

Susitna-Watana Hydroelectric Project Document ARLIS Uniform Cover Page

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December 14, 2012

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

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

Submission of USFWS and NMFS Study Requests Crosswalk Tables

Dear Secretary Bose:

Through this filing, the Alaska Energy Authority (AEA) is submitting written “crosswalk” tables that compare the original study requests of the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) (collectively, the Services), filed with the Federal Energy Regulatory Commission (Commission or FERC) on May 31, 2012, with AEA’s Revised Study Plan (RSP) for the original license application for the Susitna-Watana Hydroelectric Project, FERC Project No. 14241 (Project). These crosswalk tables have been prepared at the request of the Commission Staff and the Services.

Concurrent with this filing, AEA is filing the RSP pursuant to the regulations of the Commission, 18 C.F.R. § 5.13(a). The RSP includes 58 individual study plans, organized into resource sections and by topic within each section. As detailed in RSP Section 1.1, AEA has been working closely with licensing participants, including the Services, over the last year to develop this study plan. Following AEA’s development of the Proposed Study Plan (PSP) in July 2012, AEA continued to consult regularly with licensing participants on the PSP, which led to AEA’s release of an interim draft RSP at the end of October 2012. AEA’s responses to comments received during the numerous Technical Workgroup and other meetings during the July through October period appear in Appendix 3 of the RSP, and documentation supporting these comments (e.g., meeting summaries, e-mail messages) appears in Appendix 4 of the RSP. With regard to comments received after the interim draft RSP, the Appendix 1 sets forth AEA’s responses to licensing participants’ written comments filed with the Commission after November 1. As documented in the RSP and its appendices, AEA and licensing participants have resolved the majority of study-related issues in the Integrated Licensing Process.

With respect to the Services, the attached crosswalk tables document how the objectives and methodologies of the Services' original study requests—dating back to May 2012, prior to the PSP—have been addressed in the RSP. *See* RSP § 1.1.4 n.9. Specifically, the crosswalk tables identify the equivalent RSP sections where the Services' original study request objectives and methodologies have been substantially incorporated into the RSP. In instances where the RSP does not substantially incorporate an original study request objective or methodology submitted by one or both Services, the crosswalk tables either: (1) provide AEA's rationale for not incorporating the objective or methodology; or (2) document, by reference to Appendix 1 of the RSP, how the objective or methodology has been modified, resolved, or dropped from the study plan through the collaborative efforts of the licensing participants following AEA's filing of the PSP.

AEA notes that the Services included references to their specific resource management objectives in several of their study requests. While AEA did not incorporate equivalent resource management objectives in the RSP, it intends to consider those objectives in its Exhibit E Environmental Exhibit included in its License Application. As part of its effort in developing its Exhibit E, AEA will undertake a broader, more comprehensive integrated analysis of Project impacts in the timeframe leading up to its preparation of the Preliminary Licensing Proposal/Draft License Application, and continuing through its filing of the final License Application. The integrated resource analysis envisioned will involve the assimilation of individual study results, identification and understanding of issues and impacts across resources, and an assessment of how those impacts, and potential protection, mitigation, and enhancement measures to address those impacts, might be influenced by elements of other resource areas. This analysis will rely on a variety of analyses and computational models, at appropriate levels of quantification, to compare various "with Project" scenarios to the base case "without Project" conditions. AEA looks forward to interactive engagements with the Services and other licensing participants, starting in early 2015 following the filing of the Updated Study Report, in developing and conducting this integrated resource analysis. Through these engagements, AEA anticipates that the Services' resource management objectives will be comprehensively analyzed based upon study results.

If you have any questions regarding this matter or need additional information, please do not hesitate to contact the undersigned at wdyok@aidea.org or (907) 771-3955.

Sincerely,

A handwritten signature in black ink that reads "Wayne M. Dyok". The signature is written in a cursive style with a horizontal line underneath the name.

Wayne Dyok
Project Manager
Alaska Energy Authority

Attachments

cc: Distribution List (w/o Attachments)

ATTACHMENT 1

CROSSWALK TABLE BETWEEN

**U.S. FISH AND WILDLIFE SERVICE STUDY REQUESTS
(MAY 31, 2012)**

AND

**ALASKA ENERGY AUTHORITY REVISED STUDY PLAN
(DECEMBER 14, 2012)**

**CROSSWALK TABLE BETWEEN
U.S. FISH AND WILDLIFE SERVICE STUDY REQUESTS (MAY 31, 2012)
AND
ALASKA ENERGY AUTHORITY REVISED STUDY PLAN (DECEMBER 14, 2012)**

**USFWS Study Request Enclosure No. 3:
Study of Eagles and Other Raptors**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
3.3.1: Identify number, location, and activity status of raptor nests and territories that would be lost or otherwise impacted by Project construction and operations.	Section 10.14.1.	USFWS Study Request objective substantially incorporated into study plan.
3.3.1: Estimate project effects on potential loss of productivity of raptors.	Section 10.14.1.	USFWS Study Request objective substantially incorporated into study plan.
3.3.1: Estimate effects on nesting habitats and further meet Objectives #1 and 2 (above) by delineating suitable nesting habitats.	Section 10.14.1.	USFWS Study Request objective substantially incorporated into study plan.
3.3.1: Locate and map fall and winter communal roost sites and primary forage sites, and describe seasonal habitat use patterns.	Section 10.14.1.	USFWS Study Request objective substantially incorporated into study plan.
3.3.1: Determine if any section of planned overhead transmission lines may pose a collision risk to migrating or nesting raptors.	Section 10.14.1.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
3.3.1: Support other related Susitna-Watana Project studies as needed. Includes Piscivorous Wildlife and Mercury Risk Assessment, etc.	Sections 10.14.1, 10.14.7 and 5.7.4.2.5.	USFWS Study Request objective substantially incorporated into study plan. See AEA's response to comments RAPT-3, RSP Appendix 1.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
3.3.6: Surveys.	Section 10.14.4.	USFWS Study Request methodology substantially incorporated into study plan, with changes discussed and agreed to during TWG and other consultation meetings. See AEA's response to comment RAPT-2, RSP Appendix 1. With regard to owl surveys, see AEA's response to comment RAPT-4, RSP Appendix 1.

**USFWS Study Request Enclosure No. 4:
Study of Waterbird Migration, Breeding, and Habitat**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
4.3.1: Estimate potential Project impacts on waterbirds and their habitats in the study area.	No equivalent objective in RSP.	Analysis of Project-related impacts is not an objective of AEA’s study, but AEA’s study has been designed to collect necessary information to evaluate Project-related effects stated in this objective. The effects analysis will be undertaken as part of AEA’s preparation of its License Application. See Section 10.15.7. See cover letter for further explanation.
4.3.1: Estimate potential Project impacts on waterbirds in flight.	No equivalent objective in RSP.	Analysis of Project-related impacts is not an objective of AEA’s study, but AEA’s study has been designed to collect necessary information to evaluate Project-related effects stated in this objective. The effects analysis will be undertaken as part of AEA’s preparation of its License Application. See Section 10.15.7. For further explanation, see cover letter and AEA’s response to comment WTRBRD-18, RSP Appendix 1.
4.3.1: Support other related Susitna-Watana Project studies as needed. Includes Piscivorous Wildlife and Mercury Risk Assessment, etc.	Sections 10.15.1, 10.15.7 and 5.7.4.2.5.	USFWS Study Request objective substantially incorporated into study plan. See AEA’s responses to comments WTRBRD-08 and WTRBRD-19, RSP Appendix 1.

Requested Study Objectives	RSP Equivalent	AEA Explanation
4.3.1: Given the recommendations in the MOU for minimizing impacts on birds and the number of such species that occur in the Project area (ABR, Inc. 2011, AEA 2011), it is expected that there will be concern about the potential effects on waterbirds from the Project, and that mitigation plans will be developed to avoid, minimize, or offset those impacts.	No equivalent objective in RSP.	While not an objective of AEA’s study, this type of resource management objective will be considered when developing protection, mitigation, and enhancement (PM&E) measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
4.3.6: Surveys	10.15.4.1.1: Aerial Surveys 10.15.4.1.2: Migration Study 10.15.4.2.1: Breeding-pair Surveys 10.15.4.2.2: Harlequin Ducks Surveys 10.15.4.2.3: Brood Surveys	USFWS Study Request methodology substantially incorporated into study plan, with changes discussed and agreed to during TWG and other consultation meetings. See AEA’s responses to comments WTRBRD-09 and WTRBRD-16, RSP Appendix 1. With regard to Harlequin Duck surveys, see AEA’s responses to comments WTRBRD-06, WTRBRD-14 and WTRBRD-15, RSP Appendix 1.

**USFWS Study Request Enclosure No. 5:
Study of Landbirds and Shorebirds**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
5.3.1: Estimate potential Project impacts on landbirds and shorebirds and their habitats in the study area.	No equivalent objective in RSP.	Analysis of any Project-related impacts is not an objective of AEA’s study, but AEA’s study has been designed to collect necessary information to evaluate Project-related effects stated in this objective. The effects analysis will be undertaken as part of AEA’s preparation of its License Application. See Section 10.16.7. See cover letter for further explanation.
5.3.1: Estimate potential Project impacts on landbirds and shorebirds in flight.	No equivalent objective in RSP.	Analysis of any Project-related impacts is not an objective of AEA’s study, but AEA’s study has been designed to collect necessary information to evaluate Project-related effects stated in this objective. The effects analysis will be undertaken as part of AEA’s preparation of its License Application. See Section 10.16.7. For further explanation, see cover letter and AEA’s response to comment BREED-09, RSP Appendix 1.
5.3.1: Support other related Susitna-Watana Project studies as needed. Includes Piscivorous Wildlife and Mercury Risk Assessment, etc.	Sections 10.16.1, 10.16.7 and 5.7.4.2.5.	USFWS Study Request objective substantially incorporated into study plan. See AEA’s response to comments BREED-09 and BREED-26, RSP Appendix 1.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
5.3.6: Surveys	10.16.4.1.2: Field Surveys 10.16.4.2: Riparian- and Lacustrine-focused Surveys 10.16.4.3: Survey of Colonially Nesting Swallows 10.16.4.4: Migration Surveys	USFWS Study Request methodology substantially incorporated into study plan, with changes discussed and agreed to during TWG and consultation meetings. See AEA's responses to comments BREED-11, BREED-13, BREED-14, BREED-20, BREED-23 and BREED-24. With regard to wildlife habitat mapping, see AEA's response to comment BREED-10, RSP Appendix 1.

**USFWS Study Request Enclosure No. 6:
Piscivorous Wildlife and Mercury - Risk Assessment Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
6.2: Document the presence and abundance of river otter and mink in the reservoir area and downstream.	Section 10.11.1.	USFWS Study Request objective substantially incorporated into study plan.
6.2: Document the presence and abundance of fish-eating birds in the reservoir area and downstream.	Sections 10.14.1, 10.15.1 and 10.16.1.	USFWS Study Request objective substantially incorporated into study plan.
6.2: Document baseline mercury levels in piscivorous wildlife in the reservoir area, as measured in fur (for mink and river otter) and feathers (avian piscivores).	Section 5.7.1.	USFWS Study Request objective substantially incorporated into study plan. See AEA's responses to comments AQFUR-2, RAPT-3, BREED-26, WTRBRD-08 and WTRBRD-19, RSP Appendix 1.
6.2: Obtain quantitative dietary information for each target species in the risk assessment, including the size, quantity and species of fish eaten, and the percent diet that is aquatic vs. terrestrial, both for adults and young.	Sections 10.11.1, 10.14.1, 10.15.1 and 10.16.1.	USFWS Study Request objective substantially incorporated into AEA's study plan, which concentrates on comprehensive review of the scientific literature to provide the information requested on the diets of aquatic piscivores, rather than on the intensive field sampling that would be needed to attempt to obtain study-area-specific data.

Requested Study Objectives	RSP Equivalent	AEA Explanation
6.2: Perform an ecological risk assessment for each piscivorous species. Estimate the amount of mercury ingested by individuals of each piscivorous species, based upon dietary information obtained above and the modeled mercury levels in food items postimpoundment from the Water Quality study. Compare ingested mercury amounts to toxic levels, based on species-specific data from the scientific literature.	Sections 5.7.1 and 5.7.4.5.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
6.6.1: Collect feces of river otter and mink during winter months	No equivalent methodology in RSP.	AEA's study plan proposes to assess the relative abundance of river otters and mink through aerial surveys of tracks in winter, rather than conducting the intensive ground-based sampling that would be needed to develop population estimates using DNA genotyping of scats and mark-recapture analysis. See Section 10.11.4.
6.6.2: Breeding Bird Surveys for Piscivorous Avian Species	Sections 10.14.4.1, 10.15.4.2.1 and 10.16.4.1.2.	USFWS Study Request objective substantially incorporated into study plan.
6.6.3: Collect Feathers of Avian Piscivores for Baseline Mercury Analysis	Sections 10.14.4.1, 10.15.4.3, 10.16.4.6. See also Section 5.7.4.2.5.3.	USFWS Study Request objective substantially incorporated into study plan. See AEA's responses to comments RAPT-3, BREED-26, WTRBRD-08 and WTRBRD-19, RSP Appendix 1.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
6.6.4: Collect Fur of Mink and River Otter for Baseline Mercury Analysis	Section 10.11.4.3. See also Section 5.7.4.2.5.3.	USFWS Study Request objective substantially incorporated into study plan. See AEA's response to comment AQFUR-2, RSP Appendix 1.
6.6.5: Conduct genetic analyses of fecal (and possibly hair) samples to confirm species identity and to differentiate individual animals	No equivalent methodology in RSP.	AEA's study plan proposes to assess the relative abundance of river otters and mink through aerial surveys of tracks in winter (Section 10.11.4.2), rather than conducting the intensive ground-based sampling that would be needed to develop population estimates using DNA genotyping of scats or hair and mark-recapture analysis. DNA analysis will be used, if necessary, to identify species for which hair samples are obtained for mercury analysis.
6.6.7: Perform an ecological risk assessment for piscivorous wildlife in the study area.	Section 5.7.4.2.5.4.	USFWS Study Request objective substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 7:
Vegetation and Wildlife Habitat Mapping Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
7.3.1: Identify, delineate, and map vegetation and wildlife habitat types in the Project area in GIS.	Section 11.5.1.	USFWS Study Request objective substantially incorporated into study plan. See AEA's response to comment VWHAB-02, RSP Appendix 1.
7.3.1: Compare the vegetation mapping results with the 1987 vegetation mapping study conducted in the original Susitna Hydroelectric Project (Project) area (Kreig and Associates 1987).	No equivalent objective in RSP.	See AEA's responses to comment VWHAB-04, RSP Appendix 1.
7.3.1: Quantify the potential direct, indirect, and cumulative impacts to vegetation and wildlife habitats from Project construction.	No equivalent objective in RSP.	Analysis of any Project-related impacts is not an objective of AEA's study, but AEA's study has been designed to collect necessary information to evaluate Project-related effects stated in this objective. The effects analysis will be undertaken as part of AEA's preparation of its License Application. See Section 11.5.7. For further explanation, see cover letter and AEA's response to comment VWHAB-06, RSP Appendix 1.

Requested Study Objectives	RSP Equivalent	AEA Explanation
7.3.1: Evaluate potential changes to vegetation and wildlife habitats from Project operations, maintenance, and related activities.	No equivalent objective in RSP.	Analysis of any Project-related impacts is not an objective of AEA’s study, but AEA’s study has been designed to collect necessary information to evaluate Project-related effects stated in this objective. The effects analysis will be undertaken as part of AEA’s preparation of its License Application. See Section 11.5.7. For further explanation, see cover letter and AEA’s response to comment VWHAB-10, RSP Appendix 1.
7.3.1: Develop measures to protect and mitigate for the expected Project-related impacts to vegetation and wildlife habitats, and prepare plans to enhance (reclaim) vegetation and habitats as appropriate.	No equivalent objective in RSP.	While not an objective of AEA’s study, this type of resource management objective will be considered when developing PM&E measures. For further explanation, see cover letter and AEA’s response to comment VWHAB-03, RSP Appendix 1.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
7.3.6: Surveys.	Section 11.5.4.	USFWS Study Request methodology substantially incorporated into study plan, with changes discussed and agreed to during TWG and consultation meetings. With regard to use of Kessel’s bird habitat classification system, see AEA’s responses to comments VWHAB-09 and BREED-10.

**USFWS Study Request Enclosure No. 8:
Riparian Habitat Mapping Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
8.3.1: Identify and map riparian plant communities and characterize riparian physical and ecological processes in the Project area downstream from the Watana Dam site.	Section 11.6.1.	USFWS Study Request objective substantially incorporated into study plan.
8.3.1: Quantify the potential loss of riparian habitats from Project construction.	Sections 11.6.1 and 8.6.1.1.	USFWS Study Request objective substantially incorporated into study plan. Data from the riparian vegetation study will be used in the riparian instream flow study to address this objective (Section 11.6.7). See AEA's response to comment RIP-02, RSP Appendix 1.
8.3.1: Assess potential changes to the riparian habitats, riparian processes, wetland functions, and plant successional pathways from Project operations.	Sections 11.6.1 and 8.6.3.7.	USFWS Study Request objective substantially incorporated into study plan. See Section 11.6.7. See also AEA's response to comment RIP-02, RSP Appendix 1.
8.3.1: Develop protection, mitigation, and enhancement measures to address project-related impacts to riparian habitats, riparian processes, wetland functions, and successional pathways.	No equivalent objective in RSP.	While not an objective of AEA's study, this type of resource management objective will be considered when developing PM&E measures. For further explanation, see cover letter and AEA's response to comment RIP-09, RSP Appendix 1.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
8.3.6: Surveys.	Section 11.6.4.	USFWS Study Request methodology substantially incorporated into study plan, with changes discussed and agreed to during TWG and consultation meetings.

**USFWS Study Request Enclosure No. 9:
Wetland Mapping and Functional Assessment Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
9.3.1: Identify, delineate, and map wetlands in the Project area in GIS.	Section 11.7.1.	USFWS Study Request objective substantially incorporated into study plan.
9.3.1: Determine functional values for the mapped wetland types.	Section 11.7.1.	USFWS Study Request objective substantially incorporated into study plan.
9.3.1: Quantify the potential direct, indirect, and cumulative impacts to wetlands and wetland functions from Project construction.	No equivalent objective in RSP.	Analysis of any Project-related impacts is not an objective of AEA’s study, but AEA’s study has been designed to collect necessary information to evaluate Project-related effects stated in this objective. The effects analysis will be undertaken as part of AEA’s preparation of its License Application. See Section 11.7.7. For further explanation, see cover letter and AEA’s response to comment WETLND-11, RSP Appendix 1.
9.3.1: Evaluate potential changes to wetlands and wetland functions from Project operations, maintenance, and related activities.	No equivalent objective in RSP.	Analysis of any Project-related impacts is not an objective of AEA’s study, but AEA’s study has been designed to collect necessary information to evaluate Project-related effects stated in this objective. The effects analysis will be undertaken as part of AEA’s preparation of its License Application. See Section 11.7.7. For further explanation, see cover letter and AEA’s response to comment WETLND-11, RSP Appendix 1.

9.3.1: Develop measures to avoid, minimize, and mitigate the expected Project-related impacts to wetlands and wetland functions.	No equivalent objective in RSP.	While not an objective of AEA’s study, this type of resource management objective will be considered when developing PM&E measures. For further explanation, see cover letter and AEA’s response to comment WETLND-07, RSP Appendix 1.
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Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Surveys.	Section 11.7.4.	USFWS Study Request methodology substantially incorporated into study plan, with changes discussed and agreed to during TWG and consultation meetings. See AEA’s responses to comments WETLND-03 and WETLND-08, RSP Appendix 1. With regard to the downstream extent of the study, see AEA’s response to comment WETLND-05, RSP Appendix 1.

**USFWS Study Request Enclosure No. 10:
Instream Flows for Floodplain & Riparian Vegetation Study (Riparian Instream Flow)**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
10.3.1: Synthesize the 1980s instream flow study information, as well as more recent studies, to evaluate the applicability and to augment the current study.	Section 8.6.3.1.	USFWS Study Request objective substantially incorporated into study plan.
10.3.1: Select and design study sites in coordination with the Riparian Habitat, Groundwater, Aquatic Instream Flow, Fluvial Geomorphology, Geomorphology, and Ice Processes Studies.	Section 8.6.3.2.	USFWS Study Request objective substantially incorporated into study plan.
10.3.1: Characterize seed dispersal timing for dominant riparian species, water-level regime required for establishment, and frequency of establishment, and then use GIS to predict the areal extent of potential plant community change resulting from project operations.	Sections 8.6.3.3 and 8.6.3.7.	USFWS Study Request objective substantially incorporated into study plan.
10.3.1: Characterize the role of river ice on the establishment, survival and recruitment of dominant riparian species, and then use GIS to predict the areal extent of potential plant community change resulting from project operations.	Section 8.6.3.4.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
10.3.1: Characterize the role of sediment deposition from overbank flooding on the formation of floodplain and riparian soils that may be required for normal plant community succession, and then use GIS to predict the areal extent of potential plant community change resulting from project operations.	Sections 8.6.3.5 and 8.6.3.7.	USFWS Study Request objective substantially incorporated into study plan.
10.3.1: Characterize the water-level regime (surface and groundwater) required to maintain floodplain and riparian plant communities, and then use GIS to predict the areal extent of potential plant community change resulting from project operations.	Sections 8.6.3.6 and 8.6.3.7.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
10.3.6.1: Synthesize Historical Physical and Biological Data for Susitna River Floodplain and Riparian Vegetation, Including the 1980s Studies and Other Hydro Projects that May Provide Insights for Project Operation.	Section 8.6.3.1.	USFWS Study Request methodology substantially incorporated into study plan.
10.3.6.2: Select and Design Study Sites.	Section 8.6.3.2.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
10.3.6.3: Characterize Seed Dispersal Timing, Water-Level Regime Required for Establishment, and Frequency of Establishment, and then Predict Potential Plant Community Change Resulting from Project Operations.	Sections 8.6.3.3 and 8.6.3.7.	USFWS Study Request methodology substantially incorporated into study plan.
10.3.6.4: Characterize the Role of River Ice in the Establishment and Recruitment of Dominant Riparian Species, and then Predict Potential Plant Community Change Resulting from Project Operations.	Sections 8.6.3.4 and 8.6.3.7.	USFWS Study Request methodology substantially incorporated into study plan.
10.3.6.5: Characterize the Role of Sediment Deposition in the Formation of Floodplain and Riparian Soils, and then Predict Potential Plant Community Change Resulting from Project Operations.	Sections 8.6.3.5, 8.6.3.7 and 11.6.4.2.	USFWS Study Request methodology substantially incorporated into study plan.
10.3.6.6: Characterize the Water-Level Regime Required to Maintain Floodplain and Riparian Plant Communities, and then Predict Potential Plant Community Change Resulting from Project Operations.	Sections 8.6.3.6 and 8.6.3.7.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 11:
River Productivity Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
11.3.1: Develop a white paper on the impacts of hydropower development and operations (including temperature and turbidity) on benthic macroinvertebrate and algal communities in cold climates.	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan.
11.3.1: Characterize the pre-project benthic macroinvertebrate and algal communities with regard to species composition and abundance in the lower, middle and upper Susitna River.	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan. See also AEA's response to comment RIVPRO-26.
11.3.1: Estimate drift of benthic macroinvertebrates in habitats within the lower, middle and upper Susitna River to assess food availability to juvenile and resident fishes.	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan. See also AEA's response to comment RIVPRO-26.
11.3.1: Conduct a trophic analysis to describe potential changes in the primary and secondary productivity of the riverine community following post-project construction and operation.	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan.
11.3.1: Generate habitat suitability criteria (HSC) for Susitna River benthic macroinvertebrate and algal habitats to predict potential change in these habitats downstream of proposed dam site.	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
11.3.1: Characterize the benthic macroinvertebrate compositions in the diets of representative fish species in relationship to their source (benthic or drift component).	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan.
11.3.1: Evaluate the feasibility of reference sites on the Talkeetna and Chulitna Rivers to monitor baseline productivity, pre- and post-construction.	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan.
11.3.1: Characterize organic matter resources (e.g., available for macroinvertebrate consumers) including coarse particulate organic matter, fine particulate organic matter, and suspended organic matter in the lower, middle, and upper Susitna River.	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan. See also AEA's response to comment RIVPRO-26.
11.3.1: Estimate benthic macroinvertebrate colonization rates in the middle and lower reaches to monitor baseline conditions and evaluate future changes to productivity in the Susitna River.	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
11.3.6: Review and summarize relevant literature, including 1980s Susitna River data.	Section 9.8.4.1.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
11.3.6: Review and summarize the potential effects of dams and hydropower operations, with an emphasis on comparably large hydroelectric projects in cold-weather climates	Section 9.8.4.1.	USFWS Study Request methodology substantially incorporated into study plan.
11.3.6: Sampling sites will be located in multiple locations above and below the proposed dam site (RM 184).	Section 9.8.4. Specific details regarding site locations, timing, sampling devices, processing, and analyses will be dependent upon the results of 2012 data collection efforts.	USFWS Study Request methodology substantially incorporated into study plan.
11.3.6: Sampling collections will be conducted in a variety of habitats (e.g., riffles and large woody debris) within mainstem, tributary confluences, side channels, and sloughs.	Section 9.8.4.2.1.	USFWS Study Request methodology substantially incorporated into study plan.
11.3.6: Sampling will be stratified by reach and mainstem habitat type defined in the project specific habitat classification scheme.	Section 9.8.4.2.1.	USFWS Study Request methodology substantially incorporated into study plan.
11.3.6: Sampling will occur in all study years in all seasons to capture seasonal community structure and productivity.	Section 9.8.4.2.1.	USFWS Study Request methodology substantially incorporated into study plan.
11.3.6: Efforts will be made to locate sampling sites at transects established by the instream flow team, in an attempt to correlate with additional environmental data (flow, substrates, temperature, water quality, riparian habitat, etc.) for statistical analyses, and HSC development.	Section 9.8.4.2.1: All stations established within the Middle River Segment will be located at Focus Areas established by the Instream Flow Study (Section 8.5.4.2.1.1.), in an attempt to correlate macroinvertebrate data with additional environmental data (flow, substrates, temperature, water quality, riparian habitat, etc.) for statistical analyses, and HSC/HSI development.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
11.3.6: Measurements of depth, mean water column velocity, and substrate composition will be taken concurrently with benthic macroinvertebrate sampling at each sample location for use in HSC development in the instream flow studies.	Section 9.8.4.6: describing the method for generating HSC for Susitna macroinvertebrate and algal habitats.	USFWS Study Request methodology substantially incorporated into study plan.
11.3.6: Investigate the ability of the river water quality model (Water Quality Modeling Study) to predict changes in primary productivity in the Susitna River with changes in turbidity and temperature.	Section 9.8.4.5.	USFWS Study Request methodology substantially incorporated into study plan.
11.3.6: Target fish species will be determined by consultation and coordination with fish distribution and abundance study teams (Fish Distribution and Abundance in the Middle and Lower Susitna River Study, Fish Distribution and Abundance in the Upper Susitna River Study, and/or Salmon Escapement Study teams).	Section 9.8.4.5.1.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 12:
Fish Passage Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
12.3.1: Site reconnaissance.	Section 9.11.4.	USFWS Study Request objective substantially incorporated into study plan.
12.3.1: Development of conceptual alternatives.	Section 9.11.4.	USFWS Study Request objective substantially incorporated into study plan.
12.3.1: Collection of baseline biological information site information.	Section 9.11.4.	USFWS Study Request objective substantially incorporated into study plan.
12.3.1: Collection of project operations information sufficient to determine the need to prescribe fish passage for the proposed project.	Section 9.11.4.	USFWS Study Request objective substantially incorporated into study plan.
12.3.1: USFWS recommends that fisheries surveys be conducted for at least one average life span of each salmon species, which is an average of 5 years for Chinook salmon (range to seven years).	No equivalent objective in RSP.	See AEA’s response to comment PASS-05.
12.3.1: Genetic samples from Chinook salmon should be collected from the mainstem and tributaries and analyzed to assess the population viability; and stock identification and separation.	9.14.1: Develop a repository of genetic samples for fish species captured within the Susitna River drainage, with an emphasis on those species found in the Middle and Upper Susitna River.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
12.3.6: Feasibility Planning for Fish Passage Facility Design.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
12.3.6: Fish Passage Feasibility Review Requirements - Design Development Phases: Conduct a reconnaissance study; 12.3.6: Conceptual alternatives study; Feasibility study; Preliminary design; Detailed design phase.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Functional requirements of the proposed fish passage facilities as related to all anticipated operations and flows. Describe median, maximum, and minimum monthly flow rates through the planned hydro facility, plus any special operations (e.g., use of flash boards, seasonal storage or drawdown etc.) that modify forebay or tailrace water surface elevations or mainstem flows. Identify proposed project operational information that may affect fish migration (e.g., powerhouse flow capacity, period of operation, etc.). Proposed mitigation for these operations to the aquatic biota should also be included.	Section 9.11.4: The review will allow the Fish Passage Technical Workgroup to become familiar with the operational, physical, hydrologic, and biological setting of the Watana Dam.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Site plan drawing showing potential location and layout of the proposed downstream and upstream passage facilities relative to planned project features facilities.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Topographic and bathymetric surveys, particularly where they might influence locating fishway entrances and exits, and personnel access to the site.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
12.3.6: Drawings showing elevations and a plan view of proposed flow diversion structures, including details showing the intake configuration, location, and capacity of project hydraulic features. This drawing should also clearly depict efforts to mitigate construction impacts; and any streams, lakes or waterways within the project construction footprint.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Basin hydrology information, including daily and monthly streamflow data and flow duration exceedence curves at the proposed fish passage facility site based on the entire available period of record. Where stream gage data are unavailable, or if a short period of record exists, appropriate synthetic methods of generating flow records may be used. Methodologies used to extrapolate a record should be noted as part of the required site information.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Project forebay and tailwater rating curves encompassing the entire operational range.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Predict river morphology trends.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Special sediment and/or debris problems. Describe conditions that may influence design of the fish passage facility, or present potential for significant problems, such as glacial silt loads, fault lines, permafrost or accretion flows.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
12.3.6: Provide other site-specific or species-specific information that will inform the fishway designs and operations.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Derive hydrographs showing daily maximum and minimum flows over the entire period of record for the proposed project area extrapolated for future projected change in hydrology.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Measure and document the longitudinal stream bed profile (feet per mile) and composition, including the river from its mouth to the proposed project site for each species listed above.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Identify each species and life stages to be passed downstream.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: For each downstream migrating species and life stage, estimate the start and end date (periodicity) of the downstream migration.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: For each downstream migrating species and life stage, determine the range of fish size, swimming ability (darting, sustained and cruising speeds) over the range of environmental conditions, run size, operational conditions and behavioral constraints to downstream fish passage.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
12.3.6: Derive the standard downstream fish passage design flows for the passage season by calculation of the 5% (high design flow for fish passage) and 95% (low design flow for fish passage) exceedence flows (based on daily average flows) for the downstream passage season for each species and life stage.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Identify each species and life stages to be passed upstream.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: For each annual upstream migrating species/life stage, determine the start and end date (periodicity) of the upstream migration.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: For each upstream migrating species and life stage, determine the range of fish size, swimming ability (darting, sustained and cruising speeds) over the range of environmental conditions, run size, operational conditions and behavioral constraints to upstream fish passage. Identify spawning location for each salmonid species present at the site.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Identify other anadromous species and their life stages that are present at the proposed project site that also require intermittent passage.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
12.3.6: Identify predatory species (avian, terrestrial, and aquatic) that may be present and prey on juvenile or adult anadromous species, and describe how the proposed project could affect populations or concentrations of these predators. This should include the invasive Northern pike.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: High and low design passage flow for periods of upstream fish passage.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Identify any known behavioral factors that might affect salmonid passage. For example, most salmonid species pass upstream through properly designed orifices, but other species that are unable to pass through orifices may impede salmonid passage.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Identify what is known and what needs to be researched about upstream and downstream fish migration routes approaching the proposed project.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Compile available information on the minimum and maximum streamflow that will allow upstream migration up to the proposed project.	No equivalent methodology in RSP.	Not Applicable. In the event that fish passage is determined to be feasible and necessary, Project operations and passage design can be tailored to facilitate collection.
12.3.6: Describe the degree of activity (fishing/bears/otters) in the area of the proposed project and the need for measures to reduce or eliminate fishing activity.	No equivalent methodology in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See also cover letter for further explanation.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
<p>12.3.6: Identify water quality factors that may affect fish passage at the site. For each species/life stage migration, estimate the start and end date (periodicity) of the migration and assess the potential variation in migration season based on environmental factors (e.g. Changes in water temperature, impoundment effects, forebay delay, water temperature (average and reservoir profile), egg hatch timing, dissolved oxygen, low river flow, high river flow etc.).</p>	<p>Section 9.11.4.</p>	<p>USFWS Study Request methodology substantially incorporated into study plan.</p>
<p>12.3.6: A proposed construction schedule is necessary to allow conservation recommendations for biological sensitivities such as eggs in the gravel, migration timing, nesting birds, calving and other sensitive life stages of the fish and wildlife resources of the Susitna River basin.</p>	<p>No equivalent methodology in RSP.</p>	<p>Development of a construction schedule is not a methodology in AEA’s study proposed, but AEA’s study has been designed to collect necessary information to evaluate Project-related effects of construction. The effects analysis, together with any proposed PM&E measures, will be undertaken as part of AEA’s preparation of its License Application.</p>
<p>12.3.6: Assessment of Operational Impacts on Fish Passage for the proposed project will require the following project-specific information: forebay rating curve; tailwater rating curve; turbines; draft tube velocity; sediment capacity; reservoir hydraulics; flow continuation; upstream passage flows downstream of the project.</p>	<p>Section 9.11.4.</p>	<p>USFWS Study Request methodology substantially incorporated into study plan.</p>

Requested Study Methodologies	RSP Equivalent	AEA Explanation
12.3.6: Describe range of forebay fluctuation, relative to preliminary plans for power operations.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Describe range daily tailrace fluctuation, relative to preliminary plans for power operations.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: Describe river ramping rates, relative to preliminary plans for power operations.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: General layout of planned hydro project. Include dam layout (in plan, elevation and typical cross sections), flow direction (for the entire operational scenario), powerhouse location, spillway location, top, submerged spill routes (include longitudinal profile and cross sections of conveyance structures) and any appurtenant structures.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.
12.3.6: General operating plan. Identify expected power production on an annual basis, based on the expected water use for power production and spill. For the spillway, derive from flow records the expected frequency, duration and seasonal occurrence of spill. For the powerhouse, derive the hourly and seasonal operation schedule, in terms of flow used for power production. For the reservoir, based on the expected operation schedule, identify daily and seasonal changes in storage.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
12.3.6: Describe design capacities for hydraulic conveyance structures.	Section 9.11.4.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 13:
Early Life History and Juvenile Fish Distribution and Abundance in the Susitna River**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
13.3.1: Determine the seasonal distribution, relative abundance (as determined by CPUE, fish density, and counts), and fish-habitat associations of juvenile anadromous and juvenile resident fish species in the mainstem Susitna River (side channel, slough, backwater, and tributary confluence habitats).	Sections 9.5.1 and 9.6.1.	USFWS Study Request objective substantially incorporated into study plan.
13.3.1: Describe the seasonal movements and migratory patterns of juvenile anadromous and resident fish species among mainstem habitats and between tributaries and mainstem habitats with emphasis on identifying foraging and overwintering habitats.	Sections 9.5.1 and 9.6.1.	USFWS Study Request objective substantially incorporated into study plan.
13.3.1: Document the timing of downstream movement of all juvenile fish species and outmigration for anadromous salmon.	Sections 9.5.1 and 9.6.1.	USFWS Study Request objective substantially incorporated into study plan.
13.3.1: Document the age structure, growth, and condition of juvenile anadromous and juvenile resident fish by season.	Sections 9.5.1 and 9.6.1.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
13.3.1: Collect and analyze tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Analysis study.	Sections 9.5.1, 9.6.1 and 9.14.	USFWS Study Request objective substantially incorporated into study plan.
13.3.1: Collect and provide the Instream Flow study with habitat suitability criteria (HSC) data to support analysis of potential project impacts.	Section 8.5.1.2.	USFWS Study Request objective substantially incorporated into study plan.
13.3.1: Evaluate salmon incubation (embryo development, hatching success, and emergence times) and associated water quality conditions (e.g., temperature, DO, pH) at existing spawning habitats (slough, side channel, tributary, and mainstem) in areas with and without groundwater upwelling in the middle and lower reaches of the Susitna River.	Sections 8.5.1.2 and 9.6.1, except AEA's study plan does not include evaluation of embryo development and hatching success.	See AEA's response to comment FDAML-87, RSP Appendix 1.
13.3.1: Evaluate the potential for stranding of juvenile fish and stranding mortality by season under proposed operational conditions.	Sections 8.5.4.5.1.2.2, 8.5.4.6.1.1.4 and 8.5.4.6.1.6.1.	USFWS Study Request objective substantially incorporated into study plan.
13.3.1: Measure intragravel water temperature in spawning habitats and winter juvenile fish habitats at different surface elevations and different depths to determine the potential for freezing of redds, freezing of juvenile fish, and their habitats.	Section 8.5.1.2.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
13.3.5: Collect data using standard sampling techniques (e.g., electrofishing, snorkeling, minnow trapping, and seining) by season. For winter sampling may also use PIT tag arrays, video systems, or both.	Sections 9.5.1, 9.5.4.3.1, 9.5.4.4 and 9.6.4.3.1.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Estimate and compare the relative abundance of juvenile salmon within and across mainstem habitats by season.	<p>Sections 9.5.4.3.1 and 9.6.4.3.1: Relative abundance surveys will include seasonal multi-pass sampling events during the ice-free seasons. As mentioned above, methods will be selected based on species, life stage, and water conditions.</p> <p>Section 9.7.4.5: A comparison will be made of results from 2012–2014 studies to the historical results that characterized the relative abundance, locations of spawning and holding salmon, and use of mainstem, side channel, slough, and tributary habitat types by adult salmon.</p>	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Determine the seasonal use and movement patterns of marked/tagged juvenile fish between mainstem habitats strategically selected based on an appropriate sampling strategy (i.e., systematic, random, or stratified random design).	Sections 9.5.4.1 and 9.6.4.1.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
13.3.5: Estimate juvenile salmon production of the Susitna River at selected sites.	No equivalent methodology in RSP.	AEA will not be collecting data to generate population estimates necessary for determining salmon production. At request of USFWS, AEA agreed to eliminate population estimates in order to expand the number of sampling sites by collecting only relative abundance and present-absence data. See AEA's response to comment FDAML-54, RSP Appendix 1.
13.3.5: Determine the relative timing, distribution, and abundance of juvenile salmon in mainstem habitats and compare to historical data.	Sections 9.5.4.3.1 and 9.6.4.3.1.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Determine the distribution, and abundance of juvenile salmon in mainstem and tributary habitats upstream of the proposed Watana Dam site during open water (May through October).	Sections 9.5.4.3.1.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Use systematic scheme for sampling across habitat types by season and randomize selection of habitat units to sample.	Sections 9.5.4.1 and 9.6.4.1.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Build upon and use, as appropriate, the 1980s data applicable to non-salmon anadromous, resident, and invasive fish species.	Sections 9.5.4.3 and 9.6.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Establish a seasonal sampling design that includes turbid and clearwater sampling for these species (as appropriate).	Section 9.6.4.2.	AEA is not specifically targeting turbid and clear water, but AEA anticipates that, by monthly sampling side-channel and sloughs, AEA will be sampling under turbid and clear water conditions.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
13.3.5: Sample fish species using appropriate methods for the habitat and season (electrofishing, snorkeling, seining, minnow trapping) in the main channel, side channels, sloughs, and tributary mouths.	Sections 9.5.4.4 and 9.6.4.4.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Develop life stage specific periodicity information for the middle and lower reach in support of the Instream Flow Study.	Sections 9.5.4.3 and 9.6.4.3: Preparation of periodicity charts for each species within the study area (timing of adult migration, holding, and spawning; timing of incubation, rearing, and out-migration).	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Collect additional data to support efforts to determine the timing, distribution, and relative abundance of eulachon in the lower reach of the Susitna River.	Section 9.16.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Coordinate with other Project studies as appropriate (e.g., fish and physical characteristics of the river).	Sections 9.5.7 and 9.6.7.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Coordinate with the Synthesis of Existing Fish Population Data Study to summarize and obtain the 1980s study data applicable to juvenile salmon, non-salmon anadromous, resident and invasive fish species.	Sections 9.5.4.3 and 9.6.4.3.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
13.3.5: Use PIT tag antenna arrays near the mouths of select tributaries and sloughs or other mainstem habitats to determine seasonal habitat utilization (mainstem vs. tributary/slough) and movements of targeted fish species in the reach between the Deshka River and the Watana Dam site.	Sections 9.5.4.4.12 and 9.6.4.4.12.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Collect, radio tag, and track fish from selected species. Tag sizes will be chosen to maximize tag life within the constraints of the study fish size. Tracking duration will be determined based on the anticipated life span of the tags chosen.	Sections 9.5.4.4.12 and 9.6.4.4.12.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Operate PIT arrays at strategic side channels, sloughs, or other mainstem habitats, and the confluence of tributaries to allow for tracking of individual fish among mainstem habitats.	Sections 9.5.4.4.12 and 9.6.4.4.12.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Use data from inclined plane, rotary screw traps, or both, in the mainstem to determine the timing of all salmon species emigrating from the upper reach (i.e., Watana Dam site) and from the middle reach of the Susitna River.	Sections 9.5.4.4.10 and 9.6.4.4.10.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Collect fish length and weight data during seasonal fish surveys in Objectives 1 and 3.	Sections 9.5.4 and 9.6.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
13.3.5: Collect fish length and weight data from fish recaptured with PIT tags during seasonal fish surveys in individual to determine individual fish growth rates by season.	Section 9.5.4.4.12 and 9.6.4.4.12.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Use fish length and weight data to calculate fish condition by season and possibly habitat (e.g., in areas with and without groundwater upwelling).	Sections 9.5.4.3.1, 9.5.4.3.3, 9.6.4.3.1 and 9.5.4.3.3.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Coordinate with the Genetic Analysis study to identify the appropriate target species and genetic sampling protocols to opportunistically collect genetic tissue samples from resident species.	Sections 9.5.4.3.7 and 9.6.4.3.7: In support of the Genetic Baseline Study for Selected Fish Species (Section 9.14), fish tissues will be collected opportunistically in conjunction with all fish capture events.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Coordinate with the Genetic Study to identify the appropriate target species, sampling locations, number of samples per species, and genetic sampling protocols to collect sufficient genetic samples from juvenile salmon.	Sections 9.5.4.3.7 and 9.6.4.3.7.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
13.3.5: Systematic surveys will include collection of data for input parameters to IFIM analyses. Specifically, data will include species, length, location in the water column (distance from the bottom), substrate use classification, proximity/affinity to habitat structure/cover features (e.g., boulder, undercut bank, overhanging vegetation, large woody debris), water depth, mean column velocity, water temperature, and relevant comments pertaining to cover associations and/or behavioral characteristics of the fish observed.	Section 8.5.1.2.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Use modified Whitlock-Vibert boxes or similar methodology to monitor egg development, hatching success, and emergence times in areas with and without groundwater upwelling. Consider using approved hatchery fish source or fish spawned in the field.	Sections 8.5.4.5.1.1.5 and 9.6.1, except AEA's study plan does not include evaluation of embryo development and hatching success.	See AEA's response to comment FDAML-87, RSP Appendix 1.
13.3.5: Use siphons to monitor egg development and emergence in naturally occurring salmon spawning areas.	Sections 8.5.4.5.1.1.5 and 9.6.1, except AEA's study plan does not include evaluation of embryo development and hatching success.	See AEA's response to comment FDAML-87, RSP Appendix 1.
13.3.5: Assess egg development and survival of embryos: one potential method could include creating artificial redds and burying egg tubes in known spawning habitats.	Sections 8.5.4.5.1.1.5 and 9.6.1, except AEA's study plan does not include evaluation of embryo development and hatching success.	See AEA's response to comment FDAML-87, RSP Appendix 1.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
13.3.5: Monitor water quality parameters such as temperature and dissolved oxygen in spawning gravels and redds.	Sections 8.5.4.5.1.1.5 and 8.5.4.5.1.2.1.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Refine and use methods similar to those used in the 1980s, or use other methodologies, to evaluate embryo development, hatching success, and emergence times.	Sections 8.5.4.5.1.1.5 and 9.6.1, except AEA's study plan does not include evaluation of embryo development and hatching success.	See AEA's response to comment FDAML-87, RSP Appendix 1.
13.3.5: Use or consider other potential methods to determine or estimate fry emergence times (e.g., incline plane traps, fry emergence traps), as appropriate.	Sections 8.5.4.5.1.1.5, 9.6.1, and 9.6.4.3.3, except AEA's study plan does not include evaluation of embryo development and hatching success.	See AEA's response to comment FDAML-87, RSP Appendix 1.
13.3.5: Monitor range and peak of emergence times and by time of day.	No equivalent methodology in RSP.	The method is not useful in assessing potential Project effects because the scale of this method is too fine and is influenced by variable site-specific conditions.
13.3.5: Identify habitats occupied by juvenile fish (<50 mm in length) using the distribution and abundance information obtained from Objectives 1 and 2.	Section 9.6.4.3.3. Section 9.5.4.1 and 9.6.4.1: Fish distribution sampling will occur at Focus Areas and at representative habitat units to identify seasonal timing, size, and distribution among habitat types for fish (particularly < 50 mm).	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Monitor juvenile fish activity by season and time of day to determine periods of activity and inactivity (e.g., when using cover, interstices of gravel).	Section 9.6.4.3.3.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
13.3.5: Collect habitat slope information from habitats occupied by juvenile fish (<50 mm) and identify habitats most vulnerable to stranding.	Section 8.5.4.5.1.2.2.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Collect daily and seasonal information on natural ramping rates and document occurrence and conditions of naturally occurring stranding.	Section 8.5.4.5.1.2.2.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Incorporate other appropriate strategies to estimate potential stranding and stranding mortality.	Section 8.5.4.5.1.2.2.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Collect intragravel temperature profile information in spawning gravels and winter juvenile fish habitats using a string of thermistors (or similar methodology) located at different depths in the gravel across a channel from the gravel surface to various depths to get a temperature profile.	Section 8.5.1.2.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Collect surface elevation information from naturally occurring redd locations.	Section 8.5.1.2.	USFWS Study Request methodology substantially incorporated into study plan.
13.3.5: Use information to model the varial zone and link to flow routing model.	Section 8.5.4.6.1.6, 8.5.4.6.1.1.4 and 8.5.4.6.1.6.1.	USFWS Study Request methodology substantially incorporated into study plan.

USFWS Study Request Enclosure No. 14:

Adult and Juvenile Non-Salmon Anadromous, Resident and Invasive Fish Studies in the Susitna River Basin (RM 0 - RM 233)

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
<p>14.3.1: Characterize the seasonal (spring, summer, fall, winter) distribution, relative abundance, and habitat utilization in the Susitna River mainstem (RM 0-RM 233) for all life stages of non-salmon anadromous, resident, and invasive fish species. [Documenting both hierarchal nested habitat type and use-type as described in the resource agency Instream Flow Study and Habitat Utilization Study Request].</p>	<p>Section 9.5.1 and 9.6.3, except limited to upper reach of the Lower River, Middle River, and Upper River segments.</p> <p>Section 9.16.</p>	<p>See AEA’s response to comment FDAML-01.</p>
<p>14.3.1: Characterize the seasonal (spring, summer, fall and winter) movement patterns of all subject fish species and life stages as they relate to foraging, spawning, rearing and overwintering habitats. The characterization of seasonal movements includes run timing (immigration and emigration) and extent (periodicity) of non-salmon anadromous species in the Susitna River (RM 0-RM 233) and movement into and out of tributary streams. [Interface with resource agency Instream Flow and Habitat Utilization Study Request hierarchal nested habitat types and habitat mapping].</p>	<p>Section 9.5.1 and 9.6.1, except limited to upper reach of the Lower River, Middle River, and Upper River segments.</p>	<p>See AEA’s response to comment FDAML-01.</p>

Requested Study Objectives	RSP Equivalent	AEA Explanation
14.3.1: Characterize the flow-related or synchronized life history strategies (migration, movement, spawning, rearing, hatching, emergence) of non-salmon anadromous, resident and invasive species, and their biological behavioral response (e.g., potential for false attraction, delayed migration or increased holding time, synchrony of spawning, relative hatching and emergence timing) to Project-affected flow alterations (flow, temperature, habitat, water quality).	Sections 8.5, 9.5.1 and 9.6.1 characterize life history strategy and habitat use of all target species.	See AEA's response to comment FISH-06.
14.3.1: Synthesize existing resource data, results and information from 1980's Susitna Hydroelectric studies, and other relevant literature to determine applicability and utility of results and information to the currently proposed project.	Sections 9.5.1 and 9.6.1.	USFWS Study Request objective substantially incorporated into study plan.
14.3.1: Collect tissue samples from all resident and non-salmon anadromous fish species for genetic population structure database and future stock identification analysis. This is particularly important for salmon species, anadromous lamprey, and Bering cisco of the Susitna River drainage.	Sections 9.5.1 and 9.6.1.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
14.3.1: Characterize trophic interactions using seasonal diets (stomach content analysis) of all age classes of non-salmon anadromous, resident and invasive fish species. [Interface with the productivity study, riparian, and instream flow study requests]	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan.
14.3.1: Quantify the relative contribution (biomass) of marine-derived nutrients to the ecology of the Susitna River from adult returns of non-salmon anadromous fish species (e. g., Pacific and Arctic lamprey, eulachon, Bering cisco).	Section 9.8.1.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Fish distribution surveys should use the hierarchal nesting of habitats described in the resource agency’s Instream Flow and Habitat Utilization Study Request to document and describe habitat types.	Sections 9.5.4.1 and 9.6.4.1.	USFWS Study Request methodology substantially incorporated into study plan.
1.3.6: The distribution and movement patterns of these fish should be characterized using remote tagging techniques, such as telemetry and pit-tagging.	Sections 9.5.4.4.12 and 9.6.4.4.12.	USFWS Study Request methodology substantially incorporated into study plan.
1.3.6: Relative abundances should be developed using weirs, mark-recapture, netting or trapping in combination with scientifically sound statistical analysis.	Sections 9.5.4.4, 9.6.4.4 and 9.7.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: A minimum of two years of baseline assessment of gear types, including that for winter sampling is necessary before valid fish distribution or habitat use data can be collected.	No equivalent methodology in RSP.	A minimum of two years of baseline assessment of gear types is not needed to meet the goals and objectives of the study plan. See Sections 9.5.5 and 9.6.5.
1.3.6: Electro-fishing, trap netting, gill netting, and telemetry studies are widely accepted methods for sampling and observing behavior and habitat selection of fish populations in stream, river and reservoir habitats.	Sections 9.5.4.4 and 9.6.4.4.	USFWS Study Request methodology substantially incorporated into study plan.
1.3.6: Seasonal representative stomach content samples of all species should be collected using current scientific methodologies and protocols for a quantitative analysis.	Section 9.5.4.4.11 and 9.6.4.4.14: A total of eight fish per target species/age class per sampling site collection will be sampled for fish stomach contents, using non-lethal methods (described in Section 9.8.4.7). Section 9.8.4.7: Characterize the invertebrate compositions in the diets of representative fish species in relationship to their source (benthic or drift component).	USFWS Study Request methodology substantially incorporated into study plan.
1.3.6: All data generated during this study will be incorporated into a geospatially-referenced relational database.	Generally incorporated into all applicable studies.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 15:
Adult Salmon Distribution, Abundance, Habitat Utilization and Escapement in the Susitna River**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
15.3.1: Capture, radio tag and track adults of the five species of Pacific salmon in proportion to their abundance.	Section 9.7.1.2.	USFWS Study Request objective substantially incorporated into study plan.
15.3.1: Determine the migration behavior and spawning locations of radio-tagged fish in the lower, middle, and upper Susitna River.	Section 9.7.1.2.	USFWS Study Request objective substantially incorporated into study plan.
15.3.1: Characterize adult salmon migration behavior and run timing within and above Devils Canyon.	Section 9.7.1.2.	USFWS Study Request objective substantially incorporated into study plan.
15.3.1: If shown to be an effective sampling method during the 2012 study, and where feasible, use sonar to document salmon spawning locations in turbid water.	Section 9.7.4.3.7: Depending on the results of the feasibility study, a combination of DIDSON and high resolution side-scan sonar may be used in turbid-water spawning areas to search for and map any spawning activity.	USFWS Study Request objective substantially incorporated into study plan.
15.3.1: Compare historical and current data on run timing, distribution, relative abundance, and specific locations of spawning and holding salmon.	Section 9.7.1.2.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
15.3.1: Estimate escapement of adult salmon spawning by mainstem reaches and tributaries.	Section 9.7.1.2: Estimate the system-wide Chinook salmon escapement to the entire Susitna River, the coho salmon escapement to the Susitna River above the its confluence with the Yentna River, and the distribution of Chinook, coho, and pink salmon among tributaries of the Susitna River (upstream of Yentna River confluence) in 2013 and 2014.	USFWS Study Request objective substantially incorporated into study plan.
15.3.1: Collect tissue samples to support the Genetic Analysis Study.	Section 9.7.1.2: Collect tissue samples to support the Fish Genetic Baseline Study (Section 9.14). Sections 9.5.1, 9.5.4.3.7 and 9.6.1: Collect tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Baseline Study (Section 9.14, which includes a dedicated and focused sampling effort to collect salmon and resident fish tissues).	USFWS Study Request objective substantially incorporated into study plan.
15.3.1: Determine system-wide Susitna River escapement and run apportionment.	Section 9.7.1.2, by developing Chinook and coho salmon system and river-wide escapement estimates in 2013 and 2014. These will be added to and build upon the system-wide estimates developed in recent years for all other species except pink salmon.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
15.3.1: Determine the availability and accessibility of spawning habitats by adult salmon to mainstem and tributary locations based upon flow regime.	Sections 9.12 and 8.5.4.6.1.2.3.	USFWS Study Request objective substantially incorporated into study plan.
15.3.1: Measure critical habitat characteristics (e.g., channel type, flow, substrate, and groundwater) at reaches used for spawning and compare these characteristics with those in adjacent reaches that do not contain spawning adults.	Section 8.5.4.5.1.1.5.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
15.3.5: Install and operate fishwheels continuously from early June to early September each year of the study.	Section 9.7.4.1.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Radio-tag approximately 400 Chinook salmon and 200 chum, sockeye, pink, and coho salmon.	Section 9.7.4.1.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Assess the degree to which radio-tagged fish are representative of all salmon in the lower, middle and upper river (e.g., test for size selectivity, compare mark rates among spawning areas, surveys to count live and dead fish in a selected tributary such as Portage Creek).	Section 9.7.4.1.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
15.3.5: Evaluate the potential for handling-induced changes in fish behavior based on the post-release survival and migration rates of radio-tagged fish released.	Section 9.7.4.2.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Track the locations and behavior of radio-tagged fish using an array of fixed-station receivers and mobile-tracking surveys. Aerial surveys are anticipated to begin in July and end in early October each year.	Section 9.7.4.2.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Conduct boat- and ground-based surveys to locate holding and spawning salmon to the level of microhabitat use.	Section 9.7.4.2.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Establish an array of fixed-station receivers at and above Devils Canyon to monitor the behavior of radio-tagged fish from approximately early June to October each year.	Section 9.7.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Conduct aerial surveys of the upper river to locate tagged and other salmon.	Sections 9.7.4.3 and 9.7.4.1.5.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Locate spawning and holding salmon upstream of Devils Canyon.	Section 9.7.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Based on 2012 pilot study results use side-scan and/or DIDSON to determine salmon spawning locations in turbid water.	Section 9.7.4.3.7.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
15.3.5: Compare results from current studies to historical results that characterized the relative abundance, locations of spawning and holding salmon, and use of mainstem, sidechannel, slough, and tributary habitat types by adult salmon.	Section 9.7.4.5.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Conduct aerial adult salmon spawning surveys in each study year, replicating methods developed during 2012. Multiple surveys will be flown bracketing the peak timing of spawning. The survey effort will be coordinated with the adult salmon radio telemetry effort for all tagged salmon tracked above Devils Canyon.	Sections 9.7.4.2.2 and 9.7.4.1.5.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Collect genetic samples opportunistically for adult salmon in conjunction with Objectives 1 and 2. Sample collections will be coordinated with the Genetic Analysis Study team.	Section 9.7.4.7.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Evaluate use of genetic samples for all five salmon species to estimate proportion of salmon produced upstream of Devil's Canyon and in tributaries.	Section 9.14.4.7.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Determine adult salmon distribution and abundance.	Sections 9.7.4.5, 9.7.4.6 and 9.7.4.8.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Quantify proportion of salmon that spawn upstream of the 3-rivers confluence, and the proportion that spawn upstream of Devils Canyon.	Sections 9.7.4.5 and 9.7.5.6.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
15.3.5: Identify potential barriers to salmon spawning habitats by species.	2012 Salmon Escapement and Upper Susitna River Fish Distribution and Habitat Study efforts began to address this objective (Sections 9.5.6 and 9.7.4). Additional data will be collected during 2013 and 2014 pursuant to Sections 9.12.1 and 9.9.4.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Determine flows needed for salmon access to tributaries and mainstem spawning habitats (e.g., sloughs and side channels).	Sections 9.12.4 and 8.5.4.6.1.2.3.	USFWS Study Request methodology substantially incorporated into study plan.
15.3.5: Estimate the available spawning habitat for all salmon species (Chinook, coho, chum, pink, and sockeye) in the mainstem Susitna River in all reaches.	No equivalent methodology in RSP.	Although AEA is not quantifying available habitat, AEA will, through instream flow modeling, quantify flow-habitat relationships for spawning habitat and will address potential project effects to that habitat. See Section 8.5.

**USFWS Study Request Enclosure No. 16:
Susitna River Instream Flow and Habitat Utilization Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
16.3.1: Characterize the natural flow regime of the Susitna River and tributaries in the project area (RM 0-RM 233) from the available USGS gage records, routing data and models, and other available data.	Section 8.5.4.4.	USFWS Study Request objective substantially incorporated into study plan.
16.3.1: Identify, characterize, and integrate the timing, quantity and function of instream flow on riverine processes (Poff et al. 1996; Bragg et al. 2005; Schmidt et al. 2004; Assani 2007): geomorphology; floodplain, riparian form and vegetation; biological cues; water quality; surface/ groundwater exchange; riverine habitat availability and quality, etc.	Section 8.5.4.7 and 8.5.4.8.	USFWS Study Request objective substantially incorporated into study plan.
16.3.1: Identify, characterize, and quantify the seasonal (time) and spatial distribution of all fish species and life-stages within the defined habitat delineations of the Susitna River and floodplain.	Section 9.6.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
16.3.1: Characterize the site specific conditions of macro-, meso- and microhabitat types by all fish species and life stages. This characterization should describe (quantify) the factors (flow, water quality, structure, groundwater exchange, icing effects, temporal changes) that control habitat suitability and utility.	Section 8.5.1.2.	USFWS Study Request objective substantially incorporated into study plan.
16.3.1: Identify instream habitat models and study sites.	Sections 8.5.4.6 and 8.5.4.2.1.2.	USFWS Study Request objective substantially incorporated into study plan.
16.3.1: Develop a modeling frame work to integrate results from this and other Project studies and model results including all riverine functions, and to assess the temporal and spatial relationships between instream flow and riverine and biologic functions.	Sections 8.5.4.1 and 8.6.3.7.	USFWS Study Request objective substantially incorporated into study plan.
16.3.1: Compare temporal and spatial analysis of riverine process studies and model results for a range of alternative operations and project alternatives.	Sections 8.5.4.7 and 8.6.3.7.	USFWS Study Request objective substantially incorporated into study plan.
16.3.1: Provide a comparative analysis of instream flows implemented at other large hydropower dams, particularly in arctic and sub-arctic environments around the world, and their effects on aquatic resources.	Section 8.6.3.1.	For RSP 8.5, although not expressly stated, AEA anticipates that is will consider existing information from other projects as part of its instream flow analysis.

Requested Study Objectives	RSP Equivalent	AEA Explanation
16.3.1: Establish a technical working group to (1) work on Objective 6, above, and (2) develop evaluations of alternative instream flow regimes for the proposed project and a consensus on impacts from alternative operation flows.	Section 8.5.4.1.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
16.3.6: Review of existing information from the 1980s Susitna Project and other northern region hydroelectric projects.	Sections 8.5.2.1 and 8.6.3.1.	USFWS Study Request methodology substantially incorporated into study plan.
16.3.6: Hydrologic regime characterization.	Sections 8.5.4.4 and 8.6.3.6.	USFWS Study Request methodology substantially incorporated into study plan.
16.3.6: Riverine habitat utilization.	Sections 8.5.4.7 and 8.6.3.7.	USFWS Study Request methodology substantially incorporated into study plan.
16.3.6: Hierarchal habitat nesting: meso- and microhabitat spatial and temporal characterization by riverine habitat type, species and life-stage.	Sections 8.5.4.2.1.1 and 8.6.3.2.	USFWS Study Request methodology substantially incorporated into study plan.
16.3.6: Characterization of flow dependent biologic cues.	Sections 8.5.4.5.1.3, 8.5.4.4.1.3 and 8.6.3.3.	USFWS Study Request methodology substantially incorporated into study plan.
16.3.6: Identification of HSC by statistical analysis of selected and unselected sites for each species and life stage.	Sections 8.5.4.5.1.1.7 and 8.5.4.5.1.1.8.	USFWS Study Request methodology substantially incorporated into study plan.
16.3.6: Identification of Instream Habitat Models and Study Sites.	Sections 8.5.4.6 and 8.5.4.2.1.2.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
16.3.6: Modeling and Analysis of Project operation effects on instream flow and riverine processes.	Sections 8.5.4.3.2, 8.5.4.6 and 8.6.3.7	USFWS Study Request methodology substantially incorporated into study plan.
16.3.6: Model output coordination.	Sections 8.5.4.7, 8.5.4.8 and 8.6.3.7.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request No. 17:
Groundwater-Related Aquatic and Floodplain Habitat Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
17.3.1: Synthesize historical data for Susitna River groundwater and groundwater-dependent aquatic and floodplain habitat, including the 1980s studies.	Section 7.5.1.	USFWS Study Request objective substantially incorporated into study plan.
17.3.1: Use available information to characterize the large-scale geohydrologic processdomains/terrain of the Susitna River (e.g., geology, topography, geomorphology, regional aquifers, shallow ground water aquifers, surface-water / groundwater interactions).	Section 7.5.2.	USFWS Study Request objective substantially incorporated into study plan.
17.3.1: Assess the effect of Watana Dam/ Reservoir on groundwater and groundwater-related aquatic and floodplain habitat in the vicinity of the dam, and the downstream extent of the reservoir's influence on groundwater.	Section 7.5.3.	USFWS Study Request objective substantially incorporated into study plan.
17.3.1: Map groundwater influenced aquatic and floodplain habitat (e.g., upwelling areas, springs, groundwater-dependent wetlands).	Sections 5.5, 6.5, 7.5.4.4, 7.6, 8.5 and 8.6.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
17.3.1: Determine the surface-water / groundwater relationships of floodplain shallow alluvial aquifers at Riparian Instream Flow Study sites, including relationships with both the river and the adjacent uplands (e.g., gaining or losing stream).	Sections 7.5.4.5 and 8.6.3.6.	USFWS Study Request objective substantially incorporated into study plan.
17.3.1: Determine the surface-water / groundwater relationships of upwelling/downwelling at Aquatic Instream Flow Study sites in relation to spawning, incubation, and rearing habitat (particularly in the winter).	Sections 7.5.1, 7.5.4.6, 8.5.4.5.1.2, 8.5.4.6.1.4 and 8.5.4.6.1.5.	USFWS Study Request objective substantially incorporated into study plan.
17.3.1: Characterize water quality (e.g., temperature, DO, conductivity, nutrients) and age (i.e., indication of potential source) of representative upwelling areas where groundwater is a primary determinant of fish habitat (e.g., incubation and rearing in side channels and sloughs, upland sloughs).	Sections 7.5.1, 7.5.4.7, 8.5.4.5.1.2 and 8.5.4.6.1.5.	USFWS Study Request objective substantially incorporated into study plan.
17.3.1: Characterize how winter surface-water / groundwater interactions may differ from ice-free interactions for both the existing and the projected Project Susitna River flow regimes.	Section 7.5.4.8.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
17.3.6.1: Synthesize Historical Data for Susitna River Groundwater and Groundwater-Dependent Aquatic and Floodplain Habitat, Including the 1980s Studies and Other Hydro Projects that May Provide Insights for Project Operation.	Sections 7.5.4.1 and 8.6.3.1.	USFWS Study Request methodology substantially incorporated into study plan.
17.3.6.2: Characterize Large-scale Geohydrologic Process-Domains and Terrain of the Susitna River.	Section 7.5.4.2.	USFWS Study Request methodology substantially incorporated into study plan.
17.3.6.3: Assess the Effect of the Watana Dam / Reservoir on Downstream Groundwater and Groundwater-Related Aquatic and Floodplain Habitat.	Section 7.5.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
17.3.6.4: Map Groundwater Influenced Aquatic and Floodplain Habitat.	Section 7.5.4.4.	USFWS Study Request methodology substantially incorporated into study plan.
17.3.6.5: Model the Surface-water/ Groundwater Relationships of Floodplain Shallow Alluvial Aquifers at Riparian Instream Flow Study Sites.	Section 7.5.4.5 and 8.6.3.6.	USFWS Study Request methodology substantially incorporated into study plan.
17.3.6.6: Model Surface-water/ Groundwater Relationships of Upwelling/Downwelling at Aquatic Instream Flow Study Sites, including a characterization of water quality and seasonal variability between winter and ice-free conditions.	Sections 7.5.4.6, 7.5.4.8 and 7.5.4.8	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 18:
Water Quality Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
18.2: Summarize available data, build upon, and use as appropriate, the historical water quality data available for the study area.	Section 5.5.2.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Characterize and install new equipment for collection of stream temperature and meteorological data, to answer water balance and modeling questions.	Section 5.5.4.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Characterize surface water physical, chemical, and bacterial water quality conditions in the Susitna River within and downstream of the proposed project area, and determine the source(s) of parameters exceeding Alaska's water quality standards.	Section 5.5.4.4.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Document baseline mercury levels in the water column, and in sediment, macroinvertebrates, and fish from the project area and downstream.	Section 5.7.4, except that AEA is not sampling for mercury in macroinvertebrates.	See Section 5.7.4.2 and AEA's response to comment MERC-07.

Requested Study Objectives	RSP Equivalent	AEA Explanation
18.2: Gather information on the area to be flooded by the new reservoir, such as post-impoundment surface area, mercury content of underlying bedrock, type of soil flooded, and biomass quantity, in order to predict the amount of mercury input and degree of mercury methylation (i.e., bioavailable form) in the newly formed reservoir.	Section 5.7.4.2.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Use temperature distribution information from the thermal imaging assessment component of the Groundwater Study to supplement stream temperature data collection.	Section 5.5.4.9.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Evaluate the historical water temperature and other water quality modeling results, and determine the applicability of the past results to the currently proposed Project. Build upon those historical data as appropriate when developing an updated model for water quality.	Section 5.5.2.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Identify appropriate models for all phases of the water quality study, including reservoir and river water models for water quality parameters, mercury dynamics, and toxicity of trace elements to aquatic organisms.	Section 5.6.4.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
18.2: Model expected water quality conditions in the proposed Watana Reservoir, including (but not necessarily limited to) temperature, dissolved oxygen (DO), suspended sediment and turbidity, chlorophyll a, nutrients, metals, and ice formation and breakup (unless a separate ice dynamics model is used). Include temporal component that incorporates climate change effects.	Section 5.6.1.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Model expected water quality conditions in the Susitna River and representative tributaries downstream from the proposed Watana Dam, including (but not necessarily limited to) temperature, suspended sediment and turbidity, and ice processes (in coordination with the Ice Processes Study). Include temporal component that incorporates climate change effects.	Section 5.6.4.8.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Model mercury inputs into the reservoir, amounts of mercury methylation, uptake and biomagnification of methylmercury in reservoir organisms including concentrations at each trophic level, and transport of mercury downstream from the reservoir, from date of initial flooding until 20 years post-impoundment.	Sections 5.6.4.8, 5.7.4.2 and 5.6.4.4.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
18.2: Model changes in toxicity to aquatic organisms in the project area and downstream, due to changes in trace element concentrations, pH, hardness, dissolved organic carbon, and interactions between these parameters.	Sections 5.6.4.8 and 5.7.4.3.	USFWS Study Request objective substantially incorporated into study plan.
18.2: Coordinate study and model results with other study areas, including fish, instream flow, and piscivore risk studies.	Sections 5.5.11, 5.6.7 and 5.7.7.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
18.6.1: Summary of available and historic water quality information.	Sections 5.5.2 and 5.5.4.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.2: Water temperature data collection.	Section 5.5.4.1.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.3: Meteorological (MET) data collection.	Sections 5.5.4.2 and 5.5.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.4: Baseline water quality measurements.	Section 5.5.4.4.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.5: Metals (including mercury) in sediments in the project area.	Sections 5.5.4.4, 5.5.4.6 and 5.7.2.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.6: Aquatic macroinvertebrate and fish tissue samples for mercury analysis.	Section 5.5.4.7 and 5.7.4.2, except AEA is not sampling for mercury in macroinvertebrates.	See Section 5.7.4.2 and AEA's response to comment MERC-07.
18.6.7: Estimation of pre-impoundment surface area of reservoir to be flooded.	Section 5.7.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.8: Characterization of underlying geology, soil type and biomass amount in zone to be flooded.	Sections 5.7.4.2 and 5.7.4.3.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
18.6.9: Identify and quantify thermal refugia, including overwintering thermal refugia.	Section 5.5.4.9.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.10: Model water quality of the newly created reservoir.	Section 5.6.4.8.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.11: Model water quality of the main-stem river and representative tributaries downstream from the project.	Section 5.6.4.8.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.12: Model mercury inputs, methylation of mercury, and fish concentrations in newly flooded reservoir.	Sections 5.6.4.8 and 5.7.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
18.6.13: Model aquatic toxicology of waters of the reservoir, the main-stem river and representative tributaries downstream, taking into account interactions between water quality components such as hardness, pH, and metals mixtures.	Sections 5.5.4.6, 5.6.4.8 and 5.7.4.3.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 19:
Geomorphology Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
19.3.1: Characterize and map relic geomorphic forms from past glaciation, paleofloods and debris flow events.	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Characterize and map the geology of the Susitna River, identifying controlling features to channel and floodplain geomorphology.	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Characterize and map the fluvial geomorphology of the Susitna River.	Sections 6.5.1.1 and 6.6.4.1.2.9.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Describe and identify the primary geomorphic processes that create and influence mapped fluvial geomorphic features.	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Determine sediment supply and transport capacity in the Susitna River and associated tributaries, as well as lateral erosion potential.	Sections 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Evaluate geomorphic stability/change in the Middle and Lower reaches, including tributary confluences and deltas.	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Identify, delineate, and characterize riverine habitat types.	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Characterize the surface area versus flow relationships of riverine habitat types.	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
19.3.1: Assess large woody debris transport and recruitment, their influence on geomorphic forms and implications related to the Project.	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Evaluate and model the potential magnitude and trend of geomorphic response to the Project on downstream reaches.	Section 6.6.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Correlate geomorphic forms and processes to riverine habitat types and evaluate change to the habitat types related to the Project.	Sections 6.5.1.1 and 6.6.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Characterize the proposed Watana Reservoir geomorphology (changes resulting from conversion of the channel/ valley to a reservoir).	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Characterize geomorphic conditions at stream crossings along access road/transmission line alignments.	Section 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.
19.3.1: Coordinate with other Project studies, to inform overall Project design and recommendations for conservation of aquatic life.	Sections 6.6.1 and 6.5.1.1.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
19.3.6: Geologic and Paleo-Geomorphic Features Characterization.	Section 6.5.4.1.2.3.	USFWS Study Request methodology substantially incorporated into study plan.
19.3.6: Geomorphic Characterization of the River.	Section 6.5.4.1.2 and 6.6.4.1.2.9.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
19.3.6: Geomorphic Processes Identification and Characterization.	Sections 6.5.4.1.2.3, 6.5.4.11.3 and 6.6.4.1.2.8.2.	USFWS Study Request methodology substantially incorporated into study plan.
19.3.6: Sediment, Transport and Erosion Characterization and Analysis.	Sections 6.5.4.2.2, 6.5.4.3.2, 6.5.4.6.2.2 and 6.6.4.1.2.7.	USFWS Study Request Method accomplished, except AEA has not included tracer gravels studies to calibrate bed mobilization. See AEA's response to comment GEO-37, RSP Appendix 1.
19.3.6: Evaluation of Riverine Habitat.	Sections 6.5.4.5.2 and 6.5.4.7.2.	USFWS Study Request methodology substantially incorporated into study plan.
19.3.6: Evaluation of Stability and Change.	Sections 6.5.4.4.2, 6.5.4.5.2.3, 6.5.4.7.2.3, 6.5.4.7.2.4 and 6.5.4.7.2.5.	USFWS Study Request methodology substantially incorporated into study plan.
19.3.6: Modeling Magnitude and Trend of Geomorphic Response.	Sections 6.6.4.2.2, 6.6.4.3.2, 6.5.4.11.2 and 6.5.4.6.2.	USFWS Study Request methodology substantially incorporated into study plan.
19.3.6: Reservoir Geomorphic Effects Evaluation and Characterization.	Section 6.5.4.8.2.	USFWS Study Request methodology substantially incorporated into study plan.
19.3.6: Transportation Corridor Stream Crossings Geomorphic Characterization.	Section 6.5.4.10.2.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request No. 20:
Flow Routing Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
20.2.1: Instream flow collection for all seasons for the project area to characterize instream flow and develop a flow routing model.	Sections 8.5.1.2, 8.5.4.3, 7.6.1 and 7.6.4.3.	USFWS Study Request objective substantially incorporated into study plan.
20.2.1: Develop and calibrate an ice-free period flow routing model that is capable of modeling a range of operating conditions and scales (hourly, daily, weekly, seasonally).	Section 8.5.4.3.1.	USFWS Study Request objective substantially incorporated into study plan.
20.2.1: Develop and calibrate a winter flow routing model that incorporates ice effects, that is capable of modeling a range of operating conditions and scales (hourly, daily, weekly, seasonally).	Section 7.6.4.6.	USFWS Study Request objective substantially incorporated into study plan.
20.2.1: Inform and integrate with other studies the project operation effects on instream flow in the reservoir and downstream of the project.	Sections 8.5.4.3.2, 8.5.4.3.1 and 8.5.4.1.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
20.2.6: Stream Gages and Cross Section Data.	Sections 8.5.4.3, 8.5.4.4 and 7.6.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
20.2.6: Hydraulic Unsteady Flow Routing Models.	Sections 8.5.4.3 and 7.6.4.6.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
20.2.6: Making Model and Data available to other studies.	Sections 8.5.4.3.2.4 and 7.6.7.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 21:
Ice Processes in the Susitna River**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
21.3.1: Review and summarize existing cold-regions hydropower projects around the world and the effects of their operations on ice-covered rivers, as well as the potential implications to the current Project.	Sections 7.6.1 and 7.6.4.11.	USFWS Study Request objective substantially incorporated into study plan.
21.3.1: Document and map ice formation and break up processes in the project area.	Sections 7.6.1, 7.6.4.1 and 7.6.4.2.	USFWS Study Request objective substantially incorporated into study plan.
21.3.1: Characterize ice thickness and distribution.	Sections 7.6.1, and 7.6.4.3.	USFWS Study Request objective substantially incorporated into study plan.
21.3.1: Document and map open leads and determine the cause and if they are persistent.	Sections 7.6.1 and 7.6.4.2.	USFWS Study Request objective substantially incorporated into study plan.
21.3.1: Characterize ice processes and relationships to instream flow, geomorphology, riverine habitat, and water quality.	Sections 7.6.1, 7.6.4.6, 7.6.4.7, and 7.6.4.8.	USFWS Study Request objective substantially incorporated into study plan.
21.3.1: Model current ice processes in the Susitna River downstream of the proposed Watana Dam Site.	Sections 7.6.1 and 7.6.4.6.	USFWS Study Request objective substantially incorporated into study plan.
21.3.1: Link ice, temperature and routing models to predict changes to ice dynamics from operational changes to flow and temperature during filling of reservoir and post-Project.	Sections 7.6.1 and 7.6.4.7.	USFWS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
21.3.1: Provide ice processes data to flow routing, fisheries, in-stream flow, geomorphology, groundwater and riparian studies.	Sections 7.6.1, 7.6.4.7 and 7.6.4.8.	USFWS Study Request objective substantially incorporated into study plan.
21.3.1: Assist Water Quality Modeling Study with reservoir ice predictions.	Sections 5.6.4.8 and 5.6.7.	USFWS Study Request objective substantially incorporated into study plan.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
21.3.5: Review and summary of existing knowledge of hydropower effects on ice processes.	Section 7.6.4.11.	USFWS Study Request methodology substantially incorporated into study plan.
21.3.5: Observation, characterization, and mapping of breakup, freeze-up processes and open leads identification and mapping.	Sections 7.6.4.1 and 7.6.4.2.	USFWS Study Request methodology substantially incorporated into study plan.
21.3.5: Ice thickness measurements.	Section 7.6.4.3.	USFWS Study Request methodology substantially incorporated into study plan.
21.3.5: Ice process Modeling.	Sections 7.6.4.6, 7.6.4.7, and 7.6.4.8.	USFWS Study Request methodology substantially incorporated into study plan.
21.3.5: Inform other studies with relevant Ice process information.	Section 7.6.7.	USFWS Study Request methodology substantially incorporated into study plan.

**USFWS Study Request Enclosure No. 20:
Project Effects Under Changing Climate Conditions Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
22.3.1: To create a robust watershed model of the Susitna drainage that incorporates glacial effects and is calibrated to historic discharge information.	Section 7.7.1.	USFWS Study Request objective substantially incorporated into study plan.
22.3.1: To utilize localized, downscaled climate change information and the watershed model to project changes over the next 100 years, and to evaluate vulnerabilities of current fish, wildlife, and habitats to changing temperature and hydrologic regimes.	No equivalent objective in RSP.	See AEA’s responses to comments GLAC-4, GLAC-16 and GLAC-17, RSP Appendix 1.
22.3.1: To assess potential Project effects combined with impacts of climate change on the Susitna watershed ecosystem in order to condition the Project license in anticipation of these changes. Proposed Project operations will need to account for likely changes in precipitation and hydrology.	No equivalent objective in RSP.	See AEA’s responses to comments GLAC-4, GLAC-16 and GLAC-17, RSP Appendix 1.

22.3.5: Summarize and synthesize climate change projections and potential Project effects with other Project studies.	Section 7.7.7.	USFWS Study Request objective substantially incorporated into study plan, although AEA does not propose to study potential Project effects combined with impacts of climate change on the Susitna watershed ecosystem. See AEA's responses to comments GLAC-4, GLAC-16 and GLAC-17, RSP Appendix 1.
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Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
22.3.5: Review existing climate change literature relevant to South Central Alaska and the Susitna watershed to summarize the current understanding of the magnitudes of potential future systematic changes in long-term precipitation, snowpack and runoff, and their resulting impacts on water supply availability.	Section 7.7.4.4.	USFWS Study Request methodology substantially incorporated into study plan.
22.3.5: Model the watershed with glacial effects and calibrated to historical discharge data.	Section 7.7.4.	USFWS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
22.3.5: Analyze changes in glacial systems and their impacts on watershed hydrology.	Section 7.7.4.4.	USFWS Study Request methodology substantially incorporated into study plan. AEA proposes to focus the analysis on potential changes in sediment delivery to Watana Reservoir resulting from glacial surges. AEA does not propose to incorporate this information into any larger, overall climate change study.
22.3.5: Document trends in the historic record.	Section 7.7.4.	USFWS Study Request methodology substantially incorporated into study plan. AEA proposes to document trends in the historic record, but not in the context of a larger, overall climate change study.
22.3.5: Model the potential impacts of climate change on the Susitna watershed and ecosystems, including how anticipated seasonal, annual and long-term changes in temperature and precipitation can be expected to impact the efficiency, longevity and ecological impacts of the proposed hydropower Project and Project operations.	Section 7.7.4.	USFWS Study Request methodology substantially incorporated into study plan.
22.3.5: Develop projections for the range of hydrologic changes.	Section 7.7.2.2.	USFWS Study Request methodology substantially incorporated into study plan.
22.3.5: Assess environmental vulnerabilities to climate change based on documented methodologies, such as Bryant, 2009, and of using one of the many available climate change vulnerability assessment processes.	No equivalent methodology in RSP.	See AEA's responses to comment GLAC 4, GLAC-16, and GLAC-17.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
22.3.5: Assess potential Project effects combined with impacts of climate change on the Susitna watershed ecosystem in order to condition the Project license in anticipation of these changes.	No equivalent methodology in RSP.	See AEA’s responses to comment GLAC 4, GLAC-16, and GLAC-17.
22.3.5: Summarize potential climate change effects in a Climate Change Technical Report, in coordination with other Project studies and identify Project design and operational alternatives that can be used to develop mitigation for any adverse Project environmental effects.	Sections 7.7.4.5 and 7.7.7.	While AEA’s proposed methodology involves summarizing results in a technical report (Section 7.7.4.5), AEA does not propose to study potential Project effects combined with impacts of climate change on the Susitna watershed ecosystem. See AEA’s responses to comments GLAC-4, GLAC-16, GLAC-17, RSP Appendix 1.

ATTACHMENT 2

CROSSWALK TABLE BETWEEN

**NATIONAL MARINE FISHERIES SERVICE STUDY REQUESTS
(MAY 31, 2012)**

AND

**ALASKA ENERGY AUTHORITY REVISED STUDY PLAN
(DECEMBER 14, 2012)**

**CROSSWALK TABLE BETWEEN
NATIONAL MARINE FISHERIES SERVICE STUDY REQUESTS (MAY 31, 2012)
AND
ALASKA ENERGY AUTHORITY REVISED STUDY PLAN (DECEMBER 14, 2012)**

**NMFS Study Request Enclosure No. 3:
Fish Passage Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Determine the distribution of adult and juvenile Chinook salmon and relative abundance of juvenile Chinook salmon in the Susitna River and its tributaries above Devils Canyon for 2012.	2012 Salmon Escapement and Upper Susitna River Fish Distribution and Habitat Study efforts began to address this objective (Sections 9.5.6 and 9.7.4). Additional data will be collected during 2013 and 2014 pursuant to Sections 9.5.1, 9.6.1 and 9.7.1.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize aquatic habitat in the Susitna River and its tributaries/lakes from Devils Canyon upstream to and including the Oshetna River and determine its suitability for Chinook salmon.	Section 9.9.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Determine the fish species composition and relative abundance of all fish species within the reservoir inundation zone in 2012.	2012 Salmon Escapement and Upper Susitna River Fish Distribution and Habitat Study efforts began to address this objective (Sections 9.5.6 and 9.7.4). Additional data will be collected during 2013 and 2014 pursuant to Section 9.5.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize the type and amount of aquatic habitat within the reservoir inundation zone.	Section 9.9.2.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Identify the locations of potential fish barriers in tributaries between Devils Canyon and the Oshetna River.	2012 Salmon Escapement and Upper Susitna River Fish Distribution and Habitat Study efforts began to address this objective (Sections 9.5.6 and 9.7.4). Additional data will be collected during 2013 and 2014 pursuant to Section 9.12.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Collect genetic samples of Chinook salmon.	Section 9.14.1: Develop a repository of genetic samples for fish species captured within the Susitna River drainage, with an emphasis on those species found in the Middle and Upper Susitna River.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Assist in the development of the 2013-2014 study plans for resident and anadromous fish upstream of Devils Canyon.	No equivalent objective in RSP.	AEA has involved NMFS and other licensing participants in the development of study plans.
1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed protection, mitigation, and enhancement measures (PM&E measures). See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5: Feasibility Planning for Fish Passage Facility Design.	Section 9.11.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5: NMFS Fish Passage Feasibility Review Requirements - Design Development Phases.	Section 9.11.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5: Preliminary Design Development—Required Site Information.	Section 9.11.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5: Preliminary Design Development—Required Biological Information.	Section 9.11.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5: Assessment of Operational Impacts on Fish Passage.	Section 9.11.4.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 4:
Early Life History and Juvenile Fish Distribution and Abundance in the Susitna River Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Determine the seasonal distribution, relative abundance (as determined by CPUE, fish density, and counts), and fish-habitat associations of juvenile anadromous and resident juvenile fish species in the mainstem Susitna River (side channel, slough, backwater, and tributary confluence habitats).	Section 9.6.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Describe the seasonal movements of juvenile anadromous and resident juvenile fish species among mainstem habitats and between tributaries and mainstem habitats with emphasis on identifying foraging and over-wintering habitats.	Sections 9.5.1 and 9.6.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Document the timing of downstream movement of all juvenile fish species, and outmigration for anadromous salmon.	Sections 9.5.1 and 9.6.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize the age structure, growth, and condition of juvenile anadromous and juvenile resident fish by season.	Sections 9.5.1 and 9.6.1.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Collect and analyze tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Analysis study.	Sections 9.5.1, 9.6.1 and 9.14.4.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Collect and provide the instream flow study with habitat suitability criteria (HSC) data to support analysis of potential project impacts.	Section 8.5.1.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Evaluate salmon incubation (embryo development, hatching success, and emergence times) and monitor associated water quality conditions (e.g., temperature, DO, pH) at existing spawning habitats (slough, side channel, tributary, and mainstem) in areas with and without groundwater upwelling in the middle and lower reaches of the Susitna River.	Section 8.5.2.1 and Section 9.6.1, except that AEA's study plan does not include evaluation of embryo development and hatching success.	See AEA's response to comment FDAML-87, RSP Appendix 1.
1.3.1: Evaluate the potential for stranding of juvenile fish and stranding mortality by season under proposed project operational conditions.	Section 8.5.4.5.1.2.2, 8.5.4.6.1.1.4 and 8.5.4.6.1.6.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Measure intragravel water temperature in spawning habitats and winter juvenile fish habitats at different surface elevations and different depths to determine the potential for freezing of redds, freezing of juvenile fish, and their habitats.	Section 8.5.4.5.1.2.1.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Collect data using standard sampling techniques (e.g., electrofishing, snorkeling, minnow trapping, and seining) by season. For winter sampling may also use PIT tag arrays, video systems, or both.	Sections 9.5.4.3.1 9.5.4.4 and 9.6.4.3.1.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Estimate and compare the relative abundance of juvenile salmon within and across mainstem habitats by season.	<p>Sections 9.5.4.3.1 and 9.6.4.3.1: Relative abundance surveys will include seasonal multi-pass sampling events during the ice-free seasons. As mentioned above, methods will be selected based on species, life stage, and water conditions.</p> <p>Section 9.7.4.5: A comparison will be made of results from 2012–2014 studies to the historical results that characterized the relative abundance, locations of spawning and holding salmon, and use of mainstem, side channel, slough, and tributary habitat types by adult salmon.</p>	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Determine the seasonal use and movement patterns of marked/tagged juvenile fish between mainstem habitats strategically selected based on an appropriate sampling strategy (i.e., systematic, random, or stratified random design).	Sections 9.5.4.1, 9.5.4.3.2, 9.6.4.1 and 9.6.4.3.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Estimate juvenile salmon production of the Susitna River at selected sites.	No equivalent methodology in RSP.	AEA will not be collecting data to generate population estimates necessary for determining salmon production. At request of USFWS, AEA agreed to eliminate population estimates in order to expand the number of sampling sites by collecting only relative abundance and present-absence data. See AEA’s response to comment FDAML-54, RSP Appendix 1.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Determine the relative timing, distribution, and abundance of juvenile salmon in mainstem habitats and compare to historical data.	Sections 9.5.4.3.1 and 9.6.4.3.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Determine the distribution, and abundance of juvenile salmon in mainstem and tributary habitats upstream of the proposed Watana Dam site during open water (May through October).	Section 9.5.4.3.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Use systematic scheme for sampling across habitat types by season and randomize selection of habitat units to sample.	Sections 9.5.4.1 and 9.6.4.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Build upon and use, as appropriate, the 1980s data applicable to non-salmon anadromous, resident, and invasive fish species.	Sections 9.5.4.3 and 9.6.4.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Establish a seasonal sampling design that includes turbid and clear water sampling for these species (as appropriate).	Section 9.6.4.2.	AEA is not specifically targeting turbid and clear water, but AEA anticipates that, by monthly sampling side-channel and sloughs, AEA will be sampling under turbid and clear water conditions.
1.3.6: Sample fish species using appropriate methods for the habitat and season (electrofishing, snorkeling, seining, minnow trapping) in the main channel, side channels, sloughs, and tributary mouths.	Sections 9.5.4.4 and 9.6.4.4.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Develop life stage specific periodicity information for the middle and lower reach in support of the Instream Flow Study.	Sections 9.5.4.3 and 9.6.4.3: Preparation of periodicity charts for each species within the study area (timing of adult migration, holding, and spawning; timing of incubation, rearing, and out-migration).	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Collect additional data to support efforts to determine the timing, distribution, and relative abundance of eulachon in the lower reach of the Susitna River.	Section 9.16.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Coordinate with the Synthesis of Existing Fish Population Data Study to summarize and obtain the 1980s study data applicable to juvenile salmon, non-salmon anadromous, resident and invasive fish species.	Sections 9.5.4.3 and 9.6.4.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Selectively mark individual fish collected during seasonal surveys conducted under study Objective 1 and Objective 4 with PIT-tags.	Sections 9.5.4.4.12 and 9.6.4.12.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Use PIT tag antenna arrays near the mouths of select tributaries and sloughs or other mainstem habitats to determine seasonal habitat utilization (mainstem vs. tributary/slough) and movements of targeted fish species in the reach between the Deshka River and the Watana Dam site.	Sections 9.5.4.4.12 and 9.6.4.12.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Coordinate with salmon escapement and fish survey teams to retrieve data from PIT-tag detections and from fish wheel operations related to non-salmon anadromous, resident, and invasive species collected during their studies.	Sections 9.5.7 and 9.6.7.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Collect, radio tag, and track fish from selected species. Tag sizes will be chosen to maximize tag life within the constraints of the study fish size. Tracking duration will be determined based on the anticipated life span of the tags chosen.	Sections 9.5.4.4.12 and 9.6.4.4.12.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Use relative abundance and marking data from Objectives 1 and 2 to determine patterns of movement among mainstem habitats by season.	Sections 9.5.4.4.12 and 9.6.4.4.12.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Operate PIT arrays at strategic side channels, sloughs, or other mainstem habitats, and the confluence of tributaries to allow for tracking of individual fish among mainstem habitats.	Sections 9.5.4.4.12 and 9.6.4.4.12.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Use data from inclined plane, rotary screw traps, or both, in the mainstem to determine the timing of all salmon species emigrating from the upper reach (i.e., Watana Dam site) and from the middle reach of the Susitna River.	Sections 9.5.4.4.10 and 9.6.4.4.10.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Collect fish length and weight data during seasonal fish surveys in Objectives 1 and 3.	Sections 9.5.4 and 9.6.4.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Collect fish length and weight data from fish recaptured with PIT tags during seasonal fish surveys in individual to determine individual fish growth rates by season.	Sections 9.5.4.4.12 and 9.6.4.4.12.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Use fish length and weight data to calculate fish condition by season and possibly habitat (e.g., in areas with and without groundwater upwelling).	Sections 9.5.4.3.1, 9.5.4.3.3, 9.6.4.3.1 and 9.5.4.3.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Coordinate with the Genetic Analysis study to identify the appropriate target species and genetic sampling protocols to opportunistically collect genetic tissue samples from resident species.	Sections 9.5.4.3.7 and 9.6.4.3.7: In support of the Genetic Baseline Study for Selected Fish Species (Section 9.14), fish tissues will be collected opportunistically in conjunction with all fish capture events.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Coordinate with the Genetic Study to identify the appropriate target species, sampling locations, number of samples per species, and genetic sampling protocols to collect sufficient genetic samples from juvenile salmon.	Sections 9.5.4.3.7 and 9.6.4.3.7.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Systematic surveys will include collection of data for input parameters to IFIM analyses. Specifically, data will include species, length, location in the water column (distance from the bottom), substrate use classification, proximity/affinity to habitat structure/cover features (e.g., boulder, undercut bank, overhanging vegetation, large woody debris), water depth, mean column velocity, water temperature, and relevant comments pertaining to cover associations and/or behavioral characteristics of the fish observed.	Section 8.5.1.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Use modified Whitlock-Vibert boxes or similar methodology to monitor egg development, hatching success, and emergence times in areas with and without groundwater upwelling. Consider using approved hatchery fish source or fish spawned in the field.	Sections 8.5.4.5.1.1.5 and 9.6.1, except that AEA’s study plan does not include evaluation of embryo development and hatching success.	See AEA’s response to comment FDAML-87, RSP Appendix 1.
1.3.6: Use siphons to monitor egg development and emergence in naturally occurring salmon spawning areas.	Sections 8.5.4.5.1.1.5 and 9.6.1, except that AEA’s study plan does not include evaluation of embryo development and hatching success.	See AEA’s response to comment FDAML-87, RSP Appendix 1.
1.3.6: Assess egg development and survival of embryos: one potential method could include creating artificial redds and burying egg tubes in known spawning habitats.	Sections 8.5.4.5.1.1.5 and 9.6.1, except that AEA’s study plan does not include evaluation of embryo development and hatching success.	See AEA’s response to comment FDAML-87, RSP Appendix 1.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Monitor water quality parameters such as temperature and dissolved oxygen in spawning gravels and redds.	Sections 8.5.4.5.1.1.5 and 8.5.4.5.1.2.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Refine and use methods similar to those used in the 1980s, or use other methodologies, to evaluate embryo development, hatching success, and emergence times.	Sections 8.5.4.5.1.1.5 and 9.6.1, except that AEA's study plan does not include evaluation of embryo development and hatching success.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Use or consider other potential methods to determine or estimate fry emergence times (e.g., incline plane traps, fry emergence traps), as appropriate.	Sections 8.5.4.5.1.1.5, 9.6.1, and 9.6.4.3.3, except that AEA's study plan does not include evaluation of embryo development and hatching success.	NMFS Study Request methodology substantially incorporated.
1.3.6: Monitor range and peak of emergence times and by time of day.	No equivalent methodology in RSP.	AEA does not believe this methodology would be useful in assessing potential Project effects because the scale of this method is too fine and is influenced by variable site- specific conditions.
1.3.6: Identify habitats occupied by juvenile fish (<50 mm in length) using the distribution and abundance information obtained from Objectives 1 and 2.	Section 9.6.4.3.3. Section 9.5.4.1: Fish distribution sampling will occur at Focus Areas and at representative habitat units to identify seasonal timing, size, and distribution among habitat types for fish (particularly < 50 mm).	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Monitor juvenile fish activity by season and time of day to determine periods of activity and inactivity (e.g., when using cover, interstices of gravel).	Section 9.6.4.3.3.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Collect habitat slope information from habitats occupied by juvenile fish (<50 mm) and identify habitats most vulnerable to stranding.	Section 8.5.4.5.1.2.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Collect daily and seasonal information on natural ramping rates and document occurrence and conditions of naturally occurring stranding.	Section 8.5.4.5.1.2.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Incorporate other appropriate strategies to estimate potential stranding and stranding mortality.	Sections 8.5.4.5.1.2.2, 8.5.4.6.1.1.4 and 8.5.4.6.1.6.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Collect intragravel temperature profile information in spawning gravels and winter juvenile fish habitats using a string of thermistors (or similar methodology) located at different depths in the gravel across a channel from the gravel surface to various depths to get a temperature profile.	Section 8.5.1.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Collect surface elevation information from natural red locations.	Section 8.5.1.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Use information to model the varial zone and link to flow routing model.	Section 8.5.4.6.1.6.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 5:
Adult Salmon Distribution, Abundance, Habitat Utilization and Escapement in the Susitna River Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Determine the migration behavior and spawning locations of radio-tagged fish in the lower, middle, and upper Susitna River through capture, radio tagging and tracking of sufficient numbers of adults of all five species of Pacific salmon, in proportion to their abundance.	Section 9.7.1.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize adult salmon migration behavior and run timing within and above Devils Canyon.	Section 9.7.1.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Document salmon spawning locations in turbid water using an appropriate, field-tested methodology.	Section 9.7.1.2: Objective 2: Characterize the migration behavior and spawning locations of radio-tagged fish in the Lower, Middle, and Upper Susitna River. Objective 8: Characterize the migration behavior and spawning locations of radio-tagged fish in the Lower River, Middle River, and Upper River segments. In addition to radio tagging, if sonar is shown to be an effective sampling method during the 2012 study, it may be used where feasible to document salmon spawning locations in turbid water in 2013 and 2014 (Section 9.7.4.4).	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Compare historical and current data on run timing, distribution, relative abundance, and specific locations of spawning and holding salmon to determine the persistence (if any) of habitat use and the utility of data collected during the early 1980s.	Section 9.7.1.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Estimate escapement of adult salmon spawning by mainstem reaches and tributaries.	Section 9.7.1.2: Estimate the system-wide Chinook salmon escapement to the entire Susitna River, the coho salmon escapement to the Susitna River above the its confluence with the Yentna River, and the distribution of Chinook, coho, and pink salmon among tributaries of the Susitna River (upstream of Yentna River confluence) in 2013 and 2014.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Collect and analyze tissue samples of all salmon species as described by ADF&G with emphasis on Chinook salmon, to support the Genetic Analysis Study.	Section 9.7.1.2: Collect tissue samples to support the Fish Genetic Baseline Study (Section 9.14). Sections 9.5.1, 9.5.4.3.7, and 9.6.1: Collect tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Genetic Baseline Study (Section 9.14, which includes a dedicated and focused sampling effort to collect salmon and resident fish tissues).	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Determine system-wide Susitna River escapement and run apportionment using the study design and methodology described by the ADF&G.	Section 9.7.1.2, by developing Chinook and coho salmon system and river-wide escapement estimates in 2013 and 2014. These will be added to and build upon the system-wide estimates developed in recent years for all other species except pink salmon.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Determine the availability and accessibility of spawning habitats by adult salmon to mainstem and tributary locations based upon flow regime.	Sections 9.12 and 8.5.4.6.1.2.3.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Measure critical habitat characteristics (e.g., channel type, flow, substrate, and groundwater) at reaches used for spawning and compare these characteristics with those in adjacent reaches that do not contain spawning adults.	Section 8.5.4.5.1.1.5	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Install and operate fishwheels continuously from early June to early September each year of the study.	Section 9.7.4.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Radio-tag approximately 400 Chinook salmon and 200 chum, sockeye, pink, and coho salmon.	Section 9.7.4.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Assess the degree to which radio-tagged fish are representative of all salmon in the lower, middle and upper river (e.g., test for size selectivity, compare mark rates among spawning areas, surveys to count live and dead fish in a selected tributary such as Portage Creek).	Section 9.7.4.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Evaluate the potential for handling-induced changes in fish behavior based on the post-release survival and migration rates of radio-tagged fish released.	Section 9.7.4.1.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Track the locations and behavior of radio-tagged fish using an array of fixed-station receivers and mobile-tracking surveys. Aerial surveys are anticipated to begin in July and end in early October each year.	Section 9.7.4.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Conduct boat- and ground-based surveys to locate holding and spawning salmon to the level of microhabitat use.	Section 9.7.4.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Establish an array of fixed-station receivers at and above Devils Canyon to monitor the behavior of radio-tagged fish from approximately early June to October each year.	Sections 9.5.4.3.2 and 9.7.4.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Conduct aerial surveys of the upper river to locate tagged and other salmon.	Sections 9.5.4.3.2 and 9.7.4.1.5.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Locate spawning and holding salmon upstream of Devils Canyon.	Section 9.7.4.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Based on 2012 pilot study results use side-scan and/or DIDSON to determine salmon spawning locations in turbid water.	Section 9.7.4.3.7.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Compare results from current studies to historical results that characterized the relative abundance, locations of spawning and holding salmon, and use of mainstem, sidechannel, slough, and tributary habitat types by adult salmon.	Section 9.7.4.5.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Conduct aerial adult salmon spawning surveys in each study year, replicating methods developed during 2012. Multiple surveys will be flown bracketing the peak timing of spawning. The survey effort will be coordinated with the adult salmon radio telemetry effort for all tagged salmon tracked above Devils Canyon.	Section 9.7.4.2.2 and 9.7.4.1.5.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Collect genetic samples opportunistically for adult anadromous salmon in conjunction with Objectives 1 and 2. Sample collections will be coordinated with the Genetic Analysis Study team.	Section 9.7.4.7.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Evaluate use of genetic samples for all five salmon species to estimate proportion of salmon produced upstream of Devil's Canyon and in tributaries.	Section 9.14.4.7: If the results of the Chinook salmon genetics studies conducted during 2012 indicate that the Chinook salmon spawning upstream of Devils Canyon and in the Middle River and its tributaries are sufficiently unique, ADF&G will characterize the presence and relative proportion of fish originating from the Upper and Middle River in selected Lower River habitats.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Determine adult salmon distribution and abundance.	Sections 9.7.4.5, 9.7.4.6 and 9.7.4.8.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Quantify proportion of salmon that spawn upstream of the 3-rivers confluence, and the proportion that spawn upstream of Devils Canyon.	Sections 9.7.4.5 and 9.7.4.6.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.6: Identify potential barriers to salmon spawning habitats by species.	2012 Salmon Escapement and Upper Susitna River Fish Distribution and Habitat Study efforts began to address this objective (Sections 9.5.6 and 9.7.4). Additional data will be collected during 2013 and 2014 pursuant to Sections 9.12.1 and 9.9.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Determine flows needed for salmon access to tributaries and mainstem spawning habitats (e.g., sloughs and side channels).	Sections 9.12.4 and 8.5.4.6.1.2.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.6: Estimate the available spawning habitat for all salmon species (Chinook, coho, chum, pink, and sockeye) in the mainstem Susitna River in all reaches.	No equivalent methodology in RSP.	Although AEA is not quantifying available habitat, AEA will, through instream flow modeling, quantify flow-habitat relationships for spawning habitat and will address potential project effects to that habitat. See Section 8.5.

**NMFS Study Request Enclosure No. 6:
Susitna River Instream Flow Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Characterize the natural flow regime of the Susitna River and tributaries in the project area from the available U. S. Geological Survey (USGS) gage records, flow routing data and models, and other available data.	Section 8.5.4.4.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Identify, characterize, and integrate the timing, quantity and function of instream flow to riverine processes (Poff et al. 1996; Bragg et al. 2005; Schmidt et al. 2004; Assani 2007): geomorphology; floodplain and riparian form and vegetation; biological cues; water quality; surface/groundwater exchange; riverine habitat availability and quality, etc.	Section 8.5.4.7 and 8.5.4.8.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Identify, characterize, and quantify the seasonal (time) and spatial distribution of all fish species and life-stages of each species within the defined habitat delineations of the Susitna River and floodplain.	Section 9.6.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Characterize the site specific conditions of meso and micro habitat types by all fish species and life stages. This characterization should describe and quantify the factors that control habitat suitability and utility (flow, water quality, structure, groundwater exchange, icing effects, temporal changes).	Section 8.5.1.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Identify appropriate instream habitat models and study sites.	Sections 8.5.4.6 and 8.5.4.2.1.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Develop a modeling framework to integrate study and model results of all of the riverine functions and to assess the temporal and spatial relationships between instream flow and riverine and biological functions.	Sections 8.5.4.1 and 8.6.3.7.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Comparative temporal and spatial analysis of riverine process studies and model results for a range of alternative operations.	Section 8.5.4.7 and 8.6.3.7.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Complete a literature review of instream flow and environmental issues of other large hydropower dams; including assessment of modeling methods and results, instream flow requirements, and post project monitoring.	Sections 8.6.3.1. Section 8.5, although not expressly stated, AEA anticipates that it will consider existing information from other projects as part of its instream flow analysis.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Develop a technical working group to develop instream flow evaluations and consensus on operational flows and impacts.	Section 8.5.4.1.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Maintaining streamflow regimes sufficient to sustain native riparian and aquatic habitats in the project affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Maintaining streamflow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.1: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5.1: Review of existing information from the 1980s Susitna project (many reports are currently not scanned and thus were unavailable for development of this study request) and other northern region hydroelectric projects.	Sections 8.5.2.1 and 8.6.3.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.2: Hydrologic regime characterization.	Section 8.5.4.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.3: Characterization of flow dependent biologic cues.	Sections 8.5.4.5.1.3, 8.5.4.4.1.3 and 8.6.3.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.4: Riverine habitat utilization.	Sections 8.5.4.7 and 8.6.3.7.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5.5: Hierarchical habitat nesting: Meso and microhabitat spatial and temporal characterization by riverine habitat type, species and life stage.	Sections 8.5.4.2.1.1 and 8.6.3.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.6: Identification of instream habitat models and study sites.	Sections 8.5.4.6 and 8.5.4.2.1.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.7: Modeling and analysis of project operation effects on instream flow and riverine processes.	Sections 8.5.4.3.2, 8.5.4.6, 8.5.4.7 and 8.6.3.7.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.8: Model output coordination.	Section 8.5.4.8 and 8.6.3.7.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 7:
Susitna River Groundwater Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Synthesize historical data for Susitna River groundwater and groundwater-dependent aquatic and floodplain habitat, including the 1980s studies.	Sections 7.5.1, 7.5.4.1 and 8.6.3.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Use available information to characterize the large-scale geohydrologic process-domains/terrain of the Susitna River (e.g., geology, topography, geomorphology, regional aquifers, shallow ground water aquifers, surface-water/groundwater interactions).	Sections 7.5.1 and 7.5.4.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Assess the effect of Watana Dam/Reservoir on groundwater and groundwater-related aquatic and floodplain habitat in the vicinity of the dam and to the downstream extent of the reservoir's influence.	Sections 7.5.1 and 7.5.4.3.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Map groundwater influenced aquatic and floodplain habitat (e.g., upwelling areas, springs, groundwater-dependent wetlands).	Sections 5.5, 6.5, 7.5.4.4, 7.6, 8.5 and 8.6.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Determine the surface-water/groundwater relationships of floodplain shallow alluvial aquifers at Riparian Instream Flow Study sites, including relationships with both the river and the adjacent uplands (e.g., gaining or losing stream).	Sections 7.5.1, 7.5.4.5 and 8.6.3.6.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Determine the surface-water/groundwater relationships of upwelling/downwelling at Instream Flow Study sites in relation to spawning, incubation, and rearing habitat (particularly in the winter) in collaboration with fish and instream flow studies.	Sections 7.5.1, 7.5.4.6, 8.5.4.5.1.2, 8.5.4.6.1.4 and 8.5.4.6.1.5.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize water quality (e.g., temperature, DO, conductivity, nutrients) and age and probable flow paths (i.e., indication of potential source) of representative upwelling areas where groundwater is a primary determinant of fish habitat (e.g., incubation and rearing in side channels and sloughs, upland sloughs).	Sections 7.5.1, 7.5.4.7, 8.5.4.5.1.2 and 8.5.4.6.1.5.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize how winter surface-water/groundwater interactions may differ from ice-free interactions for both the existing and the projected Project Susitna River flow regimes.	Sections 7.5.1 and 7.5.4.8.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.4.1: Synthesize historical data for Susitna River groundwater and groundwater-dependent aquatic and floodplain habitat, including the 1980s studies and other hydro projects that may provide insights for project operation.	Sections 7.5.4.1 and 8.6.3.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.4.2: Characterize large-scale geohydrologic process domains and terrain of the Susitna River.	Section 7.5.4.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.4.3: Map groundwater influenced aquatic and floodplain habitat.	Sections 5.5, 7.5.4.4, 7.6, 6.5, 8.5 and 8.6.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.4.4: Model the surface-water/groundwater relationships of floodplain shallow alluvial aquifers at riparian instream flow study sites.	Sections 7.5.4.5 and 8.6.3.6.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.4.5: Model surface-water/groundwater relationships of upwelling/downwelling at instream flow study sites.	Sections 7.5.4.6 and 7.5.4.8.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 8:
Susitna River Water Quality Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Summarize available and historic water quality information for the Susitna River basin, including data collection and modeling studies for the 1980's Susitna project.	Section 5.5.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize the baseline water quality conditions of the Susitna River and tributaries. This will include collection of stream temperature, basic water quality, mercury levels, and meteorological data.	Section 5.5.4.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize surface water physical, chemical, and bacterial water quality conditions in the Susitna River within and downstream of the proposed project area, and determine the source(s) of parameters exceeding Alaska's water quality standards.	Section 5.5.4.4.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Gather information on the area to be flooded by the new reservoir, such as post-impoundment surface area, mercury content of underlying bedrock, type of soil flooded, and biomass quantity, in order to predict the amount of mercury input and degree of mercury methylation (i.e., bioavailable form) in the newly formed reservoir.	Section 5.7.4.2.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
<p>1.3.1: Identify and implement appropriate models to assess the effects of the proposed project on water quality in the Susitna River basin.</p> <p>a. Model expected water quality conditions in the proposed Watana Reservoir, including (but not necessarily limited to) temperature, dissolved oxygen (DO), suspended sediment and turbidity, chlorophyll a, nutrients, metals, and ice formation and breakup (unless a separate ice dynamics model is used).</p> <p>b. Model mercury inputs (amounts of mercury methylation, uptake and biomagnification of methylmercury) into the reservoir and transport of mercury downstream from the reservoir.</p> <p>c. Model changes in toxicity to aquatic organisms in the project area and downstream.</p>	<p>Sections 5.6.1, 5.6.4, 5.6.4.7, 5.6.4.8 and 5.7.1.</p>	<p>NMFS Study Request objective substantially incorporated into study plan.</p>
<p>1.3.1: Coordinate study and model results with other study areas, including fish, instream flow, and piscivore risk studies.</p>	<p>Sections 5.5.11, 5.6.7 and 5.7.7.</p>	<p>NMFS Study Request objective substantially incorporated into study plan.</p>
<p>1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.</p>	<p>No equivalent objective in RSP.</p>	<p>While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.</p>

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5.1: Summary of available/historical water quality information.	Sections 5.5.2 and 5.5.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.2: Characterization of baseline water quality conditions.	Section 5.5.4.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.3: Metals and Mercury Analysis.	Sections 5.5.4.4, 5.5.4.5, 5.5.4.6, 5.5.4.7, 5.7.3 and 5.7.4.	NMFS Study Request methodology substantially incorporated into study plan, except that AEA is not collecting data on mercury deposition from the air and from bedrock. See AEA's response to comment MERC-10.
1.3.5.4: Water temperature.	Section 5.5.4.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.5: Meteorological Station.	Sections 5.5.4.2 and 5.5.4.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.6: Identification and implementation of WQ models.	Section 5.6.4.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.7: Model output coordination.	Sections 5.6.7 and 5.7.7.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 9:
Susitna River Geomorphology Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Characterize and map relic geomorphic forms from past glaciation, paleofloods and debris flow events.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize and map the geology of the Susitna River, identifying controlling features to channel and floodplain geomorphology.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize and map the fluvial geomorphology of the Susitna River.	Sections 6.5.1.1 and 6.6.4.1.2.9.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Describe and identify the primary geomorphic processes that create and influence fluvial geomorphic features.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Determine sediment supply and transport capacity in the Susitna River and associated tributaries.	Sections 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Evaluate geomorphic stability/change in the Middle and Lower reaches, including tributary confluences and deltas.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Identify, delineate, and characterize riverine habitat types.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize the surface area versus flow relationships of riverine habitat types.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Assess large woody debris transport and recruitment, their influence on geomorphic forms and implications related to the project.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Evaluate and model the potential magnitude and trend of geomorphic response to the project.	Section 6.6.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Correlate geomorphic forms and processes to riverine habitat types and evaluate change to the habitat types related to the project.	Section 6.5.1.1 and 6.6.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize the proposed reservoir geomorphology and resulting changes.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize geomorphic conditions at stream crossings along access road alignments.	Section 6.5.1.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5.1: Geologic and Paleo-Geomorphic Features Characterization.	Section 6.5.4.1.2.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.2: Geomorphic Characterization of the River.	Sections 6.5.4.1.2 and 6.6.4.1.2.9.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.3: Geomorphic Processes Identification and Characterization.	Sections 6.5.4.1.2.3, 6.5.4.11.3 and 6.6.4.1.2.8.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.4: Sediment, Transport and Erosion Characterization and Analysis.	Sections 6.5.4.3.2, 6.5.4.2.2, 6.5.4.6.2.2 and 6.6.4.1.2.7.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.5: Evaluation of Riverine Habitat.	Sections 6.5.4.5.2 and 6.5.4.7.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.6: Evaluation of Stability and Change.	Sections 6.5.4.4.2, 6.5.4.5.2.3, 6.5.4.7.2.3, 6.5.4.7.2.4 and 6.5.4.7.2.5.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.7: Modeling Magnitude and Trend of Geomorphic Response.	Sections 6.6.4.2.2, 6.6.4.3.2, 6.5.4.11.2 and 6.5.4.6.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.8: Reservoir Geomorphic Effects Evaluation and Characterization.	Section 6.5.4.8.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.9: Transportation Corridor Stream Crossings Geomorphic Characterization.	Section 6.5.4.10.2.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 10:
Susitna River Flow Routing Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Collect instream flow data throughout all seasons to characterize instream flow and develop a flow routing model.	Sections 8.5.1.2, 8.5.4.3, 7.6.1 and 7.6.4.3.	USFWS Study Request objective substantially incorporated into study plan.
1.3.1: Develop and calibrate an ice-free period flow routing model that is capable of modeling a range of operating conditions and scales (hourly, daily, weekly, seasonally).	Section 8.5.4.3.1.	USFWS Study Request objective substantially incorporated into study plan.
1.3.1: Develop and calibrate a winter flow routing model that incorporates ice effects that is capable of modeling a range of operating conditions and scales (hourly, daily, weekly, seasonally).	Section 7.6.4.6.	USFWS Study Request objective substantially incorporated into study plan.
1.3.1: Inform and integrate with other studies the project operation effects on instream flow in the reservoir and downstream of the project.	Sections 8.5.4.3.2, 8.5.4.3.1 and 8.5.4.1.	USFWS Study Request objective substantially incorporated into study plan.
1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5.1: Stream Gages and Cross Section Data.	Sections 8.5.4.3, 8.5.4.4 and 7.6.4.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.2: Hydraulic Unsteady Flow Routing Models.	Sections 8.5.4.3 and 7.6.4.6.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.3: Making Model and Data available to other studies.	Sections 8.5.4.3.2.4 and 7.6.7.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 11:
Susitna River Ice Processes Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Review and summarize information from existing studies of cold-region hydropower projects around the world on the effects of hydro operations on ice-covered rivers, and determine potential implications for the proposed project from results of those studies.	Sections 7.6.1 and 7.6.4.11.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Document and map ice formation and spring break up processes in the Susitna River and reservoir.	Sections 7.6.1 and 7.6.4.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize river ice thickness and distribution.	Sections 7.6.1 and 7.6.4.3.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Document and map open leads in the Susitna river's ice cover and determine the cause and persistence of open leads.	Sections 7.6.1 and 7.6.4.2.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Characterize ice processes and determine the relationships of these processes to instream flow, geomorphology, riverine habitat, and water quality.	Sections 7.6.1, 7.6.4.1, 7.6.4.7 and 7.6.4.8.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Model current ice processes in the Susitna River downstream of the proposed Watana Dam site.	Sections 7.6.1 and 7.6.4.6.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Link ice, temperature and river flow routing models to develop predictions of altered ice dynamics caused by changes to the river's flow and temperature both during filling of the reservoir and from project operations.	Sections 7.6.1 and 7.6.4.7.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Provide ice processes data to flow routing, fisheries, in-stream flow, geomorphology, groundwater and riparian studies.	Sections 7.6.1, 7.6.4.7 and 7.6.4.8.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Provide the water quality modeling study with reservoir ice predictions.	Section 5.6.7.	NMFS Study Request objective substantially incorporated into study plan.
1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5.1: Review and summary of existing knowledge of hydropower effects on ice processes.	Section 7.6.4.11.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.2: Observation, characterization, and mapping of breakup, freeze-up processes and open leads identification and mapping.	Sections 7.6.4.1 and 7.6.4.2.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.3: Ice thickness measurements.	Sections 7.6.4.3.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.4: Ice process Modeling.	Sections 7.6.4.6, 7.6.4.7 and 7.6.4.8.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.5: Inform other studies with relevant Ice process information.	Sections 7.6.7.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 12:
Susitna River Project Effects Under Changing Climate Conditions Study**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Review existing climate change literature relevant to Southcentral Alaska and the Susitna watershed. This information will summarize the current understanding of the magnitudes of potential future systematic changes in long-term precipitation, snowpack and runoff.	Section 7.7.1.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Assess the potential impacts of climate change on the Susitna watershed and ecosystems, including how anticipated seasonal, annual and long-term changes in temperature and precipitation can be expected to impact the efficiency, longevity and ecological impacts of the proposed hydropower project and project operations.	No equivalent objective in RSP.	See AEA’s responses to comments GLAC-4, GLAC-16, GLAC-17, RSP Appendix 1.
1.3.1: Analyze changes in glacial systems and their impacts on watershed hydrology.	Sections 7.7.1 and 7.7.4.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Translate climate change scenarios into time series data on changed hydrology and temperature dynamics in the Susitna basin.	Partially incorporated into study plan in Section 7.7.4.4.	See AEA’s responses to comments GLAC-1, GLAC-16, and GLAC-17, RSP Appendix 1.
1.3.1: Document the trends in the historic record.	Sections 7.7.1 and 7.7.4.	NMFS Study Request objective substantially incorporated into study plan.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Assess climate change vulnerabilities of the natural resources in project watershed based on documented methodologies, such as Bryant, 2009, and of using one of the many available climate change vulnerability assessment processes.	No equivalent objective in RSP.	See AEA's responses to comments GLAC 4, GLAC-16, and GLAC-17, RSP Appendix 1.
1.3.1: Summarize potential climate change effects in a Climate Change Technical Report and incorporate these results in the other riverine studies requested by NMFS.	Section 7.7.4.5.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Identify project design and operational options that can be used to develop mitigation for any adverse project environmental effects. These options will address the specific NMFS resource management goals.	No equivalent objective in RSP.	This type of resource management objective is beyond the scope of a study plan objective.
1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA's study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5.1: Review existing climate change literature relevant to Southcentral Alaska and the Susitna watershed.	Section 7.7.4.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.2: Assess the potential impacts of climate change on the Susitna watershed and ecosystems.	Sections 7.7.4 and 7.7.5.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.3: Analyze changes in glacial systems and their impacts on watershed hydrology.	Sections 7.7.4 and 7.7.5.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.4: Translate climate change scenarios into time series data on changed hydrology and temperature dynamics in the Susitna basin.	Partially incorporated into study plan in Section 7.7.4.4.	See AEA’s responses to comments GLAC-1, GLAC-16, and GLAC-17, RSP Appendix 1.
1.3.5.5: Document the trends in the historic record.	Sections 7.7.4 and 7.7.5.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5.6: Assess climate change vulnerabilities of the natural resources in project watershed.	No equivalent methodology in RSP.	See AEA’s response to comments GLAC 4, GLAC-16, and GLAC-17, RSP Appendix 1.
1.3.5.7: Summarize potential climate change effects in a Climate Change Technical Report.	Section 7.7.4.5.	NMFS Study Request methodology substantially incorporated into study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5.8: Coordinate study data and results with other studies and technical working groups.	Section 7.7.7.	NMFS Study Request methodology substantially incorporated into study plan.

**NMFS Study Request Enclosure No. 13:
Susitna-Watana Marine Mammal Study Request**

Study Objectives

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.1: Establish pre-construction baseline habitat data for the endangered Cook Inlet beluga whale, other marine mammals, and the status of essential features or primary constituent elements of designated beluga critical habitat in the Susitna River Delta in Cook Inlet.	Section 9.17.1: Document Cook Inlet Beluga Whales (CIBWs) and other marine mammals in the Susitna River delta, focusing on CIBW distribution and upstream extent.	NMFS Study Request objective substantially incorporated into study plan.
1.3.1: Determine how potential changes in the natural system as a result of the proposed project may affect the critical habitat and prey dynamics, and ultimately, impact the conservation or recovery of the Cook Inlet belugas whales and other marine mammals.	Section 9.17.1: Collect data necessary to evaluate the relationships between potential hydropower-related changes in the Lower River, CIBW in-river movements, and CIBW prey availability.	NMFS Study Request objective substantially incorporated into study plan.
1.3.2: Maintaining native and natural aquatic communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance to ensure the health and survival of all species and natural communities.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain native riparian and aquatic habitats in the project-affected stream reaches.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Requested Study Objectives	RSP Equivalent	AEA Explanation
1.3.2: Maintaining the diversified use of fish and wildlife including commercial, recreational, scientific and educational purposes.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting, conserving and enhancing native fishes and their habitats by maintaining their access to suitable and fully functioning habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Identifying and implementing measures to protect, mitigate, or minimize direct, indirect and cumulative impacts to native anadromous fish resources, including related spawning, rearing, and migration habitats and adjoining riparian habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining riparian resources, channel conditions, and aquatic habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Maintaining stream flow regimes sufficient to sustain desired conditions of native riparian, aquatic, and wetland habitats.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.
1.3.2: Protecting aquatic systems to which species are uniquely adapted.	No equivalent objective in RSP.	While not an objective of AEA’s study plan, this type of resource management objective will be considered when developing proposed PM&E measures. See cover letter for further explanation.

Study Methodologies

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5: Conduct several systematic surveys (e.g., aerial or boat-based) each month to document the use of the Susitna Delta by marine mammals. Surveys should be designed in a manner consistent with past and current surveys so as to expand the available data set.	Section 9.17.4.1.	NMFS Study Request methodology substantially incorporated into study plan.
1.3.5: Conduct surveys (e.g., land-based observations, remote video cameras, and aerial) of the Susitna River during high tides to document the northern most extent of belugas and other marine mammals.	Section 9.17.4.1.	NMFS Study Request methodology substantially incorporated in study plan.
1.3.5: Collect and compare data regarding current environmental conditions and prey species in the Susitna River and Delta. Document the relationship between prey and habitat characteristics. <i>This data may be addressed through study topics other than Cook Inlet belugas.</i>	Section 9.16.	NMFS Study Request methodology substantially incorporated in study plan.

Requested Study Methodologies	RSP Equivalent	AEA Explanation
1.3.5: Using current data about prey and habitat (as identified in #3), develop a model, or some other scientifically valid method, to predict how changes in environmental conditions as a result of the proposed project could alter existing beluga prey characteristics.	Sections 9.7 and 9.16.	NMFS Study Request methodology substantially incorporated in study plan.
1.3.5: Using current data about Cook Inlet beluga whales' use of the Susitna Delta (as determined from #1) and the results about potential effects to beluga prey (as determined from #4) and using a scientifically valid method, determine the possible impacts to belugas' foraging and reproductive success.	No equivalent methodology in RSP.	See AEA's response to comment CIBW-01, RSP Appendix 1.