

3. PREVIOUS STUDIES

3.1. Early Studies of Hydroelectric Potential

Shortly after the end of World War II, the U.S. Bureau of Reclamation (USBR) conducted an initial investigation of hydroelectric potential in Alaska, issuing a report in 1948. Responding to a recommendation made in 1949 by the nineteenth Alaska territorial legislature that Alaska be included in the USBR program, the Secretary of Interior provided funds to update the 1948 work. The resulting report, issued in 1952, recognized the vast hydroelectric potential within the territory and placed particular emphasis on the strategic location of the Susitna River between Anchorage and Fairbanks.

After the report of 1952, the USBR performed a study of a number of sites, and compiled a report in 1953.

At various times, studies were commissioned to identify potential dam sites and to conduct geotechnical investigations. By 1961, the Department of the Interior proposed authorization of a two-dam power system encompassing the Devil Canyon and the Denali sites. The definitive 1961 report was subsequently updated by the Alaska Power Administration (APA) (an agency of the USBR) in 1974, at which time the desirability of proceeding with hydroelectric development was reaffirmed.

The U.S. Army Corps of Engineers (USACE) was also active in hydropower investigations in Alaska during the 1950s and 1960s, but focused its attention on a more ambitious development, Rampart, on the Yukon River. This project would have been capable of annually generating five times as much electric energy as the Susitna development. The size and technological challenges associated with Rampart diverted attention from the Susitna Basin for more than a decade. The Rampart initiative was finally abandoned in the early 1970s because of environmental concerns and the uncertainty of demand for electrical energy, in doubt because of natural gas that had been discovered in the Cook Inlet.

The world energy crisis precipitated by the Organization of the Petroleum Exporting Countries oil boycott in 1973 provided further impetus for seeking development of an Alaskan renewable energy resource. Federal funding was made available both to complete the Alaska Power Administration's updated report on Susitna in 1974, as well as to launch a prefeasibility investigation by the USACE. The State of Alaska itself commissioned a reassessment of the Susitna Project by the Henry J. Kaiser Company in 1974.

Although the gestation period for a viable hydroelectric project in the Susitna Basin has been lengthy, federal, state, and private organizations have been almost unanimous, over the years in recommending that a hydro project proceed.

Salient features of the various reports to date are outlined in the following sections.

3.2. U.S. Bureau of Reclamation – 1953 Study

The USBR 1952 report to Congress on Alaska's overall hydroelectric potential was followed shortly by the first major study of the Susitna Basin in 1953. Ten dam sites were identified above the Gold Creek railroad bridge:

1. Gold Creek
2. Olson
3. Devil Canyon
4. Devil Creek
5. Watana
6. Vee
7. Maclaren
8. Denali
9. Butte Creek
10. Tyone (on the Tyone tributary)

Fifteen more sites were considered below Gold Creek. However, more attention was focused over the years on the Upper Susitna Basin where the topography is better suited to economic dam construction and where less impact on anadromous fisheries is to be expected. Field reconnaissance eliminated half the original Upper Basin list, and further USBR consideration centered on Olson, Devil Canyon, Watana, Vee, and Denali. All of the USBR studies since 1953 have regarded these sites as the most appropriate for further investigation.

3.3. U.S. Bureau of Reclamation – 1961 Study

In 1961, the USBR prepared a more detailed feasibility study that recommended a five-stage development specifically planned to match the projected load growth curve at that time.

Devil Canyon was to be the first development, incorporating a 635-foot-high arch dam together with an installed capacity of about 220 megawatts. The reservoir formed by the Devil Canyon

Dam alone would not have stored enough water to permit economic installation of higher capacities, because of the long periods of low flow in the winter months. The second stage would have increased storage capacity by adding an earthfill dam at Denali in the upper reaches of the basin. Subsequent stages proposed adding generating capacity to the Devil Canyon Dam. Geotechnical investigations conducted at the Devil Canyon site were more thorough than at Denali. At Denali, test pits were dug, but no drilling was initiated.

3.4. Alaska Power Administration – 1974

The report on studies by the federal Alaska Power Administration suggested little change from the USBR proposal of a five-stage development in 1961. This later effort, however, offered a more sophisticated design, provided updated cost estimates and construction schedules, and addressed load growth and marketing, economics, and environmental considerations.

3.5. Kaiser Proposal for Development – 1974

The Kaiser study, commissioned by the Office of the Governor in 1974, proposed that the initial Susitna development consist of a single dam known as High Devil Canyon. No field investigations were made to confirm the technical feasibility of the High Devil Canyon location because the funding level was insufficient for such efforts. Visual observations by engineers suggested the site was probably favorable. The proposal for a high dam at Devil Canyon addressed the concerns USBR had expressed with respect to foundation conditions at the Denali site, the project necessary to establish storage during long periods of low flow. Kaiser instead proposed to build a rockfill dam at High Devil Canyon that, at a height of 810 ft., would create a large enough reservoir to overcome the storage problem. Although the selected sites were different, the USACE reached a similar conclusion (a preference to avoid the Denali option) when it later chose the high dam at Watana as the prime candidate for initial development.

Subsequent developments suggested by Kaiser included a downstream dam at the Olson site and an upstream dam at a site known as Susitna III. The information developed for these additional dams was confined to estimating energy potential. As in the USACE study, future development of Denali remained a possibility if foundation conditions were found to be adequate and if the value of additional firm energy provided economic justification in the future.

Although Kaiser had substantial commercial interests in aluminum smelting, their conclusion did not suggest that the development of an energy consumptive aluminum plant was necessary to justify the proposed project economically.

3.6. U.S. Army Corps of Engineers – 1975 and 1979 Studies

Prior to the efforts by the APA in the 1980s, the most comprehensive study of the Upper Susitna Basin was completed in 1975 by the USACE. Twenty-three alternative developments were analyzed, including those proposed by the USBR. The study also considered the use of coal as the primary energy source for Railbelt electrical needs. The USACE study concluded that an arch dam at Devil Canyon was appropriate, but found that a high dam at the Watana site would provide sufficient seasonal storage and would permit continued generation during low flow periods.

The USACE recommended the construction of an earthfill dam at Watana with a height of 810 ft. In the longer term, development of the Denali site remained a possibility that, if it were to be constructed, would have increased the amount of firm energy available in dry years.

An *ad hoc* task force was created by Governor Jay Hammond upon completion of the 1975 USACE Study. The task force recommended endorsement of the USACE request for Congressional authorization, but pointed out that extensive further studies, particularly those dealing with environmental and socioeconomic attributes, were necessary before any development decision could be made.

At the federal level, concern was expressed at the Office of Management and Budget (OMB) regarding the sufficiency of geotechnical data available from the Watana site as well as the economic analysis. Other parts of the USACE report dealing with the construction schedule and the thin arch dam proposed for Devil Canyon were also questioned by the OMB. In response, further investigations were funded and the USACE produced an updated report in 1979. Devil Canyon and Watana were both reaffirmed as appropriate sites, but alternative dam types were investigated. A concrete gravity dam was analyzed as a potential alternative for the thin arch dam at Devil Canyon and the Watana Dam proposal was changed from earthfill to rockfill. Subsequent cost and schedule estimates still indicated economic justification for the project.

3.7. Alaska Power Authority – Acres / Harza / Ebasco 1980s

In 1979, under Governor Jay Hammond, the State of Alaska articulated its first energy policy that included a number of principles:

1. Equitable distribution of Alaska's energy wealth
2. Improved efficiency of production and delivery
3. State planned and funded facility construction
4. Technical assistance in conservation and management

5. Support for development of locally oriented energy technologies
6. Public participation and local input in energy planning decisions

In 1977, the State created a public corporation, the APA, as a vehicle for development of state energy resources under the principles above. Several conditions at the start of the 1980s heavily influenced development plans including the concept that developing cheap power, primarily through investment in hydropower projects such as Susitna and Bradley Lake (as well as various projects in Southeast Alaska), would stimulate economic development. It was also assumed that state revenues from the newly producing oil fields at Prudhoe Bay could provide the money needed to support the required investments. The high price of oil and the expectation that it would continue to rise also led to the assumption that there would be no financial stress during development (the 1981 price of crude oil was close to US\$ 40 per barrel – equivalent to US\$ 89 in 2014 dollars).

In 1980, the APA commissioned a comprehensive analysis to determine whether hydroelectric development on the Susitna River was viable.

Initially those studies were performed by Acres, under an assignment to prepare a feasibility study and a license application to the Federal Energy Regulatory Commission (FERC). Twelve major areas of study were initiated, including: power studies; surveys and site facilities; hydrology; seismic studies; geotechnical exploration; design development; environmental studies; transmission; cost estimating and scheduling; licensing; marketing and financing; and public participation. Based on those studies, the APA submitted a license application to FERC in 1983 for the Watana/Devil Canyon Project on the Susitna River (commonly known as the Susitna-Watana Hydroelectric Project).

Subsequent to the submission of the first license application to FERC, an assignment for continuing the studies was given to a joint venture of Harza and Ebasco. An updated license application was prepared and submitted to FERC in 1985.

From 1978 to 1986, the State of Alaska through APA, expended \$145 million (of the \$227 million appropriated) on extensive field work, biological studies, and activities to support the FERC license application. Financing difficulties, along with the falling cost of gas-fired electricity in the Railbelt region, the declining price of oil throughout the 1980s, and the financial burden on the State budget, resulted in the termination of work on project development. Though the APA concluded that project impacts were manageable, the license application was withdrawn in March 1986.

The final configuration, documented in the feasibility studies (including a substantial subsurface geotechnical drilling program), included a staged development of the two dams. The initial

phase would have been a “low” dam at Watana together with a powerhouse, followed by the full development at Devil Canyon. The final stage would have been based on the raising of the Watana Dam to the full height contemplated. The Watana Project was proposed as an earth core, rockfill dam, with a separate gated, chute spillway, and an underground powerhouse. The Devil Canyon development would have been a high concrete arch dam, and an underground powerhouse.

More than 3,500 reports and documents are available from the studies in the 1980s.

3.8. Alaska Energy Authority – 2009-2010

The APA was reconstituted as the Alaska Energy Authority (AEA) in 1989, and in 2008, the Alaska State Legislature authorized AEA (as successor organization to APA) – in the fiscal year 2009 capital budget – to reevaluate the project as it was conceived in 1985. Future demand predictions, and options to meet the demand, such as from renewables, demand-side management, and energy efficiency, were evaluated.

During 2009, two reports were commissioned by AEA; Susitna Project – Watana and High Devil(s) Canyon – RCC Dam Cost Evaluation, prepared by R&M Consultants/Hatch Acres; and Susitna Hydroelectric Project – Conceptual Alternatives Design report prepared by HDR.

In 2010, the Alaska Legislature enacted House Bill 306 (HB 306), creating a goal that the State should obtain 50 percent of its electric generation from renewable and alternative energy sources by 2025. Hydropower is defined as a renewable resource in Alaska. Following HB 306, a Preliminary Decision document was prepared, documenting a comparison between the two major projects competing to satisfy the requirements of HB 306, Chakachamna and Susitna-Watana. The result of the comparison was a recommendation by AEA to develop the Susitna-Watana site, the upper of the two sites that were the subject of the 1983 License Application.

Also in 2010, after evaluation of competitive proposals, AEA engaged MWH and its subcontractors to assist in the completion of engineering feasibility studies and FERC licensing of a revised concept for the Susitna-Watana Project. These feasibility studies have been used to complete this report.