

## Susitna-Watana Hydroelectric Project Document ARLIS Uniform Cover Page

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## SYNTHESIS OF EXISTING FISH POPULATION DATA –FINAL

### INTRODUCTION

The Alaska Energy Authority (AEA) is preparing a License Application that will be submitted to the Federal Energy Regulatory Commission (FERC) for the Susitna-Watana Hydroelectric Project (Project) using the Integrated Licensing Process (ILP). The Project is located on the Susitna River, an approximately 300 mile long river in the Southcentral region of Alaska. The Project's dam site will be located at River Mile (RM) 184. The results of this study and of other proposed studies will provide information needed to support the FERC's National Environmental Policy Act (NEPA) analysis for the Project license.

Construction and operation of the Project as described in the Pre-application Document (PAD, AEA 2011) will affect the flow, thermal, and sediment regimes of the Susitna River, and thus alter the relative distribution and suitability of aquatic habitats to support native fish communities. Understanding the ecology of fish, especially the seasonal and spatial distribution of different fish species and their life stages, will contribute relevant information to assess potential Project effects. Extensive fisheries data was collected in the 1980s (Harza-Ebasco 1985) and ADF&G has conducted several studies in recent years. The data is summarized in various reports and data tables and much of the data is unavailable in digital format and has not been spatially referenced. This study plan outlines the objectives and methods for characterizing the existing information that will provide a foundation for future licensing studies.

### STUDY OBJECTIVE

This study has two objectives. The first objective is to consolidate and synthesize contemporary and historical fish resource data within the study area into a concise comprehensive reference document. The second objective is to develop a geospatially-referenced relational database of fisheries resources from which information can be obtained for use in future analyses, studies and reports.

The synthesis of existing fish population data will expedite understanding of baseline conditions by project personnel, agency staff and licensing participants. It will also refine the understanding of existing information and data gaps presented in the Aquatic Resources Data Gap Analysis (HDR 2011) and Pre-Application Document (AEA 2011). This improved understanding will contribute to well-focused aquatic resource study planning and implementation for 2013-2014.

After reviewing prior studies, the gap analysis, and other available and relevant information, the available pertinent data will be compiled into a comprehensive database. This will include geospatial reference wherever possible, and other usable formats. The following is a list of the types of information likely to be compiled.

- The river mile locations for geographic landmarks used in historical studies.

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- Resident and anadromous fish species composition within the Upper Susitna River (upstream of RM 184), the Middle Reach of the Susitna River (RM 184 to RM 99) and the lower Susitna River (RM 99 to RM 0).
  - Distribution of resident and anadromous fish species among riverine habitat types (mainstem, side channel, side slough, upland slough, tributary mouth, and tributary) within the three river segments.
  - The relative abundance of fish species in river segments and riverine habitat types.
  - Run timing, spawning and incubation periods for resident and anadromous species within each river segment.
  - Representative indicators for fish growth, condition factor, age structure, and genetic information.
  - Physical habitat attributes which appear to be highly beneficial or preferred by species life stage.
  - Physical habitat attributes which appear to be limiting to baseline populations.
  - Fish community, benthic macroinvertebrate community, and habitat conditions at stream crossings along proposed transmission line and access corridors.

## **EXISTING INFORMATION**

Existing information includes extensive data collected in the 1980s as well as recent ADF&G studies on fish distribution and relative abundance, salmon escapement, salmon spawning distribution, and run apportionment. Much of the historical ADF&G anadromous and resident fish data were compiled by Woodward-Clyde and Entrix (1985). The Aquatic Resources Data Gap Analysis (ARDGA) (HDR 2011) and PAD (AEA 2011) summarizes existing information and identifies data gaps for adult salmon, and resident and rearing fish. The ARDGA identified nine data gaps for adult salmon (AS-1 to AS-9) and 12 for resident and rearing fish (RR-1 to RR-12).

## **STUDY AREA**

The study area includes the Susitna River and its tributaries from its headwaters (~ RM 318) downstream to Cook Inlet.

## **METHODS**

The work will address the issues and information data gaps outlined in HDR (2011) AS-1 to AS-9 that are related to existing adult salmon, RR-1 to RR-12, resident and rearing fish, and MP 1 and MP 2 macroinvertebrates and periphyton. Completion of this study will be accomplished in two phases. Phase I includes an inventory of the historic and contemporary study reports and coordination with AEA and study leaders within the Fish and Aquatic Program, Instream Flow Program, and the beluga whale prey studies. Phase II includes development of GIS and relational database structures, compiling the historic information into GIS layers or database tables, and synthesis of the information into a technical memorandum.

Phase I is important for defining the scope of the data compilation and synthesis effort. Over 3,500 documents were archived from the 1980s Susitna studies implemented by the Alaska Power Authority (APA) (Harza-Ebasco 1987) and about 481 of these documents were

associated with water or aquatic resources that might be important for fulfilling the information identified above. However, not all of the information will be suitable for compiling into GIS or relational databases or needs to be synthesized. Consequently, Phase I includes a rapid inventory of the available historic documents to identify portions pertinent and suitable for compilation and/or synthesis. Coordination with the other fisheries studies and the Instream Flow Study is needed to identify the necessary elements for the synthesis and ensure no duplication of efforts.

Phase I also includes development of an initial report outline that is structured in a clear, logical manner to present a synthesis of the pertinent information. The outline shall include several example tables, figures, maps, and text summaries. This information will be provided to AEA for approval of the outline and approach. At the conclusion of Phase I an Interim Report will be prepared and AEA and the contractor will meet to re-evaluate the level of effort needed to complete Phase II of the study.

Phase II includes a detailed review of the documents identified in Phase I, development of GIS layers, population of relational database tables, and summarization of the information into a concise summary report. The report will synthesize the information identified below, and any information identified through coordination with other studies.

- Synthesize existing information on fish life history, spatial and temporal distribution, and relative abundance by species and life stage.
- Identify known upstream passage barriers into tributaries and/or factors contributing to passage barriers into sloughs.
- Synthesize recent ADF&G run apportionment and timing data for sockeye, coho, and chum salmon.
- Prepare periodicity charts for each species within the study area (timing of adult migration, holding, and spawning; timing of incubation, rearing, and outmigration).
- Summarize mainstem Susitna River habitat utilization for each species, by riverine habitat type (main channel, side channel, side slough, upland slough, tributary mouth, and tributary).
- Summarize existing age, size, and genetics information.
- Summarize distribution of invasive species, such as northern pike.
- Summarize seasonal distribution of macroinvertebrates by riverine habitat types.
- Summarize periphyton production within each river segment.

For all compiled or synthesized data and sampling locations with an identifiable spatial component, develop a spatially referenced relational database, ArcGIS products in a geodatabase, and maps. Coordinate with the Fish and Aquatics Program GIS manager to obtain spatial data for recent ADF&G fish studies. Coordination will also occur with the Fish and

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Aquatics GIS and Database Managers to ensure that the GIS layers and database tables meet the program standards. Develop the summary tables, figures, maps, and text summaries in a manner that they can be edited as necessary and used in future reports (e.g., MS Word documents, Excel spreadsheets).

### **NEXUS BETWEEN PROJECT AND RESOURCES TO BE STUDIED AND HOW THE RESULTS WILL BE USED**

Project facilities and operations will modify the flow, thermal, and sediment regimes of the Susitna River, and thus alter the relative distribution and suitability of aquatic habitats to support native fish communities. Knowing more about the ecology of native fish, especially the seasonal and spatial distribution of different fish species and their life stages, will contribute relevant information to determining what additional information is needed to undertake an assessment of Project effects.

Existing fish and aquatic resource information appears insufficient to address the following issues that were identified in the PAD (AEA 2011).

#### Upper River Fish and Aquatic Issues (Upstream of the Watana Dam Site [RM 184])

- F1: Effect of change from riverine to reservoir lacustrine habitats resulting from Project development on aquatic habitats, fish distribution, composition, and abundance, including primary and secondary productivity.
- F2: Potential effect of fluctuating reservoir surface elevations on fish access and movement between the reservoir and its tributaries and habitats.
- F3: Potential effect of Watana Dam on fish movement.

#### Middle River Fish and Aquatic Issues (Watana Dam Site [RM 184] downstream to Three River Confluence [RM 98])

- F4: Effect of Project operations on flow regimes, sediment transport, temperature, and water quality that result in changes to seasonal availability and quality of aquatic habitats, including primary and secondary productivity. The effect of Project-induced changes include streamflow, stream ice processes, and channel morphology (streambed coarsening) on anadromous fish spawning and incubation habitat availability and suitability in the mainstem and side channels and sloughs in the Middle River above and below Devils Canyon.
- F5: Potential effect of Project flow regime on anadromous fish migration above Devils Canyon. Devils Canyon is a velocity barrier to most fish movement and changes in flows can result in changes in the potential fish movement through this area (approximately RM 150).
- F6: Potential influence of the proposed Project flow regime and the associated response of tributary mouths on fish movement between the mainstem and tributaries within the Middle River reach.
- F7: Influence of Project-induced changes to mainstem water surface elevations July through September on adult salmon access to upland sloughs, side sloughs, and side channels.

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F8: Potential effect of Project-induced changes to stream temperatures, particularly in winter, changing the distribution of fish communities, particularly invasive northern pike.

Lower River Fish and Aquatic Issues (Three River Confluence [RM 98] downstream to Cook Inlet [RM 01])

F9: The degree to which Project operations affect flow regimes, sediment transport, temperature, water quality that result in changes to seasonal availability and quality of aquatic habitats, including primary and secondary productivity.

Thus, the information developed from this study will be used to help determine what additional fisheries information is needed in combination with information from other resource studies (e.g., water temperature, fish production, fish distribution and relative abundance, fish access to side sloughs and tributaries, and instream flow), to assess the Project-related effects of fish resources and provide a basis for streamflow-related resource management decisions.

## PRODUCTS

The work products for this report include a relational database, spatial data products, two interim reports, a draft technical report, and a final technical report.

**Interim Reports.** Interim Report No. 1 will describe the results of the document inventory, include a draft outline for the Technical Memo, and a proposed plan for database development and for capturing the information present in the tables, figures, maps, and text present in the available literature. It will include a comprehensive list of references to be synthesized for the Technical Memo, a list of data sources, and describe the format and availability of data and its applicability to the current Project. The contractor will identify referenced documents that are not currently available in the Susitna-Watana ARLIS library. All available data will be compiled and delivered to AEA. Interim Report No. 2 will include a revised outline for the Technical Memo that addresses comments on the draft outline from Interim Report No. 1. It will also include a description of the relational database structure and examples of the tables, figures, and maps that could be generated from the relational database and GIS. It will provide a preliminary assessment of missing data and data gaps.

**Relational database.** A relational database of the existing fisheries data will be prepared including geospatial references, where available. This database will form the basis for additional data collection in 2013-2014. This effort will be coordinated with data compilation efforts being conducted as components of other studies (e.g. Upper River fisheries studies, Instream Flow, Beluga Whale Prey, etc) to ensure no duplication of efforts. All spatial data will be converted to geographic coordinates (latitude/longitude) and the WGS84 datum. Naming conventions of files, data fields and metadata descriptions must meet the ADNR standards established for the Susitna-Watana Hydroelectric Project.

**Spatial products in ArcGIS software.** Spatial products will be developed from the relational database. At a minimum, spatial products will include a geodatabase and maps indicating fish presence by species-life stage and locations of significant features such as barriers and springs. Naming conventions of files, data fields and metadata descriptions will meet the standards established for the Susitna-Watana Hydroelectric Project. All map and spatial data products will



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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.

**Technical Memorandum.** A draft technical memorandum, in the form of a concise reference document with tables, figures, and maps, the QC'd database and all spatial products will be issued to the Fisheries and Aquatic Resources Work Group for review and comment. The technical memo will then be finalized.

## SCHEDULE

The following schedule is tentative and may be modified.

- Interim Report No. 1. – May 4, 2012
- Interim Report No. 2 – May 21, 2012
- Relational Database and ArcGIS spatial products – June 29, 2012.
- Draft Technical Memo – June 29, 2012
- Final Technical Memo – August 31, 2012

## REFERENCES

Alaska Energy Authority (AEA). 2011. Pre-Application Document: Susitna-Watana Hydroelectric Project, FERC Project No. 14241, December 29, 2011.

Harza-Ebasco (Harza-Ebasco Susitna Joint Venture). 1985. Fish, wildlife, and botanical resources. Exhibit E, Volume 11 of the Draft Application for License, Susitna Hydroelectric Project.

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Woodward-Clyde Consultants, and Entrix, Inc. 1985. Fish Resources and Habitats in the Middle Susitna River. Technical Report No. 1. Instream Flow Relationships Series. Alaska Power Authority Susitna Hydroelectric Project. Vol. 1.