FINAL

QUALITY ASSURANCE PROJECT PLAN

AND

FRESHWATER MONITORING PLAN

FOR THE KENSINGTON MINE

Revision -17-
August 2017

Prepared for:

COEUR ALASKA, INC.

Prepared by:

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A1 Title & Approval Sheet

The Approval sheet is provided to identify the signatories required for approval of the Quality Assurance Project Plan and Fresh Water Monitoring Plan (QAPP & FWMP). Each QAPP & FWMP revision will include an updated approval page (this page) including the revision numbering system as identified in the header of the revised QAPP & FWMP (See Document Control Format in A2).

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Acronyms used

ADEC	Alaska Department of Environmental Conservation
ASTM	American Society of Testing Materials
ATC	Automatic Temperature Compensating
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
DQO	Data Quality Objective
EPA	Environmental Protection Agency
FWMP	Fresh Water Monitoring Plan
HDPE	High Density Polyethylene
MDL	Method Detection Limit
NPDES	National Pollutant Discharge Elimination System
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedure
TDS	Total Dissolved Solids
TSS	Total Suspended Solids

A2 Project Management

A2.1 Document Control Format

The following document control format will be used within this plan:

Revision No.
Date

The document control information will appear in the upper right corner of each page of the Quality Assurance Project Plan (QAPP & FWMP). Each revision of the QAPP & FWMP will be assigned a number obtained by adding 1 to the previous revision number. This number along with the date will ensure that project participants understand which version of the QAPP & FWMP is being used.

The footer on each page will consist of the following:

Coeur Alaska	Page #	QAPP & FWMP

A2.2 Distribution List and Resources

A copy of each new QAPP & FWMP revision will be distributed to a comprehensive list of parties from the Alaska Department of Environmental Conservation (ADEC), the United States Department of Agriculture (USDA) Forest Service, Coeur Alaska Inc. (Coeur). Selected elements of the QAPP & FWMP may be forwarded to participating laboratories as necessary. A full list of persons included is presented in Attachment A of this document.

A3 Project Organization

The organizational structure for ADEC and Forest Service over-site, Coeur Alaska Inc. management, quality assurance, and field activities, and sub-consultants for the Kensington Mine site is established in Figure 1. A summary of contact information for principal individuals, and supporting organizations including title roles, e-mail, address, and phone numbers are included in Attachment A of the QAPP & FWMP. The following information is provided to expand on the roles and responsibilities of principal individuals:

A3.1 Alaska Department of Environmental Conservation and Forest Service

<u>Environmental Program Specialist/Minerals Coordinator</u>

The ADEC and Forest Service program specialist reviews the QAPP & FWMP and associated project requirements to determine compliance with established guidelines from the EPA guidance documents (EPA, QA-R5, March 2001) and key elements of a QAPP & FWMP as required in EPA "Guidance Document for Writing a Tier 2 Water Quality Monitoring Quality Assurance Project Plan (QAPP & FWMP)", June 2012.

Water Quality Assurance Chemist

The ADEC and Forest Service QA chemist is tasked with reviewing detailed elements of the QAPP & FWMP to determine if water quality compliance metrics are being met.

A3.2 Coeur Alaska, Inc.

Environmental Project Manager

Coeur Alaska's Environmental Manager (EM) is responsible for the planning and execution of all environmental sampling and analysis and for inclusion of field and laboratory data into analytical data reports. The EM is responsible for submittals to ADEC and others on the document distribution list.

The EM provides resources and direction to the Quality Assurance Officer to properly implement the QAPP & FWMP. Resources include personnel and supplies for sampling, quality control materials, coordination for laboratory services, and personnel for data management, and auditing. He operates in association with the QA officer and makes available assistance and resources as needed.

The EM identifies the specifications for, and administers the subcontracts for laboratory analysis. He also provides information to guide regulatory requirements and reviews aspects of Quality Control requirements from the Quality Assurance officer. Work plan tasks, referenced method quantitation limits, regulatory compliance levels, and other pertinent documents are reviewed and assessed to determine if data quality objectives are being met.

Project Quality Assurance Officer

Coeur Alaska's Quality Assurance (QA) officer is responsible for ensuring the activities in this QAPP & FWMP are followed. The QA Officer is responsible for approving the QAPP & FWMP, for implementing revisions as necessary to the QAPP & FWMP and producing any document revision for signatory approval. The QA officer is responsible for making certain that the QAPP & FWMP is implemented as designed and is followed, and for ensuring that the data collection process is conducted correctly. The QA Officer is responsible for supervising or coordinating the compliance water monitoring, annual fish and invertebrate studies, and implementation of quality control issues related to sample collection, sample handling, data recording, and instrument calibration.

The QA officer maintains a copy of the QAPP & FWMP and reviews the QAPP & FWMP on an annual basis and compares the QAPP & FWMP criteria with actual field sampling and measurement, with lab activities, and with data management. The QA officer or his/her designee is responsible for the following specific duties:

1. Coordinating and over-seeing the compliance water sampling, sample handling, laboratory contact, quality control processes, and data management processes involved in the project. This includes participating in all phases of the project and field analyses as needed.

2. Following or directing QAPP & FWMP provisions in the field and with proper implementation of data management.

3. Coordinating with project laboratories and providing initial review of subcontract laboratory analyses.

4. Coordinating with project laboratories to secure annual audit information for inclusion to the Coeur audit program.

5. Perform or designate someone to perform data quality audits of Coeur deliverables, and technical system audits (TSA) of full project facility, equipment, and personnel involved in the production of data and data deliverables.

6. Reporting appropriately verified and validated data results to the Environmental Manager for inclusion of data into the APDES Discharge Monitoring Report (DMR) process.

7. Ensuring that all personnel have appropriate training and skills with training conducted on an annual basis.

8. Documenting and reporting any noncompliance issues.

9. Coordinating future changes to the QAPP & FWMP and dissemination of QAPP & FWMP revisions to the personnel listed in Section A3.

Water Treatment Plant Operators

The water treatment plant operators are responsible for the daily operation of the treatment plants and calibration of the in-line pH meters located in the Comet and TTF treatment plants.

Field Staff

Field environmental technicians collect all water and soil samples required by the site permits with the exception of aquatic resource samples. A subcontractor collects field data relating to aquatic resources (sediment monitoring, benthic invertebrates, resident fish monitoring, anadromous fish monitoring, and periphyton biomass and community composition) and reports directly to the QA officer for completeness and quality issues.

A3.3 Golder Associates Inc.

Rens Verburg, Ph.D, P.Geo, L.G.

Mr. Verburg is responsible for meeting the needs of Coeur Alaska, Inc. through direction of Golder personnel to complete requested tasks associated with the Coeur – Kensington Mine.

Tom Stapp, Senior Chemist

Mr. Stapp provides technical guidance to Coeur – Kensington on the preparation of a Tier 2 QAPP & FWMP document as cited in previously mentioned guidance documents.

A3.4 Laboratories

Qualified laboratories will be retained for standard and specialized chemical tests on soil, water and invertebrate tissue samples as appropriate. Contract laboratories for chemical analysis will have a Quality Assurance Program that conforms to applicable guidelines in documents such as EPA SW-846, EPA QAMS-005/80, EPA QA/G-5, and ISO/IEC Guide 25. A current list of specialized laboratories is provided in Figure 1 and contact information found in Attachment A.

A3.4.1 Water Chemistry

ALS Environmental located in Kelso, Washington, is the primary contract laboratory for this project. This lab analyzes the majority of all water samples collected including the weekly monitoring of Outfall 001/Outfall 002 and the monitoring of receiving waters and contact water sites.

Should Coeur change contract laboratories, the USFS and state will be advised and provided updated laboratory QA manuals, certifications and contract statement of work.

A3.4.2 Toxicity

Bio-Aquatic Testing, Carrollton Texas performs monthly toxicity tests on mine discharge water as specified within this QAPP & FWMP.

ALS Environmental located in Kelso, Washington conducts annual toxicity tests and metal analysis on stream sediment. The Alaska Department of Fish and Game conducts the sediment sampling and contracts with ALS to perform the testing.

Bio-Aquatic Testing and ALS follow their own specific laboratory QA/QC procedures as well as the procedures described in the APDES Permit for this project, Permit No. AK-005057-1.

A4 Problem Definition/Background

A4.1 Purpose

The purpose of this QAPP & FWMP is to assist with and guide monitoring activities necessary for compliance with the APDES permit No. AK-0050571, Waste Management Permit No. 2013DB0002, Waste Disposal Permit No. 2007DB00021, and the Record of Decision issued by the United States Forest Service. This revision of the plan includes requirements of the APDES permit that became effective on June 1, 2017. The QAPP & FWMP describe the quality assurance (QA) or management quality guidelines, and quality control (QC) or technical quality guidelines that are employed during water treatment operations, data collection, and sample handling and analysis. The goal of this plan and of this sampling program is to generate unbiased data with known and traceable accuracy and precision. By following this plan, the quality of the data will be adequate to ensure compliance with the site permit requirements.

A4.2 Background

The Kensington Gold Project (Project) is an underground gold mine located approximately 45 miles north of Juneau at Latitude 58° 52' N, Longitude 135° 08' W (Figure 2). The project covers both private lands and public lands managed by the United States Forest Service (USFS). Coeur Alaska, Inc. (Coeur), a wholly owned subsidiary of Coeur Mining Inc., is the operator.

The focus of the project is underground mining of a mesothermal gold deposit. The current mine's life is estimated to be approximately 9 years, at a production rate of approximately 1,750 tons of ore and 400 tons of underground development rock (waste rock) per day.

The major components associated with the Project are an underground mine, mill site, a tailings treatment facility (TTF), two development rock stockpiles, borrow areas, an administrative office, maintenance and generator facilities, and a marine dock facility (Figure 2). Ancillary facilities include access roads, topsoil stockpiles, diversion systems, a wastewater treatment facility, water supply, and other minor facilities.

Mining and milling occurs 365 days per year. Site reclamation and closure tasks are expected to be completed in three years after cessation of all mining activities. Details regarding the reclamation of the mining project are provided in the Kensington Gold Reclamation Plan (April 2013).

Operation of the mine requires discharges of waters into Sherman Creek, East Fork Slate Creek, Ophir Creek and Johnson Creek. National Pollutant Discharge Elimination System (NPDES) Permit No. AK-005057-1 authorized by the United States Environmental Protection Agency (EPA) in April of 1998 established effluent limitations on a variety of constituents into these water bodies. The permit was modified to a new draft permit in 2004 to accommodate changes in project operations. The final permit became effective on September 1, 2005. The APDES Permit was renewed in July 2011 and became effective September 1, 2011. The APDES Permit was modified and renewed again in May 2017 and became effective June 1, 2017. The State maintains primacy of the NPDES program and has jurisdiction over the current APDES discharge permit. The purpose of the monitoring required by this permit is to verify compliance with effluent limitations and characterize water quality of the receiving water over time.

The discharge monitoring report (DMR) is provided each month to summarize conditions found as a result of sample collection and investigative actions as prescribed in the APDES permit. The DMR exhibits the information and scope of responses required to meet compliance for the APDES discharge permit. A copy of the most recent DMR is available through contact with Coeur Alaska.

Waste Management Permit No. 2013 DB0002 was issued on September 20, 2013 and became effective on September 20, 2013. The permit rescinded waste management and disposal authorization portion of the May 6, 2005 State Certification of the Corps of Engineer's permit # POA-1990-592-M, Lynn Canal, 31 M. It also rescinded and replaces Solid Waste Permit No. SWZA015-18 dated June 17, 2013.

A4.3 Current Status of Discharge

The APDES permit and the Forest Service require monthly and annual reporting of discharge conditions to the receiving water bodies aforementioned as well as baseline conditions of background locations. The monthly DMR's provide tabular presentation of current measurement and permit requirements at selected outfall and receiving water stations including:

1. Monthly receiving water monitoring program results
2. Monthly average and daily maximum results for required parameters at outfalls 001 & 002
3. Outfall 001 chronic toxicity bio-monitoring report for Pimephales promelas (fathead minnow).
4. Outfall 002 chronic toxicity bio-monitoring report for Pimephales promelas (fathead minnow).
5. Flow rate and chemical / physical parameters collected with Outfall 001/002 toxicity samples
6. Breakpoint chlorination log for outfall 001.

The waste management permit requires quarterly and annual reporting as described in Table 3.

A.5 Project/Task Description and Schedule

A5.1 Description of Monitoring

Samples are collected and analytical measurements are made at the stations shown in the following figures:

Figure 3 shows the locations of streams near Kensington and Jualin mines, the location of Outfall 001 near Sherman Creek, and the location of Outfall 002 near East Fork Slate Creek.

Figure 4 shows the existing locations of the Outfall 001 Final Effluent sampling sites at the existing water treatment facility near Sherman Creek.

Figure 5 shows locations of receiving water quality monitoring stations and illustrates stream reaches used for monitoring resident fish, anadromous fish, benthic invertebrates, and sediment on Sherman Creek.

Figure 6 shows the locations of receiving water quality monitoring stations and indicates stream reaches used for monitoring aquatic resources in Slate and Johnson Creeks. Figure 6 also shows the locations of the water quality monitoring stations at the Lower Slate Lake stabilization area.

All field measurements are made with calibrated instruments by personnel trained in the applicable techniques. Instrument calibration and personnel training records are documented in logs maintained in Coeur's environmental filing system. Laboratory training and calibration protocols are outlined within the laboratories' QA manuals.

Samples are collected either by or under the supervision of an environmental professional.

A5.2 Schedule for Monitoring

The APDES permit cites specific sampling frequency for Outfalls and receiving waters during mining and non-mining periods. Daily monitoring of selected parameters is performed using dedicated monitoring equipment (pH/flow). Weekly sampling is stipulated to be performed on the same day of each week, however variance is allowed for when extreme conditions prevent this. Monthly monitoring is performed at the receiving water locations for Sherman Creek, Slate Creek, Johnson Creek, and Ophir Creek as illustrated in Figures 4 through 6 and contained in Table 2.

Whole Effluent Toxicity (WET) testing is performed at Outfall locations 001 and 002 from a 24-hour composite (chronic and acute test) each month.

Monitoring required for contact waters and are performed at the locations and frequency contained in Table 3.

A5.2.1 Water Quality

The APDES outfalls currently monitored are Outfall 001 and 002 (treated mine water and treated tails pond water). Monitoring at Outfall 002 commenced simultaneously with the discharge of effluent from the tailings storage facility. The following list describes currently active sampling at these outfalls, citing selected analytes here and in Table #7.

1. Continuous monitoring and recording of flow and pH at Outfall 001 and 002 using instrumentation at the water treatment plants.

2. Weekly Effluent and Background monitoring for turbidity at Outfall 001 and 002 using HACH 2100 AN turbidity meters located at the Comet and TTF water treatment plants.

3. Weekly Total Suspended Solids (TSS) 24-hour composite samples at Outfall 001 and Outfall 002 effluents.

4. Weekly water sampling at Outfall 001 and Outfall 002 effluents for analysis of total recoverable metals, and general parameters including temperature, total dissolved solids, total ammonia, total nitrogen, hardness, sulfate, pH, turbidity and dissolved oxygen.

5. Visual observations of the effluent during weekly sampling for floating solids, visible foam or oily wastes.

6. At Outfall 001, sulfate associated with sodium (Na) and magnesium (Mg) is determined with the following calculation: $(([Mg] \times 3.95) + ([Na] \times 2.09))$

   A. The molar mass calculation to derive the sulfate associated with sodium and magnesium is as follows:

The measured concentration of Magnesium is converted to equivalent Magnesium sulfate, which is then converted to equivalent sulfate resulting in the following factor:
{Mg} × {120.4 ($MgSO_4$) / 24.3 (Mg)} × {96.1 (SO_4) / 120.4 ($MgSO_4$)} = **3.95**

Similarly the measured concentration of sodium is converted to equivalent sulfate resulting in the following factor:
{Na} × {142.1 (2Na SO_4) / 46 (2Na)} × {96.1 (SO_4) / 142.1(2Na SO_4)} = **2.09**

Utilizing the two factors, the Sulfate associated with Na and Mg is then calculated: (([Mg] × 3.95) + ([Na] × 2.09)) = SO_4

7. Monthly toxicity testing on water collected at Outfall 001 and Outfall 002 effluent.

8. Monthly receiving water measurements and chemical analysis from stations MLA, SLB, SLC and Site # 5 in East Fork Slate Creek; stations SH113 SH105, SH109 in Sherman Creek; stations JS2, JS4, and JS5 in Johnson Creek and stations SH111 and SH103 in Ophir Creek.

9. Monitoring required by the additional permit conditions are performed at the locations and frequency contained in Table 3.

A5.2.2 Water Quality - Non-Routine Discharges

Should any spill or upset result in modification of effluent quantity or quality, Coeur or contract personnel will collect event based samples at outfalls. Facilities are monitored visually (where feasible) at least twice daily to determine whether an unexpected discharge is occurring.

Results of such non-routine samples will be included in the calculation and reporting on the DMR for the month in which the non-routine samples are collected. Any other samples collected at outfalls on more or less frequent schedules than the schedule discussed herein would also be included in DMR calculations and similarly reported.

A5.2.3 Sediment Monitoring

Baseline sampling of stream sediment toxicity and metal concentration was conducted in Sherman Creek, Slate Creek and Johnson Creek in 2005 prior to construction. Sampling continued annually from 2005 through 2011 at: (1) a 200m long reach extending from Outfall 001 downstream; (2) a 360m long reach downstream of the fish barrier in Sherman Creek; (3) a 400m long reach beginning at the mouth of Slate Creek (downstream of Outfall 002) and (4) 200m reach beginning approximately 800m downstream of the fish barrier in Johnson Creek. Beginning in July 2012 samples shall be taken annually at Lower Sherman Creek, the inlet creek to Upper Slate Lake, East Fork Slate Creek (between Site #5 and SLB), Lower Slate Creek and lower Johnson Creek. Analysis will consist of metals, acute toxicity, solids measurements, organic carbon, sulfides, and grain size.

A5.2.4 Aquatic Resources Monitoring

Aquatic resource monitoring will be conducted annually and shall include:

Benthic Invertebrates

Monitoring will be conducted annually between late March and the end of May at two sites on Sherman Creek, and one site on Johnson Creek. Three sites on Slate Creek will be monitored and one site at the inlet of Upper Slate Lake. Baseline studies were completed on Sherman and Sweeny Creeks prior to 2004 and on Slate and Johnson Creeks in 2004 and 2005 prior to construction.

Anadromous Fish Monitoring

The quality of spawning substrate used by pink salmon shall be monitored annually in Lower Slate Creek. Substrate samples will be collected in July prior to spawning activity. Geometric mean particle size will be calculated for each sample.

In addition to substrate monitoring, annual periphyton biomass and composition monitoring shall be conducted on the inlet creek to Upper Slate Lake, Lower Slate Creek, East Fork Slate Creek, West Fork Slate Creek, and two sites at Lower Sherman Creek.

A6 Quality Objectives and Criteria for Measurement Data

A6.1 Specifying and Defining Quality Objectives

Data Quality Objectives (DQOs) include both quantitative and qualitative objectives that define usable data for meeting the requirements of this project. DQOs define the quality of services provided by the laboratory and are used in the quality assurance review of the field and laboratory data. Review of the quality control (QC) data against the DQOs determines if the data are fully usable, considered estimates, or rejected as unusable.

Table 6 in Section B provides laboratory parameters and methods with container, preservation, handling and holding time criteria as part of the DQO process. Table 7 provides parameter / method citations with specific analytical limits of detection established by the participating laboratory, including limits of precision and accuracy unique to their instrumentation.

A6.1.1 Quantitative DQOs

The quantitative DQOs for the Kensington QAPP & FWMP include analytical limits, precision, accuracy, and completeness.

Analytical Limits. Consistent analytical limits shall be maintained to ensure comparability of the data set. The analytical limits are defined by EPA guidance for most methods, and include reporting limits (RLs) and method detection limits (MDLs). Both are statistically measured by the participating laboratory using standard replicates in the case of RLs, and response above method blanks in the case of MDLs. RLs are determined frequently with the calibration of the instrument, while MDLs are usually determined by the laboratory on a quarterly or less frequent basis. The MDLs show the ability of the laboratory to confirm the sensitivity of the analytical method at very low levels. The RLs are established with a specific degree of confidence to show consistency and are determined by minimum levels specified by the permit which are typically at or below the permit limit. The RL and MDL are provided in Table 7 for the parameters measured by the participating laboratories.

Precision. Precision is the ability to replicate the measurement. It is expressed as Relative Percent Difference (RPD). The acceptance criterion for RPD between quality control samples is typically ±10 percent or within the ±RL range for low concentration waters and within 2X the ±RL range for sediments. This criterion increases to ±20 percent when the constituent concentration is more than five times the RL. RPD is typically determined using matrix spike/ matrix spike duplicates (MS/MSD) or laboratory control standards (fortified blanks)/ laboratory control standard duplicates (LCS/LCSD).

The relative percent difference between spike and spiked matrix duplicate determinations is to be calculated as follows:

$$RPD = [(LCS-LCSD) / ((LCS+LCSD)/2)]*100$$

Accuracy. Accuracy is the closeness of the measurement to the true level of the constituent. Accuracy is expressed as percent recovery (%REC). Acceptance criterion for %REC is generally between 85 to 115 percent but can vary depending on the method. Some analyses, such as mercury by method 1631, have a slightly greater acceptance range (77 to 123 percent; See Table 7). %REC is typically determined by the use of known traceable laboratory control standards (LCS) tested for each constituent within the sequence of an analytical run. Percent recovery is also monitored in the preparation and analysis of laboratory matrix spike samples.

The percent recovery is calculated as follows:

% Recovery = [(SSR – SR) / SA] * 100

Where: SSR – Spiked Sample Result

SR – Sample Result

SA – Spike Added

Completeness. Completeness is a measure of how many planned measurements for each constituent actually result in valid data. It is expressed as a percentage of the total number of valid sample results for samples collected under correct, normal conditions that produce usable data. Usable data can include estimated data that is qualified due to moderately out of limit quality control criteria. However, QC that is grossly exceeded can typically cause associated data to be 'rejected' and deemed unusable. Therefore, the unusable data remains a percentage of the total number of valid results that count against the goal for completeness. The goal for completeness criterion for the Kensington Project is 90 percent due to the extreme conditions observed on site.

Completeness is calculated as follows:

% Completeness = [(Valid Results – Rejected Results) / Total Results] * 100

A6.1.2 Qualitative DQOs

The qualitative DQOs are representativeness and comparability.

***Representativeness*.** Representativeness is a measure of how well the sample represents the environmental condition. Representativeness is addressed in this QAPP & FWMP by sampling site selection, sample collection methods, and sample handling. Sample representativeness within the laboratories is described in the laboratories' Quality Assurance Plans.

***Comparability*.** Comparability is a measure of how well data from different sources can be compared to each other. It is addressed in the plan by ensuring that appropriate and consistent reporting limits are used and the data are of known and acceptable quality and are obtained through the use of specified QC measures and QA data review. Measures affecting sample comparability such as sampling, preparation, or analytical methods used are described within the laboratories' Quality Assurance Plans.

A6.2 Specifying Measurement Performance Criteria

The quality objectives for the field parameters used for the APDES & waste management monitoring require that all measurements be made with calibrated field instruments. Instruments are calibrated or calibrations are checked against known standards before each sampling day. Records of all such calibrations and checks are maintained in designated calibration log sheets (See Figures 11, through 14). If instruments are not within their calibrations upon checking, the instruments are recalibrated and rechecked, and maintenance of instruments is performed when necessary.

If continuous monitoring field data has been collected with an instrument that fails a calibration check, the data during the time period covered by the failed calibration check will be assigned a data qualifier indicating a possible bias. If field analysis can be repeated, as in weekly analyses, the samples will be re-analyzed after the instrument is re- calibrated.

Quality objectives for laboratory analyses are specified by individual method criteria or by laboratory quality control limits and are indicated within Section B of this QAPP & FWMP and Tables 7, 8, and 9. All laboratory reporting limits are within permit limitations.

A7 Special Training Requirements/Certification

A7.1 Sampling Personnel Training

Personnel collecting field data and water quality samples will be Coeur staff or selected independent contractor/consultants. In any case, the personnel must have the following training:

Project safety protocols – assess the monitoring task, identify potential hazards, and corrective actions / techniques. Potential hazards are analyzed with respect to:

1. Sampling activity
2. Location
3. Access

4. Conditions (including weather)

5. Personnel

6. Equipment

7. Seasonal hazards (e.g. ice or bears)

Technical aspects of the monitoring activity; such as, how and when to:

8. Calibrate and operate field instruments

9. Take specified field measurements

10. Follow proper sampling protocols as contained in this manual

Personnel safety is the company's uncompromised priority. Sample collection according to the protocols contained in this manual constitutes a secondary priority. However, safety concerns are not a legitimate reason to summarily modify the QA/QC procedures contained in this manual. If QA/QC procedures must be modified, an exception is noted in the sampling documentation, which will be adequate to accurately inform the QA officer of the effect of the deviation on data quality.

Resident fish monitoring involves the use of electro-fishing. An experienced field crew is supervised by a certified electro-fishing crew leader. This certification is provided by the Alaska Fish and Game.

A7.2 Certification

Laboratories performing analysis for the site monitoring project will have the appropriate certification. Current water chemistry laboratories maintain national and or state certifications. This certification requires audits, analysis of performance samples, and an effective quality assurance/quality control program. Toxicity laboratories maintain toxicity certification/accreditation with the states of Washington, Arizona, and Oklahoma; most states including Alaska do not provide a whole effluent toxicity testing certification nor is there a national certification.

A8 Documentation and Records

A8.1 Purpose/Background

Permanent records are made and retained for all stages of the information collection process. These records allow tracking of data from the moment of sample collection through analysis, and allow tracking of problems; they are essential for the defensibility of the data generated for this monitoring project.

QA Project Plan Control

The QAPP & FWMP is reviewed annually by the QA Officer who ensures that version number and date are revised (See Section A2) and that each person listed on the distribution list (Attachment A) receives a copy of the revised QAPP & FWMP.

A8.2 Information Included in the Reporting Packages

Field Data Sheets

Field data is recorded on standard field data sheets. Included in the field data sheet are:

1. sample date, time and exact place of monitoring
2. weather observations
3. field measurements such as dissolved oxygen and temperature
4. visual observations of effluent water
5. stream gauge readings (when applicable)
6. sampling personnel
7. samples collected
8. unusual conditions

An example of field data sheets for monthly receiving water stations is in Figure 7. The field data sheets for the weekly monitoring of outfalls 001 and 002 are shown in Figures 8 and 9.

Continuous Monitoring Data

Continuous flow and pH measurements (daily SCADA reports) are stored as electronic files on the water treatment plant computers. These daily reports are periodically copied to the Coeur Alaska Server- typically at a frequency of once a week.

Equipment Calibration and Maintenance Logs

Calibration and maintenance records for field and water treatment plant meters are maintained either in the environmental office or water treatment plant filing system. The field logs are provided to field crews to allow tracking of the daily response of field instruments, field instrument calibrations, routine calibration checks, site conditions, and maintenance events. Calibration is not required on a daily basis for all instruments according to manufacturer recommendations, but a frequency of verification/calibration is provided when recorded as shown in Figure 13 [for conductivity, pH, and dissolved oxygen], and Figure 15 [for turbidity].

Chain of Custody Records

Sample identification information is listed on a chain of custody form which accompanies the samples to the laboratories (Figure 10). A copy of each original chain of custody record is maintained in the environmental filing system. A final copy of the COC record received by the laboratory is included in the laboratory analysis reports.

A8.3 Laboratory Records

Analytical Laboratory

Upon completion of analysis and data QC review, the analytical laboratory issues a full laboratory report describing the results of analysis for each sample submitted. Prior to issuance of the analytical report to Coeur, the laboratory's QA manager will review and approve the report.

Components of the analytical report include:

1. Sample information: site name, date and time collected, client name, client project.
2. Parameter name and method reference.
3. Analytical result.
4. Reporting limit.
5. Date of sample preparation (for example, digestion of metals) and date of analysis.
6. Analyst's initials.
7. Chain of custody.
8. Quality control information: blank results, spiked blank or laboratory control standard recovery, matrix spike/spike duplicate recoveries, relative percent differences between duplicate spike analyses.
9. Documentation of deviations from methods, procedural problems with sample analysis, holding time exceedences, and any additional information that is necessary for describing the sample.

Toxicity Laboratory

Components of the toxicity report include:

1. cover letter
2. test identification
3. sample collection and initiation dates
4. test material description, including results of chemical/physical parameter analysis
5. description of dilution water used in the test
6. description of test organisms
7. test procedures and conditions
8. data analysis methods and protocol deviations

9. reference toxicant test results

10. test results

A8.4 Discharge Monitoring Reports (DMR)

Monitoring data from field measurements and laboratory analyses are entered electronically into a summary spreadsheet and a database. This is performed by or under the supervision of experienced environmental personnel, and the QA Officer, who also perform a quality assurance review of the data entered. DMRs are generated from spreadsheets and a database and are signed by the Vice-President and General Manager of Coeur Alaska, Inc or authorized signer. The DMRs are prepared in accordance with the ADEC reporting requirements, Permit No. AK-005057-1. The original copy of the DMR's are submitted to the ADEC –Division of Water and copies are submitted to the USFS, and the CBJ. DMRs are mailed by the 20th day of the month following the month in which the samples were collected.

A revised DMR will be re-submitted upon receiving any outstanding laboratory analysis results in the event they are not available by the DMR reporting date.

A8.5 Annual Reports

Annual reports are completed after all data for the year has been received and quality assurance reviews are completed for each year (January 1 to December 31). The annual report is submitted by March 1 of the following year. The report provides an overview of the monitoring activities completed during the year. The annual report addresses the following:

1. Describe the ambient water quality at the site.

2. Describe the effectiveness of the monitoring plan in collecting sufficient data of acceptable quality to determine compliance with water quality criteria. Discuss the scope and effectiveness of QC/QA program and potential modification to the program included in the FWMP.

3. Provide analysis of field and analytical data to characterize water quality at sites above and below nonpoint source activities and describe any trends or indications of impact from nonpoint sources to surface water quality, including any exceedance of water quality standards.

4. Describe potential causes for data trends or impacts to water quality and flow relative to activities being completed at the mine, discuss the effectiveness of BMPs used, and identify/propose modification to BMPs or the FWMP where appropriate. Identify or list any project plans or actions implemented to address water quality standard exceedance.

5. List of personnel involved.

The annual report is submitted to the USFS, ADEC, and ADNR in the same manner as the monthly reports described above.

Coordination is conducted for an annual public meeting with the regulatory agencies to review and evaluate results. Based on results the monitoring plan is adjusted as appropriate for approval by the state and USFS.

A8.6 Adaptive Management

The evaluation of water quality monitoring result trends will be ongoing, and reported, monthly and annually, to identify if there are any natural or operational activities at the mine site, responsible for changes in water quality.

Coeur will also communicate changes or unanticipated problems and resulting actions to ADEC and the Forest Service. These "exceptions" are considered short-term or temporary conditions such as taking additional samples for a short period to verify an unusual event. Events that are unanticipated and unscheduled but do not appear to cause or have the potential to cause significant resource damage are not time critical. This may be reported along with the next scheduled report.

Emergency events are when actual or potential significant resource damage could occur. A report for an emergency is distributed as soon as possible.

Waste Management Permit 2013DB0002 contains the following reporting requirements:

1.10.1 If an exceedance of Alaska Water Quality Standards is detected at a surface water monitoring location, the permittee shall verbally notify the Department within 24 hours after receipt of monitoring results, and shall conduct corrective actions according to Condition 1.11.2. Reporting of sample results from the TTF is excluded from this requirement.

1.11.2 After reporting an exceedance under Condition 1.10.1, the permittee shall perform the following tasks.

1.11.2.1 Determine the extent of the exceedance.

1.11.2.2 In consultation with the Department and documented in writing, implement a plan to determine the cause and source of the exceedance.

1.11.2.3 Submit to the Department, within seven working days after an exceedance is verified by the permittee, a plan for corrective actions to prevent adverse environmental impacts and further exceedances of applicable Alaska Water Quality Standards or permit limits.

1.11.2.4 Implement the corrective action plan as approved by the Department.

Under condition 1.11.2, naturally high aluminum concentrations in Slate Creek have been addressed through corrective actions. Specifically, reporting according to 1.10.1 and 1.11.2 has been satisfied. The extent of the aluminum water quality standard exceedance under 1.11.2.1 has been documented. Consultation with ADEC under 1.11.2.2 has taken place, and under 1.11.2.4 a department-approved corrective action plan has been implemented.

The solid waste regulations contain provisions in 18 AAC 60.830(j) for using statistical methods to determine whether there is a statistically significant increase in background values for each parameter or constituent to be analyzed. The pre-mining 95% Upper Tolerance Limit (UTL) calculations in Table 5 show that the natural conditions frequently exceed the water quality standards.

The 24 hour reporting requirement for an exceedance of water quality standards at monitoring sites MLA, Site #5, SLB, and SLC only apply when the site-specific UTLs contained in Table 5 are exceeded. The 24-hour reporting requirement is applicable for all other surface water monitoring locations as required by condition 1.10.1.

A8.7 Noncompliance Reporting

Instances of noncompliance that must be reported within 24 hours include:

1. an event that could endanger health or the environment
2. any upset that exceeds any effluent limitation in the permit
3. any violation of a maximum daily discharge limitation
4. an unanticipated bypass of treatment facilities or upset due to factors beyond reasonable control, which results in an effluent limitation or an exceedance of a maximum daily discharge pollutant limitation.

Such violations will be reported by telephone to the APDES compliance hotline (877-569-4114) within 24 hours of their discovery.

A written report will also be prepared and submitted within 5 days of the discovery, and shall include:

5. a description of the noncompliance and its cause
6. the date, time and duration of the noncompliance
7. an estimate of the time the noncompliance is expected to continue
8. steps taken to curtail the noncompliance and prevent its recurrence

Other instances of noncompliance that are not required to be reported within 24 hours (noncompliance not listed above), will be reported in writing along with the DMR for the month. The report will include the information listed above for 24-hour reporting. ADEC will be given advance notice in writing of any planned changes in the permitted facility or activities, which could result in noncompliance with the permit. ADEC will also be notified as soon as possible of any activity resulting in, or likely to result in, a level of toxic pollutant that is not limited in the permit, that exceeds the notification levels listed on page A8 of the permit.

B MEASUREMENT/DATA ACQUISITION

B1 Sampling Process Design

B1.1 Purpose/Background

Water quality samples are collected at representative sites in terms of location and purpose for each monitoring location specified for this project. Representativeness is defined as "typical of conditions encountered in time and space". Representative samples are obtained from:

1. Upstream receiving water stations that are background and prior to addition of outfall discharges
2. Outfall discharges
3. Downstream receiving water stations that are comprised of the mixed resultant of background receiving waters and discharges

Tables 1 and 2 describe the sample type, site, location, collection frequency and purpose for each monitoring location for this project.

Tables 3 and 4 describe the sample type, site, location, collection frequency and purpose for each monitoring location specified in the waste management permit for this project.

A more detailed description of the purpose of sampling is found below. Sample measurement activities are found in sections B1.2 through B1.5. Sample locations are described in sections B1,8, B1.9, and B1.10, and illustrated in Figures 3, 4, 5, and 6 of this QAPP & FWMP.

B1.2 Outfalls 001 and 002

Continuous monitoring and recording of pH is conducted at Outfall 001 Final Effluent and at Outfall 002 Final Effluent, to verify that the pH remains within the State of Alaska Water Quality Criteria of 6.5 – 8.5 standard units. Adjustment of the pH of the water occurs as part of the mine water treatment process. Flow is monitored continuously at 001 and 002 to ensure effluent limitations are not exceeded (1,500 gpm at 002).

Weekly Effluent and Background monitoring for turbidity is conducted at Outfall 001 and 002 using turbidity meters located at the water treatment plants and by laboratory analysis.

The weekly 24hr composite samples for total suspended solids (TSS) analysis are collected from the Outfall 001 Effluent to verify that the TSS permit limits are not being exceeded. Effluent from Outfall 002 is monitored weekly for TSS.

The weekly 24hr composite samples for chemical analyses, the weekly field measurements, along with the visual monitoring of Outfalls 001 and 002 is to verify that the effluents do not exceed the limitations set forth in the permit and therefore do not exceed the State of Alaska Water Quality Criteria.

Toxicity testing on Outfall 001 and Outfall 002 effluent is conducted to determine whether the toxicity of the effluents exceed the criteria in the permit. This monthly test is an indicator of the effect of effluents on organisms downstream in the receiving waters.

B1.3 Receiving Water

Monitoring of the receiving water includes field measurements and the laboratory analysis of total and dissolved metals, nutrients, inorganic ions and hardness. Physical parameters, inorganic constituents, and metals are measured to determine whether the effluent is altering the receiving water in the vicinity of the mine site.

B1.4 Geochemical Characterization of Materials to be Excavated, Mined, or Milled

Development rock from the mine used for construction, and mill tailings that could potentially affect water quality is geochemically characterized and managed if necessary to prevent degradation of water resources. Material characterization is performed using one or more of the established analytical procedures; multi-element analysis, Acid Base Accounting (ABA), kinetic testing, and Meteoric Water Mobility Procedure (MWMP). These analytical tools are used when appropriate to accurately classify the material and their potential to affect water quality. Analysis is conducted on the parameters contained in table 4.

Tailings solids are collected quarterly as a 5 kilogram (11 lb.) composite sample for ABA and MWMP analyses. Quarterly development rock samples are collected as a 5 kilogram (11 lb.) composite sample. The ore control geologists collect representative grab samples once a month at locations underground that are development rock producing areas. A quarterly composite sample is then made utilizing the three monthly samples. The development rock samples will also have the ABA and MWMP analyses. Analysis is conducted on the parameters contained in table 4.

B1.5 Sediment Monitoring – Chemical and Physical, and Toxicity

Sediment monitoring is conducted annually to determine if changes in levels of metals, changes in grain size and solids, and changes in toxicity occur as a result of activities.

B1.6 Aquatic Resources Monitoring

The purpose of aquatic resource monitoring is to assess potential impacts of mine discharges on aquatic life including resident and anadromous fish species, benthic invertebrates and aquatic vegetation. Pink salmon spawning substrate is monitored annually to detect possible changes caused by introduction of fine sediments into lower Slate Creek.

B1.7 Critical/Noncritical Nature of samples

All samples are considered critical since they are all necessary to comply with the requirements of the APDES, waste management permit and Plan of Operations.

B1.8 Location of Sample Sites and Stream Morphology

The locations of the sampling sites are shown in Figures 3, 4, 5, and 6. The latitude and longitude coordinates of each site are provided below. Stream morphologies of the receiving water samples sites are as follows. Please note that no stream morphology is provided for sample sites that are not receiving water sample sites.

Sherman Creek

SH113 – Latitude: 58^0 51’ 57”N; Longitude: 135^0 06’ 29”W

Site SH113 is located on Sherman Creek downstream of Outfall 001. Site 113 has considerably high, turbulent stream flow. The substrate consists of cobble and small and large boulders. The width of the creek at this site is approximately four meters wide. It is located within a small incised wooded canyon.

SH105 – Latitude: 58^0 52’ 07”N; Longitude: 135^0 08’ 25”W

Site SH105 is located on Lower Sherman Creek above the influence of high tide. The stream is fast moving with a mixture of turbulent and smooth water. The substrate consists of cobble and small boulders atop bedrock. There are little, if any, compacted fines. The width of Sherman Creek at this point is approximately six meters. The stream channel is deeply incised with alder and shrubs dominating the banks.

SH109 – Latitude: 58^0 51’ 48”N; Longitude: 135^0 06’ 07”W

Site SH109 is located on Upper Sherman Creek, upstream of the existing road. It is located in a heavily wooded area. Sherman Creek at this point is fast moving, steep, and turbulent, consisting of a series of cascades and step pools. The channel is approximately five to six meters wide. The substrate consists of cobble, small and large boulders with little compacted fines.

Mine Drainage to Comet Mine Water Treatment Plant – Latitude: 58^0 52’ 13”N; Longitude: 135^0 06’ 18”W

This site is located at the Comet Portal where the underground mine drainage is put into the 18 inch pipeline to convey the mine water to the Comet Mine Water Treatment Plant.

Mine Sump Sediments – Latitude: 58^0 52’ 13”N; Longitude: 135^0 06’ 18”W

This site is located just inside the Comet Portal where the sediments from the underground mine drainage are settled out prior to being conveyed to the Comet Mine Water Treatment Plant.

Slate Creek

MLA – Latitude: 58^0 48’ 50”N; Longitude: 135^0 02’ 21”W

Site MLA is located on East Fork Slate Creek between Upper and Lower Slate lakes. The channel here is 4 to 5 meters wide with alder and brush covered banks. Hemlock and some cedar are also present. The stream consists of slow moving laminar flow.

SLB – Latitude: 58^0 47’ 48”N; Longitude: 135^0 02’ 18”W

Site SLB is located on East Fork Slate Creek 10m upstream from the confluence with West Fork Slate Creek and just downstream of the plunge pool below the falls barrier. The stream here runs through a deeply incised bedrock canyon with deep bedrock pools. Stream width is 3-5 meters depending on flow. A gravel bar is present on the east bank.

SLC – Latitude: 58^0 47’ 46”N; Longitude: 135^0 02’ 18”W

Site SLC is located 30m downstream from the confluence with West Fork Slate Creek within an incised bedrock canyon. Deep bedrock pools are separated by cascades. Stream width is 5-6 meters. There are several fallen trees in the canyon bottom resulting from slides on the steep banks.

Station #5 – Latitude: 58^0 50’ 26”N; Longitude: 135^0 03’ 09”W

Site #5 is located on East Fork of Slate Creek 25 m downstream of the Tailings Dam and the Mid Lake Slate Creek diversion outflow. Stream width is 3-5 meters depending on flow. There are several fallen trees in the canyon bottom resulting from slides on the steep banks.

Dam Seepage Sump – Latitude: 58^0 48’ 40”N; Longitude: 135^0 02’ 30”W

This site collects seepage through the dam facility.

Tailings Treatment Facility Pond – Latitude: 58^0 48’ 74”N; Longitude: 135^0 02’ 53”W

This site is located on the reclaim barge walkway.

Graphitic phyllite seeps – Latitude: 58^0 48’ 38”N; Longitude: 135^0 02’ 31”W

This site is located at the stage 2 temporary emergency spillway for the dam facility.

Graphitic Phyllite Package Treatment Plant (GPPTP) – Latitude: 58^0 48’ 41”N; Longitude: 135^0 02’ 26”W

This site is located at the effluent pipeline of the GPPTP plant. The GPPTP plant is located below the dam’s east abutment.

Johnson Creek

JS2 – Latitude: 58^0 50’ 58.2”N; Longitude: 135^0 03’ 06.4”W

This site is located on Johnson Creek upstream of the Jualin mill site. The gradient is low and the stream splits into braids with large pools due to old beaver dams at the north end of the mill site. The site is located in the main channel upstream of these braids. The channel runs through a narrow-bottomed steep valley with numerous slide zones.

JS4 – Latitude: 58^0 49' 36.8"N; Longitude: 135^0 01' 48.7"W

This site is located 100 meters downstream of the lower bridge that crosses Johnson Creek. The gradient is moderate and substrate contains large boulders. The stream is approximately 10 m wide and passes through second growth spruce and hemlock forest.

JS5 – Latitude: 58^0 50' 18.6"N; Longitude: 135^0 02' 35.7"W

This site is located 200 meters downstream of the upper bridge that crosses Johnson Creek. The gradient is moderate and substrate contains large boulders. The stream is approximately 10 m wide and passes through second growth spruce and hemlock forest.

Pit 3 Standing Seep Water – Latitude: 58^0 49' 85"N; Longitude: 135^0 01' 90"W

This site is located within the Pit -3 borrow pit.

B1.9 Sediment Monitoring

Very little deposition of fine sediment is found in the streams due to steep gradient and high velocity flows. A minimum of 2 L of sediment is required for toxicity testing so samples are collected in several small pockets along a reach. Sediment samples are collected from Lower Sherman Creek, the inlet creek to Upper Slate Lake, East Fork Slate Creek (between Site #5 and SLB), and Lower Slate Creek and lower Johnson Creek. This collection is performed by the Alaska Department of Fish and Game (ADFG).

B1.10 Aquatic Resources Monitoring

Resident Fish Monitoring

Stream reaches used for aquatic resources monitoring are shown in Figures 5 and 6. Annual surveys are conducted in inlet creek to Upper Slate Lake and East Fork Slate Creek. Monitoring in East Fork Slate Creek will take place approximately 400 m downstream from the tails impoundment dam. Lower Slate Creek has a set of barrier falls at approximately 1000 m upstream from the mouth of the creek. No resident fish monitoring will take place below the barrier falls, as the Dolly Varden may be anadromous in this section of the creek.

Anadromous Fish

The quality of spawning substrate is evaluated annually in Lower Slate Creek. The samples are collected in two separate reaches. One approximately 125 – 150 m upstream of the mouth of the creek, the second reach is approximately 175 – 200 m upstream from the mouth.

Periphyton biomass and composition is monitored in the inlet to Upper Slate Creek, East Fork Slate Creek, West Fork Slate Creek, Lower Slate Creek and lower Sherman Creek. The approximate sampling locations are: inlet of Upper Slate Lake 200-300 m upstream of the mouth, East Fork Slate Creek 400 m downstream of the tails impoundment dam, West Fork Slate Creek 400 m upstream of the confluence of the east and west fork of Slate Creek, Lower Slate Creek – 150 m upstream of the mouth. Lower Sherman Creek has two sample locations: one 150 m upstream of the mouth, the second 360 m upstream of the mouth.

Benthic Invertebrates

Benthic invertebrates are monitored annually at the inlet to Upper Slate Lake, East Fork

Slate Creek, Lower Slate Creek, West Fork Slate Creek, lower Sherman Creek and upper

Johnson Creek. The reach in the inlet creek of Upper Slate Lake is located 200-300 m upstream of the mouth. The two reaches in Sherman Creek are located between 3m and 29m and between 236m and 260m from the stream mouth. These reaches were delineated in 1991 by Konopacky Environmental. Reaches in Slate and Johnson Creek were established in 2004. The Slate Creek sampling site is located between 400m and 475m downstream from the tails impoundment dam. A longer reach is necessary here to locate suitable substrate for sampling as much of the channel is dominated by bedrock. The Johnson Creek sampling site is located downstream from the mill site from 100m to 125m upstream of the upper Johnson Creek bridge.

B1.11 Scheduled Project Activities, Including Measurement Activities

Weekly, monthly and quarterly sampling events and report due dates are entered into a monthly reminder system (Intelex) that designates a responsible individual for each task. A summary of the frequencies of sample collection and monitoring is provided in Table 1.

Continuous Monitoring

pH and turbidity is measured continuously at Outfall 001 Effluent using inline meters and is measured similarly at Outfall 002. At Outfall 001 the Effluent flow is monitored continuously with an inline meter located post-treatment on the discharge pipe. Daily flow is also measured for Outfall 002 post-treatment on the discharge pipe.

Daily Monitoring

24 hour composite samples are collected daily from Outfall 001 Final Effluent for chlorine analysis.

Flow at the bypass pipe at the TTF is monitored daily.

Weekly and Bi-monthly Monitoring

24 hour composite samples are collected weekly from Outfall 001 and 002 Effluent for additional analyses. These samples are analyzed weekly for metals (aluminum, nickel, zinc, iron, manganese, cadmium, copper and lead) and monthly metals analysis of arsenic, chromium, mercury, selenium and silver. Outfall 002 is sampled weekly for the following metals: aluminum, arsenic, cadmium, copper, chromium, iron, lead, manganese, mercury, nickel, selenium, silver and zinc. In addition,

both effluents are analyzed for total dissolved solids, sulfate, total ammonia, turbidity, and nitrate. Water temperature and dissolved oxygen (DO) are measured in the field on the Effluent at the point of discharge.

In conjunction with the weekly Outfall 001 sampling, field DO measurements are collected in Sherman Creek upstream and 500ft downstream of Outfall 001. Weekly turbidity grab samples are collected from SH109 and Outfall 001 Effluent. Visual observations of the effluent for floating solids, visible foam or oily wastes are conducted by inspecting weekly composite sample locations.

At Outfall 002, weekly turbidity grab samples are collected from MLA and the final effluent. Field DO measurements are collected from the 002 final effluent. Visual observations of the effluent for floating solids, visible foam or oily wastes are conducted by inspecting weekly composite sample locations.

Monthly Monitoring

A sample for Whole Effluent Toxicity testing is collected from Outfall 001 and Outfall 002 Effluent once a month. One organism is used for toxicity tests each month. 12 tests per year are conducted using Pimephales promela (fathead minnow). 24 hr. composite samples for toxicity are typically collected during the first week of the month. If possible, sample collection is in conjunction with weekly Outfall 001 and Outfall 002 Effluent sampling. A refresh sample (if required) is collected 48 hours later and split with additional samples for analysis of metals, nutrients and general parameters.

Receiving water stations listed in Table 2 are sampled on a monthly frequency, typically during the first week of the month. These stations are monitored for pH, dissolved oxygen, conductivity, temperature, turbidity, color, total ammonia, nitrate, chloride, sulfate, TDS, TSS, hardness, and dissolved metals (arsenic, cadmium, chromium, lead, copper, mercury, nickel, silver and zinc) and total metals (aluminum, iron, manganese and selenium). Sites monitored for the above parameters are SH113, SH105, SH109 on Sherman Creek, SH103 and SH111 on Ophir Creek MLA, Site #5, SLB, SLC on Slate Creek, and JS2, JS4 and JS5 on Johnson Creek.

The dam seepage sump, mine drainage to comet water treatment plant, and GPPTP effluent are sampled on a monthly frequency, typically during the first week of the month. The parameters to be analyzed for these sample sites are contained in Table 4. Additionally, the monthly mean flow for the GPPTP effluent and the cumulative snow accumulation is calculated on a monthly basis.

Quarterly Monitoring

An effluent sample is collected from the Outfall 001 and Outfall 002 effluent outfall points and analyzed for the complete set of anions and cations contributing to total dissolved solids on a quarterly basis (January, April, July, and October). The parameters to be analyzed include boron, sodium, potassium, calcium, magnesium, fluoride, chloride, sulfate, total alkalinity, hardness, pH, TDS, and electrical conductivity.

The mine sump sediments, Pit-4 standing seep water, tailings, development rock, and graphitic phyllite seep sumps at the northwest end of the TTF are sampled on a quarterly basis. The graphitic phyllite seeps on the east and west embankments below the tailings dam are sampled annually. The parameters to be analyzed for these sample sites are contained in Table 4.

Annual Monitoring

Benthic invertebrates are monitored each year between the end of March and end of May, after spring ice melting and before peak snowmelt. Resident fish, spawning substrate and periphyton biomass and community composition in stream reaches are monitored at various times throughout the summer depending on permit requirements. Stream sediment monitoring is conducted once a year at low flow to increase the possibility of collecting sufficient sediment for toxicity tests.

B2 Sampling Methods Requirements

B2.1 Sample Labeling System

The sample bottle is labeled prior to sampling. Included on each sample bottle label are the following:

1. Project Name
2. Sample ID (Example: CAK-SH105-20170801)
3. Sampler's Initials
4. Date and Time of Sample Collection
5. Sample preservation

This format for Sample ID allows direct importation of lab data to Coeur Alaska's water quality database. The sampling time is noted on the bottle immediately prior to sample collection. Sample bottles used for this project are pre-labeled and color-coded for the parameters to be measured. Labeling is completed using a waterproof permanent ink pen.

B2.2 Sampling Site Identification

Receiving water monitoring sites are clearly identified in the field with a red or orange sign showing the site name written in black lettering at each monitoring location.

Sample site identification numbers are based on systems previously used for historic monitoring for the Kensington Gold Project. The nomenclature previously used includes numeric, alpha, and alpha-numeric designations. For example, for sites located in the Sherman Creek and Ophir Creek drainage, a three digit numeric designation is used (e.g., 109), in the Slate Creek Drainage sites are designated using the SL- or ML- prefix combined with an alpha designation (e.g., SL-B), and in the Johnson Creek drainage an alpha numeric designation using a JS- prefix with a numeric designation is used (e.g., JS-4). Previous site identification schemes are maintained to provide consistency with historic monitoring. New sample locations will be added using the next available designation for each system. Sites will not be renamed or names from abandoned sites reused to avoid confusion and error interpreting historic data.

Current sample sites on all four creeks are identified with station codes. These codes directly reflect the site's historic identification number, however the dashes were omitted and the prefix SH added to Sherman Creek/Ophir Creek drainage site numbers (e.g., SH109). Additionally, sample Site #5 does not follow this station code nomenclature.

B2.3 Sample Collection

Field Equipment and supplies should include the following:

Field Instruments and Supplies

Dissolved Oxygen Meter	Field notebook
Handheld Barometer	Flow meter
pH Meter	Tape measure
Thermometer	

Field Laboratory Instruments and Supplies:

Conductivity Meter	Gelex Standard
Conductivity Standards	Kimwipes
pH standards	Calibration Logs
Turbidimeter Nalgene disposable 0.45 Micron filter units	Preservatives

Sample Bottles and Miscellaneous Equipment:

Field Data Sheets	Chain of Custody Records and Seals
Coolers	Sample Inventory Checklist
SPOT GPS Tracker	Safety Equipment
Ziplock Bags	Waterproof Marker
Gel pack ice	Camera
Prelabeled Teflon Sample Bottles (for Method 1631	Prelabeled Polyethylene Sample Bottles and

mercury analyses)	Preservatives
First aid kit	Radio

Field data sheets are used in conjunction with each sampling event (see Figures 7, 8, and 9). Samples are collected at the same location on each sampling event, to ensure comparability of sample results. If conditions prevent sampling at the same location, a note of the change is made in the field data sheet.

If a sample requires the use of several bottles, the bottles are filled consecutively, with the recorded sample time being the time the first bottle is immersed in the water.

Pre-cleaned and pre-tested sample bottles are provided by the laboratories. While collecting all samples in sample bottles or cube containers, bottle caps must be held or placed so that the inside of the lid or rim of the sample bottle is not contaminated. The only substance to come in contact with the inside of the sample bottle and lid will be the sample.

Field bottles are not typically used for this project. However if field bottles are used, they are dedicated to a specified site and will always be triple rinsed with source water before sample collection. Field bottles may be used for collecting samples intended for in-house turbidity analysis. Field bottles are replaced on at least a monthly basis.

The “Clean Hands / Dirty Hands” sample collection technique is used for low level mercury sampling. Sample bottles are received from the laboratory double bagged. The procedures are as follows:

1. Two samplers both wearing nitrile gloves, one “clean hands”, and one “dirty hands”.
2. “dirty hands” opens the outer bag
3. “clean hands” opens the inner bag and removes the bottle and fills out the label
4. “dirty hands” seals the outer bag and places it in the shipping container
5. “clean hands” removes the bottle cap and holds the cap in one hand. With the other hand, clean hands fills the sample bottle.
6. “dirty hands” retrieves the outer bag and opens it
7. “clean hands” places the bottle in the inner bag and seals it, then places inner bag with bottle into the outer bag
8. “Dirty hands” seals outer bag and places bottle in cooler or refrigerator

Water samples are collected from pipes, streams, or tanks/basins. Below is a description of the collection methods utilized for the sample sites.

Pipe sampling

Influent and effluent samples are often collected from the discharge of pipes or culverts. These samples are collected by firmly grasping the sample bottle and holding the bottle under the stream from the pipe or culvert. When access to the pipe is difficult or unsafe, a dipper is employed. The sample collection dipper is triple-rinsed with the effluent prior to collection and is then used to fill the sample containers.

Stream sampling

Receiving water samples are collected from stations located within streams. The stream sampling sites are approached from downstream. If streams must be crossed to enable sample collection, crossing downstream of the sampling site is essential. The samples are collected from a well-mixed portion of the stream. Sample bottles are held in the middle of the bottle with a gloved hand. Samples are collected by immersing each bottle in the stream with the opening facing downward (inverted bottle) and then turning the bottle underwater to face upstream. This method allows the sample to be collected from below the surface of the water column. Care must be taken not to contact the bottom of the stream with the sample bottle as this can possibly cause sediment from the stream bottom to enter the sample bottle.

Grab/Composite Samples

Grab samples are collected by filling a bottle completely at one time, which is the method employed for monthly receiving water stream samples, weekly turbidity grab samples, weekly downstream hardness samples, and weekly Outfall 002 sulfate, nitrate, ammonia and hardness samples. “24-hour” composite samples are collected at Outfall 001 Effluent and Outfall 002 Effluent using HACH Sigma 900 auto-samplers. Composite sample containers are kept at 4 ± 2 degrees C in a refrigerator during sample collection. In the event an auto-sampler becomes inoperable, four grab samples approximately six hours apart will be collected to build the composite sample and “Comp24-grabs” will be added to the sample ID number on the bottle and COC.

Dissolved Fraction Samples

According to the Clean Water Act criteria, dissolved metals are to be field filtered within 15 minutes of collection. Coeur performs field filtering to meet this requirement. Certified clean filters are employed in the field with a hand actuated vacuum pump as the filtering apparatus. An aliquot of station water (total fraction) is collected into a laboratory supplied sample bottle, which is poured into a receptacle styled reservoir with a 0.45 µm filter allowing suction filtration into a preserved sample bottle for the dissolved fraction.

B2.4 Field Measurements

Required field parameters are pH, conductivity, dissolved oxygen, temperature. These parameters should always be measured in the field. For conductivity and pH measurements, automatic temperature compensating (ATC) probes are used which adjust values for temperature, to 25^{o} C. See section B6 of this QAPP & FWMP for a detailed description of calibration procedures for field instruments.

B2.5 Sample Preparation

Once collected, water samples are preserved (if necessary) and placed in a refrigerator or cooler with ice packs as soon as possible and then transported to a staging area for shipment preparation. All samples are kept at 6 degrees C or less upon collection.

The pH of all samples is checked upon arrival at the laboratory, with deviations from pH <2 noted on the chain of custody form. If acid-preserved samples are found to exceed pH 2 at the laboratory, the laboratory informs Coeur environmental personnel.

General Chemistry samples are collected in white label HDPE sample bottles that remain unpreserved.

Dissolved metals samples are collected in a 250 mL pink label pre-preserved HDPE bottle with 0.5ml 1:1 HNO_3 per 250ml sample. The samples are filtered within 15 minutes of sample collection using disposable 0.45 micron filter units. The filters used are certified free of heavy metals in compliance with the Superfund Amendment Reauthorization Act (SARA). After filtration, dissolved metals samples are preserved with 1:1 HNO_3; 0.5ml per 250ml sample to a pH <2.

Total recoverable metals are collected in a 250 mL pink label pre-preserved HDPE bottle with 0.5ml 1:1 HNO_3 per 250ml sample.

Low level mercury samples are collected in 250ml blue Teflon bottles stored inside two ziplock bags to reduce the possibility of contamination. Total mercury sample bottles are pre-preserved.

Hardness samples are collected in a 250ml pink label HDPE bottle and are pre-preserved with 0.5ml 1:1 HNO_3 per 250ml sample. The hardness samples are collected from the stream site in a field bottle and transferred to the final pre-preserved bottle. Each field bottle is triple rinsed with source water before the sample is taken.

Ammonia (as N) is collected in a 250 ml yellow label HDPE bottle pre-preserved with 0.5ml 1:1 H_2SO_4.

B2.6 Sample Container Decontamination

Samples are collected in pre-cleaned sample bottles with a new bottle used for each sample. Filters with a filter reservoir used for dissolved samples, are disposable and only used once. Grab samples are collected directly into sample bottles without sampling equipment so decontamination is not necessary.

24-hour composite samples are collected in 15 L sample containers. To avoid contamination, nitrile gloves are used when handling composite sample containers and sampler tubing. It is general practice to limit the number of times the containers are handled. Sampling containers are replaced once each quarter or as needed.

B2.7 Sampling/Measurement System Failure Response and Corrective Action Process

If a sample cannot be collected on the specified date, (for example, if the weekly Outfall 001 sample cannot be collected on Tuesday) the sample will be collected on another day in the same week and an explanation for the different sample date will be kept with the sample results.

If sample collection errors are found by a laboratory and are reported to Coeur within a time period allowing re-sampling, the site will be re-sampled and an explanation for the different sample date will be kept with the sample results.

If a laboratory error is made resulting in sample destruction without results, the sample will be recollected if it can be done within the appropriate time period. If repeat sampling is not possible due to time elapsed, an incident report form will be completed and attached with the DMR for that month.

B2.8 Sampling Equipment, Preservation, and Holding Time Requirements

Water Samples

Water samples are collected using only the bottles listed in Table 6. Preservation and holding time requirements are found for all water sample parameters in Table 6.

Sediment & Benthic Invertebrates

The Alaska Department of Fish & Game (ADF&G) conducts annual stream sediment and benthic invertebrate sample collection on selected stream reaches per the APDES permit. ALS (Kelso Washington) Environmental Toxicology Laboratory conducts the toxicity tests and metal analysis on the sediment. The ADF&G has the expertise for investigation of sediments and tests run using Puget Sound Estuary Program (PSEP) methodology. Volumes of sediment are determined by ADFG field scientists and the requirements of the applicable methods. Sediments are tested in association with the PSEP preparation methods and EPA chemical methods and biological tests (eg, EPA 100.1 and 100.2) that provide parameters included in the ADF&G reports (See Table 9). Sediment samples are placed in the sterile containers provided by the analyzing laboratory and kept cool (less than 4oC). Holding time for sediment toxicity is 1 month. Spawning substrate samples (gravel) are processed (sizes quantified) on site and returned to the stream. Benthic invertebrates collected for benthic monitoring are placed in labeled plastic or glass sterile containers and preserved with 70 percent ethyl alcohol. All samples are collected by ADF&G personnel and sent to ALS without the involvement of the Coeur personnel. Therefore, information on the protocols for sample handling is associated with the ADF&G quality assurance documents which are not included here. Sediment indices are included to Table 9. Sample handling details are provided in ADF&G quality assurance documents.

B3 Sample Handling and Custody Requirements

During each sampling event, a chain of custody form is completed and copies included with the samples during shipment to the analytical laboratory. Chain of custody forms are used to maintain the integrity of the sample(s) by providing documentation of the control, transfer and analysis of samples from the time of collection to the time they are received by the analytical laboratory. Chain of custody procedures ensure the integrity of the samples and eliminate potential for sample tampering.

Sample custody while at camp will be maintained by:

1. Keeping the samples in sight or on the person of the sampler; for example, in the sampling backpack or cooler while sampling,

2. Keeping the samples locked in the camp lab refrigerator, or

3. Keeping the samples in a cooler with ice packs, sealed with signed and dated custody seals.

During shipment to all laboratories, custody will be maintained by sealing the sample(s) and chain of custody form inside a cooler with a signed and dated custody seal. An example of a chain of custody form used on this project is shown in Figure 10.

Upon receipt of the cooler by the laboratory, the sample custodian has the responsibility to note the conditions of the custody seals. If they are broken before receipt, a note will be made by the sample custodian on the chain of custody form because that form will be part of the sample's permanent record.

Samples are delivered to the laboratory (ALS Environmental) as soon as possible after collection at the field site. Sufficient blue ice is added to the coolers at the Jualin Environmental Offices to maintain a sample temperature of 6 degrees C or less. Samples are shipped via Alaska Airlines Cargo Gold Streak service to ALS Environmental in Kelso, Washington. Whole Effluent Toxicity samples are also shipped to Bio-Aquatic Testing in Texas via Gold streak service on the day of sample collection.

Once samples have arrived at the laboratories, they will be considered under custody within the laboratory environment. Chain of custody records will comprise part of the final permanent analytical report for the sample. A copy of the original chain of custody form is filed in the environmental filing system at the Jualin Environmental Office.

If a holding time is exceeded, the labs will notify the Coeur Alaska Environmental Department and re-sampling will occur if possible.

B4 Analytical Methods and Quality Control Requirements

Table 7 (Permit stations -001 and -002), Table 8 (Receiving Water), and Table 9 (Sediment) contain analytical methods for all parameters measured, and includes reporting limits (RLs), method detection limits (MDLs), with QC indices of precision and accuracy, cross referenced to the APDES permit limits for selected stations

Detailed information about laboratory precision and accuracy requirements, preparation of samples, laboratory methods used, and laboratory sample handling can be found by referencing the laboratory's QA/QC plan, attached as Attachment C. The typical requirement for precision is ± 20% RPD and for accuracy range from
75-125% to 90-110% recovery. Method 1631 for low level mercury has a requirement of 71-125%

recovery. The accuracy values for selected analytes are determined by the laboratory using periodic studies for a given matrix. Laboratory method blanks will be run with each analysis. Laboratory control standards and matrix spike/matrix spike duplicate pairs will be run on at least every 20 samples or with each delivery batch of samples, whichever occurs first.

Field Quality Control Samples

Field Duplicates

The analyses of field duplicate water samples are used to evaluate the precision of field sampling and laboratory analysis. Field duplicate samples are collected in the same manner as the primary field sample by holding the two bottles side by side while filling. For surface water samples, field duplicate samples are collected and inserted into the sample train at a frequency of once per each sampling event (this is equivalent to about 1 duplicate per 12 field samples). The sampling site for the duplicate sample set is recorded on a field data sheet, but not identified on the sample containers. During each event the location for obtaining duplicates shall be randomly rotated throughout the sites sampled. This sample location (site) is typically identified as CAK-069 and the time denoted as 00:01 on the sample bottles and chain of custody form.

Field duplicates are assessed upon receipt of laboratory data by calculation of relative percent difference (RPD) between the original and field duplicate pair results, which is described in Section A6.1.1. There are no criteria for RPD acceptance with field duplicates according to validation guidance (National Functional Guidelines for Inorganic Data Review, USEPA, 2010). This is due to the inherent variability associated with field sample collection, especially for soils and sediments. Therefore, record of variability is recorded as required in database files and summary field duplicate performance is presented in the APDES Annual Report. Excessive RPD (>35% for sediment, >20% for waters) are indicative of variability in sample collection methodology, and corrective action shall be considered with each annual assessment. Corrective actions shall be implemented in consultation with ADEC, the Coeur QA Officer and the Coeur Environmental Manager.

Field Blanks

Field blanks are required as part of the Method 1631 low-level analysis for mercury in water. Field blanks for mercury analysis are conducted at a frequency of once per month for each sample type (total and dissolved), which is equivalent to approximately 1 field blank per 11 field samples. For this, the contract laboratory provides an additional Teflon sample bottle with each sampling kit. The laboratory also provides a bottle labeled “Double Deionized Water to be used for the field blank.” The contents of this bottle are transferred into the extra Teflon sample container at the same time and location that the primary mercury analysis bottle is being prepared, and then is treated as if it were a field sample. Field blanks for other surface water collections are not required unless a transfer utensil is employed in collection of the water aliquot before it is eventually added to the laboratory provided collection bottles. Given the collection methodologies provided in the Coeur Water Sampling Manual (Coeur, 2012), all composite collections (Daily Station -001 & -002 for TSS, and Weekly Stations -001 & -002), require ‘clean hands / dirty hands’ mercury collections, and influent/ effluent water grabs, utilize dedicated sampling equipment. Therefore, field blanks are not appropriate. As stated in Section B7, cube containers for toxicity are provided by the laboratory, and are triple rinsed before filling for shipment.

Collection of sediments that employ a collection utensil, require the addition of a 'rinse blank' for each non-dedicated utensil used at a collection station. Since the ADF&G is wholly involved in the collection and handling of sediment samples for laboratory analysis and/or assessment of biological indicators, the QC requirements associated with those procedures are deferred to in lieu of the ADFG quality assurance project plan. Excessive field blank contamination (>5 times the RL) are indicative of variability in sample collection methodology and/or container integrity, and corrective action shall be considered with each annual assessment from the DMR. Corrective actions shall be implemented in consultation with ADEC, the Coeur QA Officer and the Coeur Environmental Manager.

Field Analyses

Required field analyses are pH, conductivity, dissolved oxygen, and temperature. Field analysis for each of these parameters is described below along with a description of calibration procedures for field instruments.

Dissolved Oxygen, Temperature, Conductivity and pH

Dissolved oxygen, temperature, conductivity, and pH are measured in the field via meter and probe. Dissolved oxygen, temperature and pH can change too quickly to allow measurement other than in the field. For pH and conductivity measurements, Automatic Temperature Compensating (ATC) probes are used which adjust values for temperature, to 25° C. These readings are measured directly in the stream.

B5 Quality Control: Instruments/Equipment Testing

Field instruments are checked for maintenance problems before each sampling event. Problems with instruments are usually detected during the instrument calibration or calibration check. Instrument problems are resolved immediately either by repairing, replacing, by discussion with manufacturer's technical representatives, or by sending the instrument for repair. Repairs and maintenance are recorded in the service section of the calibration logbook, and on daily report forms (Figures 11 – 14).

All field instruments have a second backup instrument at the Jualin Environmental Office for use if the primary instrument malfunctions. The backup instruments are checked for their ability to accept calibration and function properly at least once per quarter.

Continuous monitoring instruments for flow and pH located at the outfall sites have maintenance checks performed weekly. Calibration checks are completed for the pH along with the maintenance checks. Backup instruments and/or parts are maintained on site. Instruments failing to accept a calibration or exhibiting other problems that cannot be repaired on site are sent to the instrument manufacturer for repair and the backup instrument is installed in their place.

Lab instruments are checked for maintenance problems before each sampling event. Problems with instruments are usually detected during the instrument calibration or calibration check. Instrument problems are resolved immediately either by repairing, replacing, by discussion with manufacturer's technical representatives, or by sending the instrument for repair. Repairs and maintenance are recorded in the service section of the calibration logbook, and on daily report forms (Figures 11 – 14).

There are two HACH Turbidity 2100AN instruments located at site and one HACH turbidity 2100 P instrument. One 2100 AN instrument is located at both Comet and TTF WTPs. Should one of the instruments malfunction, the other instrument or the HACH 2100 P can be utilized for conducting the turbidity analysis.

B6 Instrument Calibration and Frequency

Every time calibrations or calibration checks are made they are recorded in designated calibration logs at WTP or by field technicians on individual log sheets. An example of a calibration log form is shown in Figure 12. All WTP calibration logs are maintained in the files at the WTP office and all calibration logs used by field technicians are maintained in a binder kept in the Jualin Environmental Office. This section discusses the general procedures and frequency of instrument calibrations.

B6.1 Field Instruments

Dissolved Oxygen and Temperature

A waterproof YSI Professional Plus meter is used to obtain field dissolved oxygen measurements. A second Oakton PC 10 meter is maintained on-site as a backup. The DO probe is calibrated against 100%-saturated air before every field sampling day by following the manufacturer's instructions. A record of calibration response is required for the DO meter each time calibration is applied. The field calibration log sheet for the DO meter is provided in Figure 11. Standard operating procedures for the DO meter are provided in Attachment B.

The actual DO measurement is taken after an equilibration period of at least three minutes in the water sampled to allow the ATC to reach its equilibration temperature. DO and temperature are read from the DO probe. The temperature reading on the DO probe is checked quarterly against a certified thermometer.

pH and Conductivity

A YSI Professional Plus waterproof pH and conductivity meter is used for field measurements at receiving water stations. A second Oakton PC 10 meter is maintained on-site as a backup. These meters have ATC probes which adjust the measured pH value to a standard 25 degree temperature.

The probe is checked for calibration prior to use with pH standards 4, 7 and 10. If the check is outside the acceptable range of ± 0.1 pH units, the pH meter is calibrated, readings of new pH standards (4, 7 and 10) are taken, and an acceptable final check is performed. A record of calibration response is required for the pH meter each time calibration is applied. Calibration log sheet for the pH meter is provided in Figure 11 for field activities and Figure 12 for the bench-top instrument used at the WTP. Standard operating procedures for the pH meters are provided in Attachment B.

The probe is also checked against a known and traceable conductivity standard typically around 100.5 μS/cm. If the meter reads within a range of ± 5 % of the standard value, the probe is calibrated and can be used for field measurements without any additional steps. If the meter reads outside the ± 5 % range the meter is recalibrated and rechecked prior to use in the field for sample measurement. As stated before, a back-up Oakton PC 10 meter is maintained on-site.

Turbidity

Two HACH 2100AN and one HACH 2100 P turbidimeters are used for turbidity measurements. Prior to sample measurement, the turbidimeter is checked against Gelex secondary standards that have been calibrated within the previous three months against formazin primary standards. Turbidimeters are calibrated against formazin standards whenever the Gelex standards are out of their ± 5 % range, or every three months at a minimum. The secondary standards are calibrated to primary standards using a selected instrument that utilizes the Gelex standards going forward as certified check standards to be used for periodic (daily) calibration verification. The now certified Gelex standards cannot be used on another instrument, unless they are again calibrated to the formazin (primary) readings from the new instrument. If the Gelex standards read within ± 5 % of their calibrated values, the samples are read. If the Gelex standards are outside this range, the Gelex cells are cleaned and reread; if they are still out, the turbidimeter and Gelex standards are recalibrated prior to sample measurement. A record of calibration response is required for the turbidity meters each time calibration is applied. A calibration log sheet for the turbidity meter is provided in Figure 13 for field activities and Figure 14 for the bench-top instrument used at the WTP. Standard operating procedures (SOP) for the turbidimeters are provided in Attachment B.

Sample cells are carefully cleaned with Kimwipes prior to measurement. Care is taken with cool or cold samples to wipe condensation buildup from the outside of the sample cell.

B6.2 Continuous Monitoring In-line Instruments

In-line instrument calibration checks are performed daily.

pH Monitoring –

The bench-top pH meter located in the WTP laboratory is utilized for the in-line pH instrument calibration checks. To begin, the bench top pH meter is checked against 4, 7 and 10 pH calibration standards (buffer solutions). The acceptance criterion for this check is ± 0.1 pH standard units. After the bench-top check is satisfactorily performed or a recalibration of the bench top meter is performed as necessary, a comparison is made between the readings of the in-line meter and the bench-top meter. The criterion for this check is that the two readings must read within 0.1 pH units of each other. If this calibration check is out, the in-line meter is calibrated per the instrument manufacturer's instructions. Standard operating procedures (SOP) for the pH meters are provided in Attachment B.

Turbidity Monitoring –

A similar comparison check is made between in-line or continuous turbidity monitors and the bench-top HACH 2100AN turbidimeter. The criterion for turbidity comparisons is a relative percent difference of 10 % between the bench top and in-line turbidimeters, or if the turbidity being compared is less than 1 NTU, an absolute difference of 0.1 NTU. As with pH, if the comparison criteria are not met, the in-line turbidimeter is recalibrated following manufacturer's directions. Standard operating procedures (SOP) for the in-line turbidimeters are provided in Attachment B.

B6.3 Calibration Standards Documentation Procedure

All standards used are prepared standards purchased from a scientific equipment supplier (e.g., Fisher, VWR, and HACH) and are traceable to known reference standards.

When standards are received at the on-site lab, they are inspected for leakage or other problems. If acceptable, they are logged in the Standards Log (see Figure 15). If an expiration date is not given on the standard, an expiration date of one year from the date received is written on the bottle in permanent ink. Each time a standard is used for calibration purposes, the expiration date is checked. Sufficient amount of new standards are kept on site for calibrating all meters. Expired standards are never used for calibration or calibration check purposes.

B7 Inspection/Acceptance Requirements for Supplies and Consumables

Inspection of standards and acceptance criteria are listed above in Section B6.2. Inspection and acceptance criteria for other consumables are as follows:

1. Sample bottles are supplied by the laboratories. These certified pre-cleaned bottles are monitored by the laboratories for inspection and acceptance.

2. Cube containers or buckets that are used for toxicity testing are not tested or certified as pre-cleaned. However, sample containers are triple rinsed prior to collection of waters applied to the toxicity testing. BioAquatics laboratory has stated that there is no evidence of ‘artificial toxicity’ associated with their containers. The containers are sent to the Coeur site in sealed coolers with lids attached, and the field crews are tasked with handling the containers properly before collection activities in the field. If anomalous responses are suspected by BioAquatics, an aliquot of water may be reserved from a representative bucket or cube container during the triple rinse cycle and retained for potential analysis by the testing laboratory.

3. Filters for dissolved metals samples are received in sealed cartons. Upon opening the carton, the Certificate of Quality is reviewed. If a certificate is not found in the carton, the filters will be discarded. According to the Clean Water Act criteria, dissolved metals are to be field filtered within 15 minutes of collection. Coeur performs field filtering to meet this requirement.

B8 Data Acquisition Requirements (Non-Direct Measurements or Historical Data)

While historical data exists for the Kensington Mine project, it will not be used for purposes of this monitoring project. Therefore, data acquisition/acceptance requirements will not be addressed for historical data.

B9 Data Management

This section documents hard copy and electronic information storage, access, and archive schedules for both commercial laboratory receipt and field generated data.

B9.1 Laboratory Data Receipt

Data validation and management performed by the applicable commercial laboratory are described in the laboratory QA Manuals. The following data processing steps shall be completed by the Coeur QA Technician or their designee for data received from the commercial laboratory:

1. Data Receipt - Laboratory reports are received by environmental personnel electronically. The electronic data copy includes completed report copy versions in ‘pdf’ or facsimile form and in spreadsheet form amenable to inclusion by electronic import to a database.

2. Data Storage - The electronic file is saved in the central filing system on the Coeur Alaska Server, and hard copies are printed off and stored in a separate binder for each month located at the Jualin Environmental office.

3. Data Confirmation - The hard copy is routed to the QA technician/ data validator for confirmation of analytical data receipt and subsequent validation activities. Data validation actions may require application of qualifiers to data for associated ‘out of limit’ quality control indices.

4. Database file - Construct sample, results, analyte and qualifier database files according to the project requirements. (An example DMR is available from Coeur for typical format.)

5. Enter Data - Enter results and qualifiers into the result database file from electronic result forms. Enter sample number, sample date, sample location, and additional information, as required for the project, into the sample database file.

6. Verify and Inventory - Upon completion of data entry, the QA Officer or his designee verifies the entries, applies corrections, and completes a final version for inclusion to the database.

7. Incorporate - After any required corrections are made, incorporate new records into the DMR.

8. Maintain Files - Maintain a copy of the ‘as qualified’ batch reports and the associated hard copy data for archive records.

The QA technician/ data validator reports directly to the QA Officer on the laboratory data for elements of accuracy, representativeness, and completeness.

B9.2 Field Data Management

The following data processing steps are completed by the Coeur Field Technician(s) for data recorded in the field:

1. Field data sheets are written in ball point ink or permanent marker. When errors are made in writing results, the error is crossed out with a single line and initialed.

2. The signature of the field analyst is recorded on the field data sheet and calibration logs.

3. Field data sheets are maintained at the treatment plant and at the site office. When a data sheet is filled out, a copy is scanned into the central filing system on the Coeur Alaska server and filed with the DMR monthly records.

4. The QA Officer or his designee reviews each field data sheet each month, and corrections or qualifiers added as appropriate. If the data is found to be lacking specific entries as specified on the calibration log forms, or specific station data sheets, the data will be secured from field instruments, or field technician notes if available. If the missing data is not retrievable, a 'condition found' memorandum will be generated by the QA Officer or his designee, explaining the reason(s) for the missing data, and a corrective action plan for future sampling rounds.

Field data sheets, laboratory reports, copies of DMRs, incident reports, and associated QA review reports are filed in Coeur Alaska's environmental filing system for future reference. Five years of data will be made readily available for review in this filing system. Reports are stored chronologically. Originals are photocopied as needed, and the copies are used for distribution and for satisfying requests for information. These records may be archived 5 years after the date of creation and moved to a less accessible location.

If so, the current five years of hard copies are kept readily accessible. Hardcopy reports or packets that are not already sequentially numbered are numbered before disassembly for copying. This ensures that packets can be reassembled in correct order and that copies can be easily verified as to completeness.

B9.3 Data Entry Requirements

Field and laboratory data are entered electronically or manually into Coeur Alaska's water quality database after a QA review. Associated qualifiers are also entered. All data (100%) entered into the database manually are verified against the hard copy by the QA Officer or his designee before the data are used for analysis at the time of compiling the DMR. A sample (at least 20%) of the data transferred to the database electronically will be verified against the hard copy by the QA Officer or his designee.

B9.4 Electronic Data Management

Coeur Alaska maintains electronic copies of laboratory reports and associated electronic data deliverables received from the laboratory on their network server. Complete backup of the files on the network is performed every night and backup files are saved once a week, and once a month. Access to files on the network is restricted to Coeur personnel.

C ASSESSMENT/OVERSIGHT

C1 Assessments and Response Actions

C1.1 Purpose/Background

Oversight of this monitoring program provides an evaluation of the efficiency and effectiveness of the QAPP & FWMP for APDES permit AK-005057-1 and Waste Management Permit No 2013DB0002. This feedback loop provides the information needed for continuous improvement of the program. It also verifies whether the QA guidelines for the sampling and analysis program are being met.

Oversight Responsibilities

Coeur management has the primary responsibility for ensuring that the permit sampling and QA program activities have been implemented as designed. The Environmental Manager represents Coeur management for these purposes. The QA officer is tasked with implementing the auditing procedures, and evaluating and reporting on the level of compliance with quality assurance goals. The audit procedures below evaluate how well the program is meeting the information goals and Data Quality Objectives.

C1.2 Audits of Field Data and Sample Acquisition

The following discusses the purpose and frequency of assessments, records to be reviewed, and documentation.

Purpose

The review of field data and the laboratory sample collection system will evaluate whether or not the QC procedures are being followed and if the documentation of these activities is sufficient to establish the quality of the information collected. If lapses in program execution or documentation are found, corrective action will be taken by Coeur management.

Frequency & Scope of Audits

The QA Officer will perform a formal technical systems audit (TSA) each year but may perform additional audits as needed. The TSA is a thorough, systematic, on-site, qualitative audit of facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of the Coeur permit compliance system. The QA Officer may perform this audit or may hire a qualified firm to perform the audit. Elements of an annual TSA audit may include the following:

1. Assessment of sample locations, location viability, and sample location identifier.
2. Update of Figures for the QAPP & FWMP to identify sample location changes (if necessary).
3. Assessment of APDES and waste management Permit modifications (if necessary).

4. Assessment of contractual laboratory deliverables as relates to sample volume, sample handling, analytical methods, and data quality.

5. Assessment of equipment used in daily or less frequent collection of data, including period of use, calibration stability, and maintenance record.

6. Review of personnel for training status, refresher training, and certifications as needed.

7. Review of Standard Operating Procedures (SOP) for relevance, equipment updates, and applicability.

8. Assessment and review of procedures to archive documents in the Coeur records database or filing system.

9. Assessment of data validation viability. Or, if so arranged, assessment of sub-contractor deliverables as data validation reports.

10. Assessment of data collection procedures, storage systems, and backup systems as necessary.

11. Establishing reporting formats and updates as necessary for communicating information to the DMR, and the management of Coeur.

The QA Officer, or the QA technician as his designee, will perform a formal data quality assessment (DQA) audit as part of a technical systems (TSA) audit on all field and laboratory data on a monthly basis during the generation of the DMR. The data quality assessment process will include review of all field data sheets, including calibration logs, and instrument readouts as available. Laboratory data will be checked for completeness of all requested analytical tests as indicated on the Chain of Custody, and for all contractual requests between Coeur Alaska Inc., and the designated laboratory. Immediate feedback will be made to the QA officer in a written memorandum as necessary, with annotated corrections and recommendations for follow-up. The QA Officer will inform the field staff of corrective actions if needed. Laboratory data discrepancies or errors will be addressed with the contract laboratory by the QA officer or a QA designee, and a corrected deliverable will be secured as needed. Each formal data quality assessment will be documented with annotated hard copy sheets of data deliverables (if necessary), added to the project files. When a formal TSA is performed, findings will be generated in a memorandum to management, and a record kept in project files.

Contents of Audit and Records to be Reviewed

The following chart presents elements of a TSA, with procedural actions, acceptance criteria, and corrective actions.

Audit Target	Audit Acceptance	Accept Criteria	Corrective Action
The field data sheets and laboratory reports for a	Field data sheets are reviewed for	100 %	Discussion and review of goals with field personnel are

Audit Target	Audit Acceptance	Accept Criteria	Corrective Action
randomly selected month are reviewed by randomly selecting 2 – 4 sampling events from the month.	completeness, signature, and readability. Data sheet entry completeness is critical.		implemented by the QA Officer.
Field equipment or in-line instrument readouts (electronic or otherwise) will be retained as available.	Data from instrument recordings including calibration will be corroborated with field data sheets by a QA technician as designated by the QA Officer.	100 % of data for the selected sampling events	Discussion and review of record goals with field personnel are implemented by the QA Officer.
The QAPP & FWMP is reviewed in conjunction with the field data sheets and laboratory reports.	All sections of the QAPP & FWMP for measurement, calibration, recording, and sample handling will be in compliance.	100 %	Discussion and review of goals with field personnel are implemented by the QA Officer.
Are the site maps and access information still accurate? Are there any changes that need to be incorporated in the next update of the QAPP & FWMP?	Figures 3, 4, 5, and 6 will be designated with a version identifier and a date to let the reader know of the last update to sample locations, and location names.	Annual review	Annual update of the QAPP & FWMP will be implemented as necessary by the QA Officer.
Were all field measurements performed as specified in the QAPP & FWMP?	All measurements will be collected as scheduled, unless safety concerns prevent compliance as noted by the QA Officer.	100 %	Discussion and review of goals with field personnel are implemented by the QA Officer. Possible return to location to collect missing measurement.

Audit Target	Audit Acceptance	Accept Criteria	Corrective Action
Were the field instruments calibrated as required?	Field log sheets will be reviewed on a per sample event basis, by the QA Officer.	100 % for completeness; Calibrate within 90-110% compliance.	Discussion and review of goals with field personnel are implemented by the QA Officer.
Were samples analyzed within the holding times?	Validation of Laboratory Reports performed in accordance with National Functional Guideline (NFG) limits for holding times.	100 % for compliance with NFG limits. (See Table 6 for limits)	Qualification of results as “estimated” for out-of-limit H/T. Discussion with lab for improved coordination of sample delivery and analysis.
Are DMR reporting spreadsheets over-checked for accuracy and errors?	Each spreadsheet deliverable will be over-checked and calculations performed by a designee of the QA Officer.	20% for data entry; 100% for calculations.	Discussion and review of goals with data entry personnel implemented by the QA Officer.

C1.3 Laboratory Audits

Contract laboratory certification is maintained through an annual review of proficiency testing (PT) results from an appropriate PT program that administers to ISO/IEC 17025 Laboratories. Accreditation bodies that meet the ISO/IEC standards include the American Association for Laboratory Accreditation (A2LA), and the National Voluntary Laboratory Accreditation Program (NVLAP). The PT results must relate to the same matrices and methods used for the Coeur testing regimen applied to submitted samples. Bio Aquatic Testing subscribes to an NVLAP PT provider, which provides and tests PT samples once a year for the WET method applied to Coeur samples. ALS Environmental participates in PT studies twice per year, and PT samples are applied to all analytical areas of the laboratory.

For purposes of this QAPP & FWMP, Coeur Alaska can rely on the laboratory’s certification as assuring acceptable data quality as specified in Section A8.2.2 of this QAPP & FWMP.

A copy of the letter of certification or accreditation will be obtained as needed from the laboratory.

C2 Reports to Management

Reports to management are prepared by the QA Officer for all issues relating to data quality. These reports will include elements of a 'technical systems audit' (TSA) or 'monthly data quality assessment' (DQA), including sample collection and monitoring parameters as discussed in Section C1.2. The formal audits will be summarized in report format to management to include 'conditions found', deficiencies noted, and corrective actions required or suggested, in accordance with the severity of the condition found. The QA Officer is also responsible to forward the subcontracted laboratory audit findings to management, with a summary review memorandum assessing the status of the participating laboratory, including results of the PT studies (Section C1.3). If issues of non-compliance with accepted laboratory practice, deviation from the current laboratory QAPP & FWMP, or failing of PT results are found, the QA Officer will create a record of non-compliance report to management with a summary of samples suspected to be affected and recommendations to notify ADEC. The Environmental Manager will provide copies of TSA or monthly DQA to the sampling team with requests of the sampling team to take corrective action if problems became apparent through the audit. The reports will be used in preparing updates of the QAPP & FWMP and kept as a part of the QA files in Coeur's environmental filing system.

D DATA VALIDATION AND USABILITY

D1 Data Review, Validation, and Verification Requirements

D1.1 Purpose/Background

The purpose of this QAPP & FWMP element is to state the criteria for deciding the degree to which each data item has met its quality specifications as described in Section B. Data generated to satisfy the requirements of the monitoring project must be reviewed to ensure the procedures and acceptance criteria in Section B of this QAPP & FWMP have been followed.

Data validation is the process by which data are compared with data quality objectives (DQOs) to determine which data points are accepted, rejected, or qualified. Data verification involves ensuring that any conclusions based on measurements or analyses are correct.

D1.2 Sampling Design

Sampling design requirements are specified in APDES permit AK-005057-1 and are described in section B1 of this QAPP & FWMP. Samples must be collected from the sites specified. If a deviation from a site occurs, either from error or from conditions such as ice, a note will be made in the field data sheet. A qualifier that is associated with that result will be entered into the database when the field data are entered.

D1.3 Sample Collection Procedures

Procedures for sample collection and related activities are described in section B2 of this QAPP & FWMP. Changes to these procedures during sample collection must be documented in the field data sheet and/or in the database with the sample results. Notification to ADEC and Forest Service of changes will be made in the cover letter with the DMR if the sample collection changes are substantial and/or appears to have affected the data. Changes may be required in inclement weather conditions; any such altered sample collection procedures will be thoroughly documented.

D1.4 Sample Handling

Specifications for sample handling and shipping are described in section B3. Deviations from these specifications include broken custody seals or exceeded holding times. Any errors associated with sample handling that occur en route to the laboratory or at the laboratory are documented by the lab, either on the chain of custody form or in the lab's data qualifying report. Any errors affecting the integrity of the sample will be noted in the cover letter to ADEC and the Forest Service accompanying the DMR. Sample results that are analyzed outside of hold times will be qualified in the database.

D1.5 Analytical Procedures

If a deviation is made from the analytical procedures specified in section B4 of this QAPP & FWMP, the data will be qualified. If the different procedure is deemed appropriate by a qualified chemist, the data will be accepted and justification for acceptance will be documented and kept with the sample results in the database. If an analytical procedure will be changed permanently, section B4 of the QAPP & FWMP will be updated.

D1.6 Quality Control

The quality control objectives specified in section B4 must be achieved or the associated data will be qualified.

D1.7 Calibration

Instruments are calibrated and calibration records are maintained per section B6. During routine review of field calibration as specified in section C1, errors detected will be addressed as described in section C1.

D1.8 Data Reduction and Processing

Section B9 of this QAPP & FWMP describes data processing requirements. Most data reduction is performed by the laboratories and lab data reduction procedures and lab QA/QC are described within the lab Quality Assurance Manual. Laboratory reports will be issued with qualifiers describing data irregularities. These qualifiers will be incorporated into the Coeur database. Errors detected during data entry will be resolved at the time of data entry.

D2 Validation and Verification Methods

At least 20% of all laboratory data will be reviewed by the QC Technician on a monthly basis and compared with the DQOs and methods listed in Table 7 in Section B4. The following elements will be checked:

1. Is the report signed?

2. Does the chain of custody accompany the report?
3. Were all samples analyzed within the required holding times?
4. Were correct methods used?
5. Are accuracy and precision within the specified DQOs?
6. Are reporting limits correct?
7. Are qualifiers provided by the lab where needed?

If long-term or repeat problems are discovered, they will be addressed by contact with the laboratories.

Field data will be reviewed on a monthly basis in conjunction with problems or errors noted in the field records, and addressed by training and discussion with field samplers.

D3 Reconciliation with Data Quality Objectives

Reconciliation will occur as described in sections D1 and D2, by comparing the data generated and the process used with the guidelines in this QAPP & FWMP. Resolution will be made by correctly qualifying questioned elements of the sampling and data collection process and by addressing the situation that caused the qualification. In addition, all problems affecting data quality discovered through the review processes described herein will be reported to ADEC and the Forest Service in the appropriate DMR.

Significant modifications to project monitoring that could affect the quality of reported data will require notification to and pre-approval by ADEC and the Forest Service. Subsequent edits to the approved QAPP & FWMP will be made after comment and acceptance from ADEC and the Forest Service. Such modifications include changes in senior staff, changes in contract laboratories, analytical methods, method parameters, monitoring locations, frequency of sample collection and/ or sample types.

At least annually, the Coeur QAPP & FWMP will be reviewed by the QA Officer to ensure the QAPP & FWMP represents actual monitoring operations and procedures, and if deemed a significant modification, the QAPP & FWMP will be updated, reapproved and distributed to all parties as cited in Section A2 and listed in Attachment A.

TABLES

Table 1: Water Quality Sampling Site Summary

Sampling Site	Location	Purpose	Collection Frequency	Parameters	Field QC
001 Effluent	Final outfall from mine water treatment system	Assess water quality at Outfall 001 and verify compliance with APDES permit.	1. Continuous for pH, flow. 2. Daily 24-hour composite for chlorine. 3. Weekly for full parameter list including turbidity and background turbidity. 4. Monthly toxicity testing for resident organisms.	pH, flow, turbidity, temp. DO, TSS, TDS, TDS metals, inorganic chemistry, toxicity, hardness	Sample collection requires 'clean hands / dirty hands' mercury collections, and influent/ effluent water grabs, dedicated sampling equipment and containers utilized.
002 Effluent	Final outfall from last treatment unit prior to discharge	Assess water quality at Outfall 002 and verify compliance with APDES permit.	1. Continuous for pH, flow. 2. Weekly for full parameter list including turbidity and background turbidity. 3. Monthly toxicity testing for resident organisms.	pH, flow, turbidity, temp., DO, TSS, TDS, TDS metals, inorganic chemistry, toxicity, hardness	Sample collection requires 'clean hands / dirty hands' mercury collections, and influent/ effluent water grabs, dedicated sampling equipment and containers utilized.
Other Receiving Water Stations & Additional Monitoring	See Tables 2 and 3	Assess water quality in receiving water and other site sample locations.	1. Weekly for turbidity, as background waters (See Table 2). 2. WMP sample locations (See Table 3).	pH, DO, color, conductivity, temp., turbidity, hardness, metals, TSS, TDS, inorganic chemistry	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.

Table 2: Receiving Water Quality Sampling Site Summary

Sampling Site	Location	Rationale	Collection Frequency	Parameters	Field QC
Johnson Creek					
JS2	Johnson Creek above the Jualin process area and development rock storage area.	Background site to evaluate upstream surface water in Johnson Creek.	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
JS5	Johnson Creek approximately 200 meters below the upper Johnson Creek bridge 2	To assess water quality downstream of process area.	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
JS4	Johnson Creek approximately 100 meters below lower Johnson Creek bridge 1	To assess water quality downstream of process area and lower Johnson Creek bridge.	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
Slate Creek Drainage					
MLA	Mid Lake Slate Creek upstream from diversion inlet structure.	Background site to evaluate upstream surface water in Mid-Lake Slate Creek	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
SLB	East Fork Slate Creek 10 meters upstream from the confluence with the West Fork Slate Creek.	Downstream site to monitor water quality in East Fork Slate Creek above the confluence with the West Fork Slate Creek.	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
SLC	Slate Creek 30 meters downstream of the confluence between	Downstream site to monitor cumulative water quality in Slate Creek below the confluence with the West	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.

	West and East Fork Slate Creeks.	Fork Slate Creek.			
Station #5	East Fork Slate Creek downstream of the Tailings Dam and Mid Lake Slate Creek diversion outflow	Downstream site to monitor water quality in Slate Creek.	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
Ophir Creek Drainage					
SH103	Ophir Creek approximately 50 meters downstream of Comet development rock stockpile	Site to monitor water quality downstream of the Comet development rock stockpile	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
SH111	Ophir Creek approximately 50 meters upstream of Comet development rock stockpile	Background site to monitor water quality upstream of the Comet development rock stockpile	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
Sherman Creek Drainage					
SH109	Upper Sherman Creek above the Kensington Mine site.	Background site to evaluate upstream surface water in Sherman Creek. Also the weekly background turbidity sample.	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.
SH113	Sherman Creek downstream of Outfall 001	Monitoring site located below Outfall 001 to evaluate water quality down gradient of Outfall 001. Also the weekly downstream hardness site.	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.

SH105	Sherman Creek above Comet Beach.	Downstream site to evaluate cumulative water quality down gradient of Kensington mine site.	Monthly	Suite CK30	Field duplicate for turbidity and hardness; Collected randomly from one receiving water station. A low-level mercury field blank will be collected once per month at a randomly chosen receiving water site.

Table 3: Additional Permit Monitoring Site Summary (Contact Water Sites)

Monitoring Site	Analysis Suite	Flow/Quantity	Frequency
Dam Seepage Sump	Suite A	Mean Flow	Monthly
TTF Pond	Suite A	N/A	Quarterly
Upper Slate Lake (USL)/TTF bypass pipe	Not Required	Max/Min gpm	Weekly
USL to TTF	N/A	Report event and impact to the TTF	N/A
Snow	N/A	Inches	Cumulative monthly
Graphitic Phyllite seeps on the East and West embankments below the dam	Suite A	N/A	When Observed
Graphitic Phyllite seep sump at the Northwest end of the TTF	Suite A	N/A	Weekly when accessible until deemed non-acid generating
GPPTP effluent	Suite A	N/A	Monthly

GPPTP effluent	N/A	Monthly Mean	Gpm
Mine drainage to WTP	Suite A	Mean gpm	Monthly
Mine sump sediments	Synthetic Precipitation Leaching Procedure (SPLP)	N/A	Quarterly
Pit-4 standing seep water	Suite A	N/A	Quarterly, When Observed

Table 4: Sample Parameter Suites

Analysis Suite	Parameters
Suite A	**Total Metals:** Aluminum, , Chromium, Iron, Mercury **Dissolved Metals:** Arsenic, Cadmium, Copper, Lead, Manganese, Nickel, Selenium, Silver, Zinc **General Parameters:** Sulfate, Turbidity, Total Dissolved Solids, Hardness (total), Chloride, , Dissolved Oxygen, Temperature, Conductivity, pH, Ammonia as N, Nitrate + Nitrite as N
Suite CK30	**Total Metals:** Aluminum, Iron, Manganese, Selenium **Dissolved Metals:** Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Silver, Zinc, Low Level Mercury **General Parameters:** Ammonia (Total), Sulfate, Turbidity, Total Dissolved Solids, Total Suspended Solids, Hardness (total), Chloride, Turbidity, Dissolved Oxygen, Temperature, Conductivity, pH; Nitrate, Color

Table 5: Aluminum UTL's at Slate Creek Monitoring Sites

Aluminum UTLs at Slate Creek Monitoring Sites				
	MLA	**Site #5**	**SLB**	**SLC**
Mean	83.00727	101.1	119.9056	82.76604
SD	63.20521	62.69202	120.4348	82.76604
n	55	14	54	53
K	2.036	2.614	2.042	2.048
UTL	**212**	**265**	**366**	**258**

Table 6: Analytical Methods, Special Handling, Sample Containers, Preservation and Hold Times

Lab Parameter	Method	Special Handling	Volume/ Container[1]	Preservation[2]	Hold Time
Physical and General					
Alkalinity as $CaCO_3$	SM2320B	Total Fraction	500 mL (P)	Cool, <6°C, Do not Freeze	14 days
Ammonia – Total	EPA 350.1	Total Fraction	250 mL (P)	Cool, <6°C, Do not Freeze, H_2SO_4 pH<2	28 days
Color	EPA 110.2	Total Fraction	250 mL (P)	Cool, <6°C, Do not Freeze	48 hours
Electrical Conductivity	SM2510B	Total Fraction	500 mL (P)	Cool, <6°C, Do not Freeze	None
Fecal coliform	SM9222D	Total Fraction	100 mL (P)	Cool, <6°C, Do not Freeze, preserve w/ 0.0008% $Na_2S_2O_3$	6 hours
Hardness	SM2340B	Total Fraction	250 mL (P)	4°C, HNO_3 to pH <2	6 months
Lab pH	EPA 150.1	Total Fraction	50 mL (P)	NA	analyze asap
Nitrogen, Nitrate (As N)	EPA 300.0	Total Fraction	500 mL (P)	Cool, <6°C,	48 hours
Total Dissolved Solids	SM2540C	Total Fraction	500 mL (P)	Cool, <6°C, Do not Freeze	7 days
Total Suspended Solids	SM2540D	Total Fraction	500 mL (P)	Cool, <6°C, Do not Freeze	7 days
Turbidity-conducted at site with HACH 2100AN	EPA 180.1	Total Fraction	250 mL (P)	Cool, <6°C, Do not Freeze	48 hours
Anions					
Chloride	EPA 300.0	Total Fraction	1L (P)	Cool, <6°C, Do not Freeze	28 days
Fluoride	EPA 300.0	Total Fraction	1L (P)	Cool, <6°C, Do not Freeze	28 days
Sulfate	EPA 300.0	Total Fraction	1L (P)	Cool, <6°C, Do not Freeze	28 days
Cations					
Calcium	EPA 200.7	Total, No Filter	1L (P)	HNO_3 to pH <2	6 months
Magnesium	EPA 200.7	Total, No Filter	1L (P)	HNO_3 to pH <2	6 months
Potassium	EPA 200.7	Total, No Filter	1L (P)	HNO_3 to pH <2	6 months
Sodium	EPA 200.7	Total, No Filter	1L (P)	HNO_3 to pH <2	6 months
Metals Total Recoverable					
Aluminum	EPA 200.7	Total Recoverable, No Filter	1L (P)	HNO_3 to pH <2	6 months
Boron	EPA 200.7	Total Recoverable, No Filter	1L (P)	HNO_3 to pH <2	6 months
Iron	EPA 200.7	Total Recoverable, No Filter	1L (P)	HNO_3 to pH <2	6 months
Manganese	EPA 200.8	Total Recoverable, No Filter	1L (P)	HNO_3 to pH <2	6 months
Selenium	EPA 200.8	Total Recoverable, No Filter	1L (P)	HNO_3 to pH <2	6 months

Table 6: Analytical Methods, Special Handling, Sample Containers, Preservation and Hold Times (continued)

Mercury- total	EPA 1631 with EPA 1669	Total Recoverable, No Filter	1L (P)	4°C, HCLµ	90 days
Lab Parameter	**Method**	**Special Handling**	**Volume/ Container(1)**	**Preservation(2)**	**Hold Time**
Metals Dissolved Fraction					
Arsenic	EPA 200.8	Dissolved fraction, 0.45 µm filter	1L (P)	HNO_3 to pH <2	6 months
Cadmium	EPA 200.8	Dissolved fraction, 0.45 µm filter	1L (P)	HNO_3 to pH <2	6 months
Chromium	EPA 200.8	Total, No Filter	1L (P)	HNO_3 to pH <2	6 months
Copper	EPA 200.8	Dissolved fraction, 0.45 µm filter	1L (P)	HNO_3 to pH <2	6 months
Lead	EPA 200.8	Dissolved fraction, 0.45 µm filter	1L (P)	HNO_3 to pH <2	6 months
Nickel	EPA 200.8	Dissolved fraction, 0.45 µm filter	1L (P)	HNO_3 to pH <2	6 months
Silver	EPA 200.8	Dissolved fraction, 0.45 µm filter	1L (P)	HNO_3 to pH <2	6 months
Zinc	EPA 200.8	Dissolved fraction, 0.45 µm filter	1L (P)	HNO_3 to pH <2	6 months
Mercury-dissolved	EPA 1631 with EPA 1669	Dissolved fraction, 0.45 µm filter	1L (P)	None	48 hours
Lab Parameter	**Method**	**Special Handling**	**Volume/ Container(1)**	**Preservation(2)**	**Hold Time**
Toxicity					
Pimephales promelas	EPA 1000.0	See BioAquatics QA Manual(3)	2, 3.5 gal buckets (P)	Cool, <6°C, Do not Freeze	36 hours
Ceriodaphnia dubia	EPA 1002.0	See BioAquatics QA Manual(3)	1, 2.0 gal buckets (P)	Cool, <6°C, Do not Freeze	36 hours
Selanastrum capricornutum	EPA 1003.0	See BioAquatics QA Manual(3)	1, 1.0 gal buckets (P)	Cool, <6°C, Do not Freeze	36 hours

Notes:

1. Container Code: (P) = Plastic
2. HNO_3 & H_2S_4: preserved samples must be pH<2
3. DO, pH, and temperature monitored in the testing room every 24-hours in both test and renewal water.

Table 7: Station Outfalls -001 and -002; Analytical Methods, Reporting & Detection Limits, Accuracy, Precision, Permit Limits

Lab Parameter	Method	Reporting Limit	Method Detection Limit	Accuracy or LCS, MS/MSD	Precision or Lab Duplicate	Permit Limits @ Stations 001/002
Physical and General		**Outfall 001/002**				
Ammonia – Total (as N)	EPA 350.1	0.1 mg/L	0.02 mg/L	90-100%	0 – 20%	9.0/ NA mg/L
Dissolved Oxygen	SM 4500-OG	0.1 mg/L	NA	±0.1 mg/L	0.05 mg/L	Monitor/Monito
Electrical Conductivity	SM2510B	5 µmhos/cm	0.4	86-113%	NA	NA
Sulfate	EPA 200.7	1.0 mg/L	0.05 mg/L	70-130%	0-20%	200/250 mg/L
Flow	Swoffer	NA	NA	NA	NA	
Hardness	SM2340B	1.0 mg/L	0.004 mg/L	70-130%	0 – 20%	Monitor
Lab pH	SM4500 H+B	0.1 s.u	NA	85-115%	NA	6.5 – 8.5
Temperature	SM2550B	0.1°C	0.1°C	± 0.1°C	0.5°C	Monitor
Total Dissolved Solids	SM2540C	20 mg/L	5 mg/L	90-110%	0 – 10%	1000/500 mg/L
Total Suspended Solids	SM2540D	4.0 mg/L	4.0 mg/L	85-111%	0 – 10%	30/30 mg/L
Turbidity-conducted at site with HACH 2100AN	EPA 180.1	0.1 NTU	0.04 NTU	90-110%	NA	Monitor
Outfall 001						
Sulfate as Sodium & Magnesium	EPA 200.7; calculated	1.0 mg/L	0.05 mg/L	70-130%	0-20%	200 mg/L
Sodium	EPA 200.7	0.2 mg/L	0.02 mg/L	70-130%	0-20%	NA
Magnesium	EPA 200.7	0.1 mg/L	0.3 µg/L	70-130%	0-20%	NA
Chronic Whole Effluent Toxicity		**Outfall 001/002 Bio Aquatics Laboratory Only**				
Pimephales promelas	EPA 1000.0	1.0 TU	NA	NA	NA	NA

Table 8: Receiving Water Monitoring Parameters Analytical Methods, Reporting Limits, Accuracy, and Precision

Lab Parameter	Method[a]	Reporting Limit[b]	Method Detection Limit	Basis[d]	Accuracy	Precision
Metals		**(µg/L)**	**(µg/L)**			
Aluminum	EPA 200.7	1.0	0.3	TR	75 – 130%	0 – 20%
Cadmium	EPA 200.8	0.1	0.007	Dissolved	75 – 130%	0 – 20%
Copper	EPA 200.8	1.0	0.009	Dissolved	75 – 130%	0 – 20%
Iron	EPA 200.7	50	3	TR	75 – 130%	0 – 20%
Lead	EPA 200.8	0.16	0.005	Dissolved	75 – 130%	0 – 20%
Manganese	EPA 200.8	1.0	0.02	TR	75 – 130%	0 – 20%
Mercury	EPA 1631	0.001	0.00006	TR	71 – 125%	0 – 24%
Nickel	EPA 200.8	1.0	0.02	Dissolved	75 – 130%	0 – 20%
Selenium	EPA 200.8	1.0	0.4	TR	75 – 130%	0 – 20%
Zinc	EPA 200.8	2.5	0.2	Dissolved	75 – 130%	0 – 20%
Hardness	SM2340B	1.0 mg/L	0.004 mg/L	TR	75 – 125%	0 – 20%
Physical General		**(mg/L)**	**(mg/L)**			
Ammonia, total	EPA 350.1	0.1	0.02	Total	90-100%	0 – 20%
Nitrate as N	EPA 300.0	0.05	0.005	Total	90-100%	0 – 20%
Sulfates	EPA 300.0	0.1	0.01	Total	90-100%	0 – 20%
Chlorides	EPA 300.0	1.0	0.03	Total	90-100%	0 – 20%
TDS	SM2540C	20	5	Total	90-100%	0 – 10%
TSS	SM2540D	4.0	4	Total	85-111%	0 – 10%
Color*	EPA 110.2	.0 Color Unit	NA	NA	NA	NA
Field Parameters						
Turbidity-	EPA 180.1	0.1 NTU	NA	NA	NA	NA
pH	EPA 150.1	0.1 s.u	NA	NA	NA	NA
Dissolved Oxygen	SM 4500-OG	0.1 mg/L	NA	NA	±0.1 mg/L	0.05 mg/L
Temperature	SM2550B	0.1°C	NA	0.1°C	± 0.1°C	0.5°C
Conductivity	SM2510B	5 µmhos/cm	NA	NA	NA	NA

Notes:

a – USEPA SW-846; SM – Standard Methods, 18th Edition.

b – Reporting limits unique to participating laboratory; Method Detection Limits are established quarterly (See Table 7).

c – This test associated with TDS ‘contributing analytes’ and is included as an indicator analyte.

d – Selected metals are designated for Total Recoverable (TR) testing in receiving waters; All metals are designated for TR at stations -001 & -002; Chromium is tested as Total Cr, and Cr6+ is tested as dissolved when required (See Permit for Cr6+ criteria)

Table 9: Sediment Monitoring Parameters Analytical Methods, Reporting Limits, Accuracy, & Precision

Lab Parameter	Method[a]	Reporting Limit[e]	Method Detection Limit[e]	Accuracy, or LCS, MS/MSD recovery	Precision, or Lab Duplicate RPD
Metals					
Aluminum	3050 / 6010C	4 mg/kg	0.5	75 – 125%	0 – 20%
Arsenic	3050 / 6020A	0.5 mg/kg	0.2	75 – 125%	0 – 20%
Cadmium	3050 / 6020A	0.02 mg/kg	0.008	75 – 125%	0 – 20%
Chromium	3050 / 6020A	0.2 mg/Kg	0.05	75 – 125%	0 – 20%
Copper	3050 / 6010C	0.8 mg/kg	0.4	75 – 125%	0 – 20%
Lead	3050 / 6020A	0.05 mg/kg	0.005	75 – 125%	0 – 20%
Mercury	EPA 7471B[d]	0.02 mg/kg	0.002	75 – 125%	0 – 20%
Nickel	3050 / 6010C	0.8 mg/kg	0.2	75 – 125%	0 – 20%
Selenium	3050 / 6020A	1.0 mg/Kg	0.5	75 – 125%	0 – 20%
Silver	3050 / 6020A	0.02 mg/kg	0.005	75 – 125%	0 – 20%
Zinc	3050 / 6010C	1 mg/kg	0.2	75 – 125%	0 – 20%
Physical & General					
Acute Toxicity[f]	Method 100.1 Method 100.2	NA		NA	NA
Total Solids	160.3M	0.1 %	NA	NA	0 – 20%
Total Volatile Solids	160.4	0.1 %	NA	75 – 125%	0 – 20%
Total Organic Carbon	9060	0.1 %	0.02%	70-112%	0 – 20%
Total Sulfides	9030M	1 mg/kg	0.5	45-150%	0-43%
Grain Size	ASTM D422M	NA	NA	NA	0-10%

Notes:

a – "*Recommended Protocols for Measuring Selected Environmental Variables, in Puget Sound Estuary Program*", EPA 910/9-86-157, updated by WA Department of Ecology; Subsection: Metals In Puget Sound Water, Sediment, and Tissue Samples.

b – Graphite furnace atomic adsorption spectrometry, USEPA SW-846; Test Methods for Evaluating Solid Waste Physical Chemical Methods, EPA 1986.

c – Inductively coupled plasma emission spectrometry, USEPA SW-846; Test Methods for Evaluating Solid Waste Physical Chemical Methods, EPA 1986.

d – Mercury digestion and cold vapor atomic adsorption spectrometry, USEPA SW-846; Test Methods for Evaluating Solid Waste Physical Chemical Methods, EPA 1986.

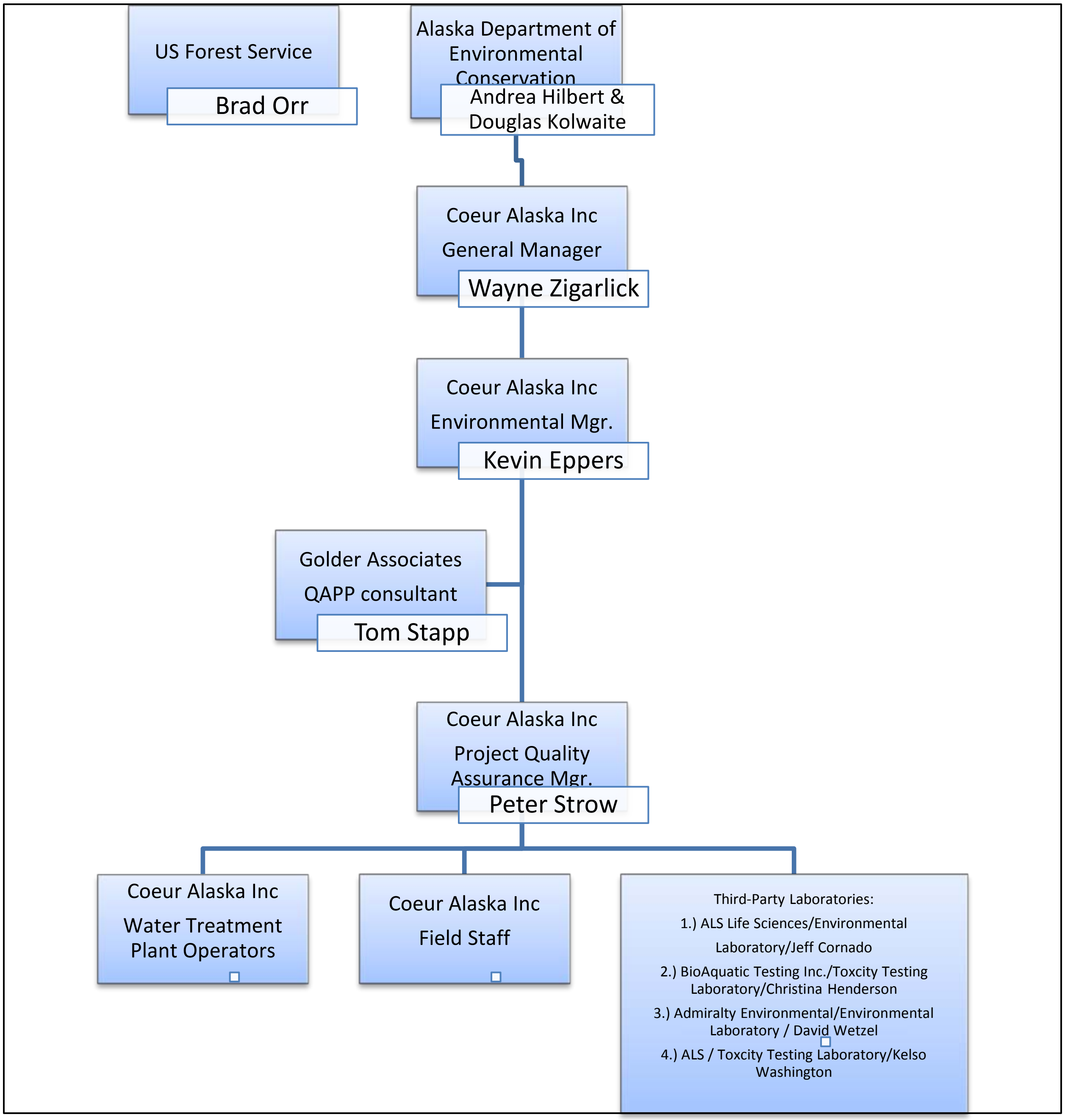
e - Reporting limits unique to participating laboratory; Method Detection Limits are established annually.

f – "*Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*", EPA 600 R-94/024.

g – "*Recommended Methods for measuring TOC in Sediment*", Kathyrn Bragdon-Cook Clarification Paper, Puget Sound Dredged Disposal Authority Annual Review, May 1993.

FIGURES

Figure 1: Organizational Chart



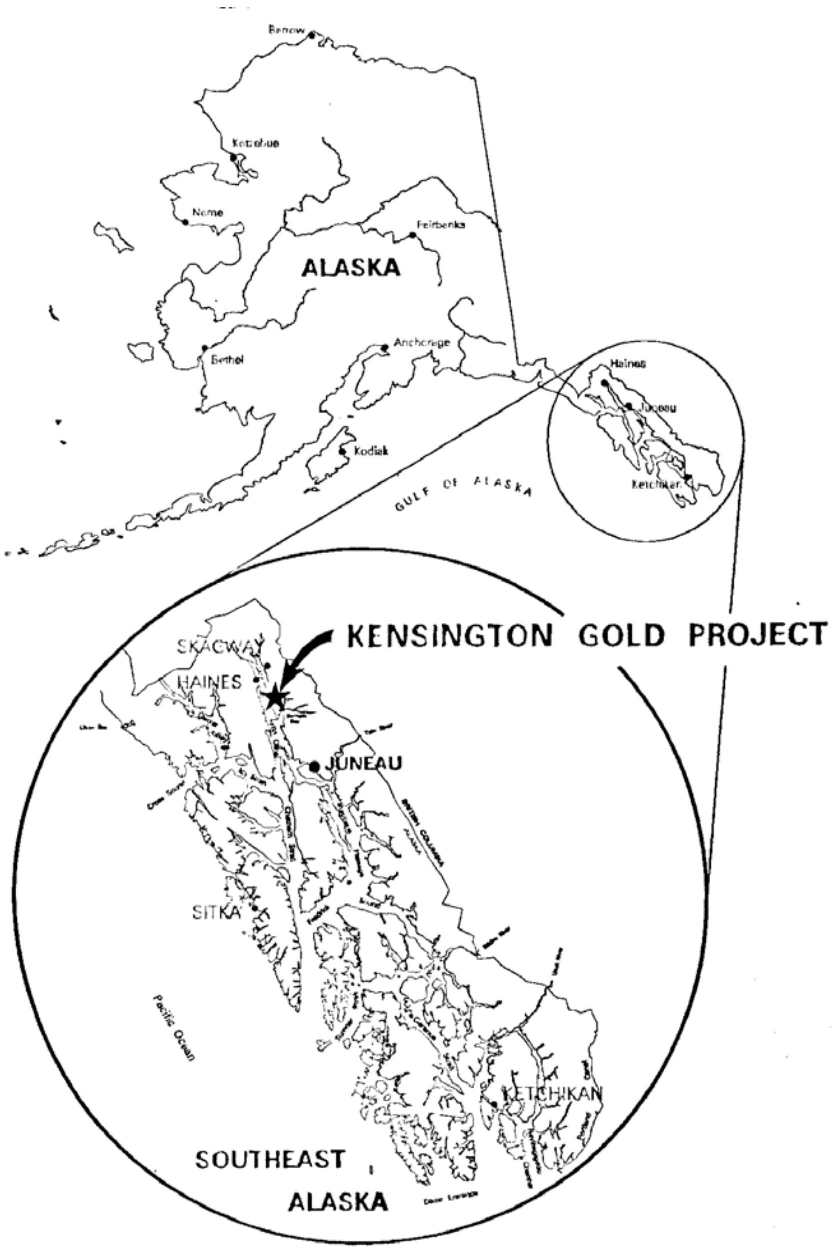


Figure 2: Project Location Map

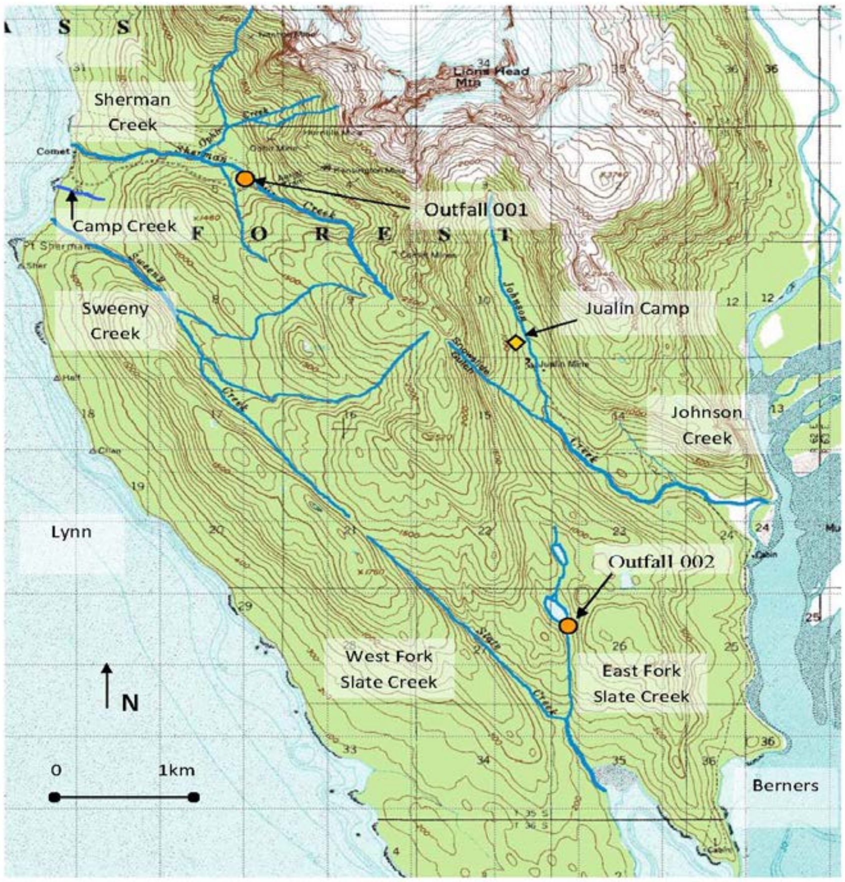


Figure 3: Location of streams and permitted outfalls near Kensington and Jualin Mines, Lynn Canal, southeast Alaska. Water quality monitoring is conducted on Sherman, Slate and Johnson Creeks. Resident fish surveys were conducted annually on Sherman and Sweeny Creeks until 2004 and conducted on Sherman, Slate and Johnson Creeks since 2005. Anadromous fish surveys, benthic invertebrate monitoring, aquatic vegetation surveys, and sediment monitoring are also conducted in Sherman, Slate and Johnson Creeks.

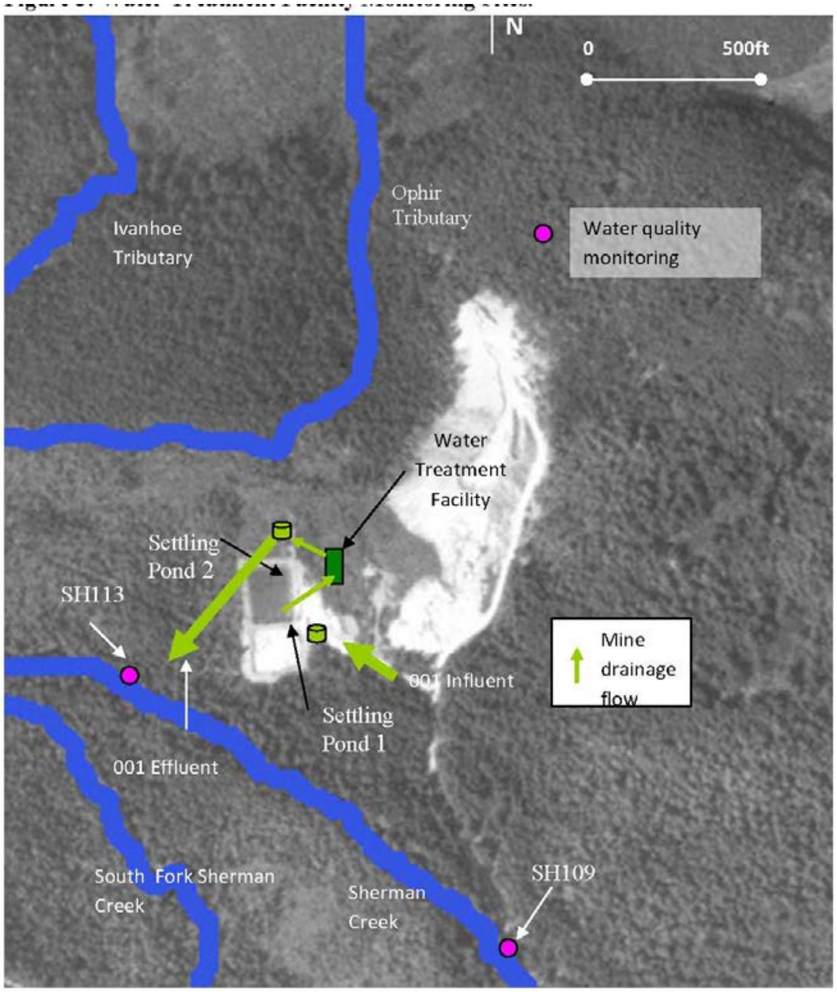


Figure 4: Water Treatment Facility Monitoring Sites

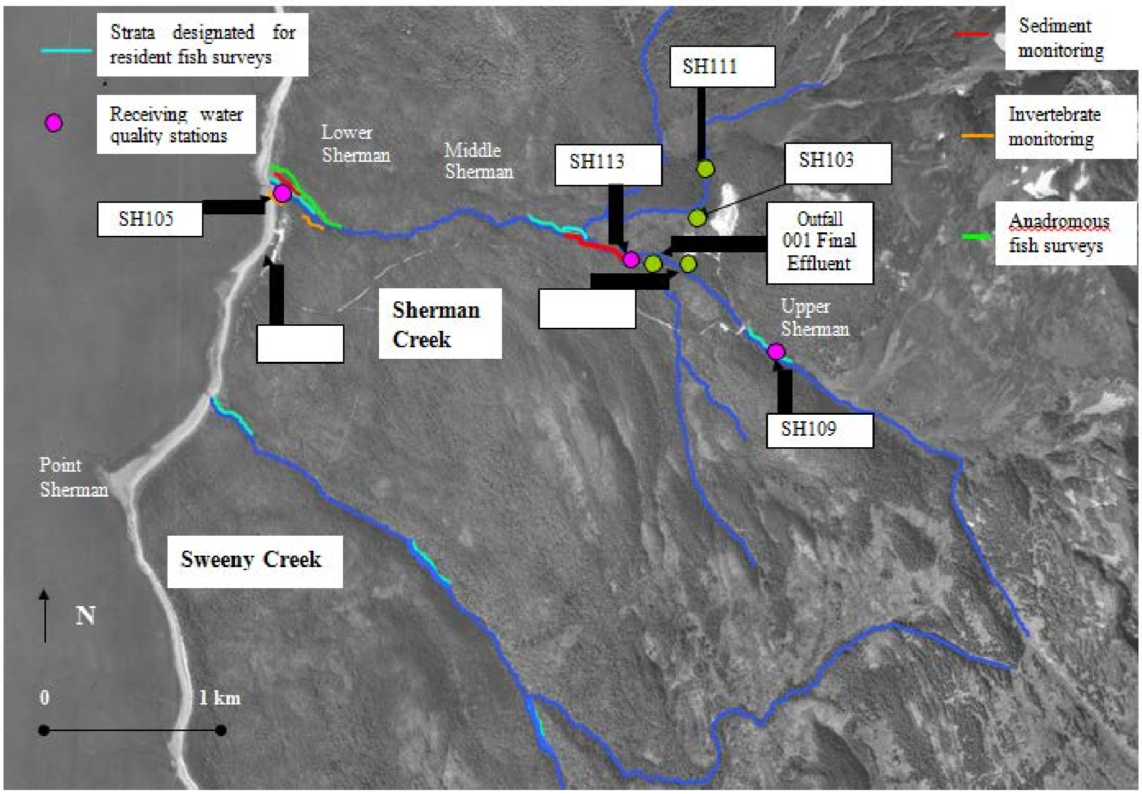


Figure 5: Location of receiving water quality monitoring stations and reaches used in monitoring of resident fish, anadromous fish, benthic invertebrates and stream sediment in Sherman Creek, near Kensington Mine, Southeast Alaska. Benthic invertebrates are also collected from Sweeny Creek.

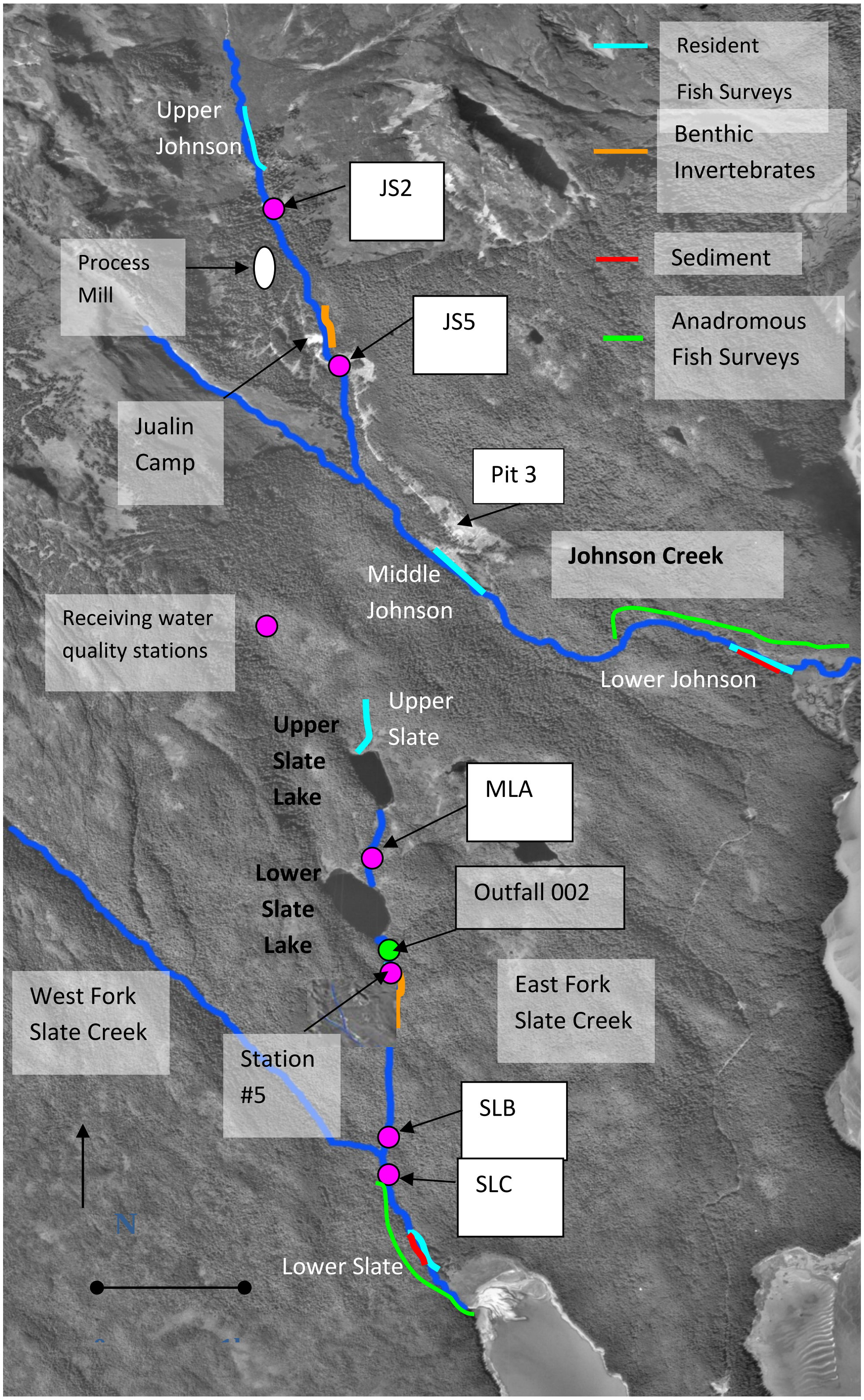


Figure 6: Locations of receiving water quality monitoring stations, and reaches for monitoring benthic invertebrates, resident fish, anadromous fish, and sediment in Slate and Johnson Creeks. Stations are listed in Table 1.

ADDITIONAL PERMIT MONITORING SITES

CONTACT WATER

Figure 8: Field Data Sheet- Receiving Water

SIGNATURE **PRINT NAME** **INITIALS**

Entered into spreadsheet for EQWin? ________________

Scanned into CFS? ________________

INSTRUMENTS:		***CALIBRATION/standards***			**Calibrated By**	
Temp/DO Meter:		pH/buffer 7, 4 & 10				
pH/conductivity Meter:		Turbidity/secondary gelex				
Turbidity Meter:		Conductivity/calibration standard				
		Dissolved Oxygen/auto calibration				
BLIND DUPLICATE SITE:	***SAMPLING SITES***	**SH103**	**SH105**	**SH109**	**SH111**	**SH113**
	DATE					
	TIME					
FIELD MEASUREMENTS/units	**Measured By**	**Result**	**Result**	**Result**	**Result**	**Result**
Stream Gage Level // feet						
Temperature // celsius						
Barometric Pressure // hPa						
Dissolved Oxygen // mg/L						
pH // pH units						
Conductivity // uS/cm						
Turbidity // ntu						
PRESERVATION/acid	**Preserved By**	**Completed?**	**Completed?**	**Completed?**	**Completed?**	**Completed?**
Gross/keep cool						
Nutrients/H2SO4 pH<2						
Metals Total/HNO3 pH<2						
Metals Dissolved/HNO3 pH<2						
# OF BOTTLES / LAB SENT TO:						
DATE:						

WEATHER CONDITIONS

Ambient Air Temperature: ____________ °C ☐ °F ☐ Not Measured ☐ **Wind**: Heavy☐ Moderate☐ Light☐

Precipitation: None☐ Rain☐ Snow☐ Heavy☐ Moderate☐ Light☐ Sunny☐ Partly Cloudy☐ Cloudy☐

Figure 9: 001 Weekly Effluent Data Sheet

INITIALS	PRINT NAME	SIGNATURE	Entered into spreadsheet for EQWin?	___
		___	Scanned into CFS?	___
		___		
		___		

INSTRUMENTS:	*CALIBRATION/standards*	Calibrated By
Temp/DO Meter:	Dissolved Oxygen / auto calibration	

	Outfall 001 Effluent	*001Effluent / SH109 / SH113*	*PRESERVATION/acid*	Preserved By
Date:			Gross / keep cool	
Time:	12:00		Metals-Total Recov. / HNO_3 pH<2	
Sampling Method:	24 hr Composite	Grabs	Hardness / HNO_3 pH<2	
Number of Sample Bottles Collected:	4	3	Nutrients / $H2SO_4$ pH<2	
Collected LLHg if 1st week of the month? YES/NO			*LABORATORY CODE*	CAS

Field Readings / Measurements - 001 Final Effluent

FIELD MEASUREMENT // units	Result / Time	Measured By	*VISUAL OBSERVATIONS*		
Water Temperature // celsius			**Effluent Surface water:**	Observed By	(YES, if visible)
Barometric Pressure // hPa			Floating Solids		
Effluent Dissolved Oxygen // mg/L			Foam		
Effluent Turbidity NTU					
SH109 Dissolved Oxygen // mg/L			Oily Sheen		
SH109 Turbidity NTU					
SH113 Dissolved Oxygen // mg/L			**Wildlife / Other Observations:**		
Site 113 Hardness - Collected? YES/NO					
Effluent total metals split - Collected? YES/NO					

Were standard methods used?: (Collection, handling, prep, etc.)

WEATHER CONDITIONS

Ambient Air Temperature: ___________ °C☐ °F☐ Not Measured ☐ **Wind:** Heavy ☐ Moderate ☐ Light ☐ **Wind Direction:**_________

Precipitation: None☐ Rain☐ Snow☐ Heavy☐ Moderate☐ Light☐ Sunny☐ Partly Cloudy☐ Cloudy☐

COMMENTS:

Figure 10: 002 Weekly Effluent Data Sheet

INITIALS	PRINT NAME	SIGNATURE	Entered into spreadsheet for EQWin?	
			Scanned into CFS?	
			Wildlife Observations:	
INSTRUMENTS:				
Temp/DO Meter # :				

	Outfall 002 Effluent	*#5 /MLA*	*PRESERVATION/acid*	Preserved By
Date:			Gross / keep cool	
Time:	10:00		Metals-Total Recov. / HNO_3 pH<2	
Sampling Method:	24 hr Composite	Grabs	Hardness / HNO_3 pH<2	
Number of Sample Bottles Collected:	7	2	Nutrients / H_2SO_4 pH<2	
			LABORATORY CODE	CAS

Field Readings / Measurements - 002 Final Effluent

FIELD MEASUREMENT // units	Result / Time	Measured By
Water Temperature // celsius		
Effuent Turbidity NTU		
MLA Turbidity NTU		
Barometric Pressure//hpa		
#5 Hardness collected YES/NO?		
Effluent total metals split -colletcted YES/NO?		

VISUAL OBSERVATIONS		
Effluent Surface water:	Observed By	(YES, if visible)
Floating Solids		
Foam		
Oily Sheen		

Were standard methods used?: (Collection, handling, prep, etc.)

WEATHER CONDITIONS

Ambient Air Temperature: ____________ °C☐ °F☐ Not Measured ☐ **Wind:** Heavy ☐ Moderate ☐ Light ☐ **Wind Direction:**_________

Precipitation: None☐ Rain☐ Snow☐ Heavy☐ Moderate☐ Light☐ Sunny☐ Partly Cloudy☐ Cloudy☐

COMMENTS:

Figure 11: Example of Chain of Custody Form

COEUR ALASKA
KENSINGTON GOLD MINE

Coeur Alaska, Inc

3031 Clinton Dr. Suite 202

Juneau, Alaska 99801

907 523 3310

	PROJECT NAME:	Kensington Gold Project					ANALYSIS REQUIRED					LAB USE ONLY	
SEAL?	SAMPLER(S):												
	Contact:	Email:											
	Phone#:	FAX#:											
TIME	DATE	SAMPLE ID	STATION	Sample Session	Sample Class	# of containers						LAB #	COMMENTS

COMMENTS	DELIVERABLES	TURNAROUND TIME
	____Level I	___ 5 Business Days
		___ Other ___________________

RELINQUISHED BY: (signature)	DATE	TIME	RECEIVED BY: (signature)	DATE	TIME	CUSTODY SEAL INTACT?	Condition of Sample Containers
RELINQUISHED BY: (signature)			RECEIVED BY: (signature)			CUSTODY SEAL INTACT?	Temp Received: _______C
RELINQUISHED BY: (signature)			RECEIVED BY: (signature)			CUSTODY SEAL INTACT?	# of Coolers: ____1________

Figure 12: Instrument Calibration Log Sheets / Multi-parameters; One Sheet, per One Instrument, per One Daily Event

Signature________________			Temperature:			Barometer:			Time:
Conductivity Calibration Log / Instrument Serial #							**In Service Date:**		Calibration: Verify Daily
Date[1]	Time	Calibrator's Name	Standard ID[2] for ICAL / CCAL	Standard Known Value	Standard Found Value	Difference[3] from known > 5%? If yes, recalibrate	Recalibrated? No	Recalibrated? Yes	Reading After Recalibration/ Final Check Reading	Status / Stream Location Applicable
pH Calibration Log / Instrument Serial #							**In Service Date:**			Calibration: Verify Daily
Date[1]	Time	Calibrator's Name	Standard ID[2] for ICAL / CCAL	Standard Known Value	Standard Found Value	Difference[3] from known > 5%? If yes, recalibrate	Recalibrated? NO	YES	Reading After Recalibration/ Final Check Reading	Status / Stream Location Applicable
Dissolved Oxygen Calibration Log / Instrument Serial #							**In Service Date:**			Calibration: Daily
Date[1]	Time	Calibrator's Name	Standard ID[2] for ICAL / CCAL	Standard Known Value	Standard Found Value	Difference[3] from known > 5%? If yes, recalibrate	Recalibrated? NO	YES	Reading After Recalibration/ Final Check Reading	Status / Stream Location Applicable

Notes: 1 - Frequency of Calibration check per manufacturer recommendation. See Manual / SOP Attachment B

2 - Standard ID associated with Initial calibration actions (ICAL); Cite ICAL standard source from Table 15.

2 - Standard ID associated with Continuing calibration or Periodic check actions (CCAL); Cite CCAL standard source from Table 15.

3 - Acceptance range for Field Instruments is per Manufacturer recommendations;

Figure 13: Field Instrument Calibration Form

Page 1 of __

FIELD INSTRUMENT CALIBRATION FORM
YSI Pro Plus Multi-Parameter Water Quality Meter

Control No.: CAK-YSI-01 **Project Name:** Coeur Alaska Kensington Gold Mine
Date: ____________
User: ____________

Planned Sample Locations and Additional Info:

____

____

CALIBRATION PROCEDURE BEFORE USE:

Do Not Calibrate in the Field - In-House Calibration Only by Field Equipment Tech.

Check when completed

Check kit contents;

- Meter ☐
- Cable w/ probes ☐
- Calibration cup, probe guard, probe sleeve ☐
- Calibration fluids ☐

Calibrate Meter using standard solutuions ☐

	Meter Reading	***Calibrated Reading***
• Ph 4 buffer	________	________
• Ph 7 buffer	________	________
• Ph 10 buffer	________	________
• Conductivity solution (solution value:__________)	________	________
• 100% D.O. calibration	________	________
• Barometer reading	________	________

Note:

Signature: ________________________________

Figure 14: Turbidity Calibration Logs / Instrument Serial # / In Service Date:

Signature:_________________			Calibration[1]: Every 3 months, Primary Formazin applied to Gelex Stnds. for Daily Checks.							
Date[2]	Time	Calibrator's Name	Standard ID[3] for ICAL / CCAL	Standard Known Value (NTU)	Standard Found Value	Difference[4] from known > 5%? If yes,	Recalibrated?		Reading After Recalibration/ Final Check Reading	Status / Stream Location Applicable
							No	Yes		

Notes: 1 - Frequency of Calibration check per manufacturer recommendation. Use Primary Formazin Standard materials only for in-house calibration [StablCal]. *Note – Do not use Gelex Standards for Calibration; Gelex are only to be used for verification checks*; See Manual / SOP Attachment B

2 – Record dates of Primary Formazin calibration in addition to Gelex daily verification.

3 - Standard ID associated with Initial calibration (Formazin) actions (ICAL); Cite ICAL standard source from Table 15.

3 - Standard ID associated with Continuing calibration (Gelex) or Periodic check actions (CCAL); Cite CCAL standard source from Table 15.

4 - Acceptance range for Field Instruments is per Manufacturer recommendations.

Figure 15: Turbidity Calibration Logs

FIELD INSTRUMENT CALIBRATION FORM METER, TURBIDITY (PORTABLE) HACH 2100P

Date:

User:

Do Not Calibrate in the Field - In-House Calibration Only by Field Staff

Check kit contents:

Check when completed

- Meter
- Low 0-10, medium 0-100, high 0-1000 standards
- Extra AA batteries
- Sample vials

Test and record Gelex standards:

Gelex Standard

Meter Reading

- Low 0-10
- Medium 0-100
- High 0-1000

Note: Condensation on outside of sample bottles affects meter readings.

Comments:

Figure 16: Standards Log

Standard	Manufacturer	Catalog Number	Lot Number	Date Received	Expiration Date

ATTACHMENTS

ATTACHMENT A

Distribution List, Contact Names, and Resources

Individual Role	Individual Name/ Email Address	Organization/ Address	Phone
Alaska Department of Environmental Conservation (ADEC) – Compliance Program Manager	Sharon Morgan sharon.morgan@alaska.gov	ADEC Environmental Conservation – Division of Water 410 Willoughby Ave. Suite 303 Juneau, AK 99801	907-465-5530
Alaska Department of Environmental Conservation (ADEC) – Environmental Engineer for Wastewater Discharge	Pete McGee william.mcgee@alaska.gov	ADEC Environmental Conservation – Division of Water 610 University Ave., Fairbanks, AK 99709	907-451-2141
Alaska Department of Environmental Conservation (ADEC) – Environmental Program Specialist	Andrea Hilbert andrea.hilbert@alaska.gov	ADEC Environmental Conservation – Division of Water 410 Willoughby Ave., STE 303 Juneau, AK 99801	907-465-5276
Alaska Department of Environmental Conservation (ADEC) – Water Quality Assurance Chemist	Douglas Kolwaite douglas.kolwaite@alaska.gov	ADEC Environmental Conservation – Division of Water 410 Willoughby Ave., STE 303 Juneau, AK 99801	907-465-5305
USDA Forest Service – Wilderness Ranger	Brad Orr	Juneau Ranger District	907-789-6244
Coeur Alaska, Inc. - Environmental Project Manager	Kevin Eppers keppers@coeur.com	Coeur Alaska - Kensington Gold Mine 3031 Clinton Dr., Suite 202 Juneau, AK 99801	907-523-3328 main 907-209-6805 cell
Coeur Alaska, Inc. - Environmental QA Officer	Peter Strow pstrow@coeur.com	Coeur Alaska - Kensington Gold Mine 3031 Clinton Dr., Suite 202 Juneau, AK 99801	907-523-3329 main
Coeur Alaska, Inc. - Water Treatment Plant Operators, Technicians, and Field Staff		Coeur Alaska - Kensington Gold Mine 3031 Clinton Dr., Suite 202 Juneau, AK 99801	907-523-3328 main
Coeur Alaska, Inc.		Coeur Alaska - Kensington Gold Mine 3031 Clinton Dr., Suite 202 Juneau, AK 99801	

Golder Associates Inc. Consultant Project Leader	Rens Verburg rens_verburg@golder.com	Golder Associates Inc. 18300 Union Hill Rd. Ste 200 Redmond, WA 98052	425-883-0777 206-316-5615 direct
Golder Associates Inc. Consultant Project Quality Assurance	Thomas Stapp tstapp@golder.com	Golder Associates Inc. 18300 Union Hill Rd. Ste 200 Redmond, WA 98052	425-883-0777 206-375-0642 cell
Golder Associates Inc. Consultant Data Management	Alyssa Neir	Golder Associates Inc. 18300 Union Hill Rd. Ste 200 Redmond, WA 98052	425-883-0777
Golder Associates Inc. Consultant Data Validation	Tom Stapp	Golder Associates Inc. 18300 Union Hill Rd. Ste 200 Redmond, WA 98052	425-883-0777
Water Chemistry Laboratory	David Wetzel	Admiralty Environmental 431 N. Franklin St., Suite 301 Juneau, AK 99801	907-463-4414 907-463-4415 main
Water Chemistry Laboratory	Jeff Coronado	ALS Environmental – 1317 S. 13th Ave. Kelso, WA 98626	360-577-7222
Toxicity Testing Laboratory	Jeff Coronado	ALS Environmental – Life Sciences Division 1317 S. 13th Ave. Kelso, WA 98626	360-501-3330
Toxicity Testing Laboratory	Chris Robason Christina Henderson	Bio Aquatic Testing 2501 Mays Rd., Suite 100 Carrollton, Texas	972-242-7750
Toxicity Testing Laboratory		ALS Kelso, Washington	360-501-3330

ATTACHMENT B

Standard Operating Procedures

Field pH Meters

Field Conductivity Meters

Field Turbidity Meters

In-Line Turbidity Meters

ATTACHMENT C

ALS Quality Assurance Manual