Alaska Energy Authority
Susitna-Watana Hydroelectric Project
813 W. Northern Lights Blvd
Anchorage, AK 99053

June 26, 2012

Subject: Susitna-Watana Hydroelectric Project Access Route Draft Report

Attached is a draft summary report entitled "Watana Transportation Access Analysis," prepared for the Alaska Energy Authority (AEA) by the Alaska Department of Transportation and Public Facilities (ADOTPF).

This draft report provides a preliminary assessment of the three alternative access routes presently under consideration for the Susitna-Watana Hydroelectric Project (Project). The intent is to provide a reconnaissance-level study based on engineering, scientific and environmental information. Additional information regarding environmental and other issues related to the routes will be developed later as part of the National Environmental Policy Act (NEPA) process. At that point, a preferred route will be selected.

Through August 31, 2012, AEA is seeking comments on the summary report that identify technical or factual concerns with ADOTPF's analysis. Comments regarding technical or factual concerns with "Watana Transportation Access Analysis" will be accepted by email at susitnawatana@aidea.org, or by mail to the above address. Please reference the Susitna-Watana Hydroelectric Project.

Copies of the attached report are available online at Susitna-watanahydro.org or by contacting Sandie Hayes at (907) 771-3965, shayes@aidea.org.

The public will have further opportunities to comment and express a preference on proposed alternative Project access routes as the licensing and permitting process continues to move forward. In particular, the NEPA process includes a public comment period on the Draft Environmental Impact Statement (EIS). It is expected that the draft EIS will be issued by the Federal Energy Regulatory Commission (FERC) in December 2016, as part of the licensing and permitting process.

NEPA establishes certain procedural requirements with respect to the identification and consideration of reasonable alternatives and assessment of environmental impacts. The intent is that this report will help inform the NEPA alternatives analysis and impacts assessment, and ultimately assist in the selection of a preferred route. The ultimate selection of a route will be made based upon a thorough evaluation of all relevant considerations, including, but not limited to: land ownership, potential environmental (including socioeconomic and cultural) impacts, cost, and technical and engineering feasibility.

Sincerely,

Wayne Dyok, project manager
Susitna-Watana Hydroelectric Project

Watana Transportation Access Analysis

Project No. 82002

Executive Summary

DRAFT

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Executive Summary

The Alaska Energy Authority (AEA) is evaluating the Susitna-Watana Hydroelectric Project, which would include a single dam on the Susitna River at river mile (RM) 184 in the vicinity of Watana Canyon. The canyon is located in the upper Susitna basin, approximately halfway between Anchorage and Fairbanks. This project is an update of a previous project, developed by the Alaska Power Authority (APA) in the 1980s, that proceeded through feasibility studies, final design, and license application before being cancelled in 1986.

While design specifics of the dam and powerhouse types for the current project are as yet unknown, the Alaska Department of Transportation and Public Facilities (DOT&PF) has undertaken this reconnaissance level transportation access study to identify suitable access corridors to the Watana dam site. The objectives of this report are to:

- Identify the primary ground transportation mode (road or rail) to be used during construction and for the operational life of the dam
- Identify and evaluate potential access corridors
- Identify suitable access corridors for further study
- Confirm the reasonableness of the proposed airport locations

Ground Access Modes

While air transport of equipment, supplies, and personnel would occur throughout construction and operation (see Airport Verification section), most equipment, supplies, and personnel would be transported to the dam site by either road or rail.

Table ES-1 details the design criteria used to develop access corridor alternatives for each transportation mode.

Table ES-1. Analysis design criteria

Road[a]		**Rail**	
Surface	All-season gravel	Type	Single track
Width	22 feet	Top embankment width	28 feet
Shoulder	5 feet	Minimum radius curve	574 feet
Overall width	32 feet	Maximum grade	3%
Design speed[b]	20–40 mph[c]	Design speed	25 mph[c]

[a] New alignment. Speed limits on the Denali Highway are not expected to change.

[b] Depending on grade. Refers to speed on new road.

[c] mph = miles per hour

Access Corridors

The consideration of alternatives in this study began with three road and one rail alignment identified in the 1982 APA planning study. These access corridors were digitized using geographic information system (GIS) software, adjusted to the project's design criteria, and mapped. Additional review of U.S. Geological Survey (USGS) maps identified an additional

road corridor (Butte Creek [East]) for analysis. The five alternatives analyzed in this study, and their variants, are described briefly below. Additional detail is provided in Chapter 3 of the study.

In all cases, this study assumed that bulk materials (e.g., cement, fuel, reinforcing steel) and manufactured materials (e.g., transformers, power parts) for dam construction would arrive at one of the ports of Southcentral Alaska. From there, they would be transported either directly to the dam site or to the offloading site at the beginning of the road, depending upon the access corridor selected. This assumption would require each alternative to include approximately 5,000 feet of new railroad siding along existing rail lines. Road access alternatives would also require an approximately 40-acre marshalling/laydown yard for the stockpile and storage of materials being transferred from rail to truck.

South Road: Based on the Plan 16 corridor identified in the 1982 APA study, this corridor would begin at the Alaska Railroad Corporation (ARRC) Gold Creek Station (ARRC MP 263), adjacent to the Susitna River. This corridor would be approximately 54.8 miles long and ranges in elevation from 750 feet at its origin to 3,500 feet at its midpoint. Three variants were also studied as part of this alternative:

- *South Road Fog Creek Variant:* Developed to shorten the corridor by approximately 4.4 miles by crossing Fog Creek closer to the Susitna River.
- *South Road B Variant:* Topographical map review identified the potential to ascend the Gold Creek drainage and avoid deep ravines and side hilling while providing a level, gently rolling terrain for most of the corridor.
- *South Road Corridor-Gold Creek Variant (South C):* Developed to shorten the corridor length by 4 miles by continuing along the north-facing slope of the Susitna River between milepost (MP) 15.5 and 36.

South Rail: The South Rail corridor would begin at the ARRC Gold Creek Station and include 60.9 miles of new rail line along the north-facing side of the Susitna River. The route's lowest elevation is 1,750 feet at its starting point, and its maximum elevation is 3,550 feet at MP 32.8.

Hurricane (West): Based on North-Access Plan 13 from the 1982 study, this alternative would require construction of 51.7 miles of new road from ARRC's Hurricane Station (near MP 171 of the Parks Highway) to the dam site. Its elevations would range between 1,750 feet at its origin to 3,550 feet near MP 32.8.

- *Chulitna Variant—Road:* This variant would use the ARRC Chulitna siding instead of Hurricane, The road component would remain the same as the Hurricane (West) alignment. Additional information would be needed to definitively identify the most suitable rail siding to use. As a result, this variant was retained in the Hurricane (West) corridor for future study.
- *Chulitna Variant—Rail:* This variant would use the ARRC Chulitna siding instead of Hurricane. An approximately 1-mile access road would connect Chulitna to the Hurricane (West) alignment near MP 7. The first 7 miles of the Hurricane (West) alignment would not be constructed resulting in this variant having no direct access to the Parks Highway.

Seattle Creek (North): This road alternative was based on the Denali-Access Plan 18 in the 1982 study, and would start nearly 20 miles east of Cantwell at MP 113.7 of the Denali Highway. It would require approximately 43.3 miles of new roadway and improvements to nearly 20 miles of the Denali Highway to support the additional volume and type of traffic. This alternative would begin at 2,700 feet at its origin and peak at nearly 4,100 feet near MP 20.9.

- *Kettle Lake Variant:* The eastern portion of Seattle Creek (North) goes through a group of kettle lakes[1] located in the center of the Brushkana Creek drainage. While the Kettle Lake variant is 1.8 miles shorter and is better exposed to the sun, it also appears to be wetter and would likely require additional stream crossings. Additional field work and research would be required to definitively identify the more suitable location for the alignment. As this work is not included in this study, it was decided to have the alignment use the western segment but keep the Kettle Lake variant in the Seattle Creek (North) corridor for future study.
- *Deadman East Variant:* At MP 14.8, the corridor runs parallel to Brushkana Creek for a short distance before turning south to ascend up to a higher valley along the western edge of Deadman Mountain. Near MP 18.5, the corridor splits into western and eastern segments because the Deadman Mountain area has the highest elevation along the alignment. The east side of Deadman Mountain would be a viable location for the road if it made economic sense to do so. Additional information is needed before a decision to locate the road on the eastern side of the mountain or to separate the road and transmission line can be made. The Deadman East Variant was kept in the Seattle Creek (North) Corridor for future study.

Butte Creek (East): This road alternative was identified during the map review portion of alternatives development, and would begin at MP 79 of the Denali Highway, approximately 53 miles east of Cantwell. It would require 42 miles of new road construction and upgrades to approximately 53 miles of the Denali highway.

- *Butte Creek—Raptor Trail Variant (East—Raptor Trail):* Would utilize part of a winter trail developed from the Denali Highway in 2011 during recovery of a crashed U.S. Air Force F-22 Raptor as basis for a 47.1 mile roadway.
- *Butte Lake Variant:* Would start at Denali Highway MP 94.5; would require 40 miles of new road and upgrades to 40 miles of the Denali Highway.
    - *Butte Lake Variant A:* This variant leaves the Denali Highway at Milepost 94.5 to head southwest toward Butte Lake. After passing the lake the alignment runs southwest to Deadman Creek (MP 29); it then travels along the southern side of Deadman Creek until it passes between Deadman Lake and Big Lake. The alignment crosses Deadman Creek twice to skirt around the east side of Deadman Lake, then travels west to connect to the Seattle Creek (North) alignment. From there it traverses the last 20 miles on the same alignment to the dam site. Due to the lack of field reconnaissance in this area, it was decided that Butte Lake A would remain in the Butte Creek (East) corridor.

[1] Kettle lakes are water-filled depressions left behind after partially buried ice blocks melt.

- *Butte Lake Variant B:* This variant departs the Butte Lake A variant southwest of the Butte Lake and includes a connection to the Butte Creek (East) alternative at approximately the midway point. This variant is approximately 43 miles long. Due to the lack of field reconnaissance in this area, it was decided that Butte Lake B would remain in the Butte Creek (East) corridor.

Prescreening

Of the five alternatives and nine variants identified for consideration in this study, four variants were dismissed before screening for the following reasons:

- *South Road Fog Creek, B, and Gold Creek Variants*: Additional bridge requirements, engineering challenges, and costs associated with bridge building
- *Chulitna Variant—Rail:* Anticipated socioeconomic impacts near Chulitna and logistical issues associated with rail only access,
- *Butte Creek-Raptor Trail Variant:* Aerial reconnaissance revealed very little trail remaining and excessive travel distance required for transport (100.6 miles total, including travel along the Denali Highway and new road)

The remaining five alternatives advanced for detailed screening.

Corridor Alternatives Screening

This study used a two-tier screening approach to identify suitable access corridors. The first stage was an initial screening to identify any alternatives that were so unsuitable that they would not warrant further consideration. The second screening was more detailed than the first, and was intended to identify the preferred access corridor using criteria that could be qualitatively or quantitatively assessed.

Step 1 Screening

In the first stage of screening, the alternatives were reviewed based on the initial office study and field reconnaissance. Each alternative was assessed holistically based on the following categories (detail provided in Section 4.1):

- Land status
- Creek crossings
- Mode evaluation
- Logistics
- Range of magnitude cost
- Field reconnaissance
- Ability to support dam construction schedule

Based on this first screening, one alternative was dismissed from detailed consideration:

South Rail: Due to the cost of railcars, ballast, major bridge crossings; construction time for initial access; overall schedule; and access restrictions, rail would not be practical as the primary mode of transportation to the dam site.

The remaining four corridor alternatives—South Road, Hurricane (West), Seattle Creek (North), and Butte Creek (East)—advanced to the Step 2 Screening.

Step 2 Screening

For the second tier screening, the project team identified screening criteria that could be assessed, either qualitatively or quantitatively, equally for each alternative to allow for a comparison of the alternatives. These criteria were identified in 10 main categories:

- Engineering
- Geological/geotechnical considerations
- Hydrology
- Fish streams/waterbodies
- Land status
- Fish and wildlife uses
- Cultural resources
- Socioeconomics
- Cost
- Permitting requirements

Each of the remaining four corridor alternative was evaluated independently for its performance in these categories, as detailed in Section 4.3. Within these corridors, there were four alignments and multiple variants. Based on existing information about the corridors and aerial reconnaissance, four variants were retained in the potential corridors. These variants include the Chulitna Variant Road for the Hurricane (West) alternative, Kettle Lake and Deadman East variants for the Seattle Creek (East) alternative and Butte Lake A and Butte Lake B variants for the Butte Creek (East) alternative. While these variants were retained in their respective alternatives they were not studied in further detail in this report. A summary of the findings is provided in Table ES-2.

Table ES-2. Summary of alternatives analysis

Category	Criteria	South Road	Hurricane (West)	Seattle Creek (North)	Butte Creek (East)
Engineering	New road (miles)	54.8	51.7	43.3	42.5
	Upgrades to Denali Highway (miles)	0	0	20	53
	Total length (including Denali Highway; miles)	54.8	51.7	63.3	95.5
	Highest elevation (feet)	3,450	3,250	4,100	3,200
	New road above 3,000 feet (miles)	5.0	12.5	32	6.4
	Travel time from Hurricane to Watana Dam (hours)	N/A	1.5	2.4	3.1
	Distance from Hurricane to Watana Dam (miles)	N/A	51.7	102.6	134.7
	Travel time from Cantwell to Watana Dam (hours)	N/A	2.1	1.8	2.7
	Distance from Cantwell to Watana Dam (miles)	N/A	91.0	63.4	95.5
	Travel time from railroad siding to Watana Dam (hours)	1.6	1.5	1.9	2.7
	Distance from railroad siding to Watana Dam (miles)	54.8	52.3	65.3	97.4
	Potential transmission line in close proximity	Yes	Yes	Yes	No
Geologic and Geotechnical Conditions	Borrow soil quality[a]	4	4	3	1
	Borrow rock quality[a]	2	4	3	2
	Subgrade support[a]	2	2.5	2	1.5
	Soil slope stability[a]	3	3	2	1
	Permafrost conditions[a]	2	2	3	1

Table ES-2. Summary of alternatives analysis

Category	Criteria	South Road	Hurricane (West)	Seattle Creek (North)	Butte Creek (East)
Hydrology and Hydraulics	Number of bridges on new roadway	4	6	3	1
	Linear feet of bridge on new roadway	1,000	800	200	300
	Drainage culverts on new roadway	0	2	5	0
	Small fish culverts on new roadway	15	26	3	23
	Large fish culverts on new roadway	4	2	4	2
	New/replacement bridges on Denali Highway	0	0	1	2
	Replacement of small fish culverts along the Denali Highway	0	0	6	13
	Replacement of large fish culverts along the Denali Highway	0	0	0	1
Fisheries and Aquatics	Salmon stream crossings	8	4	0	0
	Stream crossings requiring fish passage	23	32	15	29
Terrestrial	Caribou habitat [a]	2	2	3	3
	Moose habitat [a]	2.5	2	3	3
	Migratory duck habitat (acres)	763.5	387.2	128.3	298
	Swan habitat (acres)	166.4	65.4	0	65.2
	Bear habitat [a]	3.5	3	2.5	2
Wetlands	Category 2, 3 and 4 wetlands (acres)	226.8	553.9	699.2	544.1[b]
Fish and Wildlife Use	Sport fishing[a]	2	3	2	2.5
	Sport and subsistence hunting[a]	2	2	3	3

Table ES-2. Summary of alternatives analysis

Category	Criteria	South Road	Hurricane (West)	Seattle Creek (North)	Butte Creek (East)
Land Status	Corridor (acres)				
	Federal lands	0	14,817	6,613	10,238
	State lands	13,791	19,443	36,042	50,634
	Native	40,828	9,521	896	896
	Private or Borough	1,692	5,160	0	818
	ROW (acres)				
	Federal lands	0	771	357	255
	State lands	417	749	1,174	1,230
	Native	1,466	300	45	45
	Private or Borough	112	66	0	0
Socioeconomics	Distance between Parks Highway junction and Cantwell (miles)	N/A	39	0	0
Costs	New road construction ($ millions)	251.2	211.5	149.1	144.0
	Denali Highway upgrades ($ millions)	0	0	14.6	31.7
	Total roadway ($ millions)	251.2	211.5	163.7	175.7

Red: Not preferable **Green: Favorable**

[a] Criteria evaluated on a qualitative basis

[b] Wetland information was only available for a portion of the corridor. However, based on existing aerial photography and other information, it is believed that the unmapped portion of the corridor also contains a substantial amount of wetland.

Summary of Findings

Based on the findings of the Step 2 Screening, the Seattle Creek (North) corridor appears to best meet the schedule and cost goals for the future Watana dam access road corridor. The environmental analysis for each corridor relied on existing information. Further engineering and environmental analysis may be required before an access corridor is selected. . While Seattle Creek and Butte Creek would both be acceptable, Seattle Creek minimizes upgrades to the Denali Highway, has the potential for lower dam construction costs, and should reduce dam operations and maintenance cost due to its reduced length. Additionally, Seattle Creek allows the possibility to collocate the transmission line within the road corridor, which the Butte Creek alternative does not.

Airport Verification

Given the remoteness of the area, air transport will be required to support construction of the dam before completion of the ground access infrastructure. The 1980s permitting effort identified two potential airport locations: one north of the Susitna River, and one south of the river. Each airport was evaluated using the design criteria outlined in Table ES-3.

Table ES-3. Airport design criteria

Design aircraft	Boeing 737-200
Runway size	6,500 feet by 100 feet
Runway safety area	8,500 feet by 500 feet
Apron dimensions	400 feet by 200 feet
Apron distance from runway	500 feet

The project team also evaluated runway approaches, wind coverage, constructability, and cost. Based upon this evaluation, both airport locations appears to be feasible. Each site has sufficient room and terrain to accommodate standard construction techniques, sufficient airspace for safe approaches, and the flexibility to rotate the runway on its axis during design if necessary.