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SUSITNA-WATANA HYDRO

ALASKA ENERGY AUTHORITY

July 15, 2013

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: Susitna-Watana Hydroelectric Project, FERC Project No. 14241-000; Characterization and Mapping of Aquatic Habitats Technical Memorandum

Dear Secretary Bose:

On April 1, 2013, the Federal Energy Regulatory Commission (Commission or FERC) issued its Study Plan Determination (April 1 SPD) for 14 of the 58 proposed individual studies in the Alaska Energy Authority's (AEA) Revised Study Plan (RSP) for the Susitna-Watana Hydroelectric Project, FERC Project No. 14241 (Project).

When approving the Characterization of Aquatic Habitats Study, RSP Section 9.09, FERC recommended that AEA consult with the Technical Workgroup (TWG) and file the following information to quantify small and low-order tributaries in the Upper River study area:

1. *A detailed description of the specific methods to be used for selecting a representative sample of small and low-order Upper River tributaries for aquatic habitat mapping.*
2. *Documentation of consultation with the TWG, including how its comments were addressed.*

Consistent with the Commission's recommendations within the April 1 SPD, AEA is filing the attached Characterization and Mapping of Aquatic Habitats Technical Memorandum (attached as Attachment A).

Although the April 1 SPD recommended that this document be filed by June 30, 2013, this recommended deadline was extended by Commission Staff to allow AEA to seek additional consultation from TWG participants.

The draft version of this document was made available for review on July 3, 2013.

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On Saturday, July 13, 2013, via email, AEA received written comments on this document from U.S. Fish and Wildlife Service and National Marine Fisheries Service. Attached as Attachment B is a comment response table that includes a response to these written comments, and an explanation for why comments were not incorporated into the final plan.

As always, AEA appreciates the participation and commitment to this licensing process demonstrated by Commission Staff, federal and state resource agencies, and other licensing participants. AEA looks forward to working with licensing participants and Commission Staff in implementing the approved studies, which AEA believes will comprehensively investigate and evaluate the full range of resource issues associated with the proposed Project and support AEA's license application, scheduled to be filed with the Commission in 2015.

If you have questions concerning this submission please contact me at wdyok@aidea.org or (907) 771-3955.

Sincerely,

Wayne M Dyok

Wayne Dyok
Project Manager
Alaska Energy Authority

Attachments

cc: Distribution List (w/o Attachment)

Attachment A

Characterization and Mapping of Aquatic Habitats Technical Memorandum (July 2013)

Susitna-Watana Hydroelectric Project (FERC No. 14241)

Technical Memorandum: Characterization and Mapping of Aquatic Habitats

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

HDR

July 2013

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LIST OF ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
AEA	Alaska Energy Authority
AWC	Anadromous Waters Catalog
FDAIP	Fish Distribution and Abundance Implementation Plan
FERC	Federal Energy Regulatory Commission
HRM	historic river mile
ISR	Initial Study Report
PRM	Project river mile
Project	Susitna-Watana Hydroelectric Project
RSP	Revised Study Plan
TM	Technical memorandum
ZHI	zone of hydraulic influence

1. BACKGROUND

On December 14, 2012, Alaska Energy Authority (AEA) filed with the Federal Energy Regulatory Commission (FERC) its Revised Study Plan (RSP), which included 58 individual study plans (AEA 2012). Included within the RSP was the Characterization of Aquatic Habitats Study, Section 9.9. This study focuses on the characterization and mapping of aquatic habitats with the potential to be altered and/or lost as a result of construction and operation of the proposed Susitna-Watana Hydroelectric Project (Project).

On February 1, 2013 FERC issued its Study Plan Determination (February 1 SPD) for 44 of the 58 studies, approving 31 studies as filed and 13 with modifications (FERC 2013a). A decision on the remaining 14 studies was deferred until AEA filed additional information and held meetings with licensing participants to discuss the new information. RSP Section 9.9 was one of the 14 deferred studies.

On April 1, 2013, FERC issued its SPD (April 1 SPD) for the remaining 14 of the 58 proposed individual studies in the RSP (FERC 2013b). When approving the Characterization of Aquatic Habitats Study, RSP Section 9.9, FERC included certain recommendations. This Technical Memorandum addresses one of the FERC recommended modifications to RSP Section 9.9. Specifically, in the April 1 SPD (B-211), FERC stated:

> *We recommend that AEA consult with the TWG and file no later than June 30, 2012, the following information to quantify small and low-order tributaries in the Upper River study area:*
>
> 1. *A detailed description of the specific methods to be used for selecting a representative sample of small and low-order Upper River tributaries for aquatic habitat mapping.*
> 2. *Documentation of consultation with the TWG, including how its comments were addressed.*

This memo provides a detailed description of the methodology for selecting a representative sample of small primary tributaries and low-order (secondary and tertiary) tributaries within the proposed inundation zone of the Upper River.

2. FERC STAFF SPD RECOMMENDATIONS TO RSP SECTION 9.9

In its April 1 SPD, in addition to the above mentioned FERC recommendation, FERC included other recommended changes to RSP Section 9.9, which AEA is implementing.

AEA addressed the other FERC SPD recommendations as follows:

a. We recommend that AEA remove the level 5 calculation of edge habitat from the habitat classification system. See April 1 SPD at 208.

AEA Response: AEA will remove the Level 5 edge habitat from the classification system described in RSP Section 9.9.5.4 and Table 9.9-4.

b. We recommend changing the classification of backwater, beaver complex, and clearwater plume habitats from level 3 (mainstem habitat) to level 4 (mainstem and tributary mesohabitats). See April 1 SPD at 210.

AEA Response: AEA will revise the classification of mainstem backwater, beaver complex, and clearwater plume habitats in the mainstem as described in RSP Section 9.9.5.4 and Table 9.9-4 from Level 3 to Level 4.

c. *We recommend modifying the study plan to have AEA identify and give specific consideration to backwater habitats, as defined by the agencies (i.e., the confluence of off-channel habitats with main channel habitats), as a unique habitat feature and ensure a representative subsample of these locations when selecting transect locations for one-dimensional or two-dimensional aquatic habitat modeling within Middle River and Lower River instream flow study sites. See* April 1 SPD at 212.

AEA Response: AEA will revise RSP Section 9.9.5.4 and Table 9.9-4 to identify backwater as a unique habitat feature and to ensure modeling of backwater habitat in Focus Areas.

d. *We recommend modifying the study plan to have AEA classify Middle River tributary reaches within the zone of hydrologic influence into geomorphic reaches based on tributary basin drainage area and stream gradient to provide a general understanding of the relative potential value to fish and aquatic resources, and report on these attributes in the initial and updated study reports. See* April 1 SPD at 213.

AEA Response: AEA will revise the study to state that Middle River tributary reaches within the zone of hydrologic influence will be classified into geomorphic reaches based on tributary basin drainage area and stream gradient and that these attributes will be reported in the Characterization of Aquatic Habitats Study Initial Study Report (ISR) to be filed with FERC in February 2014.

e. We recommend that AEA provide a detailed description of methods and results of 2012 and 2013 habitat mapping in the initial study report, including a complete set of photographic base maps delineating macrohabitats (level 3) and mesohabitats (level 4) for all mapped locations. See April 1 SPD at 214.

AEA Response: AEA will revise the study plan to state that a detailed description of methods and results of 2012 and 2013 habitat mapping will be provided in the Characterization of Aquatic Habitats Study ISR to be filed with FERC in February 2014.

3. SELECTION OF SMALL AND LOW-ORDER TRIBUTARIES FOR HABITAT MAPPING WITHIN THE RESERVOIR INUNDATION ZONE

The reference of "small and low-order" tributaries are interpreted by AEA to mean small tributaries emptying directly into the mainstem Susitna River and tributaries to tributaries. For the purpose of this technical memorandum a tributary that confluences directly with the Susitna River is referred to as a primary tributary. A tributary that confluences with a primary tributary is referred to as a secondary tributary and a tributary that confluences with a secondary tributary confluences is referred to as a tertiary tributary. Also, for the purposes of this technical memorandum the nomenclature primary, secondary, and tertiary is more definitive than the term "low-order" that generally refers to any tributary ranging from the smallest of headwater stream (first-order) to a tributary emptying directly into the Susitna.

The methodology used for selection of tributaries within the inundation zone that will be habitat mapped incorporates three independent steps. Step 1 describes tributaries selected as proposed in the RSP Section 9.9. These tributaries represent primarily larger primary and secondary tributaries. Steps 2 and 3 described below are in response to Item 3 of FERC's April 1 SPD that recommends the selection of additional small and low-order tributaries within the proposed inundation zone.

Step 1: Select all tributaries within the reservoir inundation zone that are proposed for Fish Distribution and Abundance Sampling (Study 9.05 Implementation Plan).

The tributaries that were previously selected as Step 1 and proposed in RSP Section 9.9 are listed in Table 1 and include:

- The largest of the primary tributaries - Jay Creek, Kosina Creek, Watana Creek, and Deadman Creek;
- Four smaller primary tributaries - Unnamed tributaries 206.2, 204.3, 197.6, and 194.8;
- Two large secondary tributaries - Tsisi Creek and Watana Tributary (RB 8.7).

Habitat mapping in tributaries also selected for the Fish Distribution and Abundance Study sampling provides for synergy across studies and allows for more robust characterization of these important aquatic habitats. In addition to habitat mapping at low flow events, fish sampling teams will describe habitats where fish are collected, gaining an understanding of how habitat conditions and fish-habitat associations in these tributaries change seasonally.

Step 2: Selection of small primary tributaries within the reservoir inundation zone that are not targeted for fish surveys.

AEA will also habitat map a representative proportion of primary tributaries smaller than those selected in Step 1. As shown in Appendix A, there are approximately 37 small primary tributaries that have some distance of channel length within the inundation zone, none of which have been targeted for fish sampling. Many of these tributaries range in length from 1 to 2 miles with some exceeding 3 miles. Many can be characterized as having a lower gradient reach located within the inundation zone, followed by a high gradient reach within, or beyond, the upstream limit of the inundation zone. For most of these tributaries, less than 25% of the total length of the stream is within the inundation zone. Several of these tributaries may be seasonal streams or have barriers very near their confluences with the Susitna River. A review of the aerial video shows that some tributaries may only have subsurface flow in late summer and fall, as they cross the lateral cobble bars along the Susitna River.

AEA will rely on existing data and GIS analyses to select a subset of these small primary tributaries for habitat mapping. AEA will determine morphological metrics for each tributary and then categorize the tributaries into similar groupings (e.g. larger drainage basin with higher gradient inundation zone; smaller drainage basin with lower gradient inundation zone) based on the results of the GIS analysis and professional judgment. The morphological metrics that may be used in categorization include the following:

- Stream length
  - total stream length
  - reach length in the inundation zone
  - reach length upstream of the inundation zone
- Average gradient

  - for the entire stream length
  - for the reach in the inundation zone
  - for the reach upstream of the inundation zone
- Drainage basin area

AEA will randomly select 25% of the tributaries within each category for a total of approximately 10 additional small primary tributaries to be habitat mapped within the inundation zone. Habitat mapping methods will be consistent with methods described in RSP Section 9.9.5.3.2.

Step 3: Selection of secondary and tertiary tributaries located within the reservoir inundation zone.

In addition to large fish-bearing tributaries selected in Step 1 and smaller primary tributaries selected in Step 2, AEA proposes to habitat map a subset of secondary and tertiary tributaries that have a section of their stream channel located within the inundation zone. Using available topographic maps and Project aerial imagery, AEA has identified 21 secondary and tertiary tributaries having any reach within the proposed inundation zone. Table 2 is a list of these tributaries and Appendix A is a map of their locations.

As can be seen in Appendix A and Table 2, 15 of the 21 secondary and tertiary tributaries are within the watersheds of two primary tributaries; unnamed tributary 194.8 and Watana Creek, both of which fall within the boundaries of geomorphic reach UR-6. The remaining 6 low-order tributaries are contained within the watersheds of 5 other primary tributaries, all in geomorphic reaches UR-6, UR-5, and UR-4.

Table 2 provides relative estimates of gradient and rough calculations of stream length for each of the 21 tributaries. Drainage basin area is unknown at this time. Morphological metrics of all 21 low-order tributaries will be determined using the best available GIS data sets.

A subset of these secondary and tertiary tributaries will be selected for habitat mapping based on physical characteristics of the tributaries using the methods described below.

1) The initial filter of tributaries to be habitat mapped will be based on those with reach lengths in the inundation zone that are equal to or exceed one-half mile and 50% of their total stream length. This minimum stream length is necessary to ensure that there will be adequate stream length to represent the range of habitat types potentially present in non-mapped streams.
2) From among the initial cut of secondary and tertiary tributaries a second filter will be applied to obtain a general representation of streams with similar gradients and drainage areas.

Applying criteria from 1) above, 9 tributaries are filtered out as candidates for habitat mapping of low-order tributaries in the inundation zone. Six of these nine are located in the Watana Creek watershed. Since the other 3 candidates are each in a different watershed, all three of these will be habitat mapped. Applying criteria 2) in Watana Creek watershed, a sub-set of the six secondary and tertiary tributaries will be selected based on stream typing using similarities in gradient and drainage basin size.

At this time the physical data on stream gradient and drainage area are not available for filtering at the second criteria level. Regardless, we propose that a minimum of 33 percent of the low-order tributaries identified in Watana Creek (or two tributaries) will be selected for habitat mapping.

In summary, AEA will field habitat map at least five secondary and tertiary tributaries from a population of 21 low-order tributaries (24 percent) in the inundation zone. Three of these are 197.6 RB-1, 198.4 LB-1, and 207.4 RB-1 and two will be selected in the Watana watershed as described above. Habitat mapping methods will be consistent with methods described in RSP Section 9.9.5.3.2.

4. SUMMARY

In this technical memorandum AEA has described a proposed method that will result in the selection of 25 tributaries within the proposed reservoir inundation zone for habitat mapping. Ten of these tributaries are large primary and secondary tributaries known to support fish populations and are targeted for fish sampling under RSP Section 9.5. In addition, AEA provides a systematic approach to grouping smaller primary, secondary, and tertiary tributaries based on physical characteristics and random selection of tributaries within categories. This will result in selection of an additional 10 primary tributaries and at least 5 secondary or tertiary tributaries for habitat mapping.

5. REFERENCES

ADF&G (Alaska Department of Fish and Game). 2012. Anadromous Waters Catalog. http://www.sf.adfg.state.ak.us/SARR/AWC/index.cfm. Accessed May 2013.

AEA (Alaska Energy Authority). 2012. Susitna-Watana Hydroelectric Project No 14241-000. Revised Study Plan (RSP) submitted to FERC December 2012.

AEA. 2013. Susitna River Fish Distribution and Abundance Implementation Plan: Susitna-Watana Hydroelectric Project FERC Project No. 14241. March 31, 2013.

FERC (Federal Energy Regulatory Commission). Office of Energy Projects. 2013a. February 1, 2013 Study Plan Determination for the Susitna-Watana Hydroelectric Project No 14241-000. Federal Energy Regulatory Commission.

FERC. Office of Energy Projects. 2013b. April 01, 2013 Study Plan Determination for the Susitna-Watana Hydroelectric Project No 14241-000. Federal Energy Regulatory Commission.

Table 1. List of primary and secondary tributaries proposed for fish population sampling and habitat mapping within the proposed inundation zone.

Primary Tributary	Secondary Tributary	Geomorphic Reach	Project River Mile	Total Stream Length	Drainage Area Mi	Approximate Elevation and River Mile of Anadromous Barrier	Habitat Mapping Study Area[1]	Documented Chinook in Watershed	Tributary Proposed for FDA Sampling	Mapping Method	Species Known to be Present in Tributary or Plume[2]													
											Chinook	Dolly Varden	Lake Trout	Arctic Grayling	Round Whitefish	Humpback Whitefish	Whitefish spp.	Salmonid spp.	Burbot	Longnose Sucker	Slimy Sculpin	Sculpin spp.	Rainbow Trout	Sampled [NO FISH]
Jay Creek - RB		UR-4	211.0	19.6	61.8	None	PRM 0.0 to 2,200 ft	NI	Yes	Aerial and Ground		X		X	X			X	X	X	X	X		
Kosina Creek - LB		UR-4	206.8	39.5	400.2	None	PRM 0.0 to 3,000 ft	Yes	Yes	Aerial and Ground	X			X	X		X	X	X	X	X	X		
	Tsisi Creek1 - LB	UR-4	7.4 (LB)	NI	NI	None	PRM 0.0 to 3,000 ft	Yes	Yes	Aerial and Ground														
Unnamed Tributary - LB		UR-5	206.2	7.43	<31	None	PRM 0.0 to 2,200 ft	NI	Yes	Ground only				X							X			
Unnamed Tributary - LB		UR-5	204.3	6.2	<31	Possible – PRM 0.5	PRM 0.0 to 2,200 ft	NI	Yes	Ground only				X					X			X		
Unnamed Tributary - LB		UR-6	197.6	5.4	<31	PRM 1.3	PRM 0.0 to 2,200 ft	NI	Yes	Ground only					X			X			X	X		
Watana Creek - RB		UR-6	196.8	26.9	174.8	None	PRM 0.0 to 3,000 ft	Yes	Yes	Aerial and Ground		X		X	X			X	X	X	X	X		
	Watana Tributary – RB	UR-6	8.7 (RB)	UNI	NI	None	PRM 0.0 to 3,000 ft	Yes	Yes	Aerial and Ground														
Unnamed Tributary - RB		UR-6	194.8	7.1	124	None	PRM 0.0 to 2,200 ft	NI	Yes	Ground only		X		X	X			X		X	X	X		
Deadman Creek - RB		UR-6	189.3	41.9	175.1	≈1,700 ft - PRM 0.4	PRM 0.0 to 2,200 ft	NI	Yes	Aerial and Ground		X		X					X	X		X		

[1] For streams in watersheds known to support Chinook salmon, the habitat mapping study area will extend to 3,000 feet unless there is a confirmed Chinook barrier between 2,200 and 3,000 feet elevation; in which case the study area will terminate at the impassable barrier. For streams in watersheds not known to support Chinook salmon, the habitat mapping study area will terminate at 2,200 feet elevation..

[2] Fish species presence based on historical and current surveys. Streams between the low the proposed dam

NI: No information available at this time.

Table 2. Inventory of low-order (secondary or tertiary) tributaries in the proposed reservoir inundation zone.
(Green shading indicates preliminary selection for habitat mapping consideration based on Criteria 1, above.)

Primary Tributary	Secondary or Tertiary Tributary[1]	Geomorphic Reach	Estimated Total Tributary Length[2] (mi)	Estimated Stream Length in Inundation[2] Zone (mi)	Percent of Estimated Total Stream Length in Inundation Zone	Relative Estimated Gradient in Inundation Zone[3]	Total Drainage Basin Area[4]	Perennial[5]	Anadromous Barrier Downstream	Documented Chinook in Watershed	Aerial Video Available	Primary Tributary Proposed for Habitat Mapping or FDA
194.8	RB-1	UR 6	3.1	1.2	40.0	M-H	UK	UK	No	No	No	Yes
	RB-2		3.7	0.8	21.7	M-H		UK				
	RB-3		1.2	0.2	12.5	L		UK				
	LB-1		0.9	0.2	20.0	M-H		UK				
	LB-2		1.6	0.2	12.0	L		UK				
	LB-3		1.6	0.1	4.0	L		UK				
Sub-total	*6*		*12.1*	*2.6*	21.8							
Watana Creek	RB-1	UR-6	0.6	0.6	100.0	H	UK	UK	No	Yes	No	Yes
	RB-2		1.2	1.2	100.0	L		UK				
	RB-3		6.2	2.2	35.0	L-M		Likely				
	RB-4		7.5	0.6	8.3	H		Likely				
	LB-1		5.0	3.7	75.0	L-H		Likely				
	LB-1.1		2.2	1.6	71.4	M-H		UK	UK			
	LB-1.1.1		1.1	1.1	100	M-H		UK	UK			
	LB-2		2.5	1.2	50.0	M		UK	No			
	LB-2.1		4.3	0.3	7.1	M-H		UK	UK			
	LB-3		5.0	0.9	18.8	M		Likely	No			
Sub-total	9		34.5	13.5	*38.0*							
197.6	RB-1	UR 6	3.1	1.9	60.0	H	UK	UK	No	No	No	Yes
Sub-total	*1*											
198.4	LB-1	UR 6	0.9	0.6	66.7	M-H	UK	UK	No	NI	No	No
Sub-total	*1*											
207.4	RB-1	UR 5	0.8	0.6	77.7	M-H	UK	UK	No	NI	No	No
Sub-total	*1*											
Kosina	RB-1	UR 4	5.0	0.2	3.8	M	UK	Likely	No	Yes	No	Yes
Sub-total	*1*											
Jay	RB-1	UR 4	2.2	0.2	7.1	M-H	UK	UK	No	No	No	Yes
	RB-2		2.5	0.3	12.5	M-H		UK				
Sub-total	*2*		*4.7*	*0.5*	*10.0*							
Total	*21*		*62*	*19.9*	*32*							

[1] Unnamed secondary and tertiary tributaries in the Upper River have not been assigned a Project name at this time. The alpha-numeric naming system applied in this TM is for the purposes of this TM only.
[2] Digitized GIS lengths not yet available.
[3] Relative gradients are: H = high, M= moderate, L=low. Digitized GIS gradient data not yet available.
[4] Digitized GIS drainage basin area not yet available.
[5] Likelihood of tributary being perennial is attributed to any tributary greater than 5 miles in length. There is no other basis for this determination. Field reconnaissance in later summer required.
UK = Unknown,
NI = No information available; UK= Unknown

ATTACHMENT B

Alaska Energy Authority Response to the July 15, 2013 Comments of National Marine Fisheries Service and U.S. Fish and Wildlife Service on the Technical Memorandum; Characterization and Mapping of Aquatic Habitats, the Susitna-Watana Hydroelectric Project, FERC Project No. 14241[1]

Comment	AEA Response
1. Paragraphs 1, 2, 3, 6, and 7.	Consistent with the FERC April 1, 2013 Study Plan Determination, this technical memorandum is limited to providing a detailed description of the methodology for selecting a representative sample of small primary tributaries and low-order (secondary and tertiary) tributaries in the within the proposed inundation zone of the Upper River. The NMFS/USFWS recommendations provided within these paragraphs pertain to other aspects of RSP Section 9.9 and are therefore beyond the scope of this technical memorandum.
2. Paragraphs 4 and 5 Recommendation: "….it may be prudent, given the uncertainty of the eventual dam height, to include the Oshetna River in the list of tributary rivers within the inundation zone - in addition to Jay, Kosina, Watana and Deadman Creeks. Similarly, Goose Creek should be included."	These tributaries will be mapped per RSP Section 9.9.5.3.2 and RSP Table 9.9.2.
3. Paragraph 8 Recommendation: "The relationship to this study and the fish habitat and abundance study has been alluded to in this study plan, the interactions of these two studies should be explicitly described: what information feeds into which study, when, and how."	The relationship between RSP Section 9.9 and other studies is described in RSP Section 9.9.8 and RSP Figure 9.9-20.

[1] A PDF copy of the July 13, 2013 comments is attached as Exhibit 1 to this attachment.

EXHIBIT 1

From: Susan Walker - NOAA Federal [susan.walker@noaa.gov]
Sent: Saturday, July 13, 2013 4:23 PM
To: Betsy McGregor; Matt Cutlip; Jeffrey Davis; Buntjer, Michael; eric Rothwell; Berg, Catherine; Haught, Stormy B (DFG); <jan@hydroreform.org>; joe.klein@alaska.gov
Subject: Review of Technical Memo: Characterization and Mapping of Aquatic Habitats

Hi Betsy -

I apologize for getting this review to you late. Receiving the draft at COB on Wednesday, July 3 did not allow much time for review.

As discussed during the Fish and Aquatics TWG meetings on June 24, NMFS agrees with the the manner with which AEA has addressed FERC's SPD recommendations a and b (edge habitat reclassification removal and reclassification of backwater, beaver complex and clearwater plume habitats from level 3 - mainstem, to level 4 - main stem and tributary mesohabitats).

In regard to FERC SPD recommendation c, we still have concerns over the representativeness of the subsamples of backwater habitats given the influence of flows on the presence and extent of this habitat type, and the low-flow (about 12,000 cfs) aerial photography used to classify these important habitats. We expect that AEA will address the representativeness issue in its ISR.

We also expect that AEA will address and describe the *relative potential value* of tributary reaches in the middle river *to fish and aquatic resources*, based upon tributary basin drainage area and stream gradient and report this assessment in the ISR, per FERC SPD recommendation d. Similarly, we expect that the photographic base maps delineating meso- and macro-habitats will be field-verified and corrected given the limitations and errors inherent in the original aerial photography based mapping, per FERC SPD recommendation e and as explained and discussed during the TWG meeting.

The major issue AEA is seeking to consult with the Services and TWG with is the selection of small and low-order tributaries for habitat mapping within the reservoir inundation zone. We agree that the nomenclature AEA proposes: primary, secondary and tertiary, is more definitive than "low-order". AEA prposes to select all tributaries within the reservoir inundation zone that are proposed for fish distribution and abundance sampling, Study 9.05. We generally concur with the methods AEA proposes to select these tributaries. We would like to see more detail on how these tributaries are determined to be representative the lotic habitats that will be lost or altered by reservoir flooding and fluctuation in the ISR. However, we question whether the current inundation zone, based on a dam height of 730 feet, is accurate. The height of the dam, and thus the elevation of the reservoir inundation zone, is not set. We have seen proposed ams heights ranging from 730' to 750' with plans for expanding the dam height to as high as 885'. As there is one very major anadromous fish-bearing tributary, the Oshtna River,

located less than one mile with an outlet less than 50' higher in elevation above the current low dam and reservoir elevation of 2050', it may be prudent, given the uncertainty of the eventual dam height, to include the Oshetna River in the list of tributary rivers within the inundation zone - in addition to Jay, Kosina, Watana and Deadman Creeks. Similarly, Goose Creek should be included.

Related to the unknown dam and reservoir heights and elevations, the fluctuation of the head of the reservoir is not described here (it may be elsewhere). Based on personal conversations with Bryan Carey and Wayne Dyok, we understand that the head, or upstream-most extent of the reservoir may fluctuate over a five-mile longitudinal distance as the reservoir is drawn down and refilled; the interaction of that fluctuation will undoubtably have significant effects on the two fish-bearing rivers within or near to that fluctuating zone of hydraulic influence, Goose Creek and the Oshetna Rver. Thus this is another reason to include these tributaries in the initial assessment.

"Missing" from the assessment of quantification and description of project effects to tributaries to the reservoir is an assessment of the mainstem Susitna River above the proposed reservoir and its tributary rivers and streams. The mainstem river could be considered the largest "tributary" to the reservoir, and no assessment is proposed of the characterization and mapping of this habitat is proposed. It should be. The effects, loss or change in habitat values and ecosystem functions from the project on the upper 100 miles of river habitat or the 100s of miles of the upper river tributaries (from the head of the reservoir to the glacial headwaters should be quantified. There seems to be an unstated assumption that the project effects will not extend upstream from the head of the reservoir, yet, creating a 40+ mile long lentic habitat in place of existing logic river is certain to have effects on the upper river. The effects of the project need to consider the river system in its entirety, as opposed to assessment of small isolated patches.

AEAs use of the proposed selection of small and low-order tributaries for habitat mapping within the reservoir inundation zone is not clearly stated. It is implied that the selected habitats will be mapped to document fish habitat values that will be lost, and that this information will be extrapolated to result in a total amount of lost habitat and lost habitat value for purposes of mitigation, compensatory or otherwise. But this is not stated or described. It should be explicit. In addition to the amount of habitat lost due to inundation, the amount and type of habitat lost to inundation, affected by reservoir fluctuation and the amount and value of habitat remaining needs to be mapped, described as to function and quantified. The quality of lost stream habitat as well as the quality of remaining stream habitat above the reservoir fluctuation zone and inundation zone should be assessed for its current and post-project values to support fish and other flora and fauna and contributions to ecosystem functioning.

The relationship to this study and the fish habitat and abundance study has been alluded to in this study plan, the interactions of these two studies should be explicitly described: what information feeds into which study, when, and how. Similarly, the relationship between information gathered in this study with information useful to other studies should be described. At a glance it appears that this study is inter-related to at least the Fish Passage Feasibility Study (quality and quantity and connectivity of stream habitat accessibile from the reservoir and upstream in the main stem, and ability of that altered habitat to support anadromous, resident and adfluvial species), several terrestrial wildlife studies, the Future

Reservoir Fish Study, avian studies (for shorebirds, raptors, and other piscivorous species as well as those feeding upon other aquatic invertebrate species), and Water Quality (especially mercury). This study plan should identify other studies which will or could use this information on how and wen that information will be provided to those investigations.

Thank you for this opportunity to comment on this important technical memorandum. Please contact me if you have any questions.

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