Susitna-Watana Hydroelectric Project Document
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SUSITNA-WATANA HYDRO

ALASKA ENERGY AUTHORITY

October 8, 2014

Socheata Lor
Anchorage Field Supervisor
United State Fish and Wildlife Service
605 West 4th Avenue, Room G-61
Anchorage, Alaska 99501-2250

Re: Susitna-Watana Hydroelectric Project, FERC Project No. 14241-000

Dear Ms. Lor:

The Alaska Energy Authority (AEA) is in receipt of a letter from the United States Fish and Wildlife Service (USFWS) dated September 22, 2014,[1] in which you provide comments on portions of the Initial Study Report (June 3, 2014) (ISR) for the proposed Susitna-Watana Hydroelectric Project, Federal Energy Regulatory Commission (FERC) Project No. 14241 (Project).

Your letter raises three topics of concern: 1) data collection and reporting, 2) effective model integration, and 3) development of a decision support system (DSS). Your letter states that it is important that these issues be resolved prior to conducting additional field studies.

We respectfully disagree with your comments. As documented in the ISR, AEA was largely successful in implementing the FERC-approved study plan in 2013. This effort included, among many other studies, a large-scale field effort for fishery studies with a suite of 10 studies covering more than 200 sampling sites across more than 200 miles of river, with sampling occurring during not only the open water period but also during winter and spring periods. Your letter, however, focuses on the limited exceptions in which AEA's data collection varied from FERC-approved study plan methods during the 2013 field season. These variances, as we all know, occurred mostly due to private land access issues, and conditions in the field such as the late ice breakup in the spring of 2013. The ISR includes a detailed description of proposed modifications to the study plan to account for these variances.

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[1] Letter from Socheata Lor, United States Fish and Wildlife Service, to Wayne Dyok, Alaska Energy Authority, Project No. 14241-000.

Attached to this letter is a comment-response table that addresses in detail each of the concerns and comments in your September 22 letter. I think you will agree, on careful review of our responses, that these responses address your concerns and that the 2013 study program provides a solid foundation of data upon which we can continue to build. We look forward to continuing this dialogue in the upcoming ISR meetings.

AEA remains committed to implementing the comprehensive suite of studies proposed in the FERC-approved study plan and encourages USFWS to continue working with us in studying the feasibility of and potential effects associated with an undertaking that is critically important to Alaskans. If you have questions or comments concerning this matter, please feel free to contact me directly at (907) 771-3955.

Sincerely,

Wayne M Dyok

Wayne Dyok
Project Manager
Alaska Energy Authority

Attachment

Cc: Distribution List
Ellen Lance
Betsy McCracken
Phil Brna
Jeff Wright
Ann Miles
Vince Yearick
Dr. Jennifer Hill
Nick Jayjack

Page and Paragraph Numbering

- Partial sentences at the top of a page are considered Sentence 1.
- Partial paragraphs at the top of a page are considered Paragraph 1.
- Paragraphs are numbered by their position on a page, not within a Section.
- Paragraphs are blocks of text separated by hard returns; each heading, bullet, and item in a numbered list is considered one paragraph.

Comment Page, Para	Comment Number	Comment	Response
Page 5 Para 4	1	• As currently planned, some two-year studies cannot be completed because access to all Focus Areas (FAs) was not granted until after the first study year (e.g., ISRs 8.5, 9.6, 9.7, 9.9). For example, a fish wheel was not installed and fish were not tagged near the entrance to Devil's Canyon (e.g., ISR 9.7).	As stated in the ISRs for Studies 9.5, 9.6, 9.7, and 9.9 all of the site where access restricted sampling in 2013 were sampled in 2014. As indicated in ISR Sections 9.5.7 and 9.6.7, the second year of data for these studies that require two years of study will be conducted in 2015. The Salmon Escapement Study 9.7 was successful at collecting sufficient data to address study objective for three consecutive years 2012, 2013, and 2014. This comment ignores the data and analysis presented in the ISR. The variance for not installing a fishwheel at the entrance to Devils Canyon is described in Study 9.7 ISR Section 4.1.8.1. This change in tagging location was compensated for by increased fishwheel effort and an increase in tagging targets at the Curry fishwheels.
Page 5 Para 5	2	• Anomalous weather conditions prevented or delayed fieldwork on aquatic studies (e.g., ISR 8.5), resulted in late installation of migrant traps, which were likely influenced by environmental conditions associated with late breakup (e.g., ISR 9.6). Moreover, juvenile salmon distribution and abundance measured in 2013 were likely affected by the record fall floods in 2012 (e.g., ISR 9.6).	Downstream migrant traps were installed and operated as indicated in the Study 9.5 ISR Section 9.5.4.4.10 and Study 9.6 ISR Section 9.6.4.4.10: "flow conditions permitting, traps will be fished on a cycle of 48 hours on, 72 hours off throughout the ice-free period." As soon as break-up and flow conditions allowed in mid-June 2013 traps were installed and fished immediately upon installation in June through mid-October 2013. In 2014 breakup occurred earlier and migrant trap installations occurred in mid-May with traps operated immediately after installation (the Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum filed with FERC on September 17, 2014). AEA agrees that floods can affect juvenile salmonid distribution. While the Fall 2012 floods did not approach the magnitude of the flood of record, they potentially distributed juvenile salmonids into lateral habitats that may not otherwise be occupied during a low water year. AEA believes that the range of hydrologic events that occur over the multi-year study period provide opportunities to better understand the response of aquatic resources to flow fluctuations.
Page 5 Para 6	3	• Sampling has not been *temporally* adequate across all seasons. ISR 9.6 reports winter fish sampling did not occur across all FAs as proposed; early spring sampling	Fish sampling followed the sampling plan. RSP Section 9.6.4.1 states that "winter sites will be selected based on information gathered during 2012-2013 pilot studies ... attempts will be made to sample all Focus Areas." The winter pilot study was conducted in Winter 2013 at two Focus Areas as described in Study 9.6 RSP Section 9.6.4.5. AEA made recommendations based upon the winter

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		occurred only in three FAs; initial sampling following breakup and installation of migrant traps did not occur until the middle of June, and therefore, spring sampling for fish distribution and abundance was not conducted (e.g., ISRs 7.5, 8.5, 8.6). The extent to which fishes move must be described through sampling; multiple sampling days across all seasons are required to capture the full seasonality of a fish's life-history strategy, which varies considerably within a single season. A single-day of sampling is insufficient to understand the habitat associations of different fish species with differing mobility and life-stages.	pilot study for sampling sites, as stated in the Study 9.6 ISR Appendix C Section 6.1.1, and the 2014 Winter Study was expanded to three Focus Areas and opportunistic sampling at accessible sites outside of the Focus Areas. Results of the first year of the winter study for fish are presented in the Study 9.5 Winter Study Technical Memorandum filed with FERC on September 17, 2014. In 2013 Early Life History (ELH) sampling began two weeks after winter sampling was stopped and continued bi-weekly through June with the exception that no sampling was conducted for two weeks during the dynamic break up in mid-May 2013 (Study 9.6 ISR Section 4.6). As stated in Study 9.6 ISR Section 4.6.2, ELH sampling included 6 Focus Areas identified to have both spawning and rearing habitat as well as additional sites in the Upper (Study 9.5 ISR 4.6.2), Middle and Lower River (Study 9.6 ISR 4.6.5). Sample sites for these various fish study components were visited multiple times during the Winter Study (1- 3 times), Early Life History Study (3 times), and Fish Distribution and Abundance Study (3 times). Some sites were visited during all three seasonal study components and ended up being sampled more than eight times in 2013.
Page 5 Para 7	4	• Sample site selections for integrated studies were inconsistently co-located. For example, invertebrate sampling locations (ISR 9.8) were not co-located with fish sampling locations (ISR 9.6). Failure to co-locate sampling sites risks the magnification of data discrepancies, and because the data will be used as inputs for predictive models, may jeopardize the validity of the models.	As an initial matter, the RSPs never specified the co-location of sample sites across study disciplines. It did specify the location of 10 specific Focus Areas that would be evaluated relative to the different resource disciplines and study sites across disciplines were co-located within the Focus Areas Furthermore, this comment ignores the data and analysis presented in the Study Plan. AEA's selection of sampling sites was consistent with the River Productivity Implementation Plan. As presented in the River Productivity Implementation Plan Section 2.1: "All stations established within the Middle River Segment will be located at Focus Areas established by the Instream Flow Study (AEA 2012, Section 8.5.4.2.1.2), in an attempt to correlate macroinvertebrate data with additional environmental data (flow, substrates, temperature, water quality, riparian habitat, etc.) collected by other studies (e.g., AEA 2012, Section 5.5, Baseline Water Quality), for uses in statistical analyses, and HSC/HSI development. Furthermore sites for Fish Distribution and Abundance, Habitat Suitability Criteria, and River Productivity were all co-located within Middle River Focus Areas. In 2013, private land access restrictions prevented fish sampling in some desired locations, yet River Productivity sampling was able to be conducted because the sites for that study were located in mainstem and within ordinary high water. Maps depicting the co-locations of sampling sites among these three studies will be presented in the October 15, 2014 ISR meeting.
Page 5 Para 8	5	• Detection arrays did not cover the entire channel and tagging efforts did not allow for detection of fish migrating upstream, therefore the data were biased and	This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. As stated in RSP Sections 9.5.4.4.1.2 and 9.6.4.4.1.2, remote telemetry techniques were "intended to provide detailed information on relatively few individual fish." PIT tags were used to "document relatively localized movements of fish as well as growth

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		efficiency estimates cannot be calculated. Detection rate and recovery of passive integrated transponder (PIT) tags is insufficient to yield useful data to meet study goals and objectives (ISR 9.6).	information from tagged individuals." Due to the large size of rivers in the study area, the necessity for installing arrays across split channels, side-channels and/or as partial coverage array across a portion of the main channel was described in the Fish Distribution and Abundance Implementation Plan Section 5.6.5. Furthermore, the PIT tag arrays spanned the entire channels located in FA-104 (Whiskers Slough) and FA-128 (Slough 8A). Data from PIT tag arrays provided limited but valuable information on fish movements. As indicated in Study 9.5 ISR Section 5.2.2.2 and Study 9.6 ISR Section 5.2.2.2, antenna arrays recorded 29,047 detections of 33 fish in the Upper River and 126,351 detections of 664 fish at Middle River arrays. These resightings provided information on local and inter-stream movements of individuals for six species in the Upper River and 11 species in the Middle River as well as site-specific growth rates for individuals of several species (Study 9.6 ISR Section 5.5.1).
Page 5 Para 9	6	• Fish targets for fish Habitat Suitability Curve (HSC) sampling were not met (e.g., ISR 8.5), therefore, power to assess fish habitat-preferences and relationships is reduced.	This comment ignores the data and analysis presented in the ISR and reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. AEA notes that absolute target numbers were never established for HSC data collection (see RSP 8.5.4.5.1.1.5). What was noted was that "If possible, a minimum of 100 habitat use observations will be collected for each target species life stage. However, the actual number of measurements will be based on a statistical analysis that considers variability and uncertainty. While information will be collected on all species and life stages encountered, the locations, timing, and methods of sampling efforts may target key species and life stages identified in consultation with the TWG." This was discussed during several TWG meetings where it was emphasized that the approach AEA is taking in developing HSC curves will include several components, including collection of new site specific data, which is AEA's and agencies preferred approach, as well as other approaches for species or life stages infrequently encountered. AEA listed those in RSP 8.5.4.5.1.1 and included use of existing site specific data collected during the 1980s studies, use of site specific data from other similar Alaska systems, as well as professional opinion. A summary of HSC collection efforts to date is provided below. As noted, there are a number of species for which the numbers of observations have exceeded 100, including those for Chinook juvenile, chum fry and spawning, coho fry, sockeye fry and spawning, Arctic grayling fry, and whitefish fry. These species and life stage mixes reflect the majority of the target species and life stages that are central to the habitat-flow modeling for evaluating Project effects.

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Species	Lifestage	2013	2014 Through July	Project Total	1980s Total
Chinook Salmon	Fry	54	164	218	
	Juvenile	38	25	63	
Chum Salmon	Fry	14	258	272	
	Spawning	348		348	333
Coho Salmon	Fry	99	181	280	
	Juvenile	56	28	84	
Pink Salmon	Fry	0	39	39	
	Spawning	59	0	59	NR
Sockeye Salmon	Fry	79	299	378	
	Spawning	181		181	81
Arctic Grayling	Fry	113	7	120	
	Juvenile	43	9	52	
	Adult	4	4	8	140
Burbot	Juvenile	2	4	6	

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	Adult	17	3	20	18
Dolly Varden	Fry	20		20	
	Adult	1	1	2	2
Longnose Sucker	Fry	41	46	87	
	Juvenile	52	27	79	
	Adult	70	3	73	157
Rainbow Trout	Juvenile	5	2	7	
	Adult	6	1	7	143
Whitefish	Fry	39	73	112	
	Juvenile	39	15	54	
	Adult	29	4	33	384

For some species and life stages, the 2013 site-specific data discussed above may be used in development of final curves. Additional HSC/HSI sampling is planned for the next year of study and it is anticipated that most HSC relationships will be updated. However, for species and life stages that are rarely observed, final HSC curves may be based on additional data, including utilization data from 2012 and the 1980s studies on the Susitna River. Even then, there may still be some species where few or no empirical HSC/HSI data were able to be collected. In those cases, AEA will consider other methods for developing curves. This may include the use of literature based curves, developing envelope curves (see, for example, Jowett et al. 1991, and GSA BBEST 2011), guilding (e.g., creating a combined HSC/HSI curve representing multiple species and/or life stages; see, for example, Vadas, Jr. and Orth 2001, GSA BBEST 2011), developing curves based on expert

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			opinion/round table discussions) and the use of Bayesian statistical methods for updating data distributions (see, for example, Hightower 2012).
Page 6 Para 1	7	• Data collected on fish habitat for the Fish Passage Barrier Study (ISR 9.12) and the HSI/HSC component of the fish and aquatic Instream Flow Study (ISR 8.5) were gathered at incompatible spatial scales to meet the study objectives.	This comment reflects a lack of understanding of the methodologies being relied upon by the FERC-approved study plan. The data collected by HSC is not needed for analysis of fish barriers. However, Fish Barriers and IFS studies are collaborating in a number of other ways including: evaluating target species, in the development of passage criteria that meet model outputs, and to ensure overlap in sampling locations. This collaboration will ensure that the model outputs from IFS are applicable to the analysis of depth and velocity passage barriers. This comment ignores the data and analysis presented in the ISR.
Page 6 Para 3	8	• Water quality samples were qualified as either estimated or rejected by the analytical laboratory due to quality-related failures (ISR 5.5). Issues included failure to deliver samples to the laboratories within the method-specified temperature range; failure to meet procedure specified holding times; contaminated or missing field, trip, and method blanks; and Chain of Custody and bottle labeling discrepancies. AEA proposed to apply a correction factor to the 2013 data to render it useable, but provided no details on how that would be done.	Water quality samples with those "qualifiers" identified by USFWS were not the reason why select parameters were rejected and required re-sampling in 2014. The primary reasons why select water quality parameter results were rejected was due to: matrix interference in turbid waters, recovery of matrix spike much higher than acceptance limits, laboratory split sample results exceeded acceptance limits, and potential for sample preservative appearing as target analyte among other criteria used to validate and verify quality of results. A link to a table describing qualifiers applied to specific analytes is in the companion GINA document provided to Licensing Participants in June (as cited in ISR Study 5.5; Part C, Section 7.1.2). Data rejected from 2013 results will be corrected following evaluation of multiple strategies for determining the nature of the difference between 2014 results and 2013 results. The strategy for identifying individual correction factors may vary among the water quality parameters rejected from the 2013 sampling effort. Specific methods that will be evaluated for each rejected parameter will be similar to the approach described by Stuart (2002) where independent surrogate variables (e.g., periphyton biomass, total suspended solids, nutrient concentration, flow and solar radiation) related to the target analyte are used to examine the time series of data collected during 2013. The approach will first test for normality in the surrogate parameter data distribution (i.e., application of Chi-square goodness of fit test) on transformed and non-transformed data. A linear regression will be developed between surrogate parameter and target analyte from the 2014 collection effort to determine significant r^2 predictive relationships. It is expected that surrogate parameters could include established ratios (e.g., SRP : TP) or differences between total and dissolved metals samples from select portions of the data set (e.g., those from low turbidity sample sites where matrix interference does not occur in the Susitna Basin or from published literature describing the same). The surrogate parameter will have a known synchronous (direct or indirect) relationship with the target analyte as a test in suitability for use. A correction factor may also be derived through simple comparison of multiple paired differences between 2013 and 2014 results for each water quality parameter. The tests for identifying correction factors for each 2013 parameter will not begin until the 2014 data have undergone the complete data validation/verification procedure as required by

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			ADEC in compliance with the credible data policy.
Page 6 Para 4	9	• There is evidence that juvenile salmon may have been misidentified. A comparison of juvenile fish collections from the Susitna River in the 1980s (Alaska Department of Fish and Game 1983 as cited by R2 Consultants in the Fish Population Summary Document), local Alaskan rivers (Alaska Department of Fish and Game, unpublished data; Davis et al. 2013), recent studies on the Susitna River (Kirsch et al. 2014), and nearby tributaries (Miller et al. 2011), signal substantial differences in total fork length distribution and habitat associations among juvenile salmon from that which is expected. Large numbers of unidentified salmonid juveniles (some of which were PIT tagged), anomalous length distributions and questionable habitat associations decrease our confidence in the accuracy of species identification. For example, juvenile Chinook salmon measuring 150 mm fork-length were reported, juvenile Chinook salmon were reportedly most abundant in beaver ponds, there was absence of pink salmon in any samples, and a disappearance of sockeye salmon from Indian River between the February draft ISR and the June draft ISR. We have strong reservations about the identification of these juvenile fish, and suspect many juvenile salmons identified as Chinook salmon may be coho salmon.	In Study 9.6 ISR Table 5.1-2: 865 undifferentiated Pacific salmon Juveniles in MR, five percent of all juvenile salmon, ~ half from Slough 6A. 436 fish have been identified after photo review and classified to species. Resulting in a total of 429 undifferentiated Pacific salmon remaining in database, 2.5 percent of total. In Study 9.46 ISR Table 5.1-3: 78 undifferentiated Pacific salmon juveniles in LR, two percent of total. AEA is in the process of reviewing photos from the Lower River, which should reduce the number of unidentified juvenile salmonids. In 2013, 11 undifferentiated pacific salmon were PIT-tagged (67 reported in ISR but photo review resulted in identification of 56 of the 67); 4 of these 11 tagged unidentified pacific salmon met length criteria to be two-year-olds. Ten of these 11 fish have photos that are under review. In total 1,872 Chinook salmon and 2,793 Coho salmon were PIT-tagged in 2013 and Winter 2014. Pink salmon were caught during winter sampling and ELH sampling. Winter data are provided in Study 9.6 ISR Appendix C Tables C2.2-5 and C2.2-5 and Figure C A1-17. ELH data are provided in Study 9.6 ISR Tables 5.3-1, 5.3-2, and 5.3-3. Summary of large juvenile Chinook and coho salmon. Based on growth modeling, juvenile Chinook and coho salmon >100mm in May and June were presumed to be two-year-old fish and >120mm from July-April were presumed to be two years of age. These data are not consistent with data from the 1980s and are undergoing additional analysis.

Location	PRM	Habitat	Chinook salmon	Coho salmon	Pacific salmon, undifferentiated	Total
DMT-Talkeetna Station	106.9	MS Susitna River	72	8	3	83
Indian River DMT	142.1	Tributary	70	4		74
FA-141-Slough 17	142.3	Upland Slough Beaver Complex	70	16	1	87
Montana Creek DMT	80.8	Tributary	37	4		41
FA-104-Slough 3A	105.7	Upland Slough Beaver Complex	15	25	1	41

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FA-104-SS	105	Side Slough	14	2		16
PRM-63.5-US	62.5	Upland Slough Beaver Complex	9	11		20
FA-115-Slough 6A	116.2	Upland Slough Beaver Complex	6	31		37

Genetics samples were collected from 37 age-2 Chinook and four coho salmon in 2013. An additional 29 samples were collected from Chinook salmon ≥100 mm collected July 2013-April 2014. Analysis of these samples is currently underway. A total of approximately 600 Chinook salmon tissue samples have been delivered to ADF&G for analysis and can be used to determine Chinook salmon ID error rate if desired.

Approximately 11 voucher specimens have been collected for Chinook and coho salmon. These fish will be used for meristic counts to determine species ID. The ADF&G permit limited voucher specimen collection to 10 per species but was recently modified to up to 20 Chinook and coho salmon.

Thirty-one photos of these larger Chinook salmon juveniles are also available for review. Review is complete for photos gathered by one contractor but those collected by other contractors remain to be reviewed.

Habitats where Chinook salmon were collected in 2013 and winter 2014: 681 juvenile Chinook salmon were collected from upland slough beaver complexes compared to 3,414 coho salmon. Approximately 14 percent of Chinook salmon were associated with upland slough beaver complexes. The highest habitat supporting collection was tributaries, over 21 percent of total collections. Of larger Chinook salmon juveniles, roughly one third, 100 of 313 were associated with upland slough beaver complexes.

	Chinook salmon		Coho salmon		Pacific salmon, undifferentiated		Total
Macro Habitat	**All Sizes**	**Larger**	**All Sizes**	**Lager**	**All Sizes**	**Larger**	
Additional Open Water	1		32	1			**33**
Backwater	31	1	107		3		**141**

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Clear Water Plume	69	2	144		14		**227**
Main Channel	1,038	74	1,210	23	79	3	**2,327**
Side Channel	176	12	291	1	42		**509**
Para Side Channel Complex	11	1			3		**14**
Side Slough	177	3	554		147		**878**
Side Slough Beaver Complex	76	1	221	11	25		**322**
Tributary	1,875	43	1,411	6	53		**3,339**
Tributary Mouth	615	70	2,123	7	28		**2,766**
Upland Slough	108	6	378	19	1		**487**
Upland Slough Beaver Complex	681	100	3,414	65	131	1	**4,226**
Grand Total	**4,858**	**313**	**9,885**	**133**	**526**	**4**	**15,269**

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Page 6 Para 5	10	• Information used to describe fish/habitat preferences were gathered using professional best judgment, literature, and limited field data, but were not confirmed with an adequate sample from the Susitna River system (ISR 8.5). Fish/habitat data gathered from the Susitna River is necessary to identify preferential use of the habitats. It is vital that these data are accurate as they will be used to: 1) develop Habitat Suitability Indices (HSI) and Habitat Suitability Criteria (HSC); 2) describe fish-macrohabitat relationships, which may be used to evaluate project effects; 3) validate the Instream Flow Study (8.5) habitat model predictions; and 4) extrapolate results from FAs to geomorphic reaches and river segments. Ultimately the	AEA is confused by and disagrees with the first sentence of this comment. AEA has repeatedly described the methods being used for developing HSC related data and has noted that the preferred method and the one that AEA has been following involves the collection of site specific data. However, for species and life stages that are rarely observed, final HSC curves may be based on additional data, including utilization of data from 2012 and the 1980s studies on the Susitna River. However, there may still be some species where few or no empirical HSC/HSI data were able to be collected. In those cases, AEA will consider other methods for developing curves. This may include the use of literature based curves, developing envelope curves (see, for example, Jowett et al. 1991, and GSA BBEST 2011), guilding (e.g., creating a combined HSC/HSI curve representing multiple species and/or life stages; see, for example, Vadas, Jr. and Orth 2001, GSA BBEST 2011), developing curves based on expert opinion/round table discussions) and the use of Bayesian statistical methods for updating data distributions (see, for example, Hightower 2012). Bootstrapping may be used as one technique for estimating variability around these types of combined curves.

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		data will be used to develop protection and mitigation measures and to provide a basis for post-project monitoring.	
Page 6 Para 6 – Page 7 Para 1	11	• The Service is concerned about AEA's proposal to "scale up", and requests rationale for its implementation (Riverine Model Integration Meeting 2013). "Scaling up" is only appropriate when the sampling is conducted accurately, in a random fashion throughout the population, and at a scale relevant to resource concerns. To assess impacts from the Project on fish resources, sampling effort must be at a scale relevant to Susitna River fish species at various life stages in order to adequately quantify baseline conditions with the accuracy required for accurate extrapolation. For example, incorrect fish identification and would lead to imprecise and inaccurate extrapolation of species-specific habitat associations.	Several points of clarification are warranted regarding the topic of scaling up. Firstly, it is important to note that AEA is not developing fish/habitat associations so they can be extrapolated. Rather, AEA is developing HSC curve sets that reflect fish species and life stage preferred habitat use that will be used in the habitat-flow models for defining how Project operations may influence fish habitats (target species and life stages) within different habitat types. The scaling up that AEA would use is associated with the extrapolation of the habitat-flow modeling results from one location to other, unmeasured locations. In addition, the specific concern cited related to potential fish identification issues of juvenile fish in selected lateral habitats has no bearing on the outcome of the habitat-modeling studies and extrapolation of results since that analysis will consider all five of the Pacific salmon species. And finally, AEA has identified and discussed several approaches for extrapolating the results of this type of analysis to other areas of the Middle River during the April 15-17, 2014 Proof of Concept meetings (see http://www.susitna-watanahydro.org/wp-content/uploads/2014/04/2014_04_17TT_Riverine_SpatialExtrapolation.pdf) but has not selected a specific approach pending further review with licensing participants.
Page 7 Para 3	12	• Standard error was not reported for stated relationships between species of juvenile salmonids at various life stages and their habitat (e.g., ISRs 9.5, 9.6). A robust assessment of statistical results must include calculations for standard error.	Statistical error associated with relative abundance fish data was not in ISRs 9.5 and 9.6. As these catch-per-unit-effort (CPUE) data were preliminary and were subject to additional post-ISR QAQC, no error metric was calculated for the ISR. The data are available to generate Standard Error or another measurement of error around CPUE or density estimates. Such error will be reported for these data in the USR. As stated in Study 9.5 ISR Section 5.1.3 and Study 9.6 ISR Section 5.1.3, data presented on habitat associations was preliminary and based only on counts and therefore have no standard error associated with these data. Once QAQC has been completed on the fish data, the analysis of fish-habitat associations will be completed with additional inputs including relative abundance, species richness, and life stages supported. As stated in RSP Section 9.6.4.3.1, Study 9.5 ISR Section 5.1.3, and Study 9.6 ISR Section 5.1.3 fish-habitat associations will be evaluated at the meso-habitat level. These data will not be used to validate the instream flow model.
Page 7 Para 4	13	• Assumptions for the estimating numbers of Chinook salmon migrating above Devils Canyon were not clearly specified and the	This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. As described in RSP Section 9.7.4.1.5 (Objective 1) and Section 9.7.4.6 (Objective 6), AEA planned to examine fish on selected spawning grounds (e.g., Indian

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		standard error of that estimate was not reported (e.g., ISRs 9.6, 9.7).	River) in part to establish mark rates (proportion of fish tagged) so that inferences could be made about the representativeness of tagging across stocks. In addition, AEA stated that mark rates from these areas can be used to estimate the abundance passing the tagging sites (but not the abundance at the recovery site). If sufficient sampling can be obtained and some assumptions met, some inference can be made about relative abundance among recovery locations using the estimates of mark rates and the number of radio-tagged fish present. However, it was not an objective of this study to produce a mark-recapture estimate of the number of Chinook salmon migrating above Devils Canyon (or above the proposed dam site). In the FERC Study Plan Determination (SPD) (page B-13), NMFS and the USFWS requested that AEA add the additional goal of estimating the numbers of fish above Devils Canyon (and the proposed dam site) to the study. FERC did not recommend this additional goal be included in the study. Instead, FERC recommended the study be modified to require AEA to include in the 2013 ISR an evaluation of the feasibility of putting in a weir or sonar counting station at or near the dam site during the 2014 study season to count anadromous fish. In ISR Section 5.6.4, AEA used two different approaches to estimate of the number of Chinook salmon that migrated above Devils Canyon in 2013. The first approach involved expanding the peak aerial spawner count in tributaries above Devils Canyon (29 fish) by the estimated observer efficiency (46.3 percent, as observed in the Indian River; 26/0.463 = 63 fish). This expanded count should be considered a minimum number since only fish counted on the July 25-27 survey were included. Chinook salmon were also observed in tributaries above Devils Canyon on four other surveys, so it is possible that some of these fish were not present during the July 25-27 survey. Also, this approach assumed that the observer efficiency in tributaries above Devils Canyon was similar to that in the Indian River (which was 'ground-truthed' with weir counts in 2013). The second approach involved expanding the number of radio-tagged Chinook salmon detected above Devils Canyon (3 fish) by the marked fraction of Chinook salmon in the Middle River (6.3 percent; 3/0.063 = 48 fish). It was highly unlikely that more than three fish migrated above Devils Canyon. This approach assumed that the mark rate of fish above Devils Canyon was the same as the mark rate of fish sampled in the Indian River. Sensitivity analyses were included in ISR Section 5.6.4 and Section 6.6 to illustrate how extreme, but unlikely, parameter values affected the expanded counts derived from both approaches. In summary, too few tagged and untagged fish were observed above Devils Canyon to derive a statistically valid estimate of the number of Chinook salmon that passed Impediment 3 (or the proposed dam site). Regardless, the study was not designed to produce such estimates. As proposed

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			in the RSP, AEA used available data to make inferences about the abundance of Chinook salmon above Devils Canyon. Although lacking statistical rigor, these estimates provided insight into the order of magnitude of Chinook salmon abundance above Devils Canyon (e.g., 50-65 fish above Devils Canyon in 2013 was likely, but 100 or more was unlikely). These estimates also illustrate how difficult it would be to achieve sufficient sample sizes to derive a reasonably accurate and precise mark-recapture estimate for Chinook salmon above Devils Canyon. **Summary of passage events for large Chinook salmon (MEF $\geq$ 50 cm) released in the Middle River, 2012-2014. Small Chinook salmon, and large Chinook salmon released in the Lower River, were not included in this table.**

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			(table below)
Page 7 Para 5	14	• Sampling and non-sampling errors were not clearly stated (e.g., ISR 9.7). Sampling error is the error resulting from sampling	See Response to Comment 13.

	2012	2013	2014	Total
Tags Released at Curry	352	536	590	1,478
Number of Tags Detected Above:				
Gateway	313	445	491	1,249
Impediment 1	23	17	11	51
Impediment 2	20	13	8	41
Impediment 3	10	3	2	15
Proposed Dam Site	6	2	1	9
Percent of Tags Released Detected Above:				
Gateway	88.9	83.0	83.2	84.5
Impediment 1	6.5	3.2	1.9	3.5
Impediment 2	5.7	2.4	1.4	2.8
Impediment 3	2.8	0.6	0.3	1.0
Proposed Dam Site	1.7	0.4	0.2	0.6
Percent of Tags Past Gateway Detected Above:				
Impediment 1	7.3	3.8	2.2	4.1
Impediment 2	6.4	2.9	1.6	3.3
Impediment 3	3.2	0.7	0.4	1.2
Proposed Dam Site	1.9	0.4	0.2	0.7
Number of Tags That Approached Impediment 1 (within 1 km)	34	60	32	126
Percent of Tags Released That Approached Impediment 1	9.7	11.2	5.4	8.5
Percent of Tags Past Gateway That Approached Impediment 1	10.9	13.5	6.5	10.1

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		only a part of the population and not the whole population. Non-sampling errors are those errors resulting from selection bias, systematic non-representativeness of samples, and transcription or recording errors. Sampling error is usually quantified and reported with confidence intervals or standard errors and related to *precision* of the estimates. Non-sampling errors are harder to recognize, yet very important, and more closely related to the *accuracy* of the estimates. Sampling errors must be clearly accounted for in statistical analyses to assess data reliability and interpret results.	
Page 7 Para 6	15	• Consistent fish sampling methods were not applied (i.e., different gear types used, different effort was applied within and across sampling units, concurrent use of non-compatible gear types within a sampling unit). This resulted in inability to estimate sampling error because (e.g., ISR 9.6) inconsistent sampling methods resulted in individual datasets that are not comparable.	The use of different gears consistent with habitat characteristics was implemented as proposed in the Fish Distribution and Abundance Implementation Plan filed with FERC on March 1, 2013 with modification described in Study 9.5 ISR Section 4.4.4 and Study 9.6 ISR Section 4.4.4. AEA respectfully disagrees that sampling error will impact AEA's ability to meet objectives of fish distribution and abundance sampling for Studies 9.5 and 9.6. The fish distribution and relative abundance methods were implemented consistent with Studies 9.5 and 9.6 RSPs, the Fish Distribution and Abundance Implementation Plan, and FERC's SPD.
Page 7 Para 7	16	• No power analysis was reported (ISR 9.14), and it is unclear how sample size for both adult and juvenile Chinook salmon was determined. Based on the number of genetic markers sampled and the magnitude of genetic divergence measured in the population documented thus far, a power analysis would inform determination of the number of samples needed to provide a robust estimate of genetic diversity. Furthermore, three years of samples may not be adequate to characterize genetic diversity among a species with a life cycle	AEA agrees that power analysis will be needed, but disagree that we have the information at hand to perform a meaningful analysis at this time to determine adequate sample sizes. NMFS also commented that a power analysis will be critical to determine if lack of detection of effect is due to a lack of samples or truly a lack of effect. In response we added a power analysis section (Section 4.6.9) in the Final 2014 Implementation Plan (Study 9.14 ISR Part B). This section added a power analysis so that we can quantify the level of effect necessary for detection. As for using a power analysis to determine the number of samples needed, we could use programs such as POWSIM, but we would have to make assumptions regarding the relatedness of individuals sampled, representativeness of samples of underlying populations, and variation among years. Results from such an analysis using the limited information we have, could provide misleading results. AEA also agrees that additional years may be needed, especially if we do not detect differences due to a lack of statistical power (small samples sizes, small number of years). However, if we are able to

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		of five to seven years; this limitation must be addressed in the study results.	collect an adequate number of samples, we may have adequate power to distinguish among hypotheses with adequate certainty.
Page 8 Para 1	17	• Samples from presumed siblings were proposed for removal from the genetic analyses (ISR 9.14). Only if the samples have been collected in a non-random way may this method be justified. Purging related animals as proposed will bias the results. Furthermore, ISR 9.14 proposes to exclude samples from juvenile Chinook salmon if they show significant differences in allele frequency from adult Chinook salmon. Using all data will produce a more robust estimate of allelic frequencies across the entire population.	AEA agrees that samples from presumed siblings should not be removed. Removal of juvenile collections based on comparisons to adults was added to the 2014 Genetics Implementation Plan (Study 9.14 ISR Part B) based on recommendations from USFWS and NMFS. We are in agreement about keeping all samples to provide the most robust overall estimate of population allele frequencies. Section 4.6.2 (Study 9.14 ISR Part B) reflects this change.
Page 8 Para 2	18	• Using a Bonferroni adjustment on the tests for Hardy-Weinberg Equilibrium (ISR 9.14) will increase the risk of a Type-2 error and reduce the statistical power of the test to detect a difference. Furthermore, estimates of genetic distance using F^{st} must include a correction for sample size otherwise small samples tend to look like outliers (ISR 9.14).	AEA agrees with not using the Bonferroni adjustment on tests for HWE. Section 4.6.3 of the 2014 Genetics Implementation Plan (Study 9.14 ISR Part B) was revised to reflect this recommendation as it was received in NMFS's written comments to the Draft 2014 Genetics Implementation Plan. We agree that estimates of F^{st} will need to be corrected for sample size. Section 4.6.8 of the 2014 Genetics Implementation Plan (Study 9.14 ISR Part B) was revised to reflect this recommendation as it was received in NMFS's written comments to the Draft 2014 Genetics Implementation Plan.
Page 9 Para 2	19	Model integration is the manner in which all of the physical studies interact to assess baselines and Project impacts on the Susitna River. Within the ISRs, methodologies for model integration are not transparent and it is not possible to determine if model integration will identify project impacts with any degree of certainty.	AEA disagrees. This comment reflects a fundamental lack of understanding of the methodologies being relied upon by the FERC-approved study plan. The two Riverine Modelers Meetings held in November 2013 and April 2014 respectively were specifically held in response to licensing participant concerns about model integration. Review of the presentations from both of these meetings which are available on AEA's website (http://www.susitna-watanahydro.org/meetings/past-meetings/) clearly demonstrate the linkages between the models and how individual model outputs will be used in evaluating Project effects for each resource discipline, with an emphasis on effects on fish habitats. The meeting notes for the two meetings provide a clear record of the major topics discussed and licensing participants' questions pertaining to model integration. Indeed, one of the comments provided at the end of the April meeting by a USGS representative suggested that the modeling and model integration efforts were moving in the right direction – ". . . . thought it was a great meeting and that the studies are making good progress. Feels that there has been tremendous amount of focus on where the problem areas are and are a lot further along than in November 2013."

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			Since then, the resource modelers have continued working in a collaborative fashion on each of the respective models.
Page 9 Para 3	20	As previously stated by the Service (USFWS 2013), we are concerned that time allotted to develop methods for model integration is inadequate. Prior to the release of the June 3, 2014, ISRs, a three-day Riverine Modeling Integration Meeting (RMIM) was held (November 13-15, 2013). The goal of this meeting was to provide a forum to review and discuss various riverine-related modeling and study integration efforts (AEA Instream Flow Study-Technical Team [ISF-TT] Riverine Modeling Integration Meeting Agenda, 2013). A collaborative meeting such as this one was a good effort toward developing meaningful model integration methods and the Service encourages AEA to continue this type of cooperative work.	AEA notes that there have been two three-day Riverine Modelers meetings, and one two-day Riparian Modeling meeting designed to provide Licensing Participants with updates on model development and integration and to solicit feedback and suggestions on model refinements. The first of these was held from November 13-15, 2013, the second April 15-17, 2014 which involved a Proof of Concept discussion to demonstrate the integration of the different models by highlighting model outputs within a single Focus Area (FA-128) (Slough 8A). The third was held April 29-30, 2014 to discuss various riparian / riverine-related modeling and study integration efforts, and present and discuss proposed metrics. During these meetings, each of the resource modelers explained first the specific models they were working on and the model dependencies on other models or data sources, as well as the model outputs to other models.
Page 9 Para 4	21	During the RMIM, 25 and 50-year scenarios for predicting project impacts to the physical river channel and habitats were proposed. While those timelines are consistent with what is specified in RSP and may present a manageable timeframe for the modeling work (B. Fullerton, Personal Communication, November, 2013), they may not be sufficient to assess impacts to fish and wildlife resources in a biologically meaningful way.	AEA disagrees. The time frames of 0, 25, and 50 years were selected because they represent time intervals that span the potential length of the FERC license, and as well are reasonable increments from which to gauge and compare changes in channel morphology (RSP 6.6, Section 6.6.4.2.2.1) that may translate into changes in fish habitat. Having time intervals at shorter increments of geomorphological modeling would be less likely to elicit substantive changes in channel morphologies and would therefore be less likely to elicit changes in the results of the habitat-flow modeling. However, the greatest potential effects of Project operations on fish and fish habitats are on the actual regulation of flows that would occur over much shorter time intervals (annual, seasonal, weekly, daily, and hourly) and for which the habitat-flow models are being developed to evaluate. As described in RSP 8.5, Section 8.5.7.4.1.1, the "Temporal analysis will involve the integration of hydrology, Project operations, the Mainstem Open-water Flow Routing Model, and the various habitat-flow response models to project spatially explicit habitat changes over time. Several analytical tools will be utilized for evaluating Project effects on a temporal basis. This will include development and completion of habitat-time series that represent habitat amounts resulting from flow conditions occurring over different time steps (e.g., daily, weekly, monthly), as well as separate

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			analysis that address effects of rapidly changing flows (e.g., hourly) on habitat availability and suitability. The Mainstem Open-water Flow Routing Model and habitat models will be used to process output from the Project operations model. This will be done for different operating scenarios, hydrologic time periods (e.g., ice free periods: spring, summer, fall; ice-covered period: winter [will rely on Ice Processes Model – Section 7.6]), Water Year types (wet, dry, normal), and biologically sensitive periods (e.g., migration, spawning, incubation, rearing) and will allow for the quantification of Project operation effects on the following: • Habitat areas (for each habitat type – main channel, side channel, slough, etc.) by species and life stage; this will also allow for an evaluation of the effects of breaching flows on these respective habitat areas and biologically sensitive periods (e.g., breaching flows in side channels during egg incubation period resulting in temperature change). • Varial zone area (i.e., the area that may become periodically dewatered due to Project operations, subjecting fish to potential stranding and trapping and resulting in reduced potential invertebrate production). • Effective spawning areas for fish species of interest (i.e., spawning sites that remain wetted through egg incubation and hatching). • Other riverine processes." These shorter time intervals (hourly, daily, weekly, monthly) represent those that are the most biologically meaningful in the sense that they would have the most direct and immediate effect on fish and fish habitats. If warranted, it will also be possible to evaluate effects over longer time steps that encompass Project operations over several different water years.
Page 9 Para 5	22	The Service is concerned the modeling capability to answer biological questions is not sensitive enough to detect biologically meaningful changes to species and habitats likely to be affected by project operations. We recommend that modelling capabilities be developed that incorporate biological inputs and deliver outputs that are validated under an appropriate range of operational scenarios (e.g., base load, ecological flows, load-following, run-of-river). The temporal scales (e.g., 25, 50-year) must have biological relevance. For example, 5, 10 and 15 year operational scenarios should be	See AEA's response to Comment 21.

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		considered to demonstrate the model's ability to detect generational impacts to fish populations and habitat persistence (e.g., Susitna River Chinook salmon; five to seven years).	
Page 9 Para 6	23	Data collected for some studies do not provide the information needed for the proposed integrated modeling efforts. During the RMIM, for example, it was revealed the Water Quality Modeling study (ISR 5.6) would require data collected on the spatial distribution of groundwater discharge to surface water bodies. Analytical or numerical groundwater flow simulation would be one (of several) ways to satisfy this input requirement. However, the Groundwater Study (ISR 7.5) does not explicitly state analytical or numerical groundwater flow simulations would be undertaken in support of the other physical process models.	AEA disagrees, Review of the November Riverine Modelers Meeting notes (http://www.susitna-watanahydro.org/wp-content/uploads/2014/02/2013.11.13Modelers_Notes.pdf) indicates questions did occur related to the Water Quality model that pertained to the integration of groundwater, that were addressed by noting that data from targeted grab samples as well as data from groundwater wells would be used, as well as data from other locations. Additional information was provided on the groundwater study during the April Proof of Concept meetings (http://www.susitna-watanahydro.org/wp-content/uploads/2014/04/2014_04_15TT_Riverine_Presentation-Groundwater.pdf), and more recently in two Technical Memorandums (GWS and R2 2014a, http://www.susitna-watanahydro.org/wp-content/uploads/2014/09/07.5_GW_GWS_T6_TM_Aquatic_Hydro_Final_Draft_20140925.pdf; GWS and R2 2014b, http://www.susitna-watanahydro.org/wp-content/uploads/2014/09/07.5_GW_GWS_T5_TM_Riparian_Final_Draft_20140926.pdf) which describe some of the analysis leading to development of preliminary groundwater/surface water relationships in selected Focus Areas.
Page 9 Para 7 – Page 10 Para 1	24	As a follow up to the RMIM, a Proof of Concept (POC) meeting was held April 15-17, 2014. This meeting was to: 1) confirm successful integration of models and associated metrics in a single FA (Slough 128); 2) examine the modeling process rather than focus on the actual POC results; and 3) clarify many questions related to the integration of multiple models. The discussions of modeling processes at the POC meeting was considered valuable by the Service, but not fully effective in demonstrating successful model development and integration; many questions regarding model development and integration were unanswered. To develop	AEA will take this under advisement.

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		greater stakeholder confidence in the models, the Service recommends conducting a formal model integration meeting to: 1) establish a model development process, 2) develop an understanding of inputs and outputs, 3) demonstrate conceptual linkages, 4) demonstrate the predictive capabilities of the models, and 4) conduct sensitivity analyses to better understand model limitations and reduce uncertainty.	

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Anchorage Field Office
605 W. 4th Avenue, Room G-61
Anchorage, Alaska 99501-2250

In Reply Refer To:
FWS/AFES/AFWFO

SEP 22 2014

Mr. Wayne Dyok
Susitna-Watana Project Manager
Alaska Energy Authority
813 West Northern Lights Boulevard
Anchorage, Alaska 99503

FERC Project P-14241, Susitna-Watana Hydropower

Dear Mr. Dyok:

The U. S. Fish and Wildlife Service (Service) is providing comments on the Alaska Energy Authority's (AEA) June 3, 2014, Initial Study Report (ISR) for the proposed Susitna-Watana Hydropower project (Project). We provide AEA with our preliminary findings of concern so that they may be meaningfully considered prior to and discussed at the October, 2014 ISR meeting. The Service intends to provide full and detailed comments on these and other topics by the November 30, 2014, Federal Energy Regulatory Commission's (FERC) filing deadline.

As per the FERC Integrated Licensing Process (ILP; 18 CFR 5.15 (c)(2)), the ISR meeting scheduled in October, 2014, provides an opportunity for AEA and licensing participants to discuss the 2013 studies and identify potential modifications to study designs based on the first year's data collection. The process allows for review and recommendation of changes to sampling methodologies implemented by first year studies to ensure study objectives, as specified in the FERC-approved Revised Study Plans (RSP), are met. Our filing to FERC by November 30, 2014, will formalize our comprehensive comments and recommendations after AEA has had the opportunity to address our concerns during the October, 2014 ISR meeting.

The Service has identified three topics of significant concern: 1) data collection and reporting, 2) effective model integration, and 3) development of decision support systems (DSS). These three topics are closely tied together because precise and accurate data provide inputs to models that are used to support Project decision-making.

In these preliminary comments, the Service identifies data collection and reporting concerns (Attachment I) and recommends the data issues be resolved as soon as possible. Without robust data from individual studies, we are concerned the data do not meet study objectives, that model validation will be hindered, and model integration may lead to incorrect conclusions. Given the magnitude of our concerns related to data collection and reporting, we believe it may not be possible to yield plausible model predictions describing baseline conditions or to predict potential impacts. It is important that these issues be resolved prior to conducting additional field studies.

Much of the data collected under FERC approved study plans are proposed for use in fish habitat models, and the development of those models are based on changes to channel geomorphology and hydrology. Relationships among hydrologic models should be validated and models calibrated for the Susitna River system before their use in fish habitat models. Likewise, relationships among fish habitat models should be validated, and models calibrated for the Susitna River system prior to their use in estimating Project effects under various operational scenarios. To our knowledge there is currently no specific model integration process proposed that will ensure sound relationships among models and their accurate calibration for the Susitna River system. The Service believes that development and implementation of rigorous model integration procedures is critical to our review of this project and we discuss our preliminary concerns in detail (Attachment II).

A DSS is one of the end products of the studies, where data and models from the studies are ultimately used to help make decisions on the effects of the Project on natural resources. We understand AEA intends to develop a DSS using a manual matrix method by early 2015 (FERC 2013). As the DSS plays such an important role in the assessment of Project impacts, the Service requests its development be a collaborative process so that the fundamental objectives, assumptions, critical inputs, weighting methods, and other parts of the model are mutually agreed upon. Furthermore, we are concerned that the timeline for DSS development is lagging other efforts. The ILP process is founded under the principal of early identification of potential issues and conducting studies needed to fill information gaps (FERC 2014). Data gaps may be revealed once the fundamental objectives for the DSS are formulated. Until the DSS development process occurs, it is uncertain all the data needed to implement the DSS has been gathered. Because the DSS is not scheduled for development until 2015, it is distinctly possible that crucial new data needs may be revealed when updated study reports are filed by AEA in 2016 (as per the ILP extension approved by FERC on January 28, 2014). However, going forward, the Service believes the development of a collaboratively designed DSS is of great importance to this Project and recommends that, if practicable, the timeline for its development be accelerated.

Finally, FERC established a new schedule for the proposed Susitna-Watana hydroelectric project ILP in their January, 2014 determination. In that determination, FERC ordered AEA to submit final ISRs on June 3, 2014, for stakeholder review, to hold a meeting in October, 2014, to present results of those ISRs, and to discuss AEA proposed changes to the studies or those proposed by other licensing participants. During a meeting with the Service and National Marine Fisheries Service on September 2, 2014, AEA stated its intent to release reports from 21 new or continued studies conducted in 2014, with intent to discuss results at the October 15, 2014, ISR meeting. On September 17, 2014, AEA filed 10 of 21 reports to FERC. Because the data were gathered outside timelines specified by the FERC-ordered process, and given the limited review time the Service will have, we will be unable to consider and comment on those study reports in advance of the October, 2014 ISR meeting. Furthermore, we recommend AEA dedicate the limited time at the October, 2014, ISR meeting to discuss concerns related to 2013 studies, as reported in the June 3, 2014, ISR. Additionally, an email on May 6, 2014, copied to the Service by FERC, indicated that studies carried out by AEA in 2014 were conducted outside of the ILP process and would not be considered "second year" studies. This is procedurally very important because neither the Service, nor other licensing participants (Non-Governmental Organizations (NGO) Participants 2014), will have the opportunity to fully review or comment on the design and implementation of the 2014 studies. The Service will be unable to meaningfully contribute to the discussion of the 2014 studies and urge AEA to not discuss any work conducted in 2014 at the ISR meeting. Instead, we suggest the interim results gathered between study years (i.e., 2014 data collection) be discussed at the next quarterly Technical Workgroup meeting, once we have had sufficient opportunities to review those additional data.

Summary

This letter describes some of the Service's concerns with studies reported in the June 3, 2014, ISR, and we are providing them to AEA prior to the November 30, 2014, FERC filing deadline so some issues can be discussed and resolved in a timely manner. The concerns address: 1) data collection and reporting, 2) ability to recommend further studies under the FERC ILP licensing process, 3) development of valid models to assess baseline conditions and effects from Project operations on fish and wildlife resources, 4) capacity to formulate recommendations under section 10(j) of the Federal Power Act for protection, mitigation, and enhancement measures associated with the Project, and 5) formulation of informed decisions pursuant to our Section 18 Fishway Prescription authority under the Federal Power Act. We believe the modified ILP schedule for the Project affords AEA the opportunity to make necessary changes to studies prior to entering the second year of study. The Service believes this review process accommodates the development and implementation of more accurate, effective, and cost-effective plans of study for the Project.

Thank you for the opportunity to submit these comments in advance to the October, 2014 ISR meeting. We hope they are useful to AEA and will generate valuable conversations at the meeting. If you have questions, please contact Ellen Lance (907) 271-1467.

Sincerely,

Socheata Lor, Ph.D.
Anchorage Field Supervisor

Cc: Sarah Goad, AIDEA
Betsy McGregor, AEA
Nicholas Jayjack, FERC
Joe Klein, ADFG, Sport Fish Division
Jeanne Hansen, NMFS
Sue Walker, NMFS
Mike Bethe, ADFG, Habitat Division
Matthew LaCroix, EPA

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Attachment I. Data Issues
Below we discuss our preliminary concerns relating to deviations from study plans, quality assurance and control, and statistical practices and procedures for the 2013 study year.

Deviations From Study Plans – Deviations from established sampling designs occurred in some studies for various reasons, and in some cases resulted in reduced sample size or compromised reliability of data. Below we provide examples.

1 • As currently planned, some two-year studies cannot be completed because access to all Focus Areas (FAs) was not granted until after the first study year (e.g., ISRs 8.5, 9.6, 9.7, 9.9). For example, a fish wheel was not installed and fish were not tagged near the entrance to Devil's Canyon (e.g., ISR 9.7).

2 • Anomalous weather conditions prevented or delayed fieldwork on aquatic studies (e.g., ISR 8.5), resulted in late installation of migrant traps, which were likely influenced by environmental conditions associated with late breakup (e.g., ISR 9.6). Moreover, juvenile salmon distribution and abundance measured in 2013 were likely affected by the record fall floods in 2012 (e.g., ISR 9.6).

3 • Sampling has not been *temporally* adequate across all seasons. ISR 9.6 reports winter fish sampling did not occur across all FAs as proposed; early spring sampling occurred only in three FAs; initial sampling following breakup and installation of migrant traps did not occur until the middle of June, and therefore, spring sampling for fish distribution and abundance was not conducted (e.g., ISRs 7.5, 8.5, 8.6). The extent to which fishes move must be described through sampling; multiple sampling days across all seasons are required to capture the full seasonality of a fish's life-history strategy, which varies considerably within a single season. A single-day of sampling is insufficient to understand the habitat associations of different fish species with differing mobility and life-stages.

4 • Sample site selections for integrated studies were inconsistently co-located. For example, invertebrate sampling locations (ISR 9.8) were not co-located with fish sampling locations (ISR 9.6). Failure to co-locate sampling sites risks the magnification of data discrepancies, and because the data will be used as inputs for predictive models, may jeopardize the validity of the models.

5 • Detection arrays did not cover the entire channel and tagging efforts did not allow for detection of fish migrating upstream, therefore the data were biased and efficiency estimates cannot be calculated. Detection rate and recovery of passive integrated transponder (PIT) tags is insufficient to yield useful data to meet study goals and objectives (ISR 9.6).

6 • Fish targets for fish Habitat Suitability Curve (HSC) sampling were not met (e.g., ISR 8.5), therefore, power to assess fish habitat-preferences and relationships is reduced.

7 • Data collected on fish habitat for the Fish Passage Barrier Study (ISR 9.12) and the HSI/HSC component of the fish and aquatic Instream Flow Study (ISR 8.5) were gathered at incompatible spatial scales to meet the study objectives.

Quality Assurance and Control Concerns - Below we preliminarily provide some discrete examples where the Service has data quality concerns. Poor data quality has a rippling effect throughout this assessment process because extrapolating inaccurate results throughout the river would amplify errors across the river and associated habitat.

8 • Water quality samples were qualified as either estimated or rejected by the analytical laboratory due to quality-related failures (ISR 5.5). Issues included failure to deliver samples to the laboratories within the method-specified temperature range; failure to meet procedure specified holding times; contaminated or missing field, trip, and method blanks; and Chain of Custody and bottle labeling discrepancies. AEA proposed to apply a correction factor to the 2013 data to render it useable, but provided no details on how that would be done.

9 • There is evidence that juvenile salmon may have been misidentified. A comparison of juvenile fish collections from the Susitna River in the 1980s (Alaska Department of Fish and Game 1983 as cited by R2 Consultants in the Fish Population Summary Document), local Alaskan rivers (Alaska Department of Fish and Game, unpublished data; Davis et al. 2013), recent studies on the Susitna River (Kirsch et al. 2014), and nearby tributaries (Miller et al. 2011), signal substantial differences in total fork length distribution and habitat associations among juvenile salmon from that which is expected. Large numbers of unidentified salmonid juveniles (some of which were PIT tagged), anomalous length distributions and questionable habitat associations decrease our confidence in the accuracy of species identification. For example, juvenile Chinook salmon measuring 150 mm fork-length were reported, juvenile Chinook salmon were reportedly most abundant in beaver ponds, there was absence of pink salmon in any samples, and a disappearance of sockeye salmon from Indian River between the February draft ISR and the June draft ISR. We have strong reservations about the identification of these juvenile fish, and suspect many juvenile salmons identified as Chinook salmon may be coho salmon.

10 • Information used to describe fish/habitat preferences were gathered using professional best judgment, literature, and limited field data, but were not confirmed with an adequate sample from the Susitna River system (ISR 8.5). Fish/habitat data gathered from the Susitna River is necessary to identify preferential use of the habitats. It is vital that these data are accurate as they will be used to: 1) develop Habitat Suitability Indices (HSI) and Habitat Suitability Criteria (HSC); 2) describe fish-macrohabitat relationships, which may be used to evaluate project effects; 3) validate the Instream Flow Study (8.5) habitat model predictions; and 4) extrapolate results from FAs to geomorphic reaches and river segments. Ultimately the data will be used to develop protection and mitigation measures and to provide a basis for post-project monitoring.

11 • The Service is concerned about AEA's proposal to "scale up", and requests rationale for its implementation (Riverine Model Integration Meeting 2013). "Scaling up" is only

appropriate when the sampling is conducted accurately, in a random fashion throughout the population, and at a scale relevant to resource concerns. To assess impacts from the Project on fish resources, sampling effort must be at a scale relevant to Susitna River fish species at various life stages in order to adequately quantify baseline conditions with the accuracy required for accurate extrapolation. For example, incorrect fish identification and would lead to imprecise and inaccurate extrapolation of species-specific habitat associations.

Statistical Practices and Procedures – Based on our preliminary reviews, we note (below) failures to report standard statistical procedures and calculations required for complete analyses.

12 • Standard error was not reported for stated relationships between species of juvenile salmonids at various life stages and their habitat (e.g., ISRs 9.5, 9.6). A robust assessment of statistical results must include calculations for standard error.

13 • Assumptions for the estimating numbers of Chinook salmon migrating above Devils Canyon were not clearly specified and the standard error of that estimate was not reported (e.g., ISRs 9.6, 9.7).

14 • Sampling and non-sampling errors were not clearly stated (e.g., ISR 9.7). Sampling error is the error resulting from sampling only a part of the population and not the whole population. Non-sampling errors are those errors resulting from selection bias, systematic non-representativeness of samples, and transcription or recording errors. Sampling error is usually quantified and reported with confidence intervals or standard errors and related to *precision* of the estimates. Non-sampling errors are harder to recognize, yet very important, and more closely related to the *accuracy* of the estimates. Sampling errors must be clearly accounted for in statistical analyses to assess data reliability and interpret results.

15 • Consistent fish sampling methods were not applied (i.e., different gear types used, different effort was applied within and across sampling units, concurrent use of non-compatible gear types within a sampling unit). This resulted in inability to estimate sampling error because (e.g., ISR 9.6) inconsistent sampling methods resulted in individual datasets that are not comparable.

16 • No power analysis was reported (ISR 9.14), and it is unclear how sample size for both adult and juvenile Chinook salmon was determined. Based on the number of genetic markers sampled and the magnitude of genetic divergence measured in the population documented thus far, a power analysis would inform determination of the number of samples needed to provide a robust estimate of genetic diversity. Furthermore, three years of samples may not be adequate to characterize genetic diversity among a species with a life cycle of five to seven years; this limitation must be addressed in the study results.

17 • Samples from presumed siblings were proposed for removal from the genetic analyses (ISR 9.14). Only if the samples have been collected in a non-random way may this method be justified. Purging related animals as proposed will bias the results. Furthermore, ISR 9.14 proposes to exclude samples from juvenile Chinook salmon if they show significant differences in allele frequency from adult Chinook salmon. Using all data will produce a more robust estimate of allelic frequencies across the entire population.

18 • Using a Bonferroni adjustment on the tests for Hardy-Weinberg Equilibrium (ISR 9.14) will increase the risk of a Type-2 error and reduce the statistical power of the test to detect a difference. Furthermore, estimates of genetic distance using F^{st} must include a correction for sample size otherwise small samples tend to look like outliers (ISR 9.14).

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Attachment II. Model Integration

19 Model integration is the manner in which all of the physical studies interact to assess baselines and Project impacts on the Susitna River. Within the ISRs, methodologies for model integration are not transparent and it is not possible to determine if model integration will identify project impacts with any degree of certainty.

20 As previously stated by the Service (USFWS 2013), we are concerned that time allotted to develop methods for model integration is inadequate. Prior to the release of the June 3, 2014, ISRs, a three-day Riverine Modeling Integration Meeting (RMIM) was held (November 13-15, 2013). The goal of this meeting was to provide a forum to review and discuss various riverine-related modeling and study integration efforts (AEA Instream Flow Study-Technical Team [ISF-TT] Riverine Modeling Integration Meeting Agenda, 2013). A collaborative meeting such as this one was a good effort toward developing meaningful model integration methods and the Service encourages AEA to continue this type of cooperative work.

21 During the RMIM, 25 and 50-year scenarios for predicting project impacts to the physical river channel and habitats were proposed. While those timelines are consistent with what is specified in RSP and may present a manageable timeframe for the modeling work (B. Fullerton, Personal Communication, November, 2013), they may not be sufficient to assess impacts to fish and wildlife resources in a biologically meaningful way.

22 The Service is concerned the modeling capability to answer biological questions is not sensitive enough to detect biologically meaningful changes to species and habitats likely to be affected by project operations. We recommend that modelling capabilities be developed that incorporate biological inputs and deliver outputs that are validated under an appropriate range of operational scenarios (e.g., base load, ecological flows, load-following, run-of-river). The temporal scales (e.g., 25, 50-year) must have biological relevance. For example, 5, 10 and 15 year operational scenarios should be considered to demonstrate the model's ability to detect generational impacts to fish populations and habitat persistence (e.g., Susitna River Chinook salmon; five to seven years).

23 Data collected for some studies do not provide the information needed for the proposed integrated modeling efforts. During the RMIM, for example, it was revealed the Water Quality Modeling study (ISR 5.6) would require data collected on the spatial distribution of groundwater discharge to surface water bodies. Analytical or numerical groundwater flow simulation would be one (of several) ways to satisfy this input requirement. However, the Groundwater Study (ISR 7.5) does not explicitly state analytical or numerical groundwater flow simulations would be undertaken in support of the other physical process models.

24 As a follow up to the RMIM, a Proof of Concept (POC) meeting was held April 15-17, 2014. This meeting was to: 1) confirm successful integration of models and associated metrics in a single FA (Slough 128); 2) examine the modeling process rather than focus on the actual POC results; and 3) clarify many questions related to the integration of multiple models. The discussions of modeling processes at the POC meeting was considered valuable by the Service, but not fully effective in demonstrating successful model development and integration; many

questions regarding model development and integration were unanswered. To develop greater stakeholder confidence in the models, the Service recommends conducting a formal model integration meeting to: 1) establish a model development process, 2) develop an understanding of inputs and outputs, 3) demonstrate conceptual linkages, 4) demonstrate the predictive capabilities of the models, and 4) conduct sensitivity analyses to better understand model limitations and reduce uncertainty.

Literature Cited

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