Susitna-Watana Hydroelectric Project Document
ARLIS Uniform Cover Page

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SUSITNA-WATANA HYDRO

March 1, 2013

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

Re: Susitna-Watana Hydroelectric Project, FERC Project No. 14241-000; Submittal of Information Related to Study Plan Determination

Dear Secretary Bose:

By letter dated January 17, 2013, Staff of the Federal Energy Regulatory Commission (Commission) revised the licensing schedule for the Alaska Energy Authority's (AEA) proposed Susitna-Watana Hydroelectric Project, FERC Project No. 14241 (Project).[1] Primarily, Commission Staff's January 17th letter established a process for its April 1, 2013 issuance of the Study Plan Determination (SPD) for 14 of the individual study plans included in AEA's Revised Study Plan (RSP),[2] filed with the Commission on December 14, 2012.[3] Leading up to Staff's April 1 SPD, the January 17th letter required AEA to prepare and file, following consultation with licensing participants, additional information that Commission Staff have deemed necessary for the April 1 SPD. The purpose of this filing is to submit the information required by Staff's January 17th letter, as well as other relevant information in support of these 14 study plans.

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

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

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

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

Requested Information[4]	Attachment
Final implementation plan for Study of Fish Distribution and Abundance in the Upper Susitna River (RSP 9.5)	Attachment A, *Final Susitna River Fish Distribution and Abundance Implementation Plan* (March 2013)
Final implementation plan for Study of Fish Distribution and Abundance in the Middle and Lower Susitna River (RSP 9.6)	Attachment A, *Final Susitna River Fish Distribution and Abundance Implementation Plan* (March 2013)
Final implementation plan for River Productivity Study (RSP 9.8)	Attachment B, *Final Susitna River Productivity Study Implementation Plan* (March 2013)
Final focus areas for 2013 middle and lower river studies	Attachment C, *Technical Memorandum, Selection of Focus Areas and Study Sites in the Middle and Lower Susitna River for Instream Flow and Joint Resource Studies – 2013 and 2014* (March 2013)

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

In accordance with Commission Staff's revised licensing schedule, licensing participants may file comments on the attached implementation plans and technical memorandum—as well as the 14 studies subject to Staff's April 1st RSP[6]—by March 18, 2013.[7] Based on the technical information discussed in the February 7-8 and 14-15 meetings, AEA has made changes to the attached implementation plans and technical memo since the drafts of these were filed and distributed on January 31.

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

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

5 *Id.*

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

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

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

As always, AEA appreciates the participation and commitment to this licensing process demonstrated by Commission Staff, federal and state resource agencies, and other licensing participants. Following Commission Staff's April 1st SPD, AEA looks forward to working with licensing participants and Commission Staff in implementing the approved studies, which AEA believes will comprehensively investigate and evaluate the full range of resource issues associated with the proposed Project and support AEA's license application, scheduled to be filed with the Commission in 2015.

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

Sincerely,

Wayne M Dyok

Wayne Dyok
Project Manager
Alaska Energy Authority

Attachments

cc: Distribution List (w/o Attachments)

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

9 *See* RSP § 5, Attachment 5-1.

10 DEC RSP Comments, Attachments 1 & 2.

Attachment D

Quality Assurance Project Plan

FINAL

QUALITY ASSURANCE PROJECT PLAN
FOR
BASELINE WATER QUALITY MONITORING SAMPLING AND ANALYSIS ACTIVITIES

for the

Susitna-Watana Hydroelectric Project
Water Quality Study
Susitna River, Southcentral Alaska

March 2013

Alaska Energy Authority
Contract No. AEA-11-025

Prepared for:
Alaska Energy Authority
813 West Northern Lights
Anchorage, AK 99503

Prepared by:
URS/Tetra Tech, Inc.
700 G Street, Suite 500
Anchorage AK, 99501

A PROJECT MANAGEMENT ELEMENTS

A.1 Title and Approvals:

Title: Quality Assurance Project Plan For Baseline Water Quality Monitoring Sampling and Analysis Activities for the Susitna-Watana Hydroelectric Project Water Quality Study

Date: March 2013

Project Implementation by: Alaska Energy Authority (AEA), URS Corporation (URS), and Tetra Tech, Inc. (Tt)

Name: Betsy McGregor Environmental Manager Phone: 907-771-3957
Organization Name: Alaska Energy Authority email: bmcgregor@aidea.org

Signature: _____ Date: _____

Name: Paul Dworian Principal Manager Phone: 907-261-6735
Organization Name: URS Corporation email: paul.dworian@urs.com

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Name: William Loskutoff Project QA Officer Phone: 907-261-6736
Organization Name: email: bill.loskutoff@urs.com

Signature: _____ Date: _____

Name: Robert Plotnikoff WQ Technical Lead Phone: 206-728-9655
Organization Name: Tetra Tech email: robert.plotnikoff@tetratech.com

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Name: Harry Gibbons TT Project Manager Phone: 206-728-9655
Organization Name: Tetra Tech email: harry.gibbons@tetratech.com

Signature: _____ Date: _____

Name: William Ashton DEC DOW Project Manager Phone:
ADEC DOW Program Name: email:

Signature: _____ Date: _____

Richard Heffern ADEC DOW QA Officer Phone: (907) 465-5305
ADEC DOW WQSAR Program email: richard.heffern@alaska.gov

Signature: _____ Date: _____

A.2 TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

Table of Appendices

LIST OF ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AEA	Alaska Energy Authority
°C	degrees Celsius
cm	centimeters
DO	Dissolved oxygen
DQI	Data quality indicators
DQO	Data Quality Objectives
EPA	U. S. Environmental Protection Agency
g	grams
m	meter(s)
µS/cm	microSiemens per centimeter
mg/L	milligrams per liter
MQO	measurement quality objectives
NPS	Nonpoint source
PDF	Portable Document Format
PM	Project Manager
PT	performance test
QA	Quality assurance
QAO	Quality Assurance Officer
QAPP	Quality assurance project plan
QC	Quality control
QCO	Quality Control Officer
RPD	Relative percent difference
RSD	Relative standard deviation
SNTEMP	Stream Network Temperature
SOP	Standard Operating Procedure
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
TIR	Thermal infrared
TMDL	Total Maximum Daily Load
TL	Technical Lead
Tt	Tetra Tech, Inc.

A.3 DISTRIBUTION LIST

This document will be distributed to the following Alaska Energy Authority (AEA), URS Corporation (URS), Tetra Tech, Inc. (Tt), and Alaska Department of Environmental Conservation (ADEC) staff members who are involved in this project, as well as to all responsible participants including the selected analytical laboratory.

Table 1: QAPP Distribution List

Name	Position	Agency/ Company	Division/ Branch/Section	Contact Information
Betsy McGregor	Project Manager/Environmental Manager	AEA	Environmental Branch	Phone: 907-771-3957 Email: bmcgregor@aidea.org
Paul Dworian	URS Principal Manager	URS	Geosciences and Remediation Services	Phone: 907-261-6735 Email: paul.dworian@urs.com
William Loskutoff	Project Quality Assurance Officer	URS	Geosciences and Remediation Services	Phone: 907-261-6736 Email: william.loskutoff@urs.com
Harry Gibbons	Tt Project Manager	Tt	Surface Water Group	Phone: 206-728-9655 Email: harry.gibbons@tetratech.com
Robert Plotnikoff	WQ Technical Lead	Tt	Surface Water Group	Phone: 206-728-9655 Email: robert.plotnikoff@tetratech.com
Mark Vania	URS Project and Field Operations Manager: Mark Vania	URS	Geosciences and Remediation Services	Phone: 907-261-9755 Email: mark.vania@urs.com
Shannon Brattebo	Sampling Manager	Tt	Surface Water Group	Phone: 509-232-4312 Email: shannon.brattebo@tetratech.com
Charles Homestead	Lab Manager	SGS North American, Inc.	Alaska Division	Phone: 907-550-3206 Email: charles.homestead@sgs.com
Dana Stewart	Data Manager	R2 Resources	Data Resources Management	Phone: (907) 345-6398 Email:dstewart@r2usa.com
William Ashton	Project Manager	ADEC	Division of Water/WQSAR	Phone: (907) 269-6283 Email: William.Ashton@alaska.gov

Name	Position	Agency/ Company	Division/ Branch/Section	Contact Information
Richard Heffern	QA Officer	ADEC	Division of Water/ WQSAR/QA	907-465-5305 richard.heffern@alaska.gov

A.4 PROJECT TASK/ORGANIZATION

The AEA is preparing a License Application that will be submitted to the Federal Energy Regulatory Commission (FERC) for the Susitna-Watana Hydroelectric Project (Project). The Project is located on the Susitna River, an approximately 300 mile long river in the South-central region of Alaska. The Project's dam site will be located at River Mile (RM) 184. The results of this study and of other proposed studies will provide information needed to support the FERC's National Environmental Policy Act (NEPA) analysis for the Project license.

Construction and operation of the Project as described in the Pre-Application Document (PAD, AEA 2011) is expected to change some of the water quality characteristics of the resulting riverine portion of the drainage downstream of the dam site as well as the inundated area that will become the reservoir. This study plan outlines the objectives and methods for developing a monitoring program that will adequately characterize surface water quality, stream temperatures and meteorological data in the Susitna River within and downstream of the proposed Project area.

This Quality Assurance Project Plan (QAPP) is being prepared to document the quality assurance (QA) and quality control (QC) measures that will be observed to ensure the following objectives are met: data are consistent, correct, and complete, with no errors or omissions; QC sample results have been reviewed and are included; established criteria for QC results are met; measurement quality objectives have been met, or data qualifiers are properly assigned where necessary; and data specified in the sampling process design are obtained. Data collection methods will follow established state and federal (e.g., ADEC, U.S. Environmental Protection Agency (EPA)) guidelines.

The purpose of this document is to present the QAPP for conducting a baseline water quality study of the Susitna River.

This QAPP provides general descriptions of the work to be performed to collect in-river data, the objectives to be met, and the procedures that will be used to ensure that the data are scientifically valid and defensible and that uncertainty has been reduced to a known and practical minimum. The QAPP describes procedures used to prepare for the field effort, conduct field sampling using standard protocols, and post-process field data.

The organizational aspects of a program provide the framework for conducting tasks. The organizational structure can also facilitate project performance and adherence to QC procedures and QA requirements. Key project roles are filled by those persons responsible for ensuring the collection of valid data and the routine assessment of the data for precision and accuracy, as well as the data users and the person(s) responsible for approving and accepting final products and deliverables. The key personnel involved in the Baseline Water Quality Study of the Susitna River are listed in Table 2.

Table 2: Project Organizational Responsibilities

Position Title	Company or Agency	Division Branch/Section	Responsibilities
Environmental Manager: Betsy McGregor	Alaska Energy Authority	Environmental Branch	Responsible for project coordination with local, county, state, and federal government officials; and for reviewing drafts of the study plan, QAPP and summary data reports
ADEC Project Manager: William Ashton	Alaska Department of Environmental Conservation	Division of Water	Responsible for overall technical and contractual management of the project. For permit related monitoring projects, responsible for ensuring permittee complies with permit required water quality monitoring as specified in the approved QAPP.
ADEC Water Quality Assurance Officer: Richard Heffern	Alaska Department of Environmental Conservation	Division of Water	Represents the ADEC regulatory agency and responsible for review of the Quality Assurance documentation for each of the water quality studies. Oversight of the QA activities ensuring collected data meets project's stated data quality goals
URS Principal Manager: Paul Dworian	URS Corporation	Geosciences and Remediation Services (GRS)	Responsible for directing daily project activities and tracking product delivery. Communicates with AEA Environmental Manager on project schedule and timing for product delivery.
URS Project and Field Operations Manager: Mark Vania	URS Corporation	Geosciences and Remediation Services	Responsible for Project Management of field logistics, sampling strategies, quality assurance and quality control of field protocols. Ensures that all samples are collected from scheduled collection sites on a daily basis. Checks on completion of field forms and completeness of field data entries. Ensures that sample sets are couriered each day to the laboratory. Also responsible for organization of URS staff conducting water quality monitoring and sampling, quality assurance and quality control of

Position Title	Company or Agency	Division Branch/Section	Responsibilities
			field protocols.

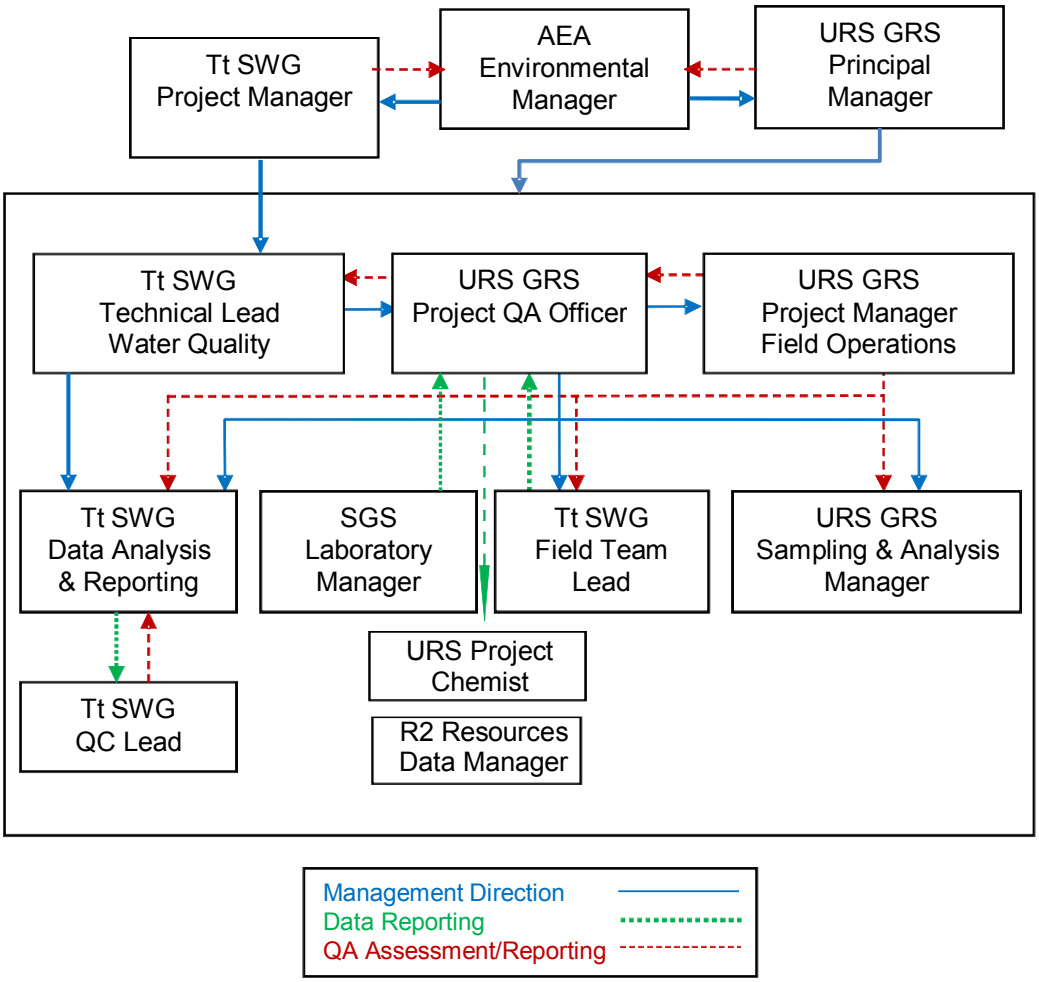
Table 3: Project Organizational Responsibilities (continued)

Position Title	Company or Agency	Division Branch/Section	Responsibilities
URS QA Officer: William Loskutoff	URS Corporation	Geosciences and Remediation Services	Quality Assurance Officer that independently evaluates progress in implementing the QAPP elements.
URS Project Chemist	URS Corporation	URS Seattle Analytical Chemistry Group	Responsible for analytical data validation and usability
Tt Water Quality Technical Lead: Robert Plotnikoff	Tetra Tech, Inc.	Surface Water Group (SWG)	Responsible for preparing the project QAPP, coordinating and completing sampling activities, analyzing project data, and preparing the draft and final data reports. Serves as the principal project team contact for field staff for the duration of the study
Tt Project Manager: Harry Gibbons	Tetra Tech, Inc.	Surface Water Group	Responsible for managing the project, overseeing preparation of the project QAPP, reviewing analysis of project data, and review of the draft and final data reports. Serves as the principal project team contact for the technical aspects of the study
Tt Field Team Lead: Shannon Brattebo	Tetra Tech, Inc.	Surface Water Group	Responsible for organization and instructions to Tt staff conducting water quality and toxics field sampling, quality assurance and quality control of field protocols. Ensure that field forms have data entries and are completed during each site visit.
Tt QC Lead: Gene Welch	Tetra Tech, Inc.	Surface Water Group	Reviews QAPP. Provides technical assistance on QA/QC issues during the implementation and assessment of the project.
Laboratory Manager: Charles Homestead	SGS North America, Inc.	Alaska Division	Alaska Division Manager for SGS Laboratory Analytical Services. Manages laboratory staff that

Position Title	Company or Agency	Division Branch/Section	Responsibilities
			provide sample collection materials, sample handling and chain-of-custody documentation, and return of sample results to URS/Tt. Reports any laboratory errors and sample condition issues.

Figure 1 describes how each position contributes to the project. The lines of reporting and communication between project staff are identified.

Figure 1: Project Organizational Structure



Additional technical staff will be responsible for conducting specific tasks during the project (e.g., performing field sampling and collecting surface water quality data) at the direction and discretion of the URS Project Manager of Field Operations and the Tt Project Manager. These Project Managers (PMs) will supervise the technical staff participating in the project, including implementing the QC program, completing assigned work on schedule with strict adherence to procedures established in the approved QAPP, and completing required documentation. The PMs will direct the work of the field

sampling team including collection, preparation, and shipment of samples and completion of field-sampling records. To perform the required work effectively and efficiently, the field-sampling team will include scientific staff with specialization and technical competence in field-sampling activities, as required to ensure the highest quality data are collected without incident, and experience qualifications set forth by ADEC. They must perform all work in adherence with the project work plan and QAPP, including maintenance of field sample documentation. Where applicable, custody procedures are required to ensure the integrity of the samples with respect to preventing contamination and maintaining proper sample identification during handling. Where field samples are collected the sampling team is responsible for the following:

- Receiving, inspecting, and inventorying the sample containers
- Receiving, inspecting, calibrating, and maintaining field instrumentation
- Completing, reviewing, and signing appropriate field records
- Assigning tracking numbers to each sample (sample identification numbers)
- Controlling and monitoring access to samples while in their custody
- Verifying the completeness and accuracy of chain-of-custody documentation
- Initiating shipment and verifying receipt of samples at their appropriate destinations
- Verifying the results of sample measurements collected for compliance with the requirements of the reference methods, data quality objectives (DQOs) and this QAPP

Additional oversight will be provided by the Tt. QC Lead (QCO), who is responsible for performing evaluations to ensure that QC is maintained throughout the sampling process, that the data collected will be of optimal validity and usability, and that limitations of the data set are minimized as much as is possible given the challenges of the routine field investigation. The QC Lead is a senior technical staff assigned the responsibility of providing a second-level review of all documentation and records developed during the sample and data collection process. The QC evaluations will include double-checking work as it is completed and providing written documentation of these reviews (minimally initialing and dating documents as they are reviewed) to ensure that the standards set forth in the QAPP are met or exceeded. The QC Lead may be assigned at the task or subtask level allowing teams to efficiently divide work processes or tasks required and exchanging project documentation for review prior to departure from a sampling station. In this regard, QC Leads ensure that all required data and information are recorded for each sampling station prior to physically leaving the collection site. The URS QA Lead (QAO), will assign staff, such as technical reviewers and technical editors selected as needed, will provide peer review oversight on the content of work products and ensure that work products comply with project QC protocols and the client's specifications.

Technical staff involved with the program will be responsible for reading and understanding this QAPP and complying with and adhering to its requirements in executing their assigned tasks relative to this project.

A.5 PROBLEM DEFINITION/BACKGROUND AND PROJECT OBJECTIVES

A.5.1 Problem Definition

Construction and operation of the Project as described in the Pre-Application Document (PAD, AEA 2011) is expected to change some of the water quality characteristics of the resulting riverine portion of the drainage downstream of the dam site as well as the inundated area that will become the reservoir.

A.5.2 Project Background

The study area includes the Susitna River within the proposed Watana Reservoir and downstream of the proposed Watana Dam. Water quality studies will be conducted from river mile 15.1 (Susitna River above Alexander Creek) to river mile 233.4 (at Oshetna River, just above the upper extent of the proposed reservoir area) and within select tributaries. The proposed dam would be located at river mile 184.5. The dam would create a reservoir 42.5 miles long and 1 to 2 miles wide, with a normal reservoir surface area of approximately 23,546 acres and a normal maximum pool elevation of 2,050 feet. The lowermost boundary of the monitoring activity is above the area protected for Beluga whale activity.

A large-scale assessment of water quality conditions throughout the Susitna drainage has not been completed. Historical water quality data available for the study area includes water temperature data, some general water quality data, and limited metals data primarily collected during the 1980s. Additional data has been recently collected at limited mainstem Susitna sites describing flow, in-situ, general, and metals parameters by the United States Geological Study (USGS). In 2012, water temperature data loggers and meteorological stations were installed throughout the Project area. A data gap analysis was conducted for water quality and sediment transport in 2011 (URS 2011) summarizing mainstem and tributary data available. Some general observations based on existing data are as follows:

- Large amounts of data were collected during the 1980s. However, a comprehensive data set for the Susitna River and tributaries is not available.
- The influence of major tributaries (Chulitna and Talkeetna rivers) on Susitna River water quality conditions is unknown. There are no monitoring stations in receiving water at these mainstem locations.
- Continuous temperature data and seasonal water quality data are not available for the Susitna River mainstem and sloughs potentially used for spawning and rearing habitat.

The following series of tables represent summaries and results from the limited available data from 1975 through 2011 (URS 2011). Table 3 summarizes the existing historical information for the basin and highlights some of the needs for future monitoring.

Table 3. Reach Segmentation for the Susitna River Basin and Known Data Gaps

Bounds of Reach (Susitna River Miles)	Reach Number	General Description	Water Quality Data Gaps
313 – 184	1	Upper Susitna River, including headwaters and tributaries above the proposed Watana dam site	1. Surface water and sediment analysis for metals not available for mainstem, only for one tributary. 2. Need to know concentrations of metals in media and current water quality conditions to predict if toxics can be released in a reservoir environment.
184 - 150	2	Middle Susitna River and tributaries through	1. Temperature data is not available above and below

Bounds of Reach (Susitna River Miles)	Reach Number	General Description	Water Quality Data Gaps
		Devil's Canyon and below the proposed Watana Dam site	most tributaries on the mainstem Susitna River. 2. Overall, very limited surface water data available for this reach. 3. Metals monitoring data does not exist or is limited. 4. Monitoring of mainstem and sloughs (ambient conditions and metals) needed for determining bioaccumulation potential of juvenile Chinook and Coho salmon .

Table 3. Reach Segmentation for the Susitna River Basin and Known Data Gaps (continued)

Bounds of Reach (Susitna River Miles)	Reach Number	General Description	Water Quality Data Gaps
150 – 99	3	Middle Susitna River and tributaries from the mouth of Devil's Canyon to the Susitna – Chulitna – Talkeetna confluence	1. Sources for metals detected at high concentrations in mainstem (1 location). Sampling needs to occur increasing spatial coverage of sampling points to provide adequate representative of conditions. 2. Current data reflects large spatial data gaps between upper reach 1 and the mid- to lower reach 3 and 4. 3. Monitoring of mainstem and sloughs needed for juvenile Chinook and Coho survival.
99 - 0	4	Lower Susitna River from Susitna – Chulitna – Talkeetna confluence to mouth at Cook Inlet	1. Although has the most data available, most data is old and most likely does not represent current conditions. 2. Metals data not available for mouth of Chulitna River. Since this tributary has a high sediment load the metals content should be monitored. 3. Influence of major tributaries (Chulitna and Talkeetna Rivers) on water quality conditions is unknown. There are no monitoring stations in receiving water at these mainstem locations. 4. Metals data not available for the Skwentna River or the Yentna River.

Historical and existing data were compared with conventional (or general) water quality parameters. Table 4 is a description of the general parameters and water quality standards used to identify where conditions have exceeded these standards.

Table 4. Alaska State Water Quality Standards for the Protection of Aquatic Life and Wildlife (18 AAC 70, April 2012)

Parameter	Criteria
Color (platinum-cobalt scale)	Color or apparent color may not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonally established norm for aquatic life. For all waters without a seasonally established norm for aquatic life, color or apparent color may not exceed 50 color units or the natural condition, whichever is greater.
Fecal Coliform Bacteria	Not applicable.
Dissolved Oxygen	D.O. must be greater than 7 mg/l in waters used by anadromous or resident fish. In no case may D.O. be less than 5 mg/l to a depth of 20 cm in the interstitial waters of gravel used by anadromous or resident fish for spawning. For waters not used by anadromous or resident fish, D.O. must be greater than or equal to 5 mg/l. In no case may D.O. be greater than 17 mg/l. The concentration of total dissolved gas may not exceed 110% of saturation at any point of sample collection.
Total Dissolved Solids	TDS may not exceed 1,000 mg/l. A concentration of TDS may not be present in water if that concentration causes or reasonably could be expected to cause an adverse effect to aquatic life.
pH	May not be less than 6.5 or greater than 8.5. May not vary more than 0.5 pH unit from natural conditions.
Temperature	May not exceed 20°C at any time. The following maximum temperatures may not be exceeded, where applicable: Migration routes 15°C Spawning areas 13°C Rearing areas 15°C Egg & fry incubation 13°C For all other waters, the weekly average temperature may not exceed site-specific requirements needed to preserve normal species diversity or to prevent appearance of nuisance organisms.
Turbidity	May not exceed 25 NTU above natural conditions. For all lake waters, may not exceed 5 NTU above natural conditions.

Historical and existing data were also compared with toxics water quality parameters. Table 5 is a description of the toxics parameters and standards used to identify where conditions have exceeded these standards.

Table 5. Alaska State Water Quality Standards for Toxics and Other Deleterious Organic and Inorganic Substances (December 2008)

Parameter	Acute Criteria (CMC)	Chronic Criteria (CCC)
Aluminum, *Total recoverable*	**750 µg/L** (1-hr avg)	**87 µg/L** (4-day avg)
Ammonia, *(total ammonia nitrogen in mg N/l)*	**1.77 to 28.1** Criteria are pH dependent[1] (1-hr avg)	Criteria are pH and temperature dependent[2] (30-day avg)
Arsenic, *dissolved*	**340 µg/L** (1-hr avg)	**150 µg/L** (4-day avg)
Barium	No Criteria	No Criteria
Cadmium, *dissolved*	Criteria Hardness Dependent[3] (1-hr avg)	Criteria Hardness Dependent[3] (4-day avg)
Chloride, *dissolved*	**860,000 µg/L** (1-hr avg) Applies to dissolved chloride when associated with sodium.	**230,000 µg/L** (4-day avg) Applies to dissolved chloride when associated with sodium.
Copper, *dissolved*	Criteria Hardness Dependent[3] (1-hr avg)	Criteria Hardness Dependent[3] (4-day avg)
Iron	No Criteria	**1,000 µg/L**
Lead, *dissolved*	Criteria Hardness Dependent[3] (1-hr avg)	Criteria Hardness Dependent[3] (4-day avg)
Manganese	No Criteria	No Criteria
Mercury, *dissolved*	**1.4 µg/L** (1-hr avg)	**0.77 µg/L** (4-day avg)
Mercury, *Total*	**1.694 µg/L**	**0.9081 µg/L**
Nickel, *dissolved*	Criteria Hardness Dependent[3] (1-hr avg)	Criteria Hardness Dependent[3] (4-day avg)
Selenium, *Total recoverable*	See Note[4] (1-hr avg)	**5.0 µg/L** (4-day avg)
Zinc, *dissolved*	Criteria Hardness Dependent[3] (1-hr avg)	Criteria Hardness Dependent[3] (4-day avg)

Existing data were used to summarize the reaches of the river where water quality conditions exceeded criteria (Table 6). This summary of conditions represents limited sampling locations within each of the river reaches and does not necessarily describe more current water quality conditions as many of the data were collected during the 1980s studies.

Table 6. Location of Water Quality Criteria Exceedances in the Susitna River Basin

Bounds of Reach (Susitna River Miles)	Reach Number	General Description	Water Quality Criteria Exceedance
313 – 184	1	Upper Susitna River, including headwaters and tributaries above the proposed Watana dam site	Aluminum Iron
184 - 150	2	Middle Susitna River and tributaries through Devil's Canyon and below the proposed Watana Dam site	Total Dissolved Gas Temperature (for Migration) Aluminum
150 – 99	3	Middle Susitna River and tributaries from the mouth of Devil's Canyon to the Susitna – Chulitna – Talkeetna confluence	Temperature (for Migration) Aluminum Iron Total Mercury (Mainstem at Gold Creek)
99 – 0	4	Lower Susitna River from Susitna – Chulitna – Talkeetna confluence to mouth at Cook Inlet	Temperature (for Spawning, Talkeetna River) Dissolved Oxygen pH Iron Mercury

Concentrations of water quality parameters, including metals in sediment immediately below the proposed Project, are unknown. Metals in these sediments may become mobile once the Project begins operation. Monitoring information in the immediate vicinity of the reservoir and riverine habitat will be important for developing two models (reservoir and riverine) which will be coupled for predicting expected water quality conditions below the proposed dam.

An expanded monitoring network for continuous temperature and water quality data (including sediment, surface water, potentially pore water) collection is required for this Study for the following reasons:

- More information is needed to define existing thermal refugia throughout the Susitna drainage.
- Limited information is available on natural, background conditions for water quality.
- It is unknown if seasonal patterns exist for select water quality parameters.
- Additional information is required for calibrating the water quality model to be used in the water quality modeling study. More recent water quality data will be used for predicting reservoir conditions and predicting riverine conditions downstream of the proposed dam.

An expanded network of water quality and temperature monitoring sites is proposed from approximately RM 15.1 to RM 234. Monitoring sites are located at (or nearby) the same sites characterized during the 1980s studies, as well as additional locations. Monitoring of areas of the mainstem Susitna River or tributaries with high metals concentrations or temperature measurements

(based on the Data Gap Analysis for Water Quality, URS 2011) will confirm previous observations and will describe the persistence of any water quality exceedances that might exist.

A.5.3 Project Objective(s)

The collective goal of the water quality studies is to assess the impacts of the proposed Project operations on water quality in the Susitna River basin with particular reference to state water quality standards set forth in ADEC regulations Title 18-Health, Safety, and Housing; Chapters: 70-Water Quality Standards [surface water]; 75-Oil and Other Hazardous Substances Pollution Control [groundwater], and 80-Drinking Water Standards; of the Alaska Administrative Code (AAC); 18 AAC 70, 18 AAC 75, and 18 AAC 80, respectively (ADEC 2012a; ADEC 2012b; and ADEC 2012c). Predicting the potential impacts of the dam and its proposed operations on water quality will require the development of water quality models. The goal of the Water Quality Modeling Study will be to utilize the extensive information collected from the Baseline Water Quality Study to develop a model(s) in which to evaluate the potential impacts of the proposed Project and operations on various physical parameters within the Susitna River watershed.

The specific objectives of the Baseline Water Quality Study are to:

- Document historical water quality data and combine with data generated from this study. The combined data set will be used in the water quality modeling study to predict Project impacts under various operations.
- Add three years of current stream temperature and meteorological data to the existing data. Stream temperatures and meteorological data was collected in 2012 (Tetra Tech 2012) and will continue to be collected in 2013-2014.
- Develop a monitoring program to adequately characterize surface water physical, chemical, and bacterial conditions in the Susitna River within and downstream of the proposed Project area.
- Measure baseline inorganic metals concentrations in sediment and fish tissue for comparison to federal and state criteria.

A.6 PROJECT/TASK DESCRIPTION and SCHEDULE

A.6.1 Project Description

Water quality data will be collected from multiple aquatic media including surface water, sediment, and fish tissue. The fish tissue collection will be conducted as part of Study Plan 7.5/7.6 (Study of Fish Distribution and Abundance in the Upper Susitna River and the Middle/Lower Susitna River, respectively). Continuous temperature monitoring will be conducted at 37 sites to inform the predictive model on how the mainstem river and tributaries will respond to alternative Project operational scenarios and if changes in water quality conditions could affect aquatic life use and survival in the Project area. In addition, several other requirements of the 401 Water Quality Certification Process will be addressed with collection and description of additional water quality data including the following:

- conducting a water quality baseline assessment;
- description of how existing and designated uses are met;
- use of appropriate field methods and models;
- use of acceptable data quality assurance methods;
- scheduling of technical work to meet deadlines;
- and derivation of load calculations of potential pollutants (pre-Project conditions).

The study area begins at RM 15.1 and extends past the proposed dam site to RM 233.4. The lowermost boundary of the monitoring is above the area protected for Beluga whale activity. Twelve mainstem

Susitna River monitoring sites are located below the proposed dam site and two mainstem sites above this location for calibration of the models. Five sloughs will be included in the monitoring and represent important fish-rearing habitat. Tributaries to the Susitna River will be monitored and include those contributing large portions of the lower river flow like the: Talkeetna, Chulitna, Deshka, and Yentna rivers. A partial list of the remaining tributaries that will be included in monitoring and represents important spawning and rearing habitat for anadromous and resident fisheries include: Gold Creek, Portage Creek, Tsusena Creek, Watana Creek, and Oshetna River. Water quality (water and sediment) samples will be collected at 17 of the 38 temperature monitoring sites; 15 below the proposed dam site and two sites above. Continuous temperature monitoring activities in 2013 and 2014 will follow the 2012 SAP/QAPP for Water Temperature and Monitoring and Meteorological Station Installation for Use in Water Quality Model Calibration and Development: Susitna River, South-central Alaska (AEA 2012).

Water quality sampling sites were selected based on the following rationale:

- Adequate representation of locations throughout the Susitna River and tributaries above and below the proposed dam site;
- Preliminary consultation with AEA and licensing participants including co-location with other study sites (e.g., in-stream flow, ice processes);
- Access and land ownership issues; and
- Eight of the sites are mainstem monitoring sites that were previously used for Stream Network Temperature Modeling (SNTEMP) in the 1980s (refer to Table 12). Twenty nine of the temperature sites are Susitna River mainstem, tributary, or slough locations, most of which were also monitored in the 1980s by the Alaska Energy Authority.

Water quality data will also be collected at ten Focus Areas along the Susitna River. The Focus Areas are intended to serve as specific geographic areas of the river that will be the subject of intensive investigation by multiple resource disciplines including water quality. The proposed Focus Areas were selected during an interdisciplinary resource meeting that involved a systematic review of aerial imagery within each of the Geomorphic Reaches (MR1 through MR8) for the entire Middle Segment of the river. Focus Areas were selected within MR1, MR2, MR5, MR6, MR7, and MR8. Focus Areas were not selected for MR3 or MR4 due to safety considerations related to Devils Canyon.

A list of water quality parameters and measurements to be collected during this project are summarized in Table 7. Samples collected within the Focus Areas will be analyzed for a reduced list of parameters but at a greater frequency (every two weeks for a six week period) than samples collected along the mainstem network.

Table 7. List of Water Quality Parameters to be Measured

Field Measurements	Laboratory Measurements
SURFACE WATER	
Dissolved Oxygen (DO)	Hardness
pH	Alkalinity
Temperature	Nitrate/Nitrite
Specific Conductance	Ammonia as N
Turbidity	Total Kjeldahl Nitrogen (TKN)
Redox Potential	Total Phosphorus
Color	Ortho-phosphate
Residues	Chlorophyll *a*
	Total Dissolved Solids (TDS)
	Total Suspended Solids (TSS)
	Turbidity
	Total Organic Carbon (TOC)
	Dissolved Organic Carbon (DOC)
	Fecal Coliform
	Benzene, Ethylbenzene, Toluene, Xylenes (total aromatic hydrocarbons [TAH])[1]
	Total aqueous hydrocarbons (TAqH, See Table 10)1
	Radionuclides (See Table 10)
	Aluminum, (Total and Dissolved)
	Arsenic, (Total and Dissolved)
	Barium, (Total and Dissolved)
	Beryllium, (Total and Dissolved)
	Cadmium, (Total and Dissolved)
	Chromium, (Total and Dissolved)
	Cobalt, (Total and Dissolved)
	Copper, (Total and Dissolved)
	Iron, (Total and Dissolved)
	Lead, (Total and Dissolved)
	Manganese, (Total and Dissolved)
	Magnesium, (Total and Dissolved)
	Mercury, (Total and Dissolved)
	Methyl-mercury (Dissolved)
	Molybdenum, (Total and Dissolved)
	Nickel, (Total and Dissolved)

Field Measurements	Laboratory Measurements
	Selenium, (Total and Dissolved)

Table 7. List of Water Quality Parameters to be Measured (continued)

Field Measurements	Laboratory Measurements
	Thallium, (Total and Dissolved)
	Vanadium, (Total and Dissolved)
	Zinc, (Total and Dissolved)
SEDIMENT	
	Aluminum, Total
	Arsenic, Total
	Cadmium, Total
	Copper, Total
	Iron, Total
	Lead, Total
	Mercury, Total
	Zinc, Total
	TOC
	Grain Size
FISH TISSUE	
	Total Mercury
	Methyl-mercury
	Arsenic
	Cadmium
	Selenium

[1] Petroleum hydrocarbons will be assessed based on total aromatic hydrocarbons [TAH] and total aqueous hydrocarbons [TAqH].

A.6.2 Project Implementation Schedule

The Baseline Water Quality Monitoring Study for the Susitna River began October 2012 and will continue through March 2014. The exact scheduling of the monthly and seasonal sampling will be coordinated between AEA, URS, and Tt staff. Table 8 gives the projected schedule of activities and deliverables. Table 9 summarizes sampling frequency and number of samples per site for water quality monitoring activities for all tasks associated with this QAPP.

Table 8. Schedule for the Baseline Water Quality Study Elements and Production of Associated Deliverables

Monitoring Activity	Timeline
Thermal Imaging (one survey)	October 2012
MET Station Installation and Data Collection (as part of the 2012 Water Temperature Monitoring and MET Station Installation Study)	July 2012 (monitoring activities covered under different QAPP)
QAPP/SAP Preparation and Review	January 2013-March 2013
Deployment of Temperature Monitoring Apparatus (if removed before winter ice-up)	June 2013 (retrieve in October 2014)
Water Quality Monitoring (monthly)	June 2013-September 2013 (one sampling event in each of December 2013 and March 2014)
Focus Area Surface Water Quality Sampling (every 2 weeks for 6 week period)	June-September 2013
Sediment Sampling (one survey)	August-September 2013
Fish Tissue Sampling (one survey)	August-September 2012/2013
Thermal Imaging (one survey)	October 2013
Field Audit	< 30 days of project start-up (once per year)
Data Analysis and Management	June 2013-November 2013
Data QA Review	June 2013-November 2013 (once per month; final review in November)
QA Review of Initial Study Report	December 2013
Initial Study Report	December 2013
QA Review of Updated Study Report	December 2014
Updated Study Report	December 2014

Table 9 includes parameters to be measured for Baseline Monthly WQ samples, Sediment samples, Focus Area samples, and Fish Tissue samples.

Table 9. Sample Collection Frequency per Analyte and No. of Samples to be Collected for Each Water Quality Monitoring Site.

Product	Measurement/Parameter(s)	Task	Sampling Frequency	No. of Samples/Site
In-Situ Water Quality Parameters				
Field Measurement	Dissolved Oxygen (DO)	Baseline WQ	Monthly June-Sept	3 profiles
		Sediment[1]	Single Event (Aug or Sept)	3
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Field Measurement	pH	Baseline WQ	Monthly June-Sept	3 profiles
		Sediment[1]	Single Event (Aug or Sept)	3
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Field Measurement	Temperature	Baseline WQ	Monthly June-Sept	3 profiles
		Sediment[1]	Single Event (Aug or Sept)	3
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Field Measurement	Specific Conductance	Baseline WQ	Monthly June-Sept	3 profiles
		Sediment[1]	Single Event (Aug or Sept)	3
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Field Measurement	Turbidity	Baseline WQ	Monthly June-Sept	3 at surface
		Sediment[1]	Single Event (Aug or Sept)	3
Field Measurement	Redox Potential	Baseline WQ	Monthly June-Sept	3 profiles
		Sediment[1]	Single Event (Aug or Sept)	3

Product	Measurement/Parameter(s)	Task	Sampling Frequency	No. of Samples/Site
Field Measurement	Color	Baseline WQ (Visual)	Monthly June-Sept	3

Table 9. Sample Collection Frequency per Analyte and No. of Samples to be Collected for Each Water Quality Monitoring Site. (continued)

Product	Measurement/Parameter(s)	Task	Sampling Frequency	No. of Samples/Site
Field Measurement	Residues	Baseline WQ (Visual)	Single Event (Aug or Sept)	3
General Water Quality Parameters (grab samples for laboratory analysis)				
Laboratory Analysis	Hardness	Baseline WQ	Monthly June-Sept	6*
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	Alkalinity	Baseline WQ	Monthly June-Sept	6*
Laboratory Analysis	Nitrate/Nitrite	Baseline WQ	Monthly June-Sept	6*
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	Ammonia as N	Baseline WQ	Monthly June-Sept	6*
Laboratory Analysis	Total Kjeldahl Nitrogen	Baseline WQ	Monthly June-Sept	6*
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	Total Phosphorus	Baseline WQ	Monthly June-Sept	6*
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	Ortho-phosphate	Baseline WQ	Monthly June-Sept	6*

		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	Chlorophyll *a*	Baseline WQ	Monthly June-Sept	6*

Table 9. Sample Collection Frequency per Analyte and No. of Samples to be Collected for Each Water Quality Monitoring Site. (continued)

Product	Measurement/Parameter(s)	Task	Sampling Frequency	No. of Samples/Site
Laboratory Analysis	Total Dissolved Solids	Baseline WQ	Monthly June-Sept	6*
Laboratory Analysis	Total Suspended Solids	Baseline WQ	Monthly June-Sept	6*
Laboratory Analysis	Turbidity	Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	TOC	Baseline WQ	Single Event (Aug or Sept)	6*
		Focus Areas (Surface Water)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	DOC	Baseline WQ	Monthly (June-Sept, Dec 2013 and March 2014)	6*
Laboratory Analysis	Fecal Coliform	Baseline WQ	Single Event (Aug or Sept)	6*
Laboratory Analysis	BTEX and PAHs (for Petroleum Hydrocarbons assessment)	Baseline WQ	Single Event (Aug or Sept)	6*
Laboratory Analysis	Radionuclides	Baseline WQ	Single Event (Aug or Sept)	6*
Metals – (Water) Dissolved and Total				
Laboratory Analysis	Aluminum	Baseline WQ (Total & Dissolved)	Single Event (Aug or Sept)	6*
		Focus Areas (Surface Water) (Total &	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)

		Dissolved)		
Laboratory Analysis	Arsenic	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Barium	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*

Table 9. Sample Collection Frequency per Analyte and No. of Samples to be Collected for Each Water Quality Monitoring Site. (continued)

Product	Measurement/Parameter(s)	Task	Sampling Frequency	No. of Samples/Site
Laboratory Analysis	Beryllium	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Cadmium	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Chromium	Baseline WQ (Total & Dissolved)	Single Event (Aug or Sept)	6*
Laboratory Analysis	Cobalt	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Copper	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Iron	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
		Focus Areas (Surface Water) (Total & Dissolved)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	Lead	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Manganese	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Magnesium	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Mercury	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
		Focus Areas (Surface Water) (Total & Dissolved)	Every 2 weeks for 6 weeks (June-Sept)	6 to 19 (depending on site)
Laboratory Analysis	Methyl-mercury (Dissolved)	Focus Areas	Every 2 weeks for 6 weeks	6 to 19 (depending on

		(Surface Water)	(June-Sept)	site)

Table 9. Sample Collection Frequency per Analyte and No. of Samples to be Collected for Each Water Quality Monitoring Site. (continued)

Product	Measurement/Parameter(s)	Task	Sampling Frequency	No. of Samples/Site
Laboratory Analysis	Molybdenum	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Nickel	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Selenium	Baseline WQ (Total & Dissolved)	Single Event (Aug or Sept)	6*
Laboratory Analysis	Thallium	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Vanadium	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Laboratory Analysis	Zinc	Baseline WQ (Total & Dissolved)	Monthly June-Sept	6*
Metals –Sediment (Total)				
Laboratory Analysis	Aluminum	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	Arsenic	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	Cadmium	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	Copper	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	Iron	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	Lead	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	Mercury	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	Zinc	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	TOC	Sediment Samples	Single Event (Aug or Sept)	3
Laboratory Analysis	Grain Size	Sediment Samples	Single Event (Aug or Sept)	3
Metals – Fish Tissue (Use EPA Sampling Method 1669)				

Laboratory Analysis	Total Mercury	Fish Tissue Screening	Single Event (September)	3-6 fish

Table 9. Sample Collection Frequency per Analyte and No. of Samples to be Collected for Each Water Quality Monitoring Site. (continued)

Product	Measurement/Parameter(s)	Task	Sampling Frequency	No. of Samples/Site
Laboratory Analysis	Methyl-mercury	Fish Tissue Screening	Single Event (September)	3-6 fish
Laboratory Analysis	Arsenic	Fish Tissue Screening	Single Event (September)	3-6 fish
Laboratory Analysis	Cadmium	Fish Tissue Screening	Single Event (September)	3-6 fish
Laboratory Analysis	Selenium	Fish Tissue Screening	Single Event (September)	3-6 fish

*Baseline monthly WQ samples will be collected along a transect at each sample location. Samples will be collected at 3 equidistant locations along each transect and at two depths (top and bottom) if water depth is greater than 5ft (1.5 m). If water depth at each sampling point along the transect is less than 4ft (1.5m) then only a top sample will be collected. Top (or surface) samples will be collected at 0.5 m below water surface and bottom samples will be collected 0.5 m above the bottom.

1 Field measurements to be collected from surface water directly above sediment sampling location.

A.7 DATA QUALITY OBJECTIES AND CRITERIA FOR MEASUREMENT DATA

A.7.1 Data Quality Objectives (DQOs)

Data Quality Objectives (DQOs, EPAQA/G4). DQOs are qualitative and quantitative statements derived from the DQO Process that:

- Clarify the monitoring objectives (i.e., determine water/wastewater pollutant concentrations of interest and how these values compare to water quality standards regulatory limits).
- Define the appropriate type of data needed. In order to accomplish the monitoring objectives, the appropriate type of data needed is defined by the respective AWQS. For pollutants, compliance with the AWQS is determined by specific measurement requirements. The measurement system is designed to produce water pollutant concentration data that are of the appropriate quantity and quality to assess compliance.

For this Tier 2 QAPP, the DQOs require maintenance of sufficient data quality to demonstrate compliance with Alaska's Water Quality Standards. Data will meet all MQOs in order to ensure consistent quality for use in calibrating and running the water quality model for predicting outcomes of water quality scenarios under different Project operation scenarios.

A.7.2 Measurement Quality Objectives (MQOs)

Measurement Quality Objectives (MQOs) are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the project's DQOs. MQOs define the acceptable quality (data validity) of field and laboratory data for the project. MQOs are defined in terms of the following data quality indicators:

- Detectability
- Precision
- Bias/Accuracy
- Completeness
- Representativeness
- Comparability

The MQOs for this project are presented in Table 10. Industry standard field methods will be used throughout this project to minimize measurement bias (systematic error) and to improve precision (to reduce random error).

Detectability is the ability of the method to reliably measure a pollutant concentration above background. DEC DOW uses two components to define detectability: method detection limit (MDL) and practical quantification limit (PQL) or reporting limit (RL).

- The MDL is the minimum value which the instrument can discern above background but with no certainty to the accuracy of the measured value. For field measurements, the manufacturer's listed instrument detection limit (IDL) can be used.
- The PQL or RL is the minimum value that can be reported with confidence (usually some multiple of the MDL).

Note: The measurement method of choice should at a minimum have a practical quantification limit or reporting limit 3 times more sensitive than the respective DEC WQS and/or permitted pollutant level (for permitted facilities).

Sample data measured below the MDL is reported as ND or non-detect. Sample data measured ≥ MDL but ≤ PQL or RL is reported as estimated data. Sample data measured above the PQL or RL is reported as reliable data unless otherwise qualified per the specific sample analysis.

Precision is the degree of agreement among repeated measurements of the same parameter and provides information about the consistency of methods. Precision is expressed in terms of the relative percent difference (RPD) between two measurements (A and B).

For field measurements, precision is assessed by measuring replicate (paired) samples at the same locations and as soon as possible to limit temporal variance in sample results. Overall project precision is measured by collecting blind (to the laboratory) field replicate samples. Laboratory precision is determined similarly via analysis of laboratory duplicate samples. For paired and small data sets, project precision is calculated using the following formula:

$$RPD = 100 * \frac{(A - B)}{\left({}^{(A+B)}/_{2} \right)}$$

Where: RPD = relative percent difference
A = primary sample
B = replicate field sample or laboratory duplicate sample

For larger paired precision data sets (e.g. overall project precision) or multiple replicate precision data, use the following formula:

$$RSD = 100*\sigma/mean$$

$$\sigma = \int \frac{\Sigma d^2}{2k}$$

Where: RSD = relative standard deviation
σ = standard deviation
k = number of paired replicate samples (A and B)
d = A - B
A = primary sample
B = replicate field sample or laboratory duplicate sample

Field sample replicates for assessment of precision will be analyzed at no less than at 10 percent frequency of the total number of samples. Laboratory replicates for assessment of precision will be analyzed at no less than at 5 percent frequency of the total number of samples submitted to the laboratory.

For sample results that exceed the reporting limit (RL), the relative percent difference (RPD) will be less than or equal to 20 percent. No criteria are presented for duplicates that are below the RL, as these data are provided for informational purposes only. When one or more of the results is below the RL, professional judgment will be used in determining the compliance of the data to project requirements.

Bias (Accuracy) is a measure of confidence that describes how close a measurement is to its "true" value. Methods to determine and assess accuracy of field and laboratory measurements include, instrument calibrations, various types of QC checks (e.g., sample split measurements, sample spike recoveries, matrix spike duplicates, continuing calibration verification checks, internal standards, sample blank measurements (field and lab blanks), external standards), performance audit samples (DMRQA, blind Water Supply or Water Pollution PE samples from American Association for Laboratory Accreditation (A2LA) certified, etc. Bias/Accuracy is usually assessed using the following formula:

$$Accuracy = \frac{MeasuredValue}{TrueValue} \times 100$$

Completeness is a measure of the percentage of valid samples collected and analyzed to yield sufficient information to make informed decisions with statistical confidence. Completeness will be judged by the amount of valid data compared to the data expected. Valid data are those data in compliance with the data quality criteria as presented in this section, and in compliance within expected range of conditions and daily fluctuation patterns. While the goal for the criteria described above is 100 percent completeness, a level of 95 percent completeness will be considered acceptable.

However, any time data are incomplete, decisions regarding re-sampling and/or re-analysis will be made. These decisions will take into account the project data quality objectives as presented above.. Project completeness is determined for each pollutant parameter using the following formula:

$$\frac{T - (I+NC)}{T} \times (100\%) = \text{Completeness}$$

Where T = Total number of expected sample measurements.

I = Number of invalid sample measured results.

NC = Number of sample measurements not completed (e.g. spilled sample, etc).

Project % Data Completeness Goal = 95% /analyte for all project analytes

Representativeness assigns what parameters to sample for, where to sample, type of sample (grab, continuous, composite, etc.) and frequency of sample collection. Sample representativeness is the degree to which data accurately and precisely represent a characteristic of a population. Representativeness will be addressed at two distinct points in the data collection process. During sample collection, the use of generally accepted sampling procedures applied in a consistent manner throughout the project will help ensure that samples are representative of conditions at the point where the sample was taken. During subsampling (sample aliquot removal) in the laboratory, samples will be inverted several times to ensure that the analytical subsample is well mixed and therefore representative of the sample container's contents.

Comparability is a measure of the confidence with which one dataset can be compared to another. This is a qualitative assessment and is addressed primarily by sampling design through use of comparable sampling procedures or, for monitoring programs, through consistent sampling of stations over time. In the laboratory, comparability is assured through the use of comparable analytical procedures and ensuring that project staff are trained in the proper application of the procedures. Within-study comparability will be assessed through analytical performance (quality control samples).

Table 10: Project Measurement Quality Objectives (MQOs)

Group	Analyte	Method	MDL (µg/L)	PQL (µg/L)	Alaska WQS		Precision (RPD)	Accuracy (% Recovered)
					Aquatic Life	Recreation/Drinking Water		
Water Quality	Dissolved Oxygen (DO, Field Measurement)	Portable Multi-Parameter Field Meter (YSI or equivalent)	NA	±0.01 mg/L	>4.0 mg/L	>7 mg/l for anadromous fish; >5 mg/l for non-anadromous fish; < 17 mg/L	±20%	NA
	Redox Potential (Field Measurement)	Portable Multi-Parameter Field Meter (YSI or equivalent)	NA		NA	NA	±10%	NA
	pH (Field Measurement)	Portable Multi-Parameter Field Meter (YSI or equivalent)	NA	±0.01 pH units	6.5 - 8.5; not vary by 0.5 from natural condition	6.5 - 8.5	±0.1 pH units	NA
	Temperature (Field Measurement)	Portable Multi-Parameter Field Meter (YSI or equivalent)	NA	0.1°C	<20°C Migration routes < 15°C Spawning areas < 13°C Rearing areas < 15°C Egg /fry	<30°C	±0.2°C	±0.2°C

					incubation < 13°C			
	Color (Field Observation)	Field Kit	NA	NA	Color or apparent color may not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the normal.	May not exceed 15 color units over the natural condition	NA	NA
	Turbidity (Laboratory)	SM21 2130B	0.05 NTU	NA	May not have more than a 10% increase from the normal.	May not exceed 5 NTU above natural conditions when natural turbidity is 50 or less. If above 50 may not have more than a 10% increase.	± 10%	±5 NTU
	Turbidity (Field Measurement)	Portable Hach Meter or equivalent	NA	0.01 NTU	May not have more than a 10% increase from the normal.	May not exceed 5 NTU above natural conditions when natural turbidity is 50 or less. If above 50 may not have more than a 10% increase.		
	Total Dissolved Solids	2540C	3100		May not exceed 1,000 mg/L or have adverse effect to aquatic life	May not exceed 500 mg/L	5	75-125
	Total Suspended Solids	2540D	150				5	75-125
	Residues				Not allowed to impair designated uses, cause nuisances or result is nuisance species	Not allowed to impair designated uses, cause nuisances, or result in nuisance species, or produce objectionable odor or taste.	NA	NA
	Specific Conductance	Portable Multi-Parameter Field Meter (YSI or equivalent)	NA	0-1: 0.001 1-10: 0.01 10-100: 0.1 (mS/cm)	NA	NA	± 10%	± 10%
	Hardness	SM21 2340B	2,000	2,000	NA	NA	NA	NA
	Alkalinity	SM21 2320B	310	1,000	20,000 min as CaCO3 except where natural alkalinity is lower	20,000 min as CaCO3 except where natural alkalinity is lower	NA	85-115
	Chlorophyll a	10300					20	
Fecal Coliforms	Fecal Coliforms	SM21 9222D	1cfu/100mL	1cfu/100mL	NA	100 FC/100 mL	NA	NA
Nutrients	Nitrogen, Total Kjeldahl (TKN)	SM21 4500N D	310	1.000	NA	NA	30	80 - 120
	Ammonia-N	SM21 4500NH3-F	3,100	10,000	pH dependent	pH dependent	75	75-125
	Nitrate/ Nitrite	SM21 4500NO3-F	6.2	20	NA	10,000 µg/L	20	90-110
	Total Organic Carbon (TOC)	SM21 5310B	150	500	NA	NA	20	80-120
	Dissolved Organic Carbon (DOC)	SM21 5310B	150	500	NA	NA	20	80-120
	Ortho-Phosphate	SM21 4500P-E	31	100	NA	NA	25	75-125

	Total Phosphorus	SM21 4500 PE/4500-PB	3.1	10	NA	NA	25	75 - 125
Total Recoverable Metals	Aluminum	EPA200.8	0.62	2.0	750 µg/L Acute; 87 µg/L chronic	NA	20	85-115
	Arsenic	EPA200.8	1.5	0.5	340 µg/L acute; 150 µg/L chronic	0.018 µg/L	20	85-115
	Barium	EPA200.8	0.025	0.25	NA	2,000 µg/L	20	85-115
	Beryllium	EPA200.8	0.025	0.05	NA	4 µg/L	20	85-115
	Cadmium	EPA200.8	0.015	0.05	Hardness dependent	5 µg/L	20	85-115
	Calcium	EPA200.8			NA	NA		
	Chromium	EPA200.8			Hardness dependent			
	Cobalt	EPA200.8	0.01	0.02	NA		20	85-115
	Copper	EPA200.8	0.05	0.5	Hardness dependent	1,300 µg/L	20	85-115
	Iron	EPA200.8	6.2	20	NA Acute; 1000 µg/L chronic	NA	20	85-115
	Lead	EPA200.8	0.031	0.1	Hardness Dependent	NA	20	85-115
	Magnesium	EPA200.8	6.2	20	NA	NA	20	85-115
	Manganese	EPA200.8	0.015	0.05	NA	NA	20	85-115
	Mercury	EPA 1631E	0.0005	0.001	1.4 µg/L acute; .77 µg/L chronic	2 µg/L	20	85-115
	Molybdenum	EPA200.8	0.015	0.05	NA	NA	20	85-115
	Nickel	EPA200.8	0.062	0.62	Hardness Dependent	NA	20	85-115
	Selenium	EPA200.8	0.31	1.0	NA	50 µg/L	20	85-115
	Thallium	EPA200.8	0.006	0.02	NA	2 µg/L	20	85-115
	Vanadium	EPA200.8	0.31	1.0	NA	NA	20	85-115
	Zinc	EPA200.8	0.4	3.1	Hardness Dependent[a]	7,400 µg/L	20	85-115
Dissolved Metals	Aluminum	EPA200.8	0.62	2.0	750 µg/L Acute; 87 µg/L chronic	NA	20	85-115
	Arsenic	EPA200.8	1.5	0.5	340 µg/L Acute; 150 µg/L chronic	0.018 µg/L	20	85-115
	Barium	EPA200.8	0.025	0.25	NA	NA	20	85-115
	Beryllium	EPA200.8	0.025	0.05	NA	NA	20	85-115
	Cadmium	EPA200.8	0.015	0.05	Hardness Dependent[a]	NA	20	85-115
	Calcium	EPA 200.8			NA	NA	20	85-115
	Chromium	EPA200.8					20	85-115
	Cobalt	EPA200.8	0.01	0.02	NA	NA	20	85-115

	Copper	EPA200.8	0.05	0.5	Hardness Dependent[a]	1300 µg/L	20	85-115
	Iron	EPA200.8	6.2	20	NA Acute; 1000 µg/L chronic	NA	20	85-115
	Lead	EPA200.8	0.031	0.1	Hardness Dependent[a]	NA	20	85-115
	Magnesium	EPA200.8	6.2	20	NA	NA	20	85-115
	Manganese	EPA200.8	0.015	0.05	NA	NA	20	85-115
	Mercury	EPA 1631E	0.0005	0.001	1.4 µg/L Acute; 0.77 µg/L Chronic	NA	20	85-115
	Methyl-mercury							
	Molybdenum	EPA200.8	0.015	0.05	NA	NA	20	85-115
	Nickel	EPA200.8	0.062	0.62	Hardness dependent	NA	20	85-115
	Selenium	EPA200.8	0.31	1.0	NA	50 µg/L	20	85-115
	Thallium	EPA200.8	0.006	0.02	NA	2 µg/L	20	85-115
	Vanadium	EPA200.8	0.31	1.0	NA	NA	20	85-115
	Zinc	EPA200.8	0.4	3.1	Hardness Dependent[a]	7400 µg/L	20	85-115
Sediment Total Recoverable Inorganics	Aluminum	SW6020	0.62 mg/kg	2.0 mg/kg	NA	NA	20	80-120
	Arsenic	SW6020	0.31 mg/kg	1.0 mg/kg	NA	NA	20	80-120
	Cadmium	SW6020	0.062 mg/kg	0.2 mg/kg	NA	NA	20	80-120
	Copper	SW6020	0.18 mg/kg	0.6 mg/kg	NA	NA	20	80-120
	Iron	SW6020	3.1 mg/kg	10 mg/kg	NA	NA	20	80-120
	Lead	SW6020	0.062 mg/kg	0.2 mg/kg	NA	NA	20	80-120
	Mercury	SW6020	0.012 mg/kg	0.04 mg/kg	NA	NA	20	80-120
	Zinc	SW6020	0.31 mg/kg	1.0 mg/kg	NA	NA	20	80-120
Fish Tissue Inorganics	Total Mercury	EPA 1631	0.012 ng/g	0.40 ng/g	NA	NA	30	70 - 130
	Methyl-mercury	EPA 1630	1.0 ng/g	3.0 ng/g	NA	NA	35	65-135
	Arsenic	EPA 1638	0.014 mg/kg	0.040 mg/kg	NA	NA	30	70 - 130
	Cadmium	EPA 1638	0.003 mg/kg	0.010 mg/kg	NA	NA	30	70 - 130
	Selenium	EPA 1638	0.06 mg/kg	0.15 mg/kg	NA	NA	30	70 - 130
	Benzene	EPA 624	0.12	0.4			20	80-120
	Ethylbenzene	EPA 624	0.31	1.0			20	75-125
	Toluene	EPA 624	0.31	1.0			20	75-120

	Xylenes, total	EPA 624	0.62	2.0			20	75-130
Petroleum Hydrocarbons	Acenaphthylene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	50-105
	Acenaphthene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	45-110
	Fluorene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	50-110
	Phenanthrene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	50-115
	Anthracene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	55-110
	Fluoranthene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	55-115
	Pyrene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	50-130
	Benzo(a)Anthracene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	55-110
	Chrysene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	55-110
	Benzo[b]Fluoranthene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	45-120
	Benzo[k]Fluoranthene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	45-125
	Benzo[a]pyrene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	55-110
	Indeno[1,2,3-c,d] pyrene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	45-125
	Dibenzo[a,h]anthracene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L.	May not cause visible sheen or	30	40-125

					TAH may not exceed 10 µg/L.	impart odor or taste.		
	Benzo[g,h,i]perylene	625M SIMS	.015	0.05	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	40-125
	Naphthalene	625M SIMS	.0.031	0.1	TAqH in water column may not exceed 15 µg/L. TAH may not exceed 10 µg/L.	May not cause visible sheen or impart odor or taste.	30	40-100
Radionuclides	Gross Alpha/ Beta	EPA 900.1			NA	NA	20	
	Gamma Photon Emitters	EPA 901.1			NA	NA		
	Radium 226	EPA 903.1			NA	NA		
	Radium 228	EPA 904			NA	NA		
	Strontium 89/90	EPA 905			NA	NA		

NA = None available.

[a] Metal standards for the protection of aquatic life are hardness dependent, the formulas for calculating the appropriate standard are:

	Acute	Chronic	Total to Dissolved conversion Factor
Cadmium	$e^{1.0166(\ln \text{hardness}) - 3.924}$	$e^{0.7409(\ln \text{hardness}) - 4.179}$	1.136672-[(*ln*hardness)(0.041838) for acute 1.101672-[(*ln*hardness)(0.041838) for chronic
Copper	$e^{0.9422(\ln \text{hardness}) - 1.700}$	$e^{0.8545(\ln \text{hardness}) - 1.702}$	0.960 acute and chronic
Lead	$e^{1.273(\ln \text{hardness}) - 1.460}$	$e^{1.273(\ln \text{hardness}) - 4.705}$	1.46203 -[(ln hardness)(0.145712)] for acute 1.46203 -[(ln hardness)(0.145712)] for chronic

A.8 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

This QAPP and supporting materials will be distributed to all participants. The local Field Operations Project Manager, Mark Vania, will conduct a procedural review before the field team is mobilized for sampling. The procedural review will include the requirements of the QAPP and referenced SOPs, as well as instrument manufacturers' operation and maintenance instructions. It will be performed concurrently with a check that all equipment and sampling gear are fully functional and ready for deployment. In addition, there will be discussions and demonstrations of sampling method(s) to be used and discussions regarding specific health and safety concerns. Each sampling team will consist of, at a minimum, one sample collector and a scientist familiar with QC requirements, which will ensure strict adherence to the project protocols, check all documentation for completeness and correctness, and verify that no transcription errors or omissions have been made in preparing sample custody records and other project documentation.

All field team personnel must have completed first aid/CPR training as well as Swift Water Rescue prior to conducting any monitoring activities on the Susitna River. The Field Operations Project Manager will ensure that all field personnel meet these requirements.

Project training required for this study is summarized in Table 11.

Table 11: Project Training/Certification

Specialized Training/Certification	Field Staff	Lab Staff	Monitoring Supervisor	Lab Supervisor	Project QA Officer
Safety training – Swift Water Rescue Training	X		X		X
Safety training – Laboratory Procedures		X		X	X
Safety training – First Aid/CPR	X		X		X
Water sampling techniques	X		X		X
Instrument calibration and QC activities for field measurements	X		X		X
Instrument calibration and QC activities for laboratory measurements		X		X	X
QA principles			X	X	X
QA for water monitoring systems			X		X
Chain of Custody procedures for samples and data	X	X	X	X	X
Handling and Shipping of Hazardous Goods	X	X	X	X	X
Specific Field Measurement Methods Training	X		X		X
Lab Analytical Methods Training		X		X	X

A.9 DOCUMENTS AND RECORDS

Thorough documentation of all field sample collection is necessary for proper processing of data and, ultimately, for interpreting study results. Field sample collection will be documented in writing, on forms as well as on the following forms and labels:

- A field log notebook for general observations and notes
- A Field Data Record Form that contains information about observations and measurements made and samples collected at the site
- Checklists for each sampling event, sampling point, and sampling time.

Copies of the Field Forms and Checklists are provided in Appendix B.

All lab reports will be sent to the Field Operations PM in both electronic and hard copy. Each lab report will contain at a minimum, a summary QA data page, all lab results, data validation flags and explanation, all QC sample results with each sample analysis batch and the lab's analyte specific QC acceptance criteria limits. Comments about condition of samples when receive by the lab, exceedances

of any holding times, and any other issues encountered why performing the analysis will also be recorded and provided within the lab reports.

The Technical Leads, and the appropriate PMs within subcontractor organizations will maintain files, as appropriate, as repositories for information and data used in preparing any reports and documents during the project and will supervise the use of materials in the project files. The following information will be included:

- Any reports and documents prepared
- Contract and Task Order information
- Project QAPP
- Results of technical reviews, data quality assessments, and audits
- Communications (memoranda; internal notes; telephone conversation records; letters; meeting minutes; and all written correspondence among the project team personnel, subcontractors, suppliers, or others)
- Maps, photographs, and drawings
- Studies, reports, documents, and newspaper articles pertaining to the project
- Special data compilations
- Spreadsheet data files: physical measurements, analytical chemistry data (hard copy and disk)

Copies of the field log books and physical characterization/water quality data sheets and sampling checklists will be supplied to the Field PM at the close of each sampling event. These data will be used in conjunction with inspection checklists to compile the sampling event reports. Formal reports that are generated from the data will be subject to technical and editorial review before submission to AEA and will be maintained at URS's Anchorage, Alaska and Tt's Seattle, Washington offices in their central file (disk and hard copy). The data reports will include a summary of the types of data collected, sampling dates, and any problems or anomalies observed during sample collection.

If any change(s) in this QAPP are required during the study, a memo will be sent to each person on the distribution list describing the change(s), following approval by the appropriate persons and ADEC. The memos will be attached to the QAPP.

All written records, data, QAPP documents, project reports, and any other document relevant to the sampling and processing of samples will be maintained at URS's Anchorage, Alaska and Tt's Seattle, Washington offices in the central file. Records of all project documents will also be maintained at AEA Anchorage, Alaska office. All project records will be maintained at URS and Tt for 10 years following expiration of the contract. All project records will be maintained at AEA for the life of the project.

In addition to any written report, data collected for this study will be submitted electronically to ADEC via a CD ROM, ZIP Disk or email ZIP file. All dates will be formatted as "MM-DD-YYYY".

B. DATA GENERATION AND ACQUISITION

B.1 SAMPLING PROCESS DESIGN (Experimental Design)

This SAP and QAPP is prepared as part of the implementation of the 2013-2014 Baseline Water Quality Study Plan. The SAP and QAPP is standard documentation prepared before any water model development begins. These documents follow guidelines for the State of Alaska and U.S. Environmental Protection Agency Region 10 Credible Data Policy (ADEC 2005). The following sections document how water quality data will be collected such that existing and post-Project water quality conditions within the Susitna River basin can be characterized. Data collected as part of this study will be used in the Water Quality Model to predict how operational scenarios will impact water quality conditions in both the reservoir and riverine portions of the basin.

Water quality data will be collected from multiple aquatic media including surface water, sediment, and fish tissue. As stated earlier in the document, the fish tissue collection will be conducted as part of Study Plan 7.5/7.6 (Study of Fish Distribution and Abundance in the Upper Susitna River and the Middle/Lower Susitna River, respectively). Tissue or whole fish samples will be collected in the mainstem Susitna River under Study Plan 7.5 and Study Plan 7.6 for use in analysis of potential for bioaccumulation. Continuous temperature monitoring will inform the predictive model on how the mainstem river and tributaries will respond to alternative Project operational scenarios and if changes in water quality conditions could affect aquatic life use and survival in the Project area. The continuous temperature monitoring to be completed in 2013 and 2014 will follow the *approved 2012 SAP/QAPP for Water Temperature and Monitoring and Meteorological Station Installation for Use in Water Quality Model Calibration and Development: Susitna River, South-central Alaska* (AEA 2012). In addition, several other requirements of the 401 Water Quality Certification Process will be addressed with collection and description of additional data including the following:

- conducting a water quality baseline assessment;
- description of how existing and designated uses are met;
- use of appropriate field methods and models;
- use of acceptable data quality assurance methods;
- scheduling of technical work to meet deadlines; and
- derivation of load calculations of potential pollutants (pre-Project conditions).

Three types of water quality monitoring activities will be implemented under this QAPP: 1) routine monitoring for characterizing water quality baseline conditions, 2) a single, comprehensive survey for a larger array of parameters, and 3) detailed monitoring and intensive investigation of current conditions at Focus Area site locations. Frequency of sampling water quality parameters varies by category and potential for mobilization and bioavailability. Most of the general water quality parameters and select metals will be sampled on a monthly basis since each parameter has been demonstrated to be present in one or both of surface water and sediment (URS 2011). An initial screening survey has been proposed for several other toxics that might be detected in sediment and tissue samples (Table 9). The single event surveys for toxics in sediment, tissue, or water will trigger additional study for extent of contamination and potential timing of exposure if results exceed criteria or thresholds (e.g., LAETs, LC50s, etc.). The general list of water quality parameters and metals will be used in calibrating the water quality model in both a riverine and reservoir environment.

The operation of temperature monitoring sites (Tetra Tech 2012) will continue as part of water quality monitoring activities in 2013/2014. Continuous temperature monitoring activities in 2013/2014 will follow the approved *2012 SAP/QAPP for Water Temperature and Monitoring and Meteorological Station Installation for Use in Water Quality Model Calibration and Development: Susitna River,*

South-central Alaska (AEA 2012). Table 12 lists the temperature monitoring sites. These sites were selected based on the following rationale:

- Adequate representation of locations throughout the Susitna River and tributaries above and below the proposed dam site for the purpose of a baseline water quality characterization;
- Location on tributaries where proposed access road-crossing impacts might occur during and after construction (upstream/downstream sampling points on each crossing);
- Preliminary consultation with AEA and licensing participants including co-location with other study sites (e.g., instream flow, ice processes);
- Access and land ownership issues; and
- Eight of the sites are mainstem monitoring sites that were previously used for SNTEMP modeling in the 1980s. Thirty-one of the sites are Susitna River mainstem, tributary, or slough locations, most of which were monitored in the 1980s.

B.1.1 Define Monitoring Objectives(s) and Appropriate Data Quality Objectives

The collective goal of the water quality studies is to assess the effects of the proposed Project and its operations on water quality in the Susitna River basin, which will inform development of any appropriate conditions for inclusion in the Project license. The Project is expected to change some of the water quality characteristics of the resulting riverine portion of the drainage once the dam is in place as well as the inundated area that will become the reservoir.

The objectives of the Baseline Water Quality Study are as follows:

- Document historical water quality data and evaluate for use with data generated from this study. The combined data set will be used in the water quality modeling study to predict Project impacts under various operations.
- Generate additional years of stream temperature and meteorological data to the existing data. An effort will be made to collect continuous water temperature data year-round, with the understanding that records may be interrupted by equipment damage during river floods, ice formation around the monitoring devices, ice break-up and physical damage to the anchoring devices, or removal by unauthorized visitors to a site.
- Develop a monitoring program to adequately characterize surface water physical, chemical, and bacterial conditions in the Susitna River within and downstream of the proposed Project area.
- Measure baseline metals concentrations in sediment and fish tissue for comparison to state criteria.

The DQOs described in Section A.7.1 prescribed generation of High Quality End-Use Tier 2 Monitoring Data used to compare against ADEC water quality standards. Data generated from field collection and from modeling results will be compared against ADEC water quality standards.

B.1.2 Characterize the General Monitoring Location/s

Baseline Water Quality Data Collection: Longitudinal Profile of the Susitna River

Twelve mainstem Susitna River monitoring sites are located below the proposed dam site and two mainstem sites above this location. Five sloughs will be monitored that represent a combination of physical settings in the drainage and that are known to support important fish-rearing habitat. Tributaries to the Susitna River will be monitored and include those contributing large portions of the lower river flow like the Talkeetna, Chulitna, Deshka, and Yentna rivers. A partial list of the remaining tributaries that will be monitored represent important spawning and rearing habitat for anadromous and resident fisheries and include: Gold Creek, Portage Creek, Tsusena Creek, Watana Creek, and Oshetna River.

Monitoring sites are spaced at approximately 5 mile intervals so that the various factors that influence water quality conditions are captured and support the development (and calibration) of the water quality model. Frequency of sites along the length of the river is important for capturing localized effects from tributaries and from past and current human activity.

These sites were selected based on the following rationale:

- Adequate representation of locations throughout the Susitna River and tributaries above and below the proposed dam site for the purpose of a baseline water quality characterization.
- Location on tributaries where proposed access road-crossing impacts might occur during and after construction (upstream/downstream sampling points on each crossing).
- Preliminary consultation with licensing participants including co-location with other study sites (e.g., instream flow, ice processes).
- Access and land ownership issues.
- Eight of the sites are mainstem monitoring sites that were previously used for SNTEMP modeling (see Section 5.6) in the 1980s. Thirty-one of the sites are Susitna River mainstem, tributary, or slough locations, most of which were monitored in the 1980s.

Table 12 lists the monitoring locations for continuous temperature monitoring and baseline water quality data collection in the mainstem Susitna River, tributaries, and sloughs. Baseline water quality data collection with occur at the 17 sites bolded in Table 12. Monitoring locations are also shown in Figure 2 and in more detail in figures in Appendix A.

Table 12: Site Location and Rationale

Susitna River Mile	Description	Susitna River Slough ID	Latitude (decimal degrees)	Longitude (decimal degrees)	Location Rationale
15.1	Susitna above Alexander Creek	NA	61.4391	-150.4851	Outer Project area site (above the "Beluga Line"
25.8[3]	***Susitna Station***	*NA*	*61.5454*	*-150.516*	Influence of upstream tributary
28.0	**Yentna River**	NA	61.5876	-150.4831	Major tributary
29.5	**Susitna above Yentna**	NA	61.5759	-150.4270	Above major tribuatry
40.6[3]	**Deshka River**	NA	61.7095	-150.3248	Major tributary
55.0[1]	**Susitna**	NA	61.8622	-150.1844	Above major tributary
83.8[3]	**Susitna at Parks Highway East**	NA	62.1748	-150.1732	Mainstem river site
83.9[3]	Susitna at Parks Highway West	NA	62.1811	-150.1679	Side channel habitat connected with the mainstem
95.8	LRX 1	NA	62.3063	-150.1087	Below confluence of

Susitna River Mile	Description	Susitna River Slough ID	Latitude (decimal degrees)	Longitude (decimal degrees)	Location Rationale
					major tributary
97.2	**Talkeetna River**	NA	62.3424	-150.1122	Major tributary
98.1	**Chulitna River**	NA	62.5676	-150.2379	Major tributary
103.0[2,3]	**Talkeetna**	NA	62.3943	-150.134	Downstream of existing townsite; Historic (1980s) monitoring site
103.3	*Talkeetna*	*NA*	*62.3972*	*-150.1373*	Upstream of existing townsite
113.0[2]	LRX 18	NA	62.5252	-150.1144	Important side channel habitat
120.7[2,3]	**Curry Fishwheel Camp**	NA	62.6178	-150.0136	Historic (1980s) monitoring site
126.0	--	8A	62.6704	-149.9029	Important side channel habitat
126.1[2]	LRX 29	NA	62.6739	-149.8991	Historic (1980s) monitoring site
129.2[3]	--	9	62.7025	-149.8412	Important side channel habitat
130.8[2]	LRX 35	NA	62.7136	-149.8089	Historic (1980s) monitoring site
136.5	Susitna near Gold Creek	NA	62.7673	-149.6935	Below confluence of major tributary
136.8[3]	**Gold Creek**	NA	62.7675	-149.6919	Major tributary
138.0[1]	--	16B	62.7802	-149.6853	Important side channel habitat
138.6[3]	***Indian River***	*NA*	*62.8009*	*-149.664*	Major tributary
138.7[2]	**Susitna above Indian River**	NA	62.7854	-149.6484	Historic (1980s) monitoring site
140.0	--	19	62.7939	-149.6143	Important side channel habitat
140.1[2]	LRX 53	NA	62.7945	-149.6129	Historic (1980s) monitoring site
142.0	--	21	62.8163	-149.576	Important side channel habitat
148.0	Susitna below Portage Creek	NA	62.8303	-149.3827	Downstream of major tributary
148.8[2]	**Susitna above Portage Creek**	NA	62.8304	-149.3803	Historic (1980s) monitoring site

Susitna River Mile	Description	Susitna River Slough ID	Latitude (decimal degrees)	Longitude (decimal degrees)	Location Rationale
148.8	**Portage Creek**	NA	62.8267	-149.3693	Major tributary
165.0[1]	*Susitna*	*NA*	*62.7916*	*-148.997*	Mid-point between neighboring sites
180.3[1]	Susitna below Tsusena Creek	NA	62.8134	-148.6568	Downstream of major tributary
181.3[3]	*Tsusena Creek*	*NA*	*62.8217*	*-148.6068*	Major tributary
184.5[1]	***Susitna at Watana Dam site***	*NA*	*62.8226*	*-148.533*	Boundary condition between the reservoir and riverine models
194.1	*Watana Creek*	*NA*	*62.8296*	*-148.259*	Major tributary stream to the proposed reservoir
206.8	Kosina Creek	NA	62.7822	-147.94	Major tributary stream to the proposed reservoir
223.7[3]	***Susitna near Cantwell***	*NA*	*62.7052*	*147.538*	Uppermost mainstem site in the proposed reservoir
233.4	Oshetna River	NA	62.6402	-147.383	Uppermost tributary in the Project area

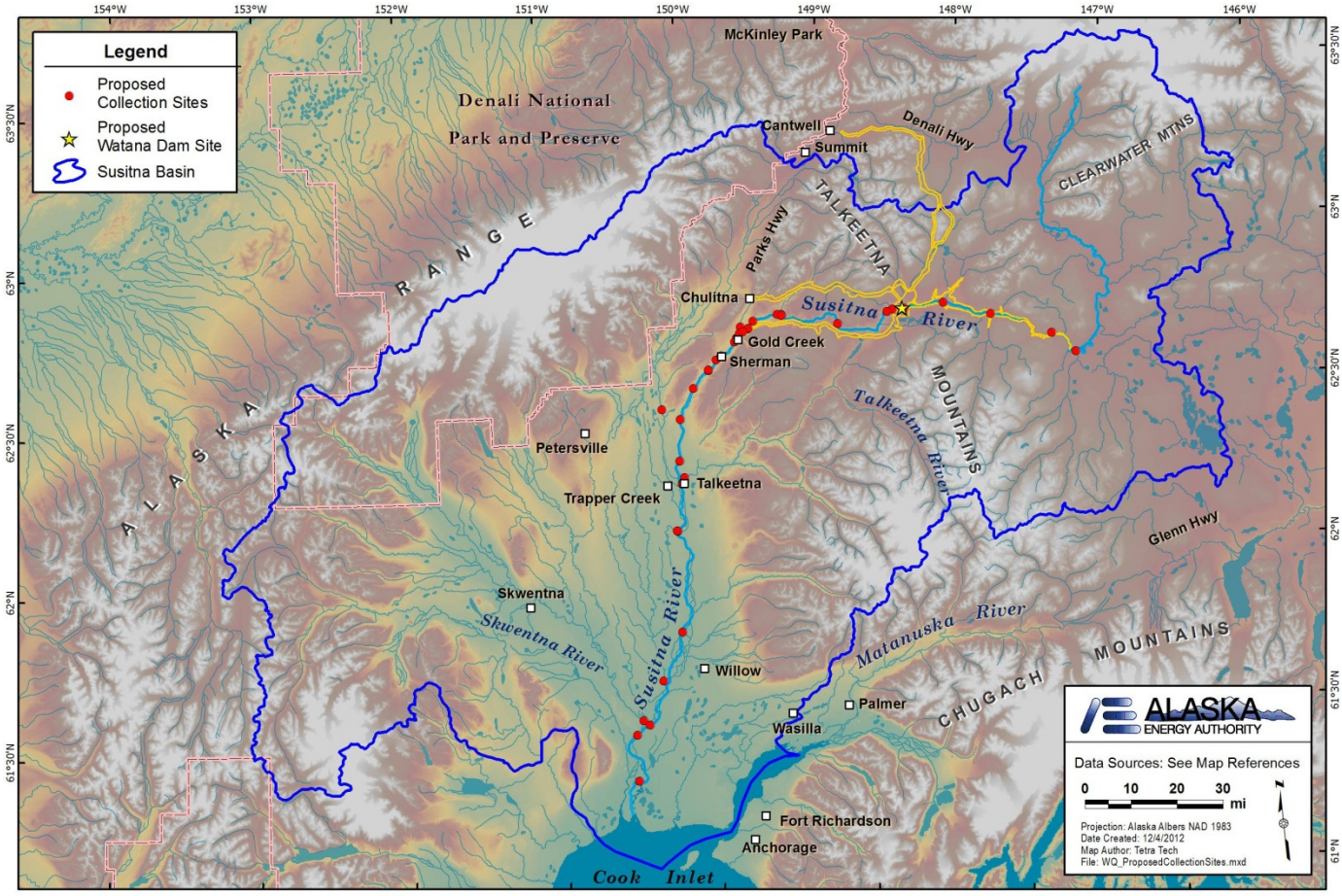
1 Site not sampled for water quality or temperature in the 1980s or location moved slightly from original location.

2 Proposed mainstem Susitna River temperature monitoring sites for purposes of 1980s SNTEMP model evaluation.

3 Locations with overlap of water quality temperature monitoring sites with other studies.

Locations in **bold** font represent both temperature and water quality samples are collected from a site. Locations in *italics* represent sites which were not installed during the 2012 sampling year.

Figure 2. 2012/2013 Stream Water Quality and Temperature Data Collection Sites for the Susitna-Watana Hydroelectric Project



Water Quality Data Collection: Focus Areas on the Susitna River

A total of ten Focus Areas are proposed for detailed study within the Middle Segment of the river. The Focus Areas are intended to serve as specific geographic areas of the river that will be the subject of intensive investigation by multiple resource disciplines including water quality. The proposed Focus Areas were selected during an interdisciplinary resource meeting that involved a systematic review of aerial imagery within each of the Geomorphic Reaches (MR1 through MR8) for the entire Middle Segment of the river. Focus Areas were selected within MR1, MR2, MR5, MR6, MR7, and MR8. Focus Areas were not selected for MR3 or MR4 due to safety considerations related to Devils Canyon.

The Focus Areas selected were those deemed representative of the major features in the Geomorphic Reach and included mainstem habitat types of known biological significance (i.e., where fish have been observed based on previous and/or contemporary studies), as well as some locations (e.g, Slough 17) where previous sampling revealed few/ no fish. The areas included representative side channels, side sloughs, upland sloughs, and tributary mouths.

The Focus Area selections considered:

- All major habitat types (main channel, side channel, side slough, upland slough, tributary delta).

- At least one Focus Area per geomorphic reach (excepting reaches associated with Devils Canyon) will be included that are representative of other areas.
- A replicate sampling strategy will be used for measure habitat types within each Focus Area which many include random selection process.
- Areas that are known (based on existing and contemporary data) to be biologically important for salmon spawning/ rearing in mainstem and lateral habitats will be sampled (i.e., critical habitats) and
- Areas for which little or no fish use has been documented or for which information on fish use is lacking, will also be sampled.
-

Maps of each Focus Area with River Mile numbers included are shown below in Figures 3 through 12.

Figure 3. Map of Focus Area 1— Below Dam

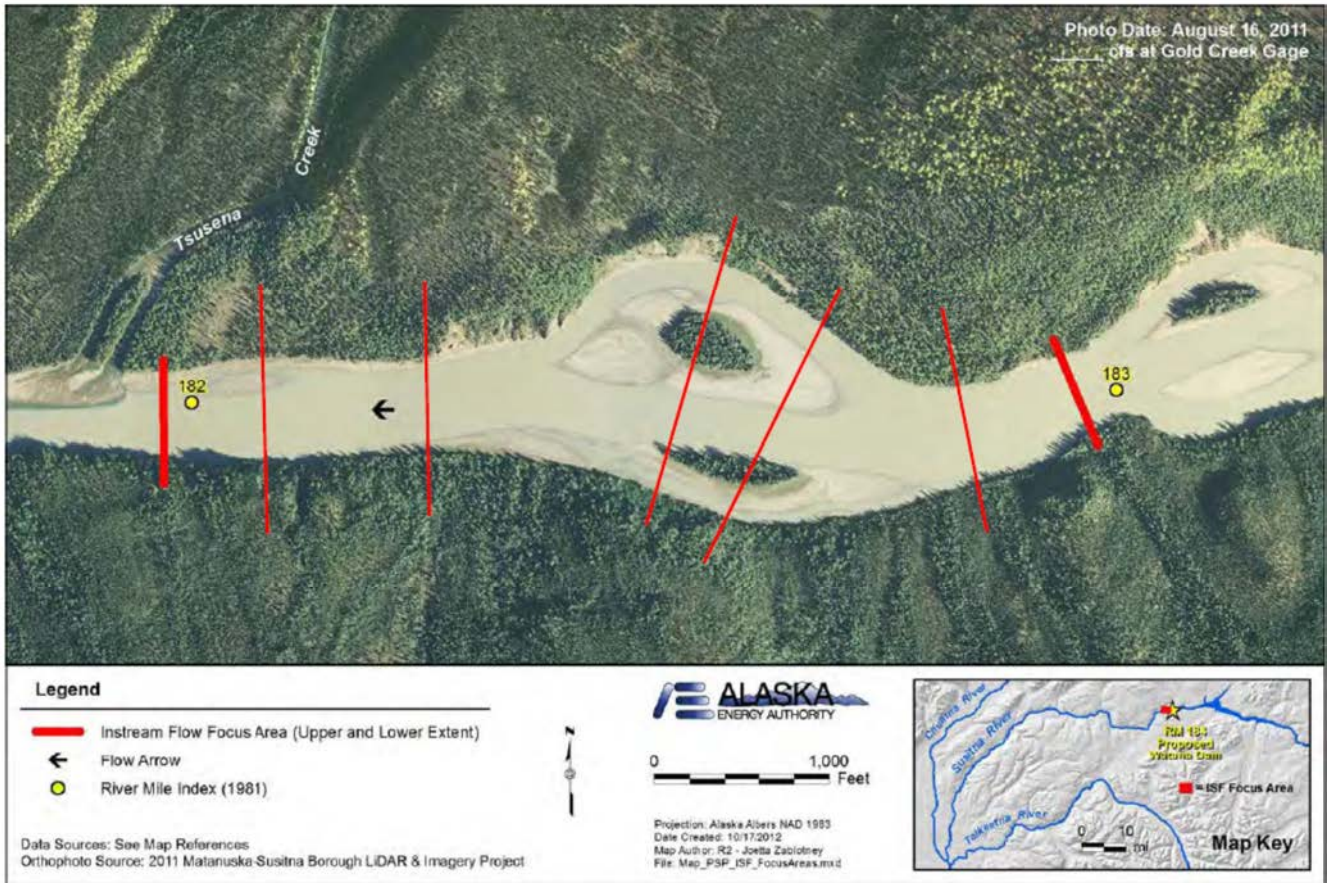


Figure 4. Map of Focus Area 2— MR2 Wide

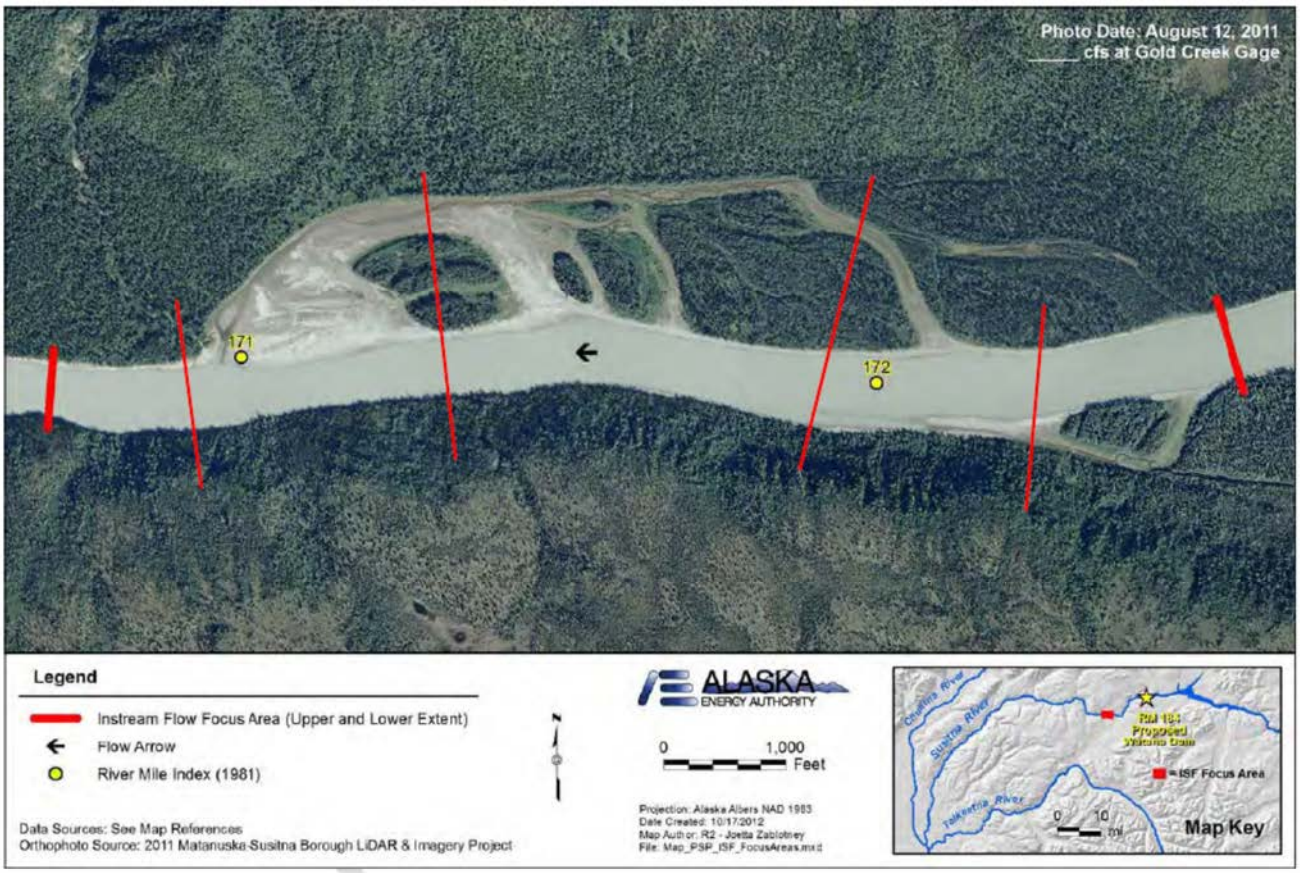


Figure 5. Map of Focus Area 3— MR2 Narrow

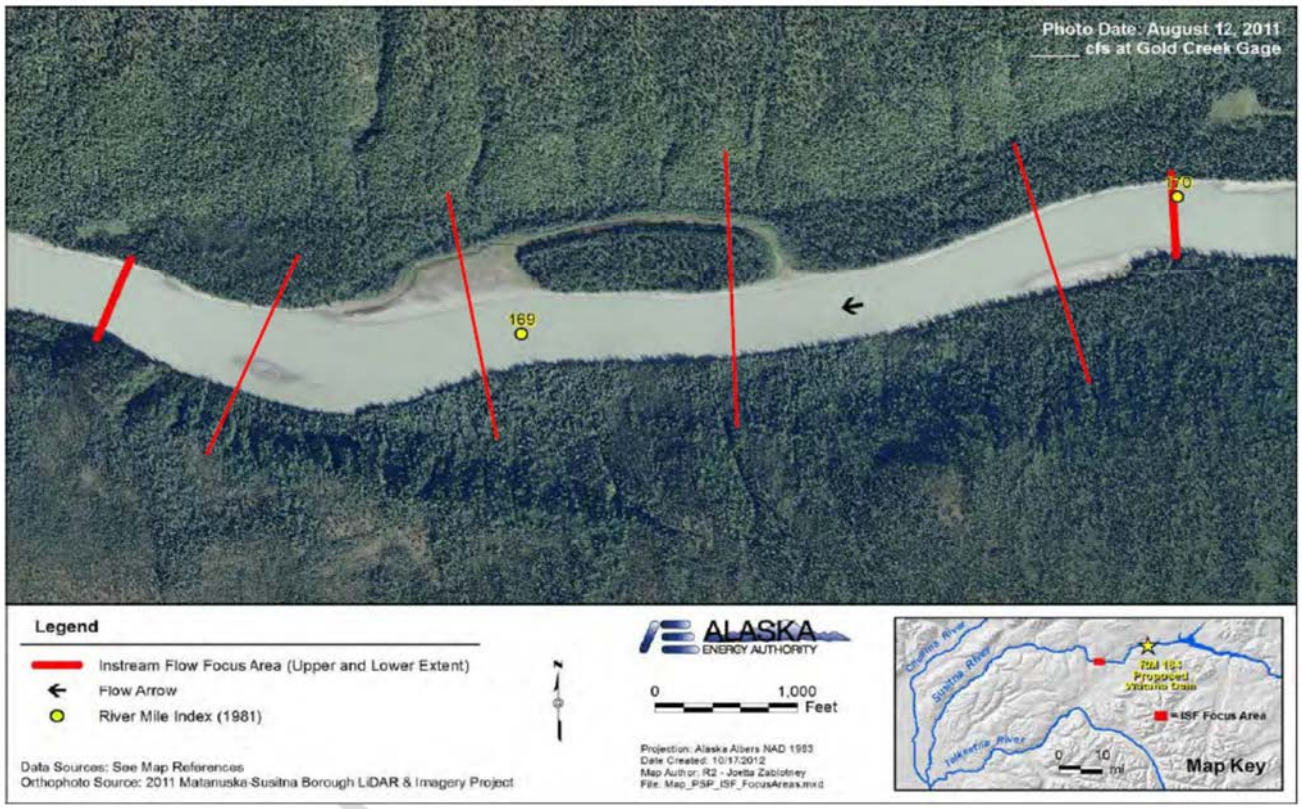


Figure 6. Map of Focus Area 4— Portage Creek

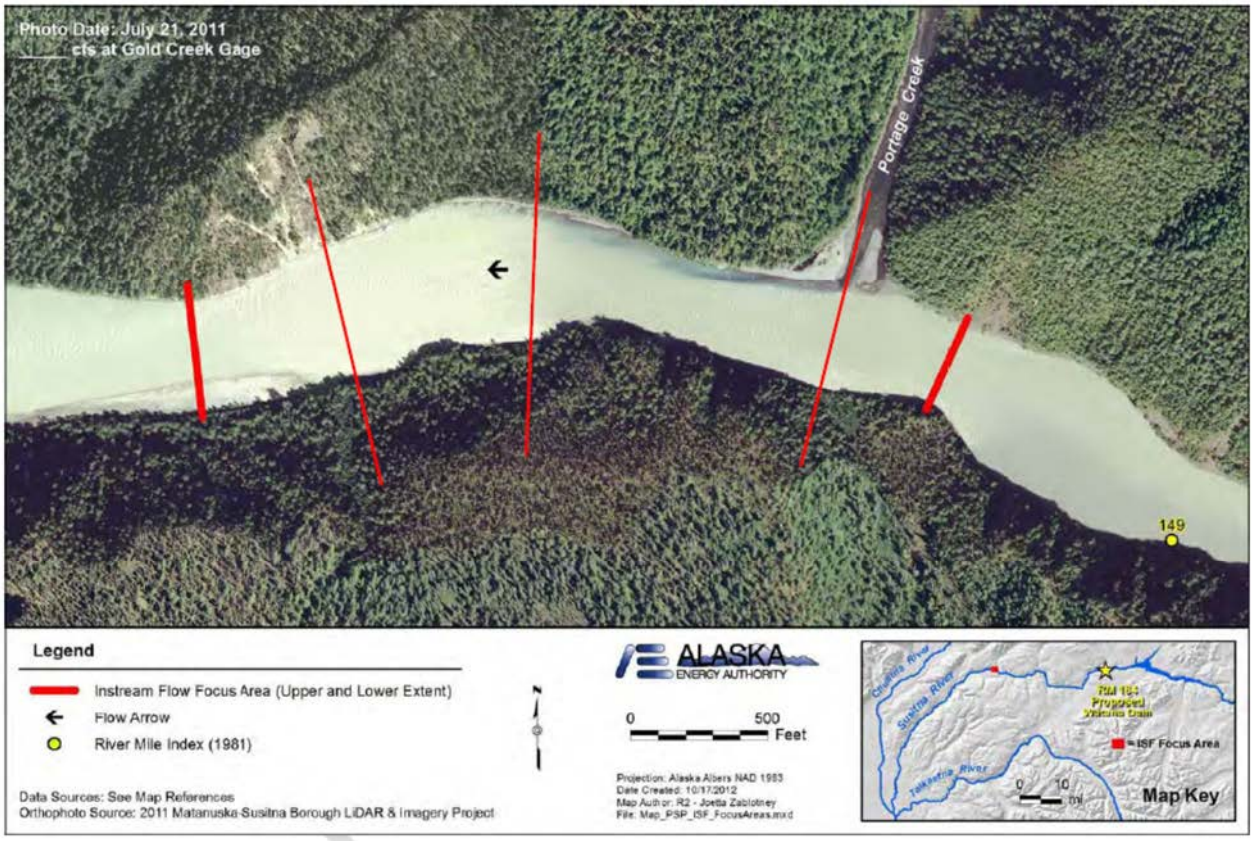


Figure 7. Map of Focus Area 5— Slough 21

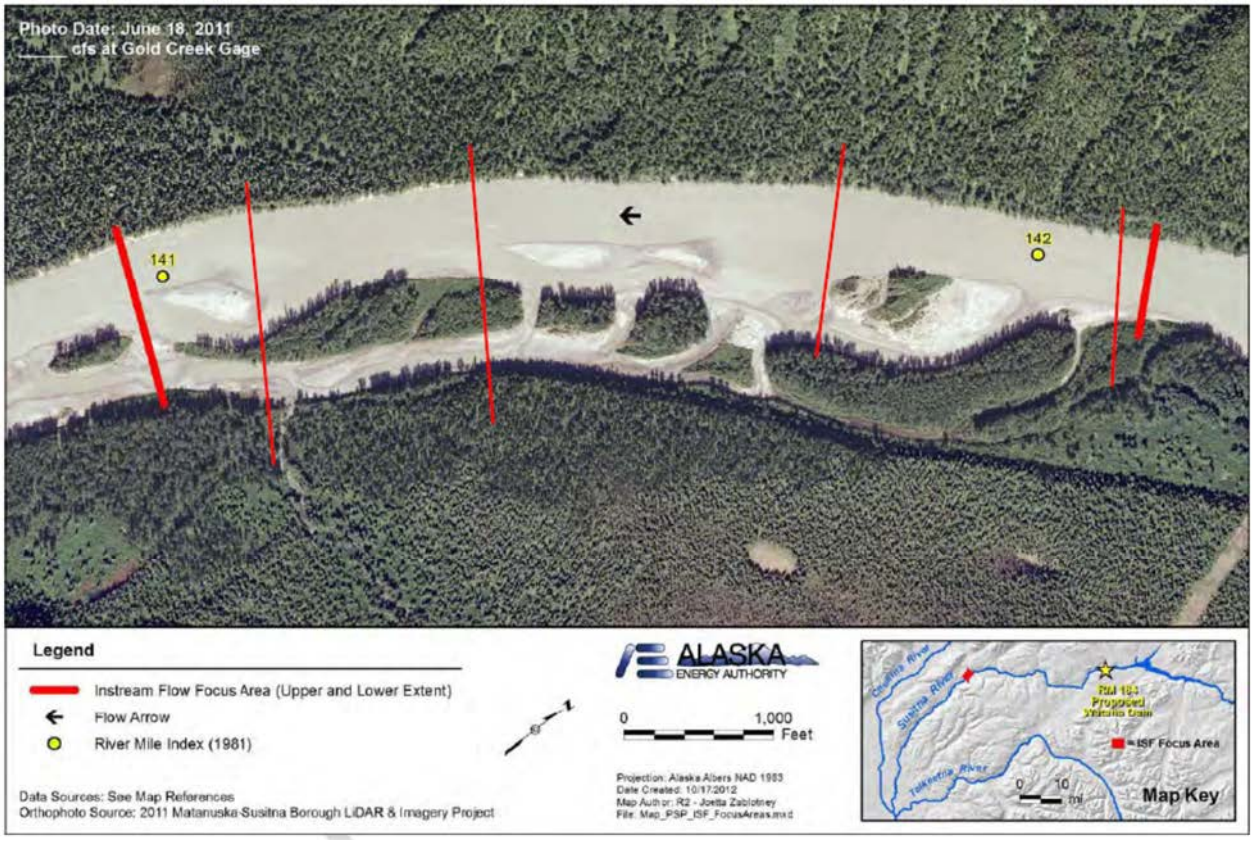


Figure 8. Map of Focus Area 6— Indian River

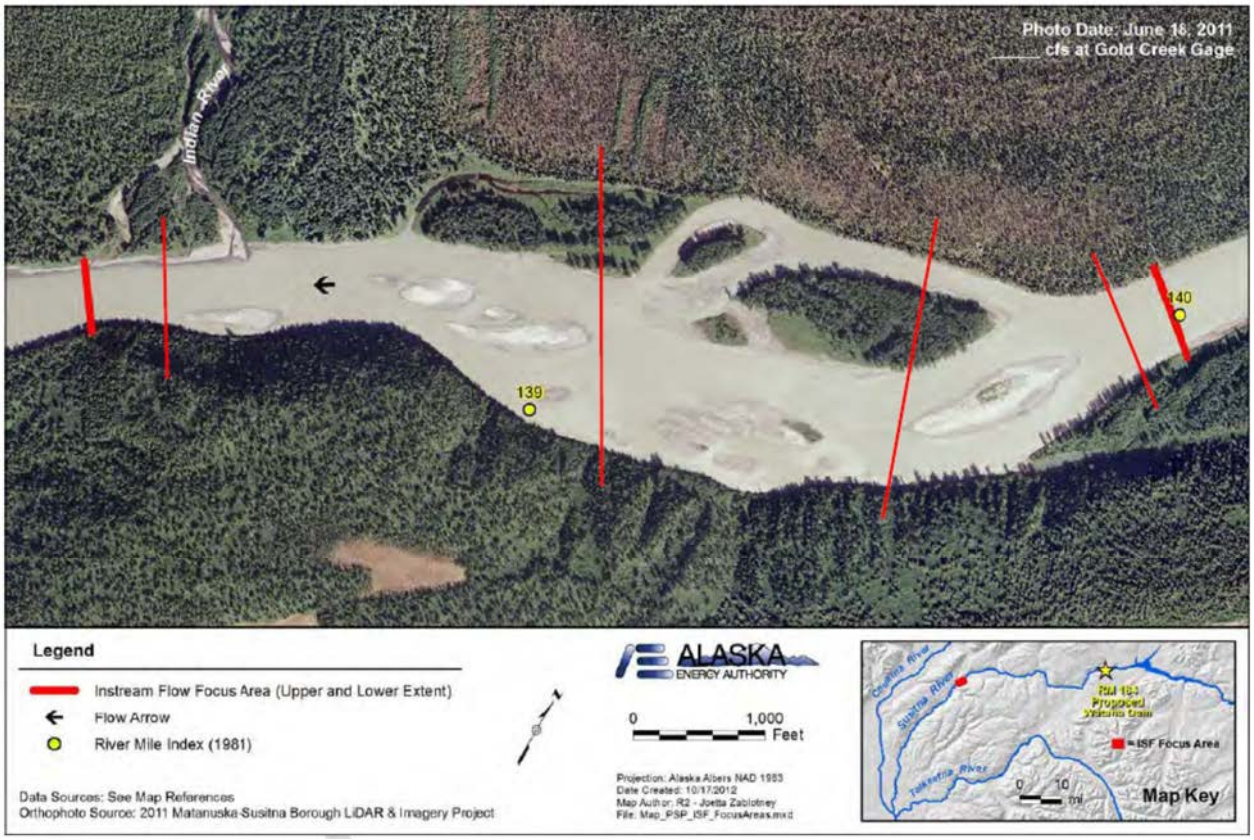


Figure 9. Map of Focus Area 7— Slough 11

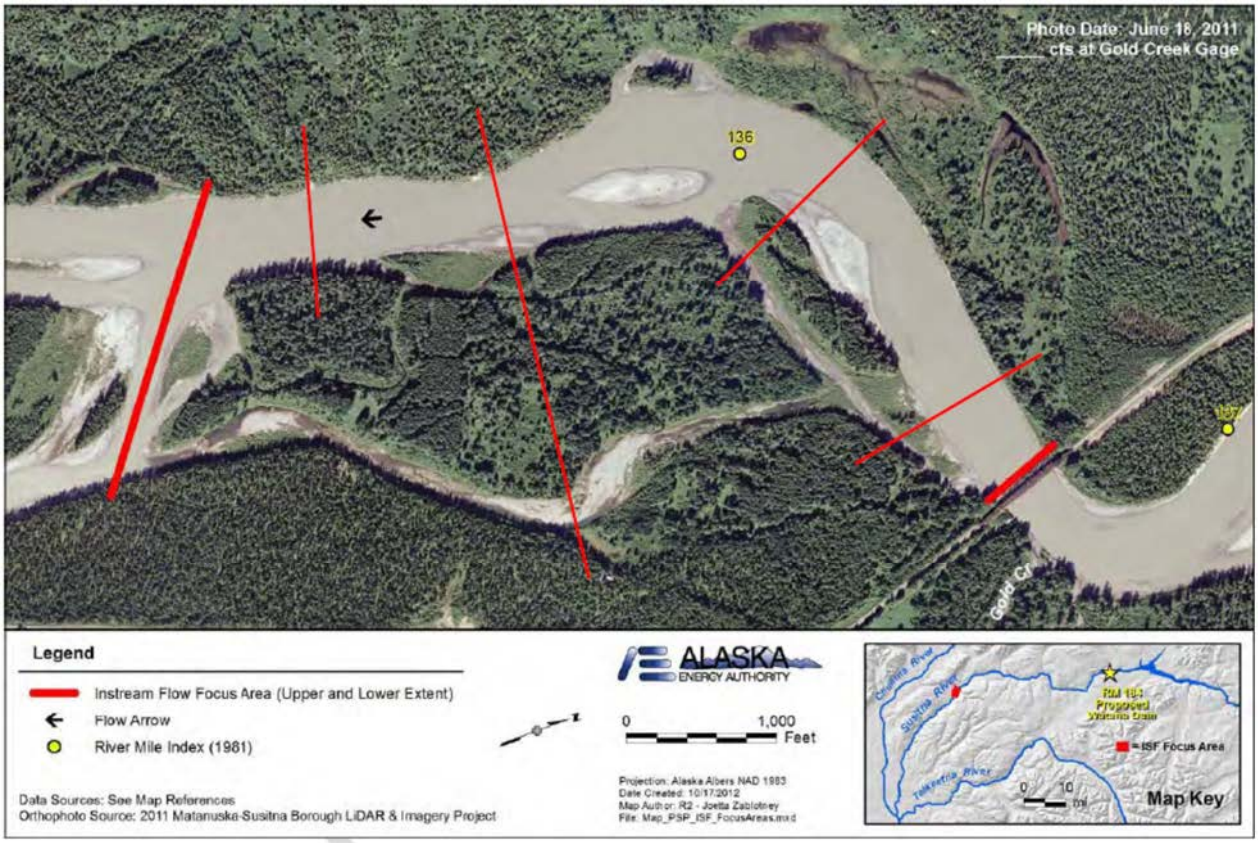


Figure 10. Map of Focus Area 8— Slough 8

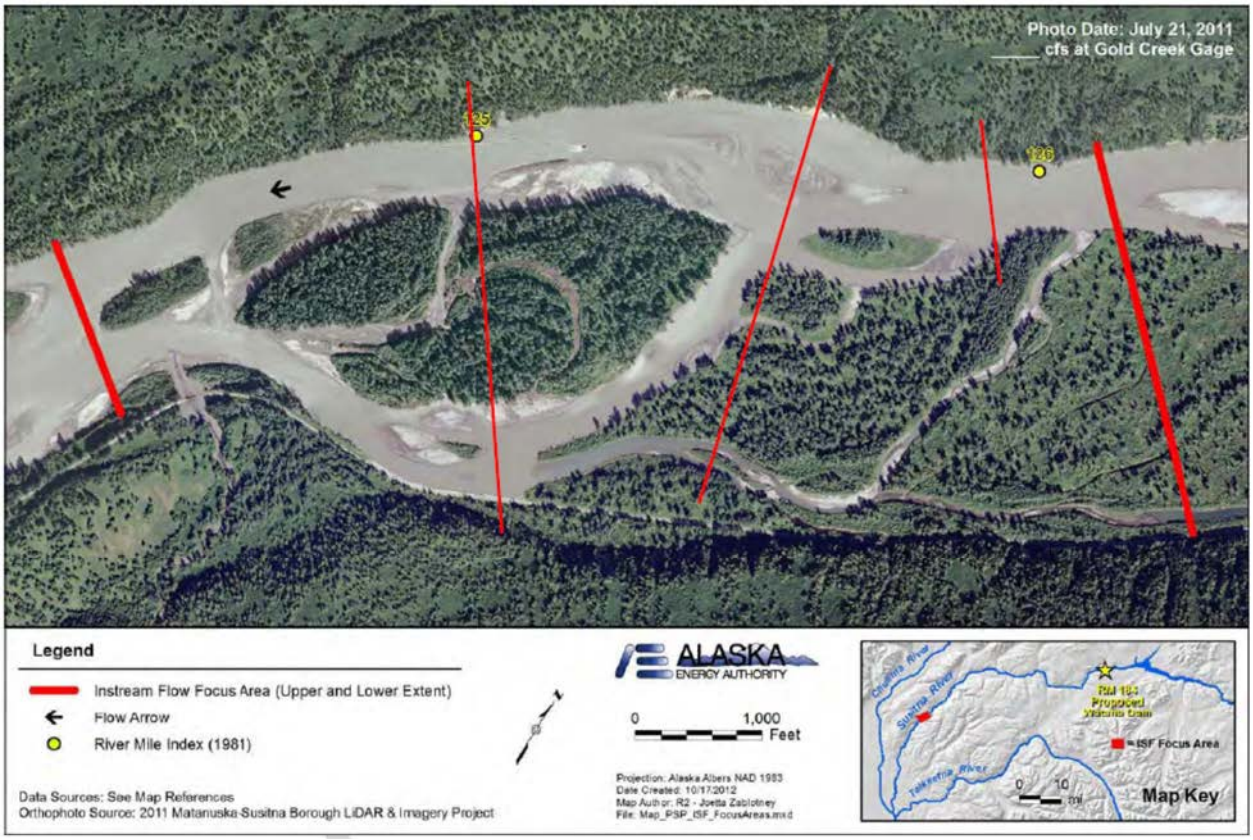


Figure 11. Map of Focus Area 9— Slough 6A

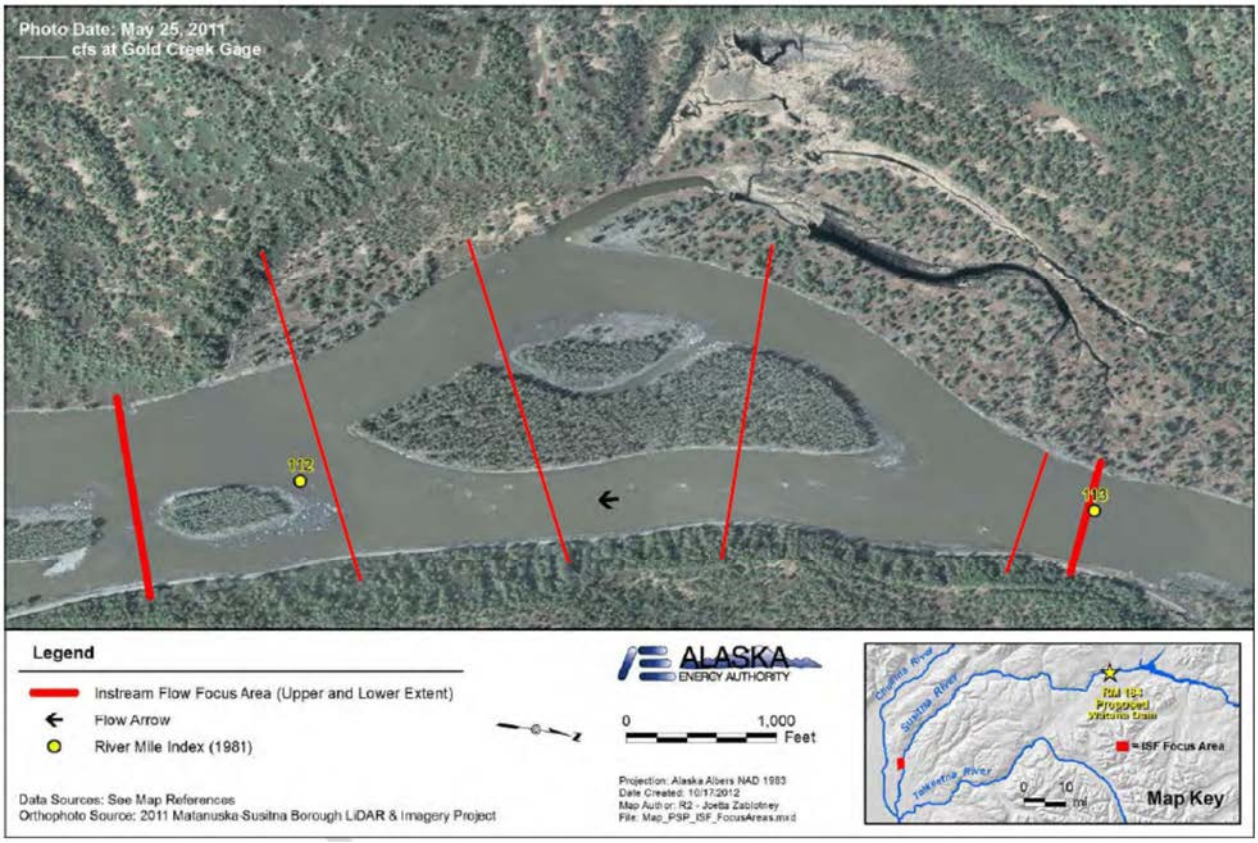
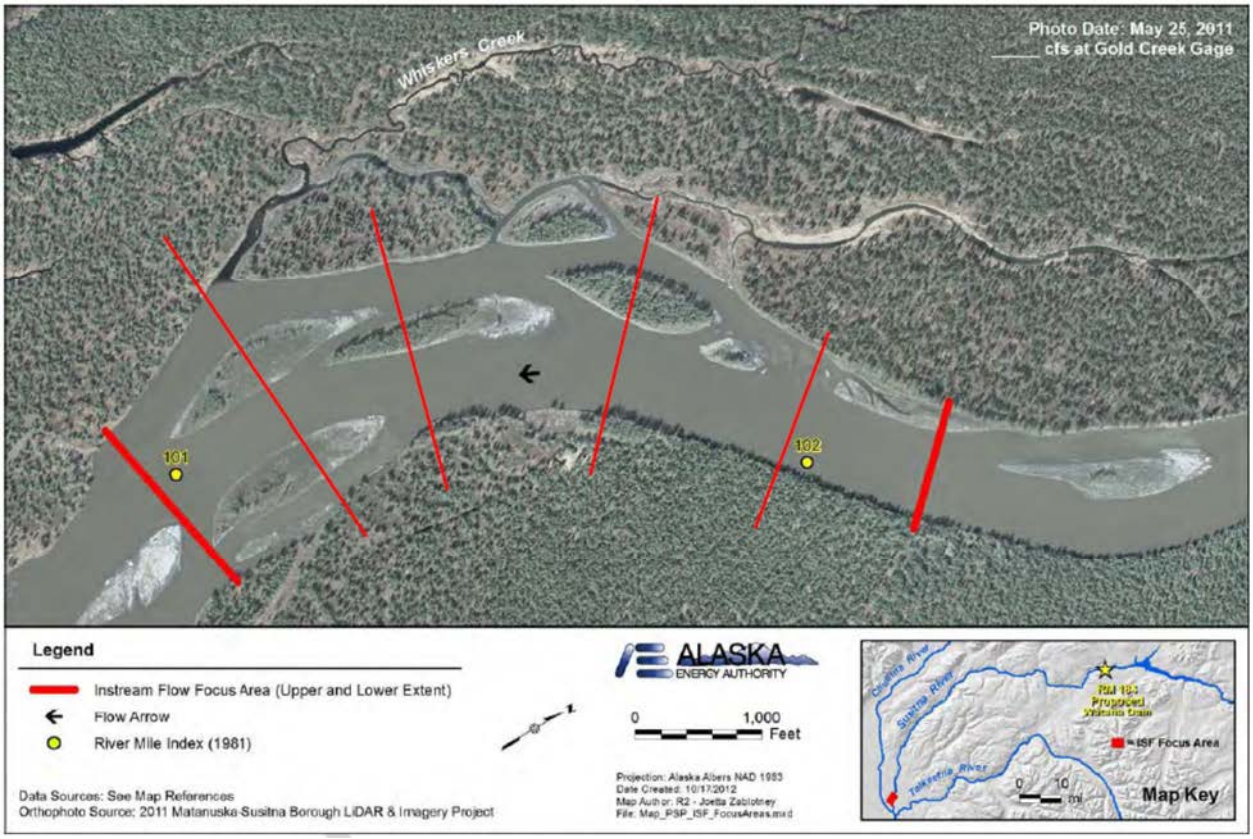


Figure 12. Map of Focus Area 10— Whiskers Slough



Sediment Samples for Mercury/Metals in Reservoir Area Data Collection

This portion of the study was designed to gather specific information on the distribution of Susitna River sediment contaminants of concern in potential source areas. In general, all sediment samples will be taken from sheltered backwater areas, downstream of islands, and in similar riverine locations in which water currents are slowed, favoring accumulation of finer sediment along the channel bottom. Samples will be collected just below and above the proposed dam site. Additional samples will be collected near the mouth of tributaries near the proposed dam site, including Fog, Deadman, Watana, Tsusena, Kosina, Jay, and Goose creeks, and the Oshetna River. In-situ water quality parameters will be measured at all sediment sample locations. Table 13 summarizes the sediment sampling locations. GPS coordinates will be collected at each sampling location during the sampling event and this QAPP will be updated as necessary. Three sediment samples will be collected per site and combined for analysis. The purpose of this sampling will be to determine where metals, if found in the water or sediment, originate in the drainage. Toxics modeling will be conducted to address potential for bioavailability in resident aquatic life. Comparison of bioaccumulation of metals in tissue analysis with results from sediment samples will inform on potential for transfer mechanisms between source and fate.

Table 13: Sediment Sampling Site Locations

Susitna River Mile	Description	Latitude (decimal degrees)	Longitude (decimal degrees)
TBD	Susitna below Watana Dam site	*TBD on site*	*TBD on site*
TBD	Susitna above Watana Dam site	*TBD on site*	*TBD on site*
TBD	Mouth of Fog Creek	*TBD on site*	*TBD on site*
TBD	Mouth of Deadman Creek	*TBD on site*	*TBD on site*
TBD	Mouth of Watana Creek	*TBD on site*	*TBD on site*
TBD	Mouth of Tsusena Creek	*TBD on site*	*TBD on site*
TBD	Mouth of Kosina Creek	*TBD on site*	*TBD on site*
TBD	Mouth of Jay Creek	*TBD on site*	*TBD on site*
TBD	Mouth of Goose Creek	*TBD on site*	*TBD on site*
TBD	Mouth of Oshetna River	*TBD on site*	*TBD on site*

Baseline Metals Levels in Fish Tissue

Two screening level tasks will be conducted to determine baseline metals levels in fish tissue. The first will be for methyl mercury in sport fish. Methyl mercury bioaccumulates and the highest concentrations are typically in the muscle tissue of adult predatory fish. Final determination of tissue type(s) for analysis will be coordinated with ADEC's Division of Environmental Health and guidance on fish tissue sampling.

Detection of mercury in fish tissue and sediment will prompt further study of naturally occurring concentrations in soils and plants and how parent geology contributes to concentrations of this native element in both compartments of the landscape. The focused study will estimate the extent and magnitude of mercury contamination so that an estimate of increased bioavailability might be made once the reservoir inundates areas where high concentrations of mercury are sequestered. Detectable concentrations of mercury may prompt additional sampling and analysis of tissues in the benthic macroinvertebrate community. The bio-magnification of mercury impact from sediments and plants to the fish community may be facilitated through consumption of impacted food sources like the benthic macroinvertebrates. Impact of this component of a trophic level may also be a conduit for mercury biomagnification in waterfowl and other wildlife that consume this food source.

B.1.3 Identify the Site-Specific Sample Collection Location(s), Parameters to be Measured and Frequencies of Collection

Baseline water quality data collection will be at the locations in bold in Table 12. The initial sampling will be expanded if general water quality, metals in surface water, or metals in fish tissue exceed criteria or thresholds. Additional contiguous sample sites will be visited on this list beginning the following sampling month wherever criteria or thresholds have been exceeded by individual parameters. This proposed spacing follows accepted practice when segmenting large river systems for development of Total Maximum Daily Load (TMDL) water quality models. Sampling during winter months will be focused on locations where flow data is currently collected (or was historically collected by the USGS) and will be used for water quality modeling.

Water quality collection can be broken into two components: in-situ water quality sampling and general water quality sampling. In-situ water quality sampling consists of on-site monthly measurements of physical parameters at site locations using field equipment. General water quality sampling will consist of monthly grab samples that will be sent to an off-site laboratory for analysis. In general, these samples represent water quality components that cannot be easily measured in-situ, such as metals concentrations, nitrates, etc.

Water quality samples will be analyzed for several parameters reported in Table 14. Metals monitoring for total and dissolved fractions in surface water include the full set of parameters used by ADEC in fish health consumption screening. The creation of a reservoir and potential alteration of surface water downstream of the proposed dam site may change characteristics of groundwater in the upper and middle Susitna basin. The water quality parameters identified in Table 14 will address the influence surface water may have on adjoining groundwater supplies in the vicinity of each sampling site. Changes to groundwater quality may have an effect on drinking water supplies so several parameters included on the inorganic chemical contaminants list have been included as part of this sampling program (ADEC 2003). The criteria that will be used for comparison with sampling results are the drinking water primary maximum contaminant levels. Additional parameters will be measured from all 17 sites in a single survey that occurs during low water conditions (e.g., August/September) in the Susitna basin.

The following is a list of pollutants for which Alaska Water Quality Standards has established water quality criteria (18 ACC 70.020(b)) for protecting designated uses in freshwater for monitoring activities in this study:

- Continuous temperature monitoring program
  - Temperature, included as part of the continuous temperature monitoring program.
- In-situ monitoring program
  - pH, included as part of the monthly water quality sampling routine.
  - Color, categorical observation.
  - Residues, categorical assessment (floating solids, debris, sludge, deposits, foam, or scum).
- General water quality program
  - Dissolved gas, included in the monitoring program (Dissolved Oxygen).
  - Dissolved inorganic substances (Total Dissolved Solids), included in monthly monitoring.
  - Turbidity, included as part of the monthly water quality sampling routine.
  - Toxic and other deleterious organic and inorganic, included in monitoring for inorganic metals and mercury/methyl-mercury (organometals).
- One time survey
  - Fecal coliform bacteria, included in monthly monitoring.
  - Sediment, included in assessing mercury and other metals from sediments.
  - Petroleum Hydrocarbons, oil, and grease, included in a one-time survey.
  - Radioactivity; radionuclide concentrations to be generated from surface water samples.
  - Toxic and other deleterious organic and inorganic, already included in monitoring for inorganic metals and mercury/methyl-mercury (organometals).

Water quality parameters listed above in the "one-time survey" category that exceed Alaska Water Quality Standards will be collected in succeeding months and will trigger a more intensive investigation.

Sediment samples will be analyzed for total metals, including aluminum, arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, and zinc (Table 14). In addition, grain size and TOC will be included to evaluate whether these parameters are predictors for elevated metal concentrations.

Most of the contaminants of interest are typically associated with fine sediments, rather than with coarse-grained sandy sediment or rocky substrates. Therefore, the goal of the sampling will be to obtain sediments with at least 5 percent fines (i.e., particle size less than 0.0025 inches [63 micrometers], or passing through a #230 sieve). At some locations, however, larger-sized sediment may be all that are available. Field parameters (temperature, DO, pH, conductivity, etc.) will also be measured in water directly above sediment sampling locations during the time of sediment sample collection (Table 14).

Table 14: Water Quality and Sediment Sample Schedule, Baseline.

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
WATER SAMPLING					
Susitna Station (RM 25.8)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Readionuclides	Grab	Once	Aug or Sept	6*
Yentna River (RM 28.0)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Susitna abv. Yentna (RM 29.5)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or	3 observations

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
				Sept	
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Deshka River (RM 40.6)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Susitna (RM 55.0)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Susitna @ Parks Hwy East (RM 83.8)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or	3 observations

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
				Sept	
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Talkeetna River (RM 97.2)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Chulitna River (RM 98.1)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Talkeetna (RM 103.0)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or	3 observations

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
				Sept	
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Curry Fishwheel Camp (RM 120.7)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Gold Creek (RM 136.8)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Indian River (RM 138.6)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or	3 observations

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
				Sept	
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Susitna abv. Indian River (RM 138.7)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Susitna abv. Portage Creek (RM 148.8)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Portage Creek (RM 148.8)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or	3 observations

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
				Sept	
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Susitna @ Watana Dam Site (RM 184.5)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
Susitna near Cantwell (RM 223.7)	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential, Color	In-situ	Monthly	June-Sept	3 profiles; 3 (Turbidity, Color)
	Residues	In-situ	Once	Aug or Sept	3 observations
	Hardness, Alkalinity, Nitrate/Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, Total & Dissolved Metals (As, Ba, Be, Cd, Co, Cu, Fe, Pb, Mn, Mg, Hg, Mo, Ni, Tl, V, Zn)	Grab	Monthly	June-Sept	6*
	TOC, Fecal Coliform, BTEX, PAHs, Total & Dissolved Metals (Al, Cr, Se), Radionuclides	Grab	Once	Aug or Sept	6*
SEDIMENT SAMPLING					
Susitna below Watana Dam	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
site	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Susitna abv. Watana Dam site	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Mouth of Fog Creek	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Mouth of Deadman Creek	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Mouth of Watana Creek	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Mouth of Tsusena Creek	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Mouth of Kosina Creek	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Mouth of Jay Creek	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Mouth of Goose Creek	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3
Mouth of Oshetna River	Temp., DO, pH, Specific Conductance, Turbidity, Redox Potential	In-situ	Once	Aug or Sept	3 (one at each sediment grab location)
	Total Metals (Al, As, Cd, Cu, Fe, Pb, Hg, Zn), TOC, Grain Size	Grab-Sediment	Once	Aug or Sept	3

*Baseline WQ samples will be collected along a transect at each sample location. Samples will be collected at 3 equidistant locations along each transect and at two depths (top and bottom) if water depth is greater than 5ft (1.5 m). If water depth at each sampling point along the transect is less than 4ft (1.5m) then only a top sample will be collected. Top (or surface) samples will be collected at 0.5 m below water surface and bottom samples will be collected 0.5 m above the bottom.

The Focus Areas will have a higher density of sampling locations, in contrast to the mainstem network, so that prediction of change in water quality conditions from Project operations can be made with a higher degree of resolution. The resolution expected for predicting conditions will be as short as 100-meter (m) longitudinal distances within the Focus Areas. Depending on the length of the Focus Area, transects will be spaced every 100 m to 500 m and water quality samples collected at three locations along each transect. Proposed transects for each Focus Area are shown in Figures 3-12 (thin red lines). The collection points along a transect will be in open water areas and have 3 to 5 collection points. These will be discrete samples taken at each collection point.

Table 15: Water Quality Sample Schedule, Focus Areas.

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
Focus Area 1 – Below Dam	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	19 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	19 Surface Water
Focus Area 2 – MR2 Wide	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
Focus Area 3 – MR2	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-	14 Surface Water

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
Narrow				Sept.)	
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
Focus Area 4 – Portage Creek	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	10 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	10 Surface Water
Focus Area 5 – Slough 21	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	15 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	15 Surface Water
Focus Area 6 – Indian River	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
Focus Area 7 – Slough 11	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
Focus Area 8 – Slough 8	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite,	Grab	Every 2	6 weeks	14 Surface Water

Site	Parameters to be Measured	Sample Type	Sampling Frequency	Sample Time	Total No. of Measurements
	TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)		weeks	(June-Sept.)	
Focus Area 9 – Slough 6A	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	14 Surface Water
Focus Area 10 – Whiskers Slough	Temp., DO, Conductivity, pH	In-situ	Every 2 weeks	6 weeks (June-Sept.)	16 Surface Water
	Turbidity, Hardness, Nitrate+Nitrite, TKN, TP, Ortho-P, Hg (Total), Methyl-mercury (dissolved), Al (total & dissolved), Fe (total & dissolved)	Grab	Every 2 weeks	6 weeks (June-Sept.)	16 Surface Water

Fish tissue samples will be analyzed for methyl and total mercury. Liver samples will also be collected from burbot and analyzed for mercury, methyl-mercury, arsenic, cadmium, and selenium. Target fish species in the vicinity of the Susitna-Watana Reservoir will be Dolly Varden, Arctic grayling, long nose sucker, lake trout, whitefish species, burbot and resident rainbow trout. Fish samples will be submitted to a state-certified analytical laboratory for individual fish muscle tissue analysis. Results will be reported with respect to applicable State and federal standards.

Results from fish tissue analysis will also be used as a baseline for determining how the proposed Project may increase the potential of current metals concentrations to become bioavailable. The projected water conditions in the reservoir will be estimated and current results for metals concentrations re-evaluated for determining potential toxicities to resident and anadromous fish species.

B.2 SAMPLING METHOD REQUIREMENTS

The laboratory will have at a minimum, National Environmental Laboratory Accreditation Program (NELAP) Certification in order to generate credible data for use by state, federal, and tribal regulatory programs for evaluating current and future water quality conditions.

B.2.1 Sample Types

Samples collected as part of the Baseline Water Quality Monitoring Study, in accordance with this QAPP, will be one of the following types:

- **In-situ**; includes all field measurements collected with a multi-parameter water quality sonde (i.e. Hydrolab®, or YSI®) and Hanna Instruments HI 98703 Portable Turbidity Meter.
- **Grab**; includes both water and sediment grab samples. Baseline water quality grab samples will be collected at distinct points along a transect at each sample location and at discrete depths, (0.5 m from water surface and 0.5 m from river bottom were applicable). Grab samples will be collected in the Focus Areas at distinct points along a transect (surface samples only) as well as from each piezometer at the end of each transect.
- **Fish Tissue**; includes fish tissues samples collected from target fish species.

Field personnel will record on the Chain-of-Custody (COC) forms as well as in the field log book and field data sheets the type of sample collected at each monitoring location. This information will be included in the field log book and data sheets along with sample date, time, location, etc.

B.2.2 Sample Containers and Equipment

All sampling equipment and sample containers will be cleaned according to the equipment specifications and/or the analytical laboratory. Bottles supplied by a laboratory will be pre-cleaned. Bottles supplied by the laboratory with sample preservative will never be rinsed and filled with the sample once. Bottles without a preservative will be rinsed three times with sample water prior to collection of the sample.

All samples collected will be stored immediately following collection in a cooler and kept cool. A COC form will accompany all samples and a strict written record will be documented tracking location and possession of the sample at all time. A courier will collect the samples every day from field personnel or Field Operations Project Manager and will hand deliver samples to the analytical laboratory within maximum holding times.

Table 16 lists container, sample size, preservation and/or filtration requirements, and maximum holding times for parameters to be analyzed in this study. Samples will not be field filtered but deliver to the contracted laboratory within the maximum holding time for filtration. Field filtration would be extremely difficult given the remote conditions of the project and may introduce unexpected contamination of samples.

Table 16: Preservation and Holding Times for the Analysis of Samples

Analyses	Matrix	Container	Preservative	Holding Time
Total Metals - Al, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Tl, V, Zn	Water	250-ml HDPE	HNO_3 (pH<2), Cool to 0-6 °C	6 months (preserved); 28 days for Hg

Dissolved Metals - Al, As, Ba, Be, Cd, Co, Cr, Cu, Fe, Pb, Mg, Mn, Hg, Mo, Ni, Se, Tl, V, Zn	Water	250-ml HDPE Combine with metals	HNO_3 (pH<2), Cool to 0-6 °C (lab filtered; field filter only if absolutely necessary)	24 hours for unfiltered; 6 months for preserved/filtered; 28 days for Hg
Hardness	Water		Cool to 0-6 °C	6 months
Alkalinity	Water	500-ml HDPE	Cool to 0-6 °C	14 days
Total Dissolved Solids	Water			7 days
Turbidity	Water			48 hours
Total Suspended Solids	Water	1-L HDPE	Cool to 0-6 °C	7 days
Nitrate/Nitrite	Water	60-ml HDPE	Cool to 0-6 °C	48 hours
Nitrate+Nitrite	Water	60-ml HDPE	H_2SO_4 (pH<2), Cool to 0-6 °C	28 days
Ammonia as N	Water	250-ml HDPE	H_2SO_4 (pH<2), Cool to 0-6 °C	28 days
Total Kjeldahl Nitrogen	Water			28 days
Total Phosphorus	Water			28 days
Ortho-phosphate	Water	125-ml HDPE	Cool to 0-6 °C (lab filter)	24 hours for filtration; 48 hours filtered
Chlorophyll a	Water	1-L amber HDPE	Cool to 0-6 °C; kept in dark	24 hours for filtration
TOC	Water	120-ml amber	HCL (pH<2) Cool to 0-6 °C	28 days
DOC	Water	120-ml amber	HCL (pH<2) Cool to 0-6 °C (lab filtered, field filter only if absolutely necessary)	28 days
Fecal Coliform	Water	125-ml sterile	Na2S203; 0-6° C	**8 hours**
PAHs (TAqH)	Water	2 x 1 liter Amber glass	Cool to 0-6 °C	7 days
BTEX (TAH)	Water	3x40-ml amber VOA vials	HCl (pH<2) Cool to 0-6 °C	14 days
Radioactivity	Water	10-Liter poly "cubie"	Cool to 0-6 °C (lab will preserve w/ HNO_3 before ship)	6 months
Metals - Al, As, Cd, Cu, Fe, Pb, Zn & Hg	Sediment	4-oz amber glass	Cool to 0-6 °C	6 months 28 days for Hg

Total Organic Carbon	Sediment			28 days
Sediment Grain Size	Sediment	8-oz amber glass if fine 5 gallon bucket if coarse	Cool to 0-6 °C	NA
Total & Methyl -- Mercury	Fish Tissue	Zip-type plastic bag	0-4 °C during shipment; ≤ -15°C in lab	1 year

B.2.3 Sampling Methods

Water Quality Data Collection: Monitoring Protocol

Water quality grab samples will be collected during each site visit along a transect of the stream channel/water body, using methods consistent with ADEC and EPA protocols for sampling ambient water and trace metal water quality criteria.

Similar sample collection techniques will be utilized for both baseline water quality sample collection at the 17 sites listed in Table 12 as well as the open water sites within the Focus Areas.

Mainstem areas of the river not immediately influenced by a tributary will be characterized with a single transect. Areas of the mainstem with an upstream tributary that may influence the nearshore zone or that are well-mixed with the mainstem will be characterized by collecting samples at two transect locations: in the tributary and in the mainstem upstream of the tributary confluence. Samples will be collected at 3 equi-distant locations along each transect (i.e. 25% from left bank, 50% from left bank, and 75% from left bank). Samples will be collected from a depth of 0.5 meters below the surface as well as 0.5 meters above the bottom if water depth at that sample location is 5 ft (1.5 m) or greater. If water depth at the sample location is less than 5 ft (1.5 m) then only a surface sample (0.5 meters below the surface will be collected). This will ensure that variations in concentrations, especially metals, are captured and adequately characterized throughout the study area.

These samples will be collected on approximately a monthly basis (four samples from June to September). The period for collecting surface water samples will begin at ice break-up and extend to beginning of ice formation on the river. Limited winter sampling (once in December 2013, and again in March 2014) will be conducted where existing or historic USGS sites are located. Winter sampling locations are still under consideration, and QAPP amendments will occur at a later date.

Review of existing data (URS 2011) indicates that few exceedances occur with metals concentrations during the winter months. If the 2013 data sets suggest that mercury concentrations exceed criteria or thresholds, then an expanded 2014 water quality monitoring program will be conducted to characterize conditions on a monthly basis throughout the winter months.

Variation of water quality in a river cross-section is often significant and is most likely to occur because of incomplete mixing of upstream tributary inflows, point-source discharges, or variations in velocity and channel geometry. Water quality profiles at each location on each transect will be conducted for field water quality parameters (e.g., temperature, pH, dissolved oxygen, and conductivity) to determine the extent of vertical and lateral mixing. Field measurements will be collected at 0.5 m increments throughout the water column.

There are several methods that could be used to collected water quality samples. Two methods for water collection are discussed below and will be used at sites where appropriate. Field personnel will be equipped to perform either method and/or make modifications based on site conditions, water

velocity, and flow. It is unknown at this time which sampling technique is more effective at a site and will be dictated by site conditions on the Susitna River and tributaries.

Water quality samples will be collected using a peristaltic pump and non-reactive tubing system. A peristaltic pump will be used to pump water at each sample site into the sample containers. In order to efficiently collect the amount of sample volume needed, a high capacity peristaltic pump will be used. Tygon® tubing or other similar non-reactive tubing will be used with the pump to collect the sample. The sample tubing will be cable tied to an adjustable pole which is affixed to the side or bow of the boat. The pole will be used to keep the tubing vertical in the water column and ensure that samples are collected at the proper depth. The tubing could also be attached to a davit cable and lowered into the water column if the boat is equipped with a davit/cable/winch system. Once the tubing is positioned at the right depth the pump will be turned on and will run for several seconds to flush/rinse the pump/tubing system. Samples will be collected from the tubing and into the proper sample containers and labeled accordingly. Sample containers that do not contain preservative will be rinsed three times will sample water prior to collecting the sample.

Some sample locations may be located in water depths less than 3 ft (< 1m) deep and may be difficult to reach by boat. If this is the case, field personnel will collect samples by wading into the river. This sample method is to only be done if field conditions are safe and wading into the river does not endanger or put at risk field personnel.

Given the volume of water needed to be collected at each sample site, the peristaltic pump and tubing sample method will be the most efficient collection method. Wading into the river to collect individual samples will be time consuming and inefficient, but may be necessary given site conditions.

Samples will be delivered to ADEC approved laboratories within the holding time frame by a courier that will pick up samples from field personnel each day and hand deliver to laboratory ASAP. Each batch of samples will have a separate completed COC sheet that will document and track sample possession at all times. A field duplicate will be collected for 10 percent of samples (i.e., 1 for every 10 water grab samples). Laboratory quality control samples including duplicate, spiked, and blank samples will be prepared and processed by the laboratory.

Field filtering of dissolved metals, chl a, DOC, or ortho-P will not occur given the remoteness of the project site and the field conditions. Instead, all samples will be delivered to the laboratory within 24 hours of collection and be filtered within the laboratory. This will also help to eliminate any contamination of samples that field filtering in remote locations can introduce. It is not anticipated that field personnel will have a clean area to set up filtering apparatus to process the volume of samples that will be collected daily.

Sample numbers (IDs) will be recorded on field data sheets immediately after collection. Samples intended for the laboratory will be stored/preserved in coolers and kept under the custody of the field team at all times. Samples will be transported to the laboratory in coolers with ice and cooled to approximately 4 °C. Chain of custody records and other sampling documentation will be kept in sealed plastic bags (Ziploc®) and taped inside the lid of the coolers prior to shipment. Packaging, marking, labeling, and shipping of samples will be in compliance with all regulations promulgated by the U. S. Department of Transportation in the Code of Federal Regulations, 49 CFR 171-177.

In-Situ Water Quality Sampling

During each site visit, in situ measurements of dissolved oxygen, pH, specific conductance, redox potential, turbidity, and water temperature will be made. A Hanna Instruments HI 98703 Portable Turbidity Meter will be used to measure turbidity, while a Hydrolab® datasonde (MS5) will be used to measure the remaining field parameters during each site visit. In order to collect water column profiles

for in situ measurements, at each sample location the Hydrolab® will be attached to an adjustable pole affixed to the boat or the cable of a davit/cable/winch system and lowered into the water column. Measurements will be collected at every 0.5 m depths until 0.5 m above the river bottom. It is imperative that the datasonde be kept vertical in the water column while measurements are being collected. The adjustable pole or davit/cable/winch system will ensure the datasonde is vertical.

Continuous turbidity measurement **may** be conducted with the Hydrolab® datasonde at select locations (e.g., former/current USGS sites where turbidity data are available from the 1980s) and operated during summer and winter conditions. The following list of former and current USGS mainstem Susitna River monitoring sites will be considered for continuous turbidity monitoring: Susitna Station, Sunshine, Gold Creek, Tsusena Creek, and near Cantwell. These locations have historic and current flow data that will be used in water quality modeling (Section 5.6) of effects on turbidity from Project operations. Continuous logging of water quality parameters using a multi-parameter probe (e.g., temperature, pH, dissolved oxygen, and conductivity) **may** be placed at Focus Area locations (identified in Section 5.5.4.5. The period of deployment will be focused on summer months June through September (four months) as water conditions permit deployment and routine download of data. Maintenance of a multi-parameter probe and risk from damage is high during winter months. Also, freezing conditions will damage sensor apparatus and the logging unit if enclosed by formation of ice.

Standard techniques for pre- and post-sampling calibration of in situ instrumentation will be used to ensure quality of data generation and will follow accepted practice. Calibration procedures will follow manufacturer's instructions. Calibration of in situ instruments for all field parameters (DO, pH, conductivity, and turbidity) will occur prior to the beginning of each day's field activities and will be checked every day following completion of sampling activities. Temperature probes on the Hydrolab® datasondes are calibrated at the manufacturer and will not be calibrated in the field. However, temperatures recorded in situ with the datasonde will be compared to continuous temperature data collected with the Onset Tidbits®. Calibration procedures for the continuous temperature loggers can be found in the approved *2012 SAP/QAPP for Water Temperature and Monitoring and Meteorological Station Installation for Use in Water Quality Model Calibration and Development: Susitna River, South-central Alaska* (AEA 2012). Calibration data, both pre- and post-sampling, will be recorded on a calibration form by field personnel. Parameters will be considered within calibration range if the instrument reading is within 10 percent of the calibration standard value.

If calibration failure is observed during a site visit, field data will be corrected according to equipment manufacturer's instructions and calibration records.

The Hydrolab® datasonde which will be used to collected in situ field measurements includes an optical DO sensor (LDO) and is calibrated based on barometric pressure at the project site. After calibration of the LDO sensor there is no need for correction of DO measurements to local barometric pressure. However, the LDO sensor will need to be calibrated every day prior to sampling activities due to changes in atmospheric pressure and weather at the project.

pH standards 7 and 10 will be used to perform the calibration of the pH probe on the Hydrolab® datasonde, For conductivity, a conductivity standard of 1412 µS/cm will be used.

Sediment Samples for Mercury/Metals in Reservoir Area Data Collection: Monitoring Protocol

Sediment samples will be collected using an Ekman dredge or a modified Van Veen grab sampler. Sampling devices will be deployed from the boat if water depth is sufficient. Samples may also be collected by wading into shallow near shore areas. To the extent possible, samples will consist of the top 6 inches (15 centimeters) of sediment. Comparison of results from the Susitna drainage will be

made with other studies for Blue Lake, Eklutna Lake, and Bradley Lake when similar data are available and where physical settings are comparable.

Sediment samples will be stored in cooler and kept under the custody of the field times at all times. Samples will be transported to the laboratory in coolers with ice and cooled to approximately 4 °C. Chain of custody records and other sampling documentation will be kept in sealed plastic bags (Ziploc®) and taped inside the lid of the coolers prior to shipment. Packaging, marking, labeling, and shipping of samples will be in compliance with all regulations promulgated by the U. S. Department of Transportation in the Code of Federal Regulations, 49 CFR 171-177.

Baseline Metals Levels in Fish Tissue: Monitoring Protocol

Target fish species in the vicinity of the Susitna-Watana Reservoir will be Dolly Varden, Arctic grayling, whitefish species, burbot, long nose sucker, lake trout, and resident rainbow trout. If possible, filets will be sampled from 7 adult individuals from each species. Body size targeted for collection will represent the non-anadromous phase of each species life cycle (e.g., Dolly Varden will be 3.5 to 5 inches [90 to 125 millimeters] total length to represent the resident portion of the life cycle). Collection times for fish samples will occur in late August and early September 2013. Filet samples will be analyzed for methyl and total mercury. Liver samples will also be collected from burbot and analyzed for mercury, methyl-mercury, arsenic, cadmium, and selenium.

Field procedures will be consistent with those outlined in applicable ADEC and/or EPA sampling protocols (USEPA 2000). Clean nylon nets and polyethylene-gloves will be used during fish tissue collection. The species, fork length, and weight of each fish will be recorded. Fish will be placed in Teflon® sheets and into zipper-closure bags and placed immediately on ice. Fish samples will be submitted to a state-certified analytical laboratory for individual fish muscle tissue analysis. Results will be reported with respect to applicable state and federal standards.

Water Sample Processing

Field equipment used for collection, measurement, and testing will be subject to a strict program of control, calibration, adjustment and maintenance. The pump/tygon tubing used to collect surface water samples will be routinely inspected to verify that it is working properly. The Van Veen grab sampler used to collect sediment sample will also be routinely inspected. Routine maintenance of all sample equipment will be conducted prior to each sampling event. Maintenance will include a visual inspection that all parts are present, attached correctly and devoid of any obvious contamination. . The Field Operations Project Manager will coordinate ordering replacement parts and repairing samplers. Spare sampling equipment will be available on-site in case of primary equipment failure.

QA/QC and Blank Samples and Frequency

Quality control activities in the field will consist of the following items:

- Adherence to documented procedures in this SAP/QAPP;
- Cross-checking of field measurements and recording to ensure consistency and accuracy; and
- Comprehensive documentation of field observations, sample collection and sample identification information.

Multiple field quality control samples will be collected: one blind field duplicate sample will be collected for every ten sites sampled and sent to the laboratory to test for precision (e.g., repeatability) of analytical procedures. A trip blank will be submitted to the lab to ensure that equipment handling and transport procedures do not introduce contamination to transported project samples. Rinsate blanks will be collected at different periods throughout the program to assure that cross-contamination between samples does not occur.

Field Sampling Decisions

Damage to equipment from wildlife, physical forces of the river, or equipment failure will be addressed using the following protocol. Field sampling decisions to deviate or modify field sampling locations or methods will only be made with the approval of the field crew chief. The field crew chief will document the decision on the field note sheets, and email a copy of the sheet or telephone the information to the study manager. If the field decision is large enough in scale to significantly affect the study's data, scope, schedule or budget, the field crew chief is authorized to stop work until further contact and coordination with the study manager can be performed.

B.3 SAMPLE HANDLING AND CHAIN OF CUSTODY REQUIREMENTS

B.3.1 Sampling Procedures

See Section B.2 of this QAPP – Sampling Method Requirements

Field Logbook and Field Log Forms

Thorough documentation of all field sample collection is necessary for proper processing of data and, ultimately, for interpreting study results. Field sample collection will be documented in writing, on forms included in (to be included in Appendix B), as well as on the following forms and labels:

- A field log notebook for general observations and notes
- A Field Data Record Form that contains information about observations and measurements made and samples collected at the site
- Checklists for each sampling event, sampling point, and sampling time.

Copies of the field log books and physical characterization/water quality data sheets and sampling checklists will be supplied to the Field Operations Project Manager at the close of each sampling event. These data will be used in conjunction with inspection checklists to compile the sampling event reports. Formal reports that are generated from the data will be subject to technical and editorial review before submission to AEA, and will be maintained at URS's Anchorage, AK and Tt's Seattle, WA, officse in the central file (disk and hard copy). The data reports will include a summary of the types of data collected, sampling dates, and any problems or anomalies observed during sample collection.

Samples will be documented and tracked on Field Data Record forms, Sample Identification labels, and COC records. The Field Task Leaders (one for each team) will be responsible for ensuring that these forms are completed and reviewed for correctness and completeness by the designated field QC Officer (Field Operations Project Manager). URS and Tt will maintain copies of these forms in the project files. A sampling report will be prepared following each sampling event. Another person will manually check data entered into any spreadsheet or other format against the original source to ensure accurate data entry. If there is any indication that requirements for sample integrity or data quality have not been met (for samples or measurements collected by URS and Tt), the QAO will be notified immediately (with an accompanying explanation of the problems encountered).

Photographic Records

Recording of sampling locations will be documented with photographs using a conventional photo-point procedure. Photographs will be taken at each sampling location and the photograph number and the associated date, description of the photograph, site identification number and GPS coordinates will be recorded on the Field Data Form for each site. The photos will be stored as digital images and maintained as files, as appropriate, in repositories for information and data used in preparing any reports and documents during the project. Digital photos will be submitted with an index for each set of photographs, identifying the project, site identification number and a description of the photograph.

Field Data Recording

In-situ field data measurements will be recorded immediately following collection, both, electronically (stored within Hydrolab Surveyor) and on the Field Data form for each station. Field data sheets will be printed on *Rite in the Rain* paper. Promptly following each sample event, scanned copies of field data sheets will be made and stored electronically.

Each sample bottle will have a waterproof sample identification label, tag, or permanent marker identification. All sample bottles will be labeled with an indelible marker before the time of collection. Sample labels will include station designation, date, time, collector's initials, and sample/analysis type. Special analyses to be performed and any pertinent remarks will also be recorded on the label.

B.3.2 Sample Custody Procedures

Chain of custody (COC) can be defined as a systematic procedure for tracking a sample or datum from its origin to its final use. Chain of custody procedures is necessary to ensure thorough documentation of handling for each sample, from field collection to data analysis. The purpose of this procedure is to minimize errors, maintain sample integrity, and protect the quality of data collected.

A data sample is considered to be under a person's custody if it is:

- In the individual's physical possession
- In the individual's sight
- Secured in a tamper-proof way by that person, or
- Secured by the person in an area that is restricted to authorized personnel

Elements of chain-of-custody include:

- Sample identification
- Security seals and locks
- Security procedures
- Chain-of-custody record

The analytical laboratory will provide blank COCs with each bottle order and provide scanned copies of finished COCs with sample results. Each batch of samples will have a separate completed COC sheet that will document and track sample possession at all times.

B.3.3 Shipping Requirements

Packaging, marking, labeling, and shipping of samples will comply with all regulations promulgated by the U.S. Department of Transportation in 49 CFR 171-177.

Samples for laboratory analysis will be collected in containers appropriate for the analytes of interest, filtered if necessary (most filtering of samples will occur in the laboratory) and will be properly preserved until delivery to the analytical laboratory. All samples will be immediately placed in coolers and packed with gel ice after sampling and will remain chilled to 4°C (±2°C) during transportation to the contract laboratory. All samples will be accompanied with completed COC forms when shipped, and coolers will be sealed with signed and dated fiber tape for shipment. Tetra Tech maintains specific SOPs (Standard Operating Procedures) for sample chain of custody, sample shipping, and supporting sample documentation.

B.4 ANALYTICAL METHODS AND REQUIREMENTS

Monitoring shall be conducted in accordance with EPA-approved analytical procedures and in compliance with 40 CFR Part 136, Guidelines Establishing Test Procedures for Analysis of Pollutants. Section A7 of this QAPP, Table 10, lists all parameters of concern, approved analytical methods, method-specific detection and reporting limits, and accuracy and precision values applicable to this project.

Under direction of the Principal Manager and the Field Operations Project Manager, project staff will ensure that all equipment and sampling kits used in the field and laboratories use EPA CWA approved methods. The project's QA officer will verify that only EPA CWA approved methods (or in specific incidences ADEC DOW pre- approved methods) are used.

Laboratory Operations Documentation

Laboratory data results will be recorded on laboratory data sheets, bench sheets and/or in laboratory logbooks for each sampling event. These records as well as control charts, logbook records of equipment maintenance records, calibration and quality control checks, such as preparation and use of standard solutions, inventory of supplies and consumables, check-in of equipment, equipment parts and chemicals will be kept on file at the laboratory.

Any procedural or equipment problems will be recorded in the field notebooks. Any deviation from this SAP/QAPP will also be noted in the field notebooks. Data results will include information on field and/or laboratory QA/QC problems and corrective actions.

Standard turnaround time for the analytical samples taken to the contract laboratory will be seven to ten working days and will not exceed twenty-two working days for reporting of data.

Chain-of-custody forms will be kept with the sample during transport and will accompany data results back to URS and Tt. Training records and data review records will be kept on file at URS and the contract laboratory and will be available on request. All sample analysis records and documents are kept at the contract laboratory and will be available to AEA for inspection at any time. In addition to any written report, data collected for the project will be provided electronically via a CD-ROM or e-mail ZIP file format.

All records will be retained by the contract laboratory for ten years. All project records at AEA, URS, and Tt are retained permanently.

B.5 QUALITY CONTROL REQUIREMENTS

Quality Control (QC) is the overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the monitoring project's data quality objectives.

Data quality is addressed, in part, by consistent performance of valid procedures documented in the SOPs (Appendix A to this QAPP). It is enhanced by the training and experience of project staff and documentation of project activities. This QAPP, including its appendices, will be distributed to all sampling personnel. Prior to the start of sampling activities (June 2013) all field personnel will be trained and debriefed on field collection procedures, Field data forms, and all types of data/samples to be collected during the 2013/2014 sampling period. A QC Officer (or equivalent) will ensure that samples are taken according to the established protocols and that all forms, checklists, and measurements are recorded and completed correctly during the sampling event.

B.5.1 Field Quality Control (QC) Measures

QC measures that field personnel will perform in the field include but are not limited to:

- Proper cleaning of sample containers and sampling equipment.
- Maintenance, cleaning and calibration of field equipment/kits per the manufacturer's and/or laboratory's specification, and field SOPs.
- Chemical reagents and standard reference materials used prior to expiration dates.
- Proper field sample collection and analysis techniques.
- Correct sample labeling and data entry.
- Proper sample handling and shipping/transport techniques.

- Field replicate samples (blind to the laboratory), e.g. 1 replicate/10 samples).
- Field replicate measurements (e.g. 1 replicate measurement/10 field measurements).

Table 17 summarizes the field QC requirements for this project.

Table 17: Field Quality Control Sample Requirements

Field Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Field Blank	All laboratory-analyzed parameters	1 set/20 sites	depends on number of sample days	< detection limit for each analyte
Trip Blank	All laboratory-analyzed parameters	1 per set of coolers/day	depends on number of sample days	< detection limit for each analyte
Field Replicate (Blind to Lab)	All laboratory-analyzed parameters	1 set/20 sites	depends on number of sample days	< detection limit for each analyte
Field Replicate Measurement	Temperature	1 replicate measurements per 10 field measurements (each day)	depends on water depth and number of measurements per profile	±0.2°C
	DO			±0.4 mg/L
	pH			±0.2 units
	Conductivity			±10 µS/cm
	Turbidity			±2 NTUs
	Redox Potential			NA
Calibration Verification Check Standard	DO	1 per sampling day	depends on number of sample days	Within 15% of calibration standard
	pH			
	Conductivity			
	Turbidity			

B.5.2 Laboratory Quality Control (QC) Measures

In this section, the Laboratory Quality Control Measures including QC samples collected in the field for subsequent laboratory analysis as well as method-specific laboratory QC activities are prescribed in each analytical method's SOP and in the monitoring project's QAPP.

Laboratory QC includes the following:

- Laboratory instrumentation calibrated with the analytical procedure.
- Laboratory instrumentation maintained in accordance with the instrument manufacturer's specifications, the laboratory's QAP and Standard Operating Procedures (SOPs).
- Matrix spike/matrix spike duplicates, sample duplicates, calibration verification checks, surrogate standards, external standards, etc. per the laboratory's QAP and SOPs.
- Specific QC activities prescribed in the project's QAPP.

- Laboratory data verification and validation prior to sending data results to ADEC and/or permitted facility.

Contracted laboratories will provide analytical results after verification and validation by the laboratory QA Officer. The laboratory must provide all relevant QC information with its summary of data results so that the project manager and project QA officer can perform field data verification and validation and review the laboratory reports. The Principal Manager reviews these data to ensure that the required QC measurement criteria have been met. If a QC concern is identified in the review process, the Project Manager and Project QA Officer will seek additional information from the contracted laboratory to resolve the issue and take appropriate corrective action.

Table 18 summarizes the field/laboratory QC sample requirements for this project.

Table 18: Field/Laboratory Quality Control Samples

Field/Lab Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Field Blank	All laboratory parameters to be analyzed	1 blank per 3 sample days	depends on number of sample days	<detection limit for each parameter
Trip Blank	All laboratory parameters to be analyzed	1 blank per 3 sample days	depends on number of sample days	<detection limit for each parameter
Field Replicate	All laboratory parameters to be analyzed	1 per 10 samples collected (Baseline & Sediment) 1 per Focus Area	10 per month (Baseline WQ) 3 (Sediment) 10 per sampling event	≤10% of the RPD

B.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTIONAND MAINTENANCE REQUIREMENTS

Periodic regular inspection of equipment and instruments is needed to ensure the satisfactory performance of the systems. Equipment to be used during the sampling event is listed in the appropriate SOPs. Before any piece of sampling or measurement equipment is taken into the field, it will be inspected to ensure that the equipment is appropriate for the task to be performed, all necessary parts of the equipment are intact, and the equipment is in working order. In addition, the equipment will be visually inspected before its use. Broken equipment will be labeled "DO NOT USE" and returned to the URS or Tt office to receive necessary repairs, or it will be disposed of. Backup field equipment will be available during all field activities in the event of equipment failure.

Field staff will document that required acceptance testing, inspection, and maintenance have been performed. Records of this documentation will be kept with the instrument/equipment kit. The objective of preventive maintenance is to ensure the availability and satisfactory performance of the measurement systems. All field measurement instruments will receive preventive maintenance in accordance with the manufacturer's specifications.

Contracted and sub-contracted laboratories will follow the testing, inspection and maintenance procedures required by EPA Clean Water Act approved methods and as stated in the respective laboratory's QAP and SOPs. Instrument/equipment testing, and inspection and maintenance requirements and procedures are located in the contract laboratories approved QA manual and is available upon request.

B.7 INSTRUMENT CALIBRATION AND FREQUENCY

Calibrated field instruments will be used for in-field, instantaneous measurement of temperature, DO, conductivity, pH, turbidity, and redox potential. Instruments will be calibrated in accordance with manufacturer's specifications every day prior to the beginning of sampling activities. Post-calibration verification will be performed on each sampling date following sampling activities. All calibration activities will be perform at the field office in Talkeetna, AK. Verification of pH measurement accuracy will be checked against standard solutions (buffer 7 and 10) in the field (if pH drift is noticeable by field staff) and adjustments made to the meter prior to the next measurement, if necessary.

The calibration of temperature, DO, conductivity, pH, redox potential, and turbidity instruments will be checked before and after each sampling event, or as deemed necessary by the multiprobe's manufacturer, using certified standard solutions. Field calibrations will be recorded on a field calibration form (Appendix B). Individual sensors will be considered to be operating correctly if the instrument reading is within 10 percent of the calibration standard value. If the two values are not within 10 percent of each other, the probe will be cleaned and recalibrated. If these two values are still not within 10 percent of each other following cleaning and recalibration, the probe itself will be replaced.

Refer to Section B.2.3 for further details on field instrument calibration methods and specifics.

Contracted and sub-contracted laboratories will follow the calibration procedures found in its QAP and the laboratory's SOPs. Specific calibration procedures for regulated pollutants will be in agreement with the respective EPA Approved CWA method of analysis. Field and/or laboratory calibration records will be made available to ADEC upon request.

B.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Supplies and consumables are those items necessary to support the sampling and analysis operation. They include bottleware, calibration solutions, hoses, decontamination supplies, preservatives, and various types of water (e.g., potable, deionized, organic-free). Upon delivery of supplies, field crews will ensure that types and quantities of supplies received are consistent with what was ordered, and with what is indicated on the packing list and invoice for the material. If any discrepancies are found, the supplier will be contacted immediately.

While preparing for specific sampling events, the field sampling Task Leaders will be responsible for acquiring and inspecting materials and solutions that will be used for obtaining the samples for field measurements. Other materials must also meet specific requirements as indicated by the appropriate manufacturer; for example, only certified standard solutions will be used for the multi-probe calibration. Buffers and standards will be checked for expiration dates and appearance (correct color).

Field task leaders will clean all sampling equipment (pump and tubing system, multi-probe, depth sounder, etc.) at the end of each day's sampling activities with de-ionized water. Field task leaders will inspect sampling equipment each day prior to the start of sampling activities to ensure all sampling equipment has been cleaned and prepared for the day.

All sample containers, tubing, filters, etc. provided by a laboratory or by commercial vendor will be certified clean for the analyses of interest (low level metals and toxics analysis). The sampling team will take note of the information on the certificate of analysis that accompanies sample containers to ensure that they meet the specifications and guidance for contaminant-free sample containers for the analyses of interest. Records will be kept the field office.

No standard solutions, buffers, or other chemical additives shall be used if the expiration date has passed. The Field Operations Project Manager or his/her designee is responsible to maintain appropriate records (e.g. logbook entries, checklists, etc.) to verify inspection/acceptance of supplies and consumables, and restock these supplies and consumables when necessary. These records will be kept at the field office and at URS's Anchorage, AK office.

Contracted and sub-contracted laboratories will follow procedures in their laboratory's QAP and SOPs for inspection/acceptance of supplies and consumables.

B.9 DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

Available existing water quality information was collected and evaluated in Water Quality Data Gap Analysis (URS, 2011). This data was further examined for its potential relevance and completeness, and whether the methods used produced information that could be applicable to the anticipated environmental analysis for the proposed Project. Other sources of information used in the analysis included that derived from contacts with agency project leaders and database searches. Where information was determined to be likely insufficient for satisfying environmental analysis requirements, a potential data gap was identified. The final analysis and identification of data gaps was used to inform site selection in this project as reported in Section B1.2.

A review of existing data generated by governmental agencies and organizations was used as background information to evaluate current and past water quality conditions in the Susitna River drainage. Natural resource agencies were identified and lead staff contacted for location of relevant information and web sites searched for general description of drainage conditions as well as for water quality data that could be further analyzed. The following agencies were initially identified for available information from the Susitna River drainage and contiguous areas:

- Alaska Department of Environmental Conservation
- Alaska Department of Fish and Game
- Alaska Department of Natural Resources
- U.S. Environmental Protection Agency, Region 10
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- National Oceanic and Atmospheric Administration-Fisheries
- Alaska Energy Authority/Alaska Power Authority
- American Geophysical Union

Generally, most of the data discovered and used in the data gap analysis was more than 20 years old. Many of the documents did not report data quality expressions and so an evaluation for comparability of data sets was not possible. The exception was the United States Geological Survey (USGS) data where long-term monitoring at select stations was completed in the drainage. The comparability of data among USGS stations was not in question, but the lack of DQOs from older data did not enable a comparison between USGS and other existing data sets. Any interpretations of data close to pollutant concentration criteria were interpreted as exceeding the standard. This conservative approach was taken in order to preserve the intent of water quality criteria and to suggest additional studies that should be conducted in order to advance definitive decisions.

Historical data was used, in part, to determine where water quality exceedance occurred (URS, 2011) and to identify monitoring sites where additional data was needed for modeling of water quality conditions. Since quality of data identified from historical records had generally undocumented DQOs, these data will not be used in the modeling exercise. Rather, the current, proposed data collection will be used for calibrating the water quality model. Since historical water quality records reflect historical human activities in the Susitna Basin, they do not indicate how current and recent past activities have influenced water quality conditions. The lack of DQOs for almost all proposed parameters in this study (except for USGS field parameters), does not enable these data records to be used for current model calibration and projections of resulting water quality under various Project operation scenarios.

B.10 DATA MANAGEMENT

Samples will be documented and tracked on Field Data Record forms, Sample Identification labels, and Chain of Custody records. The Field Task Leaders (one for each team identified in Section A.4) will be responsible for ensuring that these forms are completed and reviewed for correctness and completeness by the designated field QC Officer. The Water Quality Studies contractor will maintain copies of these forms in the project files. A sampling report will be prepared following each sampling event. The Data Manager will identify a staff member from one of the field teams to manually check data entered into any spreadsheet or other format against the original source to ensure accurate data entry. If there is any indication that requirements for sample integrity or data quality have not been met (for samples or measurements collected by Tt), the Tt QA Lead will be notified immediately (with an accompanying explanation of the problems encountered).

Hard copy data packages will be paginated, fully validated raw data packages that include an analytical narrative with a signed certification of compliance with this QAPP and all method requirements; copies of Chain of Custody forms; sample inspection records; laboratory sample and QC results; calibration summaries; example calculations by parameter; and copies of all sample preparation, analysis, and standards logs adequate to reconstruct the entire analysis. The CD-ROM data will include a full copy of the paginated report scanned and stored in portable document format (PDF) for potential future submission to the client, if requested, and for long-term storage in the project files. Initially, the full raw data package will be submitted to the Tt QA Lead for assessment of compliance with the program goals and guidance.

All computer files associated with the project will be stored in a project subdirectory by the Water Quality Studies Contractors (URS and Tt; subject to regular system backups) and will be copied to disk for archive for the 5 years subsequent to project completion. The data may eventually be stored using a data management system specified Alaska Department of Environmental Conservation.

The success of a monitoring project relies on data and their interpretation. It is critical that data be available to users and that these data are:

- Of known quality;
- Reliable;
- Aggregated in a manner consistent with their prime use, and
- Accessible to a variety of users.

Quality Assurance/Quality Control (QA/QC) of data management begins with the raw data and ends with a defensible report, preferably through the computerized messaging of raw data.

Data management encompasses and traces the path of the data from their generation to their final use or storage [e.g., from field measurements and sample collection/recording through transfer of data to computers (laptops, data acquisition systems, etc.), laboratory analysis, data validation/verification, QA assessments and reporting of data of known quality]. Data management will include/discuss all incidence of errors detected during the QA review process and include in annual water quality reports as well as documented with “qualifiers” in the water quality database.

A Data Management Flow Chart (Figure 13) at the end of this section provides a visual summary description of the data flow/management process for environmental data collected in support of the Watana Hydroelectric Project Licensing process.

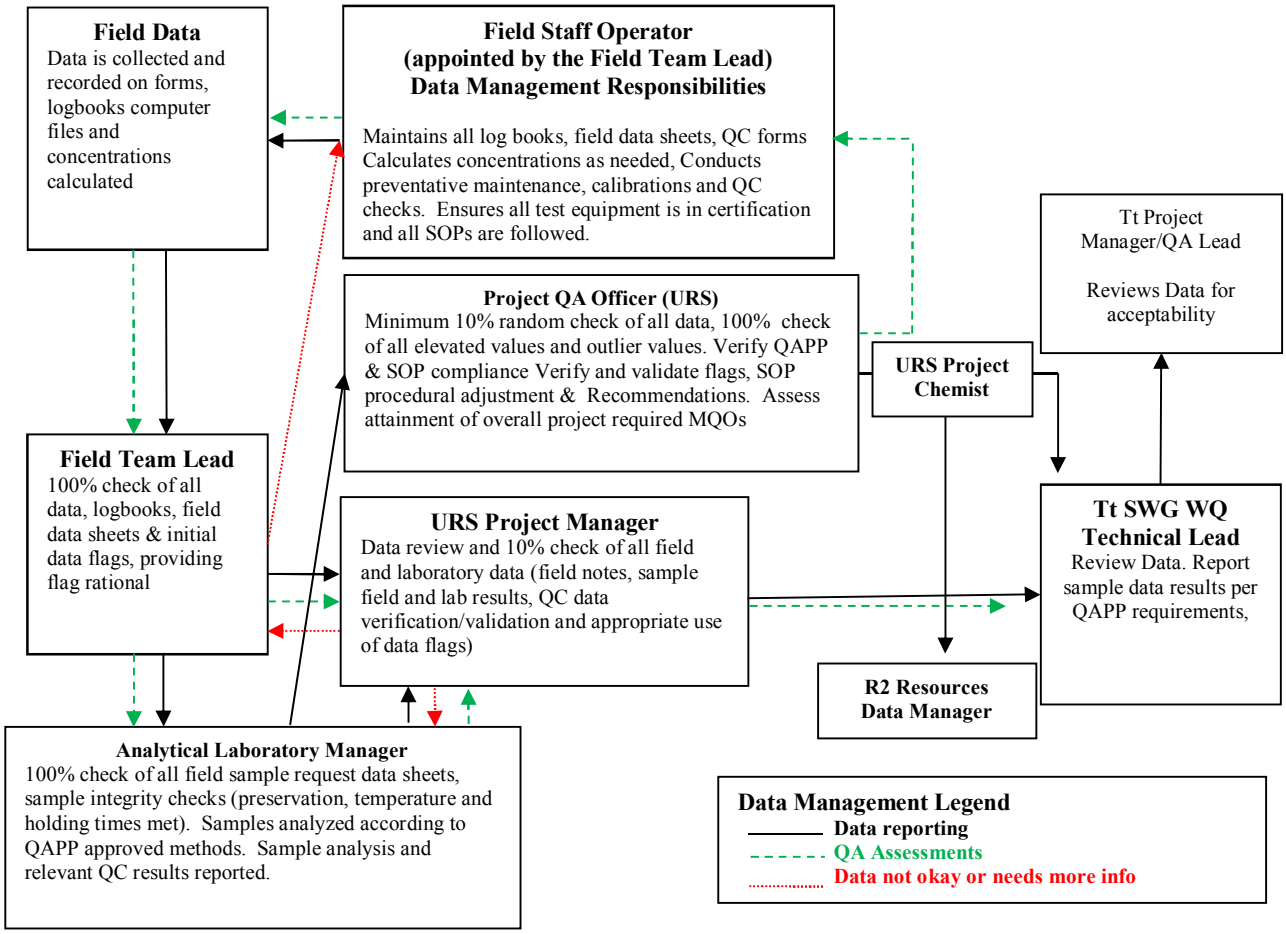
Various people are responsible for separate or discrete parts of the data management process:

- The sampling team is responsible for field measurements/sample collection and recording of data and subsequent shipment of samples to laboratories for analyses. They assemble data files,

which includes raw data, calibration information and certificates, QC checks (routine checks), data flags, sampler comments and meta data where available. These files are assembled and forwarded for secondary data review by the sampling manager or supervisor.

- Laboratories are responsible to comply with the data quality objectives specified in the QAPP and as specified in the laboratory QAP and method specific SOPs. Validated sample laboratory data results with respective analytical method QA/QC results and acceptance criteria are reported to the sampling manager or project supervisor.
- Secondary reviewers (sampling coordinator/supervisor/project supervisor) are responsible for QA/QC review, verification and validation of field and laboratory data and data reformatting as appropriate for reporting to STORET, AQMS, ICIS-NPDES, DROPS (if necessary), and reporting validated data to the project manager.
- The project QA officer is responsible for performing routine independent reviews of data to ensure the monitoring projects data quality objectives are being met. Findings and recommended corrective actions (as appropriate) are reported directly to project management.
- The project manager is responsible for final data certification
- URS/Tt Project Managers/Project QAO conducts a final review (tertiary review) and submits the validated data to STORET, AQMS, ICIS-NPDES, DROPS as appropriate.

Figure 13: Project Data Management Flow Chart



B.10.1 Data Storage and Retention

Data management files will be stored on a secure computer or on a removable hard drive that can be secured. Laboratory records must be retained by the contract laboratory for a minimum of five years. Project records must be retained by the lead organization conducting the monitoring operations for a minimum of five years, preferably longer. Site location and retention period for the stored data will be specified in Section A9, Documents and Records, Table 8.

Field Data Collection, Processing, and Delivery Standards to Water Resources Program Lead

In general, the process for preparing and submitting field data includes the following steps:

1. Create field forms and mobile device entry screens and review with R2 Resources (contact: Dana Stewart or Judy Simon) 2 weeks before field trip.
2. In the field, record data on field forms or in mobile devices and do QC1 and QC2.
3. Backup field forms and books and mobile devices (ArcPad, Trimble, cameras, GPS, thermistors, etc.) nightly.
4. Submit these raw deliverables to AEA at least monthly, via AEA SharePoint or to AEA IT on external drives/DVDs with large files. AEA considers these to be interim deliverables.
5. Process the raw data to prepare for the AEA project database: convert raw file to a submittal format, perform remaining QC levels 1 to 3, assign site IDs, flag unusable records, apply database naming and codes, perform data reduction, etc.
6. Submit final processed (QC3) data files to AEA SharePoint or via hard drive, as done for raw data. (Refer to the GIS User Guide for delivery of GIS data.)
7. For data being delivered for storage in the project database, data must be accompanied by a data dictionary.
8. The project's data resource manager will perform QC4 review and coordinate revisions with the consultant's Data Coordinator.
9. Data and dictionary are incorporated into the Susitna project relational database. No more revisions can be made in the data by consultants, as the data is considered Final for the study year.
10. If data revisions are needed later, such as for QC5, they'll be coordinated by the project's data manager. The appropriate QC columns will be updated, which will serve as adequate documentation.

Quality Control Protocol

- There will be 5 levels of data QC, named QC1 to QC5, each of which is tracked either within tabular datasets (as for Excel and database tables), or within file path names (as for raw field data files).
- This allows for quick determination of the QC status of all data.
- Details for the QC Protocol are found in Appendix A: Data QC Protocol.
- The QC levels, briefly, are as follows:

  QC1 – Field Review: Review of field forms before leaving the field, or the QC level of raw data collected via field equipment such as thermistors, cameras, GPS units, etc.

QC2 – Data Entry: Data from paper forms are entered into an electronic format and verified.

QC3 – Senior Review: Final review by senior professional before submitting field data to AEA, or the QC level of raw data cleaned up for delivery to AEA.

QC4 – Database Validation: Tabulated data files are verified to meet project database standards.

QC5 – Technical Review: Data revision or qualification by senior professionals when analyzing data for reports.

There will be 5 levels of data QC, named QC1 to QC5, each of which is tracked within the data. This allows for quick determination of the QC status of every data record. The first three levels are to be completed by the study team, the fourth level by the Program Lead team, and the final level by senior professionals during analysis and reporting.

QC1 – Field Review: QC review performed by the person collecting field data, whether recorded on paper field forms or directly into electronic data collection tools, and then by the field team leader. This is also the QC level of raw data collected via field equipment such as thermistors, cameras, GPS units, etc.

The goal of QC1 is to identify errors and omissions and correct them under similar field conditions prior to leaving the field.

Review is done on 100% of data and includes completeness, legibility, codes, and logic on all information recorded. This is typically completed in the field daily. Once completed, QC1 notations are made directly on the field form in an entry named "QC1", containing the date and responsible staff and formatted as "YYYYMMDD FLastname" (example: "20120631 JDoe").

QC2 – Data Entry: Data from paper forms are entered into an electronic format, then data entry is verified by a second party against the field forms.

The goal of QC2 is to verify correct, complete, and consistent data entry.

Verification is done on 100% of data entered and includes extrapolation of shorthand codes that might be used in the field into longhand or standard codes during data entry. Data entry errors are corrected at this time, then QC is recorded in a column named "QC2", containing the date and responsible staff and formatted as "YYYYMMDD FLastname" (example: "20120631 JDoe").

QC3 – Senior Review: Data are reviewed by a senior professional on the consultant team, checking for logic, soundness, and adding qualifiers to results if warranted. Calculated results can also be added at this time (formulas must be documented in the data dictionary). This is the final review before submitting field data to the Program Lead, and is recorded in the "QC3" column in the same format as QC2. This is also the QC level of raw files that have been "cleaned up" or otherwise processed for delivery to AEA, such as photos.

QC4 – Database Validation: Electronic data files are submitted to and verified by the Program Lead's data resources manager. The deadline for this delivery is negotiated with the team Data Coordinator in consideration of the study due date.

Data are verified for completeness, project standards (codes, field name conventions, date formats, units, etc.), calculated and derived fields, QC fields, etc. The data files are incorporated into the project database schema, splitting into normalized tables as necessary and all primary and foreign keys checked. An error report is generated for the study consultant, who is expected to make corrections and resubmit data. The process is repeated

until verification is clean and records are marked in column "QC4" (such as "20121001 DStewart").

QC5 – Technical Review: Data revision and qualification may be applied by senior professionals when analyzing data for reports, trends, and FERC applications. Data calculations may be stored with the data. Some data items may get corrected or qualified within the database, while others are only addressed in report text. QC5 may be iterative, as data are analyzed in multiple years.

If a data item is revised directly, it's recorded in 2 columns, QC5 (date and staff) and QC5Edit (what is revised and why). This will serve as adequate documentation of the revisions, so maintenance of additional documentation isn't usually necessary. QC5 revisions will be physically made by the Data Resource Manager, directed by the senior professional.

C. ASSESSMENTS

C.1 ASSESSMENTS AND RESPONSE ACTIONS

The QA program under which this task order will operate includes technical system audits, with independent checks of the data obtained from sampling, analysis, and data-gathering activities. URS Quality Assurance Officer (QAO) and the Tt Quality Control Lead (QCO) will review the data packages to ensure similar levels of QA and QC are attained. The essential steps in the QA program are as follows:

- Identify and define the problem
- Assign responsibility for investigating the problem
- Investigate and determine the cause of the problem
- Assign and accept responsibility for implementing appropriate corrective action
- Establish the effectiveness of and implement the corrective action
- Verify that the corrective action has eliminated the problem

Many of the technical problems that might occur can be solved on the spot by the staff members involved; for example, by modifying the technical approach, repairing instrumentation that is not working properly, or correcting errors or deficiencies in documentation. Immediate corrective actions form part of normal operating procedures and are noted in records for the project. Problems not solved this way require more formalized, long-term corrective action. If quality problems that require attention are identified, Tt or the subcontractor will determine whether attaining acceptable quality requires short- or long-term actions. If a failure in an analytical system occurs (e.g., performance requirements are not met), the appropriate QC Officer or laboratory QA Manager will be responsible for corrective action and will immediately inform the Tt PM or QAO, as appropriate. Subsequent steps taken will depend on the nature and significance of the problem.

The URS Quality Assurance Officer and the Tt QC Lead have primary responsibility for monitoring the activities of this project and identifying or confirming any quality problems. These problems will also be brought to the attention of the Tt QC Lead, who will initiate the corrective action system described above, document the nature of the problem, and ensure that the recommended corrective action is carried out. The URS QA Lead has the authority to stop work on the project if problems affecting data quality require extensive effort to resolve and are identified.

The AEA PM and Tt Water Quality Technical Lead will be notified of major corrective actions and stop work orders.

Corrective actions might include the following:

- Re-emphasizing to staff the project objectives, the limitations in scope, the need to adhere to the agreed-upon schedule and procedures, and the need to document QC and QA activities
- Securing additional commitment of staff time to devote to the project
- Retaining outside consultants to review problems in specialized technical areas
- Changing procedures
- The Tt Technical Lead may replace a staff member or subcontractor, as appropriate, if it is in the best interest of the project to do so.
- The URS QAO and Tt QC Lead are responsible for overseeing work as it is performed and periodically conducting checks during the data entry and analysis phases of the project. As data entries, calculations, or other activities are checked, the person performing the check will sign and date a hard copy of the material or complete a review form, as appropriate, and provide this

documentation to the Tt Technical Lead for inclusion in the project files. Field audits and technical system audits will not be conducted under this task order.

C.1.1 High Quality End-Use Tier 2 Monitoring Data

Generally, this project will require high end-use quality data results for comparison to Alaska's water quality standards and will need more frequent and varied assessments to provide a more thorough and independent validation that the monitoring project does capture high end-use quality data. This monitoring project collects samples for subsequent laboratory analysis and will need more types of assessments than just project field measurements to independently evaluate the overall monitoring system. Example QA Assessments include the following:

Field Assessments (each parameter)

- Precision (replicate) sample measurements. Project will have a minimum of three paired measurements/project or 10% of project samples, whichever is greater. Replicate measurements will be evenly spaced over project timeline. Precision criteria are specified in the project's Measurement Quality Objectives (MQO) table, see section A7.

Field samples collected for subsequent laboratory analysis (each parameter)

- Blind replicate samples for each parameter will be measured. The project will have a minimum of three paired measurements/project or 10% of project samples, whichever is greater. Replicate samples will be evenly spaced over the life of the project. Precision criteria are specified in project's MQO table, see section A.7.
- Sample splits (one split will be sent to laboratory analyzing project samples, the other split will be sent to a reference lab). This will be determined based on the laboratory SOP.
- Matrix spike duplicates (MSD) (assesses total measurement bias for project – both precision and accuracy). Frequency of MSDs is usually specified by the analytical method. Accuracy and precision of criteria for each pollutant and analytical method are specified in the project's MQO table, see section A.7.
- Third party performance evaluation samples (PE samples also called performance test (PT) samples) for wastewater analytes of interest. PT water/wastewater sample participation is at a frequency of 1/year from a NELAC certified vendor (http://www.nelac-institute.org/PT.php#pab1_4). For APDES permit monitoring, these are called DMRQA samples.
- Microbiological samples will be analyzed by the current ADEC Division of Environmental Health Drinking Water certified lab (http://www.dec.state.ak.us/eh/lab/certmicrolabs.aspx) for the methods of interest. Laboratory third party microbiological PT samples results will be submitted directly to the DEC Water QA Officer and the Monitoring Project's QA Officer.

Note 1: It is the laboratory's responsibility to enroll itself in these blind PT studies with the results mailed/emailed directly to the ADEC DOW Water QA Officer and the Monitoring Project's QA Officer. Routine laboratory performance in the blind PT sample studies will be used to assess overall laboratory data quality, as well as monitoring project data quality.

Note 2: It is the responsibility of the Project Manager and project QA Officer to ensure the selected laboratory is annually self-enrolled in a NELAC certified PT water/wastewater study for those analytes required in the monitoring project.

On-Site Assessments include the following:

- Inspection of field monitoring operations for compliance with QAPP requirements.
- Laboratory Audit (if concerns arise regarding laboratory data quality)

- Audit of project field measurement data results.

Project Data Assessments include the following elements:

- Audits of Monitoring Data for reproducibility of results from recalculation/reconstruction of field/lab unprocessed data.
- Calculation of monitoring project's overall achieved precision, accuracy and data completeness compared to QAPP defined precision, accuracy and data completeness goals.

Table 19: Project Assessments

Assessment Type	Measurement Parameters		Frequency	Acceptance Criteria Limits
	Analyte	Method		
On-site Field Audit/Inspection	All water samples collected for each set of analytes	As per Section A.7	1/site/monitoring season	Site technicians in compliance with QAPP sampling protocols, sample sites meet sample design criteria
Field Split Sample (sent to different labs for comparison analysis)	Prescribed for parameters based on laboratory SOP	As per Section A.7	1/monitoring season	Per Laboratory Protocol
On-site Technical System Lab audit	Indicated by inability to meet individual performance criteria for an analyte	As per Section A.7	If concerns arise regarding laboratory data quality	Per Laboratory Protocol
Independent Data Review Audit	All data	As per Section A.7	10% of reported data	>90% Completeness
Project Precision, Accuracy and Data Completeness Assessment	All parameters analyzed in the laboratory	As per Section A.7	end of project and at least 1/year	Defined in Section A.7 and Table 6

C.2 REVISIONS TO QAPP

Annually the QAPP will be reviewed and revised as needed by the URS Project Manager, Tt Water Quality Lead, and reviewed by the URS project QA officer. Minor revisions may be made without formal comment. Such minor revisions may include changes to identified project staff (but not lead project staff: QA project officer, project manager, field technical lead, contracted laboratories), QAPP distribution list and/or minor editorial changes.

Revisions to the QAPP that affect stated monitoring Data Quality Objectives, Measurement Quality Objectives, method specific data validation "*critical*" criteria and/or inclusion of new monitoring

methods must seek review and pre-approval by DEC DOW QA Officer/DEC Project Management before being implemented.

Revision to the QAPP will be reported in a separate document as an amendment to the original QAPP. The independent amendment will be linked to the original QAPP document by citation and dated to reflect methods that supersede the original approach.

C.3 QA REPORTS TO MANAGEMENT

A draft data report will be prepared and forwarded to the AEA for data analysis completed during winter 2013. The report will include the following:

- Description of the project purpose, goals, and objectives.
- Map(s) of the study area and sampling sites.
- Descriptions of field methods.
- Discussion of data quality and the significance of any problems encountered in the analyses.
- Summary tables of field data.
- Observations regarding significant or potentially significant findings.
- Recommendations based on project goals.

Table 20: QA Reports to Management

QA Report Type	Contents	Presentation Method	Report Issued by	Reporting Frequency	
				As Required	Year
On-site Field Inspection Audit Report	Description of audit results, audit methods and standards/equipment used and any recommendations	Written text and tables, charts, graphs displaying results	Project QA Officer/auditor	✔	
Field Split Sample Report	Evaluation/comparison of result of split sample results from different laboratories, audit method	Written text and tables, charts, graphs displaying results	Project QA Officer/auditor	✔	
On-site Laboratory Audit Report	Description of audit results, audit methods and standards/equipment used and any recommendations	Written text and tables, charts, graphs displaying results	Project QA Officer/auditor	✔	
3rd Party PT (DMRQA, etc.) Audit Report	Description of audit results, methods of analysis and any recommendations	Written text and charts, graphs displaying results	Project QA Officer/auditor	✔	✔
Corrective Action Recommendation	Description of problem(s), recommended corrective action(s), time frame for feedback on resolution of problem(s)	Written text/table	QA Officer/auditor	✔	
Response to Corrective Action Report	Description of problem(s), description/date corrective action(s) implemented and/or scheduled to be implemented	Written text/table	Project Manager overseeing sampling and analysis	✔	
Data Quality Audit	Independent review and recalculation of sample collection/analysis (including calculations, etc) to determine sample result. Summary of data audit results; findings; and any recommendations	Written text and charts, graphs displaying results	Project QA Officer	✔	
Quality Assurance Report to Management	Project executive summary: data completeness, precision, bias/accuracy	Written text and charts, graphs displaying results	Project QA Officer	✔	✔

D. DATA VALIDATION AND USABILITY

D.1 DATA REVIEW, VERIFICATIONAND VALIDATION REQUIREMENTS

The purpose of this section is to define the criteria used to review and validate monitoring data generated from field sampling at locations on the Susitna River and tributaries. Criteria adopted for validation will be used to accept, reject or qualify data in an objective and consistent manner. Data review, verification and validation are a way to decide the degree to which each data item has met its quality specifications (i.e. analyte specific QC criteria and overall project measurement quality objectives).

D.1.1 Data validation

Data validation means determining if data satisfy QAPP-defined user requirements, that is, that the data refer back to the overall data quality objectives. Data validation is an analyte and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set to ensure that the reported data values meet the quality goals of the environmental data operations (analyte and method specific data validation criteria).

D.1.2 Data Verification and Data Review

Data verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements. Data review is the process that evaluates the overall data package to ensure procedures were followed and that reported data is reasonable and consistent with associated QA/QC results.

Data validation and review services provide a method for determining the usability and limitations of data and provide a standardized data quality assessment. All Field Data forms will be reviewed by the Tt Technical Lead and Field Task Manager (assisted by the QAO, as needed) for completeness and correctness. Tt will be responsible for reviewing data entries and transmissions for completeness and adherence to QA requirements. Data quality will be assessed by comparing entered data to original data or by comparing results to the measurement performance criteria summarized in Section 4.0 to determine whether to accept, reject, or qualify the data. Results of the review and validation processes will be reported to the Technical Leads.

D.2 VERIFICATION AND VALIDATION METHODS

D.2.1 Validation Methods

Data validation determines whether the data sets meet the project-specific requirements as described in the QAPP. That is, were the data results of the right type, quality, and quantity to support their intended use. Data validation also attempts to give reasons for sampling and analysis anomalies, and the effect that these anomalies have on the overall value of the data.

All data generated shall be validated in accordance with the QA/QC requirements specified in the methods and the technical specifications outlined in this QAPP. Raw sample data will be maintained by the agency or company responsible for the monitoring project. Raw laboratory data shall be maintained by the laboratory. The laboratory may archive the analytical data into their laboratory data management system. All data will be kept a minimum of 10 years by contractors to AEA and AEA will retain all records permanently..

The summary of all laboratory analytical results will be reported to the project manager. Data validation will be performed by the laboratory for all analyses prior to the release of data. All laboratory data will be validated according to the laboratory's QAP and SOPs and, as specified in the

Monitoring Project's QAPP. The rationale for any anomalies in the QA/QC of the laboratory data will be provided to the URS/Tt Project Managers with the data results. Completed COC or transmission forms (if required) will be sent back from the laboratory to the Project Managers. Each batch of data sent from the laboratory will undergo a second review by the URS QA Officer (with assistance from the Tt QC Lead) to determine if DQOs are met. This secondary check ensures and independent review of laboratory results by project staff. The DQO review is completed using performance metrics described in Section B.5 Quality Control Requirements.

Data will be qualified as necessary. Sampling may need to be repeated. Unacceptable data (i.e., data that do not meet the QA measurement criteria of precision, accuracy, representativeness, comparability and completeness) will not be used or if used, the problems with the data will be clearly defined, flagged appropriately and data use clearly delimited and justified. Any actions taken to correct QA/QC problems in sampling, sample handling, and analysis must be noted. Under the direction of the URS/Tt Project Managers, project staff will document any QA/QC problems and the respective QA/QC corrective actions taken.

Direct evaluation of MQOs are based on the following elements for both field and laboratory data:

- Detectability;
- Precision;
- Bias/Accuracy;
- Completeness;
- Representativeness; and
- Comparability.

Laboratory analysis performance and field results will be compared against MQOs listed in Table 10. Calculation of MQO results for the above performance criteria are found in Section A.7.2. The laboratory will calculate and report the RPD and percent analyte recovery of analytical duplicate samples and MS/MSD samples (for evaluation of DQOs described next).

DQOs are evaluated based on both qualitative and quantitative performance measures the include the following:

- Preservation and holding times for analysis of samples (Table 16);
- Field quality control requirements (Table 17); and
- Field/Laboratory quality control samples (Table 18).

Performance measurements for each of the analytes and laboratory control samples must either fall within a specified range reported in these tables or meet/exceed the stated threshold.

The URS/Tt Project Managers/Field Team Lead or his/her designee is responsible for reviewing field log notebooks and field data sheets for accuracy and completeness within 48 hours of each sample collection activity, if possible. The Project Manager or his/her designee will compare the sample information in the field log notebooks and/or data field sheets with the laboratory analytical results to ensure that no transcription errors have occurred and to verify project QA/QC criteria have been met (e.g., relative percent difference (RPD) results for blind sample duplicates, percent analyte recovery results for matrix spike and matrix spike duplicate (MS/MSD) results (Table 18).

Sample results provided by the laboratory will be verified and validated by the laboratory QA Officer prior to issuing the laboratory report. Laboratory results will include the results of all QA/QC results as part of the sample data report. The laboratory report will become part of the permanent file for the monitoring project. The URS Project QA Officer or his/her designee will calculate the RPD between field replicate samples.

Analyte specific precision, accuracy and data completeness results greater than project MQO's will be noted by the Project Manager and justified in the final data report. The Project Manager, along with supervisors and/or the Project QA Officer, if necessary, will decide if any QA/QC corrective action is necessary if the precision, accuracy (bias) and data completeness values exceed the project's MQO goals.

The Tt Water Quality Technical Lead or designee will review all Field Data Record forms. The Tt QC Lead will review a minimum of 5 percent of the Field Data Record forms and other records. Any discrepancies in the records will be reconciled with the appropriate associated field personnel and will be reported to the Tt Water Quality Technical Leads The AEA PM will be consulted with deficiencies, observations, and findings, as well as with corrective action and technical directive recommendations for consideration and approval.

Data verification requires confirmation by examination or provision of objective evidence that the requirements of these specified QC acceptance criteria are met. Each step of the data collection and analysis process must be evaluated and its conformance to the protocols established in this QAPP verified, including:

- Sampling design
- Sample collection procedures
- Data analysis procedures
- Quality control
- Data format reduction and processing data

Validation involves detailed examination of the complete data package using professional judgment to determine whether the established procedures were followed. Validation will be done by the URS Quality Assurance Officer with assistance from the Tt Quality Control Lead when requested by the URS QAO (Figure 1).

Tetra Tech and URS managers for the project will review all results to verify that methods and protocols specified in this QAPP were followed; that all instrument calibrations, quality control checks, and intermediate calculations were performed appropriately; and that the final reported data are consistent, correct, and complete, with no omissions or errors.

Evaluation criteria will include the acceptability of instrument calibrations and precision data and the appropriateness of assigned data qualifiers, if any. The URS QA Officer will review data packages and companion field notations (with assistance from the Tt QC Lead) to determine if the results met the MQOs for bias, precision, and accuracy for that sampling interval (monthly) and to ensure that all analyses specified on the "Chain of Custody" form were performed (Section B.5). Based on assessments of performance measures (Section A.7.2), the data will either be accepted, accepted with appropriate qualifications, or rejected.

After the field data have been reviewed and verified by the project manager, they will be independently reviewed by the URS QA Officer and Tt QC Lead for errors before closing out the study. The initial data review will consist of a 10 percent random sampling of the project data. If any errors are discovered during the initial data review, a full independent review will be undertaken by the URS QA QA officer with assistance from the Tt QC Lead.

D.2.2 Verification Methods

The primary goal of verification is to document that applicable method, procedural and contractual requirements were met in field sampling and laboratory analysis. Verification checks to see if the data is complete, if sampling and analysis matched QAPP requirements, and if Standard Operating Procedures (SOPs) were followed.

Verification of data is the responsibility of the Project QA Officer. The Project QA Officer should verify at least 10% of generated project data in addition to all sample data anomalies and sample results approaching or exceeding AWQS and permit limits.

The following procedures will be used to determine if data meets the measurement and data quality objectives and criteria specified in Section A.7. If data QA/QC procedures do not meet the specified criteria, the URS Quality Assurance Officer and Tt Quality Control Lead will review all field and laboratory records to determine the cause. If equipment failures are limiting the usability of the data, calibration and maintenance procedures will be reviewed and changed as needed. If sampling or analytical procedures are the source of failures, methods will be reviewed to resolve the errors. Any changes or modifications to quality control procedures will be approved by the Project Manager prior to inclusion in the QA Project Plan.

Review of Sample Handling

Proper sample handling techniques are required to ensure sample integrity. During data review, the sample handling procedures identified below are evaluated to determine potential effects on data quality.

- Review of field sample collection and preservation procedures to determine whether they were completed in accordance with the requirements specified by the analytical methods.
- Review of chain-of-custody documentation to ensure control and custody of the samples was maintained.
- Review of sample holding times between sample collection, extraction, and analysis (see Section B.2.1).
- Review of sample conditions upon receipt at the contract laboratory.
- Review of Quality Assurance/Quality Control (QA/QC) Samples. Specific procedures for review of QA/QC samples are included in the sections below.

Laboratory Blank Samples

Laboratory blank samples (method and instrument blanks) are laboratory-prepared, analyte-free samples used to detect the introduction of contamination or other artifacts into the laboratory sample handling and analytical process. These blanks play an especially important role in sampling programs involving trace-level analyses or analytes that are common solvents found in a laboratory. None of the analytes of concern for this project are common laboratory contaminants.

Laboratory Control Samples

Laboratory control samples are used to assess analytical performance under a given set of standard conditions. Synthetic samples, containing some or all of the analytes of interest at known concentrations, are prepared independently from calibration standards. The samples consist of laboratory control samples (LCS) and laboratory control sample duplicates (LCSD). Laboratory control samples will be analyzed with each analytical batch. LCS may be used to estimate analytical accuracy and precision by comparing measured results to actual concentrations. LCS/LCSD percent recoveries will be checked on laboratory reports to ensure they are within the limits set by the EPA methods listed in Section A.7.

LCS are also duplicated in the laboratory and then analyzed in an identical manner by the laboratory to assess the laboratory's internal precision. The analytical precision is expressed by the relative percent difference (RPD) (see Section A.7.2). Analytical precision and accuracy should meet the method criteria listed in A.7.

Matrix Spike and Matrix Spike Duplicates

Matrix spike samples are actual field samples to which known amounts of select compounds (one, or more, of the analytes of interest) are added. Both spiked and un-spiked aliquots (sample portions) are analyzed. The difference between the concentration of the spike compound(s) in the spiked and un-spiked aliquots is compared to the amount of spike added before the extraction process. Since actual samples are used for the recovery determination, the matrix effects can be evaluated. Usually expressed as a percentage of the mass of the spiked amount, spike recovery is the measurement of accuracy anticipated for the sample matrix. Percent recoveries will be compared to EPA method specific recoveries listed in Section A.7.

Matrix spike samples are also duplicated in the laboratory and then analyzed in an identical manner by the laboratory to assess sample reproducibility and the laboratory's internal precision. The analytical precision is expressed by the RPD between the measurement results of the two duplicate samples. Analytical precision and accuracy should meet the criteria provided in Section B.5.2. MS/MSD samples will be run on each batch of samples.

Field Duplicate Samples

Field duplicate samples will be collected simultaneously with a primary project sample. Duplicates are treated in the same manner as the primary sample during all phases of sample collection, handling, and analysis. Duplicate sample results are used to assess precision, including variability associated with both the laboratory analysis and the sample collection process (i.e., QC purposes). At least one duplicate field sample (1/20/method/sampling location) will be collected and submitted blind to the laboratory for this program.

Analytical results will be reviewed for agreement with each other or their respective reporting limits and evaluated for comparability. Estimated results quantified below the reporting limit and qualified with a "J" flag are not considered significant for the purpose of data agreement. The comparison between project and field duplicate sample results should meet RSD (relative standard deviation) criteria for each method listed in Section A.7.

Reporting Limits

The reporting limits are the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory conditions. For many analytes, the reporting limit analyte concentration is selected by the laboratory as the lowest non-zero standard in the calibration curve. Sample reporting limits vary based on sample matrix and dilution of the samples during analysis. Reporting limits should be equal to or below the PQLs (Practical Quantitation Limits) provided in Section A.7 for each method.

Data Qualification

Qualifiers will be applied to QC samples when acceptance criteria are not met and corrective action is not performed or is unsuccessful. These same qualifiers will be applied to the associated sample data, as defined in Table 21.

Table 21: Data Qualifiers

Qualifier	Description
J	The analyte was positively identified, the quantitation is estimated.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the method detection limit (MDL).

F	The analyte was positively identified but the associated numerical value is below the reporting limit (RL).
R	The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
B	The analyte was found in an associated blank, as well as in the sample.
M	A matrix effect was present.
H	Analysis was performed outside of the recommended holding time.

Completeness

Completeness is calculated after the QC data have been evaluated, and the qualifiers have been applied to the sample data. Invalid results, broken or spilled samples, and samples that are unable to be analyzed for other reasons are included in the assessment of completeness. The criteria and calculation to determine completeness are provided in Section 5. If data cannot be qualified to meet completeness goals, Tetra Tech will consult with the Project Manager to determine if additional sampling should be performed to accomplish data quality objectives.

D.3 RECONCILIATION WITH USER REQUIREMENTS

The Project Manager and the Project QA Officer will review and validate data against the Project's defined MQOs (Section A.7.2) prior to the final reporting phase. If there are any problems with quality sampling and analysis, these issues will be addressed immediately and methods will be modified to ensure that data quality objectives are being met. Modifications to monitoring that affect the quality of reported data will require notification to and updates to ADEC as well as subsequent edits to the approved QAPP.

As soon as possible following completion of the sample collection and analyses, the Tt QC Lead will assess the precision, accuracy, and completeness measures and compare them with the criteria discussed in Section A.4. This will be the final determination of whether the data collected are of the correct type, quantity, and quality to support their intended use for this project. Any problems encountered in meeting the performance criteria (or uncertainties and limitations in the use of the data) will be discussed with the project QA personnel and the Alaska Energy Authority PM, and will be reconciled if possible.

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APPENDIX A

APPENDIX A: LOCATION MAPS

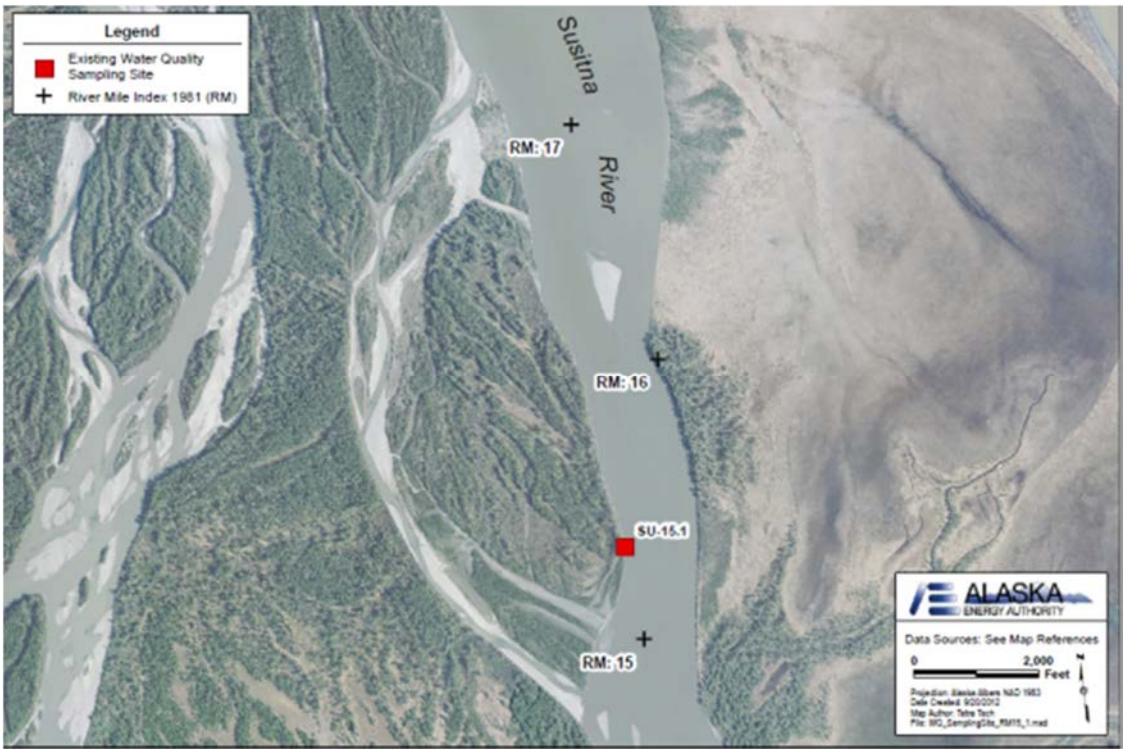

Figure A-1. Map of site Susitna above Alexander Creek at RM 15.1

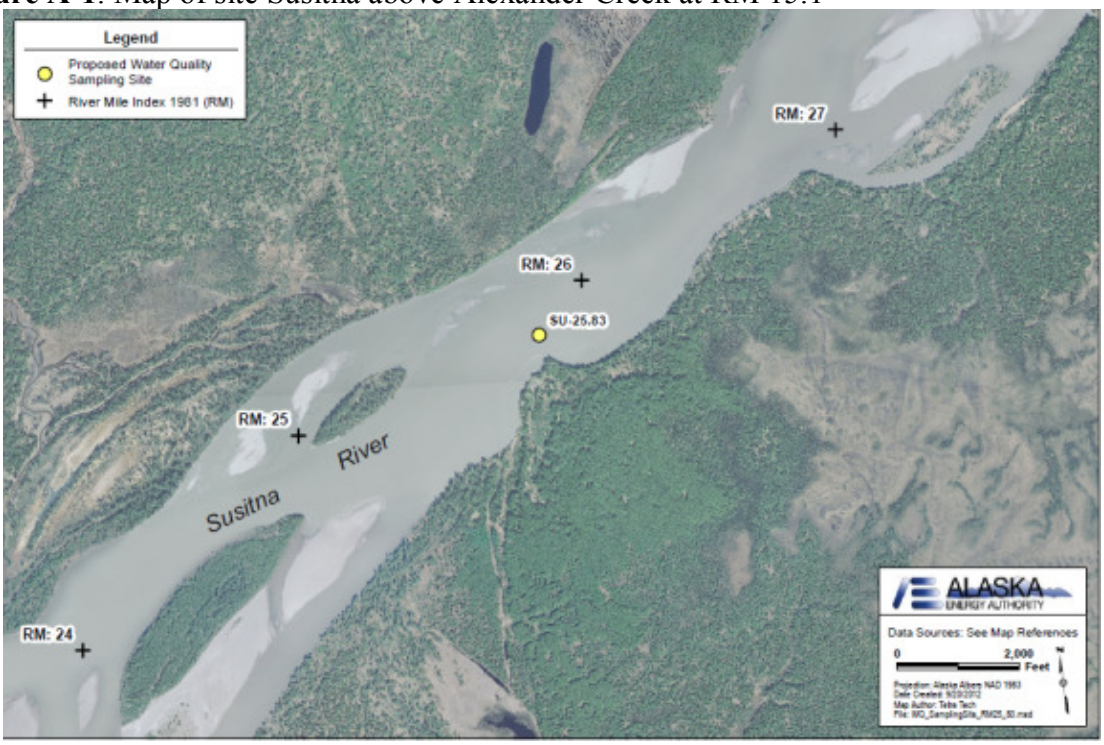

Figure A-2. Map of site Susitna Station at RM 25.8

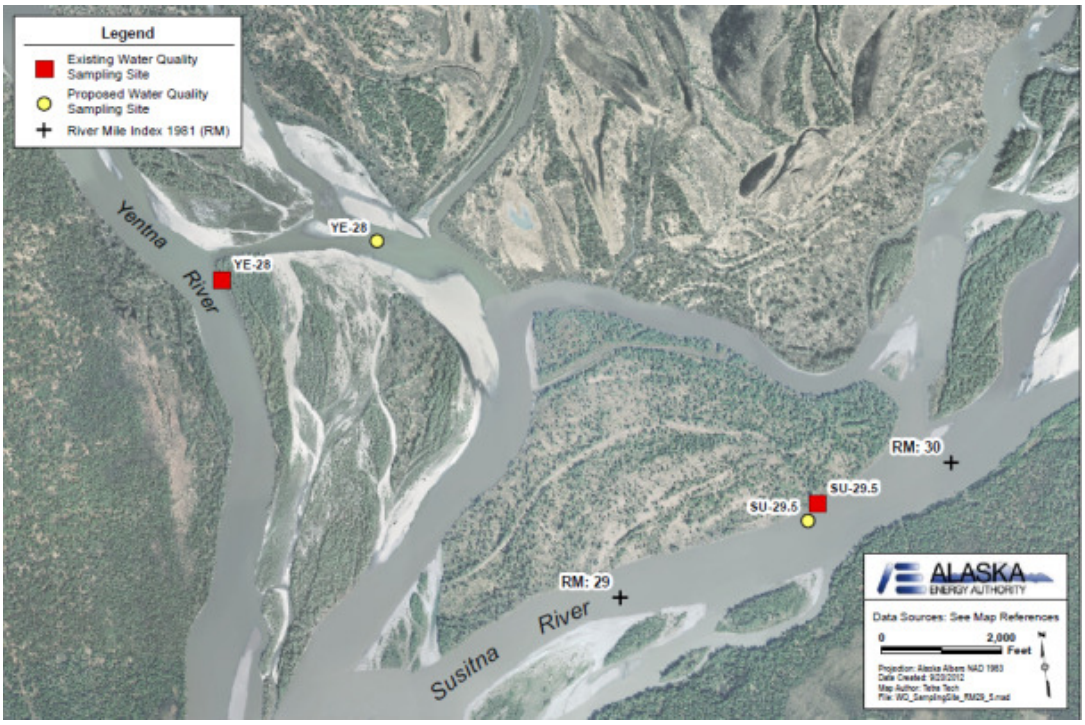

Figure A-3. Map of site Yentna River at RM 28

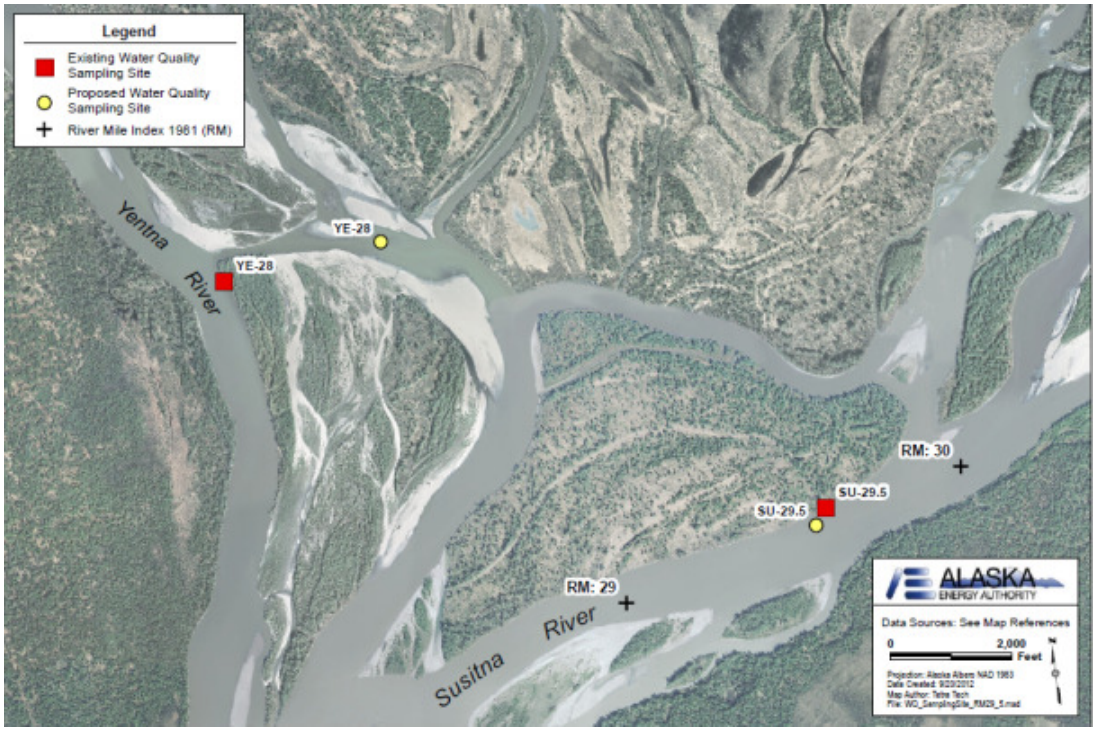

Figure A-4. Map of site Susitna above Yentna at RM 29.5

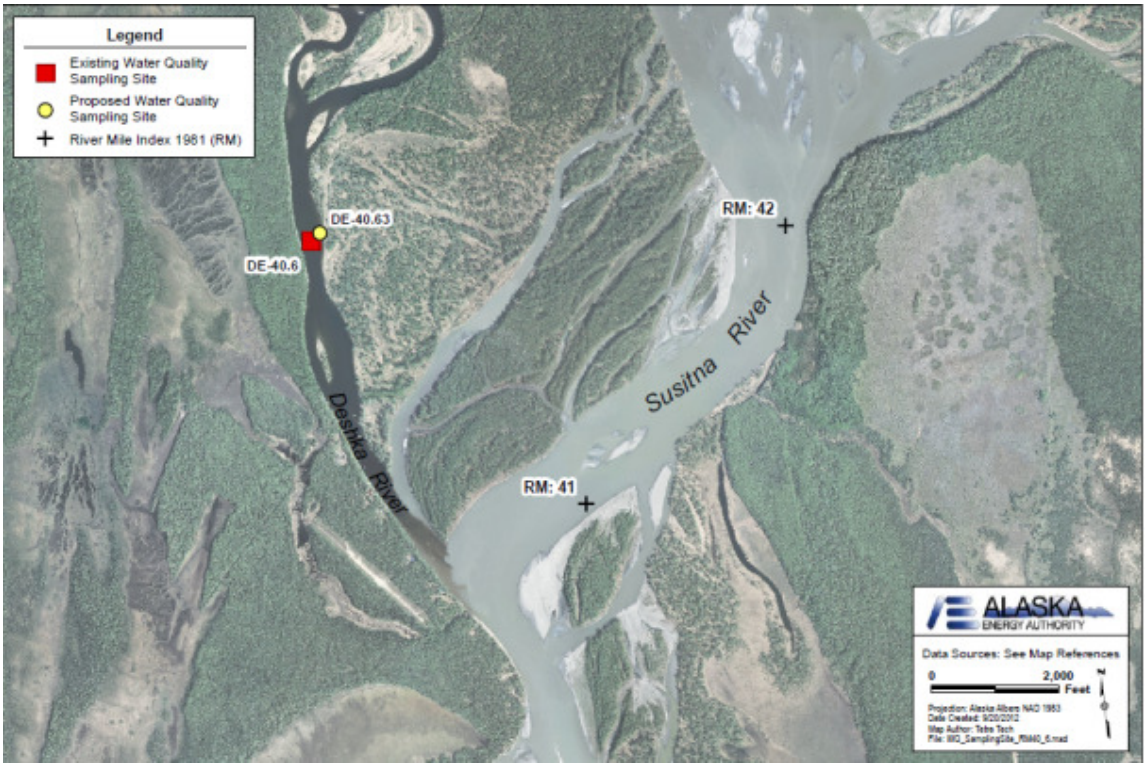

Figure A-5. Map of site Deshka River at RM 40.6

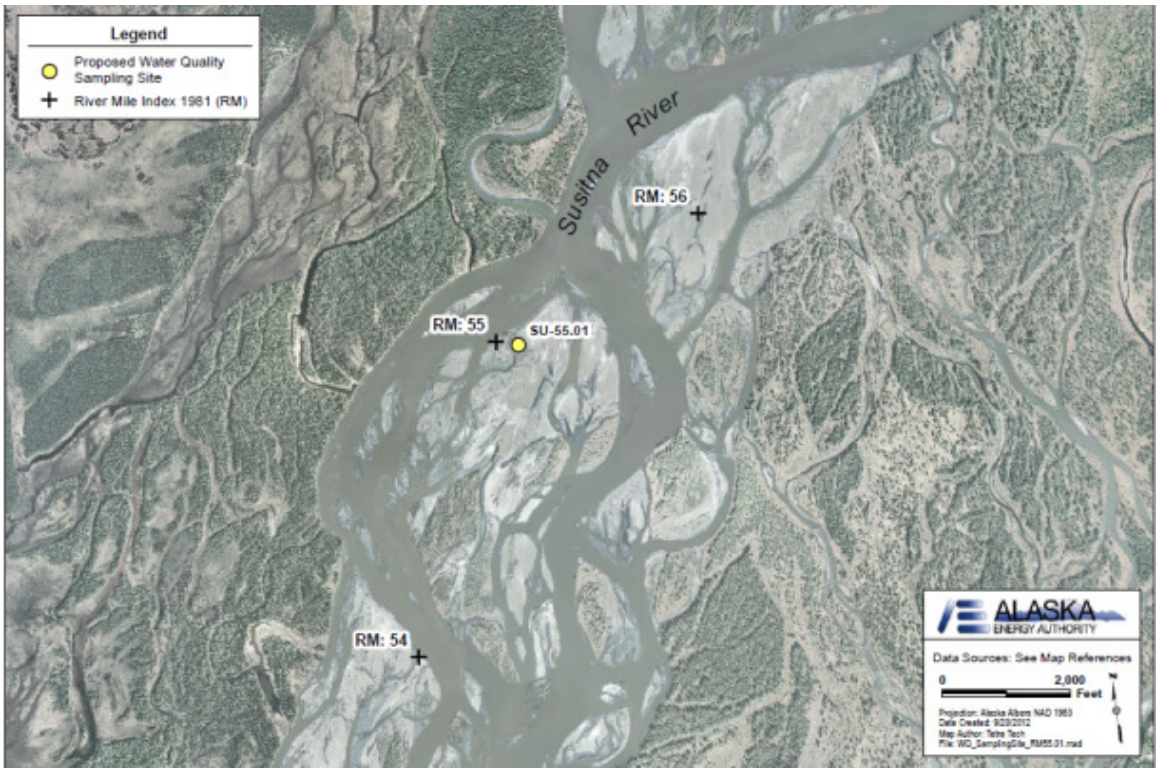

Figure A-6. Map of site Susitna at RM 55

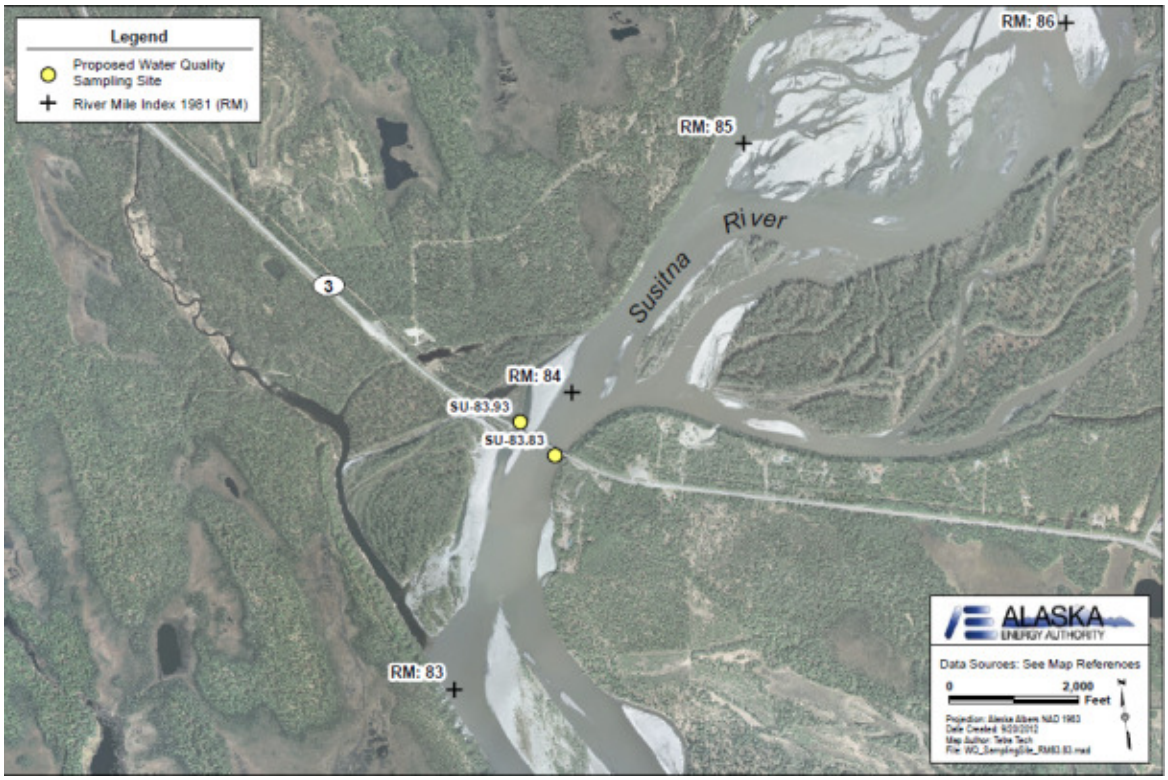

Figure A-7. Map of site Susitna at Parks Highway East at RM 83.3

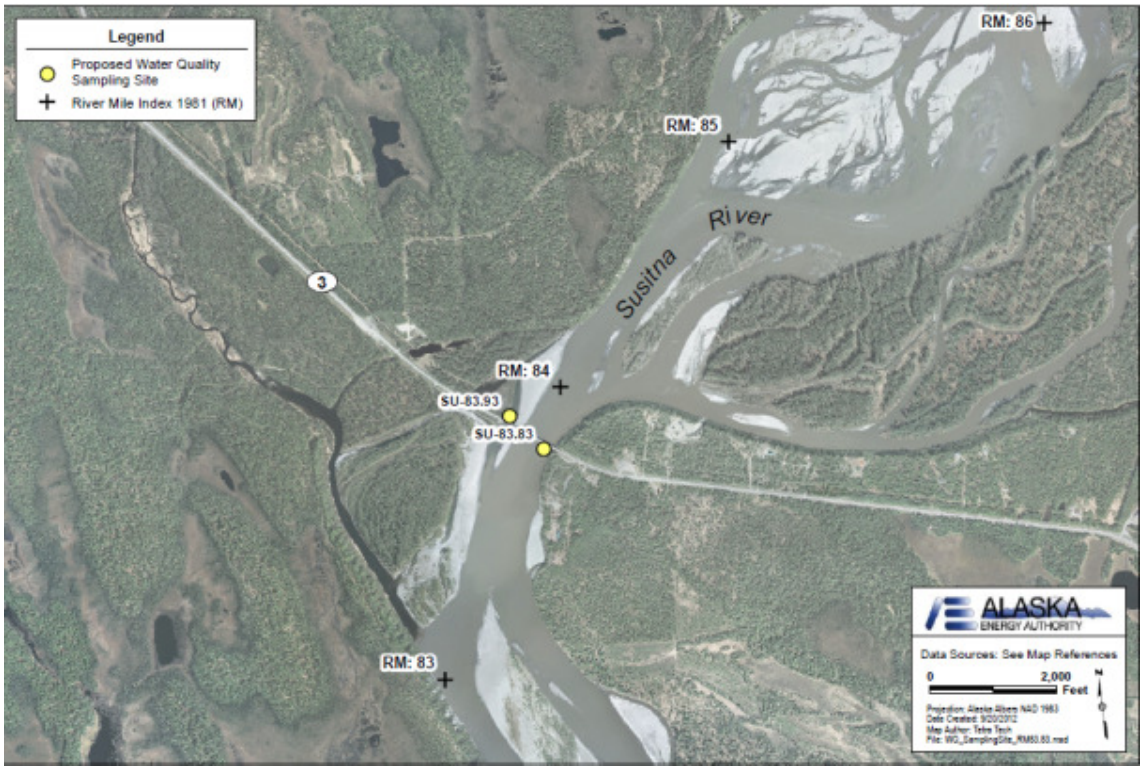

Figure A-8. Map of site Susitna at Parks highway West at RM 83.9

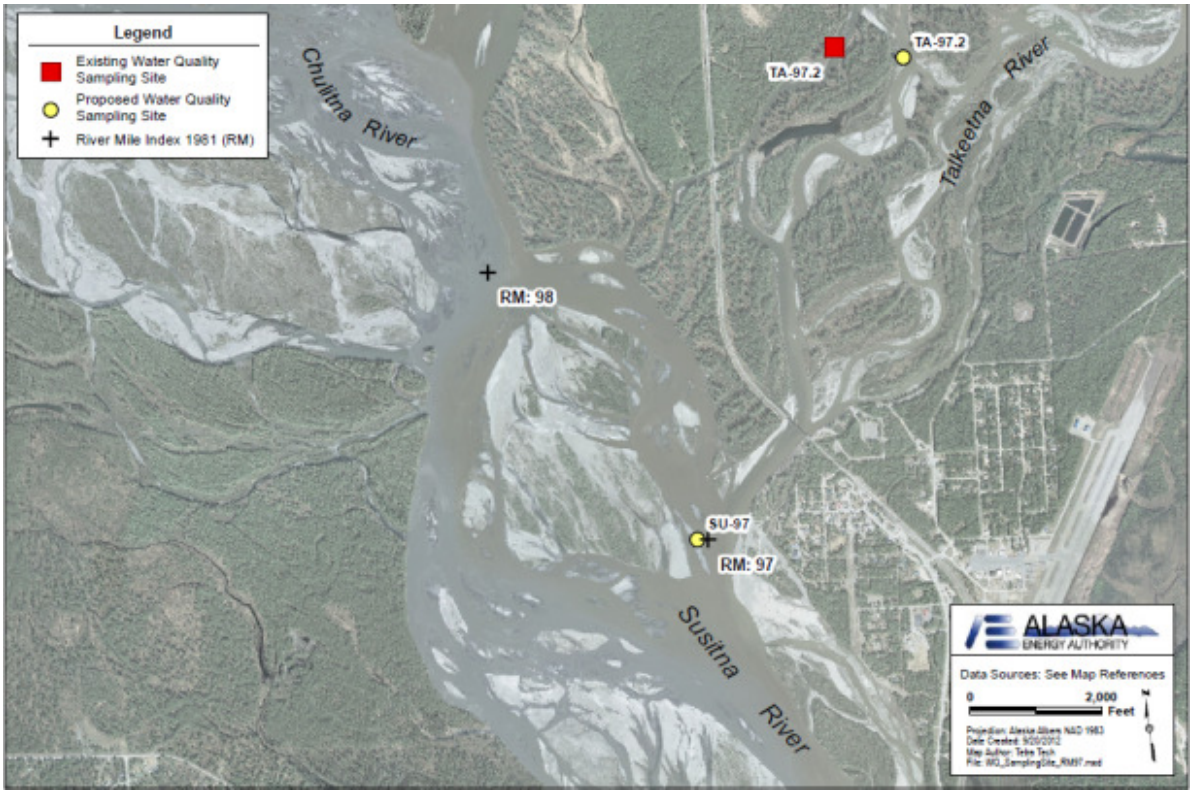

Figure A-9. Map of site Talkeetna at RM 97.2

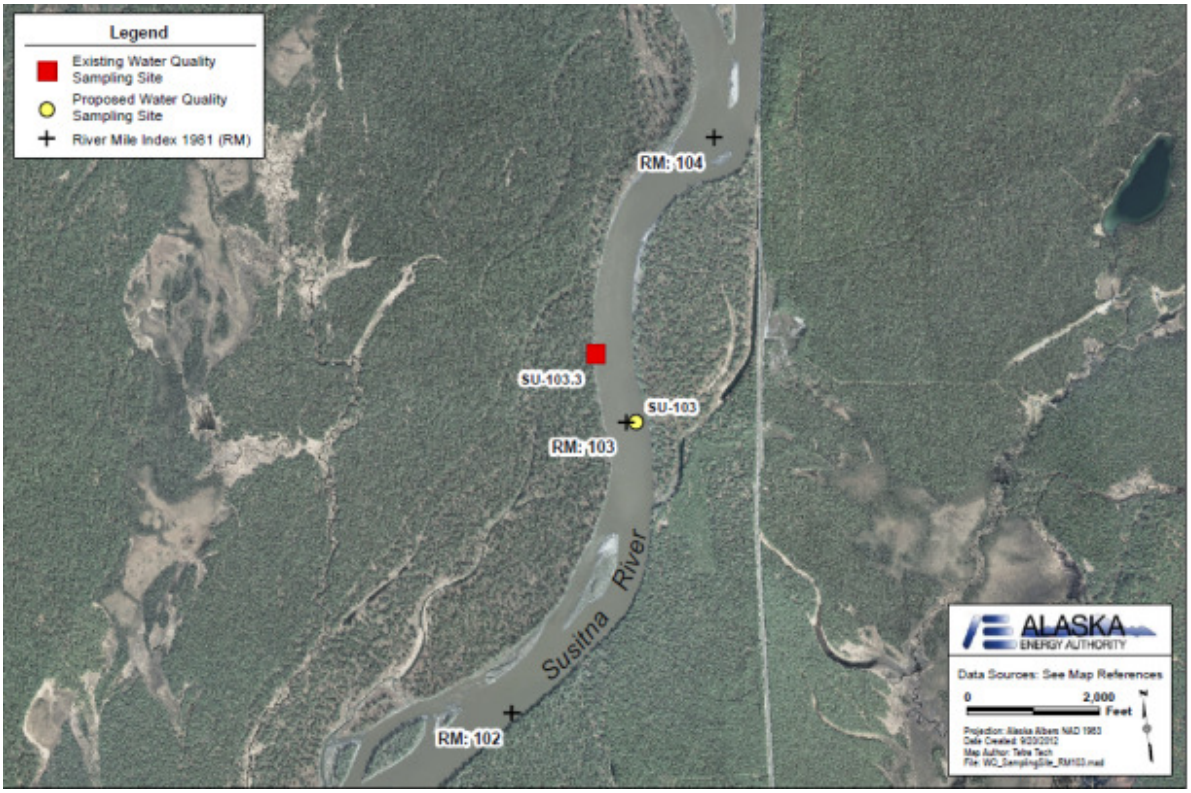

Figure A-10. Map of site Talkeetna at RM 103

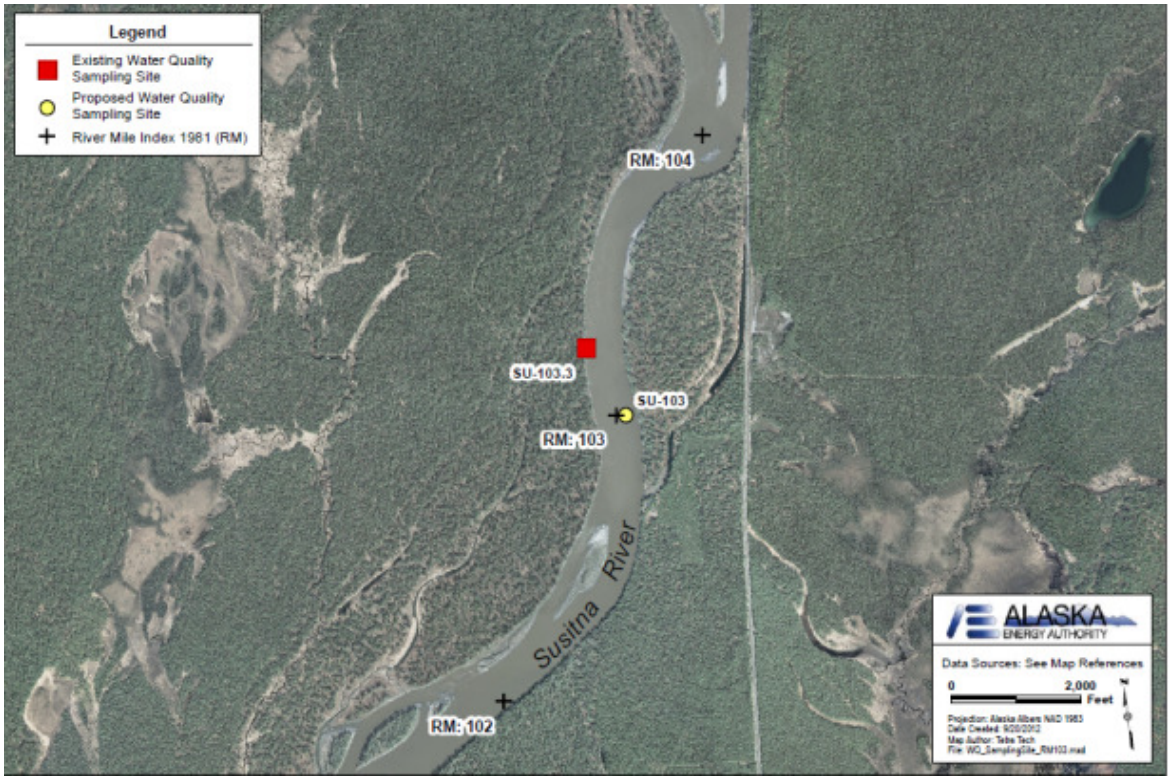

Figure A-11. Map of site Talkeetna at RM 103.3

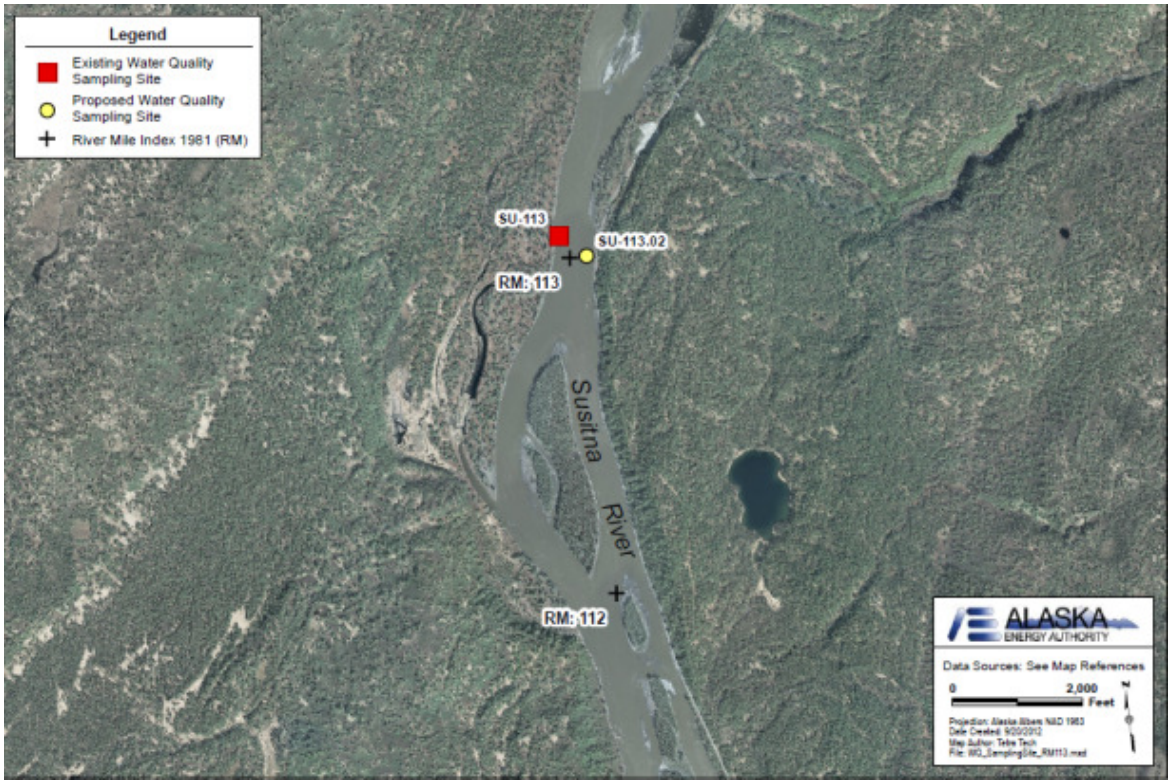

Figure A-12. Map of site LRX 18 at RM 113

Figure A-13. Map of site Curry Fishwheel Camp at RM 120.7

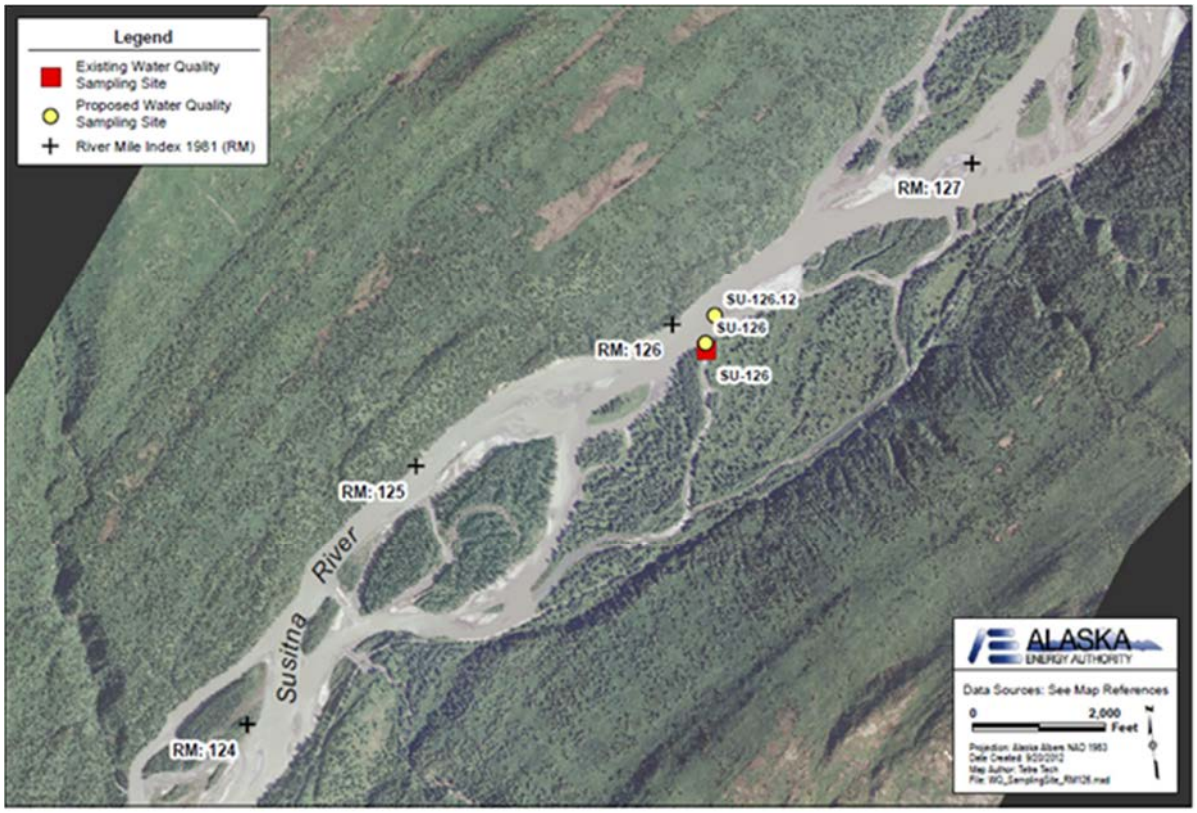

Figure A-14. Map of Site Slough 8A at RM 126

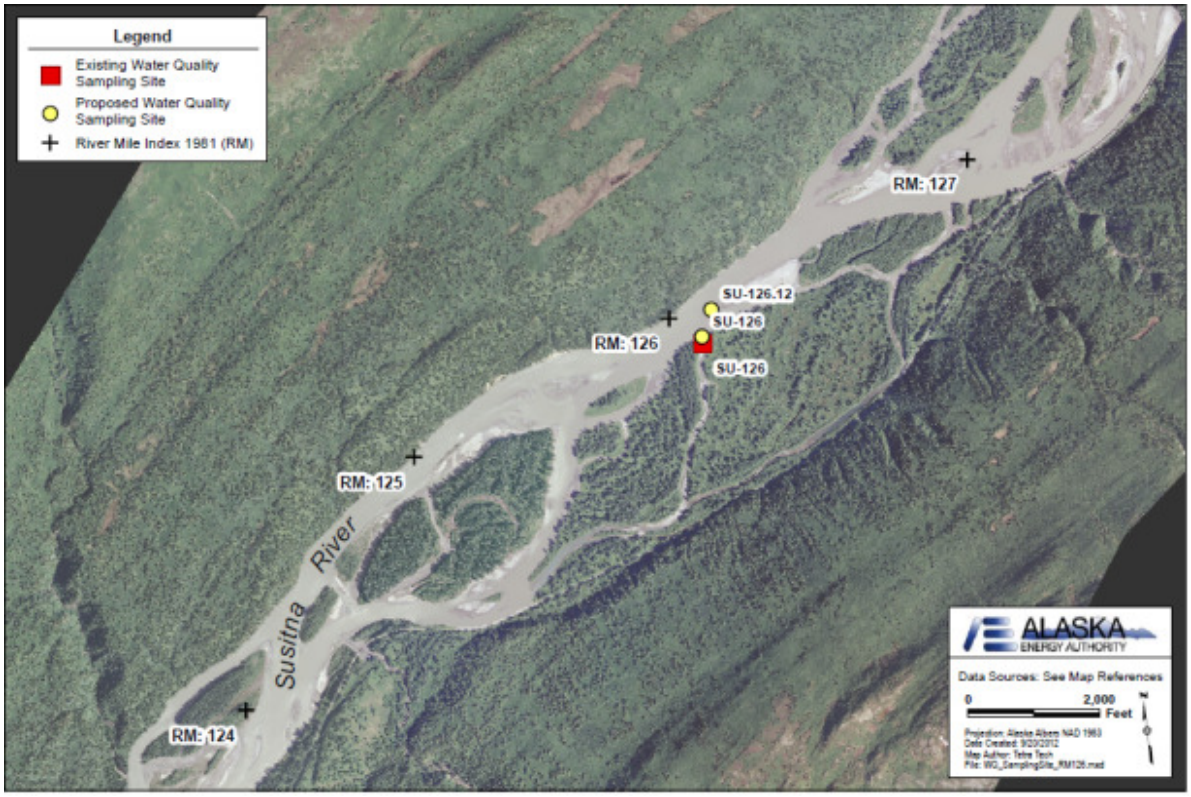

Figure A-15. Map of site LRX 29 at RM 126.1

Figure A-16. Map of site Slough 9 at RM 129.2

Figure A-17. Map of site LRX 35 at RM 130.8

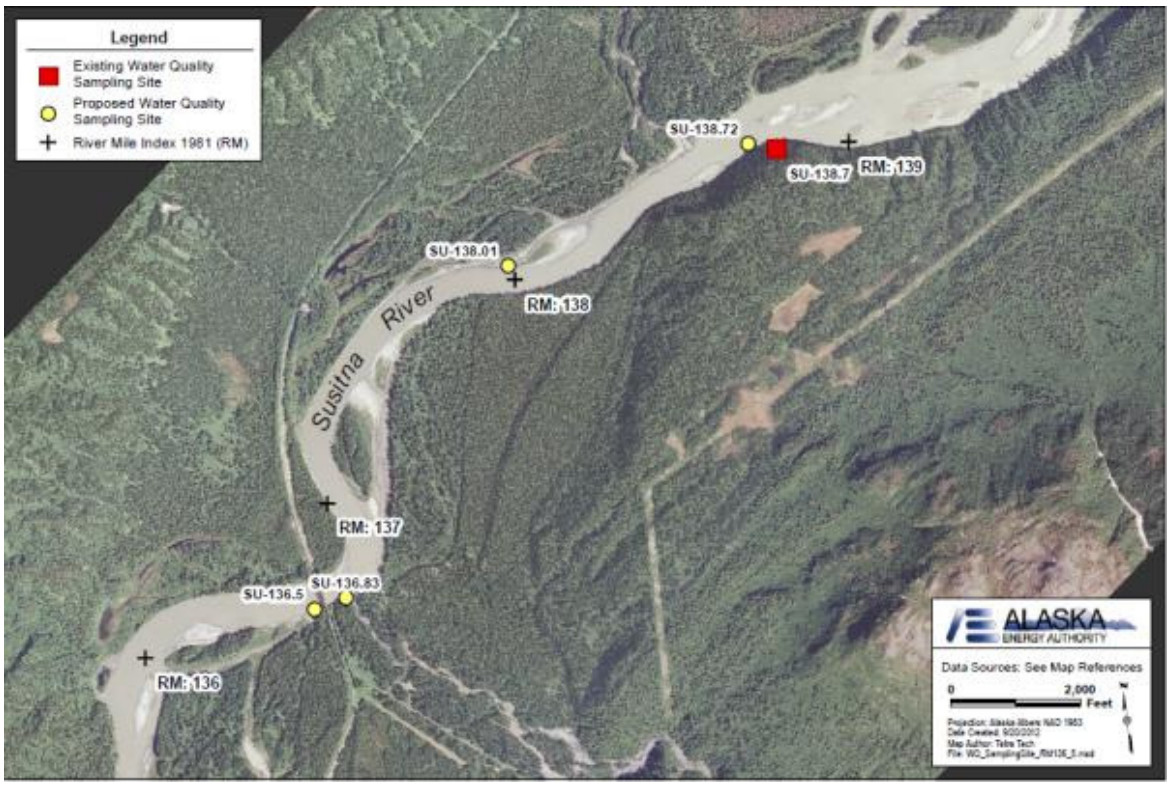

Figure A-18. Map of site Susitna near Gold Creek at RM 136.5

Figure A-19. Map of site Gold Creek at RM 136.8

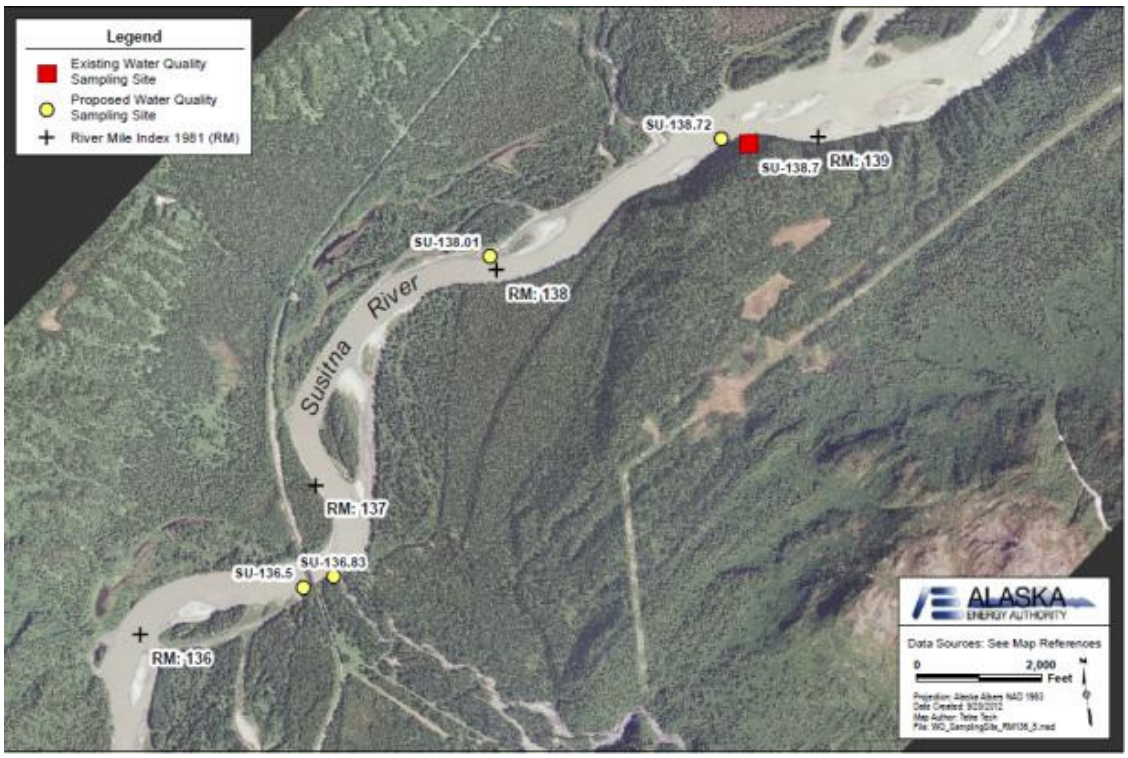

Figure A-20. Map of site Slough 16B at RM 138

Figure A-21. Map of site Indian River at RM 138.6

Figure A-22. Map of site Susitna above Indian River at RM 138.7

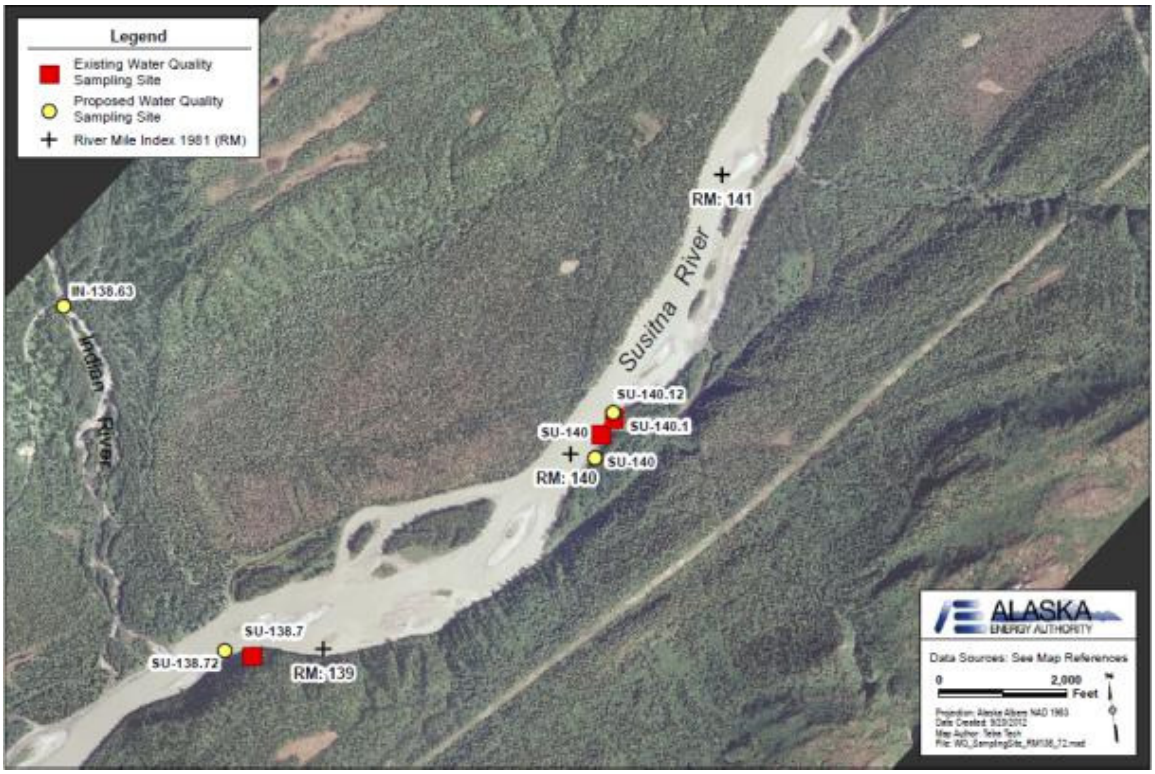

Figure A-23. Map of site Slough 19 at RM 140

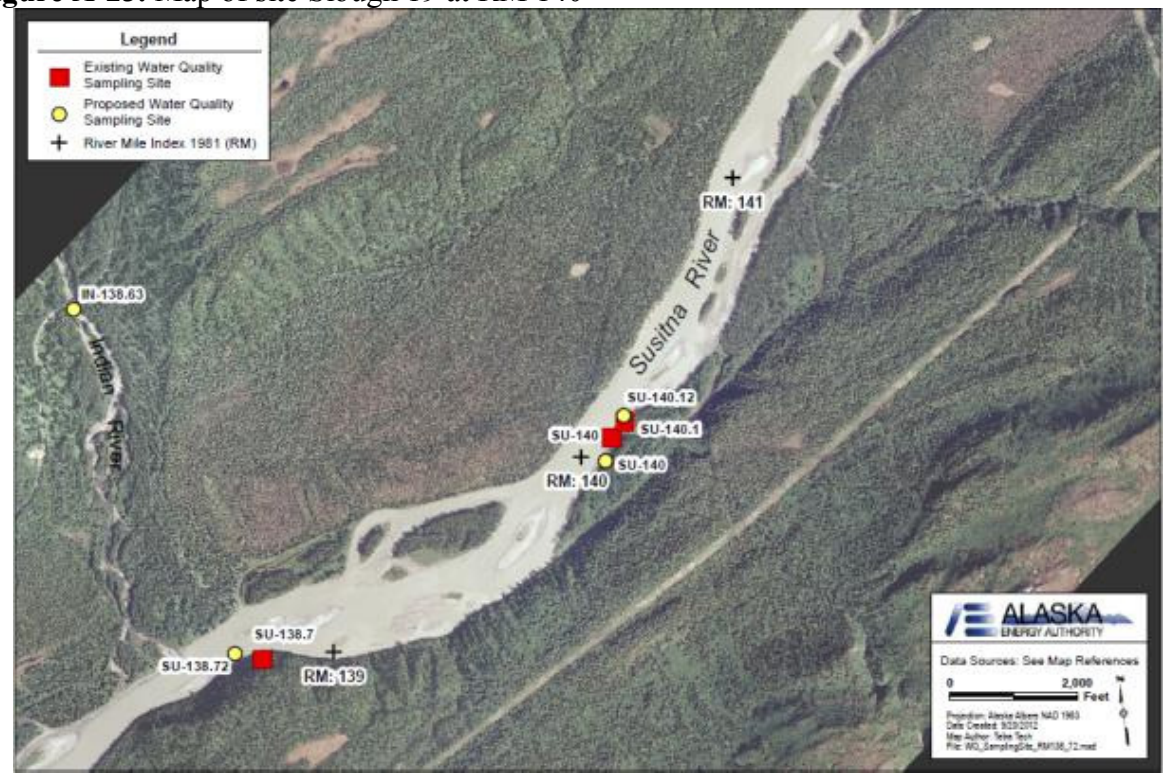

Figure A-24. Map of site LRX 53 at RM 140.1

Figure A-25. Map of site Slough 21 at RM 142

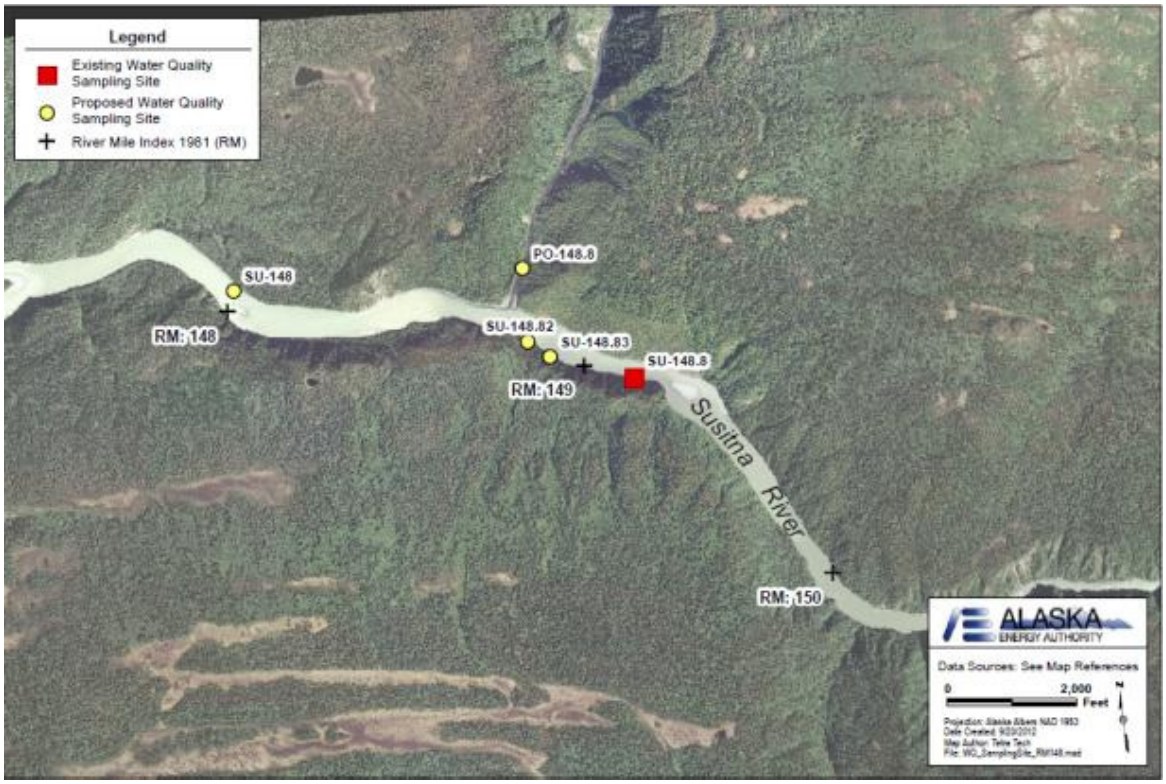

Figure A-26. Map of site Susitna below Portage Creek at RM 148

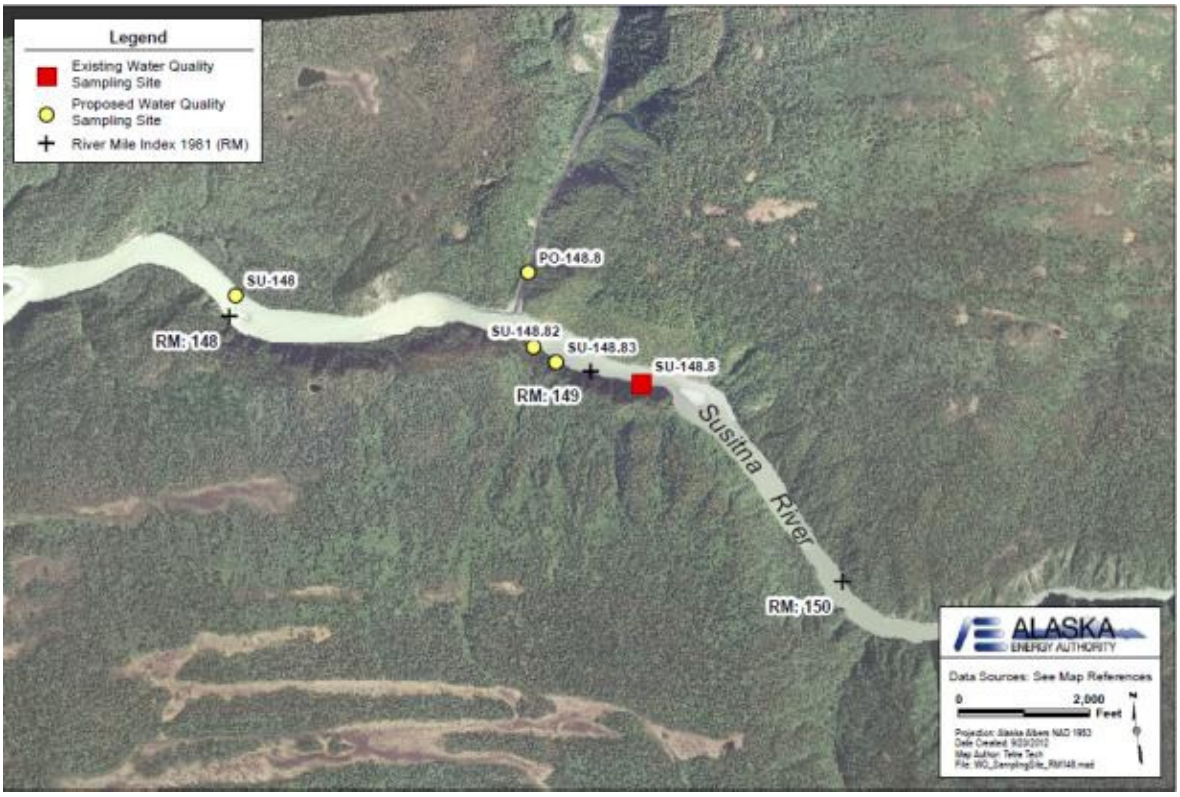

Figure A-27. Map of site Susitna above Portage Creek at RM 148.8

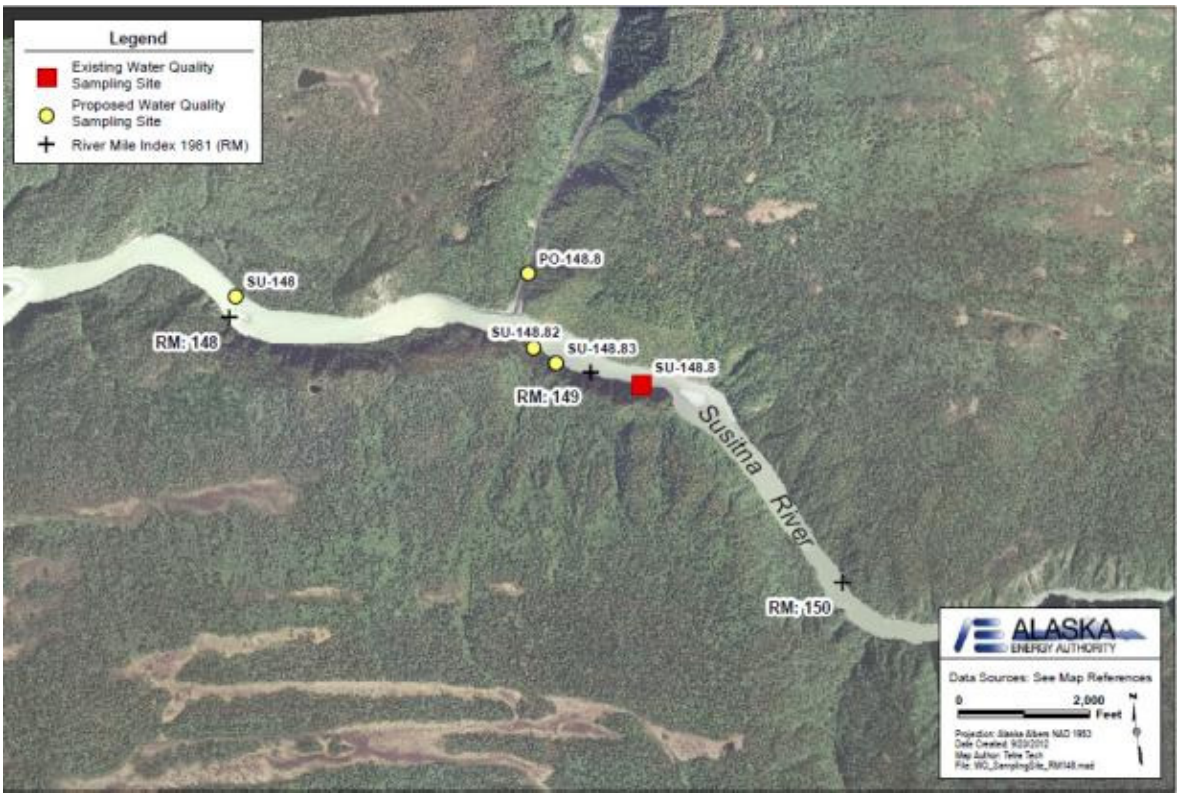

Figure A-28. Map of site Portage Creek at RM 148.8

Figure A-29. Map of site Susitna at RM 165

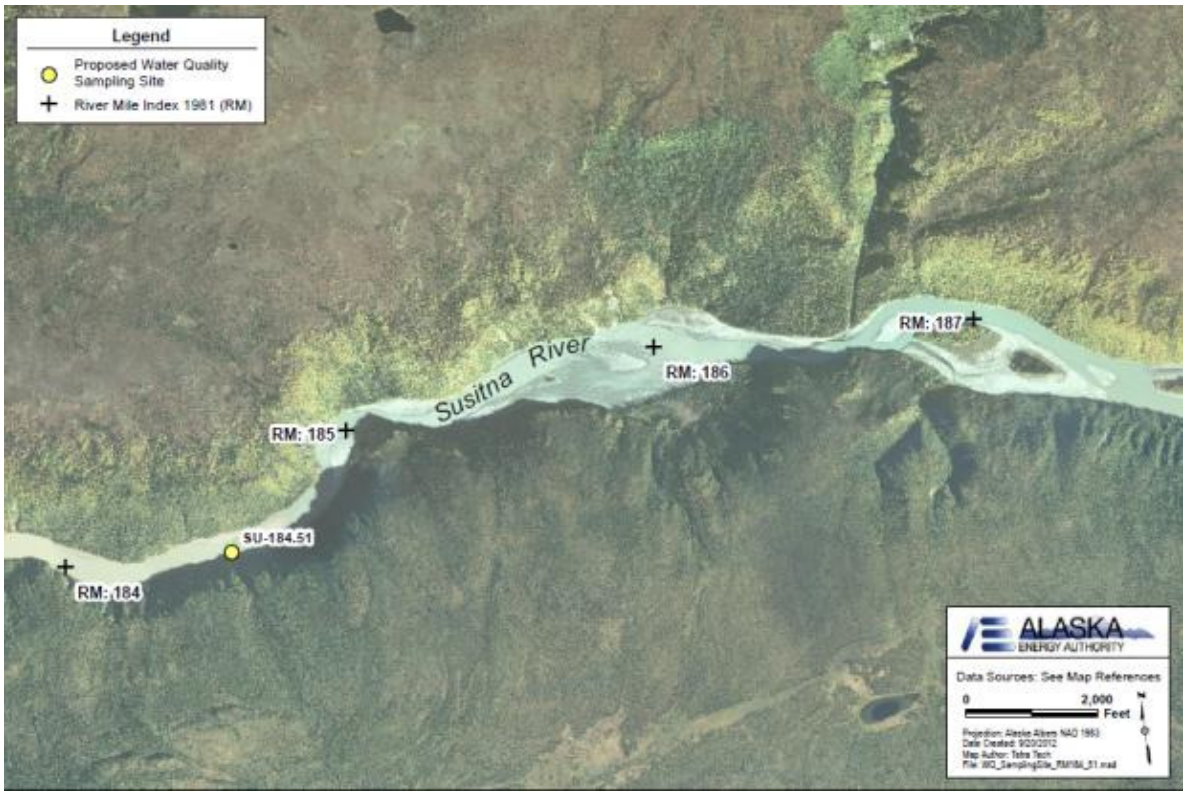

Figure A-30. Map of site Susitna at Watana Dam at RM 184.5

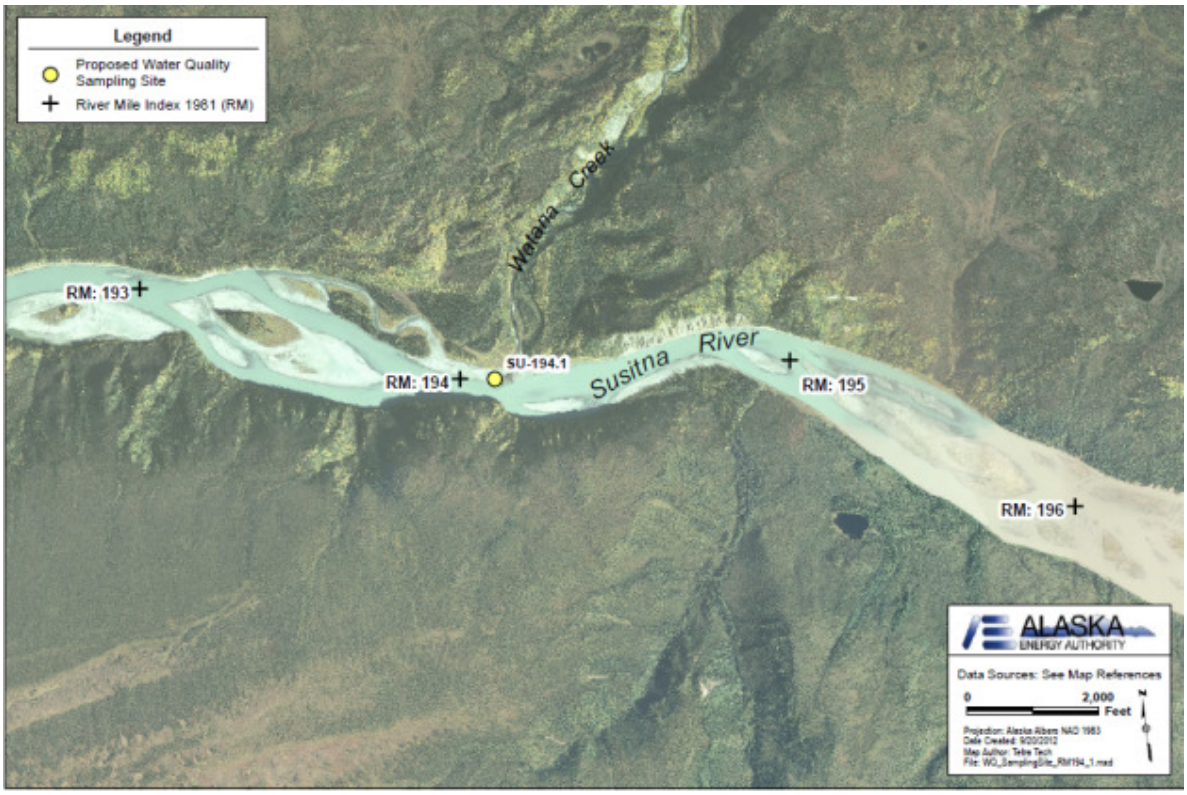

Figure A-31. Map of site Watana Creek at RM 194.1

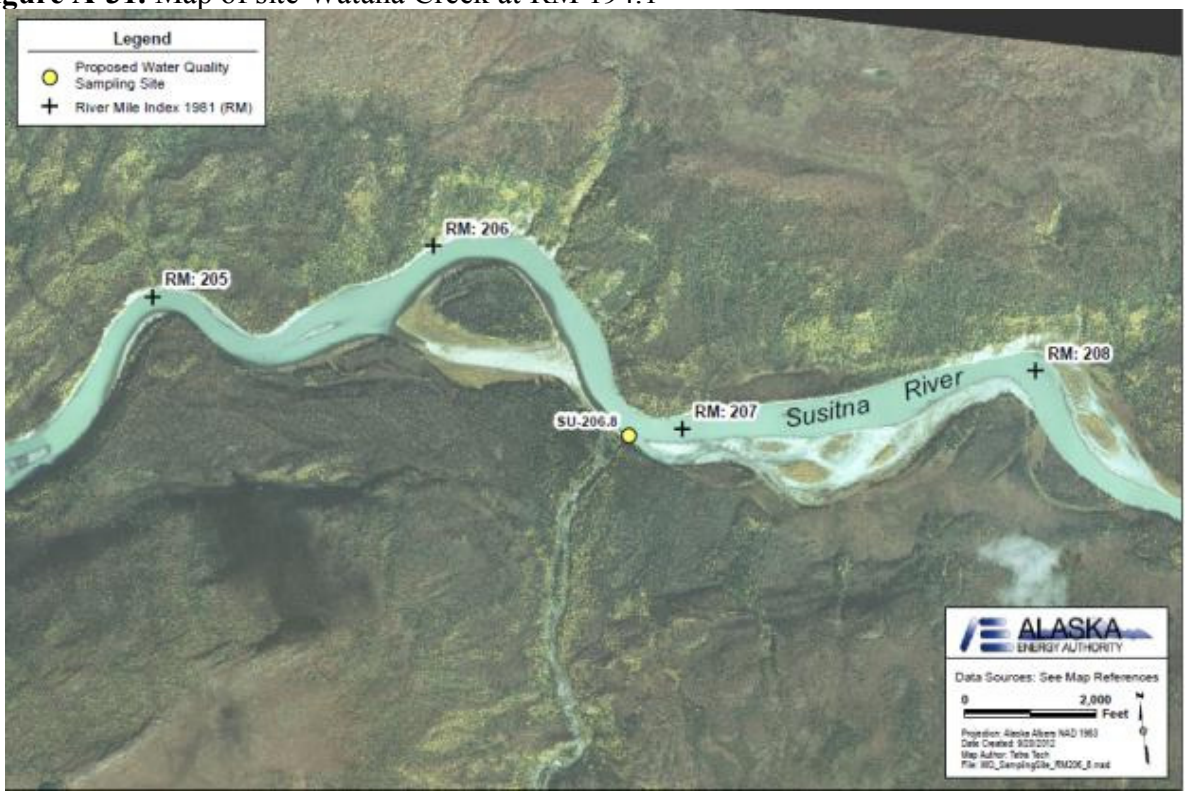

Figure A-32. Map of site Kosina Creek at RM 206.8

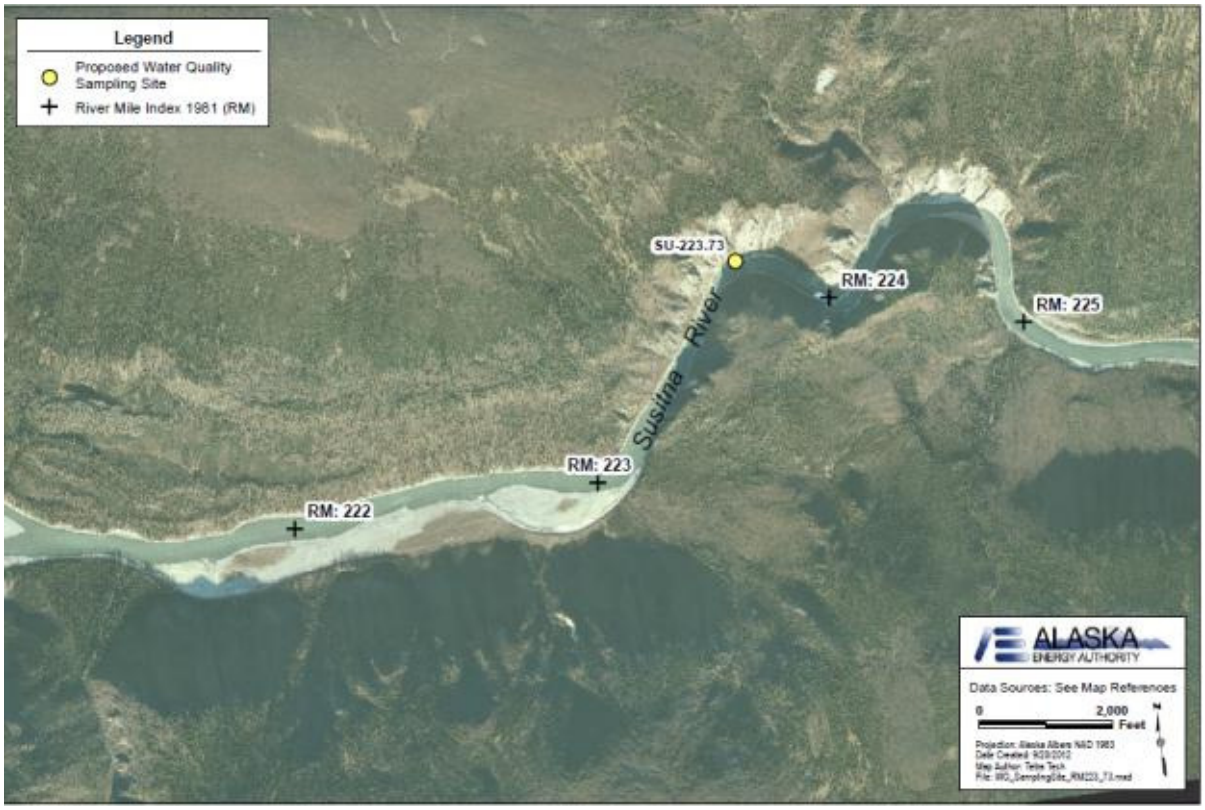

Figure A-33. Map of site Susitna near Cantwell at RM 223.7

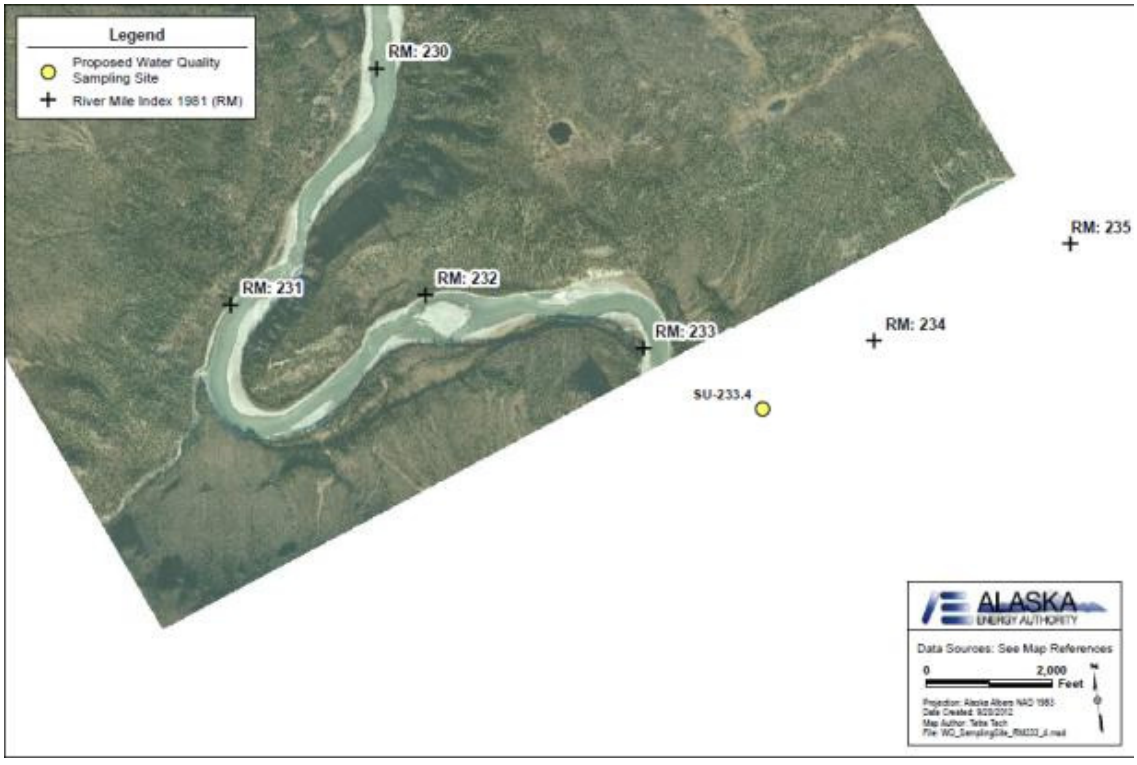

Figure A-34. Map of site Oshetna River at RM 233.4

APPENDIX B

APPENDIX B: FIELD FORMS

Susitna River Baseline Sediment Monitoring

Site Name_____ **Date**_____

Site ID _____ **Sample Time**_____

FIELD MESUREMENTS

Sample Pt #1 **GPS Coordinates** _____

Water Depth (m) _____ **Turbidity** _____

Temperature (°C) _____

Dissolved Oxygen (mg/L) _____

pH (units) _____

Conductivity (µS/cm) _____

Redox Potential (mV) _____

Sample Pt #2 **GPS Coordinates** _____

Water Depth (m) _____ **Turbidity** _____

Temperature (°C) _____

Dissolved Oxygen (mg/L) _____

pH (units) _____

Conductivity (µS/cm) _____

Redox Potential (mV) _____

Sample Pt #3 **GPS Coordinates** _____

Water Depth (m) _____ **Turbidity** _____

Temperature (°C) _____

Dissolved Oxygen (mg/L) _____

pH (units) _____

Conductivity (µS/cm) _____

Redox Potential (mV) _____

GRAB SAMPLES

Sample Pt #1	**Sample Pt #2**	**Sample Pt #3**
SAMPLE ID _____	**SAMPLE ID** _____	**SAMPLE ID** _____
SAMPLE TIME _____	**SAMPLE TIME** _____	**SAMPLE TIME** _____

GRAB SAMPLE PARAMETERS

General WQ: TOC, Sediment Grain Size
Metals (Total): Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Mercury, Zinc

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Baseline WQ Monitoring

Circle Event Type Below

Site Name_____ **Date**_____ **Monthly**

Site ID _____ **Sample Time**_____ **Monthly + Single Event**

FIELD MESUREMENTS

Sample Pt #1 – 25% from LB **GPS Coordinates** _____

Water Depth (m) _____ **Turbidity (NTUs)** _____ **Color** _____

Residues (single event) _____

Depth (m) [every 0.5 m until 0.5 m off bottom]	**Temp (°C)**	**DO (mg/L)**	**pH (units)**	**Conductivity (µS/cm)**	**Redox Potential (mV)**
0					
0.5					

Sample Pt #2 – 50% from LB **GPS Coordinates** _____

Water Depth (m) _____ **Turbidity (NTUs)** _____ **Color** _____

Residues (single event) _____

Depth (m) [every 0.5 m until 0.5 m off bottom]	**Temp (°C)**	**DO (mg/L)**	**pH (units)**	**Conductivity (µS/cm)**	**Redox Potential (mV)**
0					
0.5					

Sample Pt #3 – 75% from LB **GPS Coordinates** _____

Water Depth (m) _____ **Turbidity (NTUs)** _____ **Color** _____

Residues (single event) _____

Depth (m) [every 0.5 m until 0.5 m off bottom]	**Temp (°C)**	**DO (mg/L)**	**pH (units)**	**Conductivity (µS/cm)**	**Redox Potential (mV)**
0					
0.5					

Susitna River Baseline WQ Monitoring

GRAB SAMPLES

Sample Pt #1 – 25% from LB	**Sample Pt #2 – 50% from LB**	**Sample Pt #3 – 75% from LB**
SAMPLE ID _____	**SAMPLE ID** _____	**SAMPLE ID** _____
SAMPLE TIME _____	**SAMPLE TIME** _____	**SAMPLE TIME** _____

MONTHLY EVENT PARAMETERS

General WQ: Hardness, Alkalkinity, Nitrate+Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC

Metals (Total & Dissolved): Arsenic, Barium, Beryllium, Cadmium, Cobalt, Copper, Iron, Lead, Manganese, Magnesium, Mercury, Molybdenum, Nickel, Thallium, Vanadium, Zinc

MONTHLY EVENT + SINGLE EVENT PARAMETERS (additional parameters in bold)

General WQ: Hardness, Alkalkinity, Nitrate+Nitrite, Ammonia as N, TKN, TP, Ortho-P, Chl *a*, TDS, TSS, Turbidity, DOC, **TOC, Fecal Coliform, PAHs, Radioactivity**

Metals (Total & Dissolved): Aluminum, Arsenic, Barium, Beryllium, Cadmium, **Chromium (III & IV)**, Cobalt, Copper, Iron, Lead, Manganese, Magnesium, Mercury, Molybdenum, Nickel, **Selenium,** Thallium, Vanadium, Zinc

WEATHER AND SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #1 – Below Dam

Site Name_____ **Date**_____ **Sample Time**_____

Collect samples within Focus Area starting at the furthest downstream transect working upstream

TRANSECT #1 (Furthest Downstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #1 – Below Dam

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #1 – Below Dam

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (main channel & 2 side channels)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 South Side Channel	Sample Pt #5 North Side Channel
GPS:							
Water Depth: (m) (Surf, Mid, Bottom)							
Temperature: (°C) (Surf, Mid, Bottom)							
DO: (mg/L) (Surf, Mid, Bottom)							
pH: (units) (Surf, Mid, Bottom)							
Conductivity: (µS/cm) (Surf, Mid, Bottom)							

TRANSECT #3 – GRAB SAMPLES

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank

SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank

SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – South Side Channel

SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #5 – North Side Channel
SAMPLE ID _____

SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #1 – Below Dam

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #4 (main channel & 2 side channels)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 South Side Channel	Sample Pt #5 North Side Channel
GPS:							
Water Depth: (m) (Surf, Mid, Bottom)							
Temperature: (°C) (Surf, Mid, Bottom)							
DO: (mg/L) (Surf, Mid, Bottom)							
pH: (units) (Surf, Mid, Bottom)							
Conductivity: (µS/cm) (Surf, Mid, Bottom)							

TRANSECT #4 – GRAB SAMPLES

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank

SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank

SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – South Side Channel

SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #5 – North Side Channel
SAMPLE ID _____

SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #1 – Below Dam

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #5 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #2 – MR2 Wide

Site Name_____ **Date**_____ **Sample Time**_____

Collect samples within Focus Area starting at the furthest downstream transect working upstream

TRANSECT #1 (Furthest Downstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #2 – MR2 Wide

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 North Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – North Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #2 – MR2 Wide

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 North Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #3 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – North Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #2 – MR2 Wide

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #4 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #4 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #3 – MR2 Narrow

Site Name_____ **Date**_____ **Sample Time**_____

Collect samples within Focus Area starting at the furthest downstream transect working upstream

TRANSECT #1 (Furthest Downstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #3 – MR2 Narrow

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 North Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – North Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #3 – MR2 Narrow

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 North Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #3 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – North Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #3 – MR2 Narrow

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #4 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #4 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #4 – Portage Creek

Site Name_____ **Date**_____ **Sample Time**_____

Collect samples within Focus Area starting at the furthest downstream transect working upstream

TRANSECT #1 (Furthest Downstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #4 – Portage Creek

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #4 – Portage Creek

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (Furthest Upstream, main channel & Portage Creek)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 Portage Creek
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #3 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – Portage Creek
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #5 – Slough 21

Site Name_____ **Date**_____ **Sample Time**_____

Collect samples within Focus Area starting at the furthest downstream transect working upstream

TRANSECT #1 (Furthest Downstream, main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 SE Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – SE Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #5 – Slough 21

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 SE Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – SE Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #5 – Slough 21

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 SE Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #3 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – SE Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #5 – Slough 21

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #4 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #4 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #6 – Indian River

Site Name_____ **Date**_____ **Sample Time**_____

Collect samples within Focus Area starting at the furthest downstream transect working upstream

TRANSECT #1 (Furthest Downstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #6 – Indian River

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 NW Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – NW Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #6 – Indian River

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 NW Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #3 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – NW Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #6 – Indian River

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #4 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #4 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #7 – Slough 11

Site Name_____ **Date**_____ **Sample Time**_____

Collect samples within Focus Area starting at the furthest downstream transect working upstream

TRANSECT #1 (Furthest Downstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #7 – Slough 11

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 East Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – East Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #7 – Slough 11

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 NE Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #3 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – NE Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #7 – Slough 11

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #4 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #4 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #8 – Slough 8

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #1 (Furthest Downstream, main channel & 3 side channels)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 Small East Side Channel	Sample Pt #5 SE Side Channel -- RB	Sample Pt #6 SE Side Channel -- LB
GPS:								
Water Depth: (m) (Surf, Mid, Bottom)								
Temperature: (°C) (Surf, Mid, Bottom)								
DO: (mg/L) (Surf, Mid, Bottom)								
pH: (units) (Surf, Mid, Bottom)								
Conductivity: (µS/cm) (Surf, Mid, Bottom)								

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – Small East Side Channel
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #5 – SE Side Channel – RB
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #5 – SE Side Channel -- LB
SAMPLE ID _____
SAMPLE TIME _____

GAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #8 – Slough 8

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel & 2 side channels)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 Small East Side Channel	Sample Pt #5 SE Side Channel
GPS:							
Water Depth: (m) (Surf, Mid, Bottom)							
Temperature: (°C) (Surf, Mid, Bottom)							
DO: (mg/L) (Surf, Mid, Bottom)							
pH: (units) (Surf, Mid, Bottom)							
Conductivity: (µS/cm) (Surf, Mid, Bottom)							

TRANSECT #2 – GRAB SAMPLES

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank

SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank

SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – Small East Side Channel

SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #5 – SE Side Channel

SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #8 – Slough 8

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____

SAMPLE TIME _____ **SAMPLE TIME _____** **SAMPLE TIME _____**

Sample Pt #1 – 25% from LB
DEPTH: _____ (0.5 m off bottom)
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ (0.5 m off bottom)
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ (0.5 m off bottom)
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #9 – Slough 6A

Site Name_____ **Date**_____ **Sample Time**_____

Collect samples within Focus Area starting at the furthest downstream transect working upstream

TRANSECT #1 (Furthest Downstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #9 – Slough 6A

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 West Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – Westt Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #9 – Slough 6A

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 West Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #3 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – West Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #9 – Slough 6A

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #4 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #4 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #10 – Whiskers Slough

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #1 (Furthest Downstream, main channel & 2 side channels)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 West Side Channel	Sample Pt #5 East Side Channel
GPS:							
Water Depth: (m) (Surf, Mid, Bottom)							
Temperature: (°C) (Surf, Mid, Bottom)							
DO: (mg/L) (Surf, Mid, Bottom)							
pH: (units) (Surf, Mid, Bottom)							
Conductivity: (µS/cm) (Surf, Mid, Bottom)							

TRANSECT #1 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank

SAMPLE ID _____

GW Sample #2 – Right Bank

SAMPLE ID _____

Sample Pt #4 – West Side Channel

SAMPLE ID _____

SAMPLE TIME _____ **SAMPLE TIME _____** **SAMPLE TIME _____**

Sample Pt #5 – East Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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Susitna River Monitoring Focus Area #10 – Whiskers Slough

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #2 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 West Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #2 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – West Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #10 – Whiskers Slough

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #3 (main channel & side channel)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB	Sample Pt #4 West Side Channel
GPS:						
Water Depth: (m) (Surf, Mid, Bottom)						
Temperature: (°C) (Surf, Mid, Bottom)						
DO: (mg/L) (Surf, Mid, Bottom)						
pH: (units) (Surf, Mid, Bottom)						
Conductivity: (µS/cm) (Surf, Mid, Bottom)						

TRANSECT #3 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #4 – West Side Channel
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS

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PHOTOGRAPHS

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Susitna River Monitoring Focus Area #10 – Whiskers Slough

Site Name_____ **Date**_____ **Sample Time**_____

TRANSECT #4 (Furthest Upstream, main channel only)

Parameters	Sample Pt #1 25% LB	Sample Pt #2 50% LB	Sample Pt #3 75% LB	GW Sample #1 LB	GW Sample #2 RB
GPS:					
Water Depth: (m) (Surf, Mid, Bottom)					
Temperature: (°C) (Surf, Mid, Bottom)					
DO: (mg/L) (Surf, Mid, Bottom)					
pH: (units) (Surf, Mid, Bottom)					
Conductivity: (µS/cm) (Surf, Mid, Bottom)					

TRANSECT #4 – GRAB SAMPLES

If water depth at sample point is > than 5 ft (1.5 m) then collect a grab sample at 0.5 m below surface and 0.5 m above bottom. If water depth is < than 5ft (1.5 m) just collect a grab sample at 0.5 m below surface.

Sample Pt #1 – 25% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: 0.5 m
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #1 – 25% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #2 – 50% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

Sample Pt #3 – 75% from LB
DEPTH: _____ **(0.5 m off bottom)**
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #1 – Left Bank
SAMPLE ID _____
SAMPLE TIME _____

GW Sample #2 – Right Bank
SAMPLE ID _____
SAMPLE TIME _____

GRAB SAMPLE PARAMETERS

General WQ: Turbidity, Hardness, Nitrate+Nitrite, TN, TP, Ortho-P

Metals: Mercury (Total), Methyl-mercury (Dissolved), Aluminum (total & dissolved), Iron (total & dissolved)

WEATHER & SITE OBSERVATIONS, PHOTOGRAPHS

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