alaska Gastineau's assets (Stone and Stone 1980:54).

The Alaska Gastineau Facilities

Alaska Gastineau began to develop plans to construct a hydroelectric facility on Salmon Creek even before they had begun construction on their Sheep Creek mill. Their chief engineer, Harry Wollenberg (see Fig. 30), Alaska Gastineau's chief engineer, developed a feasibility study in 1909 that identified two alternative plans. The first plan called for transporting the water from the upper creek to the coast via a 14,500 foot-long pipeline, and building a powerhouse at the mouth of the creek. The second alternative called for constructing a 13,000-foot long tunnel to convey the water directly to Alaska Gastineau's facilities on Gold Creek (Wollenberg 1909:1, 12-13). Both alternatives entailed damming the stream to create a reservoir in the Sheep Creek valley at a spot approximately 3-miles north of Juneau. Two different types of dams were originally considered. Lars Jorgensen, a consulting engineer hired out of San Francisco favored a 160 to 180-foot high, single-arch, concrete dam (Jorgensen 1910). Wollenberg favored a 165-foot high dam with a masonry exterior, with an impermeable center layer of wood surrounded by a core of hydraulically deposited clay (Wollenberg 1912a:5). Eventually the latter design was ruled out, as was a rock filled dam, in favor of the concrete, single arch dam favored by Jorgensen (Hermann 1913:18; Wollenberg 1912c:2-3). The resulting 165-feet tall, constant-angle arch dam was a new engineering design, with the Salmon Creek Dam being the first example of its type to be built in North America, and at the time, it being the tallest dam of its type in the world (Engineering Magazine 1915:282; Wollenberg 1914a:2).

While the construction of arch dams dates to the Roman era, and concrete arch dams to 1880, the dam built at Salmon Creek utilized an innovative engineering technique that never had

been previously employed in North America.[1] Arch dams are use in relatively narrow gorges, utilizing the inherent strength of the arch to hold the weight of the water in the reservoir created behind the dam. The earliest concrete arch dams utilized a constant-radius arch, where the concave face of the dam maintains the same radius at all elevations. Since the valley where the dam is placed is narrower at the bottom than the top, the angle of the face of a constant- radius dam decreases near its base. A constant-angle arc dam, such as the Salmon Creek Dam, decreases its radius at lower elevations, and thus maintains the angle of its arc throughout the height of the dam. This design, with the weight of the impounded water pressing against its convex face, possessed great strength, allowing for a thinner profile of the dam, which significantly reduced the amount of concrete needed to construct the dam (Jorgensen 1915:685).

By 1912, the project was expanded to have two hydroelectric powerhouses, with one located approximately a mile below the dam, and the second near the shore of Gastineau Channel. Water would be conveyed to the first plant via a pipeline; the water exiting this plant would be joined by that of the natural flow of the creek, and conveyed through 10,000-feet of flume and 1,650-feet of pipeline to the second powerhouse (Wollenberg 1912b:1).

Construction began in June 1912. That year's construction included the establishment of a construction camp for 30 men on the beach, and another accommodating 40 men was at the dam site. A tramway was built to haul materials and equipment to the work sites that was powered by a steam engine in the lower section, and by horses in the upper sections. Before the year's end, the lower powerhouse was built, and a 1,500 kW generator was installed (Wollenberg 1914a:4). In 1913, the work camps near the dam site were expanded to accommodate a total of 275 workers. Power transmission lines were erected, and electricity from the lower powerplant became available at the construction sites on January 25, 1913 (Wollenberg 1914a:6). That year, the upper powerhouse was also built, and two 1,500 kW generators were installed. One of these generators came online on November 15th and the other on November 30th (Wollenberg 1914a:8). A final 1,500 kW generator was installed in the lower powerhouse in 1914.

Construction of the dam began in 1913 with the foundation of the dam being blasted out of the canyon's walls. Concrete was poured between July 24 and November 1, 1913 (see Fig. 14), when this operation was shut down for the winter. Concrete pouring on the dam resumed on April 24, 1914, and the dam was completed on August 24, 1914 (Wollenberg 1915l:3-4).

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[1]Constant-arch concrete dams had been built in the Philippines and in South America prior to the construction of the Salmon Creek Dam (Jorgensen 1915:721)

Figure 14. Salmon Creek Dam under construction c. 1913-1914 (photo: Alaska State Library ASL-M999-AEL&P-144WP).

Fire destroyed the lower powerhouse in October of 1922, although much the equipment was left relatively unharmed (Redman 1988:56). In 1934, Alaska Juneau Mining Company purchased the Salmon Creek facility from Alaska Gastineau, and in 1936 they rebuilt the lower powerhouse (Stone and Stone 1980:54, 68).

In 1972, the Alaska Juneau Mining Company sold the Salmon Creek facility to AEL&P. In December 1974, the lower powerhouse was shut down due to the high cost necessary to rebuild its generators, but ten years later, a new powerhouse was constructed adjacent to the old one. The upper powerhouse was taken out of service in 1998 (AEL&P 2009). AEL&P still operates this facility, which still provides Juneau with approximately 10-percent its electricity.

As originally envisioned, the Salmon Creek powerplant was designed to accommodate all the electrical needs of Alaska Gastineau's mill, but the expansion of the mill's capacity quickly outpaced the Salmon Creek facility's ability to supply enough electricity (Redman 1988:51-52). As a result, Alaska Gastineau began looking for additional power sources, which they found at Upper Annex Lake.

This watershed was discovered by prospectors in October 1914, who sold the water rights to Herman T. Tripp, then the Alaska Territorial Senator from Juneau. In November 1914, he agreed to sell a year's option on the water rights to the Alaska Gastineau Mining Company for $10,000 (Thane 1914a, 1914b). Planning for the project began quickly, with Wollenberg, suggesting that the outlet of Upper Annex Lake be dammed to increase the amount of