Quality Assurance Project Plan
For
YUKON RIVER INTER-TRIBAL WATERSHED COUNCIL

Prepared by
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Prepared for
US Environmental Protection Agency

And

State of Alaska
Department of Environmental Conservation
Division of Air and Water Quality

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APPROVALS

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Paul Schuster, USGS, Technical Advisory Committee/Partner	Date
Doug Dasher, DEC, Technical Advisory Committee	Date
Geoff Dates, River Network, Quality Assurance Officer	Date

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The YRITWC would like to thank the members of the technical advisory committee for advice during the development of this QAPP. We would also like to thank Paul Schuster of the USGS for the invaluable information provided by him on the dynamics of the Yukon River and also the sampling materials put together and provided by his office.

We would like to thank the YRITWC Executive Committee members for their vision and wisdom in the project. We would like to thank the Indigenous Communities of the Yukon River Watershed for filling out surveys regarding traditional drinking water sources, coming to workshops to further their education and also for sharing their knowledge and insight on water quality and contaminants in the watershed. Finally we would like to thank the Administration for Native Americans, US Environmental Protection Agency and River Network for funding this project.

Distribution List

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Copies of this Quality Assurance Project Plan will be made available to the Executive Committee, Technical Advisory Committee and the Tribes and First Nations of the Yukon River Watershed. Other interested parties may review the plan at the Yukon River Inter-Tribal Watershed Council offices.

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1. Project Management

1.1. Project Task and Organization

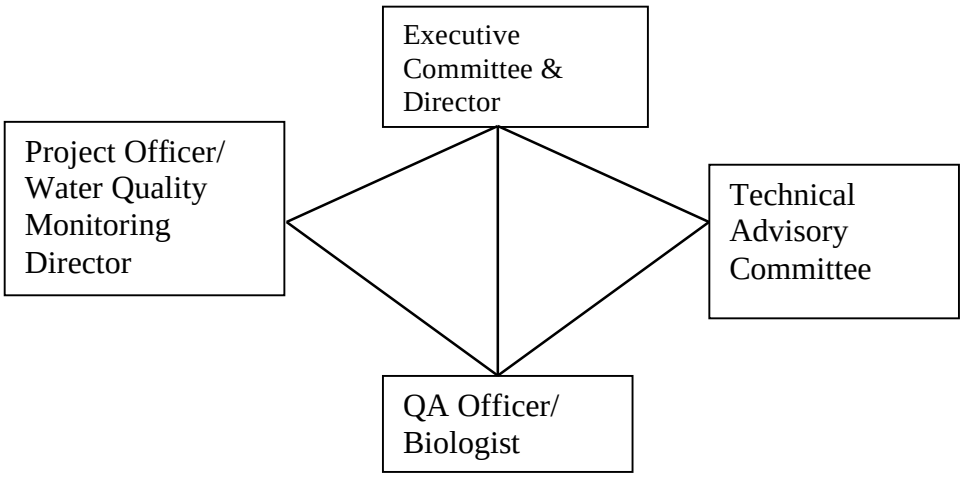


Figure 1 - YRITWC QAPP Organizational Chart

Responsibilities of Yukon River Inter-Tribal Watershed Council personnel:

Bryan Maracle – Project Officer/Water Quality Monitoring Director

Responsible for overall project management, preparation of sampling plan, sample collection and testing, data management and analysis, quality control and production of reports, administrative support and grant implementation.

Geoff Dates – QA Officer /

Responsible for technical support, operations support, data analysis and overall quality assurance of the project.

In addition to the personnel listed above, the YRITWC water quality monitoring project is assisted by a Technical Advisory Committee (TAC) composed of Mr. Paul Schuster, USGS, Doug Dasher, DEC, Terri Lomax, DEC, and Geoff Dates, River Network. The YRITWC water quality monitoring project will also be assisted by Tribal Water Quality Monitoring Technicians who we are working in partnership with to collect these samples and send to USGS labs for analysis.

Collected data will be provided in report form to all Tribes and First Nations within the Yukon River Watershed, USEPA, ADEC, USGS and River Network. Primary data users will be the Tribes and First Nations of the Yukon River and local, state and federal agencies involved in support of this project.

1.2. Problem Identification and Background

The Yukon River drains an area of 330,000 square miles in Canada and Alaska. The Yukon River Watershed is fundamental as one of the largest sources of freshwater to the Bering Sea ecosystem. Additionally, there is currently no comprehensive water

quality data associated with the Watershed in its entirety and the need to establish a water quality baseline is critical to understanding the Yukon River basin as a whole.

The Yukon River Watershed supports the indigenous and transplanted people of the region by providing; 1) food sources through fisheries and wildlife resources 2) drinking water, and 3) a major transportation system.

Water quality in parts of the system has been impacted by bacteria, contaminants in the form of heavy metals, pesticides and other trace elements from mining and atmospheric deposition, and sediments from mining as well as petroleum products and chlorinated solvents. Of equal concern is the bioaccumulation or biomagnification of certain toxins in the fish and higher forms of wildlife (birds and mammals) harvested and hunted as an important food source for the people within the basin. Water quality is currently undergoing change and becoming impacted by trends specific to the basin's response to climate change. Trends such as permafrost melt, fire increase, increase in human population (sewage, agriculture waste), lakes warming and drying-up and becoming anoxic, increase and ongoing atmospheric pollutants, increases in exotic species as a response to warming climate will all have it's effects on the watersheds ability to support and sustain healthy plant and animal populations.

1.3. Project Summary

The YRITWC watershed wide baseline data program is a study that will monitor the overall health of the Yukon River by creating a baseline dataset. The dataset will serve three main purposes; 1) a water-quality reference against which to measure any future changes in the river, 2) identify trends to help predict future changes that will act as a reference for any changes seen in the river in the future, and 3) a baseline database to measure against and to demonstrate/locate point source pollutions. The YRITWC will work with USGS and tribal technicians to sample water characteristics at important locations along the river. Tribal technicians will sample sites near their villages and the technician's interest, experience, and devotion will be crucial to the success of this study. Sampling sites will correspond with sites USGS has sampled over the previous 5 years; our data will add to data previously collected by the USGS. The overall objective of this program is to provide researchers and managers with the tools to accurately predict future changes, developing effective standards, locate point source pollutions and allowing the best possible management of resources for future generations.

A main objective of the baseline dataset is to develop it into a long-term program; the longer the dataset, the more useful the database becomes for analyzing trends and variance over time and over regions. Also, a baseline database for the Yukon will allow focus on sites of contamination concern and perhaps show that sites like certain mines or sewage lagoons are polluting the water (point source). Currently it is difficult to demonstrate point source pollution if there is no baseline to measure against. As the program evolves and develops, we are also going to expand our sampling to identify specific source contaminates as well as begin to determine the impact of non point source pollution on water quality. Non point source pollution can be loosely defined as the culmination of contaminants from multiple sources with geographically diverse boundaries. The availability of Tribal Technicians to help collect the field data and

samples is crucial to the long term success of this program. We are focused on helping Tribes and First Nations develop individual local water quality monitoring programs for their area. We will provide them with workshops focused on designing a local program, developing a QAPP, equipment choices, funding sources and database management; along with providing them with the skills and equipment to participate in this Watershed Wide Monitoring Program. One of the main responsibilities of the YRITWC will be to manage the local programs to maintain data cohesion. This will be accomplished by using consistent water quality sampling and processing strategies.

The objectives of the Yukon River Inter-Tribal Watershed Council water quality monitoring effort is to:

1) Establish a baseline water quality sampling program by conduct water quality monitoring at strategically located sites within the basin such that they; 1) provide maximum spatial coverage, 2) are co-located with USGS gagging stations, and 3) are sites with historical water quality data. These sites will be sampled 6 times during open season for purpose of continuing/creating a baseline database. The following locations are priority sites selected for this project: Yukon River at St. Mary's, Yukon River at Pilot Station, Yukon River at Anvik, Koyukuk River near Huslia and at the mouth, Yukon River at Ft Yukon, Porcupine River several miles up from the mouth, Tanana River near Nenana, Yukon River at the Dalton Highway Bridge, Chena River at Fairbanks, Tanana river near Fairbanks and Yukon River at Eagle, Yukon River at Dawson. This objective is referred to as Tier I and will begin in year 1 and continue in subsequent years. Tables 1 and 2 list the parameters to be measured as part of the baseline program.

2) Address local water quality concerns by developing and conducting local water quality programs and/or monitoring at additional locations within the Yukon River Watershed. Local Tribal Councils will formulate a question relating to a local concern and, using Tribal Technicians, collect samples and field data. This objective is referred to as Tier II and pilot programs are planned to begin in year 2. It is necessary to have Tier I in place before Tier II can begin (Tier II builds on Tier I)

3) As part of the baseline program, conduct under ice water quality monitoring at 7 sites within the Yukon River Watershed for purposes of collecting water quality data that that represents the river before snow melt influence (base flow which represents more then 200 days of the year). The following locations are selected for this sampling event: Yukon at Pilot, Yukon above Anvik, Tanana above Nenana, Yukon at Yukon Bridge, Tanana above Fairbanks, Chena above Fairbanks, and Yukon at Eagle.

4) Training. Through workshops, seminars, and on-site training programs, provide top-level training to water quality monitoring technicians from villages within the watershed; the trained technicians will be well versed in proper water quality sampling techniques, procedures and protocols. These skills will aid technicians in the development of their local program if there is a need.

5) Mapping. Help identify and map local contamination concerns in the Yukon Watershed along with; locate important water quality sampling sites for creating a baseline database and for locating point source pollutions

Table 1: Parameters Analyzed in the Field using YSI Sonde 600 probe and meter.

Parameter	Method	Detection Limits	Precision	Accuracy	Container	Minimum Sample Size (mL)	Preservation	Maximum Storage Recommended/ Regulatory
Temperature	SM2550B	0.1°C	±0.1°C	±0.1°C	P, Glass	Not applicable	Analyze Immediately	Taken in the Field
pH	EPA 150.1	0.1 units	±0.1units	±0.1 pH unit within ± 10°C of calibration temperature or ± 0.2 pH unit within ± 20°C of calibration temperature	N/A	N/A	Analyze Immediately	N/A
Dissolved Oxygen	EPA 360.1	0.1 mg/l	±0.1 mg/l	±2% or ±0.2 mg/L, whichever is greater	N/A	N/A	Analyze Immediately	N/A
Conductivity	Conductivity (2510 B)a	5 µmhos/cm	1% or 1.0µS/cm	± 10%	P, Glass	500	Refrigerate (Storage @ 4°C, in the dark)	28d/28d
Salinity	SM D1125-82**	0.5 ppt	±0.1ppt	±0.1ppt	Glass, wax seal	240	Analyze immediately or use wax seal	6 months/N.S.
Turbidity	EPA 180.1	MRL = 0.5 NTU	±5% of reading or 1 NTU, whichever is greater	±5% of reading plus stray light from 0-1000 NTU	P, Glass	100 mL	Analyze same day; store in dark up to 24h, refrigerate 4°C	24h/48h
Color, Apparent	SM2120B	5 units	Not Available	Not Available	P, Glass	500	Refrigerate (4°C)	48h/48h

*** DRO and RRO samples may be obtained from same 1 Liter Container**

**** According to the manufacturers documentation "Salinity is determined automatically from the Model 63 conductivity and temperature readings according to algorithms found in *Standard Methods for the Examination of Water and Wastewater (ed. 1995)".* "For further information on conductivity and the above standard information, refer to the ASTM document *Standard Methods of Test for Electrical Conductivity of Water and industrial Watewater,* ASTM Designation D1125-82…"**

*****Laboratory MDL's are available upon request for this project.**

Table 2: Parameters Analyzed at USGS labs.

Parameter	Method	Detection Limits	Precision	Accuracy	Container	Minimum Sample Size (mL)	Preservation	Maximum Storage Recommended/ Regulatory
Major anions, Cl, NO3, SO4	USGS, Fishman and Pyen, 1979, WRI 79-101*	MDL reported in database**	±10%	±10%	125 ml, HDPE	75 ml	Filtered, 0.45 um, Refrigerate (4°C)	30 days
Major cations, Na, K, Mg, Ca	USGS, Garbarino and Taylor, 1979*	As per method MDLs**	±10%	±10%	125 ml, HDPE, acid rinsed	75 ml	Filtered, 0.45 um, Acidify, HNO3, To pH < 2	Indefinite
Selects trace metals	USGS, Garbarino and Taylor, 1996*	As per method MDLs**	±10%	±10%	125 ml, HDPE, acid rinsed	75 ml	Filtered, 0.45 um, Acidify, HNO3, To pH < 2	Indefinite
Alkalinity	Kramer, 1982*	NA***	±10%	±10%	125 ml, HDPE, acid rinsed	30 ml	Filtered, 0.45 um, Refrigerate (4°C)	30 days
Dissolved organic carbon	*USGS, Aiken, 1992	0.2 mg/L	±10%	±10%	40 ml, amber glass, baked at 550 C	15 ml	Filtered, 0.45 um, Refrigerate (4°C)	14 days
Deuterium and oxygen isotopes	USGS, Coplen, 1988, 1991	0.2/2	±10%	±10%	60 ml glass, polyseal cap	60 ml	none	Indefinite
Carbon dioxide gas	USGS, Striegl and others, 2001	1ppm	±10%	±10%	20 ml , glass, vacuum sealed serum	15 ml	2 g KCL	Indefinite
Methane gas	USGS, Striegl and Michmerh uizen, 1998	0.1 ppm	±10%	±10%	20 ml , glass, vacuum sealed serum	15 ml	2 g KCL	Indefinite
Dissolved inorganic carbon	USGS, Striegl and others, 2001	1 ppm	±10%	±10%	20 ml , glass, vacuum sealed serum		2 g KCL acidified with HPO4	Indefinite
Nutrients	Ion Chromotog raphy	2 umol/L	±10%	±5%	HDPE	20 ml	H2SO4 or freezing	If preserved, indefinite. If not, 5 days

*** Full citation available upon request**
****Laboratory MDL's will be reported with sample batch runs and are available upon request for this project**
***** Not applicable**

1.4. Data Quality Objectives for Measurement Data

Table 1 shows objectives for precision and accuracy for each parameter to be tested in the field. Table 2 shows objectives for precision and accuracy for each parameter to be tested and analyzed at USGS laboratories. In each case the sampling matrix is water. Objectives for precision, accuracy, representativeness, comparability and completeness are also summarized in this section. These Data Quality Objectives (DQO's) have been established to ensure that the project meets its overall objectives as described – to collect water samples for purposes of creating a baseline database at selected locations within the Yukon River Watershed. Project DQO's may be revised in the future if funding becomes available for methods and equipment with finer detection limits or for testing additional parameters, or if the Steering Committee and/or Technical Advisory Committee determines that different objectives would be more effective in meeting program objectives.

1.4.1. Precision

Precision is the degree of agreement among repeated measurements of the same characteristic, or parameter, and gives information about the consistency of methods. In this project replicate sample analysis will be performed on one out of each ten samples. (10 - 15 samples are to be taken during this project. The Biologist / Project Manager will perform replicate sample analysis on one split sample from the project). Variation of duplicate values for each parameter must not exceed the range of precision specified in Table 1. All precision results will be calculated in computer spreadsheets. Results that fall outside the specified precision range will not be entered into the project data system. Additional field sampling events may be scheduled in cases where data quality objectives are not met.

1.4.2. Accuracy

Accuracy is a measure of confidence that describes how close a measurement is to its "true" value. In this project, accuracy is measured by comparative sampling and the use of known standard solutions. Sample run results including known standards that fall outside of the specified range will not be entered into the database and will be rerun until the known standards meet the accuracy criteria.

1.4.3. Representativeness

Representativeness is the extent to which measurements actually represent the true environmental condition. Representativeness of data collected is considered in project design and sampling site selection. Sampling sites will be selected for representativeness of baseline for the main steam channel of the river. A handheld GPS will be used to identify coordinates of selected sites for mapping purposes, also a GPS will be used to find past USGS sampling sites by entering the coordinates for that site.

1.4.4. Comparability

Comparability is the degree to which data can be compared directly to similar studies. Using standardized sampling and analytical methods and units of reporting with

comparable sensitivity helps ensure comparability. For the parameters included in this project, YRITWC has selected testing methods that are of high standards and used by other agencies to conduct water quality monitoring. We are using high quality equipment and laboratories to insure the comparability of our data to other datasets.

1.4.5. Completeness

Completeness is the comparison between the amount of usable data collected versus the amount of data called for in the sampling plan. In this project, completeness will be measured as the percentage of total samples collected and analyzed as a whole and for individual parameters and sites as compared to the goals set out by the project design. The project design calls for sampling and testing to be performed during open water season (May to September) at 12 sites. Each site will be sampled bi-weekly during the open water season. One under-ice sample will be obtained at each site during the winter before the influences of spring snow melt.

1.5. Training Requirements and Certification

Training of Tribal Water Quality Technicians will be provided and coordinated by YRITWC. The USGS will help instruct an annual three-day workshop providing instruction for Tribal Water Quality Technicians on how to participate in this program. YRITWC will meet with USGS staff for program planning. Tribal Water Quality Technicians who complete this course will be QAPP certified and receive 1 college credit. The YRITWC staff will travel to individual villages throughout the year holding workshops on additional water quality sampling training, QAPP development, Water Quality program design, Bio-Assessment, contaminant source testing and data management and mapping.

1.6. Documentation and Records

All field data gathered during this project will be recorded on Field Data Sheets (see Appendix C). The biologist and/or environmental technician will complete each data sheet. Any equipment or procedural problems will be recorded in the " Additional Comments" section of the data sheet. Information from this form will then be entered into the YRITWC monitoring data system. Original copies of all data sheets will be keep on file at the YRITWC office indefinitely. Tribal Water Quality Technicians will make a copy of the field data sheet, keeping one for their office and sending the original to YRITWC's Fairbanks office a copy will be made and sent to USGS.

The USGS lab in Boulder CO will be sent samples from specific sites and a complete analysis on specified constituents will be done. A report of results will be generated by USGS and sent to the YRITWC. Upon receipt of the USGS report YRITWC will merge the data into the database and make it available to stakeholders.

Field Data Sheets are to be sent to these offices:

Bryan Maracle, **Water Quality Monitoring Coordinator**
Science, and Mapping Director Phone: (907) 451-2530
Yukon River Inter-Tribal Watershed Council Fax: (907) 451-2534

815 2nd Avenue, Suite 201 Email: bmaracle@yritwc.com
Fairbanks, AK 99701

Paul F. Schuster, **Technical Advisor/Partner** Phone: (303) 541-3052
Hydrologist Fax: (303) 447-2505
U. S. Geological Survey email: pschuste@usgs.gov
3215 Marine Street, Suite E-127
Boulder, CO 80303-1066

Monitoring equipment and supplies are inspected upon receipt and again before each sampling event. Calibration data will be recorded on field data sheets. All electronic meters will be calibrated before every sampling event and calibrations will be documented on field sheets. Maintenance history for each meter will be recorded in a separate maintenance log for each instrument.

1.7. Publications and Ownership or rights to the Data

YRITWC, USGS and Tribal Councils will share all results from samples drawn during this project. After the data has been quality-assured, quality controlled and reviewed, the data will become available to the public domain through personal request, publication, or Internet. Our goal is to provide free and easy access to the reviewed data so that the stewards of the river can better understand their environment and managers and policy-makers can make sound decisions having positive impacts on the health of the river.

2. Measurement and Data Acquisition

2.1. Sampling Process Design

2.1.1 **Physical and chemical parameters we will sample/record and our reasons why.**

Year 1 (Tier I): Baseline data

Water quality information will be obtained by the use of meter probes and collecting water samples for laboratory analyses. Using a multi-probes we will record data on field parameters of: Dissolved-oxygen, pH, Conductivity, Salinity, Air and Water Temperature. We will send water samples to USGS labs to be analyzed for dissolved gasses (CO2 and CH4), major ions, dissolved organic carbon (DOC), nutrients, selected trace metals, and isotopes of oxygen. We will also send samples to other labs to be tested for hydrocarbons or heavy metals for site specific concerns. At each site, a photo and GPS point will be recorded.

The parameters to be measured during **Tier 1** are listed in **Table 1** and **Table 2**.

Year 2 (Tier II): Continuation of Tier I, Pilot studies for developing local programs (Point Source Pollution)

These are the site specific concerns we are aware of and would like to eventually monitor more closely; Sewage systems, contaminants in the form of heavy metals and other trace elements from mining, pesticides and atmospheric deposition, petroleum products, chlorinated solvents, and nutrients.

Year 3 (Tier III): Baseline data and Trends

As the program evolves and grows, collection of additional data along with the continuing collection of baseline data can be used to focus on trends specific to the basin's response to climate change

* For some of the additional constituent measurements needed for trend research, initially, outside labs will be commissioned. In the future it is possible it can be done by USGS labs**.**

Permafrost Melt
-Old versus new Carbon
(14C*, isotope of carbon)
-Possibly diatom count can be an indicator of increased carbon in a system.

Fire Increase
-DOC and Particulate Organic Carbon (POC)*, Phosphorous, Arsenic*

Increase in Shrub Growth
-DOC, 13C*, Phosphorous, Nitrogen, Chlorophyll

Increase in human population (sewage, agriculture waste)
-Phosphorous, Nitrogen, E-coli, bacterial analysis, caffeine, (This could be monitored more by the local Village Water Quality Programs (see below under Point Source Pollution).

Lakes warming and drying-up/becoming anoxic
-Sulfate Reducing bacteria's, SRB's,
-Methyl Mercury in fish*?

Atmospheric Pollutants
-non point source pollution
Some Persistent Organic Pollutants (POPs)
Asian dust storms (toxic metals)

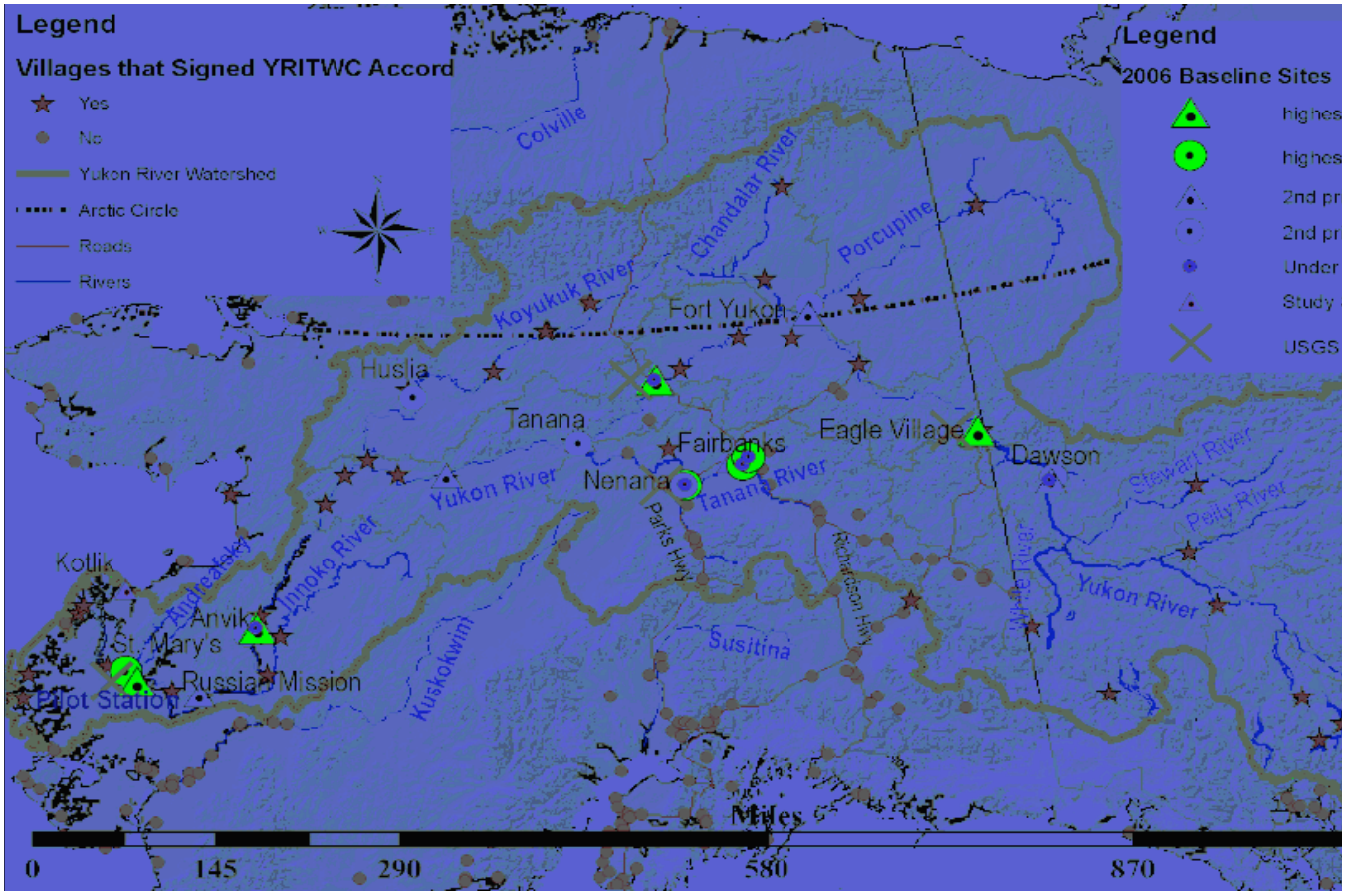
Increases in exotic species
Response to warming climate
bacteria, fish parasites, and viruses (affect the quality of rearing habitat for fish and other aquatic species)

2.1.2 **Sample Site Selection**

Each site will be assigned a site number and will be identified by its latitude, longitude and elevation as determined using a GPS. The proposed baseline sites are

shown in Figure 2. Four of these sites (Eagle, Stevens, Pilot, and Tanana at Nenana) have USGS real-time continuous flow data used as part of the USGS 2001-2005 baseline study. The YRITWC is focused on building a baseline database by continuing to collect water-quality samples at these four sites and additional sites.

Figure2: YRITWC's Water Quality Sampling Sites for 2006 Season.



Four Primary Sampling Sites:

We are focused on establishing sampling sites at four of the same stations USGS has sampled in the past in order to continue adding to the baseline dataset. These four sites have flow gage stations with websites to access real-time and historical discharge data.

Total of 8 Highest Priority Sites:

Three of our highest priority sites are located on the Lower Yukon at Saint Mary's, Pilot Station and Anvik. Five of our second highest priority sites are located at; Yukon River at St. Mary's, Yukon River at Pilot Station, Yukon River at Anvik, Tanana River near Nenana, Yukon River at the Dalton Highway Bridge, Chena River at Fairbanks, Tanana river near Fairbanks and Yukon River at Eagle. YRITWC will

coordinate efforts to ensure the collection of samples bi-weekly during the open water season. Under ice sampling will be attempted at all current sites with in the basin, logistics or weather will play a major role in the ability to obtain this sample. For both logistical and geochemical reasons, under ice sampling will be conducted only once in late March.

Additional Sampling Locations:

Additional sites have been targeted for expansion of the program. These sites are places where USGS has sampled in the past and or sites we have field technicians available and interested in sampling. Possibilities for these sites are: Yukon Delta above Kotlik, Yukon Delta at Chevak, Yukon River above Russian Mission, Koyukuk River at the mouth, Yukon River above Ruby, Yukon River above Tanana, Tanana River above Tanana, Porcupine River above Fort Yukon, Yukon River above Dawson, Yukon River somewhere above Whitehorse. It should be noted that this list of sites in not exclusive. The best scientific judgment will be used in the review of additional sites.

Special Interest Study Sites:

Three of our sites are study sites where we are not considering these sites representative of the main stem and so they will not be included as baseline data. Two of these sites are located below Fairbanks; one site is on the Chena River before it joins the Tanana River and one site is located on the Tanana River below Fairbanks and just before the Chena River. We will compare data between theses two sites and the two sites located above Fairbanks to research the effects of Fairbanks on the watershed. Fairbanks is the largest city in the Yukon River Watershed and so it is important monitor the potential effects Fairbanks may be having on water quality in the basin.

One of the study sites is located above Kotlik on one of the main channels of the Yukon River. This part of the Yukon is influenced by salt water. There are some very big questions about the Yukon delta; how much water gets to the Bering Sea? How much sediment and chical constituents get to the Bering Sea? A pilot program will start at Chevak in year 2.

2.1.3 **Who Will Sample**

Tribal Water Quality Monitoring Technicians (TWQMT) will be trained by the YRITWC and the USGS to collect field data and collect water quality samples to be sent to the USGS labs in Boulder, CO and other private labs. YRITWC staff will sample at the Yukon Bridge, Nenana, Fairbanks, Tanana and any of the other proposed sites as needed to fill in when the local technician is not available. Sampling will follow YRITWC protocols and guidelines. YRITWC protocols adhere to the standards of quality set by USGS in TWR book 9.

2.1.4 **Sampling Frequency**

These proposed sites will be sampled bi-weekly during open water and once before break-up in early spring. A peak snow melt sample will be taken in addition to the bi-weekly sampling interval. May 15 through September 30 is the approximate open

water season. The tentative sampling schedule is dependent on discharge which is, in turn, dependent on snowmelt. Technicians can utilize the USGS real-time discharge data from:

Yukon River at Eagle (http://waterdata.usgs.gov/ak/nwis/uv?15356000)
Yukon river near Stevens Village (http://waterdata.usgs.gov/ak/nwis/uv?15453500
Yukon River at Pilot Station (http://waterdata.usgs.gov/ak/nwis/uv?15565447)

Use of traditional and local knowledge may be more appropriate and more accurate, information should be weighted on its merits. Sampling at high flow right after break-up and at low flow just prior to freeze-up will provide a full spectrum (end members) of water volumes and constituent concentrations and loads to better understand the dynamics (transport, sources, sinks) of the river system during open water. Such information will help develop appropriate standards and guidelines. For example, low flow volumes may correspond to higher contaminant concentrations but not necessarily the highest loads (volume multiplied by concentration). Tracking contaminants will also help us distinguish between atmospheric inputs and local land-based inputs.

2.1.5 **Partnerships and Collaborators Involved**

We are working in partnership with USGS and individual tribal councils along the watershed. Following is a list of who will provide what:

The YRITWC will provide:

- Overall Project Oversight, Planning and Management
- Ongoing training to experienced and qualified technicians in QAPP development, Water Quality program design, Bio-Assessment, contaminant source testing, data management, and mapping.
- Training for those interested in becoming Tribal Technicians by having workshops and traveling to individual villages teaching, QAPP, Water Quality program design, Bio-Assessment, contaminant source testing and data management and mapping.
- YSI Multi Probe Sonde Field equipment for two staff members in the YRITWC office.
- Field equipment for TWQMT who currently don't have the funds for it this equipment however plan on sampling for the YRWWMP.
- Assistance in trouble-shooting field equipment (malfunctions, etc)
- Travel and Hotel for Water Quality Instructors and TWQMT.
- Gas and Boat Rental for any TWQMT who is taking samples for our program and don't have the funds for it.
- Overall compiling and maintenance of the database.
- Summary publications of future data obtained.
- Web publications of current water quality monitoring information.
- Maps and data upon request for Tribal Council's who are working with us on this Yukon River Water Wide Monitoring Program.
- Yukon River Watershed Wide Monitoring Program handbook on how participate in this program.

The Tribal Water Quality Monitoring Technician will provide:

- Ongoing training for themselves
- They may provide the boat and gas for sampling
- They may provide their own field water quality monitoring equipment.
- They will provide field data sheets, photos and send the samples to YRITWC
- They will provide a schedule showing when they would be available to sample at these sites, and determine if there are times when they will be there for the sample period.

NOTE: it is critical that the TWQMT have an open line of communication (i.e. email, phone #) in the event a sampling schedule can not be maintained so that contingency plans can be executed

The USGS will provide:

- The YRITWC staff with training
- Analysis of selected constituents
- Shared data files that have been quality assured for publication

2.2. Sampling Methods Requirements

Safety is the highest priority. If there are any doubts about the safety of the sampling operation, DO NOT sample. ***Water samples can be replaced. People cannot.***

WEAR YOUR LIFE JACKET AT ALL TIMES WHEN ON A BOAT OR NEAR MOVING WATER MORE THAN ONE FOOT DEEP

2.2.1. General Water Sample Collection Procedures

Sample collectors will sample baseline sites that have been established using GPS equipment and/or USGS 1:63,360 scale topographical maps. These sites are routinely located using recognizable local natural features (e.g. stream confluence, or other appropriate landmark). Once a site is determined using a GPS a land mark will be placed on the bank for future usage in relocation of the sampling site.

2.2.2. Collection and Preservation of Samples

A grab sample will be collected manually at each site at mid-channel using a boat when available to obtain the best representative of the entire river system. Samples will be obtained from approximately 6" to 12" beneath the water surface. Sample container, sample size, preservation and maximum storage requirements for each parameter are listed in Table 1 and Table 2.

Field samples for pH, conductivity, salinity and temperature will directly test the water in the river at the time of sample collection.

2.3. Sample Handling and Custody Requirements

All testing procedures in this project will be conducted by the Biologist and Environmental Technician in the field or at an ADEC approved analytical laboratory. All field samples will be labeled at the time of collection. The date, time, and site name will be recorded directly on the sample bottles. When samples are collected the following chain of custody procedure will be followed:

- Samples will be labeled (date, time, site name) directly on the bottles and field data will be recorded on field data sheet (appendix B) upon collection.
- In the field, samples will be the responsibility of and stay with the field technician or their designated representative as indicated on the chain of custody.
- Once samples have been collected they will be returned to the YRITWC office long with field data sheet. YRITWC will record the date, time and site name upon arrival of the samples.
- YRITWC staff will conduct secondary filtering of major ion samples using a nylon 0.45 micron filter.
- Samples will be refrigerated to maintain preservation temperature given in Table 1.
- YRITWC staff will then re-ice and ship samples to USGS Laboratories for analysis.
- The YRITWC Biologist, or their representative as indicated on the chain of custody, will be responsible for transporting samples to USGS approved analytical laboratory.
- The personnel from the certified laboratory will record the date and time the sample is received.
- At this point the samples will become the responsibility of the certified laboratory and will be subject to their sample custody and quality control procedures.

2.4. Analytical Methods Requirements

Documentation of methods used along with range, detection limits, precision and accuracy information is provided in Table 1.

2.5 Quality Control Requirements

Replicate samples will be taken at a rate of 1 per 10 samples obtained during the sampling period. Individual laboratories maintain strict quality control requirements as outline in their Quality Assurance Plans and Manuals. The QAQC and Project Director will be informed should replicates highlight problems at given locations. Data that do not meet project accuracy and precision objectives will not be entered into the Project data system and will be reported separately. The Project Director is responsible for determining the cause of data errors.

2.6 Instrument / Equipment Testing, Inspection and Maintenance

Field sampling equipment testing inspection and maintenance is the responsibility of the YRITWC Program Director. Laboratory analytical equipment will remain within the domain of the respective certified testing laboratory, and testing inspection and maintenance is the responsibility of the analytical laboratory.

2.7 Instrument Calibration and Frequency

Field equipment will be calibrated prior to each sampling event and factory calibration of the equipment will be done at the manufacturer recommendation. All calibration of field equipment will be based on the manufacturers direction.

2.7.1. General calibration and equipment check instructions

1. Calibrate the pH, conductance, and DO meters prior to each sampling.
2. Check calibration using pH buffers and conductance check standards.
3. Record observed values on field sheets and any additional comments.
4. If observed values are more then 10% of expected values, note on field sheet and alert the program coordinator. Record field measurements regardless.

2.7.1.1. pH meter calibration: (For use with YSI 600 meters)

1. Using the correct amount of pH 7 buffer standard (see Tables 1-4 in users manual) in a clean, dry or pre-rinsed calibration cup, carefully immerse the probe end of the Sonde into the solution. Allow at least 1 minute for temperature equilibration before proceeding.
2. From the Calibrate menu, select **ISE1 pH** to access the pH calibration choices and then press **2- 2-Point**.
3. Press **Enter** and input the value, appropriate for the temperature, of the buffer (7 in this case) at the prompt. Press **Enter** and the current values of all enabled sensors will appear on the screen and change with time as they stabilize in the solution. Observe the readings under pH and when they show no significant change for approximately 30 seconds, press **Enter**.
4. The display will indicate that the calibration is accepted. Record the pH reading on the field sheet in the "calibration" section.
5. After the pH 7 calibration is complete, press **Enter** again, as instructed on the screen, to continue. Rinse the Sonde in water and dry the Sonde before proceeding to the next step.
6. Using the correct amount (see Tables 1-4 in users manual) of an additional pH buffer standard into a clean, dry or pre-rinsed calibration cup, carefully immerse the probe end of the Sonde into the solution. Allow at least 1 minute for temperature equilibration before proceeding.
7. Press **Enter** and input the value of the second buffer at the prompt. Press **Enter** and the current values of all enabled sensors will appear on the screen and will change with time as they stabilize in the solution. Observe the readings under pH

and when they show no significant change for approximately 30 seconds, press **Enter**.

8. After the second calibration point is complete, press **Enter** again, as instructed on the screen, to return to the Calibrate menu.
9. Rinse the Sonde in water and dry. Thoroughly rinse and dry the calibration containers for future use.
10. **NOTE:** The majority of environmental water of all types has a pH between 7 and 10. Therefore, unless you anticipate a pH of less than 7 for your application, YSI recommends a two-point calibration using pH 7 and pH 10 buffers.

pH meter calibration: (For use with Hanna pocket meters)

1. Rinse all 3 jars that will be used for calibration. Rinse one jar with a small amount of pH 7, rinse one jar with small amount of pH 10, rinse one jar with small amount to Conductance solution standard 1413.
2. Power on the unit by pressing the power/mode button. Wait for the unit to fully power on.
3. Press the Set/Hold button to change the display to pH. In the upper right corner of the display a "pH" will appear.
4. Place a approx. 2 inches of pH 7 solution in the pH 7 jar. Place approx. 2 inches of pH 10 solution in the pH 10 jar. Place approx. 2 inches of Conductance solution 1413 in the Conductance solution 1413 jar.
5. Remove cap from the meter
6. Press and **hold down** the power/mode button. "OFF" will appear on the screen, keep holding down the button until "CAL" appears on the screen. Release the button as soon as the "CAL" appears. "USE" will appear at the bottom of the screen.
7. When the screen displays "USE" on the bottom of the screen place the meter in the pH 7 solution.
8. When the screen displays "4.01 USE" rinse the tip of the meter with a small amount of pH 10.
9. Place the tip of the meter in the pH 10 jar. The meter will atomaticly calibrate to pH 10 after a few seconds the display will read 10.03 or very close to this number. The pH calibration is now complete.

2.7.1.2. Conductance meter calibration (for use with YSI 600 meters):

1. This procedure calibrates conductivity, specific conductance, salinity, and total dissolved solids.
2. Place the correct amount (see Tables 1-4 in users manual) of 1.413 mS/cm conductivity standard into a clean, dry or pre-rinsed calibration cup.
3. Before proceeding insure that the sensor is as dry as possible. Ideally, rinse the conductivity sensor with a small amount of standard that can be discarded. Be certain that you avoid cross-contamination of standard solutions with other solutions. Make certain that there are no salt deposits around the oxygen and pH/ORP probes, particularly if you are employing standards of low conductivity.
4. Carefully immerse the probe end of the Sonde into the solution. Gently rotate and/or move the Sonde up and down to remove any bubbles from the conductivity cell. The probe must be completely immersed past its vent hole. Using the recommended volumes from the table in the previous subsection should insure that the vent hole is covered.
5. Allow at least one minute for temperature equilibration before proceeding.
6. From the Calibrate menu, select **Conductivity** to access the Conductivity calibration procedure and then **1- SpCond** to access the specific conductance calibration procedure. Enter the calibration value of the standard you are using (mS/cm at 25°C) and press **Enter**. The current values of all enabled sensors will appear on the screen and will change with time as they stabilize.
7. Observe the readings under Specific Conductance or Conductivity and when they show no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted. Record the specific conductance value on the field sheet in the "calibration" section. Press **Enter** again to return to the Calibrate menu.
8. Rinse the Sonde in tap or purified water and dry the Sonde.
9. **NOTE:** The YSI conductivity system is very linear over its entire 0-100 mS/cm range. Therefore, it is usually not necessary to use calibration solutions other than the 1.413 mS/cm reagent recommended above for all environmental applications from low conductivity freshwater to seawater.

Conductance meter calibration (for use with Hanna pocket meters):

1. Rinse all 3 jars that will be used for calibration. Rinse one jar with a small amount of pH 7, rinse one jar with small amount of pH 10, rinse one jar with small amount to Conductance solution standard 1413.

2. Press the Set/Hold button to display the specific conductance screen. In the upper right hand corner of the display "µs" will appear.
3. Rinse the tip of the meter with a small amount of Conductance standard 1413.
4. Hold down the power/mode button until "CAL" appears. Release the button as soon as "CAL" appears.
5. The screen will display "1413 USE"
6. Place the tip of the meter in the Conductance calibration solution 1413
7. When the display does not display "USE" the calibration is complete
8. Rinse the tip of the meter with tap water and replace the cap.

2.7.1.3. Dissolved Oxygen (DO) meter calibration (for use with YSI 600) :

1. Place approximately 3 mm (1/8 inch) of water in the bottom of the calibration cup. Place the probe end of the Sonde into the cup. Make certain that the DO and temperature probes are not immersed in the water. Engage only 1 or 2 threads of the calibration cup to insure the DO probe is vented to the atmosphere. Wait approximately 10 minutes for the air in the calibration cup to become water saturated and for the temperature to equilibrate.
2. From the Calibrate menu, select **Dissolved Oxy**, then **1-DO %** to access the DO percent calibration procedure.
3. Calibration of dissolved oxygen in the DO % procedure also results in calibration of the DO mg/L mode and vice versa.
4. Enter the current barometric pressure in mm of Hg. (Inches of Hg x 25.4 = mm Hg).
5. *Note:* Laboratory barometer readings are usually "true" (uncorrected) values of air pressure and can be used "as is" for oxygen calibration. Weather service readings are usually not "true", i.e., they are corrected to sea level, and therefore cannot be used until they are "uncorrected". An approximate formula for this "uncorrected"
6. (where the BP readings MUST be in mm Hg) is: True BP = [Corrected BP] – [2.5 * (Local Altitude/100)]
7. Press **Enter** and the current values of all enabled sensors will appear on the screen and change with time as they stabilize. Observe the readings under DO%. When they show no significant change for approximately 30 seconds, press **Enter**. The screen will indicate that the calibration has been accepted. Record the reading on the field sheet in the "calibration" section. Press **Enter** again to return to the Calibrate menu.
8. Rinse the Sonde in water and dry the Sonde.

2.7.2 Field measurements: pH, conductance, DO, water Temp, air temp

From boat:
Pick a location where river flow is not contaminated upstream point source pollution (sewage effluent, docks, boat landings, bridges, etc). We prefer that you chose a site

located above your community. Position boat as close to center of the river as possible pointing bow upstream and holding the same position. If the river velocity is high, you may have to let the boat drift with the current (cavitations with certain meters). Make all field measurements upstream from the boat and away from the motor, if the boat is equipped with one.

From river bank:
Pick a location where river flow is not affected by eddies (straight river reach) or contaminated upstream point source pollution (sewage effluent, docks, boat landings, bridges, etc). Wade out into current as far but as safely as possible. Always make field measurements with probes positioned upstream of you.

With the YSI 600/650 MDS we will store files electronically and also write down all results on data sheets.

Water Temp: open water
The best water temp will be where the sample was collected. This may not be possible depending on equipment. If that is not possible, then measure the temp of the water from a holding bottle as soon as the container has a sufficient amount of water to make a measurement, aprox 200-1000 mL. Record the water temp on the field sheet.

Under ice measurements: water temp.
The procedure of collecting under ice water temperature is the same as during the open water season. The water will likely be very close to 0 C.

pH and conductance: open water
The best readings will be where the sample was collected. This may not be possible depending on equipment. The next best measurement will be from the holding bottle. Using glass or plastic beakers/cups, pour just enough to get the measurements (500-1000 mL). Record the pH and conductance on the field sheet.

Under ice measurements: pH and conductance
When using the Hannah pocket meter **do not** measure pH and conductance in the ice hole. These will be inaccurate readings. Dispense water into the holding container (500-1000 mL) using the hand pump. Place tip of meter in container and record the reading on the field sheet.

Dissolved Oxygen:
Place the meter in the water and allow the meter to acclimate for 3 to 5 min. Record the readings on the field sheet.

Under ice measurements: Dissolve Oxygen
DO is not a critical parameter at under ice conditions. However, if you have the capability of measuring DO, please do so.

2.7.2.1. Quality Control

The YSI Sonde 600 system will be calibrated according to the manufacturers instructions (see Section 2.7) prior to each use. Results of the calibration will be recorded on the field sheet. Analysis will be performed twice on each sample. If results vary by more than 0.5%, a third test will be performed. If no two successive readings fall within the ±0.5% precision objective, equipment will be re-calibrated and the procedure will be repeated. All results will be recorded on the field sheet, however only the final determined value will be entered into the project data system.

2.7.2.2. pH, Conductivity, salinity, DO and temperature Measurements (for use with YSI Sonde 600/YSI650 MDS):

1. Store data electronically from a single site and write down the information manually in the field.
2. To log this data point to the Sonde memory, the user highlights the **Sonde run** selection in **the 650 Main menu** and presses **Enter** to begin data display.
3. The user places the Sonde in the water and watches the readings on the 650 display until they are stable.
4. When stable, the **Log one sample** selection in the Sonde logging window (upper right) is highlighted as shown above and the **Enter** key is pressed. The header changes from "Run" to "Sample logged" to confirm that the data storage to sonde memory was successful and then returns automatically to the **Sonde run** display.
5. The single data point is stored in the Sonde memory under the automatically generated file name NONAME1.
6. The file can be viewed by selecting **Sonde menu** from the 650 Main menu and pressing **Enter**.
7. To view the data on return from the site, the user selects the sonde menu **File** selection, presses **Enter** to confirm the entry, and then highlights the **View file** selection and presses **Enter**. Following these instructions generates a display of the data that is stored in the Sonde memory under automatically generated name NONAME1. Use the right/left arrow keys to scroll horizontally to view all of the data.
8. The user manually records the data (pH, DO, Conductivity, salinity and temperature) from the site and turns the system off.

2.7.3 Water sample collection

Wear Latex or Nitrile disposable gloves during sampling. Avoid touching the boat or anything besides sampling equipment. If gloves have become compromised, dispose and put on a new pair.

From boat:
Pick a location where river flow is not contaminated upstream point source pollution (sewage effluent, docks, boat landings, bridges, etc). Position boat as close to center of

the river as possible pointing bow upstream and holding the same position. Make collect samples off the bow or near the front of the boat.

From river bank:
Pick a location where river flow is not affected by eddies (straight river reach) or contaminated upstream point source pollution (sewage effluent, docks, boat landings, bridges, etc). Wade out into current as far but as safely as possible. Always collect samples with sample bottles positioned upstream of you.

Under ice sampling:
1. Find the centroid of flow (mid channel) where you can best estimate the most water is passing.
2. Drill a hole in the ice (at least 6") using an auger. Manual augers are preferred but gas-powered augers are also acceptable.
3. Clear the hole of loose ice as best you can. Use the manual under ice bulb sampler to collect a sample.
4. Drop the long end of the line with the brass weight down the hole so that it is well below the bottom of the ice.
5. Squeeze the bulb with it in an upright position for about 2 minutes. This will flush the sampler and also flush air bubbles.

2.7.3.1. Filtered Water: (DOC, Major Ions, Nutrients)

Open water sampling:
1. Remove the cap from the tip of the syringe and save. Rinse a 60 ml plastic syringe three times with water by sucking up about 30 ml of river water. Open the syringe to full capacity and shake for 5 seconds before discarding. This process must be repeated three times.
2. Fill the syringe by drawing river water from at least 6-12" (15.24-30.45 cm) below the water surface.
3. Screw the GMF filter on to the syringe. Make sure the connection is tight. Reuse the filter until for as many filtered samples as possible.
4. Filter river water into the vial. Apply a steady pressure to the syringe plunger filling the bottle to the "shoulder".
5. Cap vial TIGHTLY and record date, time, and site name on vial.
6. Record any observations or procedural mishaps in the comments section of the field sheet.

Under ice sampling: (DOC, Major Ions, Nutrients)
1. Rinse a 60 ml plastic syringe three times with water by sucking up about 30 ml of river water. Open the syringe to full capacity and shake for 5 seconds before discarding. This process must be repeated three times.
2. Have the syringe ready with plunger all the way in and the 3-way valve at the proper position to fill the syringe (there is an "off" indicator that will show the flow directions).

3. Squeeze the bulb and let the syringe fill to slightly past the 60 ml mark.
4. Close the syringe with the 3-way valve.
5. Disconnect the tubing from the syringe.
6. Follow procedure for open water sampling starting at step 3

2.7.3.2. Unfiltered water (Trace Metals and O18)

Open water sampling:

1. Fill the syringe by drawing river water from at least 6-12" (15.24-30.45 cm) below the water surface.
2. Empty the water into the bottle and repeat step one
3. Fill the bottle until a meniscus forms. Carfully screw on the cap. **There can be NO AIR BUBBLES in this sample.**
4. Label the bottle with the date, time, and site name
5. Record and observations or procedural mishaps in the "additional comments" section of the field sheet.

Under ice sampling:

1. Rinse a 60 ml plastic syringe three times with water by sucking up about 30 ml of river water. Open the syringe to full capacity and shake for 5 seconds before discarding. This process must be repeated three times.
2. Have the syringe ready with plunger all the way in and the 3-way valve at the proper position to fill the syringe (there is an "off" indicator that will show the flow directions).
3. Squeeze the bulb and let the syringe fill to slightly past the 60 ml mark.
4. Close the syringe with the 3-way valve.
5. Disconnect the tubing from the syringe.
6. Follow open water procedures starting with step 2.

2.7.3.3. Dissolved Gas (four 30 ml clear glass serum bottles with blue caps)

Open water sampling:

1. Rinse a 60 ml plastic syringe three times with water by sucking up about 30 ml of river water. Open the syringe to full capacity and shake for 5 seconds before discarding. This process must be repeated three times.
2. Carefully fill the syringe with bubble-free river water from 6-12 inches (15.24-30.45 cm) below the water surface. Tap the syringe while pushing slightly on the plunger to expel any bubbles.
3. Attach a 0.45 micron "GMF" filter to the syringe. Make sure the connection is tight.
4. Attach a needle to the filter, tightly. While pointing the syringe up, push on the plunger to expel air from the filter and needle, and to rinse the filter with a milliliter or so of water.
5. Applying a steady pressure to the syringe plunger, (and holding the serum bottle upside down) insert the needle through the serum bottle top and inject 15 milliliters of water into

the serum bottle (following the volumetric lines on the outside of the syringe). Maintain pressure on the syringe plunger when removing the needle from the serum bottle so gas does not move back into the syringe. Note: one needle **must** be used for **both** "acidified" serum bottles. A separate needle must be used for the "non-acidified" serum bottles.
6. Record date, time, site name, pH and water temperature on each bottle.
7. Remove the needle carefully, cap it and dispose of safely (sharps bottle)
8. Remove the used GMF filter from the syringe and dispose of.
9. Record any observations or procedural mishaps in the "additional comments" section of the field sheet.

Under ice sampling:
1. Have the syringe ready with plunger all the way in and the 3-way valve at the proper position to fill the syringe (there is an "off" indicator that will show the flow directions).
2. Squeeze the bulb and let the syringe fill to slightly past the 60 ml mark.
3. Close the syringe with the 3-way valve.
4. Disconnect the tubing from the syringe.
5. Invert the syringe and tap any air bubbles to the valve end and dispense all the air by gently plunging (don't worry about tiny bubbles, you can never get all the air)
6. Follow procedure for open water sampling starting at step 3

Note: This work needs to be done quickly as the gasses will diffuse from the plastic. It is very difficult to do this work in sub-freezing temps. If the needles keep freezing, move operations inside if possible, again, working quickly and note on field sheets

2.7.3.4. Secondary Filtering: (Anion and Cations)
1. Rinse glass beaker with DI water (3x)
2. Rinse syringe with DI water (3x)
3. Empty sample into beaker.
4. Fill syringe w/ sample water
5. Add .45 micron nylon filter to tip of syringe
6. Run water through filter back into bottle
7. Repeat steps 4 – 6 as many times as needed

Note: this procedure is to be repeated for each sample bottle.

IMPORTANT: Store all samples in the refrigerator until shipment.

2.7.3.5. Shipment

Pack samples CAREFULLY, use foam sleeves for glass vials and place all bottles in the large Ziploc bag. Field sheets should be folded in quarters with the date, time, and site name facing out. Place the folded field sheet in the small Ziploc bag and place the small Ziploc bag inside the large Ziploc bag so the date, time, and site name is visable through the bags. Place a frozen ice pack in the cooler with the sample. Turn the shiping label

over so it reads “TO: YRITWC Science Program”. Tape the cooler shut and drop sample off at the couriers office.

Contact the YRITWC staff and inform them that a shipment is being sent. YRITWC staff will need all relevant information regarding the shipment (courier, date / time of drop off, flight number and expected arrival time). Shipments are best sent using local airlines.

Bryan Maracle	T.B.A
Office Phone: 907 451-2546	Office Phone: 907 451-2538
Main Office: 907 451-2530	Main Office: 907 451-2530
	Home Phone:
Email: **bmaracle@yritwc.com**	Email:

IMPORTANT: Notify YRITWC with shipment details (carrier, arrival time, etc)

YRITWC will receive shipment, secondary filter major ions, re-ice and fed ex to:

Paul Schuster
USGS
3215 Marine Street, Suite E127
Boulder, CO 80303
(303) 541 3052

If more supplies are required or any questions, please contact:

Bryan Maracle at bmaracle@yritwc.com or (907) 451-2546

2.8 Data Acquisition Requirements

Required longitude and latitude information for monitoring sites is derived by using USGS topographic maps at 1:63,360 and confirmed using GPS coordinates taken at the site by the Biologist or environmental technician. Sites are plotted and spatially checked using a Geographic Information System (GIS) computer-mapping program (Arc view).

Historical water quality data on the sites will be collected and summarized. This data will be used in the site selection process. Additional water quality, fish and wildlife habitat, physical river characteristics and other data pertaining to the watershed will be gathered and utilized in writing the annual report. Historical data will be analyzed to assess direct comparability and may be qualified or excluded from trend analyses in annual reports.

Water quality data will be evaluated by comparison to state and federal water quality standards as applicable.

3. Data Management

Test procedures for all parameters will be documented on the field sheets. Test results will be recorded on the field data sheets (Appendix B). All observational data,

water quality data and field measurements will be recorded at the time of sampling and analysis.

The coordinator will review data sheets for precision, completeness, anomalous data and general problems. Data that appear to be in error or don't fall within the expected range will be brought to the attention of the Biologist for evaluation. The biologist will then check testing equipment and review procedures. If no procedural or equipment error can be identified a split sample may be taken from the site in question and sent for analysis at an outside, EPA certified lab.

Any problems found with data collected are noted on the Field Data sheet as well as in field logbook. The Project QA Officer and the Biologist will initial any changes to data. Data that do not meet project accuracy and precision objectives are not entered in the project data system and will not be used in project reports.

After review, data will be entered into the monitor data system. This system is accessed by a network of PC's in the YRITWC office and consists of a relational database in MS Access. The coordinator will complete an annual report summarizing all collected data. Computer data records as well as original data sheets will be maintained at the YRITWC office.

3.1 Reports

As described above, an annual report will be distributed to the TAC. This report will be in spreadsheet form and may include graphs and maps. A draft Baseline Database Report will be produced at the end of the year. Annual reports will include:

- Review of quality assurance protocols
- Spreadsheets detailing all data collected
- Graphs depicting test results for each parameter tested
- Review of historical data from each site
- Discussion of discernable trends
- Photographs of each sampling site
- GIS maps showing land use and other relevant information
- Conclusions with recommendations for futures sampling and monitoring efforts.

This report will be provided to all tribes and First Nations within the Yukon Watershed, YRITWC Steering Committee, ADEC, EPA and TAC members. Distribution by tribal governments will be at their discretion.

4. Data Validation and Usability

4.1. Data Review, Validation and Verification

The Project Officer and Biologist to determine if the data meet QAPP objectives through review all data collected. Decisions to reject or qualify data are made jointly by the Project Officer and Biologist.

4.2. Validation and Verification Methods

Field data sheets must be filled out completely and signed by the Biologist and/or Environmental Technician at the time of sampling and analysis. The Biologist will

review each data sheet for precision, missing or illegible information, errors in calculation and values outside of the expected range and initial each data sheet upon completing this review. Any questionable data will be brought to the attention of the Biologist for resolution according to the guidelines outlined. The Biologist will initial any changes made to data and any action taken as a result of the data review will be specifically recorded on the data sheet. The Biologist will compare data reports to original field data sheets to ensure accurate data entry and initial each data sheet to verify that review. The Biologist will also review data accuracy; precision and completeness objectives are being met.

The final report will include a discussion of any data quality problems. A member of the Technical Advisory Committee will be asked to review this report and offer suggestions for programmatic improvements.

4.3. Reconciliation with Data Quality Objectives

The Biologist will make calculations and determination for precision and completeness during the annual review process. The Biologist will make verification of data accuracy during quality control checks.

Results of precision, accuracy and completeness calculations will be included in the annual report along with discussion of any measures taken to resolve quality assurance problems.

If failure to meet project objectives is found to be unrelated to equipment, methods or procedural error, project specification may be revised. Revision to this QAPP will be submitted to the designated ADEC and USEPA quality assurance officers for approval.

5. Appendices

A. List of Technical Advisory Committee Members

Paul F. Schuster, **Technical Advisor/Partner**
Hydrologist
U. S. Geological Survey
3215 Marine Street, Suite E-127
Boulder, CO 80303-1066
Phone: (303) 541-3052
Fax: (303) 447-2505
email: pschuste@usgs.gov

Geoff Dates, **Quality Assurance Officer**
Phone: 907-274-9697
Fax: 907-277-5242
email:

Doug Dasher, **Technical Advisor**

B. Field Data Sheet

Yukon River Inter-Tribal Watershed Council

Date: _____-_____-_____

Time: _____

Site ID **Name:**

Technician(s):_____

Waterbody Name: _____

Latitude: _____
Longitude: _____
Elevation: _____

Weather Conditions Now (circle): overcast /clear /partly cloudy /cloudy, heavy/ steady/ intermittent rain, calm /breezy/ windy

Weather in Last 24 hours (circle): overcast/ clear/ partly cloudy/ cloudy, heavy/ steady/ intermittent rain, calm/ breezy/ windy

Equipment Brand: _____ / _____ Model: _____ / _____
(Fill second space if using 2 meters)

Calibration Data Air Temp (°C):

pH Calibration
pH 7 Buffer Reading: _____
pH 10 Buffer Reading: _____

Conductivity Calibration
Conductivity Standard (µS/cm):
Standard Reading (µS/cm):

2nd Meter Reading
Conductivity (µS/cm):
pH:

Dissolved Oxygen Calibration
Barometric Pressure (mmHg):

100% Saturation Value (mg/L):

DO Reading (mg/L):

Field Measurements Air Temp (°C):

Water Temperature (°C): /

Specific Conductance (µS/cm): /

pH: _____ / _____

Dissolved Oxygen (mg/L): /

Sample Collection Data

Bottle Description	Quantity/Size	Filter?	√ When Complete	Parameter
Serum Bottle	4 / 30mL	Yes	☐	Dissolved Gases
Amber Glass Vial	2 / 40mL	Yes		DOC
Brown Plastic Bottle	1 / 125mL	Yes		Anions
Clear Plastic Bottle	1 / 125mL	Yes		Cations
Brown Plastic Bottle	2 / 30mL	Yes		Nutrients
Clear Glass Bottle	1 / 60mL	No (*NO AIR)		Oxygen 18/Tridium

Sample Location Description (circle): mid-channel / streambank / other, riffle / pool / eddy
Flow Description (circle): isolated pools / trickle / < 5 gal per sec / > 5 gal per sec
Water Clarity (circle): clear / cloudy (> 4 " visibility) / murky (< 4" visibility)
Site Odor (circle): none / fresh algae / chlorine / rotten eggs / sewage / other
Other (circle): litter / foam or suds / oily sheen / algae and/or water plants

< = less than
> = greater than

Additional Comments

C. Sample Custody Form

Yukon River Inter-Tribal Watershed Council

815 2nd Ave Suite 201

Fairbanks AK 99701

www.yritwc.com

Sample Chain of Custody Form

Project Contact:	*Phone:*	*Page_____ of _____*
e-mail address:	*Fax:*	
Project ID:	*Comments:*	
Location:		
Sampled By:		

Sample ID	Sample Date/Time	Matrix	No. of Containers	Size of Container	Analysis Requested	Comments

Relinquished by:	*Date/Time*	*Received by:*	*To be completed by laboratory:* *Condition Sample received:* _____ *COC Seal Intact:____Yes_____No* *Temperature on Arrival_____ ℃* *Comments:*
Relinquished by:	*Date/Time*	*Received by:*	
Relinquished by:	*Date/Time*	*Received by:*	

Bibliography

Alaska Cooperatative Extension Service, *Alaska Native Village Drinking Water Protection Program Outreach, Quality Assurance Project Plan,* March, 2000.

State of Alaska, Dept. of Environmental Conservation, Dec. 1998. *A Plain English Guide to Alaska Drinking Water and Wastewater Regulations.*

Hach Company, DR/820, DR/850, and DR/890 *Portable Datalogging Colorimeter Instrument Manual, Cat. No. 48440-18,* 1997-1999.

Hach Company, *Portable Turbidimeter, Model 2100P Instrument and Procedure Manual,* 1991 – 1999.

Lower Kenai Peninsula Watershed Health Project, *Quality Assurance Project Plan,* August 1998.

YSI Incorporated, *YSI Model 63 Handheld pH, Conductivity, Salinity and Temperature System Operations Manual.*

YSI Incorporated, *YSI Model 95 Handheld Dissolved Oxygen and Temperature System, Operations Manual.*