Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Eulachon Distribution and Abundance in the Susitna River Study
Study Plan Section 9.16

Part D: Supplemental Information to June 2014 Initial Study Report

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

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November 2015

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1. INTRODUCTION

Section 1 (Part A) of the June 2014 ISR for this Eulachon Distribution and Abundance in the Susitna River Study (Study Plan 9.16) details the development of this study from the Revised Study Plan (RSP) in 2012, through the end of the 2013 study season. Section 7 of the ISR (Part C), filed in June 2014, sets forth AEA's plan and schedule, at that time, for completing this study and meeting the objectives of the RSP.

As detailed in Section 2.2 of the ISR Part D Overview, various circumstances have required AEA to extend the original timeframe for completing the Commission-approved Study Plan. The most recent field work conducted by AEA on this Study 9.16 is detailed in the June 2014 ISR. As detailed below, AEA's recent activities for Study 9.16 have consisted of the following:

- Completion of the *2015 Proposed Eulachon Spawning Habitat Study Modifications Technical Memorandum* that describes Study Plan modifications for Study 9.16;

- On October 15, 2014 AEA held an ISR meeting for the Genetic Baseline Study for Selected Fish Species in the Susitna River

The primary purpose of this Part D Supplemental Information to the ISR for Study 9.16 is to identify all documents associated with this study, provide a summary of variances and modifications presented in the ISR (Parts A and C), and identify AEA's plans for completing Study 9.16 in a manner that meets the objectives of the Commission-approved Study Plan.

2. BACKGROUND

2.1. Purpose of Study

The goal of the study is to collect baseline information regarding eulachon (*Thaleichtys pacificus*) run timing, distribution, and habitat use in the Susitna River in two years of study. Eulachon are an important prey species for the endangered Cook Inlet Beluga Whale (CIBW); therefore, this study has been designed to support the CIBW Study (Study 9.17). Together with existing information, data collected as part of this study will provide necessary baseline information to address issues identified in the Pre-Application Document (PAD) and assess potential Project effects.

The study objectives are established in RSP Section 9.16.1:

- Determine eulachon run timing and duration in the Susitna River in 2013 and 2014.

- Identify and map eulachon spawning sites in the Susitna River.

- Characterize eulachon spawning habitats.

- Describe population characteristics of eulachon returning in 2013 and 2014.

2.2. Study Components

Acoustic sampling was used at a fixed site in the Lower River to assess the timing and duration of the spawning migration and assess the relative abundance of eulachon. Radio telemetry and mobile acoustic surveys were used jointly to identify the distribution of spawning locations in the study area and evaluate fish behavior on spawning sites. Active capture methods were used to confirm eulachon spawning concentrations, collect information on eulachon population characteristics, and document incidental observations of marine fish species. Physical habitat characteristics were measured at confirmed spawning sites.

3. STATUS, HIGHLIGHTED RESULTS, AND ACHIEVEMENTS

The following tasks were completed in 2013 and reported in Part A of the ISR for Study 9.16:

- The study team conducted eulachon field studies from ice out (May 28) through June 16, 2013.

- Despite the late break-up of ice in 2013, this study was able to document the eulachon run in 2013. Information from fixed-station sonar and dip netting indicated that the bulk of the eulachon run in the Susitna River occurred between May 28 and June 16, 2013.

- In addition, 28 spawning sites were documented between Project River Miles (PRMs) 10.5 and 50.3. This distribution was similar to that observed in the 1980s. No spawning sites were detected upstream of Willow Creek and the majority of spawning sites observed were downstream of the Yentna River confluence.

- Acoustic sampling was used at a fixed site in the Lower River to assess the timing and duration of the spawning migration, and assess relative abundance of eulachon.

- Active capture methods were used to confirm eulachon spawning concentrations, collect information on eulachon population characteristics, and document incidental observations of marine fish species.

- Radio telemetry and mobile acoustic surveys were used jointly to identify the distribution of spawning locations in the study area and to evaluate fish behavior on spawning sites. Over half of the radio-tagged eulachon traveled 500 m (1,640 feet) or more upstream from their tagging location; many tagged fish travelled as much as 20 km (12 mi).

- Physical habitat characteristics were measured at confirmed spawning sites.

Because AEA has not conducted additional work on this study since the June 2014 ISR, there are no further updates to report regarding the implementation of Study 9.16. This information presented in the ISR (Part A) is up to date. As explained in Section 7 below, AEA prepared a September 2014 technical memorandum that identifies additional modifications to Study 9.16.

4.   DOCUMENTS

Since filing of the RSP in 2012, AEA and FERC have prepared several documents pertaining to this study. To aid review by FERC staff and licensing participants, each of these documents is listed below.   Each of these documents is accessible on AEA's Project licensing website (http://www.susitna-watanahydro.org/type/documents/) by clicking on the entry in the "Link" column in the table. In addition, these documents are available on FERC's eLibrary system (http://www.ferc.gov/docs-filing/elibrary.asp), in Docket No. P-14241.

Title	Date	Description	Link
9.16. Eulachon Distribution and Abundance in the Susitna River (Revised Study Plan)	12/14/2012	This document presents the plan for this study, including goals, objectives, the study area, and proposed study methods regarding eulachon run timing, distribution, and habitat use in the Susitna River.	RSP for Study 9.16
FERC's Study Plan Determination for Study 9.16	2/1/2013	This document presents FERC approval of Study 9.16, which approved AEA's Revised Study Plan with no recommended changes.	FERC SPD for Study 9.16
Draft Initial Study Report for Study 9.16	2/3/2014	This draft of the ISR summarized the study methods and variances during the 2013 study season, and presented preliminary data collected for Study 9.16. This draft ISR was later republished as Part A of the final ISR.	Draft ISR for Study 9.16
Eulachon White Paper	3/22/2013	This white paper presents the results of efforts to address portions of two objectives of the 2012 Cook Inlet Beluga Whale Study related to eulachon: (1) Summarize life history, run timing, abundance, distribution, and habitat of beluga whale prey species (eulachon and adult Chinook, chum, coho, and sockeye salmon) in the Susitna River; and (2) Evaluate life history, run timing, abundance, distribution, and habitat of beluga whale prey species (eulachon and adult Chinook, chum, coho, and sockeye salmon) in other Cook Inlet tributaries used by beluga whales	March 2013 TM for Study 9.16
Initial Study Report for Study 9.16	6/3/2014	This document is the Initial Study Report (Parts A, B and C) for Study 9.16. Part A republishes the Draft ISR. Part B identifies supplemental information and errata in Part A. Part C presents study modifications and plans for completing the study.	ISR Part A for Study 9.16 ISR Part B for Study 9.16 ISR Part C for Study 9.16

2015 Proposed Eulachon Spawning Habitat Study Modifications Technical Memorandum	9/17/2014	Technical memorandum prepared by AEA that describes a modification to Study 9.16 that is intended to address an identified eulachon habitat data gap in support of Study 9.17, Cook Inlet Beluga Whale Study	Sept. 2014 TM for Study 9.16
Initial Study Report Meetings, October 15, 2014 (Parts A and B)	11/15/2014	Transcripts and AEA's agenda and PowerPoint presentations for the ISR meeting concerning the Project fish and aquatic studies filed by AEA	Transcripts from ISR Meeting Materials from ISR Meeting

5. NEW STUDY DOCUMENTATION SUPPLEMENTING THE ISR

Because AEA has not conducted additional work on this study since the June 2014 ISR, no additional reports or documents are available to supplement the results or discussion sections of the ISR for this Study 9.16. As explained in Section 7 below, AEA prepared a September 2014 technical memorandum that identifies modifications to Study 9.16 that supersede the modifications proposed in 9.16 ISR Part C 7.1.2.

6. VARIANCES

6.1. 2013 Study Season

The following variances are reported in the June 2014 ISR.

- RSP Section 9.16.4.1.1: The blocking weir was removed due to flood conditions and because turbulence from the weir impeded sonar data collection.

- RSP Section 9.16.4.1.3: Water velocity data were not collected at the sonar station because the data were not needed to estimate eulachon run timing.

- RSP Section 9.16.4.1.2: Fish sampling was conducted at other locations along the river, in addition to the sonar site, to more effectively estimate catch per unit effort (CPUE) and run timing.

- RSP Section 9.16.4.1.1: Sonar data collection ended on June 15 when fewer than 2 fish per minute were observed.

- RSP Section 9.16.4.2.2: Visual surveys were also used to identify spawning sites.

- RSP Section 9.16.4.3.2: Visual surveys were the primary method to characterize substrate.

- RSP Section 9.16.4.3.3: A grid sampling design was not used to collect water quality information; instead, a randomized approach was used.

6.2. 2014 Study Season

Because AEA has not conducted additional work on this study since the June 2014 ISR, no variances were encountered during the 2014 study season.

7. STUDY PLAN MODIFICATIONS

7.1. Modifications Identified in ISR

Section 7 of the ISR (Part C) details modifications for this study following the 2013 study season.   However, two of the modifications in Part C Section 7.1.2 are superseded by modifications as described in the September 2014 technical memorandum for completion of the Study Plan. Modifications that have been superseded are indicated below.

- RSP Section 9.16.4.1.1 provides that AEA will use a blocking weir around the sonar unit to exclude fish from the 70-100 centimeter range. In 2013, the weir was removed due to debris accumulation during high flows and interference to the sonar from turbulence. AEA plans to eliminate the blocking weir going forward to avoid similar problems. The absence of a blocking weir will enhance AEA's ability to accurately characterize eulachon run timing and duration.

- RSP Section 9.16.4.1.1 provides that AEA will collect sonar data until no eulachon are detected for five consecutive days after June 10. In 2013, sonar data collection was terminated on June 15 when active fish sampling at PRM 17.5 had yielded less that fewer than 2 fish per minute for five consecutive days. The criterion for halting sonar surveys that was implemented in 2013 will be repeated going forward to evaluate run timing and duration.

- RSP Section 9.16.4.1.2 provides that AEA will conduct standard sampling with dip nets and/or gillnets to assess representativeness of results from the fixed sonar site. In 2013, fish sampling was conducted at additional locations to target actively migrating fish (in contrast to spawning fish which were observed milling at the fixed sonar site). AEA plans to increase the number of sites sampled by dip netting in the lower Susitna River to collect information on run timing and population characteristics to approximately five. In addition, sites will be selected that have habitat characteristics more similar to the sampling site at PRM 19.2 than those at PRM 17.5 and PRM 17.7, both of which were used for spawning. Sampling additional locations will increase the likelihood of obtaining daily information from at least one site without spawning activity throughout the eulachon migration. Sampling at locations without spawning activity will better support assessment of the sonar data and determination of run timing and duration. All sites will be selected no later than two days after sampling begins.

- RSP Section 9.16.4.1.3 provides that AEA will use water velocity at the sonar site to expand cross-sectional densities to an index of fish passage. In 2013, water velocity data were not collected because the data were not needed to estimate run timing. AEA will

continue this variance as a modification to the Study Plan. Elimination of this data collection will not impact AEA's ability to evaluate run timing and duration.

- RSP Section 9.16.4.3.2 provides that AEA will expand acoustic substrate classifications in 2014 if the feasibility testing was successful in 2013, but also provides that AEA will use only physical grab samples and visual surveys if side scan sonar does not accurately distinguish substrate composition. Although side scan sonar provided good images of substrate, visual surveys and side scan sonar output files produced similar substrate classifications for all sites. AEA will therefore use visual surveys as the primary method to classify substrate going forward. Visual surveys are the simplest effective method for characterizing substrate; however, side scan sonar and grab samples may be used if any spawning sites are found at depths too great to be surveyed visually. **This modification has been superseded.**

- RSP Section 9.16.4.3.3 provided that AEA may use a grid sampling design for the collection of water depth and velocity. In 2013, a randomized approach (three samples at each site) was adopted because river conditions were not conducive to wading or anchoring a boat to collect data at grid locations. Random habitat sampling was able to characterize spawning habitat effectively and will be used again going forward. **This modification has been superseded.**

7.2. Modifications Identified since the June 2014 ISR

Following the June 2014 ISR, and after further discussion with the National Marine Fisheries Service (NMFS) regarding the 2013 and 2014 study results in the Cook Inlet Beluga Whale (CIBW) Study, AEA determined that additional data were necessary to confirm eulachon spawning habitats and evaluate the potential for the Project to affect eulachon spawning habitat. On September 17, 2014, AEA released a document entitled *2015 Proposed Eulachon Spawning Habitat Study Modifications Technical Memorandum*, which presents further modifications for completing this Study 9.16. The modifications presented in the technical memorandum are summarized as follows.

- The radio telemetry conducted in 2013 did not provide information on potential spawning locations. Further, radio signals are not detectable in saline environments and would not be suitable for detection of potential spawning in the lower, likely intertidal, reach of the Susitna River. Thus, AEA determined that another year of radio telemetry data would not inform the eulachon study objectives and proposes to eliminate the radio telemetry study component going forward.

- In lieu of radio telemetry, AEA proposes additional visual and sonar surveys to identify potential spawning locations in the lower, likely intertidal, reach of the eulachon spawning distribution (PRM 6-11) that was not surveyed in 2013. AEA proposes to use the visual and sonar methods as described in RSP Section 9.16 to complete these surveys.

- With regard to the eulachon spawning habitat model, AEA proposes to measure transects at known eulachon spawning areas to determine whether the streambank geometry and substrate provide acceptable spawning conditions at a range of flows in the Lower Susitna River. A transect-based modeling approach, based on an adaptation of Wetted-

Perimeter instream flow methods, will be used. To the extent practical, transects will be co-located at areas where high-density eulachon spawning was observed in 1982, 1983, and 2013 as well.

- Transect-specific measurements, including bed, bank, and water surface elevations as well as surficial substrate, will be collected at high, medium, and low flow conditions to cover the range of flows observed during the eulachon spawning period. In addition, pressure transducers will be installed to record stage in 15-minute increments over the length of the field effort. The following three field efforts are proposed:

  o During May and June, efforts will include transect selection, installation of the pressure transducers, and site specific transect measurements of bathymetry, water surface elevation, and surficial substrate;

  o July field efforts will collect water surface elevation data under assumed moderate flow conditions; and

  o September low-flow field efforts will include collection of water surface elevation data, verification of substrate data, and removal of the pressure transducers.

- To evaluate potential Project-related effects, the transect-based method will be used to quantify and compare the availability of water depths and spawning-sized substrate along the banks of each transect during the May and June eulachon spawning period under pre- and post-Project conditions. In addition, changes in wetted perimeter that maintain a minimum water depth over areas of suitable spawning-sized substrates will be plotted against mainstem flow to identify a breakpoint or threshold. The breakpoint will define the flow below which aquatic habitat conditions for spawning eulachon rapidly decline and will represent the minimum mainstem flow needed to protect suitable spawning habitat.

8.   STEPS TO COMPLETE THE STUDY

In light of the variances and modifications described above, the steps necessary for AEA to complete this study are summarized below:

- As provided in the September 2014 technical memorandum, the study team will conduct visual and sonar surveys to identify potential spawning locations in the lower, likely intertidal, reach of the eulachon spawning distribution (PRM 6-11) that was not surveyed in 2013. The study team will implement the visual and sonar methods as described in RSP Section 9.16 (AEA 2012) to complete these surveys.

- As provided in the September 2014 technical memorandum, transects will be established and habitat data will be conducted in support of a wetted-perimeter type, Eulachon spawning habitat model development.

- As provided in the September 2014 technical memorandum, the study team will develop the Eulachon spawning habitat model using the field data.

- As provided in the September 2014 technical memorandum, the Eulachon spawning habitat model would be used to quantify and compare the availability of water depths and spawning-sized substrate along the banks of each transect during the May and June eulachon spawning period under pre- and post-Project conditions.