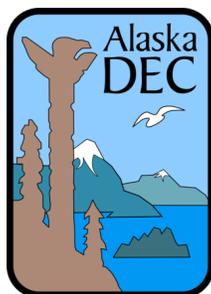


**GENERIC TIER 2 QUALITY ASSURANCE PROJECT PLAN
FOR
WATER QUALITY MONITORING
SAMPLING AND ANALYSIS ACTIVITIES**

February 1, 2011



**Alaska Department of Environmental Conservation
Division of Water**

A. PROJECT MANAGEMENT ELEMENTS

A.1 Title and Approvals:

Title: Generic Tier 2 Quality Assurance Project Plan For Water Quality Monitoring Sampling and Analysis Activities

Name: _____ Project Manager Phone: _____
Organization Name: _____ email: _____

Signature: _____ Date: _____

Name: _____ Project QA Officer Phone: _____
Organization Name: _____ email: _____

Signature: _____ Date: _____

Name: _____ 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: _____

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A.3 DISTRIBUTION LIST

This list includes the names and addresses of those who receive copies of the approved QAPP and subsequent revisions.

Example Table: Distribution List				
NAME	POSITION	AGENCY/ Company	DIVISION/ BRANCH/SECTION	CONTACT INFORMATION
	Project Manager			Phone: Email:
	Project Quality Assurance Officer			Phone: Email:
	Sampling Manager			Phone: Email:
	Lab Manager			Phone: Email:
	Data Manager			Phone: Email:
				Phone: Email:
	Project Manager	ADEC	Division of Water/	Phone: Email:
Richard Heffern	QA Officer	ADEC	Division of Water/ WQSAR/QA	907-465-5305 richard.heffern@alaska.gov
				Phone: Email:

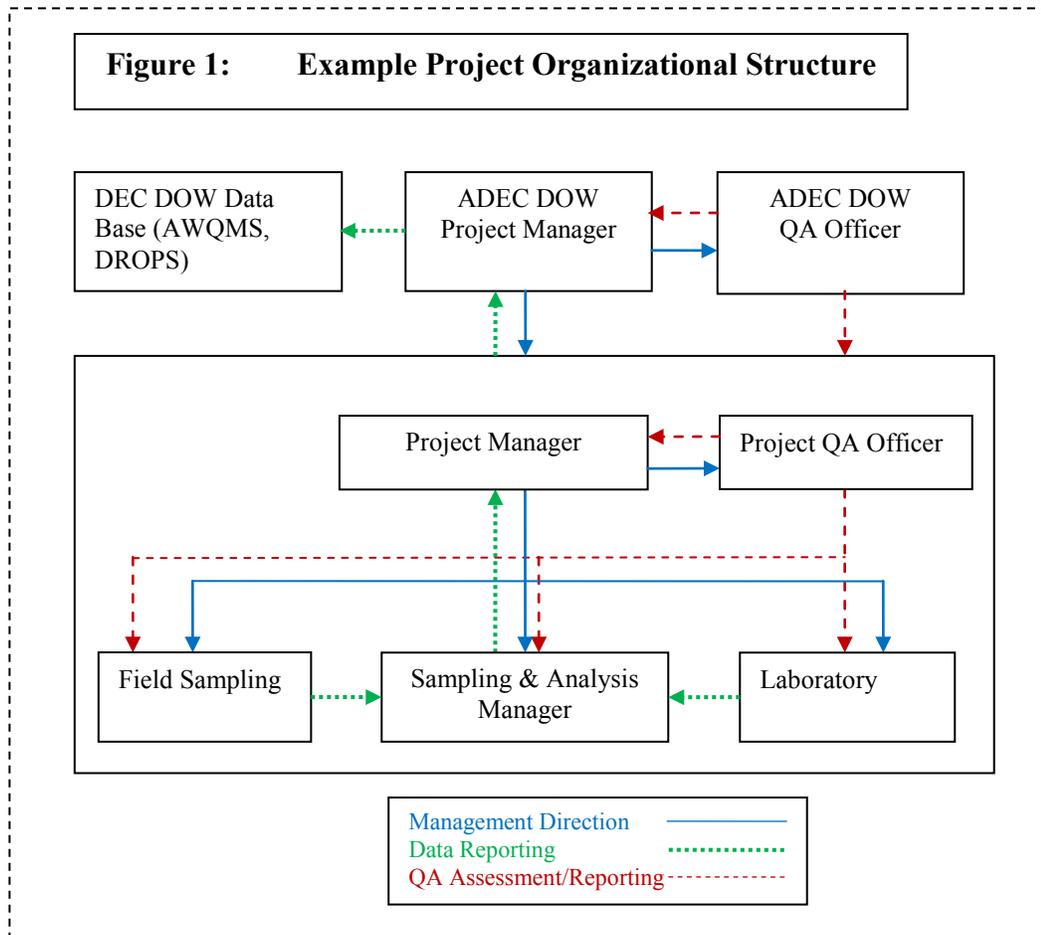
A.4 PROJECT TASK/ORGANIZATION

Duties and responsibilities of key individuals are listed below:

- Project Manager – Describe scope of responsibilities.
- Project QA Officer – Describe scope of responsibilities
- Sampling & Analysis Manager – Describe scope of responsibilities
- Field Sampling – Describe scope of responsibilities
- Laboratory Quality Assurance Manager/Officer – Responsible for QA/QC of water quality laboratory analyses as specified in the QAPP. Along with Laboratory Manager, the Lab QA Officer reviews and verifies the validity of sample data results as specified in the QAPP and appropriate EPA approved analytical methods
- Laboratory Manager – Responsible for the overall review and approval of contracted laboratory analytical work, responding to sample result inquiries and method specific details.

ADEC Staff/Division of Water:

- Project Manager -- 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.
- Quality Assurance Officer – Richard Heffern, responsible for QA review and approval of plan and oversight of QA activities ensuring collected data meets project's stated data quality goals.



A.5 PROBLEM DEFINITION/BACKGROUND AND PROJECT OBJECTIVES

A.5.1 Problem Definition

State the specific problem to be solved, decision to be made, or outcome to be achieved.

A.5.2 Project Background

Provide a brief background summary for the purpose of the monitoring project. Include sufficient information to provide historical, scientific and regulatory perspective. If previous monitoring data exists and is relevant to proposed monitoring project, provide summary of results in table format along with the appropriate numeric ADEC water quality standard/s (pollutant concentration: e.g., ground water, surface water, aquatic life freshwater, aquatic life marine water, etc). Explain how this data was used to rationalize the proposed monitoring plan.

A.5.3 Project Objective(s)

Define the overall objectives for this monitoring project. What is the purpose for collecting monitoring data, why is it being collected and how will this data be used to support the project’s purpose. If there are regulatory requirements governing the reason/s for collecting monitoring data, cite the specific federal and/or state statute/s. State how the proposed monitoring plan fulfills this requirement?

A.6 PROJECT/TASK DESCRIPTION and SCHEDULE

A.6.1 Project Description

Provide a summary paragraph of the work to be performed.

In table format list the parameters to be measured and recorded.

Samples may be analyzed in the field or in an ADEC-approved laboratory.

Note 1: ADEC certifies laboratories for drinking water and contaminated sites analysis only. At the present time, ADEC does not certify laboratories for water/wastewater analyses. However, an ADEC drinking water-approved laboratory lends credibility to a laboratory’s quality assurance and quality control processes). A list of ADEC-approved microbiological laboratories is available at: <http://www.state.ak.us/dec/deh/water/labs.htm> and for laboratories providing chemical analysis at: <http://www.state.ak.us/dec/deh/water/chemlabs.htm>.

Note 2: For microbiological analyses, only a laboratory with current ADEC drinking water certification that resides within Alaska may be used. Due to the short sample holding time (< 6 hours) labs outside of Alaska would not reasonably be able to receive and start the analysis as specified by the EPA water/wastewater approved microbiological method.

Note 2: For labs contracted outside of Alaska it is strongly recommended that the contracted laboratory have either NELAC and/or State certification (e.g., Washington State DOE (<http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html>)) for the respective water/waste water analytical methods.

Insert a large scale map showing the overall geographic location/s of field tasks. (Note in section B1, Sampling Process Design, include larger scale topographic map(s) identifying specific geographic location(s) of sampling sites.

A.6.2 Project Implementation Schedule

Example Table: Project Implementation Schedule				
Product	Measurement/ Parameter(s)	Sampling Site	Sampling Frequency	Time Frame
QAPP Preparation				
Field Sampling	DO, pH, Temp, Cond. Turbidity, Fecal Coliforms	River Road Mile 3 Site #1, upstream side of culvert, above outfall	Weekly	June – Sept
	DO, pH, Temp, Cond., Turbidity, Fecal Coliforms, TAHs	River Road Mile 3 Site #2, downstream side of culvert below outfall	Weekly randomized sample timeframe	June – Sept
	DO, pH, Temp, Cond., Turbidity, Fecal Coliforms, TAHs	Site # 3, Mile 3 River Road, Downstream of bridge	Weekly, randomized sample timeframe	June – Sept

Lab Analysis	Fecal Coliforms	All sites	Analyses within sample holding time requirements	June - Sept
Field Audit	Audit of field monitoring operations	All sites	< 30 days of project start-up	1/project
Data Analysis				
Data Review				
Data Report				

A.7 DATA QUALITY OBJECTIVES 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 WQS. For WQS pollutants, compliance with the WQS 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.

A.7.2 Measurement Quality Objectives (MQOs)

Measurement Quality Objectives (MQOs) are a subset of DQOs. MQOs are derived from the monitoring project's DQOs. 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

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 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 \geq MDL but \leq 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 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. Field and laboratory precision is measured by collecting blind (to the laboratory) field replicate or duplicate samples. For paired and small data sets project precision is calculated using the following formula:

$$Precision = \frac{(A - B)}{((A + B)/2)} \times 100$$

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

$$RSD = 100 * (\text{standard deviation}/\text{mean})$$

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 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. As with representativeness, data completeness is determined during project development and specified in the QAPP. 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 produced (e.g. spilled sample, etc).

Representativeness is determined during project development and specified in the QAPP. Representativeness assigns what parameters to sample for, where to sample, type of sample (grab, continuous, composite, etc.) and frequency of sample collection.

Comparability is a measure that shows how data can be compared to other data collected by using standardized methods of sampling and analysis. ***Comparability is shown by referencing the appropriate measurement method approved by as specified in federal and/or state regulatory and guidance documents/methods for the parameter/s to be sampled and measured*** (e.g., ASTM, Standard Methods, Alaska Water Quality Standards (<http://www.dec.state.ak.us/water/wqsar/wqs/index.htm>, EPA Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; National Primary Drinking Water Regulations; and National Secondary Drinking Water Regulations; Analysis and Sampling Procedures (<http://www.epa.gov/fedrgstr/EPA-WATER/2007/March/Day-12/w1073.htm> etc)). As with representativeness and completeness, comparability is determined during project development and must be specified in the QAPP.

For each parameter to be sampled/measured, list the measurement method to be used and the MQOs to meet the overall data quality objectives. This applies to both direct field measurements (e.g., field pH meters, DO meters, etc.) as well as samples collected for subsequent laboratory analyses.

This section is to be presented in table format along with the appropriate WQS numerical value! Please use example table format on following page to present MQO information.

Example Table: Project Measurement Quality Objectives (MQOs)

Group	Analyte	Method	MDL (µg/L)	PQL (µg/L)	Alaska WQS		Precision (RSD)	Accuracy (% Rec)
					Aquatic Life	Recreation/Drinking Water		
VOCs	Benzene	EPA 602 ^a	0.33	1.0	10 µg/l ^b		10	86-126
	Toluene	EPA 602 ^a	0.46	1.5			15	52-148
	Ethylbenzene	EPA 602 ^a	0.35	1.2			20	60-140
	Xylene, total	EPA 602 ^a	0.82	3.0			20	60-140
Settleable Solids	Settleable Solids	EPA 160.5	0.2 ml/L/hr	0.2 ml/L/hr	No measurable increase above natural condition	<5% increase in 0.1 mm to 0.4 mm fine sediment for waters with anadromous fish; <30% by weight of fines in gravel beds	NA	NA
Water Quality	DO	In situ (electronic probe) EPA 360.1	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
	pH	In situ (electronic probe) EPA 150.1	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	±0.1 pH units
	Temperature	In situ (electronic probe) EPA 170.1	NA	0.1°C	<20°C Migration routes < 15°C Spawning areas < 13°C Rearing areas < 15°C Egg /fry incubation < 13°C	<30°C	±0.2°C	±0.2°C
	Conductivity	In situ (electronic probe) EPA 120.1	NA	0-1: 0.001 1-10: 0.01 10-100: 0.1 (mS/cm)	NA	NA	± 10%	± 10%
Total Recoverable Inorganics	Aluminum	EPA200.8	0.33	1.0	750 µg/L Acute; 87 µg/L chronic	NA	20	80-120
	Iron	EPA200.7	2.7	50	NA Acute; 1000 µg/L chronic	NA	20	80-120
	Manganese	EPA 200.8	0.017	0.050	NA	50 µg/L ^d	20	80-120
	Selenium	EPA200.8	0.14	0.50	Fraction Dependent ^c	5.0 µg/L	20	80-120
Dissolved Inorganics	Arsenic	EPA200.8	0.044	0.15	340 µg/L Acute; 150 µg/L chronic	0.018 µg/L	20	80-120
	Cadmium	EPA200.8	0.062	0.20	Hardness Dependent ^c	NA	20	80-120
	Copper	EPA200.8	0.034	0.10	Hardness Dependent ^c	1300 µg/L	20	80-120
	Lead	EPA200.8	0.030	0.10	Hardness Dependent ^c	NA	20	80-120
	Mercury	EPA245.1	0.05	0.2	1.4 µg/L Acute; 0.77 µg/L Chronic	NA	20	80-120
	Zinc	EPA200.8	0.08	0.25	Hardness Dependent ^c	7400 µg/L	20	80-120
Hardness	Hardness	2340B	1000	1000	NA	NA	5	100
Nutrients	Nitrogen, Total Kjeldahl	4500-NH3C	112	400	NA	NA	30	80 - 120
	Total Phosphorous	4500 PE/4500-PB	25.7	51.4	NA	NA	8	80 - 120
Fecal Coliforms	Fecal Coliforms	EPA1604	1cfu/100mL	1cfu/100mL	NA	100 FC/100 mL	5	95 - 105

NA = None available.

^a EPA Method 602 for screening BETX. If BETX measured, confirm with EPA method 624 (GCMS).

^b Total Aromatic Hydrocarbons are BTEX (Benzene, Toluene, Ethylbenzene, and Xylene) only.

^c Metal standards for the protection of aquatic life are hardness dependent, the formulas for calculating the appropriate standard are:

	<u>Acute</u>	<u>Chronic</u>	<u>Total to Dissolved onversion Factor</u>
Cadmium	$1.0166(\ln \text{hardness}) - 3.924$	$0.7409(\ln \text{hardness}) - 4.179$	$1.136672 - [(\ln \text{hardness})(0.041838)]$ for acute $1.101672 - [(\ln \text{hardness})(0.041838)]$ 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	$e^{1.273(\ln \text{hardness}) - 1.460}$	$e^{1.273(\ln \text{hardness}) - 4.705}$	$1.46203 - [(\ln \text{hardness})(0.145712)]$ for acute $1.46203 - [(\ln \text{hardness})(0.145712)]$ for chronic

A.8 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

Describe in this section any specialized training or certifications needed by personnel in order to successfully complete the project. Discuss how training is to be provided and how the necessary skills are assured and documented as well as state how the organization implementing the data collection is qualified and competent. Training may be formal or obtained by “mentoring” provided by senior staff, and by coordination with the sub-contracted laboratory. Please summarize information as much as possible in table format (see example table below).

Sub-contracted laboratories performing analytical work must have the requisite knowledge and skills in execution of the analytical methods being requested. Information on laboratory staff competence is usually provided in each lab’s Quality Management (QMP) and/or Quality Assurance Plan (QAP). It is the responsibility of the agency and/or organization implementing the monitoring project to ensure that the contracted lab maintains on file with the ADEC DOW QA Officer a current copy (electronic preferred) of the lab’s QMP and/or QAP.

Example Table: Training					
Specialized Training/Certification	Field Staff	Lab Staff	Monitoring Supervisor	Lab Supervisor	Project QA Officer
Safety training	X	X	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 EPA Approved Field Measurement Method Training	X		X		X
ADEC Microbiological Drinking Water Certification	Certification for microbiological analysis is limited to the individually certified analyst.				
Specific EPA Approved Lab Analytical Method Training		X		X	X

A.9 DOCUMENTS AND RECORDS

In this section itemize in table format all the documents and records that will be produced, their disposition, including location and retention time. Please use the following example table format and categories to list appropriate documents and records. Record and document types are examples only.

Example Table: Project Documents and Records			
Categories	Record/Document Types	Location	Retention Time
Site Information	Network Description		
	Site characterization file		
	Site maps		
	Site pictures		
Environmental Data Operations	QA Project Plan		
	Field Method SOPs		
	Field Notebooks		
	Sample collection/measurement records		
	Sample Handling & Custody Records		
	Chemical labels, MSDS sheets		
	Inspection/Maintenance Records		
Raw Data	Lab data (sample, QC and calibration) including data entry forms		
Data Reporting	Discharge Monitoring Reports (DMRs, for permitted facility)		
	Progress reports		
	Project data/summary reports		
	Lab analysis reports		
	Investigation summary (CATS)		
	Inspection Report		
Data Management	Data management plans/flowcharts		
	Data algorithms		
Quality Assurance	Control charts		
	Data quality assessments		
	DMRQA and PE samples		
	Site audits		
	Lab audits		
	QA reports/corrective action reports		
	Response		
	Performance Evaluation Samples		

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

B. DATA GENERATION AND ACQUISITION

B.1 SAMPLING PROCESS DESIGN (Experimental Design)

In this section provide a thorough description of the following three major activities:

- Define the monitoring objective(s) and appropriate data quality objectives.
- Characterize the general monitoring location/s.
- Identify the site specific sample collection location(s), parameters to be measured and frequency of collection.

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

In this section describe in sufficient detail such that a person, knowledgeable with water quality monitoring but unfamiliar with the monitoring site and history, clearly understands the project’s breadth, scope, underlying rationale and monitoring plan design assumptions. Describe how these monitoring objectives relate to the appropriate data quality objectives.

Note: If the proposed project plan is as a result of previous monitoring efforts, the previous data is to be summarized in table format including parameters and concentrations measured, methods employed and how relate to the Alaska water quality standards criteria. Provide reference to previous data report if available or attach as appendix.

B.1.2 Characterize the General Monitoring Location/s

In this section provide a description of the monitoring locations and the rationale for their selection. Be sure to include a map providing an overview of all monitoring locations. Use a table to identify sample sites and the rationale for their selection (see example table below).

Example Table:		Site Location and Rationale	
Site ID	Latitude	Longitude	Site Description and Rationale

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

In this section describe site specific sampling locations, specific parameters to be measured, type of sample(s) to be collected and frequency of collection and representativeness of scale. Be sure to include topographic map(s) showing each monitoring site with sufficient gradient relief detail to characterize the watershed and how each sample site is representative of the monitoring project’s stated goals. Identify any structures or obstructions affecting sample collection and pollutant contamination, etc.

Note 1: Be sure to consider in the design plan how samples are to be collected to best represent environmental conditions of concern (e.g, consider how the temporal and spatial variables

of sample collection may provide differing results based upon sample collection times, sample depth and location within water (stream, lake, etc.) boundaries).

Note 2: In baseline monitoring, sample site locations should be determined to ensure both temporal and spatial representativeness. If possible, samples should be taken directly from the water body, rather than from a container filled from the water body.

Note 3: When water samples are taken in response to water pollution complaints, care should be taken to ensure the sampling sites are representative of the pollution event; e.g., at the pollution site, and above and below it.

Note 4: When a sample is taken at a wastewater facility discharge line, a volume of water equal to at least ten times the volume of the sample discharge line will first be discharged into a bucket or similar container, to clear the line of standing water and possible contamination. Since many wastewater treatment plants do not have discharge line spigots, it is acceptable to take the sample from the last effluent chamber

Use following table format to identify key “Site Representativeness” criteria for site selection.

Example Table: Criteria for Establishing Site Representativeness		
Site ID	Monitoring Purpose	Criteria for Site Selection

Use a table format to define the key parameters to be measured, types of samples (in situ measurements, grab, composite, etc), numbers of samples and collection frequency. See example below:

Example Table: Sampling Schedule (Parameters, Sample Type, Frequency)					
Site ID	Parameters to be measured	Sample Type (I, G, C, etc.)	Sampling Frequency	Sample Time	Total number measurements

I ≡ In Situ Measurement G ≡ Grab Sample C ≡ Composite Sample

Insert detailed map/s (topographic, batholithic, etc.) identifying location of monitoring sites.

B.2 SAMPLING METHOD REQUIREMENTS

Samplers should wear disposable gloves and safety eyewear, if needed, and observe precautions while collecting samples, remaining aware of the potential chemical and biological hazards present. The Project Sampling Staff collecting samples will take care not to touch the insides of bottles or lids/caps during sampling.

B.2.1 Sample Types

Samples will be listed as “composite” or “grab” on the Chain-of- Custody or Transmission Form and in field logbook or field data sheets.

B.2.2 Sample Containers And Equipment

In this section describe specific sample handling and custody requirements (If the results of a sampling program may be used as **evidence**, a strict written record (**Chain of Custody**) must be documented tracking location and possession of the sample/data at all times).

All sampling equipment and sample containers will be cleaned according to the equipment specifications and/or the analytical laboratory. Bottles supplied by a laboratory are pre-cleaned and must never be rinsed, and will be filled only once with sample.

For samples requiring cooling, a temperature blank shall accompany each cooler (min/max thermometer preferred). The thermometer shall be readable to at least 0.2°C.

Use example table below to list specific analyte/method criteria for parameter holding times and preservation methods. For parameters not listed in this table, see 40 CFR 136.6 for EPA-approved preservation methods and containers. 40 CFR 136.6 is available at:

<http://www.gpoaccess.gov/cfr/index.html>

Example Table: Preservation and Holding Times for the Analysis of Samples					
Analyte	Matrix	Container	Necessary Volume	Preservation and Filtration	Maximum Holding Time
Residue (settleable solids)	Surface Water	P, FP, G	1 L	Cool <6°C, do not freeze	48 hours
BTEX	Surface Water	G with FP lined septum	120 mL (3-40mL)	HCl to pH < 2; < 6°C, do not freeze	14 days
Cu, Cd, As, Pb (Dissolved)	Surface Water	P, FP, G	250 mL	Filtered within 15 minutes of collection using a 0.45 µm filter; HNO ₃ to pH < 2	6 months
Cu, Cd, As, Al, Pb (Total Recoverable)	Surface Water	P, FP, G	250 mL	HNO ₃ to pH < 2	6 months
Nitrate-Nitrite	Surface Water	P, FP, G	1 L	Cool <6°C; H ₂ SO ₄ to pH < 2, do not freeze	28 Days
Total Phosphorous	Surface Water	P, FP, G	1 L	Cool <6°C; H ₂ SO ₄ to pH < 2, do not freeze	28 Days
Fecal Coliform	Surface Water	G, PA	250 mL	Cool <10°C; do not freeze, 0.0008% Na ₂ S ₂ O ₃	6 hours 2 hrs lab prep (note: time not additive)
Hardness	Surface Water	P, FP, G	100 mL	HNO ₃ to pH < 2; < 4°C, do not freeze	6 months

P = polyethylene, FP = flouropolymer, G = glass, PA = autoclavable plastic

B.2.3 Sampling Methods

Surface Water Samples, Streams -

Sampling stations should always be located in the main stream channel. Because stream waters are usually well mixed vertically, often subsurface sampling at a convenient depth is adequate for collection of representative samples at a given point. Subsurface samples are taken within the upper meter or may be a composite of two or more strata. The sampler should be aware of thermal stratification due to discharges or tributaries.

Lakes, Ponds, Reservoirs-

A sufficient number of stations should be established in random locations to define adequately the parameters of concern. Usually the deepest part of the lake should be included as one of the stations.

Where concentrations of chemical or physical parameters can vary with depth, samples should be collected from all major depth zones, or water masses. In shallow waters (2 to 3 m), samples shall be collected at 0.5 to 1 m. In deeper water, samples should be collected at regular depth intervals.

Ground Water Wells-

Only grab samples may be obtained. The well should be purged of at least three casing volumes of water before sample collection, and the purged well should be allowed sufficient time to equilibrate and fines to settle. If a bailer is used, it should be slowly lowered and raised to minimize disturbances. Samples should be taken as close as possible to the water level, unless analysis indicates that contamination is at a different depth. All sampling equipment must be certified clean by the laboratory providing it, or rinsed with analyte-free distilled or deionized water. A equipment blank, a portion of this rinsate, should be collected into a separate container and analyzed along with the other groundwater samples.

All previously used sampling equipment must be properly decontaminated before sampling and between sampling locations to prevent introduction of cross-contamination. Washwater and rinsate solutions must be collected in appropriate containers and disposed of properly in accordance with federal, state, and local regulations. Bailing strings and wires and other disposable sampling tools must be properly disposed of after use at each well. For more information on groundwater monitoring and monitoring wells, see the ADEC SPAR Underground Storage Tank Procedures Manual, Section 4, Sampling Procedures Nov. 7, 2002 at: http://dec.alaska.gov/spar/ipp/docs/ust_man02_10_07.pdf

Note 1: Bailers should not be used for collecting metal samples due to potential introduction of metal contaminants to the sample.

Note 2: Peristaltic pumps should not be used for collection of VOC samples due to potential loss of volatile components.

Grab Samples – Sample bottles will be filled sequentially, normally being filled to the shoulder of the bottle, leaving a small space for expansion and mixing. Note that some sample types such as volatile organic compounds and fecal coliform bacteria have specific bottle filling requirements. The laboratory will provide sampling instructions with the sample bottles. If necessary, samplers will consult with the laboratory regarding sampling procedures.

Composite Samples – Samples will be composited directly into the sample bottles and collected sequentially. Between composite aliquots, bottles will be kept in a cooler with ice, to reach and maintain a sample temperature of 4 +/-2°C. The time of the initial portion of the composite, composite intervals, and the final compositing time will be noted in the field logbook or data sheets. Sample time listed on the Chain-of- Custody or Transmission Form and the sample bottle will be the time of the final sample composite portion.

B.3 SAMPLE HANDLING AND CUSTORY REQUIREMENTS

B.3.1 Sampling Procedures

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

B.3.2 Sample Custody Procedures

In this section describe any chain of custody (COC) procedures if required. Include example COC forms and COC SOP as an appendix to the QAPP.

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. Staff should receive the necessary training for shipping samples or consult with the sub-contracted laboratory for shipping instructions.

Holding time limitations must be considered when decisions are made regarding sampling and shipping times.

B.4 ANALYTICAL METHODS AND REQUIREMENTS

In this section provide the laboratory's Quality Assurance Plan (QAP) and applicable standard operating procedures (SOPs) for each parameter to be measured. If the lab has a current QAP and relevant SOPs on file with ADEC DOW QA Officer, these can be specifically referenced in this section. If not, it is responsibility of the monitoring project manager to ensure the lab's QAP and relevant SOPs are included (as attachments) to the monitoring project's QAPP.

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*. Reference the Project's MQO table (section A7) of this QAPP for list of parameters of concern, approved analytical methods, method-specific detection and reporting limits, accuracy and precision values applicable to this project. 40 CFR, Part 136.6 lists other regulated pollutant parameters not listed in the MQO Table (section A7).

Under direction of the Project Manager, project staff will ensure that all equipment and sampling kits used in the field meet EPA-approved methods.

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.

In this section define the quality control activities that will be used to control the monitoring process to validate sample data. Use separate tables to define field QC measurements and Lab QC measurement and their criteria for accepting/rejecting project specific water quality measurement data.

B.5.1 Field Quality Control (QC) Measures

Quality Control measures 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 specifications, and field Standard Operating Procedures (SOPs).
- Chemical reagents and standard reference materials are 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 Blind (to the laboratory) samples (1 replicate/10 samples).
- Field replicate measurements (1 replicate measurement/10 field measurements).

Field Replicate measurements and Field Replicate samples should generally be equal to 15% of total field and/or lab measurements or at least 1/sampling event, whichever is greater. Use the table below to characterize field QC types, frequency and acceptance criteria limits.

Example Table: Field Quality Control Samples				
Field Quality Control Sample	Measurement Parameter	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Field Blank				
Trip Blank				
Field Replicate (Blind to Lab)				
Field Replicate Measurement				
Calibration Verification Check Standard				

B.5.2 Laboratory Quality Control (QC) Measures

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

Quality Control in laboratories 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 laboratories 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.

Sub-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 project 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 sub-contracted laboratory to resolve the issue and take appropriate corrective action/s.

Example Table: 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				
Trip Blank				
Field Replicate				
Lab Blank				
Lab Fortified Blank				
Calibration Verification Check Standard				
Continuing Calibration Verification Check Standard				
Matrix Spike/Matrix Spike Duplicate				
Lab Duplicate Sample				
External QC Check Standard				
Surrogate Standard				

B.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE REQUIREMENTS

This section describes the procedures and criteria used to verify that all instruments and equipment are acceptable for use.

Prior to a sampling event, all sampling instruments and equipment are to be tested and inspected in accordance with the manufacturers' specifications. All equipment standards (thermometers, barometers, etc) are calibrated appropriately and within stated certification periods prior to use.

Monitoring staff will document that required acceptance testing, inspection and maintenance have been performed. Records of this documentation should be kept with the instrument/equipment kit in bound logbooks or data sheets.

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.

B.7 INSTRUMENT CALIBRATION AND FREQUENCY

Field instruments shall be calibrated where appropriate prior to using the instruments. For example, pH meters shall be calibrated according to the manufacturer's specifications using pH buffers at 4.0, 7.0 (mid-range) and 10.0 that are within their certification period (expiration date has not lapsed). If

equipment and/or kits require calibration immediately prior to the sampling event, the calibration date will be recorded in the operator's field logbook or field data sheets. When field instruments require only periodic calibration, the record of this calibration should be kept with the instrument. The project manager will delegate a field project team member to ensure that instruments are calibrated correctly and appropriate documents recorded and retained.

Contracted and sub-contracted laboratories will follow the calibration procedures found in its QAP and the laboratory's Standard Operating Procedures (SOPs). Specific calibration procedures for regulated pollutants will be in agreement with the respective "EPA Approved" Clean Water Act Pollutant methods of analysis. Field and/or Laboratory calibration records will be made available to ADEC upon request.

B.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

This section describes how and by whom supplies and consumables (e.g., standard materials and solutions, filters, pumps, tubing, sample bottles, glassware, reagents, calibration standards, electronic data storage media, etc.) are inspected and accepted for use in the monitoring project.

All reagents, calibration standards, and kit chemicals are to be inspected to ensure that expiration dates have not been exceeded prior to use in the monitoring project.

All sample collection devices and equipment will be appropriately cleaned prior to use in the monitoring project.

All sample containers, tubing, filters, etc. provided by a laboratory or by commercial vendor, will be certified clean for the analyses of interest. The sampling manager/person will make 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.

No standard solutions, buffers, or other chemical additives should be used if the expiration date has passed. It is the responsibility of the sampling manager or his/her designee to keep appropriate records, such as logbook entries or checklists, to verify the inspection/acceptance of supplies and consumables, and restock these supplies and consumables when necessary.

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)

In this section identify the type of data needed for project implementation or decision-making obtained from non-measurement sources such as maps, charts, GPS latitude/longitude measurements, computer data bases, programs, literature files and historical data bases. It describes the acceptance criteria for the use of such data and specifies any limitations to the use of the data. If data of known and accepted quality is to be modeled to predict water quality impacts, the specific model of use is to be identified, referenced and justified.

B.10 DATA MANAGEMENT

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 to the respective ADEC Division of Water Program Office. It also includes/discusses the control mechanism for detecting and correcting errors. Please include a flow chart (see example at end of section) as well as a detailed narrative of the monitoring project's data management process.

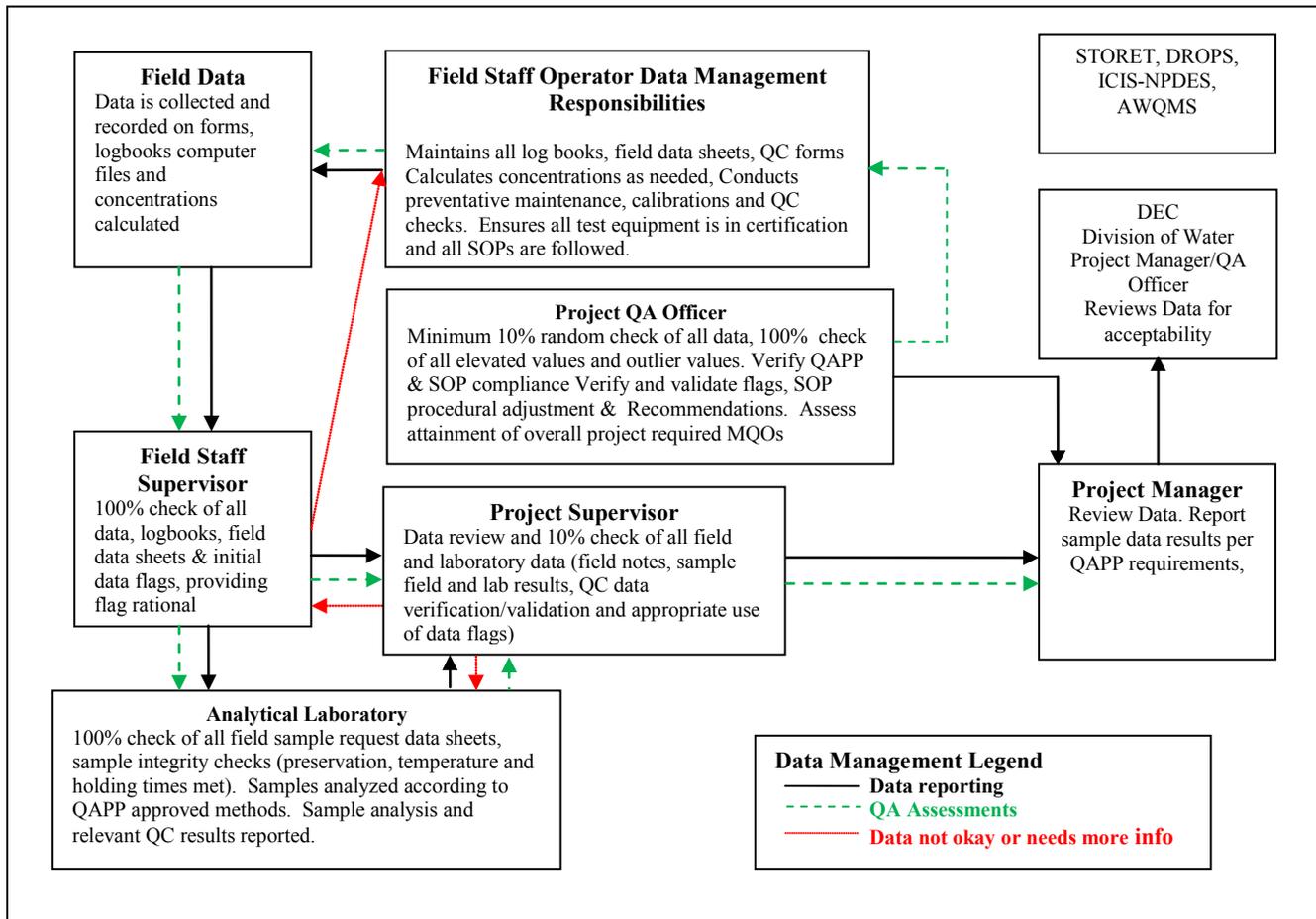
Various people are responsible for separate or discrete parts of the data management process:

- The field samplers are responsible 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 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 are reported to the sampling coordinator/supervisor/project supervisor.
- Secondary reviewers (sampling coordinator/supervisor/project supervisor) are responsible for QC the review, verification and validation of field and laboratory data and data reformatting as appropriate for reporting to STORET, AQMS, ICI-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
- DEC DOW Project Manager/QA Officer/AQS data entry staff conducts a final review (tertiary review) and submits the validated data to STORET, AQMS, ICI-NPDES, DROPS as appropriate.

An example Data Management Flow Chart at the end of this section provides a visual summary description of the data flow/management process for environmental data collected in support of ADEC's Division of Water decision making processes. Please revise as appropriate for the specific monitoring project.

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 will be retained by the contract laboratory for a minimum of five years. Project records will 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 each QAPP.



C. Assessments

C.1 ASSESSMENTS AND RESPONSE ACTIONS

The following guidance is provided for designing the appropriate QA assessment activities for a Tier 2 Water Quality Monitoring QAPP. Each monitoring project is different, has different intended data uses, different parameters to be measured and different project budgets. The key is to design an appropriate strategy to evaluate the overall monitoring system (data collection, analysis and reporting) with some level of confidence to independently substantiate the end-use quality data required by the monitoring project.

Assessments are **independent** evaluations of the monitoring project that are performed by the Project's QA Officer or his/her designee. For Tier 2 QAPPs, assessments may include (but are not limited to)

any of the following: on-site field surveillance, on-site laboratory audits, performance evaluation samples, blind sample duplicates/replicates (precision samples), field split samples, data quality audits, data reviews. The number and types of assessments are dependent upon the monitoring project's intended data uses.

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

Generally, monitoring projects requiring high end use quantitative data results for comparison to Alaska's water quality standards (e.g., for compliance monitoring, listing/de-listing of impaired waters, etc.) need more frequent and varied assessments to provide a more thorough and independent validation that the monitoring project did actually capture high end use quality data. Monitoring projects collecting samples for subsequent laboratory analysis need more types of assessments than just project field measurements to independently evaluate the overall monitoring system. Example QA Assessments are:

Field Assessments (each pollutant)

- Precision (replicate) sample measurements. Project should have minimum of 3 paired measurements/project or 10% of project samples, whichever is greater. Replicate measurements should be evenly spaced over project timeline. Precision criteria to be specified in the project's Measurement Quality Objectives (MQO) table, see section A7.

Field samples collected for subsequent laboratory analysis (each pollutant)

- Blind replicate samples for each pollutant to be measured. Project should have minimum of 3 paired measurements/project or 10% of project samples, whichever is greater. Replicate samples should be evenly spaced over project timeline. Precision criteria to be specified in project's MQO table, see section A7.
- Sample splits (one split sent to lab analyzing project samples, other split sent to a reference lab).
- Matrix spike duplicates (MSD) (assesses total measurement bias for project – both precision & accuracy). Frequency of MSDs usually specified by analytical method. Accuracy and precision of criteria for each pollutant and analytical method to be specified in the project's MQO table, see section A7.
- 3rd party performance evaluation (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 must be analyzed by a current DEC EH Drinking Water certified lab (<http://www.dec.state.ak.us/eh/lab/certmicrolabs.aspx>) for the methods of interest. For those microbiological methods not covered under the DEC EH Lab DW certification program, the microbiological lab will enroll in an approved PT study for the microbiological method of interest (see above link for approved NELAC PT vendors). Laboratory 3rd 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 responsibility of the laboratory to enroll itself in these blind PT studies with the results mailed/emailed directly to the DEC DOW Water Quality Assurance Office 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 self-enrolled in a NELAC certified PT water/wastewater study at a frequency of 1/year.

On-Site Assessments

- 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

- 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.

C.1.2 Lower Quality End-Use Tier 2 Monitoring Data

Generally low quality end –use Tier 2 monitoring projects not structured for making determinations for compliance with Alaska's Water Quality Standards or requiring only field measurements (but no subsequent laboratory analysis) need minimal QA oversight. Example projects would be: field measurements of DO, pH, conductivity, turbidity, TSS (Imhoff cones) and stream flow measurements. Example QA assessments are:

Field Assessments (each pollutant)

- Precision (duplicate/replicate) sample measurements. Project should have minimum of 3 paired measurements/project or 10% of project samples, whichever is greater. Replicate measurements should be evenly spaced over project timeline. Precision criteria to be specified in MQO table, see section A7.

On-Site Assessments

- Inspection of field measurement activities for compliance with QAPP requirements.

Project Data Assessments

- QA review of project field measurement data results.
- Calculation of monitoring project's overall achieved precision, accuracy and data completeness compared to QAPP defined precision, accuracy and data completeness goals

C.2 REVISIONS TO QAPP

Annually the QAPP will be reviewed and revised as needed. 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, sampling manager, contracted laboratories), QAPP distribution list and/or minor editorial changes.

Revisions to the QAPP that affect stated monitoring Data Quality Objectives, Method Quality Objectives, method specific data validation "*critical*" criteria and/or inclusion of new monitoring methods must solicit input/ and pre-approval by DEC DOW QA Officer/DEC Project Management before being implemented.

C.3 QA REPORTS TO MANAGEMENT

Use the following table to describe assessment types, frequency, content, responsible individual/s, and distribution of assessment reports to management and other recipients and actions to be taken.

Example Table: 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	✓	
3 rd Party PT (DMRQA, etc.) Audit Report	Description of audit results, methods of analysis and any recommendations	Written text and charts, graphs displaying results	ProjectQA Officer/auditor	✓	✓
Corrective Action Recommendation	Description of problem(s); recommended action(s) required; 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	ProjectQA 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, VERIFICATION AND VALIDATION REQUIREMENTS

The purpose of this section is to define the criteria that will be used to review and validate—that is, accept, reject or qualify data in an objective and consistent manner. It is a way to decide the degree to which each data item has met its quality specifications as described in Element B above.

D1.1 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 (method specific data validation criteria).

D1.2 Data Verification

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.

D1.3 Data Review

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.

D.2 VERIFICATION AND VALIDATION METHODS

In this section describes the process for validating and verifying data. Discusses how issues are resolved and identify the authorities for resolving such issues. Describe how the results are to be conveyed to the data users. This is the section in which to reference examples of QAPP forms and checklists (which could be provided in the appendices). Any project-specific calculations are identified in this section.

D2.1 Validation Methods

Data validation determines whether the data sets meet the requirements of the project-specific intended use 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 specification outlined in this QAPP. Raw field data will be maintained by the Program staff who collect it. 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 3 years.

The summary of all laboratory analytical results will be reported to the Project supervisor/manager staff. 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 Project Manager with the data results. Completed Chain-of-Custody or Transmission forms (if required) will be sent back from the laboratory to the Project Manager.

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 project manager, project staff will document any QA/QC problems and QA/QC corrective actions taken .

The Project Manager/monitoring supervisor 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. Sample results provided by the laboratory, will be verified and validated by the laboratory QA Officer prior to issuing the laboratory report, and will become part of the permanent file for the monitoring project. 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 QC criteria have been met (e.g., relative percent difference (RPD) results for blind sample duplicates, per cent analyte recovery results for matrix spike and matrix spike duplicate (MS/MSD) results, etc).

The Project QA Officer or his/her designee will calculate the Relative Percent Difference (RPD) between field replicate samples.

Laboratories calculate and report the RPD and percent analyte recovery of analytical duplicate samples and MS/MSD samples.

RPD's greater than the project requirements will be noted. The Project Manager, along with supervisors and/or the Project QA Officer, if necessary, will decide if any QA/QC corrective action will be taken if the precision, accuracy (bias) and data completeness values exceed the project's MQO goals.

Estimated Quantitation Limits

The estimated quantitation limits (EQLs) are the lowest concentration that can be reliably achieved within specified limits of precision and accuracy for field and lab measurement methods. Estimated quantitation limits should be equal to or below the reporting limit (RL) but above the method detection limit (MDL). These method and analyte specific detection limits are provided in the MQO Table (section A7).

D2.2 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 were 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.

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 prior to final reporting stages. 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 will require notification to ADEC and subsequent edits to the approved QAPP.

Only data that have been validated and qualified, as necessary, shall be provided to ADEC Division of Water and entered into the applicable database (STORET, AQMS, ICI-NPDES, DROPS).