

Susitna-Watana Hydroelectric Project Document

ARLIS Uniform Cover Page

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March 1, 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;
Submittal of Information Related to Study Plan Determination**

Dear Secretary Bose:

By letter dated January 17, 2013, Staff of the Federal Energy Regulatory Commission (Commission) revised the licensing schedule for the Alaska Energy Authority's (AEA) proposed Susitna-Watana Hydroelectric Project, FERC Project No. 14241 (Project).¹ Primarily, Commission Staff's January 17th letter established a process for its April 1, 2013 issuance of the Study Plan Determination (SPD) for 14 of the individual study plans included in AEA's Revised Study Plan (RSP),² filed with the Commission on December 14, 2012.³ Leading up to Staff's April 1 SPD, the January 17th letter required AEA to prepare and file, following consultation with licensing participants, additional information that Commission Staff have deemed necessary for the April 1 SPD. The purpose of this filing is to submit the information required by Staff's January 17th letter, as well as other relevant information in support of these 14 study plans.

¹ Letter from Jeff C. Wright, Federal Energy Regulatory Commission, to Wayne Dyok, Alaska Energy Authority, Project No. 14241-000 (issued Jan. 17, 2013) [hereinafter, "January 17th Letter"].

² Commission Staff's January 17th letter established April 1 as the SPD date for 13 of the individual studies in the RSP. January 17th Letter, Attachment A. When issuing the SPD for the other individual study plans in the RSP, however, Commission Staff postponed its determination on one additional study until the April 1, 2013 SPD. Letter from Jeff C. Wright, Federal Energy Regulatory Commission, to Wayne Dyok, Alaska Energy Authority, at 3, Project. No. 14241-000 (issued Feb. 1, 2013). In total, the 14 individual studies scheduled for Staff's April 1st SPD consist of the following: (1) Baseline Water Quality (RSP 5.5); (2) Water Quality Modeling Study (RSP 5.6); (3) Mercury Assessment and Potential for Bioaccumulation Study (RSP 5.7); (4) Geomorphology Study (RSP 6.5); (5) Fluvial Geomorphology Modeling Below Watana Dam Study (RSP 6.6); (6) Groundwater Study (RSP 7.5); (7) Ice Processes in the Susitna River Study (RSP 7.6); (8) Fish and Aquatics Instream Flow Study (RSP 8.5); (9) Riparian Instream Flow Study (RSP 8.6); (10) Study of Fish Distribution and Abundance in the Upper Susitna River (RSP 9.5); (11) Study of Fish Distribution and Abundance in the Middle and Lower Susitna River (RSP 9.6); (12) River Productivity Study (RSP 9.8); (13) Characterization and Mapping of Aquatic Habitats (RSP 9.9); and (14) Riparian Vegetation Study Downstream of the Proposed Susitna-Watana Dam (RSP 11.6).

³ Revised Study Plan, Project No. 14241-000 (filed Dec. 14, 2012) [hereinafter, "RSP"].

As required by Commission Staff's January 17th letter, AEA hereby submits the following documents:

Requested Information⁴	Attachment
Final implementation plan for Study of Fish Distribution and Abundance in the Upper Susitna River (RSP 9.5)	Attachment A, <i>Final Susitna River Fish Distribution and Abundance Implementation Plan</i> (March 2013)
Final implementation plan for Study of Fish Distribution and Abundance in the Middle and Lower Susitna River (RSP 9.6)	Attachment A, <i>Final Susitna River Fish Distribution and Abundance Implementation Plan</i> (March 2013)
Final implementation plan for River Productivity Study (RSP 9.8)	Attachment B, <i>Final Susitna River Productivity Study Implementation Plan</i> (March 2013)
Final focus areas for 2013 middle and lower river studies	Attachment C, <i>Technical Memorandum, Selection of Focus Areas and Study Sites in the Middle and Lower Susitna River for Instream Flow and Joint Resource Studies – 2013 and 2014</i> (March 2013)

As directed in Staff's January 17th letter, AEA on January 31, 2013, filed drafts of all these documents with the Commission and distributed them to licensing participants via its licensing website, <http://www.susitna-watanahydro.org/meetings/>. Also in conformance with Staff's January 17th letter, AEA held technical workgroup (TWG) meetings on February 14th and 15th "to discuss the study results, proposed implementation plans, and selected focus areas in the middle and lower Susitna River."⁵ Because Staff of the National Marine Fisheries Service (NMFS) were unavailable to meet on February 14-15 due to a preexisting scheduling conflict, AEA met separately with NMFS on February 7th and 8th to review these materials.

In accordance with Commission Staff's revised licensing schedule, licensing participants may file comments on the attached implementation plans and technical memorandum—as well as the 14 studies subject to Staff's April 1st RSP⁶—by March 18, 2013.⁷ Based on the technical information discussed in the February 7-8 and 14-15 meetings, AEA has made changes to the attached implementation plans and technical memo since the drafts of these were filed and distributed on January 31.

AEA also has attached two additional documents related to Commission Staff's April 1st SPD. First, based on RSP comments filed by the Alaska Department of

⁴ See January 17th Letter, Attachment A, at 5.

⁵ *Id.*

⁶ These 14 individual study plans can be found in AEA's RSP, filed with the Commission on December 14, 2012. See *supra* note 2. The RSP can be accessed from the Commission's eLibrary system or AEA's licensing website, <http://www.susitna-watanahydro.org/type/documents/>.

⁷ See January 17th Letter, Attachment A, at 5.

Environmental Conservation (DCE),⁸ AEA has prepared and included as Attachment D an updated Quality Assurance Project Plan (QAPP) for the Baseline Water Quality Study (RSP 5.5).⁹ The attached QAPP has been updated to conform with DEC's *Quality Assurance Plan Review Checklist* and *Draft Guidance for a Tier 2 Water Quality Monitoring QAPP*.¹⁰ Second, as discussed in the meetings with NMFS on February 7-8 and the TWG on February 14-15, AEA has prepared and attached as Attachment E a response to interim comments submitted by NMFS and the U.S. Fish and Wildlife Service on Characterization and Mapping of Aquatic Habitat Mapping Revised Study Plan (RSP 9.9), including a comparison table demonstrating that there is no significant difference between AEA's habitat classification system and the classification system promoted by the resource agencies.

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. Following Commission Staff's April 1st SPD, 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 Dyok
Project Manager
Alaska Energy Authority

Attachments

cc: Distribution List (w/o Attachments)

⁸ State of Alaska Resource Agency RSP Comments, Project No. 14241-000, at 3-6 (filed Jan. 18, 2013) [hereinafter, "DEC RSP Comments"].

⁹ See RSP § 5, Attachment 5-1.

¹⁰ DEC RSP Comments, Attachments 1 & 2.

Attachment E

Response to Interim Comments on Characterization and Mapping
of Aquatic Habitat Mapping Revised Study Plan (RSP 9.9)

Alaska Energy Authority Response to National Marine Fisheries Service and U.S. Fish and Wildlife Service February 5, 2013 Interim Comments on the Characterization and Mapping of Aquatic Habitats Revised Study Plan (RSP Section 9.9)

On February 5, 2013, National Marine Fisheries Service and U.S. Fish and Wildlife Service (Services) filed with the Federal Energy Regulatory Commission (FERC) interim comments on the Characterization and Mapping of Aquatic Habitats Revised Study Plan (RSP Section 9.9). Through this document, Alaska Energy Authority (AEA) responds to these interim comments.

1. Services' Comment: AEA's proposed habitat classification system is not accurate or useful for characterizing and mapping aquatic habitats.

AEA does not agree with the Services' general premise that the stream habitat classification system for tributaries and the mainstem, as presented in RSP 9.9, is inaccurate or not useful for characterizing or mapping aquatic habitats. The classification system proposed in RSP 9.9 is based on standard fundamentals for characterizing and mapping aquatic habitats, as described in the scientific literature. This system is based on a habitat classification system developed by the USFS for Alaska forested streams (USFS 2001) and has been applied throughout Alaska, often with site-specific modification. Furthermore, this classification system is the product of collaborative development with the Fish and Aquatic Technical Workgroup (TWG) that began in April of 2012 and continued through the November 2012 TWG meeting when mesohabitat refinements were proposed and discussed based on preliminary data from 2012 aerial mapping. The adaption of this standardized and widely accepted habitat mapping system to the unique aspects of the Susitna River is consistent with such scientific practices commonly applied in hydroelectric project licensing.

2. Services' Comment: AEA's proposed habitat classification system is not nested and is not hierarchical.

AEA does not agree that the classification system presented in RSP 9.9 is not nested or hierarchical. In fact, there are five levels of classification, progressing from the largest scale of river segment down to the mesohabitat level of pool, riffle, glide, etc. At the mesohabitat level, 15 different metrics of "microhabitat" are proposed for measurement. Habitat classification and measured parameters in the mainstem, tributaries, and off-channel habitats are based on the USFS (2001) tiered stream habitat survey protocol that have been refined with input from the Fish and Aquatic TWG. Habitat classifications at the mainstem habitat level were defined to be consistent with those used in the 1980s Susitna River studies. These definitions were discussed and agreed upon during agency meetings in the spring of 2012. Tables 9.9-3 and 9.9-4 depicted

the nested classifications proposed by AEA for the Upper River tributaries and mainstem habitats, respectively.

3. Services' Comment: AEA's proposed habitat classifications are not easily identifiable and are not applicable for defining areas of species or lifestage segregation by habitat or channel type.

AEA does not agree that the habitat classifications proposed in RSP 9.9 are not easily identifiable and are not applicable for defining areas of species or lifestage segregation by habitat or channel type. Habitat types can readily be identified using a combination of high-resolution still imagery, low elevation aerial video, and ground mapping. The hierarchical and nested levels of classification stratify the levels at which habitat selection might occur, both longitudinally and laterally. The River Segment level stratifies the river into three major units. The Geomorphic Reach level further divides each River Segment into reaches based on unique geomorphic and hydrologic factors. This geomorphic reach level addresses the longitudinal differentiation of habitat as influenced by physical processes.

The Mainstem Habitat Level categorizes types of main channel, off-channel, and tributary habitat at the "macro level" that addresses the longitudinal and lateral distribution and frequency of channel types selected by different species and lifestages. These channel types are further differentiated into sub-types of split, side channel, slough, etc. The physical processes of the Susitna River are manifested differentially in these mainstem classifications largely related to the variable morphology of the habitat types, different hydrologic influences such as surface versus groundwater flow based and subsequently the flow velocities they experience that influence the characteristics of these habitats such as depth, temperature, substrate. The historic data from the 1980s suggests that the variable characteristics of these mainstem habitats support different species and life stages of fishes throughout the year.

The Main Channel and Tributary Level differentiates habitat to mesohabitat scale. This level narrows and refines the habitat stratification to mesohabitats preferred or not preferred by different species and lifestages. Again mesohabitats are in part defined by the channel morphology of the geomorphic reach; gradient, flow, and channel shape all are defining parameters for mesohabitats. It is the variation in these parameters that affect the utility of mesohabitat for various species and life stages of fish.

With mainstem and mesohabitats, the Edge Habitat Level is proposed in order to better understand the longitudinal variation in channel complexity. A high channel complexity index indicates more edge habitat and greater channel and habitat diversity; important factors in instream flow and fisheries studies.

4. Services' Comment: AEA has proposed new habitat classes that do not appear to be revisions based on the Services' (or other stakeholders) comments.

AEA disagrees with this statement. At the October 25, 2012 Fish and Aquatic Resources TWG, AEA presented preliminary results of the aerial videography flown in September 2012. At that time, AEA proposed refinements to the classifications based on the habitats that were observed during video collection and from the video imagery. These refinements were presented to the TWG, discussion was had and no adverse comments were received. A few further refinements were made to the RSP classifications based on post-processing of the video, when it was made clear that specific habitat types, such as the tributary plume classification used in the 1980s, were more appropriately designated as a unique classification rather than being lumped with tributary mouths as have previously been proposed.

5. Services' Comment: AEA's proposed habitat classification is not consistent among study plan sections.

The RSP proposes one classification system that will be used by all of the Fish and Aquatic and Instream Flow studies for site selection, transect placement, as well as defining fish-habitat associations. Additional on the ground habitat data will be collected during fish distribution and abundance sampling that will be consistent with the classification system described in RSP Section 9.9. As a component of the instream flow modeling, AEA will also collect microhabitat data to develop species and life stage specific habitat suitability criteria (HSC) for use in instream flow modeling. As described in RSP Section 8.5.4.5.1.1, the data collected for HSC development will be at sites nested within the habitat classification system and will include microhabitat variables associated with individual fish and/or redds.

6. Services' Comment: The additional mainstem macrohabitats result in too many habitat classes limiting adequate replication.

AEA's proposed method maps the mainstem and, where feasible, mesohabitats that occur within the river. The number of replicates for sampling within the habitats as classified is a function of the site selection methodology. In selecting sites for fish and instream flow studies, AEA has used statistical tools to ensure that sample site selection will be spatially balanced, random, and representative of habitats that exist within each of the geomorphic reaches. Where possible we will sample multiple units of the same habitat type to evaluate variation in that habitat type within the geomorphic reach. However, the nature of the river is that some habitats are uncommon in some geomorphic reaches. AEA's proposed site selection methods ensure that these less common habitats will be sampled where they occur.

7. Services' Comment: Current survey methods bias toward mainstem and larger order tributaries due to the lack of visibility through riparian vegetation.

The remote imagery is limited in its utility for characterizing channel with heavy riparian vegetation that obscures the stream channel. As described in the RSP Sections 9.9.5.3.2, 9.9.5.4.1, and 9.9.5.4.2, AEA has proposed ground-based habitat surveys to characterize

tributary habitats not visible to the camera and to delineate all mesohabitats within Focus Areas.

8. Services' Comment: Initial classification is clearly based on water surface characteristics; therefore, classification is flow dependent and surveys or field measures need to be conducted under multiple flow conditions.

AEA's proposed classification is not based on water surface characteristics. The purpose of habitat mapping is to map the diversity of channel types and underlying channel structure. Habitat mapping only uses the mesohabitat terms pool, riffle, glide, etc. to describe the associated underlying structure of the stream, which does not change with flow. Surface water characteristics are useful to help differentiate between fast water habitats such as glide versus riffle but they are not the only characteristic used.

Habitat mapping at low flow is the generally accepted scientific approach. First, these are the conditions when the underlying channel controls that define mesohabitat types are most evident and can be measured, e.g., the pool tail crest. Second, the low flow condition aquatic habitat is at its most limited condition for fish populations.

AEA does not agree that habitat mapping needs to be conducted at multiple flows. The Services' suggestion that habitat mapping should be repeated at multiple flows is inconsistent with standard scientifically accepted practices and procedures. The purpose of habitat mapping is not to determine the relationship between flow and habitat. Flow versus habitat relationships will be studied using instream flow methods, such as the 1-D or 2-D Physical Habitat Simulation Model (PABSIM), as is proposed in RSP Section 8.5. The Services suggest that many off-channel habitat types will be eliminated at low flows and therefore should be mapped at multiple flows. AEA does not agree. The presence and structure of off-channel habitat will be mapped and the response of off-channel habitat types to changes in flow will be studied using instream flow modeling methods, as described in RSP Section 8.5.

9. Services' Comment: Middle and Lower River tributaries should be classified geomorphically because this level of classification distinguishes areas of salmon spawning and rearing distribution.

Tributary mouth and habitat lying within the zone of hydrologic influence will be mapped (RSP Section 9.9) and evaluated, as described in RSP Section 9.12. AEA does not agree that there is a logical nexus between Project operations and tributary habitat above the Project's zone of hydrologic influence.

10. Services' Comment: The Services request that AEA use their habitat classification scheme [Table 1 of Interim Comments] for project planning and assessment.

To better understand and clarify differences between AEA's and the Services' habitat classification approaches, AEA compared, line-by-line, RSP Section 9.9 (Table 9.9-3 and 9.9-4) with the Services' Alternative Classification presented in Table 1 of the Interim Comments. The comparative analysis supports the Services' statement (Interim Comments, page 4) that "...there are minor differences between AEA's and our [Services] proposed approach to habitat classification...".

AEA agrees there are only minor differences between the two approaches. Further, AEA suggests that differences are not sufficient to justify adoption of the Services' Table 1 over the classification system described in RSP Section 9.9. Further, considerable habitat mapping analyses have already been undertaken by AEA using the RSP Section 9.9 classification system in response to FERC's January 17, 2013 letter to AEA. Further these habitat mapping results have been used for development of RSP Section 8.5 and RSP Section 9.5 implementation plans. Redoing these analyses is not warranted.

The primary differences between the approaches are listed below.

- 1) The Services' approach measures microhabitat parameters not included in standard habitat mapping methods, e.g. vertical hydraulic gradient, nutrients, invertebrate drift, and water chemistry. AEA will measure these parameters as part of the other aquatic studies described in the RSP.
- 2) The Services' approach proposes some parameters be classified at Level II whereas RSP Section 9.9 will classify at Level III.
- 3) The Services' approach suggests a separate category for backwaters and mouths of sloughs. AEA will identify mouths and backwaters when mesohabitat mapping sloughs. RSP Section 9.9 specifically classifies tributary mouths.
- 4) The Services suggest specifically classifying meander margins, eddies, and side scour alcoves. AEA suggests that these features are extremely amorphous, ubiquitous, and non-dimensional, and are therefore not appropriate for specific mapping. Their function as habitat will be captured in 2-D modeling of Focus Areas.

A detailed comparison of the two classification systems is presented in Attachment 1.

Attachment 1

A Comparison of Habitat Mapping Classifications and Measured Parameters between NMFS and USFWS (Services) 02/03/2013 Interim Comments and AEA RSP Section 9.9 Characterization and Mapping of Aquatic Habitats

Habitat Level Definitions (Annear, T., I. Chisholm, H. Beecher, A. Locke, and 12 other authors, 2004. Instream flows for riverine resource stewardship, revised edition, Instream Flow Council, Cheyenne, WY.)

Macrohabitat – Abiotic habitat conditions in a segment of river controlling longitudinal distribution of aquatic organisms, usually describing channel morphology, flow, temperature, or chemical properties or characteristics with respect to suitability for use by organisms.

Mesohabitat - A discrete area of stream exhibiting relatively similar characteristics of depth, velocity, slope, substrate, and cover, and variances thereof (e.g., pools with maximum depth <5 ft, high gradient rimes, side channel backwaters).

Microhabitat – Small localized areas within a broader habitat type used by organisms for specific purposes or events typically described by a combination of depth, velocity, substrate, cover.

Color Key – The Services’ 02/03/2013 suggested classification or measurement parameters and AEA’s RSP Section 9.9 proposed parameters are:

the same	similar	different	not suggested by Services but proposed in RSP Section 9.9.
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Geomorphic Reach Classification (Level I)	
Services – Mainstem and Tributaries	AEA RSP Section 9.9 - Mainstem
Channel Width	Same
Channel Depth	Available when flow routing x-sec are analyzed
Channel Slope	Same
Sinuosity	Same
Substrate Size	Same (from 1980’s data)
Channel Confinement	Same (entrenchment ratio)
	Average Number of Channels
	AEA RSP Section 9.9 - Tributaries
	Channel Slope
	Confinement
	Significant Point of Accretion
	Sediment Supply

Macrohabitat Type Classification (Level II)	
Services - Mainstem	AEA RSP Section 9.9 - Mainstem
Tributary Mouths	Similar (same but classified at Level III)
Main channel	Similar (same but classified at Level III)
Side Channel	Similar (same but classified at Level III)
Side Slough	Similar (same but classified at Level III)
Upland Slough	Similar (same but classified at Level III)
Services - Tributaries	AEA RSP Section 9.9 - Tributaries
Fast	Same
Slow	Same

Mesohabitat Type Classification (Level III)	
NMFS - Mainstem	AEA RSP Section 9.9 - Mainstem
Mainstem and Side Channel meander margins (eddies (side scour and alcoves))	Not specifically classified
Mainstem and Side Channel Backwater Pools	Similar ¹
Mainstem and Side Channel Point Bars	Not specifically classified
Mainstem and Side Channel Riffles	Similar ¹
Mainstem and Side Channel Runs/Glides	Similar ¹
Beaver Ponds	Similar ¹
Tributary Mouth Backwater	Similar ¹
Tributary Influenced Mainstem	Similar ¹
Side Sloughs Mouths	Similar ¹
Side Slough Scour Pools	Similar ¹
Side Slough Riffles	Similar ¹
Upland Sloughs Mouths	Similar ¹
Upland Slough Scour Pools ²	Similar ¹
Upland Slough Riffles ²	Similar ¹
	Split Main Channel
	Multiple Main Channel
	Split Main Channel
	Edge or Channel Complexity Index
Services - Tributaries	AEA RSP Section 9.9 - Tributaries
Falls	Same
Cascade	Same
Chute	Same
Rapid	Same
Boulder Riffle	Same
Riffle	Same
Run/Glide	Same
Straight Scour Pool	Same
Plunge Pool	Same
Lateral Scour Pool	Same
Backwater Pool	Same
Beaver Pond	Same
Alcove	Same

^{1/} Off-channel habitats, including tributary mouths, and tributaries within the zone of hydrologic influence will be 100% ground mapped and typed to mesohabitat within Focus Areas. Outside of Focus Areas, five to ten main channel mesohabitat units and five to ten off-channel habitat units of each type will be randomly selected for sub-sampling. If there are fewer than the selected number, all units of that habitat type will be sampled.

^{2/} Services state these habitat types may not exist due to the lack of channel forming flows.

Habitat Characteristics Microhabitat Types (Level IV)	
Services – Mainstem “Microhabitat”	AEA RSP Section 9.9 – Mainstem “Microhabitat”
Depth	Same ³
Velocity	Measured as part of RSP Section 8.5
Surface Flow and Groundwater Discharge	Measured as part of RSP Section 7.5
Vertical Hydraulic Gradient	Measured as part of RSP Section 7.5
Substrate Type	Same ³
Bank undercut/Riparian cover	Same ³
Woody debris	Same ³
Turbidity or Suspended Sediment	Measured as part of RSP Section 5.0 –5.5
Dissolved oxygen (intragravel and surface water)	Measured as part of RSP Section 5.0 –5.5.4.1 ⁴
Macronutrients (N, P)	Measured as part of RSP Section 5.0 –5.6.4.6
Temperature (intragravel and surface water)	Measured as part of RSP Section 5.0 –5.5.4.1 ⁴
pH, DOC, alkalinity	Measured as part of RSP Section 5.0 –5.5.4.1
Invertebrate drift density	Measured as part of RSP Section 9.8 – 9.8.4.5
Benthic Organic Matter	Measured as part of RSP Section 9.8 – 9.8.4.12
Algal Biomass and Chl-a	Measured as part of RSP Section 5.6.4.6 and Section 9.8.4.4
	Unit length
	Average wetted width
	Pool maximum depth
	Pool crest depth
	Average maximum depth
	Width of unit
	Percent erosion,
	Percent instream cover in unit
	Dominant riparian vegetation type
Services – Tributary “Microhabitat”	AEA RSP Section 9.9 – Tributary “Microhabitat”
Depth	Same. Also collected for HSC, RSP Section 8.5.4.5.1.1.4
Velocity	Collected for HSC, RSP Section 8.5.4.5.1.1.4
Surface Flow and Groundwater Discharge	Presence of upwelling collected for HSC, RSP Section 8.5.4.5.1.1.4
Vertical Hydraulic Gradient	Not measured
Substrate Type	Same. Also collected for HSC, RSP Section 8.5.4.5.1.1.4
Bank undercut/Riparian cover	Same. Distance to cover also collected for HSC, RSP Section 8.5.4.5.1.1.4
Woody debris	Same
Turbidity or Suspended Sediment	Collected for HSC, RSP Section 8.5.4.5.1.1.4
Dissolved oxygen (intragravel and surface water)	Not measured
Macronutrients (N, P)	Not measured. Addressed in Water Quality RSP Section 5.6.4.6
Temperature (intragravel and surface water)	Not measured
pH, DOC, alkalinity	Not measured
Invertebrate drift density	Not measured
Benthic Organic Matter	Not measured
Algal Biomass and Chl-a	Not measured
	Unit length
	Average wetted width
	Pool maximum depth
	Pool crest depth
	Average maximum depth
	Width of unit
	Percent erosion,
	Percent instream cover in unit
	Dominant riparian vegetation type

³/Parameter will be 100% mapped within Focus Areas. Outside of Focus Areas, parameter mapped in five to ten main channel mesohabitat units and five to ten off-channel habitat units of each type randomly selected for sub-sampling. If there is fewer than the selected number, all units of that habitat type all will be sub-sampled.

⁴/ AEA will monitor temperature at the bottom of the water column at each of the proposed transects. AEA also proposes piezometers at the end of each transect in Focus Areas. Parameter measurements here (including DO and temperature) are intended to indicate potential for detecting groundwater influence on surface water conditions.