Pogo Quality Assurance Plan

For Monitoring Programs under

Alaska Department of Environmental Conservation Permit AK0053341

Alaska Department of Environmental Conservation Permit 0131-BA002

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1.0 INTRODUCTION

Sumitomo Metal Mining Pogo LLC (Pogo) is the operator of the Pogo gold mine, located 38 miles northeast of Delta Junction, Alaska (see **Figure 2.1**). Pogo's Plan of Operations (POO) outlines Pogo Mine activities through June 2010 and reflects site experience gained since operations began in 2005 (Pogo, May 2011). Where appropriate, it builds upon the documents used for project permitting, including the 2002 Water Management Plan and Appendices, the 2003 Plan of Operations, and the 2003 Reclamation and Closure Plan.

Pogo Mine is an underground mine that feeds gold ore to the mill at a rate of approximately 3,000 tons per day (tpd) and is permitted to feed gold ore at a rate of up to 3,500 tpd. The property produces between 380,000 to 400,000 ounces of gold annually.

The mine consists of the following major elements:

- Underground cut-and-fill mining with conveyor access for transfer of ore to the surface;
- Surface gold mill for gold recovery through gravity concentration, flotation and cyanide leaching;
- Tailings preparation facilities, including cyanide detoxification and filtration, to produce paste backfill for the underground mine workings and dewatered tailings material suitable for placement in a drystack facility on the surface;
- Drystack tailings facility (DSTF) to disposed the dewatered tailings materials and waste rocks and the recycle tailings pond (RTP) to collect the seepage and runoff water from the drystack tailing facility;
- 250 person upper camp and 126 person lower camp with recreation and catering facilities for each;
- Transmission line along the Shaw Creek Hillside route, and on-site electrical distribution system;
- 49 mile all-season road constructed along the Shaw Creek Hillside route; and
- A water management system that maximizes recycling and treats all waters affected by the project in accordance with applicable federal and state legislation.

The Pogo Mine property consists of 1,281 state mining claims covering an area approximately 41,880 acres. The Pogo claim block lies in Sections 13, 14, 22-27, and 34-36 within T5S, R14E, Sections 18, 19, and 29-34 within T5S, R15E, Sections 1-3, 10-15, and 36 within T6S, R14E, and Sections 3-11, 14-23, and 29-32 within T6S, R15E, Fairbanks Meridian (**Figure 2-1,** Location and Access, Pogo Mine).

The primary study area for the QAP includes the Liese Creek valley and a 15-mile segment of the upper Goodpaster River above and below the confluence with Liese Creek (**Figure 2-2,** Water Monitoring Stations).

The QAP was updated using the Alaska Department of Environmental Conservation (ADEC) requirements and Environmental Protection Agency (EPA) guidance. The QAP is required by Pogo's Alaska Pollutant Discharge Elimination System (APDES) permit AK0053341, May 2011, Section 1.6 for discharge of treated water to the Goodpaster River. It is also required by the Alaska Department of Environmental Conservation (ADEC) Waste Disposal, Permit 0131-BA002.

Figure 2-1: Location and Access, Pogo Mine

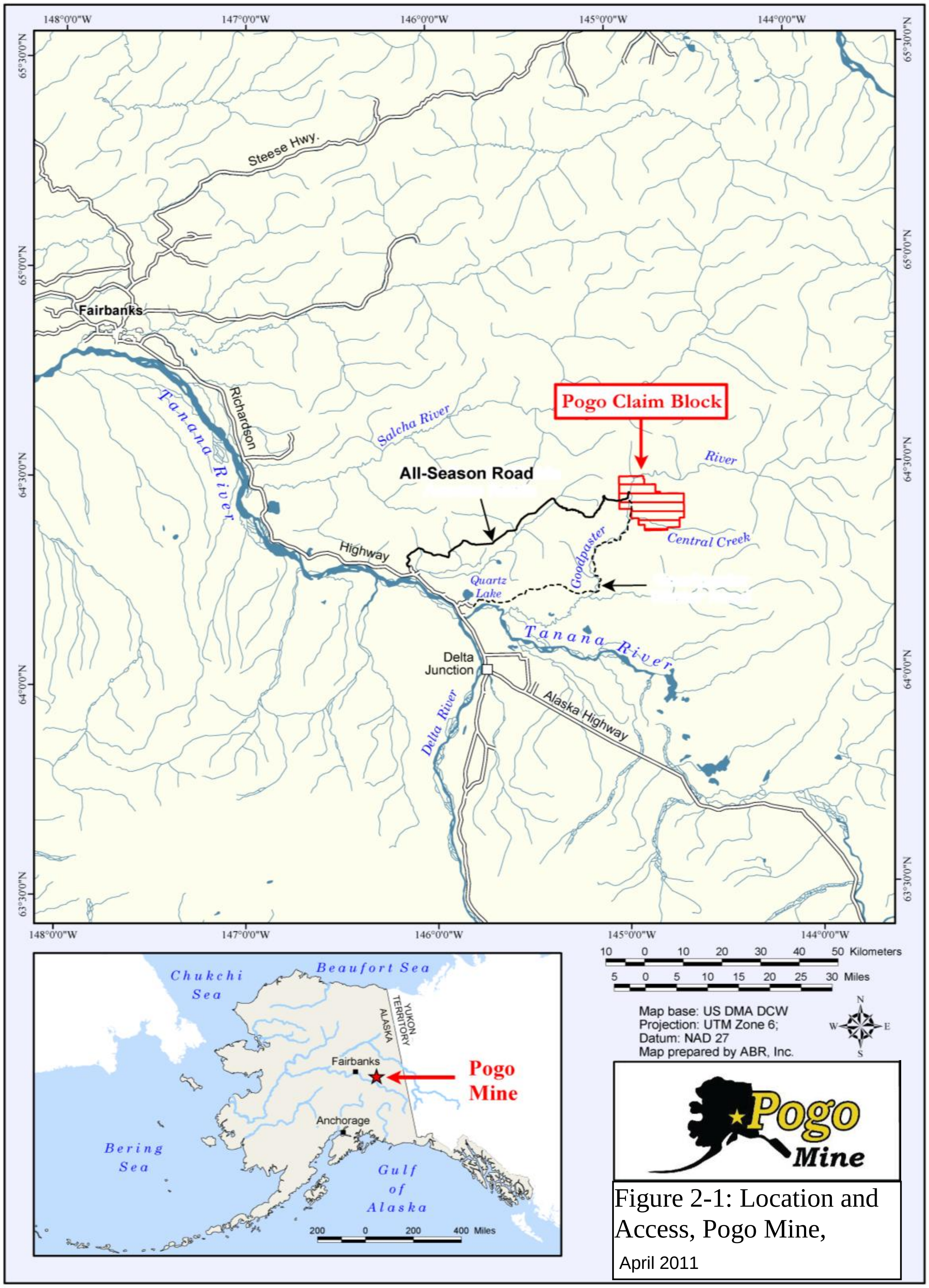
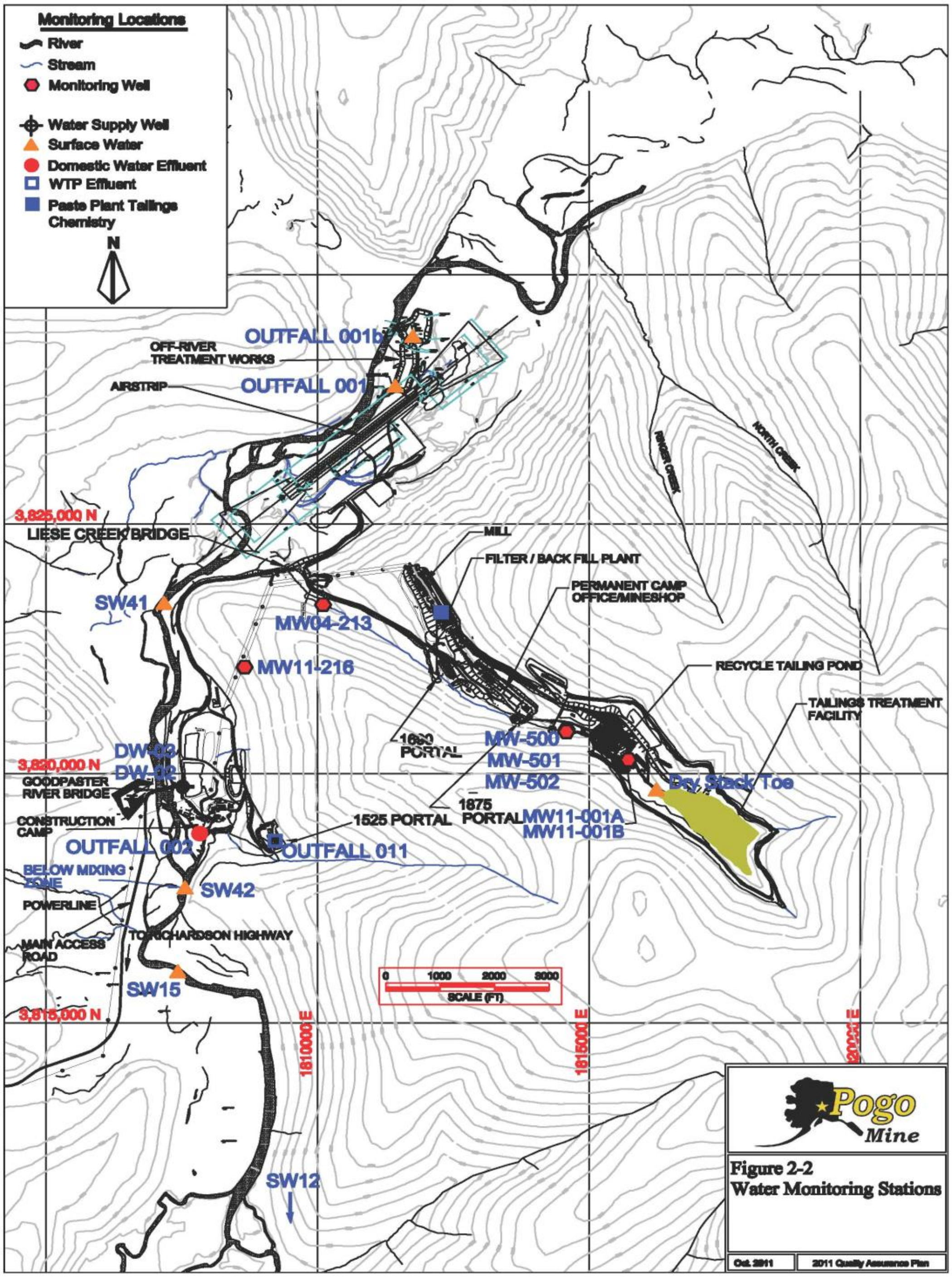


Figure 2-1: Location and Access, Pogo Mine,
April 2011

Figure 2-2: Water Monitoring Stations



2.0 PROJECT MANAGEMENT

2.1 Problem Definition and Background

The primary goal of Sumitomo Metal Mining Pogo LLC's (Pogo's) Quality Assurance Plan (QAP) is to define procedures that assure the quality and integrity of the collected samples, the representativeness of the results, the precision and accuracy of the analyses, and the completeness of the data. These defined procedures include administrative, sampling, field preparedness, safety, data validation and documentation. This document was developed with guidance from the following: EPA Requirements for Quality Assurance Plans, EPA QA/R-5 (EPA, 2001) and Guidance for Quality Assurance Plans, EPA QA/G-5 (EPA, 2002b). A description of the facilities and details of the sampling design is provided in the Pogo Mine Monitoring Plan (Pogo, 2011).

This QAP verifies that appropriate data are collected to: (1) determine if permit limitations are exceeded, where applicable, and (2) establish proper collection, handling, and preparation of samples without contamination.

The monitoring programs described in the QAP are designed to monitor activities from:

- The discharge of treated mine drainage and excess precipitation to the Goodpaster River;
- The discharge of treated domestic wastewater to the Goodpaster River; and
- The disposal of mine tailings, development rock and other solid wastes from the gold recovery facility to the Drystack Tailings Facility (DSTF) and the mine underground workings.

A summary of the programs described in the QAP is presented in **Table 2.1**.

This QAP also includes detailed procedures on how to sample in Section 9-20.

This document will be periodically reviewed and updated by site personnel to reflect actual site conditions and permit monitoring requirements as they change.

Table 2.1: Monitoring Program Summary

Area	Program Manager	QAP Section	Program	Permit Reference	Analytical Laboratory
Effluent	SH&E Manager	18.0 Effluent Monitoring Program	Effluent Monitoring (OUTFALL001, OUTFALL011, and NPDES001B)	AK0053341 (1.1, 1.2)	Analytica
	SH&E Manager	18.0 Effluent Monitoring Program	Effluent Monitoring (OUTFALL002 and Influent (STP002))	AK0053341 (1.3)	Analytica
	SH&E Manager	19.0 Whole Effluent Toxicity Program	Whole Effluent Toxicity Testing (OUTFALL001)	AK0053341 (1.4)	ENSR/CH2M Hill
Surface Water	SH&E Manager	15.0 Surface Water Monitoring Program	Receiving Water (SW01, SW15, SW41, SW42)	AK0053341 (1.5) 0131-BA002 (1.5.1.2/ 4.5)	Analytica
	SH&E Manager	16.0 Fish Tissue Monitoring Program	Fish Tissue (SW01, SW12)	AK0053341 (1.5)	TA-Tacoma
Groundwater	SH&E Manager	17.0 Groundwater Monitoring Program	Detection Monitoring (RTP – MW03-500, MW03-501, MW03-502)	0131-BA002 (1.5.1.2/ 4.6.1, 4.6.2)	Analytica
	SH&E Manager	17.0 Groundwater Monitoring Program	Trend Monitoring (MW99-213, MW99-216, LT99-009)	0131-BA002 (1.5.1.2/4.6)	Analytica
	SH&E Manager	17.0 Groundwater Monitoring Program	ORTW Groundwater (LL04-031, LL04-032)	0131-BA002 Pogo Mine Monitoring Plan	Analytica
Process Control	Mill Manager	10.0 Fluid Management Program	Water Balance (fluid management)	0131-BA002 (1.5.1.4)	NA

Area	Program Manager	QAP Section	Program	Permit Reference	Analytical Laboratory
	Mill Manager	14.0 CIP Tailings Monitoring Program	CIP Tails (PC001, cyanide)	0131-BA002 (1.5.1.3/4.4.3)	Pogo Onsite Laboratory
	Mine Manager	13.0 Development Rock Segregation	Development Rock	0131-BA002 (1.5.1.6/4.4.2)	ALS Chemex
	SH&E Manager	12.0 Flotation Tailings Interstitial Water Program	Flotation Tailing Interstitial Water	0131-BA002	Analytica
	SH&E Manager	11.0 DSTF Geochemistry Program	DSTF Geochemistry (tailings and development rock placed in DSTF)	0131-BA002	ALS Chemex
Visual Monitoring	SH&E Manager	9.0 Visual Monitoring Plan	Facility Inspection	0131-BA002 (1.5.1.1)	NA
	Maintenance Manager	9.1 Biological Visual Survey Program	Biological Visual Survey	0131-BA002 (1.5.1.5)	NA

2.2 Project/Task Organization

The organizational structure was designed to provide project control and proper quality assurance/quality control (QA/QC) for the field investigation. The roles for individuals involved in the project are provided in **Table 2.1**. The responsibilities associated with each role are outlined below:

Project Manager - has primary responsibility for the completion of project activities. They are directly responsible for the development of technical reports and other project documents. The Project Manager assists project personnel in planning, coordinating, and controlling technical aspects of the project. They are responsible for monitoring the quality of the technical and managerial aspects of the project, implementing the QAP, implementing corrective measures, and maintaining communication with regulatory authority.

Program Manager - reports to the Project Manager and works directly with other project personnel. They oversee analytical chemistry and data management activities. They communicate directly with the Field Team Leader to coordinate field sampling activities and are responsible for QC of the analytical chemistry and data management documentation. They resolve problems that may occur with laboratories, field activities, and sampling activities in accordance with the QAP.

Quality Assurance Officer (QAO) - works directly with the Project Manager and each Program Manager. They monitor and verify that the work is being performed in accordance with the QAP, the SOPs, and other applicable procedures. They also assess the effectiveness of the QA/QC program and recommends modifications to the program when applicable. The QAO ensures that personnel assigned to the project are trained on the requirements of the QAP. They also review and verify nonconformance and corrective action reports, and conduct periodic quality assurance audits. They advise the Project Manager on implementation of the QA/QC program, but function independently of the Project Manager. The QAO has authority to halt work performed in accordance with the QAP in case of nonconformance or if minor problems are not corrected in a timely manner. The QAO is also responsible for maintaining all documentation required by the QAP.

Field Team Leader - supervises site activities and is responsible for the implementation of the QAP in the field. The Field Team Leader reports to the applicable Program Manager and communicates with the field staff and the Laboratory QAO. The Field Team Leader is in charge of scheduling field activities. They also oversee day-to-day activities including field measurements and data collection activities to check that they are conducted in accordance with the QAP. They are responsible for documentation, packaging, and shipment of samples to the analytical laboratory.

Laboratory Quality Assurance Officers (LQAOs) - are identified for each contract laboratory to ensure that appropriate procedures are followed in accordance with each laboratory's Quality Assurance Plan. The laboratory QAO is responsible for:

1) Ensuring that the laboratory analyses and associated analytical methods are consistent with approved analytical methods and meet the accuracy, precision and sensitivity required by the ADEC and Pogo's permits;
2) Ensuring that their equipment is properly calibrated as specified in the manufacturer's guidelines and approved analytical methods;
3) Reviewing and validating all data and calculations in conformance with EPA and ADEC guidelines and the approved analytical method;
4) Preparing and transmitting the laboratory report;
5) Maintaining raw data including any worksheets, notebooks, sample tracking records, instrument logs, calibration records and quality control reports consistent with the laboratory's Quality Assurance Plan and the laboratory's document retention policy; and
6) Identifying and reporting any nonconformance and taking corrective action to address the nonconformance.

Table 2.2: Project Team

Role	Position	Organization
Project Manager	General Manager	Sumitomo Metal Mining Pogo LLC
Program Managers	Site Managers	Sumitomo Metal Mining Pogo LLC
Quality Assurance Officer (QAO)	Environmental Superintendent	Sumitomo Metal Mining Pogo LLC
Field Team Leaders	Environmental Staff	Sumitomo Metal Mining Pogo LLC
Contract Laboratory	LQAOs	Analytica International, Inc. (Analytica), Fairbanks, Alaska (907) 456-3116
Contract Laboratory	LQAOs	Test America, Tacoma ,WA (253)922-2310
Contract Laboratory	LQAOs	Test America Analytical Testing Corporation (TA), Beaverton, OR (503) 906-9237
Contract Laboratory	LQAOs	AECOM Laboratory in Fort Collins, Colorado (970) 416-0916
Contract Laboratory	LQAOs	ALS Chemex, Reno, NV (775) 356-5395
Contract Laboratory	LQAOs	Mappa, Fairbanks, Alaska (907) 488-1266
Contract Laboratory	LQAOs	ACZ Laboratories, Steamboat, CO (800)334-5493
Contract Laboratory	LQAOs	CH_2M Hill Toxicological Laboratory, Corvallis, Oregon (541) 758-0235

2.3 Project/Task Description

Refer to the Pogo Mine Monitoring Plan (Pogo, May 2011) for a detailed description and schedule for all monitoring activities. Measurements and associated QA/QC goals, procedures, and timetables for collecting the measurements are discussed below.

2.4 Quality Objectives and Criteria

The QAP defines data quality objectives (DQOs) and measurement quality objectives (MQOs). After completion of the DQO process, MQOs are developed as criteria for data verification.

2.4.1 Data Quality Objectives

The objective of this project is to monitor water quality changes in surface and groundwater that may occur as a result of mining activities or discharges from the facility. It is also to monitor the processes associated with Pogo Mine Facilities. Based on the project objective, the primary data quality objectives (DQO) of this project are as follows:

- Provide procedures for quality control beginning with sample collection and proceeding through data interpretation;
- Provide procedures to ensure that data are of known or acceptable precision, accuracy, representativeness, completeness, and comparability;
- Collect samples in accordance with relevant sampling methodologies;
- Obtain effluent data representative of operations and identify changes in effluent characteristics due to process variations;
- Properly package and ship samples to contract laboratory;
- Ensure that contract laboratories analyze samples using strict QC procedures as outlined in the *EPA Guidance for Analytical Methodologies*;
- Ensure that contract laboratories scrutinize and qualify data under the their QA/QC program; and
- Submit data, fully validated, to the ADEC, EPA, or other stakeholders as required.

2.5 Assessment, Oversight, Response Action and Reports

2.5.1 Assessment and Oversight

All field measurements and analytical results are systematically checked for errors throughout the entire process from sample collection to reporting to ADEC. In addition, the QAO periodically conducts audits to ensure that the Field Team Leaders are performing the sampling and data collection in conformance with the requirements of the QAP. The QAO periodically monitors contract laboratory performance by auditing the laboratory, submitting split samples, reference samples and blind audit samples and by sending duplicate samples to multiple laboratories.

Data which are found to be invalid are flagged and/or removed from the active databases. Invalid data exists when accuracy and precision requirements are not met, or when analysis, sampling and operating problems or reporting errors are present. Invalid data also occurs when samples are not received by the contract laboratory within the allowable holding time or when they are improperly preserved. Other examples are non-representative sample, mislabeling of containers, and sampling the wrong location.

In the case of missing samples, samples that exceed holding times, or broken sample containers, the sample will be collected again, if possible. Recollected samples that can be done within the permit sample frequency requirements will not be considered "missed" samples. Any missing or destroyed samples that cannot be recollected within the permit sample frequency requirements will be noted in the database and reported to ADEC.

If field equipment is found to be inoperable or functioning outside the acceptable performance limits, it will be repaired or replaced prior to continued use. Data collected from any instrument immediately prior to the repair or replacement will be identified as questionable and appropriate actions will be taken including repeating measurements or resampled, if appropriate.

2.5.2 Responsible Actions

If any nonconformance with the QAP is identified, the QAO will take steps to immediately address the nonconformance. The QAO also has the primary responsibility for designing and approving a response action plan to correct any nonconformance. When appropriate, a response action plan will contain the following:

1) The nature of the nonconformance;
2) The response actions needed to correct the nonconformance;
3) Whether or not there is a deficiency in the QAP and if a revision to the QAP is necessary;
4) The steps needed to implement the response action;

5) Who is responsible for implementing the response action and revising the QAP if appropriate;
6) A timeline to implement the response action; and
7) A post- implementation review.

If a nonconformance is identified by the contract laboratories, the contract laboratories will correct the nonconformance consistent with their applicable Quality Assurance Plans. Within the laboratory, response actions may involve a review of the calculations, check of the instrument maintenance and operation, review of analytical techniques and methodology, re-calibration of equipment, and reanalysis of quality control and field samples.

2.5.3 Reports

The QAO will periodically review and update the QAP at least annually.

The QAO is responsible for ensuring that the Program Managers and Project Manager are informed of any nonconformance with the QAP, any response actions necessary to correct the noncompliance, the completion of the response actions and any updates to the QAP.

The Program Managers and Project Managers are responsible to ensure that any response actions to address nonconformance with the QAP are timely completed and that appropriate resources are available. It is also the responsibility of the Program Manager and Project Manager to ensure that all appropriate staff read and comply with the QAP and that the QAP is regularly reviewed.

2.6 Training Requirements

Field Team Leaders receive extensive on-the-job instruction and training in proper sampling techniques based on EPA protocols. The training is supplemented by written sampling standard operating procedures (SOPs). Wastewater Treatment and Potable Water System Operators are certified by the State of Alaska for their assigned duties.

The Quality Assurance Officer is responsible for the implementation and adherence to the QAP. They are also responsible for the proper training of the Field Team Leader and Environmental Technicians in sample collection, handling and shipping.

Pogo requires that all contract laboratories analyzing data for the monitoring program have current EPA certification. They must also participate in the previous year's DMR QA Study. This ensures that the laboratory can meet the testing and evaluation guidelines requirements and standards of the EPA.

2.7 Approvals

Table 2.3: Approvals

Name	Job Title	QAP Role	Signature	Date
		EPA QAP Reviewer		
		ADEC Representative		
Todd Roth	General Manager	Project Manager		
Chris Kennedy	Safety, Health and Environmental Manager	Program Manager		
Sally McLeod	Environmental Superintendent	Quality Assurance Officer		
Luke Walker	Environmental Specialist	Field Team Leader		

3.0 FIELD PLANNING AND MOBILIZATION

3.1 Field Trip Planning

Implement the following general steps during the field planning and mobilization process, as applicable:

1) Determine the number of people required to complete the sampling activities within the allotted time frame. For safety and efficiency in remote locations, a field team should consist of at least two people.
2) Identify sampling team members and develop a detailed itinerary and schedule:
    a. Sample from the least contaminated to the most contaminated sampling point;
    b. Sample upstream in flowing water;
    c. Ensure that at least one trained, experienced individual is part of each team;
    d. Review procedures and any associated documents (sampling plan, permit, etc.);
    e. Review project/site files for unusual procedures or site peculiarities; and
    f. Review the safety plan and discuss contingencies (weather, broken equipment, site access, etc.).
3) Before leaving for the field, notify at least two people of your itinerary.
4) If a helicopter or boat is used, a Job Hazard Analysis (JHA) is recommended.
5) Assemble any needed maps, directions and site descriptions.
6) Identify the number of sampling points, and for each sampling point:
    a. Determine the matrices that will be sampled;
    b. Identify the specific analyses to be performed per matrix;
    c. Identify the sampling equipment needs;
    d. Determine the number and types of sample containers;
    e. Determine the types of preservatives that will be needed;

f. Determine what field measurements must be taken; and

g. identify transportation mode to reach each location (helicopter, truck, etc.).

3.2 Equipment and Supply Preparation

Prepare equipment and supplies as needed.

3.2.1 Sampling Equipment

Assemble all equipment and prepare as follows:

1) Inspect equipment for cracks, breaks, and other signs of wear, if necessary, repair any equipment and document the repairs in appropriate maintenance logs;
2) Clean any equipment that was not protected from the environment (stored on dusty shelves);
3) Decontaminate equipment by cleaning thoroughly with detergent and rinsing well with DI water;
4) Clean all transport ice chests and water transport containers; and
5) Check to make sure fuel and battery powered pumps are working.

Store all dedicated equipment (except dedicated pump systems or dedicated drop pipes) in a controlled environment. If possible, store equipment in an area that is located away from the sampling site. If equipment other than dedicated pumps or dedicated drop pipes are stored in monitoring wells, suspend the equipment above the well water. Secure the monitoring well in order to prevent tampering between sampling events.

3.2.2 Field Instruments

Assemble all field instruments and prepare as follows.:

1) Inspect instruments for damage, repair and/or replace parts as necessary, and document in appropriate maintenance logs;
2) Assemble the appropriate calibration standards and supplies;
3) Determine the accuracy of the instruments by either performing an initial calibration or checking the calibration before leaving the base of operations; and

4) Document the calibration.

3.2.3 Documentation

Assemble field record supplies such as field forms, waterproof pens, clipboard, camera, and GPS unit, if needed.

3.2.4 Sample Containers

Assemble the appropriate types of sample containers obtained from the contract laboratory.

3.2.5 Preservatives

Assemble preservation supplies provided by the laboratory. Discard any old solution and obtain fresh solution.

3.2.6 Field Decontamination Supplies

Assemble field decontamination supplies. Discard any old de-ionized (DI) water. Clean containers and prepare fresh solutions.

3.2.7 Shipping Supplies

Assemble shipping supplies such as coolers and ice packs, chain of custody forms, shipping labels, tape, and custody seals.

3.2.8 Vehicles

Make sure vehicle maintenance is up-to-date. Perform pre-shift inspection.

3.2.9 Safety Equipment

Assemble any needed safety equipment such as: handheld radio, rubber gloves, rubber boots (if needed), respirator (if required), first aid kit, drinking water, bear spray, and JHA (if required).

4.0 GENERAL SAMPLING PROCEDURES

This section presents sample collection methodology and sample custody requirements.

4.1 Sampling Process Design

The sampling location and frequency is described in the Pogo Mine Monitoring Plan (Pogo, May 2011) and the APDES Permit (ADEC, May 2011) and Waste Disposal Permit (ADEC, 2003c).

4.2 Sample Collection

Include the following documentation for sample collection, sample handling and field-testing activities.

4.2.1 Sample Identification Requirements

Label or tag each sample container with the sample ID.

Attach the label or tag so that it does not contact any portion of the sample that is removed or poured from the container.

Record the sample ID on all other documentation associated with the specific sample container.

4.2.2 General Requirements for Sampling Documentation

Record the following information for all sampling:

- Name of person(s) that collected the sample.
- Date and time of sample collection. Iindicate hours and minutes, use 24-hour clock time, and note the exact time of collection for individual sample containers
- Ambient field conditions such as weather, activities nearby, etc.
- Detailed description of sample location (e.g., monitoring well identification number, outfall number, station number, etc.).
- Unique sample ID for each sample container and parameters to be analyzed.
- Matrix sampled.

Field-testing measurement data, to include the following:

- Project name;
- Date and time of measurement or test;
- Detailed description of sample or monitor location (e.g., monitoring well identification number, outfall number, station number or other description);
- Parameter measured;
- Value in appropriate reporting units;
- Name of person(s) performing the measurement(s);
- Unique identification of the specific instrument unit(s) used;
- Calibration records for field-testing equipment;
- Profiles or individual analyses to be ordered;
- Preservative for each container;
- Type of purging and sampling equipment used.
- Type, number, collection location and collection sequence of quality control samples;
- Number of grab or subsamples and amount of each in any composite samples. Record location for each grab sample in a composite samples; and
- Signature(s) or initials of sampler(s).

4.3 General Sampling Procedures

4.3.1 Sample containers

When collecting aqueous samples in an intermediate container (such as dipping bottle or 5-gallon bucket, rinse the sample collection equipment with a portion of the sample water before taking the actual sample. Certified sample containers from the contract laboratory do not need to be rinsed. Do not rinse sample containers with premeasured preservatives.

4.4 Contamination Prevention and Sample Collection Order

4.4.1 Contamination Prevention

Collect the ambient or background samples first and store them in separate ice chests or shipping containers. Collect samples in flowing water from downstream to upstream. Do not store or ship highly contaminated samples (concentrated wastes, free product, etc.) or samples suspected of containing high concentrations of contaminants in the same ice chest or shipping container with other environmental samples. Isolate these sample containers by sealing them in separate, untreated plastic bags immediately after collecting, preserving, labeling, etc. Use a clean, untreated plastic bag to line the ice chest or shipping container.

4.4.2 Sample Collection Order

Unless field conditions dictate other sampling regimens, collect samples in the following order: Volatile Organics and Volatile Inorganics, Extractable Organics, Petroleum Hydrocarbons, Aggregate Organics and Oil & Grease, Total Metals, Dissolved Metals, Inorganic Nonmetallic, Physical and Aggregate Properties, and Biologicals, Radionuclides, and Microbiological.

If the pump used to collect groundwater samples cannot be used to collect volatile or extractable organics, then collect all other parameters, withdraw the pump and tubing, and collect the volatile and extractable organics.

4.4.3 Protective Gloves

Gloves serve a dual purpose to: (1) protect the sample collector from potential exposure to sample constituents and (2) minimize accidental contamination of samples by the collector.

Always wear protective gloves (latex, nitrile, etc.) when conducting sampling activities. Do not let gloves come into contact with the sample or with the interior or lip of the sample container.

Use clean, new, un-powdered and disposable gloves. Latex or nitrile gloves are recommended; however, other types of gloves may be used as long as the construction materials do not contaminate the sample or if internal safety protocols require greater protection. The powder in powdered gloves can contribute significant contamination and it is not recommended unless it can be demonstrated that the powder does not interfere with the sample analysis.

Change gloves: (1) after preliminary activities such as pump placement; (2) after collecting all the samples at a single sampling point; or (3) if torn, or used to handle extremely dirty or highly contaminated surfaces. Properly dispose of all used gloves.

4.5 Preservation and Storage

Samples are stored at < 6° C in the refrigerator at the Environmental Lab. Preservative, container and holding time requirements are specific for each analyte and are in accordance with 40 CFR Part 136, EPA and ADEC requirements.

Samples are preserved to prevent chemical, physical and/or biological processes from changing the actual concentration of an analyte present at the time of sampling. In order to preserve sample integrity until the time of analysis, various preservatives are added to the sample depending on the type of analysis required. Acids are sometimes used as preservative and it is important to use correct procedures to handle them safely. Some of the commonly used acids are:

- Sulfuric Acid;
- Nitric Acid;
- Zinc Acid;
- Sodium Hydroxide (base); and
- Hydrochloric Acid.

Personal protective gear such as safety glasses and latex/nitrile gloves will be worn when opening sample bottles. If samples are collected only for total phosphorus and are not for APDES compliance, thermal preservation (ice) is not required if the sample containers are pre-preserved with acid.

Preservation protocols specify immediate preservation. "Immediate" is defined as "within 15 minutes of sample collection." Perform all preservation on-site unless samples can be transported back to the laboratory within 15 minutes of collecting the sample. Twenty-four hour composite water samples are the exception to the "15-minute" criterion.

Samples are stored under the direct control of the Environmental Department until relinquished to the shipper. Samples are shipped to the laboratory in insulated coolers with sufficient ice packs to maintain sample temperatures at < 4° C. A temperature blank is placed in each cooler shipped so temperature can be confirmed by the contract laboratory.

4.6 Sample Custody

4.6.1 Chain of Custody

Chain of Custody (COC) procedures are used to demonstrate that the samples and/or sample containers are handled and transferred in such a manner to eliminate possible tampering. Use the following procedures to document and track all time periods and the physical possession and/or storage of sample containers and samples from point of origin through the final analytical result and sample disposal.

When COC is used, samples must be: (1) in the actual possession of a person who is authorized to handle the samples (e.g., sample collector, laboratory technician); (2) in the view of the same person after being in their physical possession; (3) secured by the same person to prevent tampering; or (4) stored in a designated secure area. Unoccupied hotel or motel rooms are not considered secure storage unless the containers are secured with custody seals or tamper-indicating tape.

Use a COC form to document sample transfers. Other records and forms may be used to document internal activities. Limit the number of people who physically handle the sample.

COC begins when the cleaned sample containers are dispatched to the field. The person who relinquishes the prepared sample kits or containers and the individual who receives the sample kits or containers must sign the COC form unless the same party provides the containers and collects the samples. All parties handling the sample are responsible for sample custody (i.e. relinquishing and receiving) and documentation except when the samples or sampling kits are relinquished to a common carrier. An example of Pogo's COC Form, Sample Label, and Sample Log are included in **Appendix A**.

4.6.2 Shipping Samples under COC

Complete all relevant information on the COC form: (1) sampling site name and address; (2) date and time of sample collection; (3) unique field identification code for each sample source and each sample container; (4) names of person(s) collecting samples; (5) signatures of all transferors and transferees; (6) time of day and calendar date of all custody transfers; (7) clear indication of number of sample containers; (8) required analyses by approved method number or other description; (8) common carrier usage; and (9) sample container/preservation kit documentation, if applicable.

The COC form must have a place to document the date, time and person who prepared the shipping container for shipment, and the name of the common carrier. The person who seals the samples in the shipping containers must be the last person to sign the COC form.

Place the forms in a sealed water-proof bag and place in the shipping container with the samples. Seal the shipping container with custody seals or tamper-proof tape so that any tampering can be clearly seen by the individual who receives the samples. Note: The common carrier does not sign COC forms but the COC form must identify the common carrier (when used).

4.6.3 Delivering Samples to the Laboratory

All individuals who handle the samples, sample containers or shipping containers with samples must sign (and relinquish) the COC form. The legal custody responsibilities of the field operations end when the samples are relinquished to the laboratory.

4.6.4 Chain of Custody Seals

Use tamper-indicating tape or custody seals on all shipping containers that are used to transfer or transport shipping containers and samples. Place the seal so the transport container cannot be opened without breaking the seal.

4.7 Instrument Equipment Testing Inspection and Maintenance

Section 7.0 provides field testing and measurement details.

4.7.1 Testing and Maintenance

Preventive maintenance activities are necessary to ensure that the equipment can be used to obtain accurate results and to avoid unusable or broken equipment while in the field. Equipment is properly maintained when: (1) it functions accurately during mobilization; and (2) it is not a source of sample contamination (e.g., dust, cross-contamination).

All field staff are responsible for regular cleaning, inspection, and maintenance of their assigned equipment. All equipment should be visually inspected daily for damage or dirt, and repaired or cleaned if needed before use. If meters are stored for long periods (greater than one week) without being used, they must be calibrated and inspected at least weekly to keep them in good working order. Refer to instruction manuals for manufacturer's recommendations for inspection, maintenance, and repair. A copy of Pogo’s Field Instrument Maintenance Form is provided in **Appendix A**.

4.7.2 Inspection and Calibration

All field meters must be inspected and calibrated at the beginning of each day used. Field staff should record calibration information on the appropriate form, including sampler(s) name, date/time of initial calibration, meter number, and date of last probe/battery replacement. A copy of Pogo’s Field Instrument Calibration Form is provided in **Appendix A**. Refer to the manufacturers' instruction manuals for specific calibration procedures.

Standards should be selected so that they bracket the range of measurements expected that day.

Meters should also be recalibrated if any of the following occur: physical shock to meter; dissolved oxygen (DO) membrane is touched, fouled, or dries out; unusual (high or low for the particular site) or erratic readings, or excessive drift; extreme readings (e.g., extremely acidic or basic pH; DO saturation >120%); or measurements are outside of the range for which the meter was calibrated.

4.7.3 Decontamination of Field Equipment

Decontamination is the cleaning process used to remove contaminants from equipment. Sample-wetted equipment is decontaminated after sample collection at each station, preferably before the equipment dries. Decontamination is conducted in clean and protected environments (in field area, vehicle, or chamber) as is appropriate to the equipment being cleaned. If this is not possible, the equipment is at least flushed and rinsed, preferably with a low-phosphate detergent, followed by a clean water (DI) rinse, before it is temporarily stored for thorough cleaning at a later date and before it is reused to collect samples.

To verify that decontamination is adequate, field blanks are prepared at selected stations.

5.0 QUALITY CONTROL

This section describes field and laboratory quality control samples. These samples are intended to provide information needed to evaluate method performance during sample collection and analysis and to determine whether subsequent analytical results meet project DQOs.

5.1 Field Quality Control Requirements

5.1.1 Scope & Applicability

Field quality control measures monitor the sampling event to ensure that the collected samples are representative of the sample source and that the field-collected data have stated limits of precision and accuracy.

(1) Field-collected blanks must demonstrate that the collected samples have not been contaminated during sampling, transport, or storage.

(2) Field Measurement Quality Controls must demonstrate that the instrument was properly calibrated and that it maintained an acceptable level of calibration during use.

5.1.2 Equipment & Supplies

De-ionized (DI) water for blanks must be obtained from the laboratory. Specify what it is for: organics, pesticides, metals, or routine. Volatile organics analysis (VOA) trip blanks require special, purged water prepared by the laboratory.

5.1.3 Procedures

When collected, analyze all quality control samples for the same parameters as the associated samples using identical methods and MRLs.

Preserve, transport, document and handle all quality control samples as if they were samples. Once collected, they must remain with the sample set until the laboratory has received them. Except for trip blanks, prepare all quality control samples on-site in the field during sample collection. Trip blanks are not required, but must be collected and analyzed if the analytical test method requires them.

Table 5.1 provides field quality control samples for various matrices.

Table 5.1: Field Quality Control Samples by Matrix

QC Sample	Matrix	Frequency of Collection
Duplicate	Water	Collect at a minimum ten percent of each reported test result (i.e. for each sample container submitted). Collect at least one field duplicate for each reported test result combination each year.
	Development Rock	Collect at a minimum four percent of each reported test result (i.e. for each sample container submitted). Collect at least one field duplicate for each reported test result each year.
Blank	Water	Collect at a minimum ten percent of each test result for *cyanide and metals (including major cations)*. Collect at least one blank (excluding trip blanks) for each reported test result for *cyanide and metals* each year. Collect field-cleaned **equipment blanks** if any sample equipment decontamination is performed in the field. If decontamination is not performed in the field, collect pre-cleaned equipment blanks if the equipment is not certified clean by the vendor or the laboratory providing the equipment. Collect **field blanks** if no equipment except the sample container is used to collect the samples or if the sampling equipment is certified clean by the vendor or the laboratory providing the equipment.
	Soil, Sediment	Collect at a minimum ten percent of each test result for *cyanide and metals*. Collect at least one blank (excluding trip blanks) for each reported test result for *cyanide and metals* each year. Collect field-cleaned **equipment blanks** if any sample equipment decontamination is performed in the field. If decontamination is not performed in the field, collect pre-cleaned equipment blanks if the equipment is not certified clean by the vendor or the laboratory providing the equipment.
	Development Rock	Collect at least one blank (excluding trip blanks) for each reported test result for *metals* each year. Collect field-cleaned **equipment blanks** if any sample equipment decontamination is performed in the field. If decontamination is not performed in the field, collect pre-cleaned equipment blanks if the equipment is not certified clean by the vendor or the laboratory providing the equipment.
	Fish Tissue	If the sample container consists of a Ziploc-type bag, field blanks will be submitted each sampling round and will consist of the sample container filled with distilled/de-ionized water.
Split	Water	Collect as necessary for determining variability between laboratories.

QC Sample	Matrix	Frequency of Collection
Replicate	Fish Tissue	Collect at a minimum ten individual fish at each station
Laboratory QC	Fish Tissue	Collect at a minimum five additional fish per station for laboratory QA/QC.

5.2 Quality Control Blanks

When applicable, collect blanks for the following parameter groups and tests: volatile organics; extractable organics; metals; ultratrace metals; inorganic metallics; radionuclides; petroleum hydrocarbons and oil & grease; volatile inorganics; and aggregate organics except Biochemical Oxygen Demand.

Blanks are not required for: microbiological (all types); toxicity; field parameters such as pH, specific conductance, residual chlorine, temperature, dissolved oxygen, ORP and salinity; radon; algal growth potential; biological community; physical and aggregate properties; and biochemical oxygen demand.

5.2.1 Equipment Blanks (EB)

Field-Cleaned equipment blanks are collected on equipment that is decontaminated in the field, usually between sampling sites. If the equipment has been certified clean by the vendor or the laboratory providing the equipment, equipment blanks aren't necessary.

Collect field-cleaned equipment blanks if any sample equipment decontamination is performed in the field (i.e., between sampling points) during the middle to end of a sampling trip. Do not prepare field-cleaned equipment blanks after leaving the sampling site.

5.2.2 Field Blanks (FB)

Field blanks are collected if no equipment except the sample container is used to collect the samples or if the sampling equipment is certified clean by the vendor or the laboratory providing the equipment.

Field blanks are used to monitor on-site sampling environment, sample container cleaning, the suitability of sample preservatives and analyte-free water, and sample transport and storage conditions. Prepare field blanks by pouring analyte-free water into sample containers for each parameter set to be collected. Field blanks are not required if equipment blanks are collected.

5.2.3 Trip Blanks (TB)

Trip blanks are used to monitor sample container cleaning, the suitability of sample preservatives and analyte-free water, and both sample transport and storage conditions. These blanks are applicable if samples are to be analyzed for volatile constituents (volatile organics, methyl mercury, etc.). The laboratory providing the volatile organic constituent (VOC) vials provides the trip blanks by filling one or more VOC vials with analyte-free water. The trip blanks are prepared without air bubbles. Place a set of trip blanks in each transport container used to ship/store empty VOC vials. They must remain with the VOC vials during the sampling episode and must be transported to the analyzing laboratory in the same shipping or transport container(s) as the VOC samples.

Trip blanks must be opened only by the laboratory after the blank and associated samples have been received for analysis.

5.3 Field Duplicates

Field duplicates are designed to measure the variability in the sampling process. Collect duplicates by repeating (simultaneously or in rapid succession) the entire sample acquisition technique that was used to obtain the first sample. Collect, preserve, transport and document duplicates in the same manner as the samples. These samples are not considered laboratory duplicates.

If collected, analyze field duplicates for the same parameters as the associated samples using the same methods and MRLs. When possible, collect duplicate samples from sampling locations where concentrations are measurable. Vary the sampling location each duplicate round.

5.4 Split Samples

Split samples may be used as a means of determining compliance, as an added measure of quality control, or for monitoring laboratory performance. Unlike duplicate samples that measure the variability of both the sample collection and laboratory procedures, split samples measure only the variability between laboratories. Therefore, the split samples must be subsamples of the same parent sample and every attempt must be made to ensure sample homogeneity.

Collect, preserve, transport and document split samples using the same protocols as the related samples.

If split samples are incorporated as an added quality control measure, all involved parties should agree on the logistics of collecting the samples, the supplier(s) of the preservatives and containers, the analytical method(s), and the statistics that will be used to evaluate the data.

5.4.1 Water

Collect split samples for water in one of two ways:

Mix the sample in a large, appropriately pre-cleaned, intermediate vessel (a churn splitter is recommended). This method shall not be used if volatile or extractable organics, oil and grease or total petroleum hydrocarbons are of interest. While continuing to thoroughly mix the sample, pour it into the appropriate sample containers.

Alternatively, fill the sample containers from consecutive sample volumes from the same sampling device. If the sampling device does not hold enough sample to fill the sample containers, use the following procedure: fill the first container with half of the sample, and pour the remaining sample into the second container; obtain an additional sample, pour the first half into the second container, and pour the remaining portion into the first container; continue until both containers are filled.

5.4.2 Soils, Sediments, Chemical Wastes and Sludges

Collecting split samples for these matrices is not recommended because a true split sample in these matrices is not possible.

5.5 Sample Frequency

Specific field QC sample minimum frequency requirements are described in the following sections.

5.5.1 Field Duplicates

Collect at a minimum ten percent of each sample profile/matrix combination (e.g., quarterly water treatment plant samples, surface water samples). Collect at least one field duplicate for each sample profile/matrix combination each year. Collect during the sampling trip that includes the first sample of every ten (or less) samples collected.

5.5.2 Blanks

Collect at a minimum ten percent of each reported test result/matrix combination. Collect at least one blank (excluding trip blanks) for each reported test result/matrix combination each year. Collect during the sampling trip that includes the first sample of every ten (or less) samples collected.

To claim that a positive result is due to external contamination sources during sample collection, transport or analysis, then at least one field collected blank (excludes trip blanks) must have been collected at the same time the samples were collected and analyzed with the same sample set.

If the results of a blank are positive, collect another blank under the same conditions during the next sample round and repeat until the problem is identified and solved.

method is in control.

6.0 General Documentation Procedures

The QAO is responsible for maintaining all documentation required by the QAP.

6.1 Universal Documentation Requirements

Ensure that the history of a sample is clearly evident in the retained records and can be independently reconstructed.

6.1.1 Criteria for All Documents

Keep all original data and records as well as reduced or manipulated forms of the original data or records for auditing purposes.

Record enough information so that clarifications, interpretations or explanations of the data are not required from the originator of the documentation.

Clearly indicate the nature and intent of all documentation and all record entries.

Refer to SOPs and other documents by the complete name, reference or publication number, revision number and revision date for the cited document, when applicable.

Retain copies of all revisions of all cited documents as part of the documentation archives.

6.1.2 Procedures

Sign or initial and date all documentation entries made to paper, digital/electronic or other records, clearly indicating the reason where applicable (e.g., "sampled by"; "released by"; "prepared by"; "reviewed by").

Employ straightforward archiving of records to facilitate documentation tracking and retrieval of all current and archived records for purposes of inspection, verification and historical reconstruction of all procedures and measurement data.

Keep copies or originals of all documentation, including documentation sent to or received from external parties.

Use indelible ink for all paper documentation.

Do not erase or obliterate entry errors on paper records. Make corrections by marking a line through the error so that it is still legible. Initial or sign and date the marked error and its correction. Indicate where and if other changes to the entry have been made.

Utilize software that allows tracking of users and data edits, if feasible. Software that prompts the user to double-check edits before execution is also preferred.

Link reports, field data, data summaries or other versions of data to the original sample data.

6.1.3 Documentation Storage Requirements

Keep all documentation archives for a minimum of five years after the date of project completion or permit cycle unless a longer period is specified in an order or permit.

Store media such as photographs, photographic negatives, microfilm, videotape, etc. under protection from deterioration.

6.2 Electronic Documentation

6.2.1 Retention of Automatic Data Recording Products

For data not directly read from the instrument display and manually recorded, retain all products or outputs from automatic data recording devices, such as strip chart recorders, integrators, data loggers, field measurement devices, computers, etc. Store records in electronic, magnetic, optical or paper form, as necessary.

Retain all original, raw output data. Ensure archiving of these data prior to subsequent reduction or other manipulation of the data.

Identify output records as to purpose, analysis date and time, field sample identification number, data source, or instrumentation used to make the measurement.

6.2.2 Electronic Data Security

Control levels of access to electronic data systems as required to maintain system security and to prevent unauthorized editing of data.

Do not alter raw instrumentation data or original manual data records in any fashion without retention of the original raw data and renaming the data record.

Maintain secure computer networks and appropriate virus protection as warranted for each system design.

6.2.3 Electronic Data Storage

Store all electronic, magnetic and optical media for easy retrieval of records.

Ensure that all records can be printed to paper if needed for audit or verification purposes.

If it is anticipated that the documentation archive will become unreadable due to obsolescence of a particular storage technology, retain a paper archive of the data or transfer to other suitable media.

Back up all data at a copy rate commensurate with the level of vulnerability of the data. Consider replicating all original data as soon as possible after origination.

6.2.4 Software Verification

Ensure that any software used to perform automatic calculations conforms to required formulas or protocols. Document all software problems and their resolution. Record the date, responsible personnel and relevant technical details. Note all software changes, updates and installations. File associated service records supplied by vendors or other service personnel.

6.2.5 Protection of Equipment and Storage Media

Protect computers, instrumentation, peripheral devices and storage media from deteriorating conditions such as temperature, humidity, magnetic fields, spillage or other hazards.

6.3 Sample Documentation

Each sample will be documented to ensure that each analytical result belongs to a uniquely identified sample and to indicate the quality of that result.

6.4 Sample Shipping

If shipping transmittal forms are placed in the transport containers with the samples, place the forms in a waterproof enclosure and seal.

For common carrier shipping, seal transport containers securely with strapping tape or other means to prevent lids from accidentally opening. Keep all shipping bills from common carriers with archived transmittal records.

6.5 Sample Handling and Custody

Written documentation of sample custody from the time of sample collection through the generation of data by analysis of that sample is recognized as a vital aspect of an environmental study. The chain-of-custody of the physical sample and its corresponding documentation will be maintained throughout the handling of the sample.

6.6 Field Records & Documentation

Field observations and findings are documented on the various forms provided in **Appendix A**. Only indelible ink should be used to record entries on field forms (no pencil). Field notes include water quality measurements, sampling times, sampler name, sampling conditions, weather conditions, and any other unusual circumstance.

At a minimum the following type of information needs to be recorded:

- Sample dates and times;
- Sampler name;
- ID number for the field meters used;
- Instrument readings;
- Site locations;
- Weather and other conditions such as ice thickness;
- Unusual circumstances such as turbid water, low or high flow, discoloration, etc; and
- If any photos were taken.

Documentation of field observations is necessary to provide a record of data and observations to enable participants to reconstruct events that occurred during sampling and to refresh the memory of samplers if called upon to testify during legal proceedings. Notes should be made in real-time and not after returning from the field. All entries should be initialed and dated. Correct mistakes by drawing a single line through the text and initialing the deletion. Do not erase or cover with liquid paper. Do not leave sections blank on forms.

6.7 Field Equipment Maintenance, Calibration, and Reagent Documentation

6.7.1 Documentation of Equipment Maintenance

Follow the manufacturer's suggested maintenance activities and document all maintenance. Assign each specific instrument with a unique description or code for each instrument unit employed. This may include a manufacturer name, model number, serial number, inventory number, etc. Label each unit accordingly.

Document the following information for each piece of instrumentation: identity (unique identifier code) and description (including software if used); manufacturer's name, model number, and serial number (if applicable); calibration checks or other tasks that demonstrate that the equipment performs as expected; manufacturer's operating and maintenance instructions; written preventive maintenance schedule that includes the activity, and the frequency of each activity; and date(s) of any preventive maintenance, repairs, malfunctions, etc., and name of person(s) performing the task(s).

Log all maintenance and repair performed for each instrument unit, including routine cleaning procedures and solution or parts replacement for instrument probes. Include the calendar date for the procedures performed. Record names of personnel performing the maintenance or repair tasks. Describe any malfunctions necessitating repair or service.

Retain vendor service records for all affected instruments. Record the following for rented equipment: rental date(s) and equipment type and model or inventory number or other description. Retain a copy of the manufacturer's operating and maintenance instructions.

6.7.2 Field Calibration Documentation

Field instrument calibration must be performed on a regular basis and calibration records must be kept on the field sheets, field logs or in a separate calibration log. The records must indicate the calibration method (or SOP), and the type of standard(s) (including the concentrations) that were used. Record each calibration check (initial, continuing or final) in the permanent field records (or calibration logs).

At a minimum, these records must include: date, time and location of each calibration check; individual performing the check; results of each check, including the concentration/type of standard, expected reading, and the actual reading; where applicable, calculate and record the percent difference of the results being compared; whether the check met or failed acceptance criteria; readings associated with a failed check; and corrective actions associated with failed check (such as recalibration, removal from use, etc.).

6.7.3 Reagent and Standards Documentation

Maintain documentation on calibration standards (e.g., buffers) and other reagents. At a minimum, note the date of receipt, expiration dates (on the bottle label), and date of first use (on the standard container).

Observe and follow the expiration dates. If any standard or chemical is used after the expiration date, there must be documentation showing that the reagent is providing an acceptable response.

If reagents or standards are prepared from stock chemicals, they must be analytical reagent grade or better. Some reagents or standards may specify "primary standard". In such cases, purchase only the specified grade. Do not substitute an analytical grade chemical.

7.0 Field Testing and Measurement

This section outlines procedures to conduct field measurements commonly associated with sampling activities. They include the parameters that are directly measured in-situ or in a field sample by means of direct-reading instruments or remotely operated meters.

7.1 Inspection/Acceptance of Supplies and Consumables

The consumables that will be used during field operations include decontamination fluids, water for rinsate, blank preparation, tubing, and filters. No material will be used beyond the manufacturers' suggested expiration date.

Decontamination fluids will be visually inspected for gross contamination and considered usable if no visible contamination is present. If contamination is visible, the fluids will be discarded and replaced.

Water used for preparation of equipment blanks and ambient blanks will be reagent-grade water. If detections are reported for equipment or ambient blanks, any remaining water from the suspected lot will be discarded and replaced.

Tubing and filters will be visually inspected for contamination. Tubing and filters will not be reused or decontaminated; only filters that are sealed in the original packaging will be used.

Maintenance of inventory, inspections, and acceptance of the field supplies and consumables is the responsibility of the Field Team Leader.

7.2 Field Measurement of pH

7.2.1 Field Instrument

A pH meter consisting of a potentiometer, a glass electrode, a reference electrode, and a functioning temperature-compensating device are part of the YSI 556 Meter used for field sampling standards

Use purchased or laboratory-prepared standard buffer solutions of pH values that bracket the expected sample pH range. Buffers with nominal values of 4.0, 7.0 and

10.0 units will be appropriate for most situations. Do not use standards past their expiration dates.

7.2.2 Calibration

The field conductivity meters are calibrated according to the manufacturer's recommendations for conductivity. For complete details refer to the Operations Manual of the meter being used.

7.2.3 Sample Container

Pour enough of the fresh sample into a clean cup to take the reading. Place the pH electrode in the sample (in the cup) and swirl the electrode. Wait for stabilization, and read the pH value.

Turn the meter off after the last sample reading, rinse the electrode thoroughly with de-ionized water and replace the electrode's cap.

7.2.4 In-Situ pH of Samples

After calibrating the multi-probe YSI meter follow the meter's instructions to select the display for reading the pH of the sample. Immerse the probe at the desired depth in the water and wait at least thirty seconds for stabilization of the reading (record the value when the difference between two readings taken ten seconds apart is not greater than 0.2 unit).

7.2.5 Flow-through Cells

When using a flow-through cell, the procedure described above for in-situ samples is applicable.

7.2.6 Winter Collection

During periods of extreme cold (less than 0^{o} F), freezing water conditions may interfere with the probe causing the meter to poorly stabilize or give meter drift. In these instances, the sample may be collected in a clean bottle and labeled. Once in the environmental lab, the sample should be refrigerated to preserve integrity. The sample pH should be measured within 24-hours of collection (EPA holding time). This procedural variation as well as the time of measurement and the temperature at measurement must be recorded in the sample notes.

7.3 Field Measurement of Specific Conductance (conductivity)

Specific conductance is a useful method to approximate the total amount of inorganic dissolved solids. The YSI 556 Meter employs automatic temperature compensation and correction on the instrument display value.

7.3.1 Field Instrument

Use any self-contained conductivity instrument suitable for field work, accurate and reproducible to 5% or better over the operational range of the instrument, and preferably equipped with temperature-compensation adjustment.

7.3.2 Standards

Use purchased or laboratory-prepared standard potassium chloride (KCl) solutions with conductivity values that bracket the expected samples' range. Do not use standards past their expiration dates.

7.3.3 Calibration

7.3.4 Measuring Specific Conductance of Samples

Follow manufacturer's instructions for sample measurement. Immerse or place the conductivity probe or sensor in situ at a measuring location representative of the sampling source. If calibration is done in the environmental lab during colder months, the buffers can be refrigerated to more closely mimic field conditions. Allow the conductivity instrument to stabilize.

Record the sample conductivity measurement reading. Rinse off the probe with de-ionized water. Follow manufacturer's instructions for probe storage between use.

7.3.5 In-Situ Measurements at Depth or With Flow-through Cells

After calibrating the instrument as outlined above, follow the manufacturer's instructions to measure the conductivity of the sample. For in-situ measurements immerse the probe at the desired depth and wait for stabilization of the reading and record its value. Follow a similar procedure when using a flow-through cell.

7.3.6 Winter Collection

During periods of extreme cold (less than 0^{o} F), freezing water conditions may interfere with the probe causing the meter to poorly stabilize or give meter drift. In these instances, the sample may be collected in a clean bottle and labeled. Once in the environmental lab, the sample should be refrigerated to preserve integrity. The sample conductivity should be measured as soon as possible, at least within 24-hours of collection (EPA holding time). This procedural variation as well as the time of measurement and the temperature at measurement must be recorded in the sample notes.

7.4 Field Measurement of Temperature

7.4.1 Field Instruments

Pogo uses an YSI instrument for performing field temperature measurements. It is capable of measuring temperature in 0.01°C increments. It is calibrated once a year offsite at a manufacturer approved maintenance facility.

7.4.2 Measuring Sample Temperature

Insert or place the sensor in situ at a measuring location representative of the sampling source. Allow the thermometer or temperature sensor to equilibrate to ambient in-situ temperature. Record the temperature to the nearest 0.1°C when the reading stabilizes and remains constant.

7.5 Field Measurement of Dissolved Oxygen (DO)

7.5.1 Field Instrument

Use a membrane/electrode DO meter, with polarographic or galvanic electrode, and a sensitivity that results in a precision of +/- 0.2 mg/L and an accuracy of +/- 0.2 mg/L. Temperature compensation must be done either automatically by the DO meter, or manually in accordance with SM 4500-O G. See reference. Field-testing measurements requiring temperature compensation necessitate calibration of the temperature field measurement device according to FS 2400.

As an alternative, use the DO ampoule kit according to manufacturer's recommendations.

7.5.2 Standards

Use NIST-traceable Celsius thermometer with a scale marked for every 0.1°C and a range of 0 to 100°C. Access to an organization with capability to perform the Winkler titration procedure is recommended. A "zero-DO standard", prepared with an aliquot of the sample water, is optional. Prepare by adding excess sodium sulfite and a trace of cobalt chloride to bring the DO to zero.

7.5.3 Calibration

The field conductivity meters are calibrated according to the manufacturer's recommendations for conductivity. For complete details refer to the Operations Manual of the meter being used.

7.5.4 Measuring DO in Samples

Place the DO probe at the depth and location appropriate for a representative measurement of the sampling source. For example, take the DO of an effluent just before it enters the receiving water. If the effluent is aerated prior to entering the surface water, take the DO reading in the receiving water at the point of effluent entry.

For well mixed surface waters, e.g., fast flowing streams, take the DO reading at approximately one-to-two feet below the surface or at mid-depth. For still or sluggish surface waters, take a reading at one foot below the surface, one foot above the bottom, and at mid-depth. For shallow waters less than two feet, take the reading at mid-depth. Do not take a reading in frothy/aerated water, since unrepresentative, elevated oxygen levels may be obtained.

For groundwater, if it is impractical to place the probe in the well, collect a sample with minimal aeration and measure the DO immediately upon collection. Use a low-flow pumping system with a flow-through cell for best results. See USGS (1998) for further information on flow through systems.

Rinse probe with de-ionized water and store the probe in a saturated atmosphere (see 1 above) according to manufacturer's directions when not in use.

If the readings show distinct, unexplainable changes in DO levels, or when the probe has been in waters with high sulfides, recalibrate using the Winkler method or perform maintenance per manufacturer's instructions. While taking a reading, if it is very low (e.g., below 1.0 mg/L), allow it to stabilize, record it and then, remove and rinse the probe, as the environment is very likely anoxic and may contain hydrogen sulfide, which can damage the probe.

Temperature corrections may be necessary. Follow manufacturer instructions for automatic corrections or perform manual calculations (SM 4500-O G.).

7.5.5 Winter Collection

DO, which must be measured in-situ, cannot be taken at ambient temperatures below the normal operating range of the instrument. During sever winter cold DO measurements may not be taken.

7.6 Field Measurement of Turbidity

Turbidity measures the scattering effect that suspended solids have on the propagation of light through a body of water (surface or ground waters). The higher the effect (i.e., intensity of scattered light), the higher the turbidity value. Suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, and plankton and other microscopic organisms cause turbidity in water.

Use a turbidimeter (aka nephelometer) or a spectrophotometer consisting of a light source and one or more photoelectric detectors with a readout device to indicate the intensity of light. The instrument must meet these specifications: (1) the light source must have a tungsten-filament lamp operated at a color temperature between 2000 and 3000°K; (2) the distance traversed by the incident light and scattered light within the sample tube must not exceed 10 cm.; (3) the light detector, positioned at 90° to the incident light, must have an acceptance angle that does not exceed + 30° from 90°; (4) the detector and any filter system must have a spectral peak response between 400 and 600 nanometers; or (5) the instrument sensitivity must permit detection of a turbidity difference of 0.02 NTU at the 0 - 1.0 NTU scale. Using the appropriate equipment and following the procedures given here, the field accuracy of this measurement is close to %R= 100 + 10% for turbidities in the range of 1 to 100 NTU.

7.6.1 Sample Cuvettes

Use sample cuvettes or tubes of clear, colorless glass or plastic. Keep cells scrupulously clean, both inside and out, and discard if scratched or etched. Never handle them where the light beam strikes the sample.

Clean sample cuvettes by thoroughly washing with laboratory soap (inside and out) followed by multiple rinses with distilled or de-ionized water, and let air-dry.

Use a very thin layer of silicone oil on the outside surfaces to mask minor imperfections or scratches in the cells. Use silicone oil with the same refractive index of the glass; making sure the cuvette appears to be nearly dry with little or no visible signs of oil. Because small differences between cuvettes significantly impact measurement, use either matched pairs or the same cuvette for standardization and sample measurement.

7.6.2 Standards

Use formazin stock suspension of 4,000 NTU, either prepared according to method SM 2130B, section 3.b, or of commercial origin. Use daily or working standards as outlined below. Do not use standards past their expiration dates.

Working formazin standards

For the turbidity ranges of interest, prepare by diluting the 4,000 NTU stock standard with "high-quality dilution water" (nominal value of 0.02 NTU). Prepare this water by passing laboratory reagent-grade water through a filter with pore size of 0.1 um (rinse the collection flask at least twice with filtrate and discard the next 200 mL).

Secondary commercial standards

Use only those certified by the manufacturer to give equivalent calibrations to the primary standards and retain their certificates.

Primary or secondary Gel-type standards

Use suspensions of microspheres of styrene-divinylbenzene (SDVB) copolymer that are as stable as the concentrated formazin and more stable than diluted formazin. These standards, available commercially, are also known as "gel-type" standards. They are recommended for field use.

7.6.3 Calibration

The field conductivity meters are calibrated according to the manufacturer's recommendations for conductivity. For complete details refer to the Operations Manual of the meter being used.

7.7 Field Measurement of Groundwater Level

Generally, water-level measurements taken in boreholes, piezometers, or monitor wells are used to construct water table or potentiometric surface maps and to determine flow direction as well as other aquifer characteristics. To be used for these purposes, water level measurements should be collected within a 24-hour period.

Use an electric water level indicator (sounder) to measure water levels.

7.7.1 Calibration

The field conductivity meters are calibrated according to the manufacturer's recommendations for conductivity. For complete details refer to the Operations Manual of the meter being used.

7.7.2 Measuring a Groundwater Level

At each well, unlock the protective steel well-head cover and remove the well cap. Lower a sounder into the well until the water surface is encountered. Measure the depth to water (DTW). DTW is defined as the distance from the water surface to the measuring point. Reel in the sounder and remove it from the well. Replace the well cap and secure the locking protective well-head cover. Note and record in the field notebook any physical changes (like erosion or cracks) in the protective concrete pad or variation in the total depth of the well. If sampling is also planned, make sure that the DTW is measured before purging begins.

7.8 Field Measurement of Water Flow and Velocity

Stream flow data is collected by the United States Geological Survey (USGS) at the Goodpaster River.

7.9 Continuous Monitoring with Multi-parameter Meters

Pogo has in-line continuous measurement devices to monitor parameters such as: conductivity, pH, temperature, residual chlorine and turbidity. Meters are calibrated weekly by the Electrical & Instrumentation department according to manufacturer's recommendations.

8.0 DATA REVIEW, VERIFICATION AND VALIDATION

The QAP objectives are defined in terms of precision, accuracy, representativeness, completeness, and comparability parameters. The primary goal is to ensure the quality and integrity of the collected samples, the representativeness of the results, the precision and accuracy of the analyses, and the completeness of the data. Data that meets the QAP objectives and goals will be deemed acceptable. Data that does not meet objectives and goals will be reviewed on a case-by-case basis to ascertain usefulness.

The data review and verification procedure should be completed in a timely manner so that, if possible, re-sampling can be accomplished within holding times or the compliance period. Samples that exceed standards or permit limits may initiate regulatory reporting requirements. Data validation includes laboratory and field data. Pogo uses the Environmental Data Management System (EDMS) developed by EnviroData Solutions, Inc to manage our data.

8.1 Initial Review

The initial data review should take place as soon as possible following issuance of the laboratory Sample Receipt.

1) Review the Sample Receipt for a Laboratory ID assigned to each sample, date and time of arrival, chain-of-custody status, and any notes that indicate the quality of the sample on arrival.

2) Check Sample Receipt for sample temperature if applicable. Sample temperature criteria have been established for proper preservation of water, solid, and tissue samples. If the sample temperature is outside of the criteria, i.e., an unpreserved water sample to be analyzed for metals is outside the temperature criterion of 4 ± 2°C or a sludge sample to be analyzed for TCLP metals is outside the criterion of 4 ± 2°C, all non-detect and positive values are considered to be estimated and the J data qualifier flag shall be applied.

3) Compare the Sample Receipt data with the Request for Analysis and note any discrepancies (i.e., station ID error, missing samples, etc.).

4) Check the Sample Receipt for sample holding time.

8.2 Manual Review of Analytical Data

8.2.1 Data Package Completeness.

Verify that the data package is complete and contains, but is not limited to, the following: cover letter signed by the laboratory project manager transmitting the data; Laboratory Report (including QA/QC results), and Laboratory Electronic Data Delivery (EDD) format digital data (for import into EDMS).

8.2.2 Transcription Errors.

Check at least 10 percent of the electronic data against the data package to ensure no transcription errors have been made.

8.2.3 QC Samples.

Verify the specified QC samples (laboratory and field) were analyzed and the frequency was adequate as described in the QAP.

8.3 Verification and Validation

After a manual review of the field data and electronic data package, the data file(s) are imported into the EDMS, a process that automatically checks for errors and user-defined warnings and verifies that the correct format was used. Results are automatically checked against standards and notification of any exceedances is immediate. Once data has been imported into EDMS various reports can be generated to validate the data:

- Comparison to Standards;
- Field Blank Evaluation;
- Identify Missing Data;
- Primary-Duplicate Comparison; and
- Qualified Data.

8.3.1 Laboratory Data Qualifier Flags

Data qualifier codes or flags are notations used by laboratories and data reviewers to briefly describe or qualify data and the systems producing data. Data qualifiers are included in the Laboratory Report (e.g., D – data reported from a preparation or analytical dilution; J – estimated value; U – analyte included in the analysis but not detected). Definitions of laboratory data qualifier flags are provided with the Laboratory Report.

8.3.2 EDMS Generated Qualifier Flags

The EDMS data validation routine compares data to prior data, and applies the statistical outlier test (EPA, 1989) to identify questionable data. A minimum of three data values must be available for the statistical outlier test to be performed. EDMS compares data to applicable standards, checks hold times, and compares the cation-anion balance to acceptable limits. Duplicate samples are checked by the validation routine but are not compared to standards. Below are the qualifiers that EDMS may apply to questionable data:

AK – Invalid Data;

NR – Non Regulatory Sample;

R – Outlier-Above 0.1% significance;

J – Outlier-Above 5% significance;

Data outliers are unusually high or low data values that may be incorrect and may skew the results of statistical analyses.

H – Holding Time Exceeded;

EDMS compares sample analysis date to the sample date to verify the samples were analyzed within recommended holding times

HJK – Holding Time Exceeded and 5% Outlier;

K – Cation/Anion Estimate;

EDMS calculates the sum of the anions, sum of cations, sum of cations and anions and the cation-anion percentage difference and adds these parameters to the database. If they are included in the data imported from the lab the lab's values are also stored in the database. The totals for the cations and anions should balance, since all waters are electrically neutral. If the percentage difference is too high the Cation /Anion Estimate is applied.

HJK – Holding Time Exceeded and 5% Outlier and Cation/Anion Estimate;

HK– Holding Time Exceeded and Cation/Anion Estimate;

HKR – Holding Time Exceeded and 0.1% Outlier and Cation/Anion Estimate;

JK – 5% Outlier and Cation/Anion Estimate; and

KR – 0.1% Outlier and Cation/Anion Estimate.

8.3.3 Review of Qualifier Status Description

The reviewer of the data will add a status description to any flagged data to indicate the usability of the data. These qualifiers include:

1 – Accepted without Change;

2 – Rechecked by Lab;

3 – Rechecked and Changed;

4 – Rechecked and not changed;

5 – Accepted and removed Qualifier; and

6 – Accepted and kept Qualifier.

8.3.4 Hardness Dependent Water Quality Criteria Calculations

When reviewing any analytical parameters, which are hardness dependent that appear to exceed water quality standards, hardness dependant calculation are performed.

The freshwater criterion for cadmium, copper, lead, nickel, silver, and zinc is expressed as a function of total hardness (mg/L CaCO3) in the water column. The action limits for these criteria are calculated for surface and groundwater according to the following equations:

Aquatic Life Fresh Water Acute (dissolved) = exp {ma [Ln(hardness)] + ba} (CF), or

Aquatic Life Fresh Water Chronic (dissolved) = exp {mc [Ln(hardness)]+ bc} (CF).

The factors for the equations are provided in **Table 8.1**. When using the above equations, for waters with hardness between 25 and 400 mg/L as CaCO3, the criterion will be calculated using the actual ambient hardness of the surface or ground water. If the ambient hardness is outside of this range, a minimum hardness of 25 mg/L or a maximum hardness of 400 mg/L will be used.

Table 8.1: Hardness Dependent Water Quality Criterion Formulas

Parameter	Acute	Acute	Chronic	Chronic	Total Dissolved Conversion Factor (CF)	
	m	b	m	b	Acute	Chronic
Cadmium	--	--	0.7409	-4.719	--	1.101672- [(ln hardness)(0.041838)]
Copper	--	--	0.8545	-1.702	--	0.960
Lead	--	--	1.273	-4.705	--	1.46203 - [(ln hardness)(0.145712)]
Nickel	--	--	0.846	+0.0584	--	0.997
Silver	1.72	-6.52	--	--	0.85	--
Zinc	--	--	0.8473	+0.884	--	0.986

8.4 Update Database

Once any concerns with the analytical data identified during the manual review and/or data verification steps have been resolved, and data qualifier flags have been applied and entered into the electronic data file(s) during the data validation step, the EDMS database will be updated with the qualified data.

9.0 Visual Monitoring Plan

The purpose of the Visual Monitoring Plan is to:

- Monitor the DSTF facility for signs of damage or potential damage from settlement, ponding, leakage, erosion or operations;
- Monitor the proper placement of incidental, non-hazardous waste that is disposed of in the DSTF;
- Inspect monitoring wells for damage; and
- Monitor wildlife interactions at the DSTF and RTP reservoir.

Table 9.1 identifies where key Visual Monitoring Plan elements are located in the Pogo Mine Monitoring Plan. **Table 9.2** provides a facility inspection schedule.

Table 9.1: Visual Monitoring Plan Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Appendix B	Pogo Facilities Map and Monitoring Locations
Appendix C	Drystack Weekly Inspection Log and RTP Dam Inspection Form

Table 9.2: Facility Inspection Schedule

Period	Location	Observation(s)
Weekly	DSTF	Surface Operations inspects on days when tailings are being placed.
	Monitoring Wells	Signs of physical damage.
Monthly	DSTF	Unusual cracks, bulging, signs of settlement, signs of seepage and erosion.
	RTP Dam	Erosion, collapse, subsidence, seepage, damage on facilities, vegetation cleared, cracks in concrete, connection to flume, obstacles in flume, and seepage collection wells.
Every Three Years	RTP Dam	Periodic Safety Inspection (PSI).

9.1 Biological Visual Survey Program

Pogo Mine operations personnel perform wildlife visual inspections during normal operations near the DSTF and the RTP Reservoir. Operations personnel note wildlife sightings and any unusual activities or conditions (sickness, mortality etc.) surrounding the interactions. The wildlife observations are logged by the Surface Department and the logs sent quarterly to the Environmental Department. If any unusual activities or conditions, such as mortalities or negative animal interactions occur, the Environmental Department and the Pogo Safety Department are notified immediately.

The Safety Department maintains the Public Safety Permit issued by Alaska Department of Fish and Game and performs any animal hazing required.

9.2 Visual Monitoring Program Reporting Requirements

Any issues at the DTSF (such as cracks, bulging or erosion) or issues with the RTP dam (such as settlement or geotechnical concerns) are reported in the quarterly and annual water quality monitoring reports as required by the Waste Disposal Permit.

Any unusual wildlife interactions, such as mortalities or hazing events, which occur at the DSTF or the RTP Reservoir, are reported in the quarterly and annual water quality monitoring reports as required by the Waste Disposal Permit.

Quarterly reports are submitted within 60 days of the last day of the quarter. The Annual Report is due March 1 of the following year. A summary of activities is presented to the agencies and public (at least two weeks after the Annual Report is submitted) at the annual meeting. All records of monitoring activities are retained for at least three years and are available upon agency request.

10.0 Fluid Management Program

The purpose of the Fluid Management Program is to:

- To monitor the RTP Dam as described in "RTP Dam Operation and Maintenance Manual."
- To monitor process water management by accounting for water discharged into or withdrawn from the RTP, RTP water recycled to the mill, and water treated and discharged.
- To monitor any Temporary Water Use Permits (TWUP), Permits to Appropriate Water, and Certificates of Appropriation.

Table 10.1 identifies where fluid management program elements are located in the Pogo Mine Monitoring Plan.

Table 10.1: Fluid Management Program Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 3.1	Fluid Management Monitoring Schedule
Table 3.2	Permits to Appropriate Water and Water Quantity Limits
Table 3.3	Temporary Water Use Authorization (TWUP) & Water Quantity Limits

10.1.1 Water Balance

Significant measurable inflows and outflows within the RTP watershed are monitored and a monthly water balance is calculated. Flow meters are installed on the major process fluid pathways and are monitored and maintained by the Mill Department and Water Operations.

The Environmental Department is responsible for gathering the following data for the water balance calculations:

- Precipitation is recorded daily during the summer from a rain gauge situated next the mineralized rock temporary storage pad near the 1525 portal;

- Annual Snow surveys are performed while snow is present and mean daily temperature is less than 32 ºF; and
- Monthly recording of water volume through the V-notch weir below the Drystack and above the RTP.

10.1.2 Water Use Permits

Pogo has a number of water use permits issued by ANDR.

Permits to Appropriate Water

Annual water use is recorded with flow meters to insure the Permits to Appropriate Water limits are not exceeded.

- The exception to this is the water withdrawn from the gravel pit pond (LAS 24612) for use as dust suppression on the roads. This value is calculated by tanker load.

Temporary Water Use Permits (TWUP)

TWUP are utilized for dust suppression on the Pogo Mine Access road and the mine site roads. The quantity of water used for dust suppression is calculated and tracked based on truck tanker loads.

TWUP are also part of the Alaska Placer Mine Application for Hardrock Exploration (APMA) permit for the exploration drilling rigs. Exploration drill rigs sometimes get their water from tanker trucks and water use tracked by the tank load. However, sometimes water is pumped directly from the water source into the drill rig holding tank. The maximum capacity of the pumping equipment in a 24–hour period is used to determine the water quantity limits when applying for the APMA. This maximum water use is never fully utilized due to the mobilization and demobilization periods of drill rig movement that occur at regular intervals during the drilling season.

10.1.3 Fluid Management Reporting Requirements

Water balance monitoring results, are reported in the quarterly and annual water quality monitoring reports as required by the Waste Disposal Permit. The annual water use associated with the Water Use Permits and Temporary Water Use Permits are presented in the annual report.

10.1.4 Fluid Management ADEC Notification

In the case of an emergency underground (e.g., too much water in underground workings), treated water may be pumped to the RTP for storage. Whenever treated water is pumped into the RTP, ADEC is notified.

11.0 DSTF Geochemistry Program

The purpose of this monitoring is to detect trends in the tailings composition that indicate any acid producing potential.

Table 11.1 identifies where DSTF Geochemistry Program key elements are located in the Pogo Mine Monitoring Plan.

Table 11.1: DSTF Geochemistry Program Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 4.1	Drystack Sampling Schedule
Table 4.2	Acid-Base Accounting of Flotation Tailing and Mineralized Development Rock Placed in Drystack
Table 4.3	Flotation Tailing and Mineralized Development Rock Whole Rock Chemistry

11.1.1 DSTF Geochemistry Sampling

Table 11.2 presents the location and purpose for DSTF geochemistry sampling program.

Table 11.2: DSTF Geochemistry Sampling Location and Purpose

Monitoring Station	Location	Purpose
PC002	Drystack, active area of mineralized development rock placement	To monitor for acid generating potential and metal content of rock.
PC003-solids	Solids from filter feed tank underflow	To monitor for acid generating potential and metal content of tailings.

The mineralized development rock sample, PC002, is collected monthly from the DSTF and composited later by the contract laboratory on a quarterly basis. Small rocks and fines are collected from recently placed mineralized development rock before it is compacted between layers of drystack material. Approximately one liter of rock is collected for each grab sample and contained in a polyethylene liter bottle, or Ziploc bags, and labeled appropriately.

A grab sample of flotation tailing solids or drystack slurry (PC003-solids) is collected monthly by mill personnel from the filter feed underflow. The grab slurry samples are composited in a single, covered five-gallon bucket. The sample is kept in the metallurgy lab while it is being collected over the quarter. A log sheet is kept of each grab sample (see **Appendix A**) and given to Environmental Department quarterly. At the end of each quarter, the composite sample is processed through a decontaminated pressure filter to separate the solids from the liquid in the slurry.

Table 11.3 provides sampling schedule (including QA/QC samples) and **Table 11.4** analytical methods used. Table **11.5** identifies sample containers and holding times.

Table 11.3: DSTF Geochemistry Sampling Schedule

Location	Sample Type	Profile	Frequency
PC002	Grab	Template PC002	Monthly sample, composited by lab for quarterly analysis
PC100	Duplicate Grab	Template PC002	Annually (lab collects a homogenized split sample from PC002)
PC003	Grab	Template PC003	Quarterly
PC100	Duplicate Grab	Template PC003	Annually

Table 11.4: Analytical Methods for DSTF Geochemistry Monitoring

Analyte Group	Parameter	Analytical Method	Units
Basic Acid Base Accounting	Paste pH	Standard	s.u.
	Inorganic Carbon	Sobek	%
	Total Carbon	Sobek	%
	Sulfate Sulfur (HCL Leachable)	LECO	%
	Sulfide Sulfur (calculated)	LECO	%
	Sulfur, Total	LECO	%
	Sulfur as Sulfate	LECO	%
	Neutralization Potential/Acid Potential	Sobek	tCaCO3/1Kt
	Maximum Potential Acidity	Sobek	tCaCO3/1Kt
	Net Neutralization Potential	Sobek	ratio
Metals	Mercury	200.8	ppm
	48 Elements	ICP-MS	ppm

Table 11.5: Holding Times and Sample Containers for DSTF Geochemical Sampling

Analyte Group	Parameter Name	Container	Container Size	Preservation	Holding Time
Acid Base Accounting	ABA parameters	Ziploc bag, Tyvek bag	18 oz bags	Ice 4°C	28 days
Metals	Metals, except mercury	Polyethylene, Glass	15 g	Ice 4°C	6 months
	Mercury	Polyethylene, Glass	15 g	Ice 4°C	28 days

11.1.2 DSTF Geochemistry Reporting Requirements

PC002 and PC003-solids monitoring results, are reported in tabular form in the Annual Activity and Monitoring Report as required by the Waste Disposal Permit. .

11.1.3 DSTF Geochemistry Exceedances

The PC002 and PC003-solids data is monitored for acid rock generating characteristics within the DSTF. A Neutralization Potential/Acid Potential (NP/AP) ratio of greater than 1.4 means that there is no acid generation.

- If a flotation tailings sample has an NP/AP ratio of less than 1.4, a confirmation sample is taken;
- If the confirmation sample confirms an NP/AP ratio of less than 1.4, and the next three quarterly samples have NP/AP ratios of less than 1.4, ADEC and ADNR will be notified; and
- A corrective action plan will be developed in conjunction with ADEC and copied to ADNR.

12.0 Flotation Tailings Interstitial Water Program

The original QA/QC objective of the flotation tailings interstitial water program was to compare the chemical nature of the drystack material being placed to a target range based on the test work and assumptions used during permitting. Pogo calculated new operating target ranges based on data collected from 2006 to 2010 for Flotation Tailing Interstitial Water. These QA/QC targets better reflect actual operating conditions.

Table 12.1 identifies where Flotation Tailing Interstitial Water Program key elements are located in the Pogo Mine Monitoring Plan.

Table 12.1: Flotation Tailings Interstitial Water Program Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 4.1	Drystack Sampling Schedule
Table 4.4	Flotation Tailing Interstitial Water Chemistry and Operating Target Ranges

12.1.1 Flotation Interstitial Water Sampling Procedures

A grab sample for flotation tailings interstitial water is collected at station PC003, which is located at the underflow of the filter feed tank. The slurry is collected in a clean five-gallon bucket and taken to the onsite metallurgy lab. The sample is put through a decontaminated pressure filter to separate the liquid for the solids in the slurry.

Table 12.2 provides sampling schedule (including the QA/QC samples) and **Table 12.3** analytical methods used. **Table 12.4** identifies sample containers and holding times.

Table 12.2: Flotation Tailings Interstitial Water Sampling Schedule

Location	Sample Type	Profile	Frequency
PC003	Grab	13g	Quarterly
PC100	Duplicate Grab	13g	Annual
PC-EB	Equipment Blank	13g	Annual

Table 12.3: Analytical Methods and Limits for Flotation Tailing Interstitial Water Monitoring

Analyte Group	Parameter	Field Filter	Analytical Method	Units	Minimum Level	Method Detection Limit
Cyanides	Cyanide, Weak Acid Dissociable (WAD)	n	SM 4500-CN I	µg/L	5.2[1]	1.2
Major Anions	Alkalinity as CaCO3	n	SM 2320B	mg/L	NA	1.2
	Alkalinity, Total	n	SM 2320B	mg/L	NA	1.2
	Chloride	n	EPA 300.0 or 340.2	mg/L	NA	0.1
	Fluoride	n	EPA 300.0	mg/L	NA	0.1
	Nitrite-Nitrate as N	n	EPA 353.2	mg/L	80	0.38
	Sulfate	n	EPA 300.0	mg/L	NA	0.1
Major Cations	Calcium	y	EPA 200.7	mg/L	NA	0.013
	Magnesium	y	EPA 200.7	mg/L	NA	0.012
	Potassium	y	EPA 200.7	mg/L	NA	0.31
	Sodium	y	EPA 200.7	mg/L	NA	0.028
	Aluminum	y/n	EPA 200.7	µg/L	50	0.33

Analyte Group	Parameter	Field Filter	Analytical Method	Units	Minimum Level	Method Detection Limit
Metals	Antimony	y/n	EPA 200.8	µg/L	3	0.027
	Arsenic	y/n	EPA 200.8	µg/L	5	0.044
	Cadmium	y/n	EPA 200.8	µg/L	0.1	0.045
	Chromium	y/n	EPA 200.8	µg/L	10	0.049
	Copper	y/n	EPA 200.8	µg/L	2.2	0.034
	Iron	y/n	EPA 200.7	µg/L	817	2.7
	Lead	y/n	EPA 200.8	µg/L	0.5	0.03
	Manganese	y/n	EPA 200.8	µg/L	NA	0.017
	Mercury	y/n	EPA 1631	µg/L	0.01	0.00015
	Nickel	y/n	EPA 200.8	µg/L	NA	0.05
	Selenium	y/n	EPA 200.8	µg/L	1.9	0.14
	Silver	y/n	EPA 200.8	µg/L	0.3	0.028
	Zinc	y/n	EPA 200.8	µg/L	16.8	0.084
Physical and Aggregate Properties	Ammonia, as TKN	n	EPA 351.2	mg/L	NA	0.11
	Conductivity (Specific Conductance)	n	EPA 120.1 (Field)	µS/cm @ 25ºC	NA	10
	Dissolved Oxygen	n	EPA 360.1 (Field)	mg/L	NA	NA
	Hardness as $CaCO_3$	n	SM 2340B	mg/L	NA	1.0
	pH Field	n	EPA 150.1	s.u.	NA	NA
	Temperature	n	EPA 170.1 (Field)	C	NA	0.1
	Total Dissolved Solids (TDS)	n	SM 2540 C	mg/L	NA	4.8
	Total Suspended Solids (TSS)	n	SM 2540D	mg/L	30	0.5
	Turbidity	n	EPA 180.1	NTU	NA	0.03

[1]APDES Permit # AK0053341 specifies a site specific ML of 20 ug/L for WAD Cyanide

Table 12.4: Holding Times and Sample Containers Flotation Tailing Interstitial Water Sampling

Analyte Group	Parameter Name	Container	Container Size	Preservation	Maximum Holding Time
Cyanides	Cyanide, WAD	Polyethylene, Glass	1 L	Cool 4°C, NaOH to pH>12	14 days
Major Anions	Alkalinity	Polyethylene, Glass	1 L	Cool 4°C	14 days
	Chloride, Fluoride & Sulfate	Polyethylene	L/1 L	Cool 4°C	28 days
	Nitrate	Polyethylene, Glass	L/1 L	Cool 4°C	48 hours
	Nitrate+Nitrite	Polyethylene, Glass	250/500 mL	Cool 4°C, H_2SO_4 to pH<2	28 days
Major Cations	Calcium, Magnesium, Potassium, Sodium	Polyethylene, Glass	250/500 mL	HNO_3 to pH<2	6 months
Metals	Metals, except mercury	Polyethylene	250/500 mL	HNO_3 to pH<2	6 months
	Mercury (Method 1631)	Fluoropolymer, Glass	125/250 mL	either 5 mL/L of pretested 12N HCl or 5 mL/L BrCl solution	28 days
Physical and Aggregate Properties	Conductivity (Specific Conductance)	Polyethylene, Glass	100 mL	None	24 hours
		Polyethylene, Glass	500 mL/1 L	Cool 4°C, Filtered (for EPA 120.1)	28 days
	Dissolved Oxygen	Glass	300 mL	None	Analyze immediately
	Hardness	Polyethylene, Glass	250/500 mL	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
	pH	Polyethylene, Glass	25 mL	None	Analyze immediately
	Temperature	Polyethylene, Glass	25 mL	None	Analyze immediately
	TSS, TDS	Polyethylene, Glass	500 mL/1 L	Cool 4°C	7 days
	Turbidity	Polyethylene, Glass	500 mL/1 L	Cool 4°C	48 hours

12.1.2 Flotation Interstitial Water Reporting Requirements

Flotation interstitial water monitoring results are reported in the quarterly and annual activity and monitoring reports as required by the Waste Disposal Permit. The data is presented graphically and includes the flotation interstitial water operating target ranges.

12.1.3 Flotation Interstitial Water Exceedances

If any of the flotation interstitial water chemistry exceeds the operating target ranges listed in **Table 4.4 of the Pogo Mine Monitoring Plan**:

- A flotation interstitial water confirmation sample is taken;
- If the confirmation sample confirms the exceedance **and** continues to exceed in the next three quarterly samples ADEC will be contacted; and
- A corrective Action Plan will be developed in conjunction with ADEC.

13.0 Development Rock Segregation

Development rock is non-gold bearing rock brought to the surface to be disposed of in the DSTF. The development rock segregation program classifies development rock based on sulfur and arsenic concentration for each blasted round.

Table 13.1 identifies where Development Rock Segregation key elements are located in the Pogo Mine Monitoring Plan.

Table 13.1: Development Rock Segregation Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 4.5	Development Rock Segregation Parameters
Appendix A	Development Rock Segregation and Tracking Procedures

Development rock is classified as "Mineralized" or Non-Mineralized." Mineralized rock is defined as having a sulfur content greater than 0.5% and/or an arsenic content greater than 600 mg/kg (refer to **Table 13.2**). Non-mineralized rock is defined as having sulfur content less than 0.5% and an arsenic content less than 600 mg/kg.

Data from the Pogo ore body indicates that sulfide-sulfur is the predominant sulfur form and sulfate-sulfur concentrations are very low. Therefore, a total sulfur concentration provides a conservative estimate of the sulfide-sulfur concentration.

Mineralized development rock is encapsulated in the drystack at least fifty feet from the edge between layers of compacted drystack material. For a more detailed description of mineralized development rock processing refer to the "Drystack Tailing Facility Construction and Maintenance Manual."

Table13.2: Development Rock Segregation Analytical Parameters and Action Limits

Parameter	Units	Action Limit
Sulfur by XRF	percent	greater than 0.5
Arsenic by XRF	Dry mg/kg	greater than 600

13.1 Development Rock Segregation

Development rock segregation and disposal is explained in detail in the **"**Pogo Development Rock Segregation and Tracking Procedures" (refer to **Appendix A of the Pogo Mine Monitoring Plan**). It includes a description of:

- Development Rock Sampling;
- Development Rock Geochemical Analysis;
- Development Rock Segregation; and
- Development Rock Tracking and Documentation.

Non-mineralized development rock can be stored in the non-mineralized development rock stockpile for use in construction or erosion control.

13.1.1 Development Rock Segregation Reporting Requirements

Development Rock Segregation monitoring results are reported in the quarterly and annual activity and monitoring reports as required by the Waste Disposal Permit. Included is the number of rounds blasted as well as the number of rounds that were classified as mineralized development rock.

14.0 Carbon-In-Pulp Tailing Monitoring Program

Pogo's Waste Disposal Permit (0131-BA002) requires WAD cyanide monitoring of Carbon-In-Pulp (CIP) tailings after it goes through the cyanide destruction circuit and prior to use as paste backfill. This ensures that the cyanide destruction process is working within operational controls. The purpose of this monitoring is:

- To verify that all CIP tailings are disposed of underground as part of the paste backfill;
- To verify the action limits for cyanide destruction are met;
  - At least 90% of the samples shall contain less than ten ppm WAD cyanide; and
  - 100% of the samples shall contain less than 20 ppm WAD cyanide.

Table 14.1 identifies where CIP Tailing Monitoring Program key elements are located in the Pogo Mine Monitoring Plan.

Table 14.1: CIP Tailing Monitoring Program Elements in Pogo Mine Monitoring Plan

Location in Plan	Description
Table 4.7	CIP Tailing Sampling Schedule
Table 4.8	CIP Tailing Analysis Profile

14.1.1 CIP Tailing Sampling

A grab sample is collected by a mill operator at the CIP Stock Tank (station PC001) which is located directly after the cyanide destruction circuit. WAD cyanide analysis is performed in the Pogo onsite lab using the Picric Acid Method.

Samples are collected once per shift and before every paste pour. If a PC001 sample meets the action limit of 10 mg/kg WAD Cyanide:

- It is re-sampled to confirm results.

- If the confirmation sample contains less than 10 mg/kg WAD cyanide then the original sample is rejected and removed from the data set used to determine compliance.
- If the mean concentration of the original sample and the confirmatory sample are greater than 20 mg/kg of WAD cyanide then the paste pour is not initiated until the WAD cyanide levels drop below the action level.

14.1.2 CIP Tailing Reporting Requirements

CIP Tailing monitoring results, are reported in the quarterly and annual activity and monitoring report as required by the Waste Disposal Permit. Only WAD cyanide data that was collected just prior to a paste pour, or during a paste pour, is included. The data is presented graphically and includes the CIP action limits.

14.1.3 CIP Tailing Exceedance

If a CIP Tailing WAD cyanide exceedance occurs:

- If any CIP Tailing WAD cyanide analysis exceeds the target limits prior to a paste pour, the pour is postponed until the cause of the problem is located and corrective action is taken.
- If any CIP Tailing WAD cyanide analysis exceeds the target limits during a paste pour, the cause of the problem is investigated and corrective action is taken.

A discussion on exceedances along with any corrective actions taken is included in the quarterly and annual reports.

15.0 Surface Water Monitoring Program

Pogo's APDES Permit (AK0053341) requires receiving water monitoring:

- To monitor changes that may occur as a result of activities associated with the discharges from the facility;
- To compare upstream and downstream monitoring results and to compare monitoring results for each station over time, to show any trends; and
- To assure that state water quality standards are met and to provide information for future permitting actions.

Pogo's Waste Disposal Permit (0131-BA002) requires surface water monitoring:

- For parameters at frequencies and locations which ensure that sampling detects any violation of the water quality standard; and
- To ensure that water quality standards are met at the outside edge of the mixing zone in the Goodpaster River.

The following sections explain field sampling procedures and guidance for surface water and sediment sample collection.

15.1.1 Water Quality

Sampling begins at the furthest downstream station and moves upstream to avoid contamination between stations from upstream sampling activities. Sample collection begins with general parameters and ends with trace metals.

Permit required sampling

Sample collection at surface water sites can be done two ways. The laboratory certified sampling bottle can be lowered in to the body of water at an angle that allows the water to flow in gently. If the bottle is pre-preserved this must be done carefully to make sure none of the preservative escapes the sample bottle while it is being filled. An alternate method includes a dedicated, extending, sampling rod with a laboratory cleaned and certified bottle (unpreserved) attached at the end. A new, clean, bottle is attached to the pole for each sampling site and is rinsed with surface water several times before the water is poured into the sample collection bottle.

Winter Surface Water Sampling

A gas powered ice auger is used to drill a hole for sampling. Samples are collected by hand using the sample bottle alone or by using an extending sampling rod as described above. A peristaltic pump may also be used with the tubing changed between stations to prevent contamination, (very low temperatures may require insulation of pump). Care is taken to avoid contact with the sides of the augered hole.

During extreme winter conditions, it may be necessary to collect field measurements and filter dissolved metals samples in the environmental lab. An adequate number of sample bottles (without preservative) are used to collect the volume of water necessary to complete procedures inside. Field parameters will be measured as soon as possible after the sample is collected. Measurement time and location will be recorded on the data sheets.

Sample Filtration

Samples for dissolved metals are filtered in the field using disposable, trace metal grade 0.45 micron filters and peristaltic field pump powered by 12 volt portable battery pack or in the environmental lab. The filter is attached to silicone tubing by a hose fitting/reducer fitting that is connected to silicon tubing and inserted into the sample bottle. At least three filter volumes (approximately 300-400 ml) of sample water are run through the filter before filling sample bottle.

Table 15.1 identifies where Surface Water Monitoring Program key elements are located in the Pogo Mine Monitoring Plan.

Table 15.1: Surface Water Monitoring Program Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 5.1	Phase II Active Mining Operations Surface Water Sampling Schedule
Table 5.2	Surface Water Analytical Parameters Profile 13s and Water Quality Standards
Table 5.4	Phase III and IV Closure Operations Surface Water Sampling Schedule
Table 5.5	Phase V Post Closure Surface Water Sampling Schedule

The primary study area includes a 7-mile segment of the upper Goodpaster River near the Pogo Mine (refer to **Figure 2-2**). Four monitoring stations are used to monitor the water quality in the Goodpaster River (**Table 15.2**).

Table 15.2: Surface Water Monitoring Station Locations and Purpose

Monitoring Station	Goodpaster River Location	Purpose
SW01	Above (upstream) all project facilities.	To monitor background water quality.
SW15	Below (downstream) all project facilities and the confluence with Pogo Creek.	To monitor the water quality below the project facilities.
SW41	Below (downstream) the confluence with Liese Creek.	To monitor the water quality below the off-river treatment works and drainage from the project facilities.
SW42	Below (downstream) Outfall 002 mixing zone.	To monitor the water quality below the mixing zone for Outfall 002.

15.2 Surface Water Sample Collection

Surface water monitoring stations are sampled six times a year during high and low flow conditions. Sampling may be rescheduled due to severe weather conditions. **Table 15.3** provides surface water sampling schedule (including QA/QC sampling). **Table**

15.4 provides analytical methods and limits. **Table 15.5** provides holding times and sample containers.

Table 15.3: Surface Water Sampling Schedule

Location	Sample Type	Profile	Frequency
SW01, SW15, SW41, SW42	Grab	13s	Late February to mid-March
SW100	Duplicate Grab	13s	Rotating locations with every sampling event
SW-FB	Blank Grab	13s	Rotating locations with every sampling event
SW01, SW15, SW41, SW42	Grab	13s	Mid-May
SW01, SW15, SW41, SW42	Grab	13s	Mid-June
SW01, SW15, SW41, SW42	Grab	13s	Early August
SW01, SW15, SW41, SW42	Grab	13s	Late-September
SW01, SW15, SW41, SW42	Grab	13s	December
SW-12	Grab	13s	September / October
Dry Stack Toe	Grab	13s	Monthly when water is present
SW100	Duplicate Grab	13s	Annual, collect with first sampling event of year
SW-FB	Blank Grab	13s	Annual, collect with first sampling event of year

Table 15.4: Analytical Methods and Limits for Surface Water Monitoring

Analyte Group	Parameter	Field Filter	Analytical Method	Units	Minimum Level	Method Detection Limit
Cyanides	Cyanide, Weak Acid Dissociable (WAD)	n	SM 4500-CN I	µg/L	5.2[1]	1.2
Major Anions	Alkalinity as CaCO3	n	SM 2320B	mg/L	NA	1.2
	Alkalinity, Total	n	SM 2320B	mg/L	NA	1.2
	Chloride	n	EPA 300.0 or 340.2	mg/L	NA	0.1
	Fluoride	n	EPA 300.0	mg/L	NA	0.1
	Nitrite-Nitrate as N	n	EPA 353.2	mg/L	80	0.38
	Sulfate	n	EPA 300.0	mg/L	NA	0.1
Major Cations	Calcium	y	EPA 200.7	mg/L	NA	0.013
	Magnesium	y	EPA 200.7	mg/L	NA	0.012
	Potassium	y	EPA 200.7	mg/L	NA	0.31
	Sodium	y	EPA 200.7	mg/L	NA	0.028
Microbiological	Fecal Coliform	n	SM 9222D	#/100 mL	200	9
Metals	Aluminum	y/n	EPA 200.7	µg/L	50	0.33
	Antimony	y/n	EPA 200.8	µg/L	3	0.027
	Arsenic	y/n	EPA 200.8	µg/L	5	0.044
	Cadmium	y/n	EPA 200.8	µg/L	0.1	0.045
	Chromium	y/n	EPA 200.8	µg/L	10	0.049
	Copper	y/n	EPA 200.8	µg/L	2.2	0.034
	Iron	y/n	EPA 200.7	µg/L	817	2.7
	Lead	y/n	EPA 200.8	µg/L	0.5	0.03
	Manganese	y/n	EPA 200.8	µg/L	NA	0.017

Analyte Group	Parameter	Field Filter	Analytical Method	Units	Minimum Level	Method Detection Limit
	Mercury	y/n	EPA 1631	µg/L	0.01	0.00015
	Nickel	y/n	EPA 200.8	µg/L	NA	0.05
	Selenium	y/n	EPA 200.8	µg/L	1.9	0.14
	Silver	y/n	EPA 200.8	µg/L	0.3	0.028
	Zinc	y/n	EPA 200.8	µg/L	16.8	0.084
Physical and Aggregate Properties	Ammonia, as TKN	n	EPA 351.2	mg/L	NA	0.11
	Conductivity (Specific Conductance)	n	EPA 120.1 (Field)	µS/cm @ 25ºC	NA	10
	Dissolved Oxygen	n	EPA 360.1 (Field)	mg/L	NA	NA
	Hardness as $CaCO_3$	n	SM 2340B	mg/L	NA	1.0
	pH Field	n	EPA 150.1	s.u.	NA	NA
	Temperature	n	EPA 170.1 (Field)	C	NA	0.1
	Total Dissolved Solids (TDS)	n	SM 2540 C	mg/L	NA	4.8
	Total Suspended Solids (TSS)	n	SM 2540D	mg/L	30	0.5
	Turbidity	n	EPA 180.1	NTU	NA	0.03

[1]APDES Permit # AK0053341 specifies a site specific ML of 20 ug/L for WAD Cyanide

Table 15.5: Holding Times and Sample Containers Surface Water Sampling

Analyte Group	Parameter Name	Container	Container Size	Preservation	Maximum Holding Time
Cyanides	Cyanide, WAD	Polyethylene, Glass	1 L	Cool 4°C, NaOH to pH>12	14 days
Major Anions	Alkalinity	Polyethylene, Glass	1 L	Cool 4°C	14 days
	Chloride, Fluoride & Sulfate	Polyethylene	L/1 L	Cool 4°C	28 days
	Nitrate	Polyethylene, Glass	L/1 L	Cool 4°C	48 hours
	Nitrate+Nitrite	Polyethylene, Glass	250/500 mL	Cool 4°C, H_2SO_4 to pH<2	28 days
Major Cations	Calcium, Magnesium, Potassium, Sodium	Polyethylene, Glass	250/500 mL	HNO_3 to pH<2	6 months
Metals	Metals, except mercury	Polyethylene	250/500 mL	HNO_3 to pH<2	6 months
	Mercury (Method 1631)	Fluoropolymer, Glass	125/250 mL	either 5 mL/L of pretested 12N HCl or 5 mL/L BrCl solution	28 days
Physical and Aggregate Properties	Conductivity (Specific Conductance)	Polyethylene, Glass	100 mL	None	24 hours
		Polyethylene, Glass	500 mL/1 L	Cool 4°C, Filtered (for EPA 120.1)	28 days
	Dissolved Oxygen	Glass	300 mL	None	Analyze immediately
	Hardness	Polyethylene, Glass	250/500 mL	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
	pH	Polyethylene, Glass	25 mL	None	Analyze immediately
	Temperature	Polyethylene, Glass	25 mL	None	Analyze immediately
	TSS, TDS	Polyethylene, Glass	500 mL/1 L	Cool 4°C	7 days
	Turbidity	Polyethylene, Glass	500 mL/1 L	Cool 4°C	48 hours

15.3 Surface Water Reporting Requirements

15.3.1 APDES Reporting Requirements

Surface water monitoring results are reported in the Annual Activity and Monitoring Report. The report includes both analytical results and the graphical evaluation of those results. It compares upstream and downstream data to show any differences and data for each station over time to show any trends. The data is also attached in an electronic spreadsheet. At a minimum the report includes:

- Date of sample collection and analyses;
- Results of sample analysis; and
- Relevant QA/QC information

15.3.2 Waste Disposal Permit Reporting Requirements

Surface water monitoring results are reported in the quarterly and annual activity and monitoring reports. The reports include information necessary to determine data validity, any water quality trends, or exceedances of the water quality standards.

15.4 Surface Water Exceedance

Pogo's APDES Permit requires monitoring of the surface water sites, and trend analysis of data collected, but defines no water quality limitations. Pogo's Waste Disposal Permit requires that Alaska State Water Quality Standards be met. If an exceedance of a water quality standard occurs at surface water monitoring station SW15, SW41, or SW42, the Waste Disposal Permit requires:

- Orally notify of ADEC within 24 hours;
- Determine the extent of the exceedance;
- In consultation with ADEC and documented in writing, implement a plan to determine the cause and/or source of the exceedance;

- Submit to ADEC, within 7 working days after an exceedance is verified, a plan for corrective actions to prevent adverse environmental impacts and further exceedances of applicable water quality standards or permit limits; and
- Implement the corrective action plan as approved by ADEC.

16.0 Fish Tissue Monitoring Program

Pogo's APDES Permit requires fish tissue monitoring:

- To monitor long-term changes that may occur as a result of activities associated with the discharges from the facility; and
- To monitor metals concentrations in fish tissue.

The Alaska Fish & Game Fish Resource Permit (for scientific/educational purposes) is required to perform fish tissue collection from the Goodpaster River to fulfill the requirements of the APDES permit.

The monitoring area is a 15-mile segment of the upper Goodpaster River in the vicinity of the Pogo Mine. Fish tissue sampling stations are located above the mine site at surface water sampling station SW01 and below the mine site at surface water sampling station SW12 (**Table 16.1**)

Table 16.1: Fish Tissue Monitoring Station Locations

Monitoring Station	Goodpaster River Location	Purpose
SW01	Above (upstream) all Pogo Mine facilities.	To monitor background fish tissue concentrations.
SW12	Below (downstream) all Pogo Mine facilities and the confluence with Pogo Creek.	To monitor fish tissue metals concentrations below the Pogo Mine facilities.

Table 16.2 identifies where Fish Tissue Monitoring Program key elements are located in the Pogo Mine Monitoring Plan.

Table 16.2: Fish Tissue Monitoring Program Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 5.3	Fish Tissue Analytical Profiles and Action Limits

16.1 Fish Tissue Sampling Procedures

A minimum of fifteen juvenile Chinook salmon are collected in late fall prior to freeze-up (usually late September). This allows for the maximum growth of the juveniles, as well as provides repeatable sampling conditions. The sampling criteria are provided in **Table 16.3**.

Table 16.3: Fish Tissue Sample Criteria

Criteria	Requirement
Fish Species	Juvenile Chinook salmon
Fish Sample Type	Whole (Individual fish)
Sample Size (Fish Weight in g)	3 +
Sample Size (Fish Length in mm)	72 to 93
No of Replicates per Station	10
No. of Laboratory QA/QC Fish per Station	5
Total No. of Fish Collected per Station	15
Total No. of Fish Collected Annually	30

Minnow traps are placed at selected locations at SW01 and SW12 sampling stations and left overnight. Minnow traps have the Pogo name, address, telephone number and the Fish Resource Permit number attached. Commercially prepared, sterilized fish eggs are used to bait the minnow traps. If non-commercial eggs are used they must be disinfected with a 10 minute soak in 1/100 Betadyne solution.

On the following day the minnow traps are collected and placed in shallow water while the fish are measured. The first 15 fish to meet the specified criteria at each sampling station are kept for analysis and the rest released after recording their length. Clipped fin tissue may be collected for genetic testing if required by Pogo's Fish Resource Permit.

The ten heaviest fish from each sampling station are designated to be analyzed individually. The five smallest fish are homogenized into one sample at the lab to be used as a QA/QC sample.

Surface Water sampling is conducted at the same time as the fish tissue sampling. Generally water samples are collected just prior to setting up minnow traps to reduce the possibility of stirring up sediments. SW12, the downstream site is collected first and minnow traps set, then the upstream sites at SW01.

16.1.1 Fish Tissue Analysis

Table 16.4 provides fish tissue analytical methods and associated MRL**.**

Table 16.4: Analytical Methods and Limits (Fish Tissue Matrix)

Parameter	Method	Units	MRL
Length	Field	mm	1
Weight	Standard Method	Wet mg	0.1
Antimony	EPA 200.8	Wet mg/kg	0.05
Total Arsenic (inorganic)	EPA 200.8	Wet mg/kg	0.5
Cadmium	EPA 200.8	Wet mg/kg	0.05
Copper	EPA 200.8	Wet mg/kg	0.1
Lead	EPA 200.8	Wet mg/kg	0.02
Total Mercury	EPA 1631	Wet mg/kg	0.05
Nickel	EPA 200.8	Wet mg/kg	0.2
Selenium	EPA 7740 (GFAA) or EPA 7741A (HGAA)	Wet mg/kg	1
Silver	EPA 200.8	Wet mg/kg	0.02

Total inorganic arsenic rather than total arsenic is be determined. For this application, it is assumed that all of the arsenic is inorganic.

Mercury in fish and shellfish tissue is present primarily as methylmercury. Because of the high cost of analyzing for methylmercury, total mercury is analyzed. A conservative assumption is made that all mercury is present as methylmercury. This approach is deemed to be most protective of human health and most cost-effective (EPA, 2000).

Fish tissue holding times and sample containers are provided in **Table 16.5.**

Table 16.5: Holding Times and Sample Containers for Fish Tissue Samples

Parameter Name	Container	Preservation	Maximum Holding Time
Metals	Polyethylene, Ziploc Bag	Freeze Fish Immediately, <20 ^{0}C	6 months
Total Mercury		Freeze Fish Immediately	28 days

16.1.2 Shipping Fish Tissue Samples

Fish tissue samples are shipped frozen with enough gel ice to insure the fish are still frozen when they arrive at the laboratory. Mercury has the shortest holding time, therefore frozen fish are generally sent to the laboratory within two weeks of their collection date.

16.2 Fish Tissue Reporting Requirements

16.2.1 APDES Reporting Requirements

The laboratory analytical report of the fish tissue samples, including QA/QC information, is submitted (as a PDF file) with the Annual Activity and Monitoring Report. Also included is the raw data in an electronic spreadsheet. The annual report graphically presents the analytical results over time, comparing upstream and downstream monitoring results to show any differences or trends.

16.2.2 Alaska Fish & Game Reporting Requirements

A Fish Resource Permit is obtained for the Delta Junction, Alaska Department of Fish & Game Department in the spring to collect fish tissue samples in September. The complete Fish Resource Permit application and sampling plan is due by August 1. The Delta Fish and Game Biologist is notified of the fish tissue sample collection date at least one week ahead of time so that they can join the Pogo sampling team.

A data collection report is due to the Delta Fish & Game by November 15 of the same year. This includes a summary of the fish captured with: date, GPS coordinates, species type, length and final disposition (collection, mortality, or release). A copy of the permit must be carried by a sampling team member.

16.3 Fish Tissue Trend Analysis

There are no action limits for fish tissue analysis. The annual review of the graphical data presented in the Annual Activity and Monitoring Report will indicate any adverse trends. If an adverse trend appears, consultation with ADEC will take place to develop a corrective action plan.

17.0 Groundwater Monitoring Program

Pogo's Waste Disposal Permit (0131-BA002) requires groundwater monitoring:

- At compliance monitoring wells MW03-500, MW03-501, MW03-502;
- At background monitoring wells MW04-213 and MW11-216; and
- At the monitoring wells MW11-001A and MW11-001B between the DSTF and the RTP.

The groundwater monitoring program provides sampling parameters at frequencies and locations that ensure sample results are representative and statistically useful.

MW03-500, MW03-501, and MW03-502

- Monitor for an exceedance of a water quality standard and the Upper Tolerance Limit Concentrations Triggering Corrective Actions (see table 17.1).

  As per 18AAC 70.020 (Waiver #3, Permit 0131-BA002), if dissolved analyses show water quality at or closely approaching the applicable water quality criteria, Total Recoverable analyses shall be added to the analytical requirements starting with the next scheduled sampling event (18 AAC70).
- Monitor for a statistically significant increase in concentration above the applicable water quality standard, including natural condition, for the parameters monitored; and
- Monitor for a statistically significant increase above background in water quality.

MW04-213, MW11-216 and the wells MW11-001A and MW11-001B

- Monitor trends in groundwater quality; and
- Monitor trends in groundwater elevation.

This section outlines the procedures required for sampling and monitoring of groundwater. Monitoring wells are designated as shallow or deep wells.

Shallow monitoring wells are completed in river gravels or overburden with depths ranging from 20 to 90 feet below ground surface (bgs). Shallow monitoring wells were installed to monitor groundwater geochemistry within the Liese Creek and Goodpaster River valleys.

Deep monitoring wells are located on Pogo Ridge and Liese Creek. Deep monitoring wells are completed in bedrock with depths ranging from 150 to 1000 feet bgs. The Deep Monitoring Wells were installed to monitor groundwater geochemistry within the L1 and L2 ore bodies and country rock outside of the ore zone.

The following sections describe general requirements for groundwater sample collection. General requirements apply to all monitoring wells that are sampled on site. Specific requirements are addressed for shallow and deep monitoring wells in later sections.

17.1.1 Sampling Procedures

(1) Calibrate and field meters and document results.

(2) Read depth to water with electronic water level meter (sounder) and record to nearest 0.01 (hundredth of a foot) at measuring point (MP) marked on riser pipe. Triple-rinse probe and bottom two feet or more of cable with de-ionized (DI) or potable water after each use.

(3) If well is frozen, record depth to frozen surface and thaw well by plugging heat trace into generator.

(4) Calculate well volume

The volume, in gallons per linear foot, for various monitoring wells can be calculated as follows:

$v = \pi r^2 (cf)$

v = volume in gallons per linear foot

π = 3.142

r = radius of monitoring well (feet)

cf = conversion factor (7.48 gal/ft3)

Field data sheets show volume in gallons per linear foot for the common size monitoring wells used on site. Using those conversion factors the above equation becomes:

Well Volume = (h)(v)

h = height of water column (ft) and

v = volume in gallons per linear foot

(5) Purge three well volumes of water.

Purge well until a minimum of three times the calculated well water volume is removed and the temperature, conductivity and pH of the purged water stabilize. If the well is unusually silty or field parameters won't stabilize, it may be necessary to purge more than three well volumes until conditions improve.

(6) Collect field parameters for every well volume and at sample time.

(7) Rinse field meter(s) with DI water after each sample is taken.

(8) Wear clean latex/nitrile sampling gloves when collecting the sample.

(9) Collect water sample by filling appropriate bottles. Add preservative as required.

(10) Field filter for dissolved metals in the in the field or at the environmental lab. Samples for dissolved metals are filtered in the field using disposable, trace metal grade 0.45 micron filters and a peristaltic field pump powered by 12 volt portable battery pack. The filter is attached to silicone tubing and inserted into the sample bottle.

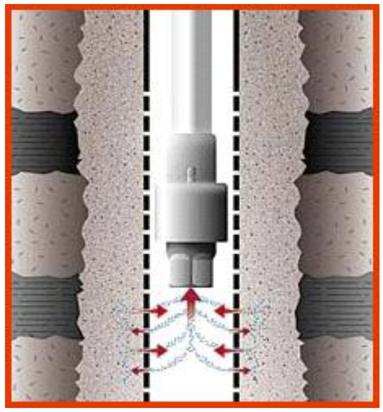
Use clean tubing in the pump for each well sampled.

Disposable in line filters are used to collect samples for dissolved metals analysis. At least three filter volumes (approximately 300 to 400 ml) of sample water are run through the filter before filling sample bottle.

Shallow Monitoring Well Sampling

Shallow monitoring well purging and sampling is accomplished with the Waterra® Inertial Pump**.** A Waterra® foot valve and tubing are dedicated to every well. The system consists of a stainless steel foot valve and a length of plastic tubing that when oscillated up and down in the well produces a flow of water. This system has proven to be a simple, reliable and versatile sampling system. **Figure 17-1**, below, is a diagram of the sampling system showing a cross sectional view of the foot valve and tubing in the well (courtesy of Waterra®).

Figure 17-1. Cross section of Waterra® Foot Valve



Deep Monitoring Well Sampling

Two deep water wells, MW11-216 and MW11-001B were drilled and completed as proper monitoring wells (four-inch diameter casing with sounder tube) in 2011. These two wells, and the existing deep water well MW04-213, have low-flow dedicated pumps installed to collect water samples.

Deep monitoring wells are sampled in a similar manner to shallow monitoring wells. However, instead of using a Waterra Foot Valve and hand bailing the wells, dedicated pumps are connected to a small generator and used to purge the wells.

The groundwater monitoring programs are designed to monitor any groundwater impact from the DSTP, RTP or underground workings. **Table 17.1** identifies where Groundwater Monitoring Program key elements are located in the Pogo Mine Monitoring Plan. **Table 17.2** provides groundwater monitoring program station locations.

Table 17.1: Groundwater Monitoring References to Pogo Mine Monitoring Plan

Location in Plan	Description
Table 6.1	Phase II Active Mining Operations Groundwater Sampling Schedule
Table 6.2	Groundwater Analytical Parameters Profile 13g and Water Quality Standards
Table 6.3	Upper Tolerance Limit Concentration Triggering Corrective Action
Table 6.4	Phase III and IV Closure Operations Groundwater Sampling Schedule
Table 6.5	Phase V Post Closure Groundwater Sampling Schedule

Table 17.2: Groundwater Monitoring Station Locations

Monitoring Program	Monitoring Stations	Location	Purpose
Detection (Compliance Points)	MW03-500, MW03-501, MW03-502	Down gradient of the Recycle Tailings Pond (RTP)	To detect seepage from the RTP.
Trend	MW04-213, MW11-216	Down gradient of the ore zones	To monitor groundwater quality and elevation trends as mining proceeds.
	Proposed shallow well at toe of DSTF	Between Drystack and RTP	To monitor groundwater quality and elevation trends from the Drystack runoff.
	Proposed deep well at toe of DSTF	Between Drystack and RTP	To monitor groundwater quality and elevation trends from infiltration groundwater below the Drystack.

Table 17.3 provides sampling schedule (including QA/QC sampling), **Table 17.4** provides analytical methods and limits, and **Table 17.5** presents holding times and sample containers.

Table 17.3: Groundwater Sampling Schedule

Location	Sample Type	Profile	Frequency
MW03-500, MW03-501, MW03-502	Grab	13g	Quarterly
MW100	Duplicate Grab	13g	Semi-annually, rotating locations between MW-500 wells
MW-EB	Blank Grab	13g	Semi-annually, rotating locations between MW-500 wells
MW04-213, MW11-216	Grab	13g	Semi-Annually
MW100	Duplicate Grab	13g	Semi-Annually, MW99-216 in spring, MW04-213 in fall
MW-EB	Blank Grab	13g	Semi-Annually, MW99-216 in spring, MW04-213 in fall
Proposed Shallow Well Toe of Dry Stack	Grab	13g	Quarterly
MW100	Duplicate Grab	13g	Semi-annually
MW-EB	Blank Grab	13g	Semi-annually
Proposed Deep Well Toe of Dry Stack	Grab	13g	Quarterly
MW100	Duplicate Grab	13g	Semi-annually
MW-EB	Blank Grab	13g	Semi-annually
LT99-009	Static Groundwater Level Measurement	NA	Quarterly

Table 17.4: Analytical Methods and Limits for Groundwater Monitoring

Analyte Group	Parameter	Field Filter	Analytical Method	Units	Minimum Level	Method Detection Limit
Cyanides	Cyanide, Weak Acid Dissociable (WAD)	n	SM 4500-CN I	µg/L	5.2[1]	1.2
Major Anions	Alkalinity as CaCO3	n	SM 2320B	mg/L	NA	1.2
	Alkalinity, Total	n	SM 2320B	mg/L	NA	1.2
	Chloride	n	EPA 300.0 or 340.2	mg/L	NA	0.1
	Fluoride	n	EPA 300.0	mg/L	NA	0.1
	Nitrite-Nitrate as N	n	EPA 353.2	mg/L	80	0.38
	Sulfate	n	EPA 300.0	mg/L	NA	0.1
Major Cations	Calcium	y	EPA 200.7	mg/L	NA	0.013
	Magnesium	y	EPA 200.7	mg/L	NA	0.012
	Potassium	y	EPA 200.7	mg/L	NA	0.31
	Sodium	y	EPA 200.7	mg/L	NA	0.028
Metals	Aluminum	y/n	EPA 200.7	µg/L	50	0.33
	Antimony	y/n	EPA 200.8	µg/L	3	0.027
	Arsenic	y/n	EPA 200.8	µg/L	5	0.044
	Cadmium	y/n	EPA 200.8	µg/L	0.1	0.045
	Chromium	y/n	EPA 200.8	µg/L	10	0.049
	Copper	y/n	EPA 200.8	µg/L	2.2	0.034
	Iron	y/n	EPA 200.7	µg/L	817	2.7
	Lead	y/n	EPA 200.8	µg/L	0.5	0.03
	Manganese	y/n	EPA 200.8	µg/L	NA	0.017
	Mercury	y/n	EPA 1631	µg/L	0.01	0.00015
	Nickel	y/n	EPA 200.8	µg/L	NA	0.05

Analyte Group	Parameter	Field Filter	Analytical Method	Units	Minimum Level	Method Detection Limit
	Selenium	y/n	EPA 200.8	µg/L	1.9	0.14
	Silver	y/n	EPA 200.8	µg/L	0.3	0.028
	Zinc	y/n	EPA 200.8	µg/L	16.8	0.084
Physical and Aggregate Properties	Ammonia, as TKN	n	EPA 351.2	mg/L	NA	0.11
	Conductivity (Specific Conductance)	n	EPA 120.1 (Field)	µS/cm @ 25ºC	NA	10
	Dissolved Oxygen	n	EPA 360.1 (Field)	mg/L	NA	NA
	Hardness as $CaCO_3$	n	SM 2340B	mg/L	NA	1.0
	pH Field	n	EPA 150.1	s.u.	NA	NA
	Temperature	n	EPA 170.1 (Field)	C	NA	0.1
	Total Dissolved Solids (TDS)	n	SM 2540 C	mg/L	NA	4.8
	Total Suspended Solids (TSS)	n	SM 2540D	mg/L	30	0.5
	Turbidity	n	EPA 180.1	NTU	NA	0.03

[1]APDES Permit # AK0053341 specifies a site specific ML of 20 ug/L for WAD Cyanide

Table 17.5: Holding Times and Sample Containers Groundwater Sampling

Analyte Group	Parameter Name	Container	Container Size	Preservation	Maximum Holding Time
Cyanides	Cyanide, WAD	Polyethylene, Glass	1 L	Cool 4°C, NaOH to pH>12	14 days
Major Anions	Alkalinity	Polyethylene, Glass	1 L	Cool 4°C	14 days
	Chloride, Fluoride & Sulfate	Polyethylene	L/1 L	Cool 4°C	28 days
	Nitrate	Polyethylene, Glass	L/1 L	Cool 4°C	48 hours
	Nitrate+Nitrite	Polyethylene, Glass	250/500 mL	Cool 4°C, H_2SO_4 to pH<2	28 days
Major Cations	Calcium, Magnesium, Potassium, Sodium	Polyethylene, Glass	250/500 mL	HNO_3 to pH<2	6 months
Metals	Metals, except mercury	Polyethylene	250/500 mL	HNO_3 to pH<2	6 months
	Mercury (Method 1631)	Fluoropolymer, Glass	125/250 mL	either 5 mL/L of pretested 12N HCl or 5 mL/L BrCl solution	28 days
Physical and Aggregate Properties	Conductivity (Specific Conductance)	Polyethylene, Glass	100 mL	None	24 hours
		Polyethylene, Glass	500 mL/1 L	Cool 4°C, Filtered (for EPA 120.1)	28 days
	Dissolved Oxygen	Glass	300 mL	None	Analyze immediately
	Hardness	Polyethylene, Glass	250/500 mL	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
	pH	Polyethylene, Glass	25 mL	None	Analyze immediately
	Temperature	Polyethylene, Glass	25 mL	None	Analyze immediately
	TSS, TDS	Polyethylene, Glass	500 mL/1 L	Cool 4°C	7 days
	Turbidity	Polyethylene, Glass	500 mL/1 L	Cool 4°C	48 hours

17.1.2 Groundwater Reporting Requirements

Pogo imports electronic data from the contract laboratories directly into EDMS as discussed in Section 8. The data is compared to the mean of the background data and any significant statistical variation (Outlier above 0.1% Significance, and Outlier Above 5% Significance) is noted and qualified within the EDMS database. Monitoring results are reported in the quarterly and annual reports. All groundwater sampling data is graphed in the quarterly and annual reports. If any statistically significant changes or trends occur, ADEC is contacted.

17.1.3 Groundwater Exceedances

Pogo's Waste Disposal Permit requires that Alaska State Water Quality Standards are met. If an exceedance of a water quality standard is detected from validated data at groundwater monitoring stations, MW03-500, MW03-501, and MW03-502 then the Waste Disposal Permit requires:

- Orally notify of ADEC within 24 hours;
- Determine the extent of the exceedance;
- In consultation with ADEC and documented in writing, implement a plan to determine the cause and/or source of the exceedance;
- Submit to ADEC, within 7 working days after an exceedance is verified, a plan for corrective actions to prevent adverse environmental impacts and further exceedances of applicable water quality standards or permit limits; and
- Implement the corrective action plan as approved by ADEC.

18.0 Effluent Monitoring Program

Pogo's APDES Permit # AK0053341requires effluent monitoring:

- To monitor the limits placed on the types and amounts of pollutants that are discharged;
- To ensure protection of water quality and human health; and
- To detect an exceedance of an effluent limitation.

Pogo discharges to the Goodpaster River through two outfalls. Outfall 001, the discharge point for treated mine drainage and excess precipitation, is located at latitude 64° 28' 12" N and longitude 144° 55' 03" W (NAD 83). Outfall 002, the discharge point for treated domestic wastewater, is located at latitude 64° 26' 36" N and longitude 144° 56' 30" W (NAD 83). Discharge outfalls are shown on **Figure 2-2**.

Table 17.1 identifies where Effluent Monitoring Program key elements are located in the Pogo Mine Monitoring Plan.

Table 18.1: Effluent Monitoring Program Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 7.1	Effluent Monitoring Outfall Locations
Table 7.3	Outfall 001 Weekly Analytical Parameters Profile 10a and Effluent Limits
Table 7.4	Outfall 001 Monthly Analytical Parameters Profile 10b and Effluent Limits
Table 7.6	Outfall 011 Weekly Analytical Parameters Profile 11a an Effluent limits
Table 7.7	Outfall 011 Quarterly Analytical Parameters Profile 11b and Effluent limits
Table 7.8	Weekly Effluent Sewage Treatment Plant Outfall 002 Analytical Parameters Profile 12a and Effluent Limits
Table 7.9	Quarterly Influent Sewage Treatment Plant STP002 Analytical Parameters Profile 12b and Effluent Limits

18.1 Effluent Sampling Procedures

Sampling is conducted periodically (including QA/QC sampling) as described in **Table 18.2**. Sampling may be rescheduled due to severe weather conditions.

Table 18.2: Effluent Sampling Schedule

Station ID	Sample Type	Profile	Frequency	Annual No. of Samples
Outfall 001	Grab	10a	Weekly	52
WW-100	Duplicate Grab	10a	Bi-Monthly	6
WW-FB	Blank Grab	Cyanide & Metals Only	Bi-Monthly	6
Outfall 001	Grab	10b	Monthly	12
WW-100	Duplicate Grab	10b	Semi-Annual	2
WW-FB	Blank Grab	Metals Only	Semi-Annual	2
Outfall 001	Grab	WET Test	Annual, prior to August 1	1
NPDES 001b	Grab	10c	Monthly	12
WW-100	Duplicate Grab	10C	Semi-Annual	2
WW-FB	Blank Grab	10C	Semi-Annual	2
Outfall 011	Grab	11a	Weekly	52
WW-100	Duplicate Grab	11a	Bi-Monthly	6
WW-FB	Blank Grab	Cyanide & Metals Only	Bi-Monthly	6
Outfall 011	Grab	11b	Quarterly	4
WW-100	Duplicate Grab	11b	Annual	1
WW-FB	Blank Grab	Metals Only	Annual	1
Outfall 002	Grab	12a	Weekly	52
WW-100	Duplicate Grab	12a	Bi-Monthly	6
WW-FB	Blank Grab	12a	Bi-Monthly	6
STP 002	Grab	12b	Monthly	12
WW-100	Duplicate Grab	12b	Semi-Annual	2
WW-FB	Blank Grab	12b	Semi-Annual	2

18.1.1 Flow

Flow discharge rates are monitored continuously at Outfall 001, Outfall 011, and Outfall 002. If there is no discharge from Outfall 011 for 72-hours, routine sampling of Outfall 001 is not required. However, when discharge from Outfall 011 commences, a sample from Outfall 001 is required within 36-hours. Sampling at Outfall 002 is only required if discharge of treated effluent occurs, however, when discharge recommences, a sample is required within 24-hours.

18.1.2 Turbidity

Turbidity is measured at station NPDES 001B, the influent to the Off River Treatment Works (ORTW) and represents the natural condition of the Goodpaster River. The discharge going out Outfall 001 cannot be more than 5 NTU's greater than the natural condition. When using the handheld turbidity meter, the turbidity data collected at NPDES 001B must be taken within one hour of the turbidity data collected at Outfall 001.

18.1.3 Stream Gauging

Stream Gauging is necessary to determine whether there is sufficient water flowing in the Goodpaster River to allow discharge. If flow drops below 20 cf/s discharge is not allowed. Low flow conditions generally do not occur unless ice thickens to the point that the Goodpaster River channel becomes very narrow. The USGS maintains a stream flow gauge on the Goodpaster River near the Goodpaster Bridge. USGS stream flow data is available online at: **http://waterdata.usgs.gov.** USGS usually emails current data to the Environmental Department as a courtesy. However, in the winter, if the USGS is not able to monitor river flow the Environmental Department does its' own stream gauging as needed to determine river flow rate.

18.1.4 Fecal Coliform

Fecal Coliform sampling at Outfall 002, has a hold time of 8 hours from time of collection to the beginning of analysis. The APDES permit allows 6 hours of transit time, if the lab begins analyzing the sample within 2 hours.

18.1.5 Sampling Frequency at Outfall 002

The sampling frequency for Total Suspended Solids (TSS), Fecal Coliform, Nitrates, pH and dissolved oxygen (DO) at Outfall 002 may decrease to monthly if the effluent discharge has been in full compliance with the APDES permit limitations for 6 consecutive months. Consultation and approval must be received from ADEC to decrease sampling frequency.

18.1.6 Mixing Zone for Outfall 002

The mixing zone in the Goodpaster River, near the sewage effluent outfall line is posted with signs upstream and downstream. The signs inform the public that a mixing zone exists, that treated and disinfected wastewater is being discharged and that users of the area should exercise caution. Signs provide name of the company, company address and contact phone numbers.

18.1.7 Effluent Sample Collection

All water samples are stored in a refrigerator until ready for shipment. Any required preservative is added to sample bottles at the contract lab previous to delivery to the Pogo Environmental Department. When dissolved metals samples are collected, the samples are filtered immediately on-site before adding preservatives.

Table 18.3 describes the applicable laboratory analytical methods, minimum levels for method detection limits, and the laboratory method detection limits. For all effluent monitoring, an ML less than the effluent limitations must be achieved. The Method Detection Limit is determined by the contract laboratory's instrumentation capabilities.

Field filtering is required by some parameters:

- y – filtered in the field before preservation,
- n – not filtered in the field,
- y/n parameter dependent; dissolved metals are field filtered, total or total recoverable metals are not.

Table 18.3: Analytical Methods and Limits for Effluent Monitoring

Analyte Group	Parameter	Field Filter	Analytical Method	Units	Minimum Level	Method Detection Limit
Aggregate Organics	Biochemical Oxygen Demand (BOD_5)	n	EPA 405.1 or SM 5210B	mg/L	30	2
Cyanides	Cyanide, Weak Acid Dissociable (WAD)	n	SM 4500-CN I	µg/L	4.7[1]	1.2
	Chloride	n	EPA 300.0 or 340.2	mg/L	NA	0.1
	Nitrite-Nitrate as N	n	EPA 353.2	mg/L	80	0.38
	Sulfate	n	EPA 300.0	mg/L	NA	0.1
Major Cations	Calcium	y	EPA 200.7	mg/L	NA	0.013
	Magnesium	y	EPA 200.7	mg/L	NA	0.012
Microbiological	Fecal Coliform	n	SM 9222D	#/100 mL	200	9
Metals	Aluminum	y/n	EPA 200.7	µg/L	50	0.33
	Arsenic	y/n	EPA 200.8	µg/L	5	0.044
	Cadmium	y/n	EPA 200.8	µg/L	0.1	0.045
	Chromium, Total	y/n	EPA 200.8	µg/L	10	0.049
	Copper	y/n	EPA 200.8	µg/L	2.2	0.034
	Iron	y/n	EPA 200.7	µg/L	817	2.7
	Lead	y/n	EPA 200.8	µg/L	0.5	0.03
	Manganese	y/n	EPA 200.8	µg/L	NA	0.017
	Mercury	y/n	EPA 1631	µg/L	0.01	0.00015
	Nickel	y/n	EPA 200.8	µg/L	NA	0.05

Analyte Group	Parameter	Field Filter	Analytical Method	Units	Minimum Level	Method Detection Limit
	Selenium	y/n	EPA 200.8	µg/L	1.9	0.14
	Silver	y/n	EPA 200.8	µg/L	0.3	0.028
	Zinc	y/n	EPA 200.8	µg/L	16.8	0.084
Physical and Aggregate Properties	Conductivity (Specific Conductance)	n	EPA 120.1 (Field)	µS/cm @ 25ºC	NA	10
	Hardness as $CaCO_3$	n	SM 2340B	mg/L	NA	1.0
	pH Field	n	EPA 150.1	s.u.	NA	NA
	Temperature	n	EPA 170.1 (Field)	C	NA	0.1
	Total Dissolved Solids (TDS)	n	SM 2540 C	mg/L	NA	4.8
	Total Suspended Solids (TSS)	n	SM 2540D	mg/L	30	0.5
	Total Suspended Solids (TSS) OUTFALL002 & STP002	n	EPA 160.2 or SM 2540D	mg/L	30	0.5
	Turbidity	n	EPA 180.1	NTU	NA	0.03

[1]APDES Permit # AK0053341 specifies a site specific ML of 20 ug/L for WAD Cyanide

Samples should be analyzed as soon as possible after collection, however, the times listed are the maximum times that samples may be held before analysis and still be considered valid. **Table 18.4** represents holding times and sample containers for effluent sampling.

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Table 18.4: Holding Times and Sample Containers Effluent Sampling

Analyte Group	Parameter Name	Container	Containe r Size	Preservation	Maximum Holding Time
Aggregate Organics	Biochemical Oxygen Demand (BOD)[5]	Polyethylene, Glass	1 L	Cool 4°C	48 hours
Cyanides	Cyanide, WAD	Polyethylene, Glass	1 L	Cool 4°C, NaOH to pH>12	14 days
Major Anions	Alkalinity	Polyethylene, Glass	1 L	Cool 4°C	14 days
	Chloride, Fluoride & Sulfate	Polyethylene	L/1 L	Cool 4°C	28 days
	Nitrate+Nitrite	Polyethylene, Glass	250/500 mL	Cool 4°C, H_2SO_4 to pH<2	28 days
Major Cations	Calcium, Magnesium, Potassium, Sodium	Polyethylene, Glass	250/500 mL	HNO_3 to pH<2	6 months
Metals	Metals, except mercury	Polyethylene	250/500 mL	HNO_3 to pH<2	6 months
	Mercury (Method 1631)	Fluoropolymer, Glass	125/250 mL	either 5 mL/L of pretested 12N HCl or 5 mL/L BrCl solution	28 days
Microbiological	Fecal Coliform	Polyethylene, Glass	100 mL (sterile)	Cool 4°C, Remove Chlorine	8 hours for APDES Permit AK-005334-1, 30 hours for drinking water
Physical and Aggregate Properties	Conductivity (Specific Conductance)	Polyethylene, Glass	100 mL	None	24 hours
		Polyethylene, Glass	500 mL/1 L	Cool 4°C, Filtered (for EPA 120.1)	28 days
	Dissolved Oxygen	Glass	300 mL	None	Analyze immediately
	Hardness	Polyethylene, Glass	250/500 mL	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
	pH	Polyethylene, Glass	25 mL	None	Analyze immediately
	TSS, TDS	Polyethylene, Glass	500 mL/1 L	Cool 4°C	7 days
	Turbidity	Polyethylene, Glass	500 mL/1 L	Cool 4°C	48 hours

Shipping Samples

When any sample is shipped by common carrier or sent through the United States Mail, it must comply with the Department of Transportation (DOT) Hazardous Materials Regulations (49 CFR part 172). The person offering such material for transportation is responsible for ensuring compliance. The Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H2SO4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less). In other words water samples are exempt.

Chlorine and Fecal Coliform

If free chlorine is present in the sample, then Sodium Thiosulfate ($Na_2S_2O_3$) should be added. Free chlorine can react with organic compounds to form chlorination by-products. Free chlorine is likely to be found in chlorinated municipal drinking waters and treated wastewaters. Sodium Thiosulfate, a reducing agent, is added to remove the free chlorine. For most levels of free chlorine, add 4 drops of 10% Sodium Thiosulfate to samples in 40 mL vials, and add 5 mL of 10% Sodium Thiosulfate to samples in 1 L bottles.

Sulfide and WAD Cyanide

Maximum holding time for WAD cyanide is 24-hours when Sulfide is present. Samples may be tested with lead acetate paper before the pH adjustment in order to determine if Sulfide is present. If Sulfide is present, it can be removed by the addition of Cadmium Nitrate powder until a negative spot test is obtained. The sample is then filtered, and NaOH is added to adjust the pH > 12.

Conductivity

Conductivity analyses can be performed in either the field or laboratory. If method EPA 120.1 is used and analysis is not completed within 24-hours of sample collection, the sample should be filtered through a 0.45-micron filter and stored at 4ºC. Filter and apparatus must be washed with high quality distilled water and pre-rinsed with sample before use.

18.2 Effluent Reporting Requirements

Table 18.5 presents the annual reporting schedule associated with Pogo's APDES Permit and the Annual Activity and Monitoring Report required by the ADEC Waste Disposal Permit.

Table 18.5: Reporting Schedule

	DMR Reporting	Quarterly Water Quality Monitoring Report	Annual Activity and Monitoring Report	
			Report	**Presentation**
Due	Postmarked by the 20th day of the following month. See **Table 18.6**.	No later than 60 days after the last day of the quarter (three total, for the first three quarters of every year).	March 1 of the following year	Not sooner than two weeks after submittal of the Annual Report
Present to	ADEC	ADEC	ADEC	ADEC, ADNR
Format	DMR form (EPA No.3320-1) or equivalent.	Paper and electronic copy	Paper and electronic copy	Presentation
Graphical Presentation	NA	A comparison of monitoring results upstream and downstream and over time to show trends (xy plots).	Same as quarterly report	Same as annual report
Electronic Appendix	NA	Sample collection date, analysis date, analytical method, method detection limit, units, sample results, data qualifier flag, and any other relevant QA/QC information.	Same as quarterly report	Same as quarterly report

18.2.1 DMR Reporting Requirements

Table 18.6 presents the reporting schedule by month for Discharge Monitoring Reports. Each month shown is reporting data collected in the previous month. The January DMR is reporting December monthly data and data from the last quarter of the previous year. The Annual DMR form, Outfall 001Y, reporting the results of the WET test, is submitted in October.

Table 18.6: DMR Reporting Schedule

Reporting Period	Sampling Results
January	OUTFALL001A, OUTFALL011A, OUTFALL002A, OUTFALL002Q, OUTFALL011Q
February	OUTFALL001A, OUTFALL011A, OUTFALL002A
March	OUTFALL001A, OUTFALL011A, OUTFALL002A
April	OUTFALL001A, OUTFALL011A, OUTFALL002A, OUTFALL002Q, OUTFALL011Q
May	OUTFALL001A, OUTFALL011A, OUTFALL002A
June	OUTFALL001A, OUTFALL011A, OUTFALL002A
July	OUTFALL001A, OUTFALL011A, OUTFALL002A, OUTFALL002Q, OUTFALL011Q
August	OUTFALL001A, OUTFALL011A, OUTFALL002A
September	OUTFALL001A, OUTFALL011A, OUTFALL002A
October	OUTFALL001A, OUTFALL011A, OUTFALL002A, OUTFALL002Q, OUTFALL011Q; OUTFALL001Y (Whole Effluent Toxicity)
November	OUTFALL001A, OUTFALL011A, OUTFALL002A
December	OUTFALL001A, OUTFALL011A, OUTFALL002A

DMR Reporting Values

For Discharge Monitoring Report (DMR) purposes only as required by APDES permit AK-005334-1:

- For a single sample, if a value is less than the method detection limit (MDL), then report "less than {numeric value of the MDL}" and if a value is less than the minimum level (ML), then report "less than {numeric value of the ML}."
- For purposes of calculating monthly averages, zero may be assigned for values less than the MDL, the numeric value of the MDL may be assigned for values between the MDL and the ML. If the average value is less than the MDL, then report "less than {numeric value of the MDL}" and if the average value is less than the ML, then report "less than {numeric value of the ML}." If a value is greater than the ML, then report and use the actual value.

Site Specific WAD Cyanide

Pogo has a site specific Minimum Level (ML) of 20 ug/L and an MDL of 10 ug/L for WAD Cyanide. Any analytical result less than 20 ug/L will be reported on the DMR as <20 ug/L. The MDL will not be used to calculate averages for WAD CN, as with other parameters, because it is a site specific ML.

Dilution Ratio

The Dilution Ratio is defined as the flow from Pond 1 (Influent Pond) to Pond 2 (Mixing Pond) will not exceed 25 times the flow from the WTP#2. Under extraordinary circumstances, such as a system upset or an unanticipated bypass, ADEC may authorize an increased dilution ratio to mitigate the impacts of the upset or bypass on the Goodpaster River. In the event that no flow from the treatment plant is occurring, the dilution ratio would not apply after 72 hours of the last effluent discharged from the WTP#2.

Continuous Meters for pH

If continuous meters are present at Outfall 001 and Outfall 011 data is collected in the DCS. If the continuous readings are outside the effluent limits for less than 60 minutes (or less than the total or 7 hours and 26 minutes for the month) it is reported in the monthly DMR cover letter as an excursion and the data is not used in the monthly DMR. If, however the exceedance lasts for more than 60 minutes the data is included in the

DMR and an exceedance is reported on the monthly DMR. Required weekly sampling of pH with handheld meters is included with any DCS data for monthly DMR reporting.

Continuous Meters for Turbidity

Continuous meters for Turbidity are in place at both NPDES 001B and Outfall 001. This data is collected in the DCS and averaged with any handheld readings taken during sampling events. Handheld turbidity reading are not required, but are performed if there are any unusual conditions or upsets occurring.

Fecal Coliform Geometric Average

For monthly DMR reporting the Fecal Coliform data must be averaged using a geometric mean, not a numeric mean. If the sample is non-detect, the detection level is used to calculate the geometric mean.

Percent Removal at STP

The influent to the sewage treatment plant, STP 002 is sampled monthly. It needs to be taken at the same time the weekly Outfall 002 sample is collected. Three sets of monthly samples (the influent and matching effluent sample) are collected every quarter and should be used to calculate the quarterly percent removal.

- average the influent BOD for the quarter
- average the effluent BOD for the quarter
- average the influent TSS for the quarter
- average the effluent TSS for the quarter

Then the formula, ((influent-effluent/influent) X 100, is used for both the BOD and TSS, to calculate % removal.

18.3 Exceedance of Effluent Limits

If an effluent limitation has been exceeded:

- Notify the ADEC by telephone at the APDES Non-Compliance Hotline (877) 569-4114, within 24 hours of becoming aware of:
    - Any non-compliance that may endanger health or the environment;
    - Any unanticipated bypass that exceeds any effluent limitation,

  - Any upset that exceeds any effluent limitation; and
  - A violation of a maximum daily discharge limitation at Outfall 001, Outfall 011 and Outfall 002.
- Submit a written report within five days of becoming aware of any event requiring 24-hour notification. The report shall include:
  - A description of the noncompliance and its cause;
  - The period of noncompliance, including exact dates and times;
  - The estimated time noncompliance is expected to continue if it has not been corrected; and
  - Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
- Non-compliance incidents, not required under 24-hour notification, are submitted in the monthly DMR (e.g. exceedance of the monthly average, pH exceedances from the continuous meters).

19.0 Whole Effluent Toxicity Testing Program

The APDES permit requires chronic toxicity tests on effluent samples from Outfall 001:

- To characterize and measure the absolute chronic toxicity of the effluent from Outfall 001, and
- To measure compliance with whole effluent toxicity triggers.

Table 19.1 identifies where Whole Effluent Toxicity (WET) Testing Program key elements are located in the Pogo Mine Monitoring Plan.

Table 19.1: WET Testing Program Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 7.4	Outfall 001 Annual Whole Effluent Toxicity Testing and Target Level

19.1 Whole Effluent Toxicity (WET) Sampling Procedures

A WET sample will be collected annually, before August 1, at the same time as the receiving water (SW01, SW15, SW41, SW42) monitoring samples are collected.

A minimum of three grab samples will be collected at two-day increments (Monday, Wednesday, and Friday) to provide adequate WET test solutions. A duplicate of all samples collected throughout the WET test is also sent to another, back-up, laboratory to run a second WET test concurrently.

A split sample of the WET test is also collected and analyzed with the combined profile of the Outfall 001 weekly and monthly sampling on the first day effluent is collected for the WET test (Monday). This split sample also fulfills the sampling requirements for the weekly /monthly sample for Outfall 001.

Sampling may be rescheduled due to severe weather conditions. The WET sample must be collected during a period when effluent discharge from Outfall 011 is occurring, generally in mid June, but before August 1.

The first two years of the APDES permit (2011 and 2012) are a screening period to determine which of the two organisms used in the WET test are the most sensitive species. After these first two suites of tests are complete, only the most sensitive organism needs to be tested in 2013. If neither organism is more sensitive, and no toxicity is observed, then only the fathead minnow needs to be used for the WET test in 2013 and in future sampling events.

WET sample collection schedule along with QA/QC samples is shown in **Table 19.2**.

Table 19.2: WET Sample Collection Schedule

Monitoring Period		Test Organism	Sampling Period	Sampling Day	Grab Sample Size	Notes
Compliance Lab	Screening (first two suites of tests in 2011 and 2012)	Water flea Fathead minnow	Mid-June (if Discharge from Outfall 011 is occurring), or before August 1	Day 1	5-gallons	Analyze a split of this sample for parameters both of Outfall 001 profiles. Collect coincident with surface water sampling.
				Day 3	5-gallons	--
				Day 5	5-gallons	--
Back-up Lab	Screening (first two suites of tests in 2011 and 2012)	Water flea Fathead minnow	Mid-June (if Discharge from Outfall 011 is occurring), or before August 1	Day 1	5-gallons	Analyze a split of this sample for parameters both of Outfall 001 profiles. Collect coincident with surface water sampling.
				Day 3	5-gallons	--
				Day 5	5-gallons	--
Compliance Lab	Monitoring (2013 and forward)	Most sensitive species from screening. If no toxicity is observed in either species, testing to be conducted on the fathead minnow.	Mid-June (if Discharge from Outfall 011 is occurring), or before August 1	Day 1	5-gallons	Analyze a split of this sample for parameters listed in **Table 27.3 and 27.4** Collect coincident with surface water sampling.
				Day 3	5-gallons	--
				Day 5	5-gallons	--
Back-up Lab	Monitoring (2013 and forward)	Most sensitive species from screening. If no toxicity is observed in	Mid-June (if Discharge from Outfall 011 is occurring), or before	Day 1	5-gallons	Analyze a split of this sample for parameters listed in **Table 27.3 and 27.4** Collect coincident with surface water sampling.

Monitoring Period		Test Organism	Sampling Period	Sampling Day	Grab Sample Size	Notes
		either species, testing to be conducted on the fathead minnow.	August 1	Day 3	5-gallons	--
				Day 5	5-gallons	--

A toxicity unit (TUc) is a unit of measure for effluent toxicity; increasing values reflect higher impacts. The IC25 is the percentage of effluent at which the organisms exhibit 25 percent reduction in a biological measurement such as reproduction or growth. It is calculated statistically and used in chronic toxicity testing.

TUc = 100/IC25

The toxicity testing on each organism must include a series of five test dilutions (100%, 75%, 50%, 25%, and 12.5%) and a control (**Table 19.3).**

Table 19.3: Analytical Methods (Toxicity)

Analyte Group	Parameter	Method	Units	Conditions	End Points
Whole Effluent Toxicity	Fathead Minnow, *Pimephales promelas*, Larval Survival and Growth Test	EPA 1000.0 (EPA, 2002a)	TUc	Moderately Hard Synthetic Fresh Water (MHSF) five test dilutions (100%, 75%, 50%, 25%, and 12.5%) and a control	IC25 Growth
	Daphnid, *Ceriodaphnia dubia*, Survival and Reproduction Test	EPA 1002.0 (EPA, 2002a)	TUc		IC25 Repro-duction

If either of the reference toxicant tests or the effluent tests does not meet all test acceptability criteria as specified in the test methods manual, the WET test must be re-sample and re-test within 14 days of receipt of the test results.

Data does not exist to support the development of a WET limit at this time, a target level of chronic toxicity of 2 TUc applies for the purposes of determining compliance with APDES Permit AK-005334-1, Section 1.4.3 (**See Table 19.4**).

Table 19.4: WET Testing Organisms and Target Level (Outfall 001)

Analyte Group	Test Organism	Short-term Chronic Test	Units	Target Level
Toxicity	Water flea (*Ceriodaphnia dubia*)	survival and reproduction test	TU_c	2
	Fathead minnow (*Pimephales promelas*)	larval survival and growth test	TU_c	2

19.1.1 WET Sample Collection

Three five-gallon CUBITAINERS® are provided by each laboratory for the annual sampling event. All sample containers are rinsed with source water before being filled with sample. After use with receiving water or effluents, CUBITAINERS® and plastic jugs are punctured to prevent reuse.

Samples collected are chilled to 0-6°C during or immediately after collection, and shipped to the laboratory. Ice, in the form of poly bottles of frozen distilled water, should be used. Loose bags of cube ice are not accepted by airlines and gel ice is not cold enough. Sufficient ice should be placed with the sample in the shipping container to ensure that ice will still be present when the sample arrives at the laboratory and is unpacked. Insulating material should not be placed between the ice and the sample in the shipping container. **Table 19.5** represents holding times and sample containers for WET sample collection.

Table 19.5: Holding Times and Sample Containers for WET sampling

Analyte Group	Parameter Name	Container	Container Size	Preservation	Maximum Holding Time
Toxicity	Whole Effluent Toxicity	Polyethylene	4 L per test	Ice to 0-6°C, with minimum head space	36 hours

19.2 WET Reporting Requirements

WET reporting is done on the Annual DMR for Outfall 001 (001Y). If the TU_c is less than 2, then No Toxicity is reported. A complete copy of the WET test laboratory results are attached to the Annual Activity Monitoring Report (due March 1 the following year).

Also to be included in the Annual Report:

- Dates of sample collection and initiation of each test;
- Flow rate at Outfall 001 at time of sample collection;
- Toxicity trigger of 2 Tuc; and
- Results of split sample from Outfall 001 collected at beginning of WET test.

Any results from Accelerated Testing should be submitted to ADEC within two weeks of receiving it from the lab and a full report in four weeks. Or if accelerated testing is unnecessary, a full report is due to ADEC four weeks after the investigation is completed, submitted with the DMR for the month following the investigation.

19.3 Exceedance of WET Test

- ADEC will be notified in writing within two weeks of receipt of the test results; and
- Accelerated testing will be initiated within two weeks of receipt of the test results that indicate an exceedance.
  - If the cause of the exceedance is known and corrective actions have been implemented then conduct one accelerated test. If the toxicity trigger is exceeded in this test, then implement a Toxicity Reduction Evaluation.
  - Or conduct four more biweekly tests over an eight-week period. If the toxicity trigger is exceeded in any of the four tests then implement a Toxicity Reduction Evaluation.

20.0 Drinking Water Program

Drinking Water Monitoring fulfills the requirements of the Potable Water System Operation Approval for PWSID: 372643 (Pogo Construction Camp) and PWSID 372685 (Pogo Permanent Camp) as well as the State of Alaska Drinking Water Regulations, 18ACC80. Both water systems are classified as Type: Non-Transient, Non Community (NTNC), Class A Source: Ground Water Under the Influence of Surface Water GWUDISW).

Table 20.1 identifies where Drinking Water Program key elements are located in the Pogo Mine Monitoring Plan.

Table 20.1: Drinking Water Program Elements in the Pogo Mine Monitoring Plan

Location in Plan	Description
Table 8.1	Drinking Water Monitoring Schedule for Pogo Construction Camp PWSID: 372643
Table 8.2	Drinking Water Monitoring Schedule for Pogo Construction Camp PWSID: 372685
Table 8.3	Drinking Water Analytical Parameters for: Pogo Construction Camp, Pogo Permanent Camp and Maximum Contaminate Limits
Table 8.4	Drinking Water Operation Approval Limits for Pogo Construction Camp
Table 8.5	Drinking Water Operation Approval Limits for Pogo Permanent Camp

20.1 Drinking Water Sampling Procedures

Monthly T-coli and E. coli samples are rotated through the end points of the water distribution system in both public water systems. Monthly bromate samples, and most of the annual samples, are collected at the Potable Water Treatment Plant entry points. Lead and copper sampling are done at designated sites only. If these sites are decommissioned, ADEC must be notified if sampling needs to occur at an alternate site.

Tables 20.2 and **20.3** show the location of the sampling sites and sampling schedule for each site.

Table 20.2: Construction Camp Sampling Sites and Schedule

Site ID	Location	Monthly T-Coli and Chlorine Residual	Monthly Bromate	Lead & Copper	Other Sampling
DS029	Potable Water Treatment Plant #1, Entry Point into system		Samples only collected at Entry Point		September: Arsenic, Nitrate, Old and New Inorganics, VOC's
DS031	Construction Camp, Old B-wing (room # E22)	February, July, & December		April	
DS043	Construction Camp Office (Redpath)				
DS080	Kitchen Prep Area Sink	January, June, & November		April	September: TTHM/HAA5
DS081	Women's Restroom Sink (Left)				
DS082	Men's Dry, (back middle sink)	March & August		April	
DS083	Women's Dry (middle Sink)			April	
DS084	Men's Shower	April & September		April	
DS085	Women's Shower	May & October			
DS086	Laundry Room Sink				

Table 20.3: Permanent Camp Sampling Sites and Schedule

Site ID	Location	Monthly T-Coli and Chlorine Residual	Monthly Bromate	Lead & Copper	Other Sampling
DS050	Potable Water Treatment Plant #2, Entry Point into system		Samples only collected at Entry Point		September: Arsenic, Nitrate, Old and New Inorganics, VOC's
DS052	Dorm A 1st Floor Sink (room # A134)	March & August		April & September	
DS054	Dorm B 3rd Floor sink (room # B 324)			April & September	
DS056	Admin Building Lunchroom sink			April & September	
DS057	Mobile Maintenance Lunch Room				
DS058	Filter Building Restroom Sink				
DS059	Mill Building Lunchroom	May & October		April & September	
DS060	Rear Kitchen Sink, Prep area	January, June, & November			September: TTHM/HAA5
DS061	Dorm C 2nd Floor sink (room # C 226)	April & September		April & September	
DS062	Mill Bench Offices (AMEC Chateau) Lunchroom sink	February, July, & December			

20.1.1 Total Coli, E. Coli & Chlorine Residual

Bacteriological sampling is conducted monthly and a chlorine residual reading is taken at the same time with the handheld colorimeter. When collecting a sample remove any screens from faucet and let the water run cold for at least 5 minutes before sampling.

The analytical results from these monthly samples are reported directly from the laboratory to ADEC.

If other sampling (outside the required monitoring) takes place it is designated a “Special Sample” on the COC. For example, if a new eyewash station, shower, or plant filter is installed, Water Operations personnel will “shock” it with a strong chlorine solution after which a total coliform sample is collected before it is put into use. These samples are designated “Special “ and not reported directly to ADEC from the laboratory.

20.1.2 Bromate Sampling

Monthly bromate samples are collected at the Potable Water Treatment Plants entry points only.

20.1.3 Lead & Copper Sampling

Lead & Copper samples are collected as “First Draw” samples. When collecting a sample from the designated sampling site, no screens are removed from the faucet and water is run for approximately three to five minutes, then turned off for a minimum of six hours (not to exceed 8 hours). Faucets are taped off and “Do Not Use Water” signs hung on them. After the minimum six-hour waiting is period is complete, the sample bottle is placed directly under the tap and the cold water turned on until bottle is filled.

If any plumbing repairs or replacements have occurred since the last sampling event it is noted on the COC.

A signed sampler affidavit (supplied by the laboratory) must accompany every lead and copper sample bottle.

The Construction Camp potable water system is currently only required to be samples annually for lead and copper. The Pogo Permanent Camp is currently required to be sampled bi-annually. If 90% lead or copper values are below maximum contaminate levels for two consecutive sampling events, sampling requirements may be reduced by ADEC to an annual sampling event. If sampling events show less than 90% of the samples are below the Maximum contaminate levels sampling events may be increased by ADEC. If this occurs, the corrosion prevention additive, disodium phosphate, will need to be added by Water Operations.

20.1.4 Annual Sampling

Arsenic, Nitrate and VOC

Arsenic, Nitrate and Volatile Organic Compounds (VOCs) are sampled annually at the entry point of the Potable Water Treatment Plants. VOC vials are filled carefully to form a meniscus on the surface of the vial before the lid is screwed on. This prevents air bubbles form forming in the vials. Vials are then turned upside down to check for air bubbles. If a vial contains air bubbles it is rejected by the laboratory. VOCs always include a prefilled and sealed travel blank also provided by the laboratory.

TTHM & HAA5

TTHM & HAA5 samples are collected annually at the ends of the distribution systems. TTHM sampling begins with collecting the sample into a 500 ml amber glass bottle with preservative provided by the laboratory. This is shaken slightly to mix, then the four amber glass vials are filled from this bottle so as to prevent air bubbles from forming (as described above for the VOC sampling).

Old and New Inorganics

Pogo is required to collect Old Inorganics and New Inorganics once during a cycle of eight years (current cycle is from 2011 to 2019). Samples were collected in 2011 and are due in 2020.

Table 20.4 shows the location, hold times, and sampling containers for each site.

Table 20.4: Holding Times and Sample Containers Drinking Water Sampling

Analyte Group	Parameter Name	Container	Container Size	Preservation	Maximum Holding Time
Major Anions	Chlorine	Glass	10 ml	Phosphate Reagent	Read Immediately
	Nitrate	Polyethylene, Glass	125 mL	Cool 4°C	48 hours
	Bromate	Polyethylene, Glass	100 mL	Cool 4°C	28 days
Metals	Arsenic	Polyethylene	250 mL	HNO_3 to pH<2	6 months
	Lead & Copper	Polyethylene	1000 mL	HNO_3 to pH<2	6 months
	Old Inorganics				
	Arsenic	Polyethylene, Glass	250 mL	HNO_3 to pH<2	6 months
	Barium				
	Cadmium				
	Chromium				
	Mercury				
	Selenium				
	Fluoride	Polyethylene, Glass	125 mL	Cool 4°C	28 days
	New Inorganics				
	Antimony	Polyethylene, Glass	250 mL	HNO_3 to pH<2	6 months
	Beryllium				
	Nickel				
	Thallium				
	Cyanide, WAD	Polyethylene, Glass	1000 mL	NaOH to pH >11	14 days
Microbiological	T. Coli & E. Coli	Polyethylene, Glass	125 mL	Cool 4°C	30 hours
Organics	HAA5	Amber Glass	500 mL	NH_4Cl	14 days
	TTHM	4 Amber Glass Vials	40 mL	HCl	14 days
	Volatile Organic	4 Amber Glass Vials	40 mL	HCl	14 days

Analyte Group	Parameter Name	Container	Container Size	Preservation	Maximum Holding Time
	Compounds				

20.2 Drinking Water Reporting Requirements

Waivers are required for Pesticides & Other Organics (SOC). Waiver forms are provided by ADEC. Waivers are good for three years. The SOC waivers for the Pogo Construction Camp and the Pogo Permanent Camp were submitted for renewal in 2011. The next SOC renewal is due by 12/31/2015.

The Asbestos Waiver is a signed affidavit on file with ADEC indicating that Pogo has no asbestos piping in either potable water distribution systems. This waiver does not have to be renewed unless new piping is added to either of the distribution systems.

ADEC required monthly Drinking Water reports are due by the 10th of every month. A separate report is submitted for the Pogo Construction Camp and the Pogo Permanent Camp. The monthly data is collected at both Potable Water Treatment Plants and is entered into EDMS by Water Operations personnel (or the Environmental Department as needed). Data entered includes entry point chlorine, turbidity (after filtration), flow rate during peak water treatment plant flow, ozone residual, and chlorine residual collected during monthly total coliform sampling. The monthly report is generated by EDMS and is emailed to ADEC by the Environmental Department.

A Sanitary Survey must be conducted every three years for both potable water distribution systems. The Pogo Construction Camp is due for a Sanitary Survey in 2011 and The Pogo Permanent Camp is due in 2012. The surveys are conducted by a third party consultant and submitted to ADEC.

20.3 Exceedances of Potable Water Quality Standards

If an exceedance of a Water Quality Standards occurs, or an exceedance of the Operational Approval Limits occurs, ADEC needs to be notified as soon as possible. If other disruptions to the systems occur, such as over-chlorination or ozone generator breakdown, these also need to be reported immediately. If the event occurs after business hours a message should be left on the phone. A follow-up email goes to the

ADEC Project Manager for Pogo, describing the situation and what corrective actions are being taken. **Table 20.5** gives contact names and numbers for ADEC.

Table 20.5: Drinking Water Exceedance/Upset Reporting to ADEC

Contact Person	Phone Number
Dawhn Bodyfelt, ADEC Project Manager	(907) 451-2170
After Hours Message	1-800-770-2137
In Dawhn is unavailable others in department to contact::	
Marci Irwin, ADEC	(907) 451-2168
Lee Johnson, ADEC	(907) 451-2179

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Appendix A

Forms

ANALYTICA GROUP ®

Analytica Chain of Custody Form

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5438 Shaune Drive, Juneau, AK 99801, (907) 780-6668, (907) 780-6670 fax
4307 Arctic Blvd, Anchorage, AK 99503, (907) 258-2155, (907) 258-6634 fax
475 Hall St., Fairbanks, AK 99701, (907) 456-3116, (907) 456-3125 fax
12189 Pennsylvania St., Thornton, CO 80241, (303) 469-8868, (303) 469-5254 fax

Chain of Custody No:

Client Name & Address:

Public Water System (PWS) ID#:

Project Name:

Section To be Completed by Analytica

Quote ID: | LGN:

Account #: | Cash | Check | Visa/MC

Turnaround Time for Results (TAT)

___ **Standard** ___ **Expedited** (< 10 days, prior authorization required) *(please specify due date below; add'l charges may apply)*

Requested Due Date for Results:

Invoice to Name & Address:

Same

Special Instructions/Comments: ***See profile summary for analytes/methods.**

P.O. or Contract No:

Kit Prep/Shipping Charge: $

Client Sample Identification / Location	**Date Sampled**	**Time Sampled**	**Matrix (S-DW-WW-Other)**	**No. of Containers**	**Requested Analysis/Method**							**Field Preserved**	**Field Filtered**	**MS/MSD ?**
					Lot #: Pres:	Lot #: Pres:	Lot #: Pres:	Lot #: Pres:	Lot #: Pres:	Lot #: Pres:	Lot #: Pres:			

Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Name of Sampler: (printed)					

Section To Be Completed by Analytica

	THO	ANC	JNU	FBKS
Condition of Custody Seal?:				
Initialed By:				
Temp/Loc:				
Thermo ID#:				
Shipped Via:				

Version 2.0

ANALYTICA GROUP

Preservative:

None

Requested Analysis/Method: ____________________

Project Name: ____________________

Client Sample Identification/Location: ____________________

Date Sampled: ________; Time Sampled: ________

Collected By: ____________________

Sample Location	Sample Profile	Sample Date & Time		Collected By	Lab	Date Shipped	Date Received	Lab Report Received	Lab WO #	Date EQWin

Sumitomo Metal Mining Pogo LLC

Field Instrument Calibration Form (Single Meter)

INSTRUMENT (MAKE/MODEL #)________________________ **INSTRUMENT #**____________

PARAMETER: *[check only one]*

☐ TEMPERATURE ☐ CONDUCTIVITY ☐ SALINITY ☐ pH ☐ ORP
☐ TURBIDITY ☐ RESIDUAL CL ☐ DO ☐ OTHER ____________

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

Standard A ____
Standard B ____
Standard C ____

DATE (MM/DD/YYYY)	TIME (HR:MIN)	STD (A, B, C)	STD VALUE	INSTRUMENT RESONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS

Sumitomo Metal Mining Pogo LLC

Field Instrument Calibration Form (Multi-Meter)

INSTRUMENT (MAKE/MODEL #)______________________ **INSTRUMENT #**___________

DATE (mm/dd/yyyy)	TIME (hr:min)	PARAMETER*	STD (A, B, C)	STD VALUE	INSTRUMENT RESPONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

FIELD PARAMETER	ABBREVIATION*	STANDARD	TYPE	VALUE	ORIGIN	DATE (mm/dd/yyyy)
Specific Conductance	COND	A				
		B				
		C				
Dissolved Oxygen	DO	A				
		B				
		C				
pH	pH	A				
		B				
		C				
Residual Chlorine	CL-R	A				
		B				
		C				
Temperature	TEMP	A				
		B				
		C				
Turbidity	TURB	A				
		B				
		C				

Sumitomo Metal Mining Pogo LLC

Field Instrument Maintenance Form

INSTRUMENT (MAKE/MODEL #)______________________**INSTRUMENT #**___________

PARAMETER(S): *[check all that apply for this instrument]*

☐ TEMPERATURE ☐ CONDUCTIVITY ☐ SALINITY ☐ pH ☐ ORP
☐ TURBIDITY ☐ RESIDUAL CL ☐ DO ☐ OTHER __________

DATE (mm/dd/yyyy)	TIME (hr:min)	TYPE OF MAINTENANCE	DESCRIPTION OF PERFORMED MAINTENANCE	SAMPLER INITIALS

REMARKS: ____

Pogo Mine
Groundwater Sampling Field Data Sheet

Station ID ________________________

Date__________________________Time________________________ Sample Class (P/M/F)___________Sample Profile____________

Blank Collected (Y/N)____ Type: ______________Name: ______________Field Duplicate Collected (Y/N)_____ Name: _________________

Field Preserved (Y/N)____________________ Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:_________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Field Conditions____

Field Equipment ____

Depth to Water (feet)____________________________ Frozen (Y/N)____

Estimated Well Bore Volume (gallons)________________ Total Volume Purged (gallons)__________________________________

Volume Purged (gals)	Temperature (°C)	pH (pH units)	Specific Conductance (µS)	D.O. (mg/L)	Appearance	Purge Calculations (DBT-DTW)*WVCal	
						Depth to Bottom -	
						Depth to Water	
						=	
@Sample						* (Well Volume Calc)	

Total Purge =

Notes/Comments (stick-up, depth to water, well repairs needed, unusual appearance of water, etc.) ______________________________________

Station ID________________________

Date__________________________Time________________________ Sample Class (P/M/F)___________Sample Profile____________

Blank Collected (Y/N)____ Type: ______________Name: ______________Field Duplicate Collected (Y/N)_____ Name: _________________

Field Preserved (Y/N)____________________ Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:_________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Field Conditions____

Field Equipment ____

Depth to Water (feet)____________________________ Frozen (Y/N)____

Estimated Well Bore Volume (gallons)________________ Total Volume Purged (gallons)__________________________________

Volume Purged (gals)	Temperature (°C)	pH (pH units)	Specific Conductance (µS)	D.O. (mg/L)	Appearance	Purge Calculations (DBT-DTW)*WVCal	
						Depth to Bottom -	
						Depth to Water	
						=	
@Sample						* (Well Volume Calc)	

Total Purge =

Notes/Comments (stick-up, depth to water, well repairs needed, unusual appearance of water, etc.) ______________________________________

(Well Volume calculations: 1"= 0.041 gal/ft 1.5"= 0.092 gal/ft 2"= 0.163 gal/ft 3" =0.367 gal/ft 4"= 0.653 gal/ft)
DtB: MW04-213, 152.6' (2 inch); MW99-216, 500.0 ; MW03-500 (2 inch), 59.8'; MW03-501, 52.7'; MW03-502, 36.6'; MW04-503, 67.1'; MW04-504, 72.1'; LL04-031, 63.0' (2 inch); LL04-032, 58.9' (2 inch).

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Pogo Mine
NPDES 001b Sampling Field Data Sheet

Date___________________________ Time_____________________

Sample Class (P/M/F) _____________ Sample Profile______________

Blank Collected (Y/N) _____________ Type: _______________ Name: _______________________

Field Duplicate Collected (Y/N) __________ Name: ______________________

Field Preserved (Y/N) ___________ Field Filtered (Y/N)__________

Filtered in Site Lab (Y/N) _________ Date/Time: __________________

Were field parameters measured in site lab? (Y/N)___________ Date/Time: ____________________

Field Team Members____

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	Turbidity (NTU)	Appearance

Notes/Comments ____

____

____

____

____

____

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Pogo Mine
Outfall 001 Sampling Field Data Sheet

Date___________________________ Time_____________________

Sample Class (P/M/F) _____________ Sample Profile______________

Blank Collected (Y/N) _____________ Type: _______________ Name: _______________________

Field Duplicate Collected (Y/N) __________ Name: ______________________

Field Preserved (Y/N) ___________ Field Filtered (Y/N)__________

Filtered in Site Lab (Y/N) _________ Date/Time: __________________

Were field parameters measured in site lab? (Y/N)___________ Date/Time:____________________

Field Team Members____

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	Turbidity (NTU)	Appearance
Notify supervisor immediately if	**6.5 >pH>8.5**		**>5 NTUs above NPDES 001b turbidity reading**	

Notes/Comments ____

____

____

____

____

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Pogo Mine

Outfall002 & STP002

Sampling Field Data Sheet

Outfall 002

Date____________________________ Time___________________________

Sample Class (P/M/F)____P________ Sample Profile_BOD/TSS, Nitrate, Fecal

Blank Collected (Y/N)____ Type: _______________ Name: _______________

Field Duplicate Collected (Y/N)_____ Name: ___________Class _______

Field Preserved (Y/N)______________________ Field Filtered (Y/N)________

Filtered in Site Lab (Y/N)____ Date/Time:__________________

Were field parameters measured in site lab?(Y/N)______ Date/Time:___________

Field Team Members____

Start Flush Time for Outfall 002 (must be discharging)	UV Bank #1 # of LED Bar Indicators	UV Bank #2 # of LED Bar Indicators	Sand Filter Operating? (Yes/No)	Turbidity (NTU)	Stop Flushing (> 5 Minutes)	Appearance

Note: If there are more than 5 bars showing on the UV lights, or a turbidity reading higher than 5 NTU's contact a water operator before collecting sample to make sure the system is operating properly!!!!! Notify supervisor immediately if any sampling problems occur.

STP 002 (Influent Tank)

Date____________________________ Time___________________________

Sample Class (P/M/F)____P________ Sample Profile_BOD/TSS

Blank Collected (Y/N)____ Type: _______________ Name: _______________

Field Duplicate Collected (Y/N)_____ Name: ___________Class _______

Field Preserved (Y/N)______________________ Field Filtered (Y/N)________

Filtered in Site Lab (Y/N)____ Date/Time:__________________

Were field parameters measured in site lab?(Y/N)______ Date/Time:___________

Field Team Members____

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Pogo Mine
Outfall 011 Sampling Field Data Sheet

DISCHARGE MONITORING

Did a discharge occur from Thursday – Tuesday? YES_____ NO_____

If YES, then discharge must be in progress during sampling.

Is discharge currently occurring? YES____ NO____

Date discharge began: ____________________ Time discharge began: ___________

If NO, contact WTP Operator to open valve for 011 before sampling.

FIELD DATA COLLECTION

Date________________________ Time___________________________

Sample Class (P/M/F)__________ Sample Profile______________

Blank Collected (Y/N)_______ Type: _______________ Name: _____________________

Field Duplicate Collected (Y/N)_______ Name: _____________________

Field Preserved (Y/N)_______ Field Filtered (Y/N)___________

Filtered in Site Lab (Y/N) _______ Date/Time: __________________

Were field parameters measured in site lab?(Y/N)________ Date/Time:__________________

Field Team Members____

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	Turbidity (NTU)	Appearance
Notify Supervisor immediately if	**6.0>pH>9.0**			

Notes/Comments ____

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Pogo Mine
Interstitial Water/Solids Sampling Field Data Sheet

PC003-Interstial Water

Date___________________________ Time__________________________

Sample Class (P/M/F)____________ Sample Profile____________

Blank Collected (Y/N)____ Type: _______________Name: _______________

Field Duplicate Collected (Y/N)_____ Name: __________________

Field Preserved (Y/N)______________________

Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:____________

Were field parameters measured in site lab?(Y/N)______Date/Time:__________

Field Team Members____

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	Turbidity (NTU)	Appearance

PC003-Tailing Solid Quarterly Composite

Date___________________________ Time__________________________

Sample Class (P/M/F)____________ Sample Profile____________

Blank Collected (Y/N)____ Type: _______________Name: _______________

Field Duplicate Collected (Y/N)_____ Name: __________________

Field Preserved (Y/N)______________________

Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:____________

Were field parameters measured in site lab?(Y/N)______Date/Time:__________

Field Team Members____

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	Turbidity (NTU)	Appearance

Notes/Comments ____

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Pogo Mine
Potable Sampling Field Data Sheet

Lower Camp PWSID #372643
Upper Camp PWSID #372685

Station ID ________________________

Date_________________________Time______________ Sample Class (P/M/F)____P_______Sample Analysis_____Pb &Cu ______

Blank Collected (Y/N)_N____Type: ________Name: ________________Field Duplicate Collected (Y/N)___N__ Name: _______________

Field Preserved (Y/N)____Y________________

Field Team Members____

Location	Time Flushed	Time sample collected	Comments

Station ID ________________________

Date_________________________Time______________ Sample Class (P/M/F)____P_______Sample Analysis___Pb & Cu________

Blank Collected (Y/N)__N___Type: ________Name: ________________Field Duplicate Collected (Y/N)__N___ Name: _______________

Field Preserved (Y/N)____Y________________

Field Team Members____

Location	Time Flushed	Time sample collected	Comments

Station ID ________________________

Date_________________________Time______________ Sample Class (P/M/F)___P________Sample Analysis_____Pb & Cu______

Blank Collected (Y/N)_N____Type: ________Name: ________________Field Duplicate Collected (Y/N)___N__ Name: _______________

Field Preserved (Y/N)_____Y_______________

Field Team Members____

Location	Time Flushed	Time sample collected	Comments

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Pogo Mine
Soil Sampling Field Data Sheet

***Name*___________**

Date_________________________ Time________________________ Sample Class (P/M/F)__________ Sample Profile__________

Blank Collected (Y/N)____ Type: _____________Name: _____________Field Duplicate Collected (Y/N)_____ Name: ________________

Field Preserved (Y/N)___________________ Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Notes/Comments ____

***Name*___________**

Date_________________________ Time________________________ Sample Class (P/M/F)__________ Sample Profile__________

Blank Collected (Y/N)____ Type: _____________Name: _____________Field Duplicate Collected (Y/N)_____ Name: ________________

Field Preserved (Y/N)___________________ Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Notes/Comments ____

***Name*___________**

Date_________________________ Time________________________ Sample Class (P/M/F)__________ Sample Profile__________

Blank Collected (Y/N)____ Type: _____________Name: _____________Field Duplicate Collected (Y/N)_____ Name: ________________

Field Preserved (Y/N)___________________ Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Notes/Comments ____

Pogo Mine
Surface Water Sampling Field Data Sheet

Station ID ________________________

Date_________________________Time________________________ Sample Class (P/M/F)___________Sample Profile____________

Blank Collected (Y/N)____ Type: ______________Name: ______________ Field Duplicate Collected (Y/N)_____ Name: ________________

Field Preserved (Y/N)___________________ Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Field Conditions____

Field Equipment ____

Approx depth of channel (inches)___________________ Flow conditions____

Depth of ice cover (inches)_______________________

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	D.O. (mg/L)	Appearance

Notes/Comments (animal activity, stream disturbance, channel conditions, need for station move upstream/downstream)_____________________

Station ID ________________________

Date_________________________Time________________________ Sample Class (P/M/F)___________Sample Profile____________

Blank Collected (Y/N)____ Type: ______________Name: ______________ Field Duplicate Collected (Y/N)_____ Name: ________________

Field Preserved (Y/N)___________________ Field Filtered (Y/N)____Filtered in Site Lab (Y/N)___Date/Time:________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Field Conditions____

Field Equipment ____

Approx depth of channel (inches)___________________ Flow conditions____

Depth of ice cover (inches)_______________________

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	D.O. (mg/L)	Appearance

Notes/Comments (animal activity, stream disturbance, channel conditions, need for station move upstream/downstream)_____________________

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Pogo Mine
WAD Cyanide Sampling Field Data Sheet

Station ID ________________________

Date________________________Time________________________ Sample Class (P/M/F)__________Sample Profile WAD Cn Only

Blank Collected (Y/N)____ Type: _____________Name: _____________ Field Duplicate Collected (Y/N)_____ Name: ________________

Field Preserved (Y/N)____________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Field Conditions____

Field Equipment ____

Approx depth of channel (inches)___________________ Flow conditions____

Depth of ice cover (inches)_______________________

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	Appearance

Notes/Comments (animal activity, stream disturbance, channel conditions, need for station move upstream/downstream)____________________

Station ID ________________________

Date________________________Time________________________ Sample Class (P/M/F)__________Sample Profile WAD Cn Only

Blank Collected (Y/N)____ Type: _____________Name: _____________ Field Duplicate Collected (Y/N)_____ Name: ________________

Field Preserved (Y/N)____________________

Were field parameters measured in site lab?(Y/N)______Date/Time:______

Field Team Members____

Field Conditions____

Field Equipment ____

Approx depth of channel (inches)___________________ Flow conditions____

Depth of ice cover (inches)_______________________

Temperature (°C)	pH (pH units)	Specific Conductance (µS)	Appearance

Notes/Comments (animal activity, stream disturbance, channel conditions, need for station move upstream/downstream)____________________

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Pogo Mine
Fish Tissue Sampling Field Data Sheet

Station ID ______ **SW01** ______________

Station Location (lat & long) ___*N 64° 28.772' W 144°49.843'*___________

Date__________________ Time_______________ Sample Class (P/M/F) ______*P*_____ Sample Profile_______*8*________

Field Team Members____

Field Conditions____

Flow conditions____

Approx depth of channel (feet/inches) ______________________ Depth of ice cover (feet/inches) ______________________

Mode of Transportation (walk, boat, helicopter) _____________________ Procedure ______*Pogo Fish Tissue Sampling SOP*

Type of Bait________________ Species Sought______*Chinook Salmon*_________ Other Species Caught/Observed ________

____

Field Equipment ____

____

Traps Set Date/Time____ Number of Traps__________________

(1) Trap Check Date/Time____________________________ (2) Trap Check Date/Time____________________________

(3) Trap Check Date/Time____________________________ (4) Trap Check Date/Time____________________________

Trap Pull Date/Time____ Number of Traps Pulled_________________

Fish Number	Date/Time	Length (cm)	Weight (g)	Notes
SW01-F01				
SW01-F02				
SW01-F03				
SW01-F04				
SW01-F05				
SW01-F06				
SW01-F07				
SW01-F08				
SW01-F09				
SW01-F10				
SW01-F11				
SW01-F12				
SW01-F13				
SW01-F14				
SW01-F15				

Notes/Comments (animal activity, stream disturbance, channel conditions, need for station move upstream/downstream) _______
____
____
____
____

Map and or Drawing of Site (including river channels, trap locations, etc.):

Pogo Mine
Fish Tissue Sampling Field Data Sheet

Station ID **SW12**

Station Location (lat & long) ***N 64 22.100' W 144 57.686'***

Date__________ Time__________ Sample Class (P/M/F) ***P*** Sample Profile ***8***

Field Team Members__________

Field Conditions__________

Flow conditions__________

Approx depth of channel (feet/inches) __________ Depth of ice cover (feet/inches) __________

Mode of Transportation (walk, boat, helicopter) __________ Procedure ***Pogo Fish Tissue Sampling SOP***

Type of Bait__________ Species Sought ***Chinook Salmon*** Other Species Caught/Observed __________

Field Equipment __________

Traps Set Date/Time__________ Number of Traps__________

(1) Trap Check Date/Time__________ (2) Trap Check Date/Time__________

(3) Trap Check Date/Time__________ (4) Trap Check Date/Time__________

Trap Pull Date/Time__________ Number of Traps Pulled__________

Fish Number	Date/Time	Length (cm)	Weight (g)	Notes
SW12-F01				
SW12-F02				
SW12-F03				
SW12-F04				
SW12-F05				
SW12-F06				
SW12-F07				
SW12-F08				
SW12-F09				
SW12-F10				
SW12-F11				
SW12-F12				
SW12-F13				
SW12-F14				
SW12-F15				

Notes/Comments (animal activity, stream disturbance, channel conditions, need for station move upstream/downstream) _______
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Map and or Drawing of Site (including river channels, trap locations, etc.):