

# Susitna-Watana Hydroelectric Project Document

## ARLIS Uniform Cover Page

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## 1.1. The Future Watana Reservoir Fish Community and Risk of Entrainment Study

### 1.2. Requester of Proposed Study

AEA anticipates resource agencies will request this study

### 1.3. Responses to Study Request Criteria (18 CFR 5.9(b))

The following sections provide the necessary context and justification for the proposed study.

#### 1.3.1. Describe the goals and objectives of each study proposal and the information to be obtained.

The overarching goal of this study is to evaluate the direct effects of the Project on the fish community, their habitat within the inundation zone, and potential loss from entrainment.

Specific objectives include:

1. Develop scenarios for anticipated daily and seasonal changes in reservoir habitat characteristics based on predicted reservoir operations, size, temperatures, and water quality and depth profiles.
2. Develop scenarios for future reservoir fish communities based on current fish species composition upstream of the proposed dam site and anticipated reservoir habitat characteristics.
3. Characterize potential management options for the reservoir fishery.
4. Conduct a desktop analysis on the potential for entrainment of fish species inhabiting the proposed reservoir upstream of Watana Dam.

#### 1.3.2. If applicable, explain the relevant resource management goals of the agencies and/or Alaska Native entities with jurisdiction over the resource to be studied. [Please include any regulatory citations and references that will assist in understanding the management goals.]

Aquatic resources including fish and their habitats are generally protected by a variety of state and federal mandates. In addition, various land management agencies, local jurisdictions, and non-governmental interest groups have specific goals related to their land management responsibilities or special interests. These goals are expressed in various statutes, plans, and directives:

- Alaska Statute 41.14.170 provides the authority for state regulations to protect the spawning, rearing, or migration of anadromous fish. Alaska Statute 41.14.840 regulates the construction of fishways and dams. State regulations relating to fish resources are generally administered by ADF&G. ADF&G is responsible for the management, protection, maintenance, and improvement of Alaska's fish and game resources in the interest of the economy and general well-being of the state (AS 16.05.020). ADF&G monitors fish populations and manages subsistence, sport and commercial uses of fish through regulations set by the Board of Fisheries (AS 16.05.221). ADF&G's authority for protection of fish resources and habitat is further established through the Anadromous Fish Act (AS 16.05.871 – 901) and the Fishway Act (AS 16.05.841). In addition to the state statutes, the following resource management plans and directives provide guidance and direction for protection of fish resources and aquatic habitats on lands within or adjacent to the Project area:

- The Federal Subsistence Board, which comprises representatives of the U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, and U.S. Forest Service, oversees the Federal Subsistence Management Program (57 FR 22940; 36 CFR Parts 242.1–28; 50 CFR Parts 100.1–28), with responsibility for managing subsistence resources on Federal public lands for rural residents.
- Magnuson-Stevens Fishery Conservation and Management Act (PL 104-267) provides federal protection for Essential Fish Habitat (EFH) defined as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” NOAA’s National Marine Fishery Service (NOAA Fisheries) is responsible for designating EFH. In the case of anadromous fish streams (principally salmon), NOAA Fisheries has designated the AWC prepared by ADFG (Johnson and Klein 2009) as the definition of EFH within freshwater habitats.
- Aquatic Resources Implementation Plan for Alaska’s Comprehensive Wildlife Conservation Strategy, September 2006. Prepared by ADF&G, Division of Sport Fish.
- Our Wealth Maintained: A Strategy for Conserving Alaska’s Diverse Wildlife and Fish Resources. Prepared by ADF&G, Juneau, Alaska. xviii+824 pp.

Management and land use plans relevant to Aquatic Resources Study Components:

- The role of state land use plans, generally administered by Alaska Department of Natural Resources (DNR), was established by state statute (AS 38.04.005). The Susitna-Matanuska Area Plan (SMAP) and The Southeast Susitna Area Plan (SSAP) direct how the DNR will manage general state uplands and shorelands within the planning boundaries.
- The Susitna Basin Recreation Rivers Management Plan describes how the Department of Natural Resources (DNR) will manage state land and water along six rivers including: the Little Susitna River, Deshka River, Talkeetna River, Lake Creek, Talachulitna River, and Alexander Creek. The plan determines how these six rivers will be managed over the long term including providing management intent for each river segment, new regulations for recreation and commercial use, and guidelines for leases and permits on state land.
- The Susitna Flats Game Refuge Management Plan provides ADF&G guidance to manage the refuge to protect fish and wildlife populations, including salmon spawning and rearing habitats.

**1.3.3. If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.**

Fisheries resources are owned by the State of Alaska and the Project could potentially affect these public interest resources.

**1.3.4. Describe existing information concerning the subject of the study proposal, and the need for additional information.**

Information regarding resident species, non-salmon anadromous species, and the freshwater rearing life stages of anadromous salmon was collected as part of the studies conducted during the early 1980s. Existing information includes the spatial and temporal distribution of fish

species and their relative abundance. The Aquatic Resources Data Gap Analysis (ARDGA; AEA 2011a) and PAD (AEA 2011b) summarized this existing information and also identified data gaps for resident and rearing anadromous fish.

At least eight species of fish are known to occur in the Upper Susitna River (AEA 2011a). These species are Arctic grayling, Dolly Varden, humpback whitefish (*Coregonus* spp.), round whitefish, burbot, longnose sucker, Chinook salmon, and sculpin (all assumed to be slimy sculpin). Northern pike, Alaska blackfish, and lake trout may also be present. Chinook salmon are the only anadromous species that has been documented in the Upper Susitna River.

In the proposed impoundment zone, arctic grayling are believed to be the most abundant fish species (AEA 2011a ARDGA) and were found to spawn in tributary pools. In tributaries, juvenile grayling were found in side channels, side sloughs, and pool margins and in the mainstem at tributary mouths and clear water sloughs during early summer (AEA 2011b PAD). Dolly Varden populations in the Upper Susitna River are apparently small but widely distributed (AEA 2011b PAD). Burbot in the Upper Susitna River were documented in mainstem habitats with backwater-eddies and gravel substrate (PAD). The abundance of longnose suckers in the Upper Susitna River was less than downstream of Devils Canyon. Lake trout have been documented in lakes near the proposed impoundment zone but those within the impoundment zone have not been sampled.

**1.3.5. Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.**

Construction and operation of the Project ~~as described in the Pre-application Document (PAD, AEA 2011) likely~~ will result in inundation of the river upstream from the dam location ~~up to an elevation of 2,125 feet msl~~. The actual proposed operating pool level will depend upon completion of a number of optimization studies. Several operational scenarios will also be considered as part the licensing studies. ~~Some operating strategies, such as load following, could result in relatively large and frequent fluctuations of the water surface elevation within the reservoir.~~ Operations could also result in seasonal differences in pool elevation such as a winter or early-spring time drawdown in advance of the annual melt of accumulated snow during early summer.

Construction of the project will fundamentally change the fish habitat characteristics in the area to be inundated. Riverine habitat from the Dam site to approximately the Oshetna River, about 39 miles of mainstem river plus an unknown amount of tributary stream, will be converted to lacustrine habitat. Conversion from riverine habitat to lacustrine habitat will be beneficial for some fish species and detrimental to others, resulting in modified fish community. Depending upon the fish protection measures included in the Project and specific engineering design elements, the modified fish community may be subject to entrainment and mortality as a result of spill or passage through turbines. This study will provide information and tools needed for predicting the likely changes to the fish community due to habitat conversion, potential mortality from entrainment, and for assessing the potential Project operational effects on lacustrine habitat following Project construction.

Understanding the relationship between Project design, operations, lacustrine habitat, and the potential fish community in the proposed Watana Reservoir is important for refining project operations, assessing potential Project impact, and development of PM&E measures. The

proposed Watana Reservoir has the potential to provide public benefits in the form of recreational fishing opportunities. Identifying the potential fish community and species valued as sportfish is also important for identifying alternative fishery management strategies in advance of project construction.

**1.3.6. Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.**

**Objective 1:** Develop scenarios for anticipated daily and seasonal changes in reservoir habitat characteristics based on predicted reservoir operations, size, temperatures, water quality, and depth profiles.

- Coordinate with hydrologic study team to adapt an existing model or develop a new unsteady flow hydraulic model of the proposed reservoir that can be used to evaluate daily and seasonal changes in reservoir depth and the amount of exposed shoreline. Use the model to estimate the amount of varial, littoral, limnetic, profundal, and benthic zones in the reservoir under alternative operating scenarios. Collaborate with the fish and aquatic technical working group (FATWG) in the development of model assumptions.
- Coordinate with the water quality assessment team in the development of a water temperature model of the proposed reservoir that can be used to evaluate daily and seasonal changes in water temperatures and the potential for thermal stratification.
- Coordinate with water quality assessment team to evaluate whether the water clarity of the reservoir will support overwintering lake trout, burbot, grayling, and whitefish.
- Incorporate potential operational affects related to peaking.

**Objective 2:** Develop scenarios for future reservoir fish communities based on current fish species composition upstream of the proposed dam site and anticipated reservoir habitat characteristics.

- Use information synthesized as part of FS-1 plus fish community information collected as part of FS-4 to characterize the existing fish community in the mainstem river and any tributaries or lakes that could colonize the reservoir.
- Identify species in the existing fish community that may use lacustrine habitat for one or more history stages and prepare a white paper identifying their life history and habitat requirements, focusing on the lacustrine elements. Include a discussion of the uncertainty in predicting the future fish community that can aid in the development of a post-construction monitoring program.
- Identify the presence of invasive species in lakes and ponds that are currently disconnected from the mainstem but have potential to be inundated.

**Objective 3:** Characterize potential management options for the reservoir fishery.

- Analyses associated with this objective will be conducted in 2014 when more information on public access and recreational goals for the reservoir are available.
- Collaborate with the ADFG and FATWG on the development of alternative fishery management strategies for the reservoir.

- Coordinate with recreation team to determine recreational basis and potential access in support of a potential fishery.

**Objective 4:** Conduct a desktop analysis on the potential for entrainment of fish species inhabiting the proposed reservoir upstream of the proposed Dam site.

- Analyses associated with this objective are anticipated to be conducted in 2014 when more dam design and operational details are available.
- Coordinate with Project Engineers to understand alternative Project designs (spillways, penstocks, turbines, etc.) and operating scenarios.
- Review the abundant literature and previous analysis on risk of fish entrainment at hydropower with a focus on deep water intakes and cold water reservoirs.
- Conduct a desktop analysis to identify the potential vulnerability of fish in the anticipated reservoir community to entrainment and mortality at the proposed dam under alternative design and operating scenarios.

Deliverable work products include the following:

#### **Proposed Study Plan**

**Revised Study Plan.** The study plan for 2013-14 will be finalized in consultation with AEA, the Program Lead, resource agencies and other licensing participants.

**Summary of Interim Results.** Interim reports will be prepared and presented to the Work Group to provide study progress. Reports will include up-to-date compilation and analysis of the data and ArcGIS spatial data products.

**Hydraulic and Temperature model products.** All models, source code, calibration and input datasets, and result products will be delivered to AEA in electronic format. Model documentation will be provided that allows technical staff familiar with similar models to run new alternative scenarios.

**ArcGIS spatial products.** Shape files of the potential passage barriers will be created. All map and spatial data products will be delivered in the two-dimensional Alaska Albers Conical Equal Area projection, and North American Datum of 1983 (NAD 83) horizontal datum consistent with ADNR standards. Naming conventions of files and data fields, spatial resolution, and metadata descriptions must meet the ADNR standards established for the Susitna-Watana Hydroelectric Project.

**Technical Memorandum.** A technical memorandum summarizing the study results will be prepared and presented to resource agency personnel and other licensing participants, along with spatial data products.

#### **1.3.7. Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.**

This is largely a desk top analysis that will be completed in late 2013 and 2014 as information from other studies becomes available. The schedule, staffing, and costs will be detailed as the 2013–2014 Study Plan develops.



### 1.3.8. Literature Cited

- Alaska Department of Transportation and Public Facilities. 2011. Watana Transportation Access Study, Project 82002.
- AEA (Alaska Energy Authority). 2011a. Aquatic Resources Gap Analysis. Prepared by HDR, Inc., Anchorage. 107 pp.
- AEA. 2011b. Pre-application Document: Susitna-Watana Hydroelectric Project FERC Project No. 14241. December 2011. Prepared for the Federal Energy Regulatory Commission, Washington, DC.
- Johnson, J. and K. Klein. 2009. Catalogue of waters important for spawning, rearing, or migration of anadromous fishes – Southcentral Region, Effective June 1, 2009. Alaska Department of Fish and Game Special Publication No. 09-03, Anchorage.
- USFS. 2001. US Forest Service - US Department of Agriculture. Aquatic Habitat Management Handbook, Chapter 20 – Fish and Aquatic Stream Habitat Survey.