[DRAFT]

Kenai River Water Quality Monitoring Quality Assurance Project Plan (QAPP)

**Multi-Agency Baseline**

***V. 2. Updated April 2019***

***V. 3. Updated April 2020***

***V.4. Updated July 2022***



***Original Version Prepared by:* Kenai Watershed Forum 44129 Sterling Highway**

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*Prepared for:*

**STATE OF ALASKA**

**DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

**Division of Water**

**Water Quality Standards and Restoration**

***Note: the most current version of this draft may be downloaded at*** [***https://bit.ly/draft\_qapp\_2022***](https://bit.ly/draft_qapp_2022)

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## Al. Title and Approval Page

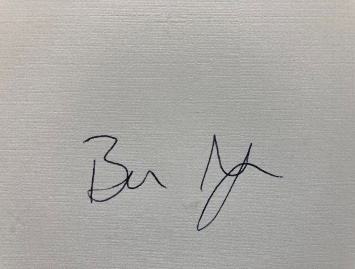
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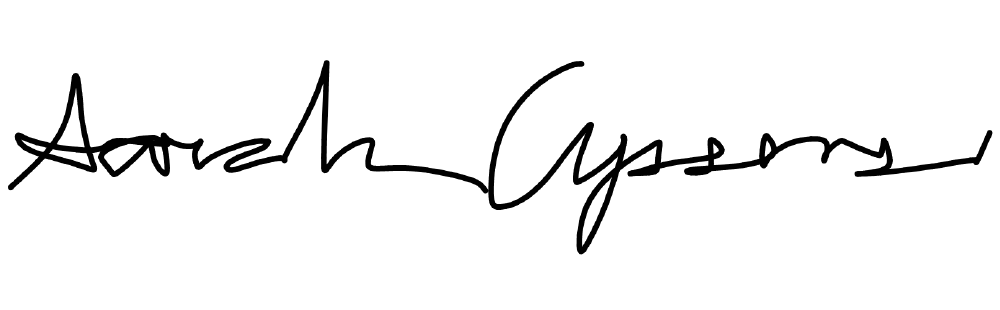
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## A2. Acknowledgements

This document was originally developed by the Kenai Watershed Forum and was modeled and adapted, with permission, from Quality Assurance Project Plans (QAPP) produced by the Cook Inlet Keeper of Homer, Alaska. Portions of the Cook Inlet Keeper QAPP were adapted from similar plans developed by The Friends of Casco Bay (Maine) and Texas Watch. The United States Environmental Protection Agency (EPA), the Alaska Department of Environmental Conservation (ADEC), the United States Geological Survey (USGS), and the National Marine Fisheries Service / Auke Bay Laboratory (NMFS / ABL) also provided guidance and cooperation in helping both the Cook Inlet Keeper and the Kenai Watershed Forum develop and refine their QAPP.

## A3. Distribution List

Signees (Project Manager, Project QA Officer, ADEC Project Manager and ADEC QA Officer) shall receive a copy of the QAPP and subsequent revisions. Offers for official copies of this QAPP and any subsequent revisions will be extended to individuals on the Distribution List.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 1. Distribution List** | | | | |
| **NAME** | **POSITION** | **AGENCY** | **DIVISION/ BRANCH** | **CONTACT INFORMATION** |
| Benjamin Meyer | Project Manager, QA Officer | KWF |  | (907) 260-5449  [hydrology@kenaiwatershed.org](mailto:hydrology@kenaiwatershed.org) |
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| Moses Jordan | Environmental Program Manager | Kenaitze  Indian Tribe |  | (907) 545-1444  mjordan@kenaitze.org |
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Copies of this Quality Assurance Project Plan will be made available online at [https://www.kenaiwatershed.org/science-in-action/research-information/water-quality](https://www.kenaiwatershed.org/science-in-action/research-information/water-quality/)/. Interested parties may request a digital copy from ADEC or KWF, or purchase a copy for the cost of production and shipping by writing the Kenai Watershed Forum, 44129 Sterling Highway, Soldotna, AK 99669, or calling (907) 260-5449.

## A4. Project / Task Organization

**KWF Project Manager/ Project QA Officer** Benjamin Meyer

**ADEC QA Officer**

John Clark

**ADEC Project Manager**

Sarah Apsens

**KWF Sampling Teams**

Determined Annually

Figure 1. Project management organization

**Key Contacts and Responsibilities**

Sarah Apsens - ADEC Project Manager. Ms. Apsens will oversee the project for DEC, provide technical support, QAPP review, review of any proposed sampling plan modifications, and the review of all reports.

John Clark - ADEC Division of Water QA Officer. Mr. Clark will be responsible for the review/approval of the QAPP and oversight of QA activities ensuring collected data meets project’s stated data quality goals. He will work with the ADEC project manager to provide recommendations and requirements to the contracting Project Manager.

Benjamin Meyer - Kenai Watershed Forum - Project Manager- Oversees the water quality monitoring efforts and projects conducted by the Kenai Watershed Forum. Provides and/or ensures adequate training is completed for each of the team members conducting water quality monitoring throughout the project. Has completed training in each of the monitoring elements outlined in the plan. Project Quality Assurance Officer - Supervises and trains water quality monitors. They are trained in Agency Baseline Sampling protocols. They are responsible for overall supervision of quality assurance and data entry.

Justin Nelson **-** SGS Environmental Laboratory Services (SGS) - Subcontractor for Kenai River Water Quality Assessment element of the project. Provides training of Agency Staff for data collection and oversees all analyses to be performed at SGS. This contract will be used to ensure proper sampling and analysis of water for 25 Kenai River Watershed sites to determine the water quality within the Kenai River Watershed.

John Essert - City of Soldotna Wastewater Treatment Plant operator plays a significant role in the Kenai River Water Quality Assessment. Will work cooperatively with the Project QA Officer and will perform a variety of water quality analysis for the Kenai Watershed Forum.

Technical Advisory Committee - The technical advisory committee will review results obtained from the monitoring effort on an annual basis. The committee may at any time ask for additional information on any aspect of the project. If monitoring data raises a particular concern, the advisory committee will be asked to suggest and review any changes to the monitoring plan. KWF will not be bound to implement any changes, but will give serious consideration to their input and will follow the committee’s wishes if feasible.

Field Monitoring Staff - Monitoring staff collect samples for the Kenai River Watershed Monitoring program. Monitoring staff are provided by the following Agencies/Organizations:

* Kenai Peninsula Borough
* U.S. Fish and Wildlife Service
* U.S. Forest Service
* Alaska Department of Fish and Game
* Alaska Department of Natural Resources
* Alaska Department of Environmental Conservation
* Cook Inlet Aquaculture Association
* Salamatof Tribe
* Kenaitze Indian Tribe
* The Kenai Watershed Forum and any volunteers under direct supervision of Kenai Watershed Forum monitoring staff.

## A5. Problem Definition/Background and Project Objectives

The Kenai Watershed Forum's (KWF) water quality program is designed to document the existing and changing conditions of water quality within the Kenai River Watershed by developing and maintaining baseline information. It is the intent of the program to first identify and then address a wide range of activities that may contribute to nonpoint source pollution in the Kenai River Watershed. The baseline water-quality monitoring program is consistent with the recommendation 4.5.10.2.2 in the ***Kenai River Comprehensive Management Plan*** (AKDNR 1997)***.*** This recommendation was developed for Alaska State Parks and the ***Upper Kenai River Cooperative Plan*** (USFWS 1997) as a partnership between Alaska State Parks, U.S. Fish and Wildlife Service and the U.S. Forest Service, Chugach National Forest. The State of Alaska does not currently operate a statewide ambient monitoring network due to the high operating costs to maintain such a system over large undeveloped areas. Historically, on the Kenai Peninsula There have been several water quality analyses conducted by state agencies in the early 1990's (Litchfield and Kyle 1992; ADEC 2022b, 2022a). Although these studies indicated that measured water quality parameters were within state and federal compliance standards, *impacts of development and recreational use were evident.* Litchfield and Kyle (1992) analyzed water quality at 17 sites located between the outlet of Kenai Lake and Cook Inlet, and recommended the continued sampling of critical water quality parameters (fecal coliform, hydrocarbon, metals, and nutrients) for the purpose of monitoring future impacts on the Kenai River. They selected representative sites with the suggestion that they be monitored at least twice a year. It was also suggested that more intensive sampling be conducted in the Lower Kenai River, where concentrations of water quality contaminants were the highest priority and of greatest concern.

The baseline-monitoring program is needed to link water quality trends to an understanding of the natural and human factors that affect the water quality. The program is also necessary since many of the enforceable parameters rely on background or natural conditions. Without long-term data collection, it is impossible to know what the appropriate standards of enforcement are. This program must be integrated among many agencies that have differing objectives and must be long-term. The unique hydrologic features of the Kenai River, such as its glacier origin and two large lake systems, require an investigation that is designed to assess the whole of the watershed. The monitoring program must also be consistent with standard sampling and analysis protocols. The monitoring program addresses these needs and implements methods to monitor changes to the Kenai River as the local population and recreational use increase. For more detailed information on historical results, see the two previous Kenai River Water Quality Assessments published by Kenai Watershed Forum (Guerron Orejuela 2016; McCard 2007).

## A6. Project / Task Description

There are three project elements of the Kenai River Watershed Forum’s Water Quality Monitoring Program described in this QAPP:

1. Agency Baseline Monitoring Partnership
2. Collection of specified interval data with programmable Electronic Instruments
3. Stream Temperature Monitoring

Continuous monitoring with electronic instruments was conducted by KWF in 2008 through 2012 on the lower Kenai River, which was summarized by KWF (Martin et al. 2011). Temperature monitoring was conducted in tributaries of the Kenai River by Cook Inletkeeper (CIK) 2008 through 2012. Monitoring results were synthesized (Mauger 2013) and later applied in a peer-reviewed publication (Mauger et al. 2017). Stream temperature monitoring continues currently in a selected subset of these streams (as of October 2022). In 2018, a zinc and copper monitoring project was added to the KWF Water Quality Monitoring Program. This Alaska Clean Waters Action (ACWA) grant funded project was designed to monitor copper and zinc levels in key locations on the Kenai River and its tributaries. This element was added in response to an observed increase in zinc and copper levels between 2014 and 2016 (Sires 2017b, 2017a; Guerron Orejuela 2016). A final report on this project was completed in 2021 (Meyer 2021).

## Task A) Agency Monitoring Partnership to develop a baseline for Nutrients, Dissolved Metals, Hydrocarbons, and Fecal Coliforms (Referred to as Agency Baseline hereafter)

Narrative Task Description

Work with the Kenai River Special Management Area Board and the agencies represented on that board to conduct sampling with the help of a professional environmental contractor.

Objectives:

* Develop a baseline data set to include, at a minimum, dissolved metals, hydrocarbons, and fecal coliforms
* Work with the City of Soldotna to supplement this data with parameters that Soldotna’s wastewater treatment plant can analyze. (i.e. – total suspended solids, pH, fecal coliforms, turbidity and specific conductance, etc.)
* Near concurrent sample collection at 22 sites located on the Kenai River main stem and tributaries throughout the Kenai River Watershed using federal, state and local agency personnel (See Table 6 for a narrative description of the 22 sample sites)
* Attain high quality data by using a professional lab certified by ADEC for drinking water analysis
* Sample each of the 22 sites at least 2 times per year as financial resources allow.

Data Collection

* Surface water quality parameters include; total metals, dissolved metals, petroleum hydrocarbons, fecal coliform, turbidity, specific conductance, temperature, nutrients
* Physical parameters include; weather conditions, boat traffic, and air temperature

Schedule

* Data collection will occur in spring (April/May) and summer (July/August)

## Task B) Collection of specified interval data with programmable Electronic Instruments

Narrative Task Description

Maintain and deploy as needed instruments capable of recording time series of water quality parameters, e.g. water quality sondes. Work with partners to identify projects where such monitoring is beneficial.

Objectives

* Maintain a collection of 8-10 water quality sondes capable of recording continuous parameters
* Work with agencies, NGOs, and citizens to identify locations where continuous monitoring of water quality parameters may be valuable. E.g.; invasive species treatments; developing areas, impacted water bodies.

Data Collection

* Parameters include pH, turbidity, conductivity, temperature, and dissolved oxygen
* Sondes will be subject to pre and post deployment calibrations and checks for all parameters

Schedule

* Fieldwork will be executed based on funding opportunities and local need
* Sondes will be returned to the manufacturer for bench calibration as needed depending on annual usage

## Task C) Stream Temperature Monitoring

Narrative Task Description

Maintain stream temperature monitoring sites in perpetuity at six sites in the lower Kenai River and Kasilof River area, and at other sites as needed by new and ongoing projects

Objectives

* Perform site visits at the six long-term stream temperature monitoring sites a minimum of twice annually
  + Moose River
  + Funny River
  + Soldotna Creek
  + Slikok Creek
  + Beaver Creek
  + Crooked Creek
* Apply the highest available standards for site management and data curation as outlined in Mauger et al. (2015)

Data Collection

* Record year-round continuous time series of water temperature using programmed electronic instruments

Schedule

* Site visits to locations with water temperature loggers will be visited a minimum of biannually, typically once in early summer (May/June) and once in Fall (September/October)

## A7. Quality Objectives And Criteria For Measurement Of Data

Data Quality Objectives (DQOs) for this program have been established to ensure that the data meets its overall objectives as described in A6, above – establishing a basic water quality inventory and detecting significant changes and trends. Tables 1 through 4 show objectives for detectability, precision and accuracy for each parameter tested by all possible methods used by both the Agency Baseline. DQOs are also included for automated multiprobes. In each case the sampling matrix is the water body of interest. Table 5 shows the objectives for the Stream Temperature monitoring. Objectives for precision, accuracy, representativeness, comparability and completeness are also summarized below (where???). Project DQOs may be revised in the future if funding becomes available for additional training and equipment or if the project manager determines that different objectives would be more effective in meeting program objectives. Any changes in DQOs will be submitted to USEPA and ADEC for approval before implementation.

**Table 2. Data Quality Objectives for Electronic Instruments**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PARAMETER | METHOD/RANGE | UNITS | SENSITIVITY | PRECISION | ACCURACY |
|  |  |  |  |  |  |
| pH | SM H+ B-2000, Hydrolab pH probe on Minisonde  0-14 | Standard pH units | 0.01 units | +0.2 units | +0.2 units |
| Turbidity | ISO 7027, Self Cleaning Turbidity Hydrolab Minisonde 5  0-3000 NTU | Nephelometric Turbidity Units (NTU) | 0.1 0-400 NTU  1.0 400-3000 NTU | +5 NTU | +5% 0-100 NTU  +5% 100-400 NTU  +5% 400-3000 NTU |
| Turbidity (Soldotna Lab) | EPA 180.1 Rev 2.0, Hach 2100 P  0-1000 NTU | Nephelometric Turbidity Units | 0.010-9.99 NTU  0.1 10-100 NTU  1 100-1000 NTU | +5 NTU | +5% 0-500 NTU  +5% 500-1000 NTU |
| Water Temperature | SM 2550 B-2000, YSI Model 30, 55, and  95  -5 to 95, -5 to +45, and -5 to +45 | Degrees Celsius (C) | 0.1, 0.2,  and 0.1 | ±0.1, ±0.2, and  ±0.2 | ±0.1, ±0.2, and ±0.2 C |
| Conductance | EPA 120.1, Hydrolab probe on Minesonde 0-100 mS/cm | Micro-Siemens/cm (µS/cm)  (converted to 25 C) | 4 digits | +0.001 units | 2% full Scale |
| Dissolved Oxygen | SM 4500 O C-2000, Micro Winkler Titration  0 to 20 mg/L | Milligrams per liter (mg/L) | 0.1 mg/L | ±0.9 mg/L | ±0.3 mg/L |
| Dissolved Oxygen (Winkler used for calibration) | ASTM D888-09 (A), Hydrolab LDO  probe on Minisonde 0 to 50 mg/L | Milligrams per liter (mg/L) | 0.01 mg/L | NA | ±0.2 mg/L |
|  |  |  |  |  |  |

**Table 3. Data Quality Objectives for Hydrocarbons Collected for Agency Baseline (Supplied by SGS) (pg 1 of 2)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PARAMETER** | **METHOD / RANGE** | **Sensitivity**  **(MDL)** | **PQL** | **OVERALL PROJECT PRECISION[[1]](#footnote-1)** | **ACCURACY** |
|  |  |  |  |  |  |
| Gasoline Range Organics (GRO) | AK101 by GCFID: 25- 1,000,000,000 | 3.0 µg/L | 5x MDL | 20% | Calibration: ±25%  Recovery: 60-120% |
| Diesel Range Organics (DRO) | AK102 by GCFID: 50- 1,000,000 | 0.0065 mg/L | 0.11 mg/L | 20% | Calibration: ±25%  Recovery: ±25% |
| Residual Range Organics (RRO) | AK103 by GCFID: 500- 1,000,000 | 0.22 mg/L | 0.54 mg/L | 20% | Calibration: 75-105%  Recovery: 60-120% |
| Benzene | EPA 602 by GC/PID: 1-  1,000,000,000 | 0.074 µg/L | 1.0 µg/L | 20% | Calibration: ±15%  Recovery: ±30% |
| Ethylbenzene | EPA 602 by GC/PID: 1-  1,000,000,000 | 0..088 µg/L | 1.0 µg/L | 20% | Calibration: ±15%  Recovery: ±30% |
| Toluene | EPA 602 by GC/PID: 1-  1,000,000,000 | 0.078 µg/L | 1.0 µg/L | 20% | Calibration: ±15%  Recovery: ±30% |
| m,p-Xylene (total) | EPA 602 by GC/PID: 1-  1,000,000,000 | 0.20 µg/L | 2.0 µg/L | 20% | Calibration: ±15%  Recovery: ±30% |
| o-Xylene | EPA 602 by GC/PID: 1-  1,000,000,000 | 0.20 µg/L | 1.0 µg/L | 20% | Calibration: ±15%  Recovery: ±30% |
| Xylenes (total) | EPA 602 by GC/PID: 1-  1,000,000,000 | 0.82 µg/L | 3.0 µg/L | 20% | Calibration: ±15%  Recovery: ±30% |
| Bromofluorobenzene (surrogate) | EPA 602 by GCPID | 0.12 µg/L | 0.50 µg/L | 20% | Calibration: ±15%  Recovery: ±30% |

**Table 3. Continued (pg 2 of 2).**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PARAMETER** | **METHOD / RANGE** | **Sensitivity (MDL)** | **PQL** | **OVERALL PROJECT PRECISION[[2]](#footnote-2)\*** | **ACCURACY** |
| Benzene | EPA 624 | 0.12 µg/L | 0.40 µg/L | 20% | ±20.5% |
| Ethylbenzene | EPA 624 | 0.31 µg/L | 1.0 µg/L | 20% | ±21% |
| Toluene | EPA 624 | 0.31 µg/L | 1.0 µg/L | 20% | ±20.5% |
| m,p-Xylene (total) | EPA 624 | 0.620 µg/L | 2.0 µg/L | 20% | ±20.5% |
| o-Xylene | EPA 624 | 0.31 µg/L | 1.0 µg/L | 20% | ±22% |
| 1,2-Dichloroethane-D4 (surrogate) | EPA 624 |  |  |  | ±18.5% |
| 4-Bromofluorobenzene (surrogate) | EPA 624 |  |  |  | ±14.4% |
| Toluene D-8  (surrogate) | EPA 624 |  |  |  | ±11.5% |

GCFID, gas chromatograph flame ionization detector

GCPID, gas chromatograph photo ionization detector

PQL, practical quantification limit

µg/L, micrograms per liter (parts per billion)

mg/L, milligrams per liter (parts per million)

RPD; relative percent difference

**Table 4. Data Quality Objectives for Metals Collected for Agency Baseline (Supplied by SGS)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PARAMETER** | **METHOD** | **SENSITIVITY (MDL)** | **PQL** | **OVERALL PROJECT PRECISION[[3]](#footnote-3)\*** | **ACCURACY** |
| Hardness | Calculated from Ca, total  and Mg, total as CaCO3 + MgCO3 |  |  |  |  |
| Calcium, total | EPA 200.7 | 1.0 mg/L | 4.0 mg/L | ≤ 20 RPD | ±21 % LCS |
| Iron, total | EPA 200.7 | 2.0 mg/L | 8.0 mg/L | ≤ 20 RPD | ±49.5 % LCS |
| Magnesium, total | EPA 200.7 | 0.2 mg/L | 2.0mg/L | ≤ 20 RPD | ±27 % LCS |
| Arsenic, dissolved | EPA 200.8 | 1.5 µg/L | 5.0 µg/L | ≤ 20 RPD | ±15 % LFB |
| Cadmium, dissolved | EPA 200.8 | 0.15 µg/L | 0.50 µg/L | ≤ 20 RPD | ±15 % LFB |
| Chromium, dissolved | EPA 200.8 | 0.78 µg/L | 2.0 µg/L | ≤ 20 RPD | ±15 % LFB |
| Copper, dissolved | EPA 200.8 | 0.031µg/L | 1.0 µg/L | ≤ 20 RPD | ±15 % LFB |
| Lead, dissolved | EPA 200.8 | 0.06 µg/L | 0.2 µg/L | ≤ 20 RPD | ±15 % LFB |
| Zinc, dissolved | EPA 200.8 | 3.1 µg/L | 10.0 µg/L | ≤ 20 RPD | ±15 % LFB |

MDL, method detection limit

PQL, practical quantification limit

LCS, laboratory control sample

LFB, laboratory fortified blank mg/L,

milligrams per liter (ppm)

µg/L, micrograms per liter (ppb)

RPD, relative percent difference

Appendix 1

Appendix 2

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1. \* All measurements used to calculate precision / RPD must be above practical quantitation limit (PQL) and/or reporting limit (RL) [↑](#footnote-ref-1)
2. \* All measurements used to calculate precision / RPD must be above practical quantitation limit (PQL) and/or reporting limit (RL) [↑](#footnote-ref-2)
3. \* All measurements used to calculate precision / RPD must be above practical quantitation limit (PQL) and/or reporting limit (RL) [↑](#footnote-ref-3)