FORT KNOX GOLD MINE

MONITORING PLAN

Prepared by:

Fairbanks Gold Mining, Inc.
(A subsidiary of Kinross Gold Corporation)
PO Box 73726
Fairbanks, Alaska 99707-3726

Updated April 2026

CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

Appendix A	Baseline Water Quality Analysis
Appendix B	Quality Assurance Project Plan and Field Procedures Manual
Appendix C	Wildlife Mortality Reporting Form

ACRONYMS

AS	Alaska Statute
AAC	Alaska Administrative Code
ABA	Acid/Base accounting
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
BCHLF	Barnes Creek Heap Leach Facility
CIC	Carbon in Column
CIP	Carbon in Pulp
COE	United States Department of the Army Corps of Engineers
DEC	Alaska Department of Environmental Conservation
FGMI	Fairbanks Gold Mining
INCO	International Nickel Company
LCRS	Leachate Collection and Recovery System
MDL	Method Detection Level
mg/L	Milligrams per liter
ML	Minimum Level
MSHA	U.S. Department of Labor Mine Safety & Health Administration
MWMP	Meteoric Water Mobility Procedure
PCMS	Process Component Monitoring System
Pit Lake	The Main Pit approved as a treatment works for disposal of solid and liquids at Fort Knox
TSF	Fort Knox Tailings Storage Facility
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WCHLF	Walter Creek Heap Leach Facility
WQS	Alaska Water Quality Standards

1 INTRODUCTION

Fairbanks Gold Mining, Inc. (FGMI), a wholly owned subsidiary of Kinross Gold U.S.A., Inc., is submitting this updated monitoring plan for the Fort Knox Mine to the Alaska Department of Environmental Conservation (DEC) in accordance with Alaska Statute (AS) 46.03.0100, 18 Alaska Administrative Code (AAC) 60.005, 18 AAC 15.090 and 18 AAC 72.600. Concurrently, the plan is being submitted to the U.S. Army Corps of Engineers (COE) as required by Section 404 Permit Number 4-920574 Fish Creek 23.

The Fort Knox Mine and all operating and ancillary facilities are located on private land and legally filed and held State mining claims. The State mining claims are on land administered by Alaska Department of Natural Resources (ADNR). State Water Rights are held by FGMI for the entire upper drainage of Fish, Solo, and Last Chance creeks with the point of use identified as the water supply reservoir.

It is the goal of FGMI to operate the mine and milling processes at the Fort Knox Mine in a manner that will ensure zero discharge for the protection and enhancement of surface and groundwater quality. This monitoring plan assists FGMI in the establishment and refinement of operating procedures to ensure the long-term protection of State of Alaska land, wildlife, and water resources. Periodic updates of the monitoring plan will coincide with regulatory changes, five-year reviews, process modifications, or anomalies noted as a result of monitoring and sampling.

This monitoring plan is a part of the comprehensive environmental and operational management system for the Fort Knox Mine. The overall project and each process component have specific management plans, which dovetail with this monitoring plan. To minimize duplication of information and rationale for specific monitoring and sampling requirements the reviewer needs to reference the following management plans:

- Fort Knox Project Water Resources Management Plan, March 1994;
- Fort Knox Mine Tailing Storage Facility Operation and Maintenance Manual, Rev 10, April 2021;
- Fort Knox Mine Water Supply Dam & Reservoir Operation and Maintenance Manual, Rev 6, February 2020;
- Fort Knox Mine Reclamation & Closure Plan, R2, November 2013;
- Fort Knox Mine Reclamation & Closure Plan Amendment, March 2017;
- Fort Knox Mine Reclamation & Closure Plan Amendment 2, January 2018;
- Fort Knox Mine Reclamation & Closure Plan, January 2020;
- Fort Knox Mine Reclamation & Closure Plan Amendment 1, May 2021 ;
- Fort Knox Mine Reclamation & Closure Plan Amendment 2: Gil Project Addition, May 2021;
- Walter Creek Heap Leach Facility Project Description, January 2006;

- Walter Creek Heap Leach Facility Operations and Maintenance Manual Rev 17, February 2021;
- Barnes Creek Heap Leach Facility Project Description, December 2016;
- Barnes Creek Heap Leach Facility Operations and Maintenance Manual, Rev. 1 November 2020;
- Waste Management Permit for Fort Knox Mine, 2020DB0002, March 25, 2020;
- Fort Knox Mine Drinking Water Monitoring Plan PWSID#314093, July 2015; and
- Fort Knox Water Monitoring QA/QC and Field Procedures Manual, August 2019.

Access by Federal and State regulatory personnel to the Fort Knox Mine facilities for the purpose of inspecting for reclamation, wildlife mortalities, or other appropriate compliance areas are statutory/regulatory mandates and will be adhered to by FGMI, with the request that agents contact mine security to gain access. The health and safety of FGMI employees and that of regulatory personnel is the rationale for this request. Mining is regulated under the Mine Safety and Health Administration (MSHA), and their regulations require minimum training for employees and visitors for Hazard Recognition and Safety. Visitors, as well as employees, must wear safety equipment approved by MSHA. FGMI requests consideration by the regulatory agencies to conduct routine inspections during weekdays when administration and process managers are available to answer questions and, if necessary, accompany agents to different process components.

1.1 Applicant Information

Fairbanks Gold Mining, Inc.

A Subsidiary of Kinross Gold U.S.A., Inc.
P.O. Box 73726
Fairbanks, AK 99707-3726
Telephone: (907) 490-6175

Fairbanks Gold Mining, Inc. Officer Completing Application

Name: Shane Parrow
Title: Vice-President and General Manager, Alaska
Telephone: (907) 490-2279

Designated Contact Person

Name: Bartly Kleven
Title: Environmental Affairs Director, Alaska
Telephone: (907) 490-2207

Kinross Gold Corp. Information

Address: 25 York Street (17th Floor)
Toronto, Ontario
Canada, M5J 2V5
(416) 365-5123

President & Chief Executive Officer:	J. Paul Rollinson
Executive Vice President & Chief Operating Officer:	Claude Schimper
Executive Vice President & Chief Financial Officer:	Andrea Freeborough
External Relations & Chief Legal Officer:	Geoffrey Gold

Fairbanks Gold Mining, Inc. is a wholly owned subsidiary of Kinross Gold U.S.A., Inc.

Alaska Registered Agent

Name: Fairbanks Gold Mining, Inc.
Address: c/o United Agent Group, Inc. (Agent)
310 K ST #200
Anchorage, Alaska 99501

1.2 Site Description

The Fort Knox Mine is an open pit gold mine on the north flank of Gilmore Dome approximately 26-road miles northeast of Fairbanks, Alaska (Figure 1-1). Access to the Fort Knox Mine is via the Steese Highway, Twin Creek Road, and an access road. Fish Creek and its tributaries drain the project area.

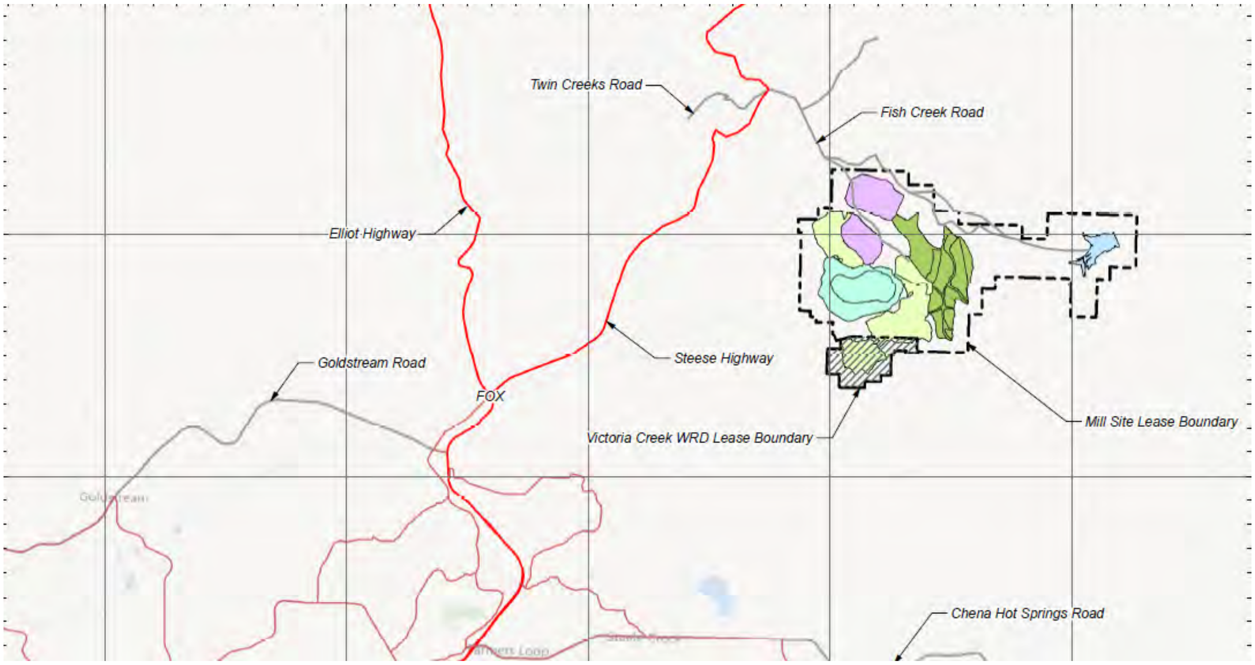


Figure 1-1 Site Location and Vicinity Map

The Fort Knox Mine runs 24 hours per day year-round and uses conventional open pit mining methods. The Fort Knox Mine produces between 250,000 to 350,000 ounces of gold per year.

The Fort Knox mill processes between 10,000 and 45,000 tons of ore per day. The beneficiation process starts by crushing the gold ore and adding water to create a slurry. The gold is extracted from the slurry in tanks using a cyanide solution that dissolves the gold. Next the gold is captured by activated carbon, then stripped from the carbon and recovered from solution by electrolysis. Once the gold is removed, the remaining slurry goes to the thickener that recovers a majority of the cyanide, other reagents, and heated water before the tailings slurry is released to the Tailing Storage Facility (TSF) or Pit Lake. The cyanide concentration in the tailings is maintained within permit limits using the INCO process when necessary. The INCO process combines the tailings slurry with sodium bisulfate, copper sulfate, and air, to destroy the cyanide. Tailings are piped to the TSF and Pit Lake from the mill and deposited sub-aerially using multiple discharge points.

The Walter Creek Heap Leach Facility (WCHLF) is located in the upper end of the Walter Creek drainage upstream from the TSF. The Barnes Creek Heap Leach Facility (BCHLF) is located in the upper end of the Barnes Creek drainage, upstream from the TSF. Both heap leach facilities at the Fort Knox Mine are approved treatment works per 18 AAC 70.990 (33) and not subject to Alaska water quality standards (WQS) in 18 AAC 70.010(c).

Ore for the heap leach consists of run-of-mine rock from the Fort Knox Pit and various stockpiles. The ore is characterized by relatively high permeability which promotes solution flow and drainage. An embankment in the downstream toe of the heap allows in-heap storage of process solution and storm water Following contact with the ore, the pregnant solution (cyanide/gold bearing solution) from the heap is piped to a Carbon in Column (CIC) circuit that captures the gold. The gold bearing carbon is then processed through existing facilities in the mill.

Tailings, the slurry from which gold has been extracted as part of the milling process, are deposited in either the TSF or the Pit Lake. The TSF, and the Pit Lake are approved for disposal of solid and liquid wastes and approved as treatment works per 18 AAC 70.990(33) and not subject to Alaska WQS) in 18 AAC 70.010(c).

The TSF dam is an earth-filled structure designed to hold all process water from the mill and surface runoff water. The TSF dam is designed and operated to contain the 100-year, 24-hour storm event in addition to the average 30-day spring breakup. The TSF is a treatment works and intended to contain levels of certain contaminants above drinking and/or aquatic water standards. Contaminant levels are maintained below toxic levels for avian and terrestrial wildlife species. Impoundment water is not discharged but is recycled to the mill for reuse in the beneficiation process of the gold ore.

In November 2006, FGMI discovered a small seep just below the downstream toe of the dam on the south abutment. Since that time, FGMI has taken numerous steps to explore and address this issue, in conjunction with state and federal agencies. From the time the seep was discovered until the update of this report, extensive sampling has indicated that no process water has escaped FGMI's containment system. Down-gradient groundwater and wetland areas continue to be free from cyanide.

To ensure zero discharge, a seepage control system located at the toe of the dam collects subsurface flow and returns it to the tailing impoundment. A series of twenty-one groundwater interceptor wells (designated as IW-1, IW-2, IW-3, IW-5, IW-6, IW-7, IW-8, IW-11, IW-13, IW-14, IW-16, IW-17, IW-18, IW24-19, IW24-20, IW24-21, IW24-22, IW24-23, MW-1, MW-3, and 401) along with Sites 501 and 801 are located down gradient of the seepage control system. These wells collect a combination of groundwater and seepage. Well production is pumped either to the tailing seepage sump and subsequently to the tailing impoundment, or to the RO2 Water Treatment Plant and discharged into the North Channel, authorized by the APDES Permit dated April 30, 2018. Three additional groundwater monitoring wells are installed downstream of the interceptor wells to monitor water quality. They are designated as MW-5, MW-6, and MW-7. Six new groundwater monitoring wells were installed during the summer of 2017 between the interceptor wells and MW-5, MW-6, and MW-7. Water quality sampling began in fourth quarter of 2017. These new wells are designated PMW-1 through PMW-6.

A fresh water supply reservoir is located on Fish Creek three miles below the tailing dam. Fresh water can be supplied from the reservoir to the mill for mixing reagents, gland water, and make-up water for the milling process when necessary. Currently no water from the reservoir is being withdrawn for use in the mill.

1.3 Objectives

Baseline monitoring for the Fort Knox Mine was started in 1989 and continued throughout the permitting process. The objective of baseline monitoring was to collect data that described the pre-mining surface water and groundwater quality in the project area. These data were used to determine the potential impacts caused by development and operation of the Fort Knox Mine. Construction of the mine commenced in the spring of 1995, and the first doré bar was poured in December 1996. Compliance monitoring was initiated on November 14, 1996, when mill operations commenced. The objective of compliance monitoring is to ensure that the Fort Knox Mine operates within permit limitations minimizing impact to the environment.

2 REGULATORY FRAMEWORK

This monitoring plan has been developed to meet the requirements of Title 18 Chapters 60 and 70 of the AAC. Specifically, this document follows the guidelines set forth in Article 7 of 18.AAC.60; Monitoring and Corrective Action Requirements (Title 18 Chapter 60 Section 800-860) with the objective of meeting the requirements of 18 AAC 70.

Fort Knox operates the TSF under the Waste Management Permit # 2020DB0002. The permit is subject to the surface water and groundwater monitoring requirements of 18.AAC.60.810 and 18.AAC.60.825, respectively. A summary of the relevant portions of these regulations is provided below.

2.1 Surface Water Monitoring

Per 18.AAC.60.810 (a-g) the surface water monitoring program reflects the following requirements:

- 18.AAC.60.810(b) The points of compliance have been chosen so that highest concentrations of hazardous constituents migrating off the facility will be detected and so that interference from sources of pollution unrelated to the facility's waste management operations will be minimized;
- The criteria of 18.AAC.60.825(c) specifically applicable to surface water including;
    - o 4(B) the volume and physical and chemical characteristics of the leachate; and

    - 4(F) the existing quality of the groundwater, including other sources of pollution and their cumulative effects on the groundwater, and whether the groundwater is used or might reasonably be expected to be used for drinking water.
- 18. AAC.60.810 (d) Monitoring parameters have been selected that are indicative of the type of hazardous constituents associated with the type of waste handled at the facility.

The surface water monitoring program reflects these regulations in the following manner:

- The compliance points are located to ensure detection of changes in water quality and minimize the influence of historical mining activities;
- A set of indicator parameters has been established that reflects the composition of the decant water in the TSF;
- A compliance monitoring and reporting program based on indicator parameters has been defined to reflect the composition of the decant water and site-specific background water quality; and
- Tolerance intervals have been established for selected parameters to identify if statistically significant increases occur over background conditions.

2.2 Groundwater Monitoring

The groundwater monitoring program reflects the following components of 18 AAC 60 and 18 AAC 70:

- 18 AAC.60.825 (a-e) The monitoring system has been designed to meet the requirements in terms of location, design, local hydrogeologic conditions, facility design, the ability to detect potential releases and local physiographic constraints;
- 18 AAC.60.825 (a1B) Sampling at other wells will provide an indication of background groundwater quality that is at least as representative as that provided by up gradient wells;
- 18 AAC.60.825 (c) Has established relevant points of compliance which reflect local hydrogeologic conditions, the volume and physical and chemical characteristics of the leachate (i.e. decant water), the existing quality of the groundwater, including other sources of pollution and their cumulative effects on the groundwater, and whether the groundwater is used or might reasonably be expected to be used for drinking water; and
- 18 AAC 60.830 A compliance monitoring and reporting program based on indicator parameters has been defined to reflect the composition of the decant water and site-specific background water quality.

Similar to the surface water monitoring program, the groundwater monitoring program reflects these regulations in the following manner:

- The compliance wells are located to ensure detection of changes in water quality and minimize the influence of historical mining activities;
- A set of indicator parameters has been established that reflects the composition of the decant water in the TSF;
- Appropriate tolerance levels have been established for parameters to appropriately reflect background conditions and allow detection of statistically significant increases; and
- A compliance program and indicator parameters have been defined to reflect the composition of the decant water and site-specific background water quality.

For surface water and groundwater, the indicator parameters have been selected to provide definitive evidence if the TSF ceases to function as a zero-discharge facility. They reflect parameters which are relatively conservative and at significantly higher concentrations in the decant pond relative to ambient downgradient water.

2.3 Background Conditions

Before depositing any waste in the TSF, Fort Knox collected baseline water quality data in the Fish Creek Drainage from 1989 through 1995. In the area downstream of the TSF, which was disturbed before 1989 by placer mining, the baseline period identified several parameters in both surface and ground water with concentrations exceeding Alaska Water Quality Standards. DEC recognizes and acknowledges that concentrations of iron and manganese were elevated within the Fish Creek drainage after placer mining and before Fort Knox operations. Appendix A presents an analysis of the baseline data.

Due to their elevated concentrations below the TSF prior to mine operations, iron and manganese were specifically excluded from the suite of parameters chosen to indicate seepage and compliance with the mine’s zero discharge requirements. This is consistent with the need to minimize the interference of conditions unrelated to the mining operation relative to the effectiveness of the monitoring plan.

2.4 Mill and Tailing Facilities Process Fluids

Process fluids are any liquids including meteoric waters, which are intentionally or unintentionally introduced into any portion of the beneficiation process. All process fluids are controlled under the fluid management system, which consists of the following components:

- Mill/heap leach/process recovery plant including but not limited to all existing tanks, basins, sumps, pumps and piping necessary to interconnect the components that contain process fluid within this plant;

- Tailing impoundment, the main embankment (all phased lifts), tailing discharge lines, seepage collection within the main embankment, and the recycling system to return all seepage flows to the tailing basin;
- Interceptor wells to recover seepage that bypasses the reclaim system in the embankment toe and groundwater; and
- Monitoring wells down gradient to assure interceptor system is performing as designed.

The process fluid monitoring network includes the following:

- Tailing at Mill (post cyanide detox);
- Tailing Liquor (filtrate);
- Tailing Solids;
- Tailing Decant Solution;
- Tailing Seepage Reclaim;
- Site's 501 & 801;
- Interceptor Wells (IW-1, IW-2, IW-3, IW-5, IW-6, IW-7, IW-8, IW-11, IW-14, IW-16, IW-17, IW-18, IW24-19, IW24-20, IW24-21, IW-24-21, IW-24-22, IW-24-23, MW-1, MW-3, and Site 401); and
- Pre-monitoring Wells (PMW-1, PMW-2, PMW-3, PMW-4, PMW-5, and PMW-6)
- Compliance Monitoring Wells (MW-5, MW-6, and MW-7).

The location for these points is illustrated on Figure 3-1 (Note tailing solids and liquor are sampled in the plant).

2.5 Heap Leach Process Fluids

The *Walter Creek Heap Leach Facility Project Description* (FGMI, 2006) has a complete description of the various process components associated with the WCHLF. Please refer to this document for more in-depth explanations of the heap and ancillary facilities.

The WCHLF monitoring network includes:

- Leak detection monitoring in the Leachate Collection and Recovery System (LCRS) and Process Component Monitoring System (PCMS) sumps;
- Heap underdrain monitoring wells at the base platform, the bench of the in-heap storage pond embankment, and the crest of the in-heap storage pond embankment; and
- Monitoring well at the old batch plant (OL-296).

The *Barnes Creek Heap Leach Facility Project Description* (FGMI, 2016) has a complete description of the various process components associated with the heap leach. Please refer to this document for more in-depth explanations of the BCHLF and ancillary facilities.

The BCHLF monitoring network includes:

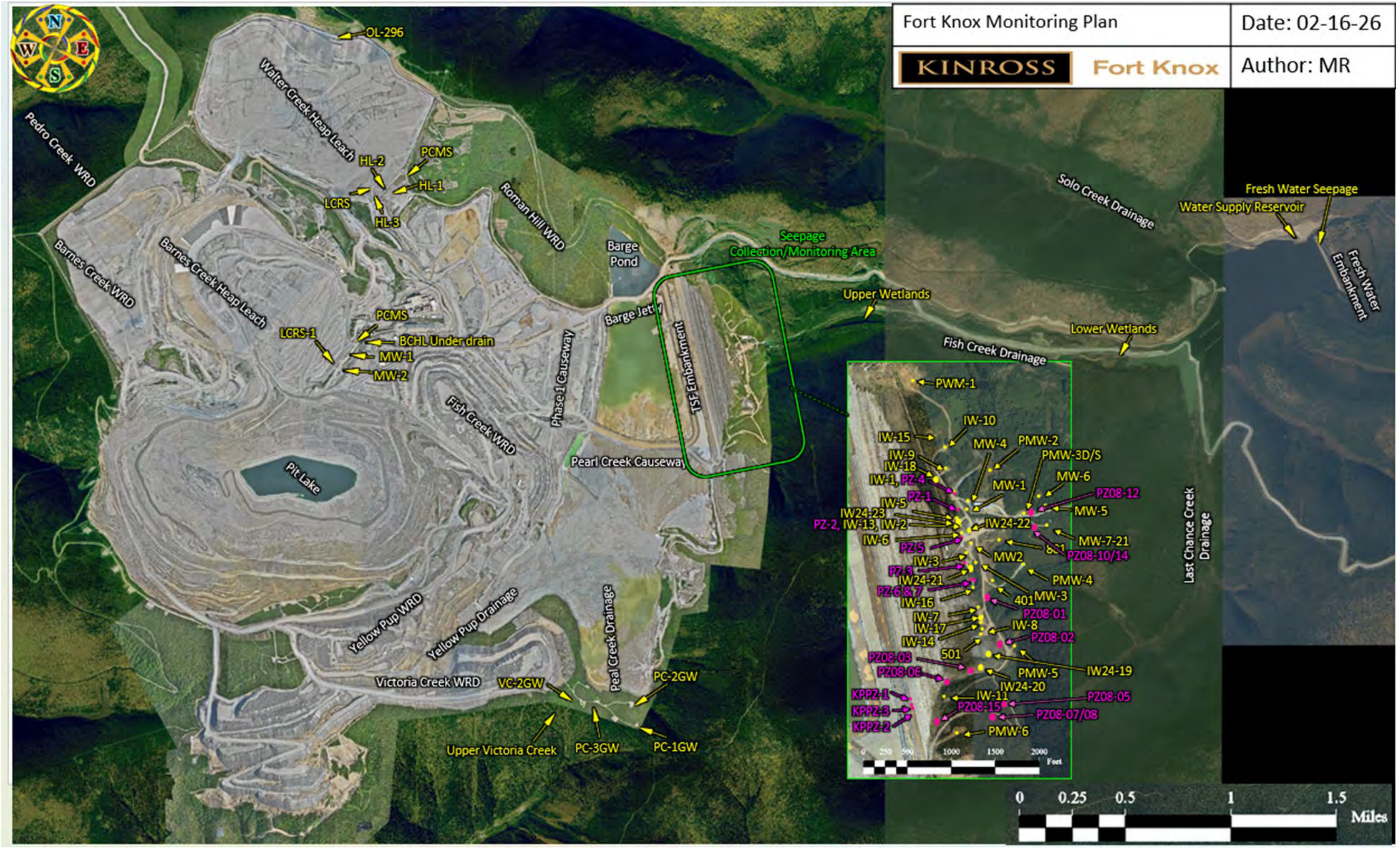
- Leak detection monitoring in the LCRS and PCMS sumps; and
- Heap underdrain system consisting of two monitoring wells in the locations shown in Figure 5-1.

2.6 Developed Wetlands and Water Supply Reservoir

The monitoring network employed for the developed wetlands and water supply reservoir includes:

- Upper wetlands;
- Lower wetlands;
- Water supply reservoir; and
- Freshwater reservoir seepage.

Figure 2-1: Locations of Monitoring Points



3 INDICATOR PARAMETERS AND TOLERANCE LEVELS

The Fort Knox TSF functions as a zero discharge facility. All contact water is captured within the facility either through surface water controls or the groundwater interception system. The purpose of the indicator parameter monitoring and reporting is to confirm that the TSF continues to function as a zero discharge facility. The indicator parameters represent constituents present in the decant pond that are at concentrations significantly higher than the downgradient surface water and groundwater. The parameters are relatively conservative in the environment and provide unambiguous data regarding the performance of the controls responsible for maintaining zero discharge.

3.1 Decant Water Composition

Decant water is characterized by high pH, high total dissolved solids, elevated concentrations of nitrogen and trace metals. Decant water is predominantly alkaline, with a pH range between seven and ten, and an average of 8.4. When plotted on a tri-linear diagram, most decant water samples are of the calcium-sodium/sulfate type (Table 3-1).

A number of parameters are found in high concentrations, which contributes to high total dissolved solids concentrations (average of 796 milligrams per liter (mg/L)). The most common constituents are sulfate (average concentration 359.2 mg/L), calcium (average concentration 120.3 mg/L), and sodium (average concentration 85.86 mg/L). Trace constituents include relatively high levels of iron, cyanide, Weak Acid-Dissociable (WAD) cyanide, antimony, arsenic, manganese, and barium. Full descriptive statistics can be found in Table 3-1.

3.2 Indicator Parameters

Indicator parameters were selected as those most likely to give an unambiguous chemical signature at monitoring locations in the event of a release from the tailing storage facility. Parameters were selected which showed a clear difference in concentration between decant waters and waters naturally found at monitoring locations. In selecting parameters, preference was also given to relatively conservative ions to reduce the possibility that these parameters would attenuate through chemical processes between the time of a possible release and when the constituents would arrive at the monitoring locations.

Based on these criteria, chloride, sulfate, nitrate, arsenic, cadmium, cyanide, nitrite, nitrogen as ammonia, and WAD cyanide were selected as indicator parameters. These parameters show significant differences in concentration between decant and ambient downgradient water (Table 3-2). These parameters are all conservative, and those most likely to undergo chemical reactions (ammonia, nitrate, nitrite, cyanide, and WAD cyanide), are also likely to yield another of those parameters as a product, which will still indicate a potential discharge.

Table 3-1 Summary Statistics for Tailings Pond Decant Water

Variable	Number of		Fraction	Statistics Calculated Using Detected Observations Only (mg/L)				
	Detections	Non-Detects	Non-Detects	Minimum	Maximum	Mean	Median	Standard Deviation
Lab pH	41	0	0.00%	7	10	8.376	8.2	0.601
TDS	41	0	0.00%	180	1170	795.6	803	194.9
TSS	32	9	21.95%	1.2	175	25.98	21.5	29.7
Ca	59	0	0.00%	18	233	120.3	118	39.97
Mg	59	0	0.00%	0.94	12.7	5.809	5.6	2.131
Na	59	0	0.00%	8.6	119	85.86	88.5	21.76
K	59	0	0.00%	3.8	34.6	15.41	15.1	4.823
SI	59	0	0.00%	4	36.2	6.613	5.7	4.17
CL	41	0	0.00%	0.83	92	34.31	29.8	19.23
SO4	41	0	0.00%	5.33	637	359.2	353	133.8
NO3	41	0	0.00%	0.5	20.6	9.013	7.9	4.994
F	35	6	14.63%	0.1	1	0.395	0.36	0.162
Fe	46	13	22.03%	0.03	5.15	0.533	0.38	0.783
Mn	58	1	1.69%	0.008	0.307	0.062	0.0435	0.0521
As	58	1	1.69%	6.00E-03	1.09	0.326	4.00E-02	0.393
Cd	8	51	86.44%	5.00E-04	0.009	0.0027	7.35E-04	0.00378

Table 3-1 (continued): Summary Statistics for Tailings Pond Decant Water

Variable	Number of		Fraction	Statistics Calculated Using Detected Observations Only (mg/L)				
	Detections	Non-Detects	Non-Detects	Minimum	Maximum	Mean	Median	Standard Deviation
Cn	38	3	7.32%	2.00E-02	3.8	0.828	2.50E-01	1.057
Cr	3	56	94.92%	3.00E-04	0.05	0.0169	4.00E-04	0.0287
Cu	59	0	0.00%	3.00E-02	3.04	0.88	0.447	0.933
	11	48	81.36%	1.00E-04	0.012	0.0035	0.003	0.0032
Zn	19	40	67.80%	0.002	0.04	0.0159	0.01	0.0107
NO2	39	2	4.88%	1.00E-01	13.8	1.889	0.93	2.64
Ag	2	57	96.61%	2.00E-04	0.01	0.0051	0.0051	0.00693
Ba	59	0	0.00%	0.016	0.194	0.0357	0.032	0.0226
BI	0	59	100.00%	N/A	N/A	N/A	N/A	N/A
Hg	0	59	100.00%	N/A	N/A	N/A	N/A	N/A
Sb	47	12	20.34%	0.002	2.42	0.796	0.545	0.804
Se	33	26	44.07%	0.006	0.065	0.0261	0.023	0.0153
Nitrogen(as Ammonia)	39	2	4.88%	4.4	50.1	18.9	15.9	11.46
WAD Cyanide	38	3	7.32%	0.01	2.6	0.566	0.14	0.765
Total Alkalinity	41	0	0.00%	37	92	61.04	59	14.05
Bicarbonate Alkalinity	40	1	2.44%	5	86	51.37	53	20.43
PO4	25	17	40.48%	0.01	0.44	0.162	0.12	0.136

Table 3-2: Summary Statistics for Indicator Parameters in Decant and Monitoring Location Waters

		Number of		Proportion	Statistics Calculated Using Detected Observations Only (mg/L)				
	Variable	Detections	Non-Detects	Non-Detects	Minimum	Maximum	Mean	Median	SD
Decant Water	CL	41	0	0.00%	0.83	92	34.31	29.8	19.23
	SO4	41	0	0.00%	5.33	637	359.2	353	133.8
	NO3	41	0	0.00%	0.5	20.6	9.013	7.9	4.994
	AS	58	1	1.69%	6.00E-03	1.09	0.326	4.00E-02	0.393
	CD	8	51	86.44%	5.00E-04	0.009	0.00268	7.35E-04	0.00378
	CN	38	3	7.32%	2.00E-02	3.8	0.828	2.50E-01	1.057
	NO2	39	2	4.88%	1.00E-01	13.8	1.889	0.93	2.64
	Nitrogen (as Ammonia)	39	2	4.88%	4.4	50.1	18.9	15.9	11.46
	WAD Cyanide	38	3	7.32%	0.01	2.6	0.566	0.14	0.765
Groundwater Sites	CL	55	50	47.62%	0.7	26	2.941	2	4.961
	SO4	74	31	29.52%	0.39	910	31.65	18.5	105.1
	NO3	12	91	88.35%	0.01	13	2.28	0.09	4.243
	AS	45	92	67.15%	5.00E-04	0.0031	0.00128	0.0012	6.18E-04
	CD	2	136	98.55%	3.00E-04	6.00E-04	4.50E-04	4.50E-04	2.12E-04
	CN	4	102	96.23%	0.007	0.235	0.107	0.0935	0.115
	NO2	5	93	94.90%	0.01	0.12	0.046	0.02	0.0456
	Nitrogen (as Ammonia)	41	65	61.32%	0.05	0.43	0.13	0.1	0.0849
	WAD Cyanide	4	102	96.23%	0.011	0.091	0.0393	0.0275	0.0368

Table 3-2: (continued) Summary Statistics for Indicator Parameters in Decant and Monitoring Location Waters

		Number of		Proportion	Statistics Calculated Using Detected Observations Only (mg/L)				
	Variable	**Detections**	**Non-Detects**	**Non-Detects**	**Minimum**	**Maximum**	**Mean**	**Median**	**SD**
Surface Water Sites	CL	4	62	93.94%	0.7	1.7	0.975	0.75	0.486
	SO4	69	0	0.00%	1	58	16.77	15	10.78
	NO3	28	41	59.42%	0.02	1.6	0.331	0.205	0.402
	AS	8	61	88.41%	0.003	0.0437	0.0158	0.01	0.0145
	CD	0	69	100.00%	N/A	N/A	N/A	N/A	N/A
	CN	0	69	100.00%	N/A	N/A	N/A	N/A	N/A
	NO2	3	66	95.65%	0.04	0.95	0.357	0.08	0.514
	Nitrogen (as Ammonia)	45	24	34.78%	0.05	1.7	0.279	0.17	0.326
	WAD Cyanide	0	69	100.00%	N/A	N/A	N/A	N/A	N/A

Surface water sites include Upper and Lower developed wetlands
Groundwater sites include monitoring wells MW-5, MW-6, and MW-7
Decant water is collected at the barge (Barge Pond)

3.3 Tolerance Limits

A number of methods are available to detect statistically significant deviations from baseline water quality. Among these methods, tolerance intervals have already been established as an acceptable method of detecting deviations from baseline conditions at the Fort Knox site in the Baseline Water Quality Analysis Memo (Appendix A). Appendix A contains explanations and references for tolerance interval techniques, along with citations for the ProUCL 4.0 software used to calculate tolerance limits and other statistics.

Before calculating tolerance limits, monitoring locations were divided into groups where necessary. This prevents inappropriately applying the same upper tolerance limits to monitoring locations with different water chemistries. Differences were identified using a non-parametric method suitable for identifying differences between site chemistries (Gehan test). The Gehan test was selected over other methods because it is effective even when considering a high proportion of non-detected observations and multiple detection limits as are found in the monitoring location data for the indicator parameters (ProUCL Version 4.0 Technical Guide, 2007).

The results of the Gehan tests found that both surface water sites (Upper Wetlands and Lower Wetlands) belonged to the same group. The groundwater monitoring locations were segregated into one group containing MW-5 & MW-6, and one grouping encompassing MW-7. This result confirms results of other analyses such as water typing using tri-linear diagrams, which also show that MW-7 has a distinct chemistry relative to the other monitoring wells (Table 3-3).

Upper tolerance limits with 95 percent coverage and 95 percent confidence were calculated for each group of monitoring locations using non-parametric methods, which were selected because of the high percentage of non-detected data (for a fuller explanation of the tolerance interval approach, consult Appendix A). Tolerance limits were computed using dissolved concentrations for groundwater sites and total concentrations for surface water sites. For parameters with no observations above the detection, the detection limit was used to define the upper tolerance limit. Results are summarized in Table 3-3 and Table 3-4.

Table 3-3: Upper Tolerance Limits for Groundwater Monitoring Locations

Indicator Parameter	MW-5, MW-6 Upper tolerance limit* (mg/L)	MW-7 Upper tolerance limit* (mg/L)
As	0.005	0.002
Cu	0.02	0.02
Sb	0.002	0.0155
Cl	17	26
CN WAD	0.05	0.05
NO2	1	1
NO3	3.87	13
NH4	0.33	0.36
SO4	70	910

**Dissolved concentrations*
Note: If the minimum level (ML) for any indicator parameter is greater than the calculated tolerance limit, the ML will be adopted as the tolerance limit.

Table 3-4: Upper Tolerance Limits for Surface Water Monitoring Locations

Parameter:	Upper and Lower Wetlands Upper tolerance limit*(mg/L)
As	0.0437
Cu	0.01
Cl	2.5
CN WAD	0.05
NO2	1
NO3	1.4
NH4	1.1
Sb	0.005
SO4	53

** Total concentrations*
Note: If the ML for any indicator parameter is greater than the calculated tolerance limit, the ML will be adopted as the tolerance limit.

Other parameters will continue to be monitored as set forth in Sections 5 and 6. For wells and surface waters down gradient of the facility, monitoring of parameters other than indicator parameters is to provide continuing reference data for overall water quality within the system, rather than for compliance purposes.

4 ANALYTICAL PROFILES

The current analytical profiles used for surface water, groundwater, and organic parameters are summarized in Tables 4-1 and 4-2. Analytical methods are all United States Environmental Protection Agency (USEPA) and State approved. Baseline samples were analyzed for organic parameters only once. The results were below detection for all parameters and the analysis was not repeated.

Table 4-1: Analytical Profile I - Surface Water Inorganic Parameters

Major ion chemistry	**Minor ion chemistry**	**Trace ion chemistry**
Lab pH	* Arsenic	* Antimony
Lab Conductivity	Cyanide	* Aluminum
Temperature (field)	Total	* Barium
Turbidity	WAD	* Bismuth
Settleable Solids	Fluoride	* Cadmium
Total Suspended Solids	*Iron	* Chromium
Total Dissolved Solids	* Manganese	* Copper
* Calcium	Nitrogen, Ammonia	* Lead
* Magnesium	Nitrate as Nitrogen	* Mercury
* Potassium	Nitrite as Nitrogen	* Nickel
* Silicon	Total Phosphorus	* Selenium
* Sodium	TPH	* Silver
Chloride		* Zinc
Sulfate		
Alkalinity (as CaCO3)		
Bicarbonate		
Total Hardness		

** Total recoverable*

Table 4-2: Analytical Profile II - Groundwater Inorganic Parameters

Major ion chemistry	Minor ion chemistry	Trace ion chemistry
Lab pH	* Arsenic	* Antimony
Lab Conductivity	Cyanide	* Aluminum
Temperature (field)	Total	* Barium
Turbidity	WAD	* Bismuth
Total Suspended Solids	Fluoride	* Cadmium
Total Dissolved Solids	*Iron	* Chromium
* Calcium	* Manganese	* Copper
* Magnesium	Nitrogen, Ammonia	* Lead
* Potassium	Nitrate as Nitrogen	* Mercury
* Silicon	Nitrite as Nitrogen	* Nickel
* Sodium	Total Phosphorus	* Selenium
Chloride	Sulfide	* Silver
Sulfate		* Zinc
Alkalinity (as CaCO3)		
Bicarbonate		
Total Hardness		

**Dissolved*

On August 15, 2003 FGMI received approval from DEC to reduce the water quality analysis for both Profile I and Profile II for Fort Knox. Approval was given to conduct analyses for dissolved constituents in groundwater samples and to conduct total recoverable analyses in surface water samples. Previously, analyses were performed for both total recoverable and dissolved constituents for both profiles.

5 COMPLIANCE MONITORING AND SAMPLING

5.1 Mill and Tailing Facilities Process Fluids

Monitoring requirements for the fluid management system associated with the Mill and Tailing Facilities are shown in Tables 5-1 and 5-2. Analytical profiles were described in Section 4.

Table 5-1: Monitoring Requirements for TSF Tailings

Identification	Parameter	Frequency
Tailing at Mill (post cyanide detox)	pH and WAD CN	Two per day
Tailing Liquor (filtrate)	Profile I	Quarterly
Tailing Solids at Mill (post cyanide detox)	Profile II/MWM	
	Acid/Base Accounting	Quarterly
Tailing Decant Solution (Barge Pond)	Profile I	Quarterly
MW-2	Profile I	Quarterly
Tailing Seepage Reclaim	Profile I	Quarterly
Tailing Seepage Monitoring Graphs		Quarterly
Interceptor Wells[1]	Profile II	Quarterly
Compliance Monitoring Wells[2]	Profile II	Quarterly
	Static Water Depth	Weekly

Table 5-2: Monitoring Requirements for Pit Tailings

Identification	Parameter	Frequency
Tailing at Mill (post cyanide detox)	pH and WAD CN	Two per day
Tailing Liquor (filtrate)	Profile I	Quarterly
Tailing Solids at Mill (post cyanide detox)	Profile II/MWM	
	Acid/Base Accounting	Quarterly
Tailing Decant Solution	Profile I	Quarterly
(Barge Pond)	Profile I	Quarterly

Results of analysis for the two samples per day collected from the mill tailings at the post cyanide detox point are recorded on the mill operations log and available for review. Mill tailing samples are drawn at two-hour intervals on each of the two 12-hour shifts. The sample analyzed and reported represents a composite of the six, two-hour interval, post cyanide detox, samples collected during each shift. The information is summarized in the quarterly report indicating maximum, minimum, and average pH/WAD cyanide readings for the quarter.

Individual parameters may be reduced after additional sampling. The criteria for reducing parameters will be based on consistent results of analysis below the detection limit and the potential for changes that could result in water quality concerns.

Tailings seepage is monitored for parameters in the ore (Fort Knox and the Gil satellite pits) and process reagents. Manh Choh tailings do not report the TSF and are disposed of in the Pit Lake only. Tailings seepage monitoring is reported graphically in quarterly reports. Separate graphs for antimony, arsenic, cadmium, copper, mercury, and WAD cyanide are provided. These graphs start in January 2005 and denote the date when Gil ore and Manh Choh ore processing commenced. Antimony, arsenic, cadmium, copper, and mercury are enriched in the Gil ore, and these graphs serve to demarcate any changes to the tailings seepage resulting from processing of the Gil ore. WAD cyanide is included as metallurgical testing indicates that more cyanide is required to process the Gil ore.

5.2 Heap Leach Process Fluids

Table 5-3 summarizes the monitoring requirements for the WCHLF. Monitoring is required for the heap leach LCRS and PCMS and the underdrain system due to their potential to be affected by process fluids. The LCRS and the PCMS are checked for flow weekly, and if fluid is present a monthly sample will be analyzed for WAD CN and pH. The underdrain system is sampled quarterly. Underdrain system samples are analyzed using the Profile II list of analytes (Table 4-2). The pregnant solution is also sampled quarterly and analyzed for WAD CN and pH. The elevation of the in-heap storage pond is monitored and controlled automatically.

Table 5-3: Summary of WCHLF Monitoring Requirements

Identification	Parameter	Frequency
LCRS	WAD CN/pH	Monthly
PCMS	WAD CN/pH	Monthly
Underdrain – HL1, HL2, HL3	Profile II	Quarterly
Pregnant Solution	WAD CN/pH	Quarterly
In-Heap Storage Pond	Elevation	Continuous Automatic Monitoring

Required monitoring locations for WCHLF discharges include:

- Heap water to the TSF;
- Leak detection monitoring in the LCRS; and PCMS sumps; and
- heap underdrain system consisting of three monitoring wells in the following locations:
    - the base platform;
    - the bench of the in-heap storage pond embankment; and
    - the crest of the in-heap storage pond embankment.

The old batch plant well (OL296) is also sampled as part of the WCHLF discharge monitoring program.

Table 5-4 summarizes the monitoring requirements for the BCHLF. Monitoring is required for the BCHLF LCRS and PCMS and the underdrain system due to their potential to be affected by process fluids. The LCRS and the PCMS are checked for flow weekly, and if fluid is present a monthly sample will be analyzed for WAD CN and pH. The underdrain system is sampled quarterly. Underdrain system samples are analyzed using the Profile II list of analytes (Table 4-2). The pregnant solution is sampled quarterly and analyzed for WAD CN and pH. The elevation of the in-heap storage pond is monitored and controlled automatically.

Table 5-3 Summary of BCHLF Monitoring Requirements

Identification	Parameter	Frequency
LCRS	WAD CN/pH	Monthly
PCMS	WAD CN/pH	Monthly
Under drain – BCMW-01, BCMW-02	Profile II	Quarterly
Pregnant Solution	WAD CN/pH	Quarterly
In-Heap Storage Pond	Elevation	Continuous Automatic Monitoring

Required monitoring locations for BCHLF discharges include:

- Heap water to the TSF;
- Leak detection monitoring in the LCRS and PCMS sumps; and
- Heap underdrain system consisting of two monitoring wells in the locations shown on Figure 2-1.

If WAD cyanide concentration above 10 mg/L is detected in the heaps' PCMS sumps, then all sump water must remain contained within heap leach system. The DEC must be notified within one working day of discovery.

If WAD cyanide concentration above 0.2 mg/L is detected in the heaps' underdrain systems, the permittee must notify DEC within one working day of discovery. Then, the permittee must demonstrate to the department's satisfaction that all water reports to the TSF.

The specific Method Detection Level (MDL) and Minimum Level (ML) for WAD cyanide concentration values between the MDL and ML provide a margin of safety indicating increasing trends prior to any exceedances. Based on the rate and magnitude of a trend, DEC may require corrective action. When an MDL is exceeded, the permittee shall verbally notify DEC within 60 days of the end of the calendar quarter when it occurred and provide written notification within 7 days of verbal notice.

FGMI conducts periodic audits for the purpose of reviewing performance under this permit and approvals, and the agencies' regulatory oversight of such performance, and to aid in updating the Reclamation and Closure Plan and associated closure and post closure monitoring cost estimate. The last third-party facility audit was conducted in 2024, and the revised final audit report was provided to the ADNR, Office of Project Management & Permitting on December 19, 2024.

The WCHLF and BCHLF will be closed before the TSF and Pit Lake are closed. Until closure of the TSF, any surface, groundwater, heap process water, and any other water originating from Walter Creek Valley and Barnes Creek Valley must meet the following requirements; the tailing waste slurry will be neutralized to contain a monthly average of 10 mg/L or less of WAD cyanide. The maximum concentration of WAD cyanide in the slurry discharge will be 25 mg/L. These discharge limits will be changed in accordance with Waste Management Permit No. 2020DB0002.

5.3 Developed Wetlands, Water Supply Reservoir, and Victoria Creek

The monitoring requirements for the developed wetlands, water supply reservoir, and Victoria Creek are summarized in Table 5-4 and Table 5-5. Individual parameters may be reduced after additional sampling. The criteria for reducing parameters will be based on consistent results of analysis below the detection limit and the potential for changes that could result in water quality concerns.

Table 5-4 Developed Wetlands and Water Supply Reservoir

Identification	Parameter	Frequency
Upper developed wetlands	Profile I	Quarterly
Lower developed wetlands	Profile I	Quarterly
Water supply reservoir	Profile I	Quarterly
Surface water below the water supply reservoir (Freshwater Seepage)	Profile I	Quarterly

Table 5-5 Victoria Creek Monitoring Wells and Surface Water Sites

Identification	**Parameter**	**Frequency**
Monitoring Wells		
PC-1GW, PC-2GW, PC-3GW, VC–2GW	Profile II	Quarterly[1]
Surface Sites		
Upper Victoria Creek	Profile I	Quarterly

5.4 Characterization of Acid Generation Potential

Annual characterization of overburden/topsoil, B-stockpile, waste rock, and ore will continue over the life of the mine. Collection of representative samples will be based on annual operational and geological records identifying materials mined. Meteoric Water Mobility Procedure (MWMP) and acid/base accounting (ABA) will be performed on the samples. If ABA results show less than a 3 to 1 ratio of net neutralization potential to net acid generation, kinetic testing (12-week humidity cell testing) will be completed.

Tailing solids are submitted quarterly for ABA and MWMP analysis. If these test results indicate less than 3 to 1 net neutralization potential, a 12-week humidity cell test will be completed. MWMP testing will also be performed on the tailings solids, using Profile II analysis.

5.5 Solid Waste Landfill Monitoring

Inert construction and demolition materials from the mine and mill operations will be disposed of in the solid waste landfill trenches in accordance with the Fort Knox Waste

Management Permit 2020DB0002. For a more detailed discussion of permit requirements please refer to the Fort Knox Mine Solid Waste Management Plan. Since materials disposed of within the landfill trenches are inert, the potential for leachate is minimal. Furthermore landfill trenches will be located at least one hundred feet from any surface water body, greater than two hundred feet from any surface drinking water source and all surface water runoff will be diverted away or around landfill trenches to minimize infiltration. Additionally, trench bottoms will be located more than ten feet above existing or expected future groundwater table. Therefore, no special groundwater or surface water monitoring is planned.

Weekly visual inspections will ensure that landfill trenches are being operated properly and in compliance with the Fort Knox Waste Management Permit 2020DB0002. A summary of monitoring requirements for an active landfill is shown in Table 5-6.

Table 5-6 Summary of Monitoring Requirements for an Active Landfill

Frequency	Action
Weekly	Landfill inspection
Monthly	Litter cleanup, site wide, during snow free months (begin within 2 weeks of snowmelt)
Spring	Cover waste with 6" compacted soil
Fall	Cover waste with 6" compacted soil
Annually	Landfill Locations, report in Annual Report
As Needed	Cover light debris (foam, packing material) within 24 hours of placement to prevent windblown debris
As Needed	Vector control (flies/rodents) to prevent health hazards

5.6 Embankment Monitoring

The TSF, WCHLF, BCHLF, and the Water Supply Reservoir embankments are routinely monitored. For a complete description of monitoring requirements, please refer to the most up to date Operations and Maintenance manuals for the Fort Knox Mine Tailing Storage Facility, WCHLF, BCHLF, and the Fort Knox Mine Water Dam. Tables 5-7, 5-8, 5-9, 5-10, and 5-11, summarize the respective inspection schedule.

Table 5-7 Tailing Storage Facility Inspection Schedule

TSF Associated Structure	Inspection Activity	Document	Schedule	Responsible Person / Group
Embankment	Tailings Dam Inspection Form	Appendix C	Daily	Pond Operator
	Update Water Balance	GoldSim Model	Quarterly and as needed	Environmental Engineer
	Piezometer Monitoring	1.1 Monitoring Data (Internal Server M:\Enviromental)	Weekly	Environmental Technician
	Stability Monuments	Survey Slope spreadsheet	Monthly	Surveyors
Tailing Discharge Lines	Barge Inspection Form	Appendix D	Daily	Pond Operator
	Shift Log	Mill Control System	Daily	Mill Control
	Deposition	Spot survey according to deposition plan	Quarterly (minimum)	Surveyors
	Sub-Aqueous Deposition	Bathymetric Survey	Twice a year	Environmental Technicians and Surveyors
Barge and Pipeline	Barge Inspection Form	Appendix D	Daily	Pond Operator
	Pond Operators Daily Report	Appendix E	Daily	Pond Operator
Seepage Collection System	Seepage Monitoring	Appendix F	Weekly	Pond Operator
Interceptor and Monitoring Wells	Seepage Monitoring	Appendix F	Weekly	Pond Operator
Periodic Safety Inspection	Annual Inspection	Report on Annual Inspection	Annual	Engineer of Record
	Safety Inspection	Appendix G	Every Three Years	Engineer of Record
Pit Lake	Update Pit Geochemistry	Pit Lake Geochemistry Model	Annually	Environmental Engineer

Table 5-8 Seepage Monitoring Locations

Location	Sample and Analysis	Schedule
Site 501 Site 801 Upper Wetlands Lower Wetlands Pond C (as required) Pond D (as required) TSF Decant Tailings Filtrate Tailings Solids TSF Seepage Fresh Water Reservoir Fresh Water Dam Seepage IW – 1, 2, 3, 6, 7, 8, 11, 13, 14,16,17,18,19,20,21,22,23 MW – 1, 2,3, 4, 5, 6, 7 PMW – 1, 2, 3S, 3D, 4, 5,6	Full Profile (Appendix B)	Quarterly

Table 5-9 WCHLF Inspection Schedule

DAILY

1. Heap leach embankment inspection: inspect upstream slope, downstream slope, abutment, and downstream toe. Inspect for settlement, misalignment, and adequate freeboard.
2. Pregnant and barren pipeline corridor – inspect and record surface movements indicating problems with the pipe in the trench or the trench itself, excessive snow load, erosion, or maintenance needed for the corridor, including the discharge flow rate at the end of the pipe trench.

WEEKLY

1. Record LCRS, PCMS flows.
2. Surface water collection system – inspect for excessive erosion, debris, diversion ditch integrity of liner systems, channels, and ice jams during applicable weather conditions.

QUARTERLY

1. Survey monuments S-1 though S-7, read piezometers record and graph.
2. Record water levels of the HL-1, HL-2, and HL-3.

ANNUALLY

1. Annual Performance report per most current Certificate of Approval to Operate a Dam.
2. Review Emergency Action Plan, conduct orientation class and perform an internal drill exercise.

TRI-ANNUALLY

1. Periodic Dam Inspection.
2. Table top exercise of the Emergency Action Plan with all responsible parties. Revise Plan as required.

As Required

Carry out checks and services, as specified by the manufacturer, on pumps, valves, and controls.

Table 5-10 BCHLF Inspection Schedule

DAILY

1. Heap leach embankment inspection: inspect upstream slope, downstream slope, abutment, and downstream toe. Inspect for settlement, misalignment, and adequate freeboard.
2. Pregnant and barren pipeline corridor – inspect and record surface movements indicating problems with the pipe in the trench or the trench itself, excessive snow load, erosion, or maintenance needed for the corridor, including the discharge flow rate at the end of the pipe trench.

WEEKLY

1. Record LCRS, PCMS flows.
2. Surface water collection system – inspect for excessive erosion, debris, diversion ditch integrity of liner systems, channels, and ice jams during applicable weather conditions.

QUARTERLY

1. Survey monuments BCTS1, BCTM2, BCTM3, BCTM4, read piezometers record and graph.

ANNUALLY

1. Annual Performance report per most current Certificate of Approval to Operate a Dam.
2. Review Emergency Action Plan, conduct orientation class and perform an internal drill exercise.

TRI-ANNUALLY

1. Periodic Dam Inspection.
2. Table top exercise of the Emergency Action Plan with all responsible parties. Revise Plan as required.

As Required

Carry out checks and services, as specified by the manufacturer, on pumps, valves, and controls.

Table 5-11 Water Supply Reservoir Inspection Schedule

DAILY

1. Check pump station including trash screens, heater, piping, and valves when operating
2. Record instantaneous flow rates to tails pond and mill (when operating).
3. Check spillway for blockage damage.
4. Check condition of: Upstream slope, Downstream slope, Downstream toe, Crest of Dam.
5. Visually check seepage flow rate and clarity.

WEEKLY

1. Check pump station condition.
2. Record pond elevation weekly.
3. Check spillway and outlet works for blockage/damage.
4. Check embankment condition.
5. Observe flow into seepage sump, rate, and clarity.
6. Check sump overflow line.
7. Check Solo Creek causeway.
8. Check Solo Creek culvert and riprap.
9. Check security and safety devices.

MONTHLY

1. Note pond elevation fluctuation.
2. Record total volume pumped and average flow rates to tails pond and mill.
3. Summarize pertinent weekly and daily comments.

QUARTERLY

1. Read piezometers, update graphs.

ANNUALLY

1. Complete detailed facility inspection including all exposed earthwork, concrete, structural steelwork (bridge), pump houses, sumps, valves, and exposed piping.
2. Review and update Water Dam Operation and Maintenance Manual, if necessary.
3. Review and update Emergency Action Plan, if necessary.

AS REQUIRED

1. Carry out checks and services, as specified by the manufacturer, on pumps, valves, and controls.

5.7 Potable Water Supply Monitoring

Routine sampling and analysis of water from the potable water system at appropriate points and times are completed in accordance with 18 AAC 80.200. Reporting requirements conform to 18 AAC 80.260. Presently, a detailed monitoring plan for the potable water system is described in the Fort Knox Mine Drinking Water Monitoring Plan PWSID # AK2314093, February 2025. Table 5-12 summarizes the monitoring requirements for the potable water system.

Table 5-12 Summary of Potable Water Monitoring Requirements

Analyte	Analytical Method	Frequency	Report
Free Chlorine	Pocket Colorimeter	Monthly	Submit to DEC
Bact-T	Laboratory	Monthly	Submit to DEC
TTHM&HAA5	Laboratory	Every Three Years	Submit to DEC
Sanitary Survey	DEC Certified Inspect DEC issues Monitoring Summary yearly with further requirements.	Every Five Years	Submit to DEC

5.8 Avian and Terrestrial Wildlife Monitoring

Frequent visual inspection of the TSF and In-Pit surfaces focus on the decant pool and unconsolidated tailing depositional areas. No open pools of process solution were included in the heap leach design; therefore, inspections would focus on any unusual occurrences of surface ponding of solution. Although all employees are directed to report unusual circumstances involving wildlife to security; all environmental, mill and mine maintenance, and mill and mine operations personnel have specific responsibility to thoroughly inspect and report wildlife mortalities and terrestrial animals mired in unconsolidated tailing.

Operational standards require the tailing discharge from the mill and the resultant decant pool to be non-toxic to avian and terrestrial wildlife species. However, realizing that all wildlife species have a finite life span, some natural mortalities will occur within the boundaries of the mine site. Occurrences within specific process component areas, such as the tailing impoundment, will require special collection and sampling.

All wildlife mortalities will be immediately reported to the security officer on duty. The species and a decant water or heap leach solution sample, will be collected should the mortality involve areas associated with decant water, heap leach solution, and mill process leach solution. The decant/solution sample will be collected as close to the site of the carcass as standing solution is present. The solution sample will be preserved immediately with sodium hydroxide to attain a pH >10 and submitted to an outside laboratory for WAD cyanide analysis. The collected wildlife species will be immediately preserved by freezing (size dependent) and temporarily stored in a facility under the control of mine security.

5.8.1 **Fish Sample Collection and Handling Procedure**

On the day of collection, collector name, address, date, location (latitude and longitude) of fish capture, species, and number of each species kept should be documented. Fish capture shall comply with State and Federal laws including licensing and permitting requirements. Every effort should be made to collect fish that are representative of a given location; therefore, samples should be collected from different depths and locales within a lake or stream. The species collected will depend on the data quality objectives of the project. The species life stage, sex, as well as geographical and seasonal life history parameters may all need to be considered during sample planning. Consult with the Alaska Department of Fish and Game (ADF&G) or the United States Fish and Wildlife Service (USFWS) for more information on targeting fish species and fish capture methods and approaches. A minimum of three individuals of the target species should be collected, and a total sample mass of fish species should be at least ten grams. Some contaminant concentrations tend to increase with increasing fish size, thus collecting fish of different lengths should be considered. If ecological risk assessment is the project goal, targeting species that piscivorous birds and mammals consume should be considered. Composing fish samples can be approved depending on the data quality objective and provided fish are collected of similar size (i.e., smallest fish within 75% of largest fish as measured by fork length). If the goal of the study is to determine the variability of contaminants in fish populations, then compositing is not recommended. The collection of field duplicates fish tissue samples is not required. 78 Care in handling of fish during collection is needed to ensure specimens are not being contaminated. This includes handling fish with latex or nitrile gloves, as appropriate, and storing fish in a sealed clean plastic bag. Samples should be collected at a clean location (e.g., avoid bilge water or boat exhaust locations). Rinse fish in ambient water to remove debris. Sample and analysis of the whole fish is the common approach but will ultimately depend on the data quality objectives. It is recommended that the chosen commercial laboratory fillet or cut fish prior to analysis. If captured fish is cut or filleted in the field to meet data quality objectives, then decontamination procedures should be conducted and approved by CSP. Fish tissue should be placed in a food grade resealable clean plastic bag. Non-lethal forms of fish capture for collecting fish tissue can be approved by CSP to meet site-specific data quality objectives. It is important that each fish be placed in its own individual clean plastic bag to avoid cross contamination. For small fish to be analyzed as a composite, put all fish for the composite sample in a single resealable clean plastic bag. The resealable plastic bag should be labeled with the date, species, and sample number. Fish samples should be kept as cool as possible immediately after harvesting. Fish should be put on ice or gel packs and either shipped immediately to the laboratory, or frozen within 12 hours. As soon as possible, fish samples should be frozen to a minimum of -20° C ±5° C. Temperature logs of the freezer should be kept to document freezer did not fail during fish storage. Electronic loggers may also be required for coolers to ensure samples have not been exposed to excessive temperatures. Once frozen, the fish samples can be submitted to the laboratory and analyzed in accordance with an approved method identified in the project's QAPP or work plan. A fish collection record is provided in Appendix G of this document. Fish samples should be delivered to laboratories under standard chain of custody procedures with custody seals applied to coolers if samples are not hand delivered. Laboratories selected for analyzing fish samples should be listed in CSP work plans for review and approval. The following data should be recorded on a fish tissue sampling form:

- Project name;
- Qualified Environmental Professional responsible for collecting tissue samples including name, address, phone number, and email;
- Tissue sample identifier or Tag Number;
- Species identification;
- Collection date;
- Sample location (latitude and longitude coordinates) and description of capture vicinity;
- Length (use fork length); and
- Weight- measurements should be collected as soon as possible after collection with calibrated and protected instruments (e.g., from wind).

If sampling equipment is to be reused, it should be thoroughly cleaned with detergent, rinsed in isopropanol, and washed with distilled water before each specimen is processed. Original copies of Chain of Custody and tissue sampling forms should accompany delivery tissue to the laboratory.

U.S. Fish & Wildlife Service (USFWS), the Alaska Department of Fish & Game (ADFG), and DEC will be contacted to report appropriate mortalities within 24-hours or during their next scheduled workday. A written follow-up report (Appendix B) will be submitted to USFWS and ADFG with the date the mortality was discovered, identification of species, and WAD cyanide level of solution sample. The follow-up report will be submitted within seven (7) days of the initial verbal notification to allow verification of analytical results. In a verbal notification by Agent Ryan Kote (USF&W) to Dave Stewart (FGMI) on Monday, May 21, 2018, Agent Kote instructed Mr. Stewart that the USF&W no longer required notification of accidental or incidental mortalities.

5.8.2 Mortality Contacts:

U.S. Fish & Wildlife Service
Ecological Service
101- 12th Avenue

Fairbanks, Alaska 99701
Telephone (907) 456-2335

Alaska Department of Fish & Game
1300 College Road
Fairbanks, Alaska 99701-1599
Telephone (907) 459-7282

Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, Alaska 99709
Telephone (907) 451-2136

All carcasses will be available for final collection by USFWS or ADFG, depending on species (i.e., migratory bird or game species). Laboratory results of analysis for WAD cyanide concentration from solution samples will determine final disposal procedure for all carcasses collected. WAD cyanide levels >25 mg/L will trigger a necropsy to determine cause of death. WAD cyanide levels <25 mg/L will not require further analytical analysis. Final deposition of all carcasses will be determined by the appropriate agency.

Terrestrial animals mired in unconsolidated tailing material will be extracted and moved or herded to a safe area. All attempts to extract mired animals will be based on evaluation as to the health and safety of employees and that of the animal.

5.9 Mine Closure Monitoring

For a complete description of monitoring after mine closure please refer to the Fort Knox Reclamation and Closure Plan. Table 5-13 is a summary of closure monitoring requirements for the pit lake, decant pond, seepage collection system, injection system, groundwater compliance wells, and surface water compliance point. Table 5-14 shows a summary of monthly and quarterly analytes.

Table 5-13 Summary of Closure Monitoring

Monitoring location	0 to 2 years		3 to 5 years		+ 6 years	
	Frequency	**Parameter list**	**Frequency**	**Parameter list**	**Frequency**	**Parameter list**
Decant pond	Quarterly	Complete	Quarterly	Complete	Quarterly	Complete
Pit lake	Annual	Complete	Annual	Complete	Annual	Complete
Seepage collection system	Monthly	Indicator	Quarterly[1]	Complete	NA	NA
Injection system	Monthly	Indicator	Quarterly[1]	Complete	NA	NA
compliance wells	Monthly	Indicator	Quarterly	Complete	Annual	Complete
Surface water compliance point	NA	NA	NA	NA	Monthly[2]	Indicator

1 Only if operational

2 Discharges predicted to begin after about 12 years

Table 5-14 Summary of Monthly and Quarterly Analyte Lists

Monthly samples	Quarterly samples
pH	pH
TDS	TDS
Sulfate	TSS1
Alkalinity	Calcium
Arsenic	Magnesium
Antimony	Sodium
Cadmium	Potassium
Copper	Chloride
Iron	Sulfate
Manganese	Alkalinity
Selenium	Arsenic
Cyanide	Antimony
WAD cyanide	Cadmium
	Copper
	Iron
	Manganese
	Selenium
	Zinc
	Nitrate
	Nitrite
	Ammonia
	Cyanide
	WAD cyanide

1 Surface water only

6 MONITORING/SAMPLE RECORDS AND REPORTING

6.1 Documentation of Measurements, Sampling, and Inspections

For each measurement or sample taken pursuant to this monitoring plan, the following information shall be recorded on the field data sheet:

- The exact place, date, and time of inspection, observation, measurement, or sampling; and
- The person(s) who inspected, observed, measured, or sampled.

6.2 Retention of Records

During operation, closure, and reclamation all records of monitoring activities and results, calibrations, and maintenance records will be retained for a period of three years.

6.3 Monitoring Reports and Submission Schedules

Indicator parameters have been selected to represent constituents present in the decant pond that are at concentrations significantly higher than the downgradient surface water and groundwater. The indicator parameters have been selected because they are relatively conservative in the environment and provide the best indication of performance of controls responsible for maintaining zero discharge. Monitoring results for indicator parameters will be compared with the upper tolerance limits established in Section 3.3. If an indicator parameter exceeds its established tolerance limit, this exceedance will be reported to the State.

Other parameters will continue to be monitored as set forth in Sections 4 and 5. For wells and surface waters downgradient of the facility, monitoring of parameters other than indicator parameters is to provide continuing reference data for overall water quality within the system, rather than for compliance purposes. This is consistent with operation of a zero-discharge facility where the primary purpose of monitoring is to confirm performance of discharge controls rather than measuring changes in downgradient water quality.

Monitoring results will be reported quarterly to DEC. All quarterly reports will be submitted within 60 days of the end of the quarter. An Annual Activity Report will be presented to the DEC, ADNR, COE and USEPA during the first quarter of the following year summarizing monitoring results. Along with previous requirements from the Fort Knox Monitoring Plan, the annual report prepared for the DEC, ADNR, COE and USEPA will address the following:

- The groundwater collection system is operating adequately to collect all groundwater from the tailing impoundment.

- The LCRS and PCMS and underdrain groundwater collection systems are operating adequately.
- An updated annual water accounting including the heap leach.
- Contaminant levels within the tailing impoundment and documentation of any increases that would indicate toxic concentrations to wildlife.
- Reports will be on forms or in a data base format, which is agreeable to DEC, ADNR, COE and USEPA.

In addition, a trend analysis will be completed on selected parameters as a confirmation that the TSF continues to function as zero-discharge.

Appendix A

Baseline Water Quality Analysis

Appendix A

Baseline data

Table 2: The below table shows the baseline data from July 1996 to April 2015 before Fort Knox starting to discharge treated water at freshwater reservoir.

	Baseline data		
	Maximum (mg/L)	*long Term Average (mg/L)*	*No. of data*
TSS	104	11.48	26
pH	8.8	7.18	75
Ammonia, Total	0.66	0.14	59
Fluoride, Total	0.57	0.124	66
Nitrite+Nitrate, Total	0.7	0.123	50
Sulfate, Total	160	15.63	110
Manganese, Total	0.87	0.29	124
Antimony, Total	0.006	0.00345	2
Arsenic, Total	0.0064	0.00138	73
Cadmium, Total	0.0004	0.00022	5
Chromium, Total	0.007	0.00365	2
Copper, Total	0.02	0.01175	8
Lead, Total	0.0084	0.000786	44
Mercury, Total	0.007	0.0004	3
Nickel, Total	0.02	0.02	2
Selenium, Total	0.0006	0.00019	12
Silver, Total	0.07	0.0234	3
Zinc, Total	0.1	0.029	66
Cyanide, Total	0.007	0.007	2

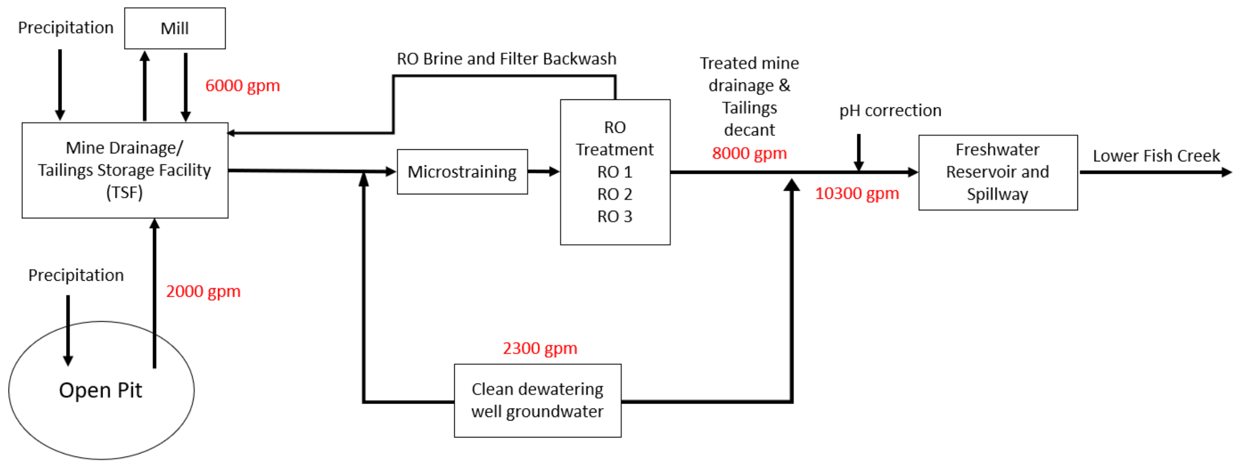


Figure 1: Line diagram shows the water sources, treatment, and discharge in mine. The average flowrates at each stage are marked in red color.

Figure 2: Fort Knox site map.

Appendix B

Quality Assurance Project Plan and Field Procedures Manual

QUALITY ASSURANCE PROJECT PLAN
AND
FIELD PROCEDURES MANUAL

Prepared by:

Fairbanks Gold Mining, Inc.
(a subsidiary of Kinross Gold Corporation)
PO Box 73726
Fairbanks, Alaska 99707-3726

Updated August 2024

1 CONTENTS

Page

List of Tables

List of Appendices

LIST OF ACRONYMS

ADEC	Alaska Department of Environmental Conservation
EPA	United States Environmental Protection Agency
FGMI	Fairbanks Gold Mining, Inc.
KGC	Kinross Gold Corporation
MCL	Maximum Contaminant Level
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PARCCS	Precision, Accuracy, Representativeness, Comparability, Completeness, Sensitivity
QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
SOPs	Standard Operating Procedures
SRMs	Standard Reference Material(s)

2 INTRODUCTION

2.1 Objectives

This Quality Assurance Project Plan and Field Procedures Manual (QAPP) is for the use of Fairbanks Gold Mining, Inc. (FGMI) operating personnel. The objectives of this QAPP are to communicate, to all parties, the specifications for implementation of the project design and to ensure that the quality objectives are achieved for the project. Specific quality assurance and quality control (QA/QC) activities are identified for field activities, laboratory analyses, and data analysis. Additionally, QA measures for data verification and validation are identified. This manual will be used in conjunction with manufacturer supplied manuals for training employees in approved field monitoring procedures (i.e. instrument calibrations, measurements, and maintenance).

This document serves as the QAPP for monitoring requirements specified in the Alaska Pollutant Discharge Elimination System Permit Number AK0053643, effective June 1, 2018.

This document will be periodically reviewed and updated by site personnel to reflect site conditions and permit monitoring requirements as they change. Minimally, this QAPP will be reviewed annually he plan is revised to keep project information current or when changes affect the scope, implementation, or assessment of the outcome of data acquisition activities.

2.2 Quality Assurance / Quality Control Program

The QA/QC program consists of three components:

- ***Field QA/QC*** *identifies the procedures to be used in the field to verify that water samples and field monitoring data are collected according to the requirements of the project. The objective of field QA/QC is to assure that both field measurements and samples collected for laboratory analyses can be demonstrated to be representative of the environment sampled and are of known and acceptable quality.*

a. ***Laboratory QA/QC*** *identifies the protocols to be used by the laboratories to demonstrate that project data are analyzed according to U.S. Environmental Protection Agency (EPA)-acceptable methodologies, and that reported values are accurate. The objective of the laboratory QA/QC program is to produce data that will meet state and federal analytical requirements.*

- ***Data QA/QC*** *identifies the protocols to be used to verify that laboratory and field data have been reported accurately. The objective of the data QA/QC program is to demonstrate that the data reported meets the specified requirements, including comparability with data from previous years.*

2.3 Data Uses and Data Quality Objectives

Quality assurance requirements are established in this QAPP to ensure that project objectives for the data uses are met. Applicable quality control procedures, quantitative target limits, and level of effort for assessing the data quality are dictated by the intended use of the data and the nature of the required field and analytical methods. The project objectives for this QAPP is to collect high-quality data for FGMI to comply with the analytical permit requirements during operation and ultimately closure.

EPA-approved analytical methods will always be used and will have detection limits low enough to determine if Alaska Water Quality Standards are being met. The use of EPA approved methods meet Federal and State of Alaska acceptable standards for data collection, data verification, and data validation.

2.4 Data Quality Parameters

The quality of laboratory data is assessed by validation methods that determine the precision, accuracy, representativeness, comparability, completeness, and Sensitivity (PARCCS) of the data. The following sections provide qualitative descriptions of the PARCCS standard, applicable data quality measure(s), and level of effort. Refer to QAPP § 5.1 for quantitative definitions of the PARCCS parameters utilized by FGMI .

2.4.1 Precision

Precision is the measure of agreement among repeated measurements of the same property under identical, or substantially similar conditions. Common methods for determining precision include:

- *Utilizing the same analytical instrument to make repeated analyses on the same sample;*
- *Utilizing the same method to make repeated measurements of the same sample within a single laboratory;*
- *Utilizing two or more laboratories to analyze identical samples with the same method;*
- *Splitting a sample in the field and submit both for sample handling, preservation and storage, and analytical measurements; and*
- *Collecting, processing, and analyzing collocated samples for information on sample acquisition, handling, shipping, storage, preparation, and analytical processes and measurements.*

Precision is calculated as either the range or as the standard deviation. For the methods described above, analytical precision is expressed as the relative percent difference (RPD).

The current contract analytical laboratory's QA/QC Manual provides acceptable RPDs for internal laboratory QC measures.

The level of effort for precision measurement will be at a minimum frequency of one per 20 (5 percent) or one per batch, whichever is more frequent.

2.4.2 Accuracy

Accuracy is the measure of the overall agreement of a measurement to a known value. Accuracy includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations. For samples processed by the analytical laboratory, accuracy will be evaluated using matrix spikes and standard reference materials (SRMs) to establish the average recovery.

A quantitative definition of average recovery is included in the current contract analytical laboratory's QA/QC Manual.

The level of effort required for accuracy evaluation requires the laboratory perform a matrix spike (MS) and matrix spike duplicate (MSD) measurements at a minimum frequency of one per 20 samples for organic parameters, and matrix spikes of one per 20 for inorganic or miscellaneous samples, or one per batch, whichever is more frequent. The level of effort does not require that the MS/MSD be performed on FGMI samples provided the batch frequency of one MS/MSD per 20 samples is maintained.

2.4.3 Representativeness

Representativeness is a qualitative term that expresses "the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition." Representativeness evaluates whether measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the environment or condition being measured or studied.

Sampling plan design, sampling techniques, and sample handling protocols have been established to reduce sampling variability (QAPP § 2.3). Field documentation collected as part of sample collection, establishes that protocols have been followed. Post-sample documentation (Chains of Custody, laboratory receipt forms, and laboratory reporting) and sample identification and labelling ensure sample integrity from collection through analysis.

Field blanks (Profile III only) and field duplicates will be collected at a minimum frequency of 1 per 20 primary samples or one per sample event. Field blanks assess non-sampling related sources of field, sampling, and transportation contamination and method variation. Laboratory sample retrieval, storage, and handling procedures have also been developed and are discussed in other sections of this document. Laboratory method blanks will be run at the minimum frequency of 5 percent or one per set to assess laboratory contamination.

2.4.4 Comparability

Comparability is a qualitative term that expresses the measure of confidence that one data set can be compared to another and can be combined for the decision(s) to be made. Comparability reviews the sample collection and handling methods, sample preparation and analytical procedures, holding times, stability issues, and QA protocols. Comparability includes utilizing consistent units when evaluating sample results.

Prior to using non-EPA standard methods, FGMI will obtain permission from the ADEC. A 30% relative percent difference will be considered acceptable for comparing duplicate samples between different laboratories.

2.4.5 Completeness

Completeness is a measure of the amount of valid data obtained from the measurement system. The target completeness objectives are approximately 90 percent for each analytical parameter; the actual completeness can vary with the intrinsic nature of the samples. The completeness of the data will be assessed during the data review and validation.

2.4.6 Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest. The minimum concentration or attribute that can be measured by a method (method detection limit), by an instrument (instrument detection limit), or by a laboratory (quantitation limit) defines sensitivity. The established permit limit or maximum contaminant level (MCL) established by ADEC or Water Quality Standard, whichever is lowest, establishes the maximum laboratory detection limit required. If no laboratory method exists with a detection limit below applicable regulatory standards, FGMI and ADEC will determine a suitable method.

2.5 Description of Duties

The QAPP roles of the Kinross Alaska Environmental team at Fort Knox are described in the following sections.

2.5.1 Environmental Affairs Director

The Environmental Affairs Director certifies agency reports and compliance documents. The Environmental Affairs Director maintains communication with outside agencies.

2.5.2 Environmental Superintendent

The Environmental Superintendent maintains and updates the QAPP as required by Section 1.1. The Environmental Superintendent shall ensure that data validation and verification is completed, and any QA failures are identified, reported as required, and corrected. The Environmental Superintendent communicates with outside agencies to address data discrepancies, QA issues, and corrective measures.

2.5.3 Environmental Specialist

The Environmental Specialist is responsible for verifying that collected data is within established regulatory parameters. The Environmental Specialist will prepare regulatory reporting based on the collected data. Reporting

2.5.4 Environmental Engineer

The Environmental Engineer is responsible for verifying that collected data is within established regulatory parameters. The Environmental Engineer will prepare regulatory reporting based on the collected data.

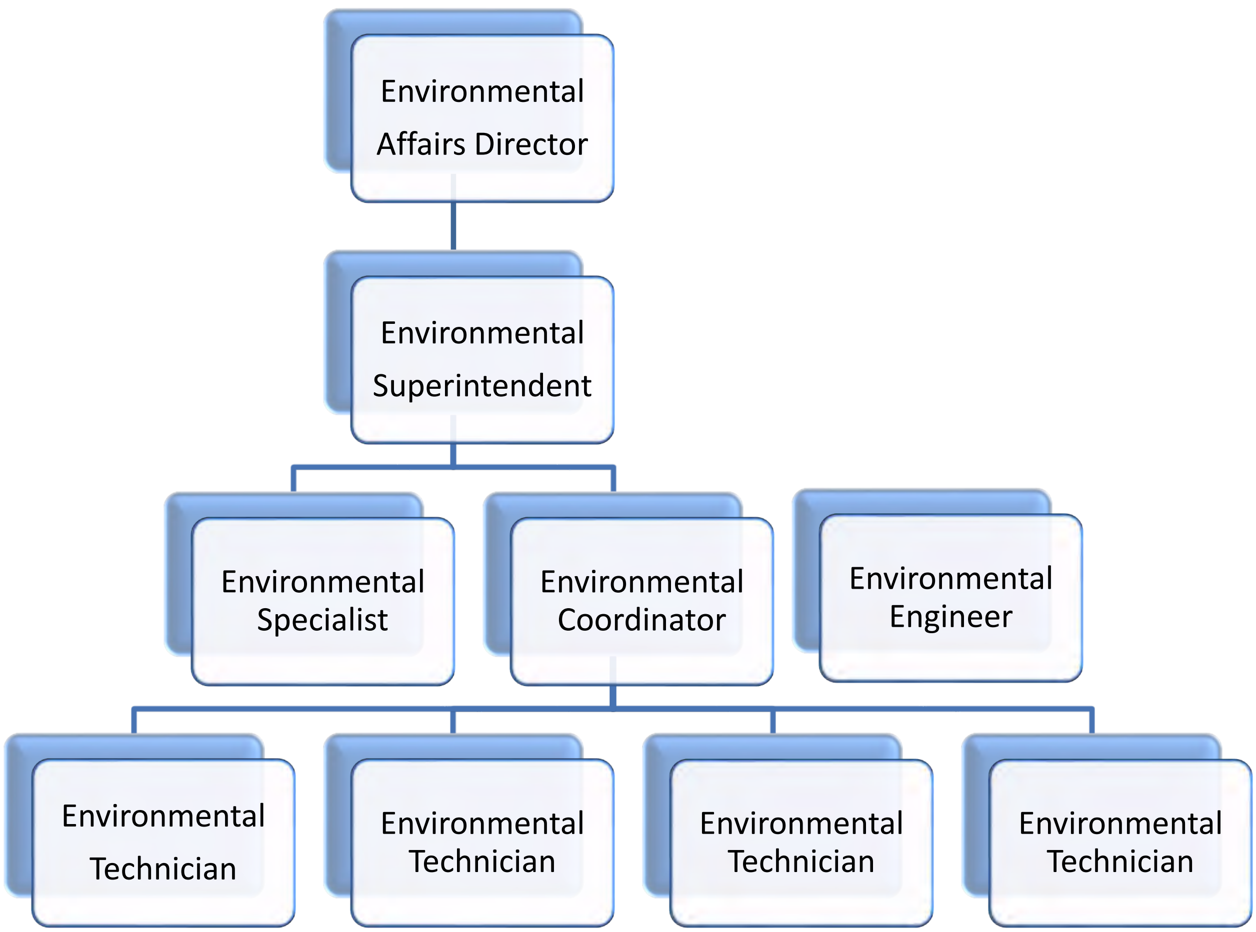
2.5.5 Environmental Coordinator

The QAPP Manager is the Environmental Coordinator. The Environmental Coordinator will oversee each aspect of field operations to verify that these components are accomplished within the strict requirements of the project. The Environmental Coordinator oversees data gathering protocols and verifies proper sample containers and preservatives. The Environmental Coordinator receives the monitoring results and is responsible for maintaining close communication with analytical laboratories and tracking sample progress.

2.5.6 Environmental Technicians

Collecting samples according to approved methods. Labelling and packaging samples according to protocols to prevent leakage or cross-contamination. Properly completing chain of custody forms and maintaining adequate documentation. Shipping samples at properly maintained temperatures and within holding times. Also responsible for field instrument calibration, decontamination, documentation, and operation and maintenance procedures.

Personnel performing activities related to this document will receive training by reading, understanding, and receive field training to be qualified to conduct monitoring activities in accordance with this document.



3 FIELD QUALITY ASSURANCE / QUALITY CONTROL PROCEDURES

3.1 Purpose

The main components of this QAPP are:

- *Verification of sample containers and preservatives;*
- *Collection and analysis of field QC samples including blanks and duplicates;*
- *Sample handling, labeling, and shipping procedures;*
- *Field equipment calibration;*
- *Equipment decontamination;*
- *Field documentation; and*
- *Field corrective action.*

The QAPP Manager is the Environmental Coordinator. The Environmental Coordinator will oversee each aspect of field operations to verify that these components are accomplished within the strict requirements of the project.

The Environmental Superintendent is the Quality Assurance Manager (QAM) for this QAPP. The superintendent shall ensure that data validation and verification are completed and QA failures are identified, corrected, and reported as required.

The Environmental Technician is responsible for the field implementation of the QAPP.

The Environmental Specialist and Environmental Engineer are responsible for verifying that collected data is within established regulatory parameters and reporting data to regulatory authorities.

3.2 Verification of Sample Containers and Preservatives

The Environmental Technicians are responsible for ensuring that the correct bottles and preservatives are used during sampling. A list of required bottles and preservative for each sample profile is provided in Appendix C.

3.3 Quality Control Samples

The following QC samples are collected as part of this QAPP:

- *Field Duplicate(s);*
- *Equipment Blank(s); and*
- *Field Blank(s).*

QC sample types and frequency of collection are described in the following sections.

3.3.1 Field Duplicates

Two types of field duplicates will be collected once per quarter:

a. *A field duplicate will be collected in accordance with FGMI-ENVSAMPE-SOP-03 § 3.1 and analyzed for the same parameters as the primary sample by the same analytical laboratory; and*

b. *A laboratory duplicate will be collected in accordance with FGMI-ENVSAMPE-SOP-03 § 3.1 and analyzed for the same parameters as the primary sample by a different analytical laboratory.*

3.3.2 Equipment Blanks

Equipment Blanks (rinse blanks) will be collected once per quarter.

a. *Equipment Blanks will be collected in accordance with FGMI-ENVSAMPE-SOP-03 § 3.3 and analyzed for the same parameters as the primary sample by the same laboratory.*

3.3.3 Field Blanks

Field Blanks will be collected at a frequency of one per quarter.

b. *Field Blanks will be collected in accordance with FGMI-ENVSAMPE-SOP-03 § 3.4 and analyzed for the same parameters as the primary sample by the same laboratory.*

3.4 Sample Collection, Documentation, and Handling Procedures

Each Environmental Technician is responsible for implementing the appropriate standard operating procedures (SOPs) for surface and groundwater sampling. The Environmental Technician will ensure that the proper sample collection, labelling, and handling procedures are utilized.

The Environmental Coordinator will oversee these activities. Sample collection, labelling, and handling procedures are periodically checked by the Environmental Coordinator to verify that the following requirements of the field sampling SOPs are met.

3.4.1 Sample Collection

Sample collection will be performed in accordance with the following FGMI approved SOPs:

Surface Water samples will be collected pursuant to *FGMI-ENVSAMPE-SOP-07 Surface Water Sampling Procedures*.

Groundwater samples will be collected pursuant to either:

a. *FGMI-ENVSAMPE-SOP-06 Groundwater Sampling Procedures; and*
b. *FGMI-ENVSAMPE-SOP-11 Low Flow Groundwater Sampling Procedures.*

Potable Water samples will be collected pursuant to *FGMI-ENVSAMPE-SOP-09 Groundwater Sampling Procedures.*

Water Treatment System samples will be collected pursuant to *FGMI-ENVSAMPE-SOP-12 Reverse Osmosis System Sampling Procedures.*

Soil and Rock samples will be collected pursuant to either:

a. *FGMI-ENVSAMPE-SOP-08 Rock and Soil Composite Sampling Procedures; or*

b. *ADEC, 2024. Field Sampling Guidance[1]. Alaska Department of Environmental Conservation, Division of Spill Prevention and Response, Contaminated Sites Program.* *https://dec.alaska.gov/media/2kcbhgia/field-sampling-guidance-2024.pdf*

Activated Carbon Scrubber samples will be collected pursuant to:

a. *FGMI -ENVSAMPE-SOP-10 Activated Carbon Scrubber Bed Material Sampling Procedures.*

3.4.2 Sample Documentation

Sample field documentation, labelling, and laboratory documentation will be performed in accordance with *FGMI-ENVSAMPE-SOP-01 Field Documentation Procedures*.

3.4.2.1 Field Documentation

Field documentation for each laboratory sample will be completed in accordance with *FGMI-ENVSAMPE-SOP-01 Field Documentation Procedures* § 3.1.

The Environmental Technician will record all information for each sampling event and respective samples and replicates collected at each site on the Field Data Sheet.

Completed field data sheets will be managed in accordance with *FGMI-ENVSAMPE-SOP-01 Field Documentation Procedures* § 3.4.

The Environmental Coordinator will regularly inspect field documentation field data sheets for completeness.

3.4.2.2 Sample Labelling

Sample labelling with be performed in accordance with *FGMI-ENVSAMPE-SOP-01 Field Documentation Procedures* § 3.2. For Knox Sample labelling convention is:

FKR1DS150401401

FK = The site identifier (FK is Fort Knox)

R1DS = Sample site identifier (i.e, R1DS is RO1 Discharge)

240901 = Date (September 1, 2024)

401 = Sequential sample number recorded in logbook for that date

All blanks and duplicates will be noted on field data sheets. Blanks and duplicates will be identified the same as other samples, including date and identification number.

3.4.2.3 Chain-of-Custody

Sample chain-of-custody forms will be completed in accordance with *FGMI-ENVSAMPE-SOP-01 Field Documentation Procedures* § 3.3 for all samples submitted for laboratory analysis.

[1] The ADEC, 2024 *Field Sampling Guidance* is used for contaminated media sites only when directed by ADEC to perform site cleanup activities governed by Regulations found at 18 AAC 75 and/or 18 AAC 78.

Following collection, samples will remain in the custody of the sampler. Each time the sample bottle or sample changes hands, both the sender and receiver will sign and date the chain-of-custody form and specify what samples have changed hands. The pink carbon copy of the chain-of-custody form is retained by FGMI and the original (white) and yellow carbon copy is sent to the laboratory.

3.4.2.4 Corrections to Documentation

Field documentation is considered a “vital document” pursuant to the Kinross Gold Corporation (KGC) *Record Retention & Destruction Policy.* No vital documents will be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on a vital document assigned to one person, that person must make corrections by drawing a line through the error, initialling and dating the lined-out item, and entering the correct information. The erroneous information is not to be obliterated but is to remain legible. The person who made the entry will correct any subsequent error discovered on a vital document. All such corrections will be initialled and dated.

3.4.3 Sample Handling

Following collection, analytical samples are packaged for shipment and shipped to the selected laboratory. The procedures for handling, packaging, shipping procedures are described in the following sections.

3.4.3.1 Sample Packaging

Sample packaging will be performed in accordance with *FGMI-ENVSAMPE-SOP*-02 *Sample Handling, Packing, and Shipping Procedures* § 3.2 and 3.3.

3.4.3.2 Shipping

Sample shipping will be performed in accordance with *FGMI-ENVSAMPE-SOP*-02 *Sample Handling, Packing, and Shipping Procedures* § 3.4.

3.4.4 Field Equipment Calibration

FGMI utilizes portable water quality instruments for the *in-situ* measurement of pH, temperature, and conductivity. Calibrations will be performed daily prior to beginning any sample tasks. Environmental Technicians perform portable field equipment calibration in accordance with *FGMI-ENVSAMPE-SOP-04* and Manufacturers Recommendations. All calibration activities are documented on Field Data Sheets.

The Environmental Technician obtains and reviews data measured in the field. The Environmental Coordinator periodically observes field data collection procedures, including field preparation, to identify and correct any deviations. Data that cannot be validated may require corrective action(s) in accordance with QAPP § 3.4.6).

3.4.5 Decontamination Procedures

Whenever possible, disposable, or one-time use sampling equipment will be utilized. If sampling equipment or apparatus must be used at more than one location, the equipment shall be decontaminated in accordance with *FGMI-ENVSAMPE-SOP-05 Decontamination of Sampling Equipment Procedures*.

3.4.6 Field Corrective Action

Field sampling corrective actions are procedures to follow when field data results are not within the acceptable error tolerance range. Field corrective action procedures include the following:

- *Comparing data readings being measured with readings previously recorded*
- *Recalibration of equipment (i.e., pH meters)*
- *Replacing or repairing faulty equipment*
- *Resampling when feasible*

The Environmental Technician is responsible for determining if file corrective actions are necessary and implementing appropriate field corrective actions as required. The Environmental Coordinator will be responsible for overseeing these corrections. All field corrective actions will be recorded on the field data sheet.

4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

The laboratory QA/QC program is available to all FGMI personnel.

4.1 Data Quality Assurance/Quality Control Program

The data QA/QC program serves four major functions:

- Maintenance of a duplicate record of all field data
- Sample tracking through laboratory analysis
- Data validation
- Oversight of data management
- Field data sheets are "vital documents" pursuant to the Kinross Gold Corporation (KGC) *Record Retention & Destruction Policy*. No vital documents will be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. The Environmental Coordinator will receive copies of all field data sheets. which will then be filed in the Kinross Alaska Environmental Department filing system. These duplicates will serve as a backup file and will be checked against the field data entered into the database management system.

The Environmental Coordinator will maintain close communication with all analytical laboratories to verify sample receipt, proper sample management, and strict adherence to sample holding times. The laboratories will inform the Environmental Coordinator of sample breakages, inadequate sample media, and other sample receipt problems. The Environmental Coordinator will notify the Environmental Technician and the Environmental Superintendent of sample receipt issues and if needed, the Environmental Manager will be notified so that corrective action can be undertaken.

Following the receipt of the analytical data package, the Kinross Alaska Environmental Staff will verify that all sample parameter data have been received and will compare detection limits and preliminary results with previous results. Should major discrepancies be found, the Environmental Staff will communicate these to the Environmental Superintendent for forwarding to the Environmental Manager. Possible corrective measures will then be evaluated as appropriate.

A data review or validation process will also be performed on 20 percent of all analytical data received from the laboratories. Chemical data validation will include:

- Ensuring correct analytical methodologies were used;
- Reviewing detection limits in terms of statutory/regulatory requirements;
- Examining blanks for detected analytes;
- Verifying that internal laboratory QC requirements are met;
- Applying quantitative measures to evaluate accuracy and precision
- Reviewing hold time exceedances to determine effect on data quality.

Where data do not meet the requirements specified in this QAPP program, the data will be flagged with qualifiers. These reviews of data will be summarized and included in the report of sampling data.

4.2 Data Management and Reporting

On a monthly and yearly basis, all water quality data from discharge sampling will be compiled, reviewed and validated, and a report of results sent to the appropriate state agency. FGMI QA/QC documents and records are kept onsite and available for inspection upon request by regulators. The analytical laboratory has on file QC reports for all samples analysed and these are available for inspection, upon request, by regulators.

4.3 Analytical Laboratories

ACZ Laboratories, Inc.
2773 Downhill Drive
Steamboat Springs, CO 80487

970-879-6590

ALS Environmental
1317 South 13th Avenue
Kelso, WA 98626

360-501-3275

SVL Analytical, Inc.
One Government Gulch
Kellogg, Idaho 83837

800-597-7144

TRE Environmental Strategies, LLC.

100 Racquette Drive-Unit A
Ft Collins, Co. 80524

970-416-0916

Table 4-1 Discharge Sampling Requirements

Parameter	Maximum Daily Limit (MDL)	Average Monthly Limit (AML)	Units	Minimum Sample Frequency	Sample Type
antimony	monitor only		micrograms per liter (µg/L)	1/quarter	grab (total recoverable)
arsenic	monitor only		µg/L	1/quarter	grab (total recoverable)
cadmium	0.31	0.15	µg/L	1/week	grab (total recoverable)
chloride	monitor only		Milligrams per liter (mg/L)	1/quarter	grab
copper	8.7	3.1	µg/L	1/quarter	grab (total recoverable)
Cyanide, weak-acid dissociable (WAD)	8.7[b]	2.8[b]	µg/L	1/week	grab (total recoverable)
lead	2.9	0.92	µg/L	1/week	grab (total recoverable)
mercury	0.020	0.010	µg/L	1/week	grab (total recoverable)
Nitrite & nitrate as N	monitor only		mg/L	1/week	grab
pH	See Permit Part 1.3.1.		Standard units (s.u.)	1/week	grab
sulfate	monitor only		mg/L	1/quarter	grab
total suspended solids (TSS)	30	20	mg/L	1/week	Grab(total recoverable)
Volume, cumulative	See Permit Part 1.3.2.		gallons	continuous	meter
zinc	78	26	µg/L	1/week	grab (total recoverable)
Whole effluent toxicity (WET)	monitor only		Chronic toxic units (TUc)	annually	grab

a. *Use the following test methods: EPA Method 200.8 for metals, Standard Method 4500 CN-1 for WAD cyanide, EPA Method 1631=E for mercury and EPA Method 300.0 for anions.*
b. *See Permit Part 1.2.8*

Table 4-2 Sampling Details

Parameter	Minimum Sample Frequency	Sample Containers	Preservative	Hold Times	Detection Limits	
					MDL	PQL
antimony	1/quarter	HDPE	Nitric Acid	6 months	0.0004	0.002
arsenic	1/quarter	HDPE	Nitric Acid	6 months	0.0002	0.001
cadmium	1/week	HDPE	Nitric Acid	6 months	0.1	0.5
chloride	1/quarter	HDPE	Nitric Acid	6 months	.05 mg/L	2 mg/L
copper	1/quarter	HDPE	Nitric Acid	6 months	0.4	2
Cyanide, weak-acid dissociable (WAD)	1/week	HDPE	Sodium Hydroxide	14 days	3	10
lead	1/week	HDPE	Nitric Acid	6 months	0.1	0.5
mercury	1/week	HDPE	Hydrochloric Acid	28 days	0.0002	0.0005
Nitrite & nitrate as N	1/week	HDPE	Nitric Acid	28 days	0.02	0.1
pH	1/week	HDPE	None	24 hours	0.1	0.1
sulfate	1/quarter	HDPE	None	14 days	1 mg/L	5 mg/L
total suspended solids (TSS)	1/week	HDPE	None	7 days	5 mg/L	20 mg/L
zinc	1/week	HDPE	Nitric Acid	6 months	2	5
Whole effluent toxicity (WET)	annually					

a. Use the following test methods: EPA Method 200.8 for metals, Standard Method 4500 CN-1 for WAD cyanide, EPA Method 1631=E for mercury and EPA Method 300.0 for anions.
b. See Permit Part 1.2.8
c. Mercury samples will have one trip blank per cooler

Table 4-3 Receiving Water Monitoring Requirements

Parameter[a]	Units	Minimum Level of Quantification (ML)
cadmium	µg/L	0.5
copper	µg/L	3.1
cyanide, WAD	µg/L	10
lead	µg/L	1.4
mercury	µg/L	0.010
nitrite + nitrate as N	mg/L	10
pH	S.U.	±0.1
zinc	µg/L	78
hardness, calculated[b]	mg/L	-

a. Use the following test methods: EPA Method 200.8 for metals, Standard Method 4500 CN-I for WAD cyanide, and EPA Method 1631-E for mercury.
b. Hardness is calculated as follows: (2.497 x [Ca} + (4.118 x [Mg]).

5 INSTRUMENT CALIBRATION, OPERATION, AND MAINTENANCE

5.1 Electrical Conductance

5.1.1 Instrument Calibration

At the beginning of each day of sampling, check instrument linearity.

1. *Rinse probe with deionized water.*
2. *Measure conductivity of two potassium chloride solution standards, which bracket expected sample values.*
3. *Measure temperature of both solution standards.*

Calculate cell constant for each standard to determine if instrument linearity is reasonable. The cell constant is the ratio of the computed conductivity to the measured conductivity of the standard solution.

5.1.2 Maintenance

1. *Store meter in its case during transport.*
2. *Check batteries before taking meter into the field. Carry spare batteries in the field (9 volt).*
3. *Inspect conductivity probe for cracks or other damage.*

5.1.3 Field Measurement Procedures

1. *Turn instrument on.*
2. *Rinse plastic beaker with approximately 50 milliliters of sample water three times.*
3. *Place water sample in plastic beaker (fill to at least 50 millimeters).*
4. *Rinse probe with deionized or sample water and place in sample water.*
5. *Immerse conductivity probe in sample so that vent hole is submerged. Move probe around in sample to displace any air bubbles. Turn instrument on to appropriate scale to measure conductivity. Record conductivity reading after a stable reading is obtained.*
6. *Remove probe from sample and turn off instrument.*

5.2 Field pH

5.2.1 Instrument Calibration

1. *Calibrate pH meter at the beginning of each day of fieldwork when pH will be measured, and whenever the standard check is out of acceptable bounds.*
2. *Rinse pH electrode probe with deionized water.*

3. *Immerse electrode and temperature probe in beaker of fresh commercial calibration solution of pH 4.0. Calibrate meter to solution.*
4. *Remove electrode and temperature probe from solution, and then rinse with deionized water.*
5. *Immerse electrode and temperature probe in fresh pH 10.0 solution. Calibrate meter to solution.*
6. *Remove electrode and temperature probe from solution, and rinse with deionized water.*
7. *Measure pH of a third fresh calibration solution at pH 7.0. If measured value differs from expected value by more than 0.1 units, obtain fresh calibration solutions and recalibrate. If discrepancy persists, begin trouble-shooting procedures following meter-operating instructions: check batteries, connections, probe, etc.*

5.2.2 Maintenance

1. *Store meter in its case with electrode immersed in a pH 7 buffer solution.*
2. *Inspect electrode prior to use.*
3. *Check glass electrode for cracks or scratches.*
4. *Check batteries each time meter is used. Carry a spare battery pack into the field in the pH meter case.*

5.2.3 Field Measurement Procedures

1. *Rinse decontaminated glass beaker or sample bottle with approximately 50 milliliters of sample water three times.*
2. *Rinse pH electrode with deionized water.*
3. *If measurement is read ex situ, fill beaker with sample water.*
4. *Immerse electrode and temperature probe in sample while swirling the sample to provide thorough mixing. Turn on meter. Read pH to nearest 0.1 until the reading has stabilized (when beaker icon stops flashing).*
5. *Record sample pH. Note any problems such as erratic readings.*
6. *Rinse probe with deionized water and store according to manufacturer's directions.*

5.3 Water Temperature

5.3.1 Linearity and Field Measurement Procedures

1. *Use either a National Institute of Standards and Technology (NIST)-calibrated thermometer or a digital temperature probe calibrated against a NIST-calibrated thermometer to measure temperature.*
2. *Check thermometers for cracks or gaps in the mercury. Do not use thermometers if either cracks or gaps are visible.*
3. *When possible, measure temperature of surface water at midstream by submersing the thermometer or electronic temperature probe for approximately 1 minute or until temperature stabilizes.*
4. *When in situ temperature measurements are not possible, draw sample of at least 200 ml into a decontaminated beaker or sample bottle as soon after sampling as possible.*
5. *Place thermometer or electronic temperature probe in sample and allow temperature to stabilize.*
6. *Record temperature to nearest 0.5°C in field logbook or on field data sheet.*
7. *Rinse thermometer or electronic temperature probe with deionized water.*
8. *Check field thermometers or digital temperature probes against a NIST-certified laboratory thermometer, on a quarterly basis. Agreement should be within 0.5°C.*

5.4 Dissolved Metal Filtration Method for Groundwater

1. *Place disposable, high capacity, pre-cleaned, vacuum-type, and 0.45-micron filter in two-way hose fitting/reducer fitting after restricting flow to one outlet.*
2. *After inserting filter firmly into the two-way hose fitting adjust valves so as to divert flow through the filter.*
3. *Let at least three filter volumes run through the filter before filling sample bottles.*

6 QUANTITATIVE DEFINITIONS OF DATA QUALITY PARAMETERS

6.1 Quantitative Definitions of Data Quality Parameters

6.1.1 Precision

If calculated from duplicate measurements:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2) / 2}$$

RPD = relative percent difference
C_1 = larger of the two observed values
C_2 = smaller of the two observed values

If calculated from three or more replicates, use relative standard (RSD) rather than RPD:

$$RSD = (s/y) \times 100\%$$

RSD = relative standard deviation
s = standard deviation
y = mean of replicate analyses

Standard deviation, s, is defined as follows:

$$S = \sqrt{\frac{\sum (y_I - y)^2}{n - 1}}$$

s = standard deviation
y_i = measured value of the i^{th} replicate
y = mean replicate measurements
n = number of replicates

6.1.2 Accuracy

For measurements where matrix spikes are used:

$$\%R = 100\% \times \left[(S - U) / C_{sa} \right]$$

%R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot
C_{sa} = actual concentration of spike added

For situations where standard reference material (SRM) is used instead of or in addition to matrix spikes:

$$\%R = 100\% \times \left(C_m / C_{srm} \right)$$

%R = percent recovery
C_m = measured concentration of SRM
C_{srm} = actual concentration of SRM Accuracy

6.1.3 Completeness (Statistical)

Defined as follows for all measurements:

$$\%C = 100\% \times \left(V/n \right)$$

%C = percent completeness
V = number of measurements judged valid
n = total number of measurements to achieve a specified statistical level of confidence in decision making

7 CASING VOLUMES TABLE

Table 6-1 Casing Volume Table

DIAMETER OF CASING (inches)	GALLONS per LINEAR FOOT	LINEAR FEET per GALLON
2.00	0.1632	6.1275
2.50	0.2550	3.9216
3.00	0.3672	2.7233
3.50	0.4998	2.0008
4.00	0.6528	1.5319
4.25	0.7369	1.3570
4.50	0.8362	1.2104
4.75	0.9206	1.0862
5.00	1.0200	0.9804
5.25	1.1246	0.8892
5.50	1.2342	0.8102
5.75	1.3489	0.7413
6.00	1.4688	0.6808
6.25	1.5938	0.6276
6.50	1.7238	0.5801
6.75	1.8590	0.5379
7.00	1.9992	0.5002
7.25	2.1445	0.4663
7.50	2.2950	0.4357
7.75	2.4505	0.4081
8.00	2.6112	0.3830

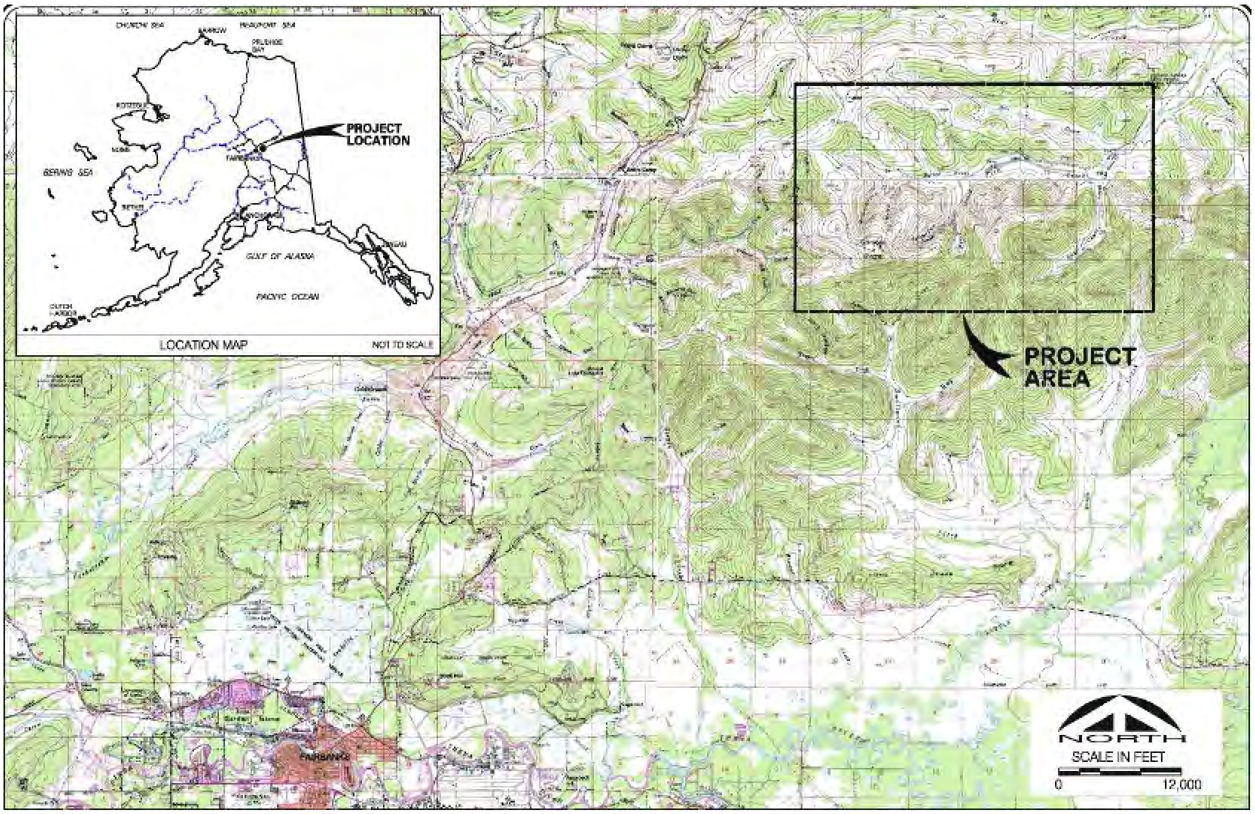
One Casing Volume = (Well Depth – Depth to Water) x Gallons per Linear Foot
One Purge Volume = One Casing Volume x 3.0

Note: Well Depth and Depth to Water are measured in feet!

8 REFERENCE

Anderson, Keith E., 1989, “Water Well Handbook”, Missouri Water Well & Pump Contractors Assn Inc.

Appendix A
Project Location



Appendix B
APDES General Arrangement and Outfall Locations

Appendix C
Profile Constituent Tables

Table 5: Analytical Profile II - Groundwater Inorganic Parameters

Major ion chemistry	Minor ion chemistry	Trace ion chemistry
Lab pH	* Arsenic	* Antimony
Lab Conductivity	Cyanide	* Aluminum
Temperature (field)	Total	* Barium
Turbidity	WAD	* Bismuth
Total Suspended Solids	Fluoride	* Cadmium
Total Dissolved Solids	*Iron	* Chromium
* Calcium	* Manganese	* Copper
* Magnesium	Nitrogen, Ammonia	* Lead
* Potassium	Nitrate as Nitrogen	* Mercury
* Silicon	Nitrite as Nitrogen	* Nickel
* Sodium	Total Phosphorus	* Selenium
Chloride	Sulfide	* Silver
Sulfate		* Zinc
Alkalinity (as CaCO3)		
Bicarbonate		
Total Hardness		

**Dissolved*

Table 5: Analytical Profile I - Surface Water Inorganic Parameters

Major ion chemistry	Minor ion chemistry	Trace ion chemistry
Lab pH	* Arsenic	* Antimony
Lab Conductivity	Cyanide	* Aluminum
Temperature (field)	Total	* Barium
Turbidity	WAD	* Bismuth
Settleable Solids	Fluoride	* Cadmium
Total Suspended Solids	*Iron	* Chromium
Total Dissolved Solids	* Manganese	* Copper
* Calcium	Nitrogen, Ammonia	* Lead
* Magnesium	Nitrate as Nitrogen	* Mercury
* Potassium	Nitrite as Nitrogen	* Nickel
* Silicon	Total Phosphorus	* Selenium
* Sodium	TPH	* Silver
Chloride		* Zinc
Sulfate		
Alkalinity (as CaCO3)		
Bicarbonate		
Total Hardness		

** Total recoverable*

Profile 6

Parameter
cadmium
copper
Cyanide, weak-acid dissociable (WAD)
lead
mercury
Nitrite & nitrate as N
pH
total suspended solids (TSS)
Volume, cumulative-continuous
zinc
Whole effluent toxicity (WET)-Yearly

Profile 7

Parameter
cadmium
copper
cyanide, WAD
lead
mercury
nitrite + nitrate as N
pH
zinc
hardness, calculated

Profile 8

Parameter
Antimony
Arsenic
Chloride
Sulfate

Appendix D
Sample Event Standard Operating Procedures

<table>
<tr><td colspan="3" align="center">Fairbanks Gold Mining, Inc.</td></tr>
<tr><td colspan="3" align="center">Field Documentation Procedures
FGMI-ENVSAMPLE-SOP-01</td></tr>
<tr><td colspan="2" align="center">Management Endorsement:</td><td>Synopsis:
This document defines the Fairbanks Gold Mining, Inc. minimum standards for field documentation of environmental sampling.</td></tr>
<tr><td rowspan="3">Bartly Kleven
Environmental Manager
Fairbanks Gold Mining, Inc.

______________________</td><td rowspan="3">

______________________</td><td>Published by:
Fairbanks Gold Mining, Inc.</td></tr>
<tr><td></td></tr>
<tr><td>February 3, 2021</td></tr>
</table>

Revision Record			
Change Date	**Remove**	**Insert**	**Description of Change(s)**
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

This standard operating procedure (SOP) provides the general technical requirements and operational guidelines associated with documenting environmental compliance sampling activities associated with the Fairbanks Gold Mining, Inc. (FGMI) Alaska Pollutant Discharge Elimination System (APDES) and Waste Management permit requirements for the Fort Knox Mine, Fairbanks, Alaska. This SOP should be used in conjunction with other FGMI project record documents as necessary. The procedures described in the SOP are applicable to:

- Field logbooks (hard copy or electronic format).
- Field data sheets (hard copy or electronic format).
- Sample labels.
- Chain-of-Custody (COC) documentation.
- Forms or other documentation tools described in the Quality Assurance/Quality Control (QA/QC) Manual and the retention of these documents.

2.0 GENERAL CONSIDERATIONS

Proper documentation of field activities is a crucial part of the field sampling process. Proper documentation provides legally-defensible documentation of information regarding sampling locations, sampling methods and equipment, sample identification, sample collection date and time, and field personnel responsibilities (among other important information). Field documentation procedures are important from both a technical and a legal perspective.

This procedure describes the actions and protocols for field data entry utilizing field logbooks and field data forms. The requirements described in this SOP are applicable to field documentation in either hard copy or electronic formats. These protocols are not typically discussed in recent regulatory guidance associated with field investigation activities because the protocols were addressed in detail during early policy development periods of the environmental industry. See references (Section 4.0) for examples of early US Environmental Protection Agency (US EPA) publications that address field documentation.

Lastly, this procedure explains the practice of document retention. Documents will be maintained according to the document retention policies established for this project. Project-related documents will be retained; no documents are to be discarded or destroyed.

2.1 Personnel Training

Personnel responsible for field documentation must read FGMI-ENVSAMPLE-SOP-01, understand the SOP contents, and agree to comply with the SOP. After reviewing this SOP, personnel will sign the signature page (page 10) in order to document their review, willingness to comply and understanding of the SOP.

3.0 PROCEDURES

This section describes general operating procedures and methods associated with field documentation activities. In the event that these procedures cannot be performed as written in this SOP, field personnel must contact the Environmental Manager to obtain approval for the deviation to the procedure prior to conducting sampling activities to the extent practicable. The Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations will be recorded in the field logbook.

3.1 Field Logbook

Each sampling team conducting sampling activities will maintain a field logbook to document the activities performed by the sampling team each day that field work is conducted. At a minimum, the following information will be recorded in the field logbook as appropriate:

- Name and location of the site, including applicable permit sample location designation, if applicable.
- Date(s) of sample collection or event.
- Names of sampling team members and responsibilities.
- Daily time of arrival to the site.
- Daily weather conditions.
- Pertinent field observations.
  Note: Only objective field observations should be recorded in the field logbook; subjective observations should not be included. Opinions and speculations should also not be recorded in the field logbook.
- Record of daily phone calls and/or contact with individuals at or visitors to the site, if related to sample collection activities.
- Management or disposal of investigation-derived wastes if applicable.
- Daily equipment procedures (by reference to project control documents).
- Time of sample collection (sample collection time is defined as the time when the first sample container is filled with sample material).
- Sample identification numbers.
- Description of sampling methodology (by reference to project control documents).
- Field measurements collected as outlined in the applicable project record documents, including any APDES permit requirements.
- A reference to Global Positioning System (GPS) data collected and coordinate system of collected data point, if applicable.

The field logbooks for the Fort Knox project will incorporate field data sheets that have historically been kept by the project to record the above information. To the extent practicable the forms included in the field logbooks have been developed to capture the required information. However, the Environmental Technicians will utilize the “notes” section as needed to document deviations from project document procedures and other field conditions and/or events. In the event these pre-printed logbooks are not available at the time of sample collection the required information may be recorded on loose, single sheet versions of the field data forms used to develop the project field logbooks. When used, the loose, single sheet field data forms will be inserted into the project field logbooks and an explanation provided for the insertion will be noted on the field data sheet. Alternately, standard blank field logbooks may also be used if necessary.

Field logbooks will include contact information of the sampling team member(s) to facilitate retrieval of a misplaced field logbook. At a minimum, the name of the sampling team member(s) and the team's home office/company contact information will be recorded on the inside cover of the field logbook.

Key procedures of field documentation described in the reference documents (see Section 4.0) and other pertinent documents are provided below:

- Ensure field logbooks are bound.
- Consecutively number each page of the field logbook.
- Make the field logbook entries in chronological order such that a time notation introduces each entry.
- Use only indelible ink for field logbook entries.
- Record data directly and legibly in the field logbook.
- Line out errors in the field logbook (a single line strike-through) and initial and date the correction.
- Avoid leaving blank line(s) between field logbook entries. Cross out lines intentionally left blank with a single line and initial and date the cross-out.
- Cross out blank areas that exist with a single line and initial and date the cross-out or populate blank areas with "NA".
- Multiple blank lines may be crossed out using a single diagonal line that passes from the top left of the first blank line to the bottom right of the last blank line.
- If sampling of a location is abandoned or not completed but data entry in the field logbook has begun; "void" the page with a single line and initial and date the cross-out. Ensure the reason sampling wasn't completed is recorded.
- The sample team member entering field data into the database will sign and date each page of the field logbook.

Field documentation is a crucial element of field activities and, therefore, sampling team members will strictly adhere to the field logbook entry protocol presented herein. Field logbook entries will include the information previously detailed and will be recorded in a manner consistent with this procedure. The Environmental Supervisor will review the field logbook entries prior to saving them to the Project Files. The logbooks will be reviewed for completeness, accuracy, and compliance with this SOP and the review will be indicated by initialing and dating the entries.

3.2 Sample Labeling

Sample containers will be pre-labeled before sample collection. The labels will be permanent and protected from the sample matrix by using waterproof labels or by covering with clear tape. Sample labels will include the following information:

- Sample date and sample time (in military format; *i.e.*, HHMM)
- Unique sample identification (sample ID)

Each sample will be assigned a unique multi-digit number, which includes the date, and identification number of the sample. An example of the sampling code is as follows:

WWXXXXXXZZZ

Where:

WW = Site Location
XXXXXX = Sample collection date (year as two digits, month, day)

ZZZ = Sequential sample number for that date

3.2.1 Label Correction Process

For instances when labeling errors have occurred and the label can be directly corrected, use an indelible ink pen to single line strike through the error. The sampler will then initial and date the correction and write the correct information in the space provided.

For instances when labeling errors have occurred and the label cannot support edits or the label has been taped, the label containing the error (including the tape) will be removed from the sample container. A new label with the correct information will be placed on the sample container. A new label will not be placed over an old or incorrect label nor will edits be made to the tape placed over a label.

3.3 Chain-of-Custody Documentation

The COC form is intended to be a legal record of possession of samples for analytical laboratory analysis. The field sampling team will use the specified COC form as required by FGMI. The COC form will be completed by the Environmental Technician at the time of sample collection and will bear the name of the person responsible for the secure and appropriate handling of the samples. The COC form will be filled out correctly and completely leaving no blank fields or blank spaces between entries.

Sampling personnel will maintain the COC form during sample collection activities. The following is the minimum information required on the COC form:

- Name and location of the site.
- Names (printed) of sample team members, if applicable.
- Name (printed), signature, and affiliation of sampler relinquishing samples.
- Sample identification number.
- Date and time of sample collection.
- Matrix of sample collected.
- Number of containers per sample.
- Parameters to be analyzed (analytical profile number).
- Identification of laboratory.
- Special Handling instructions (if applicable).
- Date and time samples were relinquished by sampler.

When completing COC forms, field personnel will employ the applicable field documentation techniques described previously in this SOP. Blank spaces should be single-lined through, initialed, and dated, unless it is obvious from the nature of the form that the spaces may be left blank or are intended to be utilized during a subsequent step of the shipping and receiving process.

Other COC components will include sample labels, custody seals, field data sheets, and sample shipment receipts from the laboratory.

3.4 Field Records Management

Field logbooks will have a unique identifier and pre-numbered pages. Logbooks that are carried into the field will have completed pages scanned to the project database and copied to Project Files weekly such that loss or accidental destruction in the field would involve a minimum of lost data. The copies will be reviewed by the Environmental Coordinator to ensure they are entirely legible. Completed field logbooks, and scanned duplicative copies, will be retained by FGMI, and reside in the Project File. The original logbook will be maintained as the primary record though duplicative copies can become a working copy.

In addition, accompanying documents that are initiated or completed in the field, and are used as official records will be retained by FGMI and reside in the Project File.

In addition to the original COC that accompanies each sample shipment, a copy of each COC is to be retained in the Project File. A working copy of the COC may be retained in working files in the field sampling work area for reference. The receiving analytical laboratory will provide a completed copy of the COC as part of data deliverables and as part of routine sample receipt notification. A copy released as part of data deliverables will become part of Project Files.

All monitoring information associated with the Fort Knox Mine APDES permit will be retained for a minimum of 5 years.

4.0 REFERENCES

- US EPA. "A Compendium of Superfund Field Operations Methods." Office of Solid Waste and Emergency Response. Directive 9355.0-14, 1987. http://www.hanford.gov/dqo/project/level5/Sfcompnd.pdf.
- US EPA. "Compliance-Focused Environmental Management System - Enforcement Agreement Guidance." National Enforcement Investigations Center. EPA-330/9-97-002R, 2005. http://www.epa.gov/oecaerth/resources/policies/neic/cfems_05.pdf.
- US EPA. "Contract Laboratory Program Guidance for Field Samplers." Office of Superfund Remediation and Technology Innovation. OSWER 9240.0-44, EPA 540-R-17-06, July 2007. http://www.epa.gov/superfund/programs/clp/download/sampler/clp_sampler_guidance.pdf.
- US EPA. "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA." Office of Solid Waste and Emergency Response. Directive 9355.3-01, 1988. http://www.epa.gov/superfund/policy/remedy/pdfs/540g-89004-s.pdf.
- US EPA. "Guidance for Performing Preliminary Assessments Under CERCLA." Office of Solid Waste and Emergency Response. Directive 9345.0-01A, 1991. http://www. epa.gov/superfund/sites/npl/hrsres/#PA%20Guidance.
- US EPA. "Guidance for Performing Site Inspections Under CERCLA." Office of Solid Waste and Emergency Response. Directive 9345.1-05, 1991. http://www.epa.gov/ superfund/sites/npl/hrsres/#PA%20Guidance.
- US EPA. "Logbook Operating Procedure," Region 4. Document # SESDPROC-010-R5, May 2013.

I have read FGMI-ENVSAMPLE-SOP-01, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	**Signature**	**Company**	**Date**

End of Procedure

<table>
<tr><td colspan="3">Fairbanks Gold Mining, Inc.</td></tr>
<tr><td colspan="3">Sample Handling, Packing, and Shipping Procedures
FGMI-ENVSAMPLE-SOP-02</td></tr>
<tr><td colspan="2">Management Endorsement:</td><td>Synopsis:
This document defines Fairbanks Gold Mining, Inc. (subsidiary of Kinross Gold Mining Corporation) minimum procedures for sample handling, packing, and shipping for the Fort Knox Mine, Fairbanks, Alaska.</td></tr>
<tr><td rowspan="3">Bartly Kleven
Environmental Manager
Fairbanks Gold Mining, Inc.
____________________</td><td rowspan="3">____________________</td><td>Published by:
Fairbanks Gold Mining, Inc.</td></tr>
<tr><td></td></tr>
<tr><td>February 3, 2021</td></tr>
</table>

Revision Record			
Change Date	**Remove**	**Insert**	**Description of Change(s)**
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

This standard operating procedure (SOP) provides general technical requirements and operational guidelines for the proper handling, packing, and shipping of environmental samples (samples) to a laboratory for analysis for the Fairbanks Gold Mining, Inc. (FGMI) Alaska Pollutant Discharge Elimination System (APDES) and Waste Management permit requirements for the Fort Knox Mine, Fairbanks, Alaska. These procedures have been developed to reduce the risk of damage to the samples (such as breakage of the sample containers), to maintain sample temperature preservation (as required) within the environmental sample cooler (sample cooler) used to transport and store collected samples, and to ensure and document sample custody from collection to receipt at the analytical laboratory. This SOP should be used in conjunction with other FGMI project record documents as necessary. Furthermore, ensure proper handling, packing, and shipping of samples classified as “hazardous materials” in accordance with the following documents:

- 49 Code of Federal Regulations (CFR) Parts 171-180, Hazardous Material Regulations (HMR).
- International Air Transport Association (IATA) standards as detailed in the most current edition of the IATA Dangerous Goods Regulations.
- International Civil Air Organization (ICAO) Technical Instructions.

IATA and ICAO regulations apply to air transportation – both domestic and international. 49 CFR HMR apply to domestic and international hazardous material transportation originating in or imported to the United States.

2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks should be thoroughly evaluated prior to conducting field activities.

Personnel will wear powder-free nitrile gloves while performing the procedures described in this SOP. Specifically, powder-free nitrile gloves should be worn while preparing and handling sample containers and during sample collection and packing activities. Sample bottles will not come into contact with the exposed ground. Where appropriate,; new plastic sheeting may be placed on the ground surface as needed to prevent contact between sample bottles and the ground surface.

A Chain-of-Custody (COC) is intended to provide an accurate record to trace possessions of each sample from the time of collection to the completion of required analysis. Custody of a sample is defined as a sample that is:

- In someone’s physical possession.
- In someone’s view after being in that person’s physical possession.
- In a secured container with a completed custody seal.
- In a designated secure area under lock and key or that provides tampering evidence.

Protocols for sample temperature maintenance and sample packing will apply to the collection of samples year-round or as otherwise specified. The intent of these protocols is for samples to arrive at the designated analytical laboratory both physically intact and temperature preserved.

2.1 Personnel Training

Personnel responsible for conducting sample handling, packing, and shipping must read FGMI-ENVSAMPLE-SOP-02 understand the SOP contents, and agree to comply with the SOP. After reviewing this SOP, personnel should sign the signature page (page 10) in order to document their review, willingness to comply with and understanding of the SOP.

3.0 PROCEDURES

This section describes general operating procedures and methods associated with field documentation activities. In the event that these procedures cannot be performed as written in this SOP, field personnel must contact the FGMI Environmental Manager to obtain approval for the deviation to the procedure prior to conducting sampling activities. The FGMI Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations will be recorded in the field logbook.

3.1 Pre-Job Preparation

The FGMI Environmental Manager, or designee, is responsible for overall implementation of this procedure and ensuring compliance with current regulations and standards.

a. Check with the sampling personnel regarding the equipment required, sample container types and preservatives, and anticipated range of contaminant concentrations.
b. Obtain labeling, packing, and shipping materials as listed in the example checklist provided on Table 1.
c. Verify methods to be used to transport materials (such as the courier or commercial delivery service). Identify the telephone numbers, locations, and special requirements of couriers that are used.
d. Prepare shipping documents in advance where practical.
e. Ensure that the laboratory or recipient is aware of the project schedule and requirements for receipt as specified in Section 3.5 below.

3.2 Sample Temperature Maintenance

In order to facilitate preservation of samples, samples requiring preservation by chilling will be cooled to an appropriate temperature. The Kinross Quality Assurance/Quality Control and Field Procedures Manual requires samples be cooled to 6° C. Cooling of the samples to an appropriate temperature (≤ 6° C) will begin immediately after sample collection and be maintained throughout transport and receipt at the analytical laboratory, as specified in the project record documents.

3.2.1 Chilling Samples (≤ 6° C)

Samples will be placed in a sample cooler after collection. To ensure proper temperature preservation, the sample cooler will contain frozen water in Nalgene® bottles (or equivalent) to chill the samples (ice pack bottles). The samples will remain in sample coolers with ice pack bottles, or in a refrigerator with monitored and controlled temperature, until delivery to the analytical laboratory.

a. After sample collection, bag each sample container using appropriately sized plastic bags.
b. Place the bagged sample container(s) in a sample cooler with ice pack bottles.
c. Fill the surrounding void space of the sample cooler with inert material.
d. Sample containers will be packed in a manner that prevents breakage of glass sample containers by using bubble-wrap/bag or other inert packing materials.

Note: Bagged or loose wet ice may be used instead of ice pack bottles, as necessary. "Blue" ice packs may be used as temperature preservation for solid samples when necessary.

Note: See Section 3.3 (Sample Packing) of this SOP for further details regarding sample container packing.

The method for temperature preservation described above will be utilized unless sample temperatures upon receipt at the laboratory begin to trend above 6°C. At that point alternative measures (such as the use of loose wet ice) will be considered.

3.3 Sample Packing

Samples are collected as specified in the governing project record documents. The following is a summary of steps required for packing and sealing the samples for shipment to the analytical laboratory.

a. Verify the completeness and correctness of the sample identification information on the sample container label for agreement with the COC and information entered into the field logbook.
b. If packing aqueous samples or using wet ice for temperature preservation, place a new plastic bag or inert and impervious liner in the sample cooler.
c. Sample containers will be bagged using clean plastic bags (typically grouped by location). Use plastic bags and subsequently bubble-wrap/bags (as the outer packing material) when sample containers are made of glass or breakable material. Use caution to not over pack the plastic bags (leave space in the bag), which can cause breakage. Place the bagged sample containers inside the sample cooler. If provided by the analytical laboratory, place a temperature blank in the center of the sample cooler, and on top of the sample containers.

Note: Glass containers should be handled with extreme care; drying hands and bottles before handling may minimize the slipping and breakage potential.

d. Place ample amounts inert material inside the sample cooler around the void space between sample containers.

e. As needed, place bubble-wrap or other inert packing material around the plastic bag/liner in the sample cooler to limit the empty space inside the cooler and to provide protection for glass containers.

f. If used, seal the plastic bag/liner using heavy industrial-grade tape (duct tape or similar), a zip-tie, or by tying a tight knot such that if the contents were to spill, the plastic bag/liner would contain the spill.

g. If samples are being transported by the sampling team directly to the analytical laboratory, the designated sampler must relinquish the samples on the COC Form by signing his/her name and providing the date and time when the samples are relinquished to the analytical laboratory (skip procedures i and j listed below). Samplers will maintain custody in accordance with the definition in Section 2.0 above by utilizing custody seals or lock and key.

h. If samples are being transported by a commercial courier (*e.g.*, courier for hire, FedEx®, UPS®), the sampler must relinquish the samples on the COC Form by signing his/her name and providing the date and time that the samples were packed in the sample cooler for shipment. Once received, retain the courier waybill or Courier Documentation Form in the project files.

i. Place the completed COC form in a large resealable plastic bag and place inside the sample cooler. In the event multiple sample coolers are required, copies of the original COC will preferably be placed in each of the sample coolers that contain samples included on the original COC. Copy COCs will be clearly marked as “COPY.” If logistics prohibit the generation of a copy version of the COC, the original COC will be placed in one sample cooler of the cooler set and the COC must specify the total number of sample coolers that contain all samples listed on the COC.

Note: Sample custody is not transferred to a commercial courier when the samples are sealed inside a cooler. Therefore, commercial couriers will not write on a COC Form.

k. Place tamper-evident custody seals/tape on two sides of the sample cooler such that opening the cooler causes the custody seal/tape to break. Tamper-evident custody seals/tape must be able to indicate that the seal had been disturbed (such as leaving remnants of the seal or some type of ink residue on the surface when the seal is lifted). Sign (or initial) and date the custody seals.

3.4 Shipping Procedures for Samples

A trained FGMI transportation subject matter expert will be consulted to determine the proper shipping category for hazardous materials. Once the sample category has been determined, the following procedures are to be followed.

3.4.1 Samples Shipped as Non-Hazardous Material

Samples are shipped as non-hazardous material unless the samples meet the established 49 CFR HMR criteria for a “hazardous material” or the International Air Transport Association, ICAO Technical Instructions, and International Maritime Dangerous Goods (IMDG) Code definition of “dangerous goods” (see Section 3.4.2). When preparing the cooler for shipment, previously used shipping labels on the outside of the container will be removed before samples are placed in the container. When completing the paperwork for shipment, the standard non-hazardous shipping forms provided by the courier will be completed.

3.4.2 Samples Shipped as Dangerous Goods or Hazardous Material

49 CFR HMR and IATA regulations governing the shipment of hazardous materials and dangerous goods will be followed. These regulations (49 CFR Parts 171 – 180 HMR and the Dangerous Goods Regulations [DGR] for IATA) describe proper marking, labeling, placarding, packaging, and shipping of hazardous materials. IATA regulations apply to domestic and international air transportation. 49 CFR HMR regulations apply to domestic and international transportation originating in or imported to the United States. Consult a subject matter expert when shipping dangerous goods or hazardous material. It may be necessary or required to receive training from the transportation company before offering the material to the transporter.

3.5 Laboratory Receipt and Inspection

The FGMI Environmental Coordinator will notify the contract laboratories of the following requirements:

a. Upon receipt by the analytical laboratory, coolers are inspected for evidence of tampering (such as broken custody seals).
b. In the event custody seals are missing or broken, the laboratory will report this condition to the FGMI Environmental Coordinator.
c. The laboratory will record the condition of the sample containers upon receipt on the Sample Receipt Confirmation log and the COC form, and laboratory personnel will accept custody of the samples by signing the COC form, including the date, time, and company affiliation, in the appropriate location.
d. For sample shipments that require temperature preservation, the analytical laboratory personnel will measure and record the cooler temperature or temperature blank (if present) temperature upon receipt.
e. In the event sample coolers show evidence of tampering, sample containers are not intact, or the samples were received outside of the required temperature preservation range, the laboratory will report this condition to the FGMI Environmental Coordinator.

3.6 Documentation

The original COC Form and documented changes to the original COC form and a Sample Receipt Confirmation log will be included as part of the final analytical report from the laboratory to the FGMI Environmental Coordinator. The COC Form is used to document sample custody transfer from the sample team to the laboratory and will be retained by FGMI Environmental Department and reside in the project database.

Sample packaging and shipment tracking information will be maintained by the sampling personnel. The COC Form, courier waybill or Courier Documentation Form, and field logbook will be retained in the central data management files to maintain a complete record of the following information:

- Method of transportation.
- Courier tracking number.

- Material shipped (including, sample Identification (ID) as it appears on the COC and sample container label) associated with each courier tracking number.
- Date and time shipped.

4.0 REFERENCES

- Fairbanks Gold Mining. FGMI-*ENVSAMPLE-SOP-01 Field Documentation Procedures*. February 2021.
- International Air Transport Association (IATA). Dangerous Goods Regulations, 49th Edition, Montreal, 2008.
- International Civil Aviation Organization (ICAO). The ICAO Technical Instructions on the Safe Transport of Dangerous Goods by Air. 2007 - 2008 Edition.
- International Maritime Organization (IMO). International Maritime Dangerous Goods Code, 2006 Edition.
- Kinross. Quality Assurance/Quality Control and Field Procedures Manual. October 2012.
- Office of the Federal Register, National Archives and Records Administration, 49 Code of Federal Regulations Parts 171-180, US Government Printing Office. Washington, DC, 2012.
- United States Environmental Protection Agency (US EPA), Region 4, “Packing, Marking, Labeling and Shipping of Environmental and Waste Samples Operating Procedure.” Document Number SESDPROC-209-R3, February 2015.
- United States Environmental Protection Agency (US EPA), Region 4, “Sample and Evidence Management.” Document Number SESDPROC-005-R2, January 2013.

I have read FGMI-ENVSAMPLE-SOP-02, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the project FGMI Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	**Signature**	**Company**	**Date**

Table 1: Sample Handling, Packing, and Transport Equipment and Material Checklist	
Item Description	**Check**
Health and Safety	
Nitrile gloves	
Hard hat (If necessary)	
Steel-toed boots	
Field first-aid kit	
Eyewash	
Safety glasses	
Paperwork	
Project record documents	
Courier Documentation Form	
Chain-of-Custody forms	
Field logbook	
Appropriate SOP for field work being completed	
Indelible ink pens	
Packing and Shipping Supplies	
Packing tape	
Bubble-wrap/packaging material	
Cardboard	
Tamper-evident custody seals/tape	
Environmental sample coolers	
Cooling Material	
Permanent markers	
Shipping labels	
Resealable plastic bags (gallon and pint sizes)	
Shipping forms (or courier forms)	

End of Procedure

<table>
<tr><td colspan="3">Fairbanks Gold Mining, Inc.</td></tr>
<tr><td colspan="3">Quality Control Sampling Procedures
FGMI-ENVSAMPE-SOP-03</td></tr>
<tr><td colspan="2">Management Endorsement:</td><td>Synopsis:
This document defines the Fairbanks Gold Mining, Inc. minimum procedures for quality control sampling.</td></tr>
<tr><td rowspan="3">Bartly Kleven
Environmental Manager
Fairbanks Gold Mining, Inc.

______________________</td><td rowspan="3">

__________________________</td><td>Published by:
Fairbanks Gold Mining, Inc.</td></tr>
<tr><td></td></tr>
<tr><td>February 3, 2021</td></tr>
</table>

Revision Record			
Change Date	**Remove**	**Insert**	**Description of Change(s)**
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to describe the methods for the proper collection of field quality control (QC) samples. The purposes of QC samples are to provide information on background conditions, isolate site effects, and evaluate contamination during sample transit or to evaluate field and laboratory variability. This SOP is applicable to field QC sample collection activities associated with the Fairbanks Gold Mining, Inc. (FGMI) Alaska Pollutant Discharge Elimination System (APDES) and Waste Management permit requirements for the Fort Knox Mine, Fairbanks, Alaska. This SOP should be used in conjunction with other FGMI project record documents as necessary. The requirements of this SOP are applicable to collection of field duplicate samples, matrix spike/matrix spike duplicate (MS/MSD) samples and equipment rinsate blanks.

2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks should be thoroughly evaluated prior to conducting field activities.

Personnel should wear proper personal protective equipment (PPE) while performing the procedures described in this SOP. Specifically, powder-free nitrile gloves and safety glasses should be worn while preparing and handling sample bottleware, and during sample collection and packing. Sample labeling, packing, and shipping will be conducted in accordance with FGMI-ENVSAMPLE-SOP-02 (Sample Handling, Packing, and Shipping Procedures).

Reusable field sampling equipment should be decontaminated in accordance with FGMI-ENVSAMPLE-SOP-05 (Decontamination of Sampling Equipment Procedures) prior to use.

Quality assurance (QA) will be verified by maintaining site logs, by documenting field activities, and by collecting and analyzing QC samples. QC samples will be used to assess laboratory performance and to evaluate the potential for cross-contamination associated with both field and laboratory activities and sample transport. QC samples will be collected and analyzed in conjunction with samples designated for laboratory analysis using US Environmental Protection Agency (US EPA) methods.

The QC samples and associated frequencies presented in this SOP are to be used as guidance. The specific type of QC samples and their frequencies will be presented in the governing project control documents to meet project-specific data quality objectives and regulatory requirements.

2.1 Personnel Training

Personnel responsible for conducting QC sampling must read FGMI-ENVSAMPLE-SOP-03, understand the SOP contents, and agree to comply with the SOP. After reviewing this SOP, personnel should sign the signature page (page 8) to document their review willingness to comply and understanding of the SOP.

3.0 PROCEDURES

This section documents general operating procedures and methods associated with potable water supply and surface water sampling activities. In the event that these procedures cannot be performed as written in this SOP, field personnel must contact the Environmental Supervisor to obtain approval for the deviation to the procedure prior to conducting sampling activities to the extent practicable. The Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations will be recorded in the field logbook.

This SOP describes the requirements associated with field QC sampling. Standard analytical QC checks that will be instituted by field personnel include the following:

- Field duplicate samples.
- MS/MSD samples.
- Equipment rinsate blanks.
- Field blanks (for low-level mercury analysis)
- Split samples

Note: A temperature blank may be used to estimate the sample temperature at the time the sample is received by the laboratory. The temperature blank is supplied by the laboratory.

3.1 Field Duplicate Samples

Field duplicate samples are used to assess the reproducibility of laboratory analytical results and reproducibility of field sampling techniques. Duplicate samples are collected simultaneously with the associated compliance sample - one parameter at a time. The procedures for collecting duplicate samples in aqueous and solid media are as follows:

a. Aqueous Samples - Alternately fill by thirds (by parameter) the compliance sample and duplicate sample bottleware until both sets of bottleware are filled. If a temporary transfer container is being used for aqueous sample collection, then agitate the sample between filling each third (at a minimum) to help keep the sample homogenized.
b. Solid Samples - Prior to collecting compliance and duplicate samples, soil will be thoroughly homogenized until the material is visibly consistent. Fill the compliance sample and duplicate sample bottleware from the homogenized material.
c. After sample collection, seal the containers properly and immediately place upright in a sample cooler as described in FGMI-ENVSAMPLE-SOP-02.
d. Field duplicate samples are submitted to the laboratory as “blind” duplicates.
e. Ship the field duplicate sample(s) with the associated compliance samples to the analytical laboratory.

Field duplicate samples will be collected at a minimum frequency of one per 20 compliance samples, or one per quarter, whichever is more frequent. At the discretion of the Environmental Manager, or designee, field duplicate samples may be collected at a greater frequency. Field duplicate samples will be analyzed for the same analyses as the compliance samples.

3.2 Matrix Spike/Matrix Spike Duplicate

MS/MSD samples are compliance samples to which known amounts of compounds are added in the laboratory before extraction and analysis. The recoveries for spiked compounds can be used to assess how well the method used for analysis recovers target compounds in the site-specific sample matrices.

a. Collect MS/MSD samples by collecting triple volume of a compliance sample.
b. Aqueous Samples - Alternately fill by thirds (by parameter) the compliance sample the MS sample and MSD sample bottleware until all sets of bottleware are filled. If a temporary transfer container is being used for aqueous sample collection, then agitate the sample between filling each third (at a minimum) to help keep the sample homogenized.
c. Solid Samples - Prior to collecting compliance and duplicate samples, soil will be thoroughly homogenized until the material is visibly consistent. Fill the compliance sample and duplicate sample bottleware from the homogenized material.
d. MS/MSD samples will be labeled as such when submitted to the analytical laboratory.
e. After sample collection, seal the containers properly and immediately place upright in an iced cooler.
f. Ship the MS/MSD samples with the associated compliance samples to the analytical laboratory.

If required by the site QA/QC Manual, or requested by the Environmental Manager, collect MS/MSD samples at a minimum frequency of one per 20 compliance samples or one per quarter, whichever is more frequent. At the discretion of the Environmental Manager, MS/MSD samples may be collected at a lesser frequency once confidence in the reproducibility of results has been established. MS/MSD samples will be analyzed for the same analyses as the compliance samples.

3.3 Equipment Rinsate Blanks

Equipment rinsate blanks are used to assess the effectiveness of field equipment decontamination procedures in preventing cross-contamination between samples. The procedures for collecting equipment rinsate blanks are as follows:

a. Collect equipment rinsate blanks by pouring deionized water into, through, and/or over clean (properly decontaminated) sampling equipment.
b. Collect and containerize the rinsate that has contacted the sampling equipment surfaces in appropriate certified-clean, laboratory-supplied, preserved (if necessary) bottleware.
c. Label equipment rinsate blank samples as such when submitted to the analytical laboratory.
d. After sample collection, seal the containers properly and immediately place upright in a sample cooler as described in FGMI-ENVSAMPLE-SOP-02.
e. Ship the equipment rinsate blank(s) with the associated compliance samples to the analytical laboratory.

Equipment rinsate blanks will be collected at a minimum frequency of one per 20 compliance samples or one per quarter, whichever is more frequent, if equipment is decontaminated and reused. Collect a minimum of one equipment rinsate blank for equipment that is disposable, but is not certified clean for compliance analytes. At the discretion of the Environmental Manager, or designee, equipment rinsate samples may be collected at a greater frequency. Equipment rinsate blanks will be analyzed for the same analyses as the compliance samples.

3.4 Field Blanks

Field blanks are used to assess the potential for cross-contamination during the sample collection procedure. The collection of field blanks is required for low-level mercury analysis at a frequency of 1 field blank for every 10 investigation samples collected. Field blanks for analysis of other parameters will be collected at the discretion of the Environmental Manager at a frequency of 1 per 20 samples collected. Field blanks are to be collected as described below:

1. Collect field blanks by pouring laboratory-supplied reagent water (provided by the laboratory performing field blank analysis) into appropriate certified-clean, laboratory-supplied, preserved (if necessary) containers as close as reasonable to the sample collection site. See FGMI-ENVSAMPLE-SOP-12 for specific sampling requirements for low-level mercury sample collection.
2. Allow the reagent water to travel through the air by placing the sample container approximately 8 inches below the outflow of the container with the lab supplied reagent water.
3. After sample collection, seal the containers properly and place upright in the sample cooler.
4. Ship the field blanks with the associated investigative samples to the analytical laboratory.

3.5 Split Samples

Split samples are collected similarly to field duplicate samples or MS/MSD samples, depending on the number of parties, requiring twice or three times as much volume as is normally collected. This approach to split sampling is not applicable to trace-metals samples. Each party's sample containers will be filled by thirds, by parameter, until all containers are full. Split samples are to be collected as directed by the Environmental Manager or designee. Samples will be submitted for analyses per one of the following, depending on requirements specified dictating split sample collection:

1. Under the purview of FGMI and a separate organization, such as a state environmental agency, OR
2. To two different laboratories.

3.6 Field Logbook Documentation

Field logbooks will be maintained by the Environmental Technician to record daily activities. The minimum requirements for field logbook documentation, and format of field logbooks, are discussed in FGMI-ENVSAMPLE-SOP-01 (Field Documentation Procedures). The Environmental Coordinator will review the field logbook entries for completeness and accuracy and will indicate this review by initialing each page of the logbook. A photocopy or scan will be made of the field logbook record to protect existing data from loss; the copy will be retained in the project files.

4.0 REFERENCES

- Fairbanks Gold Mining, Inc. *FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures*,
July 2015.
- Fairbanks Gold Mining, Inc. *FGMI –ENVSAMPLE-SOP-02 Sampling Handling, Packing, and Shipping Procedures*, July2015.
- Fairbanks Gold Mining, Inc. *FGMI –ENVSAMPLE-SOP-05 Decontamination of Equipment Procedures*, July 2015.
- US EPA. Region 4, Field Sampling Quality Control. Document Number SESDPROC-011-R4, February 2013

I have read FGMI-SOP-03, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	**Signature**	**Company**	**Date**

Table 1: Quality Control Sampling Equipment and Material Checklist	
Item Description	**Check** ☐
Health and Safety	
Nitrile gloves	
Hard hat (if necessary)	
Steel-toed boots	
Hearing protection (if necessary)	
Field first-aid kit	
Eyewash	
Safety glasses	
Respirator and cartridges (if necessary)	
Sampling Equipment	
Plastic sheeting (if necessary)	
Analyte-free (deionized) water	
Water sampling equipment	
Laboratory-supplied bottleware	
Chain-of-Custody forms and custody seals	
Packing tape	
Field logbook	
Permanent marker	
Trash bags	
Paper towels	

End of Procedure

<table>
<tr><td colspan="3" align="center">Fairbanks Gold Mining, Inc.</td></tr>
<tr><td colspan="3" align="center">Field Instrumentation Operation and Calibration Procedures
FGMI-ENVSAMPLE-SOP-04</td></tr>
<tr><td colspan="2" align="center">Management Endorsement:</td><td>Synopsis:
This document defines Fairbanks Gold Mining, Inc. (subsidiary of Kinross Gold Mining Corporation) minimum procedures for field instrumentation operation and calibration for the Fort Knox Mine, Fairbanks, Alaska.</td></tr>
<tr><td rowspan="3">Bartly Kleven
Environmental Manager
Fairbanks Gold Mining, Inc.
______________________</td><td rowspan="3">______________________</td><td>Published by:
Fairbanks Gold Mining, Inc.</td></tr>
<tr><td></td></tr>
<tr><td>February 3, 2021</td></tr>
</table>

Revision Record

Change Date	Remove	Insert	Description of Change(s)
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to describe the general operation, calibration, maintenance, and storage of field instruments for monitoring as required by the Fairbanks Gold Mining, Inc. (FGMI) Alaska Pollutant Discharge Elimination System (APDES) and Waste Management permit requirements for the Fort Knox Mine, Fairbanks, Alaska. This SOP should be used in conjunction with other FGMI project record documents as necessary. The field instruments are used to collect quantitative and semi-quantitative field measurements. Specifically, this SOP details operation, calibration, maintenance, and storage of the following field instruments:

- HACH HQ30d and HQ40d pH, Conductivity, and Temperature Meter.
- Hannah HI98129 pH, Conductivity, and Temperature Meter.
- Temperature Meter.

2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks should be thoroughly evaluated prior to conducting field activities.

Personnel will wear powder-free nitrile gloves while performing the procedures described in this SOP. Specifically, powder-free nitrile gloves are worn while preparing and handling field equipment, during sample collection, and equipment decontamination.

Although this SOP provides general procedures for the use of field instruments, specific instruments' User's Manuals were consulted in preparation of this SOP. It is important to maintain and review the specific instruments' User's Manual for manufacturer's recommendations regarding assembly, operation, calibration, maintenance, and storage.

Note: The glass bulb at the end of the HI98129 electrode is sensitive to electrostatic discharges. Avoid touching the glass bulb at all times. Additionally, the HI98129 owner's manual recommends that calibration for conductivity be performed using a plastic container to minimize electromagnetic interferences.

2.1 Personnel Training

Personnel responsible for using field instruments in conjunction with a field sampling activity must read FGMI-ENVSAMPLE-SOP-04, understand the SOP contents, and agree to comply with the SOP. After reviewing this SOP, personnel should sign the signature page (page 13) in order to document their review and understanding of the SOP.

3.0 PROCEDURES

This section describes general operating procedures and methods associated with field documentation activities. In the event that these procedures cannot be performed as written in this SOP, field personnel must contact the FGMI Environmental Manager to obtain approval for the deviation to the procedure prior to conducting sampling activities to the extent practicable. The FGMI Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations will be recorded in the field logbook.

3.1 Office Preparation

3.1.1 Field Instrument Logs and Records

Field instrument logs and records will be maintained for each instrument and the logs for each instrument will, at a minimum, contain the following:

- Identity of the device as appropriate.
- Manufacturer's name, type identification, and serial number (or other unique identifier).
- Calibration and verification details or the ability to cross-reference to a calibration and verification record.
- Document information about calibration solutions and standards; date received, lot number, and expiration date.
- Maintenance plan/schedule containing records of maintenance and field repair.
- Records of routine maintenance, non-routine maintenance, or repair activities including the change out of sensors, probes, or other instrument components with serial numbers as appropriate.
- Notes regarding damage, malfunction, modification, or repair to the device or its sensors.

The annotations in the field instrument logs and field data sheets regarding maintenance, repair, damage, or malfunction will have date and initials (or signatures). The instrument maintenance and calibration logs and field data sheets will be maintained as a quality assurance record. Calibration failure or instrument malfunction status will be noted on the instrument, so field sampling personnel do not take the instrument into the field for use until repaired. Calibration failure or instrument malfunction notes will also be readily available in the field instrument logs. Field instrument logs and copies of field data sheets should be stored with or near the instruments, so they are readily available to meet documentation requirements of this SOP. Additionally, the field instrument logs, and field data sheets will be maintained in accordance with FGMI-ENVSAMPLE-SOP-01 (Field Documentation Procedures).

3.1.2 Calibration Solutions and Standards

Calibration solutions and standards will be stored out of direct sunlight and in a dry location not subject to extreme temperatures or large temperature changes, in accordance with the requirements of the product safety data sheet (SDS) and manufacturer's recommendations. An SDS for each calibration standard will be readily available and stored near the calibration standard solutions. Calibration solutions and standards must not be used beyond the manufacturer's expiration date. Calibration solutions will be properly discarded and not reused after use. Additionally, the Kinross Quality Assurance Quality Control and Field Procedures Manual requires standards of calibration to be in accordance with applicable criteria including NIST standards, American Society of Testing Materials standards, or other accepted procedures outlined in the manufacturer's handbook of specifications.

3.2 Field Preparation

Ensure that the field instrumentation is properly serviced and that the required fields are displayed, and the instrument is operating properly. The instrument's probes will be rinsed thoroughly with potable water (if applicable), and the instruments are equilibrated to ambient conditions after calibration and between each use.

3.3 pH Meter

The pH meter will be capable of the following:

- Provision of real-time field measurements.
- Ability to accurately measure pH within the instrument's accuracy and precision specifications or regulatory agency accuracy requirements (if applicable).
- Ability to be calibrated to meet acceptance criteria detailed in Section 3.3.1 of this SOP.

3.3.1 pH Meter Calibration Procedures

An FGMI Environmental Technician must calibrate the pH meters prior to each day of use and whenever the calibration verification check is out of acceptable range. The calibration standards used must bracket the expected range of field pH values. Calibration is considered complete once the pH meters have been calibrated using appropriate calibration solutions. Record the "Pre" and "Post" calibration readings for the calibration parameters in the field instruments' log or an equivalent calibration record. A three-point calibration is recommended if the pH meter is capable. When a three-point calibration is an option, ensure that the instrument is programmed to perform this method of calibration.

Note: The HI98129 is capable of a two-point calibration and it is recommended that pH 4 and pH 10 calibration standards are used to complete the two-point calibration.

The methods and steps needed to calibrate the pH meters are described below as well as in the instruments User's Manuals.

<u>Hannah HI98129 Meter</u>

a. Rinse pH electrode probe with deionized water.
b. Immerse electrode and temperature probe in beaker of fresh commercial calibration solution of pH 7.0. Calibrate meter to solution.
c. After first calibration point is accepted, remove electrode and temperature probe from solution, and then rinse with deionized water.
d. Immerse electrode and temperature probe in second known solution (fresh pH 4.01 or pH 10.01 depending on expected range of pH in water to be monitored) solution. Calibrate meter to solution.

e. Remove electrode and temperature probe from solution, and rinse with deionized water.

Hach HQ30d Meter

a. Use the 7.0 pH buffer solution first.
b. Push the “Calibrate” button. The display will show the buffers necessary for calibration.
c. Rinse the probe with DI water. Blot dry with a lint-free cloth.
d. Place the probe in the buffer solution. Use enough buffer solution to adequately cover the pH sensor. Shake the probe from side to side in the solution.
e. Press the “Read” button. Stir the probe in the solution gently. The display will show the buffer that has been read and the temperature correct pH value when the reading is stable.
f. Rinse the probe with deionized water and blot dry prior to placing probe in the subsequent buffer solutions.
g. Repeat steps *e* through *g* for the second and third buffer solutions.

After completing the steps described above, the water-quality meter’s calibrations will be checked or verified directly following the initial calibrations by measuring a pH 7 calibration standard as if it were a sample. The acceptance criterion is ± 0.1 standard pH units of the known standard. Do not reuse standards from the initial calibration during the calibration verification. Typically, confidence solutions are available from calibration solution manufacturers and can be used for calibration verification. Verify that pH standards are within use dates (do not exceed expiration date).

Parameter	Acceptance Criteria
pH	± 0.1 Standard pH Units of buffer or more stringent

If calibration verification fails to meet acceptance criteria, immediately recalibrate the instrument or remove the instrument from service.

3.3.2 pH Meter Field Instrument Operation Procedures

The pH Meter will be thoroughly rinsed with deionized water prior to collecting field measurements and between taking measurements from different samples or locations. Prior to use, ensure that the glass electrode is not cracked, scratched, check the batteries, verify the presence of spare batteries in the instruments case, and that air bubbles are not under the probe tip.

a. Rinse the pH electrode with deionized water, turn on the meter, submerge the instruments’ probes into sample water and allow the instruments to equilibrate for 1 minute.
b. When collecting *in-situ* measurements, submerge the probe into the surface water at midstream for until pH readings stabilize. Do not allow the probe to contact the side of the container or bottom of the waterbody during measurement readings.
c. If in-situ measurements are not possible, a certified clean glass or certified clean HDPE beaker are to be used for pH measurement, rinse the certified clean glass or HDPE beaker with approximately 50 milliliters (mL) of sample water three times before submerging the pH probe into the sample water to be measured.

d. Fill beaker with sample water.
e. Immerse pH probe in sample while swirling the sample to provide thorough mixing. Do not allow the probe to contact the side of the container during measurement readings.
f. Turn on meter. Read pH to nearest 0.1 until the reading has stabilized (when beaker icon stops flashing).
g. Record the reading to the nearest 0.1 standard unit in the field logbook or field data sheet in accordance with FGMI-ENVSAMPLE-SOP-01 (Field Documentation Procedures). Also, note any problems such as erratic readings.
h. Rinse probe with deionized water and store according to manufacturer's directions.

3.3.3 pH Meter Maintenance and Storage

The pH meters will be returned to the manufacturers for routine scheduled maintenance at a frequency specified in the instruments' User's Manuals or as otherwise directed. Additionally, the meters will be sent to the manufacturers for any non-routine maintenance whenever the instruments cannot properly perform the functions previously discussed.

It is imperative that the pH meters are stored in an area where freezing will not occur. The pH meter will be turned off and stored in its case with the electrode immersed in a solution and in a secure location in the field office when not in use. The instruments' logs and records and any spare parts will be stored in close proximity to each instrument to enable field sample team members to easily obtain necessary items.

For long-term storage, remove the batteries from the instruments. The instruments' User's Manuals will be consulted for any special considerations for the storage of probes or other sensitive components. Specifically, the HACH HQ30d pH probe will be cleaned with distilled water and the probe soaker bottle will be filled half-full with HACH electrode storage solution of 3M KCl solution. Ensure that the soaker bottle is secure to the probe and submerge the glass bulb and reference junction holes in the KCl solution.

Notes: Do not use distilled or deionized water for storage of the HI98129 pH meter. Rinse the electrode with deionized water to minimize contamination and store it with a few drops of storage (HI 70300) or pH 7 (HI 7007) solution in the protective cap. Also, to prolong the life of the pH electrode, the instrument manual recommends cleaning it monthly by immersing it in HI7061 cleaning solution for half an hour. Afterwards, rinse the probe thoroughly with deionized water and re-calibrate the instrument.

3.4 Electrical Conductance Meter

The electrical conductance meter (conductivity meter) will be capable of the following:

- Ability to provide real-time conductivity measurements.
- Ability to accurately measure electrical conductance within the instrument's accuracy and precision specifications or regulatory agency accuracy requirements (if applicable).
- Ability to be calibrated to meet acceptance criteria detailed in Section 3.4.1 of this SOP.

3.4.1 Electrical Conductance Meter Calibration Procedures

An FGMI Environmental Technician must calibrate the electrical conductance meter prior to each day of use. Calibration is considered complete once specific conductivity probe has been calibrated using appropriate calibration solutions. Two calibration solutions of a known conductivity are needed to calibrate the probe and the solutions should bracket the conductivity of the water to be measured if possible. Record the “Pre” and “Post” calibration readings in the field instrument log or an equivalent calibration record. The methods and steps needed to calibrate the electrical conductivity meter are summarized below and described in more detail in the User’s Manual.

At the beginning of each day of sampling, check instrument linearity.

a. Rinse probe with deionized water.
b. Measure conductivity of two potassium chloride solution standards, which bracket expected sample values.
c. Measure temperature of both solution standards.

Calculate cell constant for each standard to determine if instrument linearity is reasonable. The cell constant is the ratio of the computed conductivity to the measured conductivity of the standard solution.

The electrical conductivity meter calibration will be checked or verified directly following initial calibration by measuring a calibration standard of known value as if it were a sample and comparing the measured result to the calibration acceptance criteria listed below. Do not reuse standards from the initial calibration during the calibration verification. Typically, multi-parameter confidence solutions are available from calibration solution manufacturers and can be used for calibration verification.

Parameter	Acceptance Criteria
Specific Conductance	± 5 % of standard value

If calibration verification fails to meet acceptance criteria, immediately recalibrate the instrument using the applicable initial calibration procedure or remove the instrument from service.

3.4.2 Electrical Conductance Meter Field Instrument Operation Procedures

The electrical conductance instrument will be thoroughly rinsed with deionized water prior to collecting field measurements.

a. Turn instrument on.
b. Ensure that the meter displays the appropriate reporting units to be measured.
c. When collecting *in-situ* measurements, submerge the probe into the surface water at midstream for until temperature readings stabilize.
d. If in-situ measurements are not possible, rinse a new disposable or certified clean plastic beaker with approximately 50 milliliters of sample water three times.
e. Place water sample in new disposable or certified clean plastic beaker (fill to at least 50 millimeters).

f. Rinse probe with deionized or sample water and place in sample water.
g. Immerse conductivity probe in sample so that vent hole is submerged. Move probe around in sample to displace any air bubbles. Turn instrument on to appropriate scale to measure conductivity.
h. Allow the instrument to equilibrate for 1 minute.
i. Ensure air bubbles are not under the probe tip and do not allow the probe to contact the side or bottom of the container.
j. Record conductivity reading after a stable reading is obtained. Stabilization has occurred when the parameter reading does not fluctuate for 15 to 20 seconds.
k. Remove probe from sample and turn off instrument. Ensure air bubbles are not under the probe tip and do not allow the probe to contact the side or bottom of the container. Begin collecting measurements after the electrical conductivity has stabilized, or as specified in the Kinross Quality Assurance/Quality Control and Field Procedures Manual. Stabilization has occurred when the parameter reading does not fluctuate for 15 to 20 seconds.

3.4.3 Electrical Conductivity Meter Maintenance and Storage

Maintenance and certification will be kept current and performed in accordance with the manufacturer's recommendations. The electrical conductivity meter will be returned to the manufacturer for routine scheduled maintenance at a frequency specified in the instruments' User's Manual. Additionally, the meter will be sent to the manufacturer for any non-routine maintenance whenever the instrument cannot properly perform the functions previously discussed.

It is imperative that the electrical conductivity meter is stored in its pre-manufactured case and located in an area where freezing will not occur. Check the batteries prior to taking the instrument into the field each day and carry spare batteries with the instrument.

The electrical conductivity meter will be turned off and stored in its case and in a secure location in the field office when not in use. The instruments' User's Manual will be consulted for any special considerations for the storage of probes or other sensitive components.

The instruments' logs and records and any spare parts will be stored in close proximity to each instrument to enable field sample team members to easily obtain necessary items. For long-term storage, remove the batteries from the instruments.

Note: Do not use distilled or deionized water for storage of the HI98129 conductivity meter.

When retrieved from storage and prior to calibrating, check the electrical conductivity probe for cracks or other damage.

3.5 Water Temperature Meter

The temperature meter will be capable of the following:

- Ability to provide real-time temperature measurements.
- Ability to accurately measure temperature within the instrument's accuracy and precision specifications or regulatory agency accuracy requirements (if applicable).

- Ability to be calibrated to meet acceptance criteria detailed in Section 3.5.1 of this SOP.

Use either a National Institute of Standards and Technology (NIST) calibrated thermometer or a digital temperature probe calibrate against a NIST-calibrated thermometer to measure water temperature.

3.5.1 Water Temperature Meter Calibration Procedures

Temperature meters or probes will be calibrated by an FGMI Environmental Technician by verifying the readings against a NIST certified thermometer. If temperature fails to be within the acceptance criteria (± 0.5°C) relative to the NIST thermometer, apply a correction factor equal to the difference between the NIST thermometer and the instrument's reading (correction factor = NIST thermometer reading - instrument temperature). The correction factor must be applied to temperature measurements recorded by that multi-parameter water-quality meter during field use.

Parameter	Acceptance Criteria
Temperature	± 0.5°C

3.5.2 Water Temperature Meter Operation Procedures

Once the calibration requirements have been met, check the thermometer for cracks or gaps in the mercury. Do not use thermometers if either cracks or gaps are visible.

When collecting *in-situ* measurements, submerge the thermometer or water temperature probe into the surface water at midstream for approximately 1 minute or until temperature readings stabilize. Stabilization has occurred when the temperature reading does not fluctuate for 15 to 20 seconds.

If *in-situ* measurements cannot be performed, obtain at least 200 ml of sample water into a decontaminated beaker or new certified clean sample container as soon after sampling as possible. Submerge the thermometer or temperature meter's probe into the sample water, allow the temperature readings to stabilize based on the above criteria, and record the temperature in the field logbook or on the field datasheet.

Rinse the thermometer or electronic temperature probe with deionized water.

3.5.3 Water Temperature Meter Maintenance and Storage

It is imperative that the water temperature meter is stored in an area where freezing will not occur. The water temperature meter will be turned off and stored in its case and in a secure location in the field office when not in use. The instruments' User's Manual will be consulted for any special considerations for the storage of probes or other sensitive components. The instruments' logs and records and any spare parts will be stored in close proximity to each instrument to enable field sample team members to easily obtain necessary items. For long-term storage, remove the batteries from the instruments.

Note: Do not use distilled or deionized water for storage of the HI98129 temperature probe.

4.0 REFERENCES

- Field Instrument User's Manuals:
- HACH HQd Portable Meter. DOC022.53.80017, 2013 Edition 4.
- Hanna Instruments HI 98129 Waterproof pH, EC/TDS, & Temperature Meter. ISTR98129R2, January 2002.
- Oakton TEMP 5 Acorn Series Meter. OAKTON WD-35626-00, -10, -20, June, 1999.
- Fairbanks Gold Mining. *FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures*, July 2015.
- Kinross. Quality Assurance/Quality Control and Field Procedures Manual. October 2012.

I have read FGMI-ENVSAMPLE-SOP-04, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the FGMI Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	**Signature**	**Company**	**Date**

Table 1: Field Instrumentation Equipment & Material Checklist

Item Description	**Check□**
Health & Safety	
Nitrile gloves	
Field first-aid kit	
Eyewash	
Safety glasses	
Paperwork	
Field Instruments User’s Manuals	
Project Record Documents	
Logbook or field data sheet and indelible ink marker	
SDS for calibration solutions and standards	
Applicable sampling SOPs	
Equipment	
Field Instruments	
Calibration solutions and standards	
Spare parts, particularly for sensitive components	
Paper towels	
Spare batteries	
Deionized water	
Spray bottle	
Tool kit	
Additional items required for particular instrument calibration	

End of Procedure

<table>
<tr><td colspan="3">Fairbanks Gold Mining, Inc.</td></tr>
<tr><td colspan="3">Decontamination of Sampling Equipment Procedures
FGMI-ENVSAMPLE-SOP-05</td></tr>
<tr><td colspan="2">Management Endorsement:</td><td>Synopsis:
This document defines the Fairbanks Gold Mining, Inc. minimum procedures for decontamination of sampling equipment.</td></tr>
<tr><td rowspan="3">Bartly Kleven
Environmental Manager
Fairbanks Gold Mining, Inc.

______________________</td><td rowspan="3">

______________________</td><td>Published by:
Fairbanks Gold Mining, Inc.</td></tr>
<tr><td></td></tr>
<tr><td>February 3, 2021</td></tr>
</table>

Revision Record			
Change Date	Remove	Insert	Description of Change(s)
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

This standard operating procedure (SOP) provides the general technical requirements and operational guidelines associated with decontamination of field sampling equipment associated with the Fairbanks Gold Mining, Inc. (FGMI) Alaska Pollutant Discharge Elimination System (APDES) and Waste Management permit requirements. The procedures described in this SOP are applicable to decontaminating field sampling equipment that may contact sampled media (including soil, groundwater, surface water, soil, and other media). This SOP should be used in conjunction with other FGMI project record documents as necessary. It is important to follow these procedures from a quality control perspective to help ensure that samples are not subjected to cross-contamination.

2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks should be thoroughly evaluated prior to conducting field activities.

Proper decontamination of field equipment is a crucial part of the field investigation process. Consideration should be given to the order in which the samples are collected. In general, samples should be collected in a clean to dirty manner, thereby minimizing the potential for cross-contamination.

Sampling personnel must wear powder-free nitrile gloves while performing the procedures described in this SOP. Specifically, nitrile gloves must be worn while preparing and decontaminating field equipment. At a minimum, nitrile gloves must be changed following decontamination of field equipment and prior to use of the field equipment for sample collection activities to prevent the possibility of cross-contamination.

Prior to field activities, the field team should consider how investigation-derived waste (*i.e.*, decontamination fluids and disposable personal protective equipment) is to be handled. Avoid the use of methanol – according to US EPA RCRA regulations, Methanol; “upon use” is an F-listed waste. Thus, the decontamination fluid immediately becomes a RCRA waste if it contains “used” methanol.

2.1 Personnel Training

Personnel responsible for equipment decontamination must read FGMI-SOP-05, understand the SOP contents, and agree to comply with the SOP. After reviewing this SOP, personnel will sign the signature page (page 8) in order to document their review, willingness to comply and understanding of the SOP.

3.0 PROCEDURES

This section describes general operating procedures and methods associated with field decontamination activities. In the event that these procedures cannot be performed as written in this SOP, field personnel must contact the Environmental Manager to obtain approval for the deviation to the procedure prior to conducting sampling activities to the extent practicable. The Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations will be recorded in the field logbook.

3.1 Pre-Job Preparation

Prior to initiating sampling activities, the sampling personnel will ensure that the following activities have been completed.

a. Verify that adequate supplies of equipment necessary for completing decontamination are available for the planned sampling activities at the site. Refer to Table 1 for an example checklist of decontamination equipment and materials.
b. Review project record documents in an effort to determine the project-specific requirements, procedures, and goals.

3.2 Set-Up

The set-up for decontamination will vary depending on the type of equipment to be used.

For decontamination of hand-held sampling equipment, spread plastic sheeting on the ground and place the decontamination tubs and/or buckets and rinse bottles in order on top of the plastic. Prepare an ample volume of decontamination solution containing a non-phosphate detergent such as Liquinox® (detergent solution) and use water from a public water system, store-bought distilled or spring water, or deionized water. The source of the water should be recorded in the field logbook.

3.3 Decontamination

Equipment used for sampling, testing, or measuring that comes in contact with potentially sampled media will be decontaminated prior to use, unless the equipment is prepackaged and certified clean by a manufacturer. Reusable sampling equipment will also be decontaminated between sampling locations. If disposable sampling equipment (certified clean, prepackaged materials) is used, this equipment will not be decontaminated before use and will be disposed of properly after one use. Disposable equipment will not be used at more than one sampling location.

Dedicated sampling equipment, such as individual sampling/purging pumps that are used to sample one well, will be decontaminated prior to first use, but will not require decontamination between uses at the same well. Dedicated sampling equipment will be secured in clean, resealable plastic bags between uses. Replace dedicated sampling equipment if visual indications of stains are observed or there are indications of contamination from equipment rinsate blanks.

The following section presents decontamination procedures for manual sampling equipment.

3.3.1 Manual Sampling Equipment

The following general decontamination steps should be applied to all sampling equipment that has had or will have contact with potentially impacted media. Site-specific project control documents may specify modifications to these procedures and should be followed when applicable. It is important to note that no acids will be used to decontaminate any electrical or electronic instrumentation, unless specified by the manufacturer.

a. Physically remove visible material from the sampling equipment to the extent practicable before decontaminating the equipment with decontamination fluids.
b. Immerse (to the extent practicable) the equipment in the non-phosphate detergent solution and scrub the equipment thoroughly with a stiff brush until visible residual material is removed and the equipment is visibly clean. Detergent solution should be circulated through equipment that cannot be disassembled, such as submersible pumps (ASTM, 2008).
c. Rinse the equipment thoroughly with control water.
d. To the extent practicable, allow the equipment to air dry in a clean area (equipment does not need to be completely dry before reuse; under certain weather conditions, complete air-drying may not be possible).

If decontaminated equipment will not be used immediately, the equipment may be sealed in a plastic bag for storage. Decontamination activities, including date, time, and reagents used, should be documented in the field logbook or field data sheet.

The non-phosphate detergent solution will be changed daily and/or between sites at a minimum and more frequently as needed. If used, decontamination solvents will be collected in a separate container from water/detergent solutions and disposed of in accordance with FGMI waste handling procedures.

3.4 Documentation

Field logbooks will be maintained by the designated field personnel to record daily activities. The minimum requirements for field documentation are discussed in FGMI-ENVSAMPLE-SOP-01 (Field Documentation Procedures).

4.0 REFERENCES

- American Society for Testing and Materials (ASTM) International, *Standard Practice for Decontamination of Field Equipment Used at Waste Sites*: D 5088-02. 2008.
- Fairbanks Gold Mining, Inc. *FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures*, July 2015.
- United States Environmental Protection Agency (US EPA), Region 4. *Field Equipment Cleaning and Decontamination Operating Procedure.* Document # SESDPROC-205-R2, December 2011.

I have read FGMI-ENVSMPLE-SOP-05, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	**Signature**	**Company**	**Date**

Table 1: Decontamination of Equipment - Equipment & Material Checklist	
Item Description	**CHECK□**
Health and Safety	
Nitrile gloves	
Hard hat	
Steel-toed boots	
Hearing protection	
Field first-aid kit	
Eyewash	
Safety glasses	
Barricades, cones, flashing lights, signs	
Paperwork	
Project Record documents	
Well construction data, location map, field data from previous sampling events	
Field logbook or Field Data Sheets	
Equipment	
Non-phosphate detergent (Liquinox or Alconox)	
Buckets or washtubs	
Spray bottles	
Plastic sheeting	
Plastic bags	
Brushes	
Deionized water	
Control water	

End of Procedure

<table>
<tr><td colspan="3">Fairbanks Gold Mining, Inc.</td></tr>
<tr><td colspan="3">Groundwater Sampling Procedures
FGMI-ENVSAMPLE-SOP-06</td></tr>
<tr><td colspan="2">Management Endorsement:</td><td>Synopsis:
This document defines the Fairbanks Gold Mining, Inc. (subsidiary of Kinross Gold Mining Corporation) minimum procedures for groundwater sampling for the Fort Knox Mine, Fairbanks, Alaska.</td></tr>
<tr><td rowspan="3">Bartly Kleven
Environmental Manager
Fairbanks Gold Mining, Inc.

______________________</td><td rowspan="3">

______________________</td><td>Published by:
Fairbanks Gold Mining, Inc.</td></tr>
<tr><td></td></tr>
<tr><td>February 3, 2021</td></tr>
</table>

Revision Record			
Change Date	**Remove**	**Insert**	**Description of Change(s)**
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

This standard operating procedure (SOP) provides the general technical requirements and operational guidelines for groundwater sample collection procedures associated with the Fairbanks Gold Mining, Inc. (FGMI) Alaska Waste Management permit requirements for the Fort Knox Mine, Fairbanks, Alaska. This SOP should be used in conjunction with other FGMI project record documents as necessary. The procedures described in this SOP are applicable to groundwater sample collection from groundwater monitoring wells.

2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks should be thoroughly evaluated prior to conducting field activities.

Sampling personnel must wear proper personal protective equipment (PPE) while performing the procedures described in this SOP. Specifically, powder-free nitrile gloves must be worn while preparing sample bottleware, collecting and processing samples, decontaminating sample equipment, and packing samples. At a minimum, nitrile gloves must be changed prior to the collection of each sample or as necessary to prevent the possibility of cross-contamination with the sample, the sample bottleware, or the sampling equipment.

Field sampling equipment should be decontaminated in accordance with FGMI-ENVSAMPLE-SOP-05 (Decontamination of Sampling Equipment Procedures) prior to use. Although sampling should typically be conducted from least impacted well to the most impacted well, field logistics may necessitate other sample collection orders. When ground water well sampling does not proceed from least to most impacted, extra precautions must be taken to ensure that appropriate levels of decontamination are achieved.

Equipment that could come into contact with the groundwater should be covered and stored off the ground to avoid potential cross-contamination. If clean plastic sheeting is placed on the ground to help prevent contamination of equipment, then care should be taken to prevent slips, trips, or falls. Any plastic sheeting should be disposed of properly following completion of sampling at each well.

Prior to field activities, the field team should consider how investigation-derived waste (*i.e.*, excess groundwater, disposable sampling equipment, and disposable PPE) is to be handled.

2.1 Personnel Training

Personnel responsible for groundwater sampling must read FGMI-ENVSAMPLE-SOP-06, understand the SOP contents, and agree to comply with the SOP. After reviewing this SOP, personnel will sign the signature page (page 12) in order to document their review, willingness to comply with, and understanding of the SOP.

3.0 PROCEDURES

The following sections describe the volume-averaging purging and sampling methods. A description of bailer sampling is also provided as an alternative in the event this sampling method is necessary. In the event that these procedures cannot be performed as written in this SOP, field personnel must contact the FGMI Environmental Manager to obtain approval for the deviation to the procedure prior to conducting sampling activities to the extent practicable. The FGMI Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations will be recorded in the field logbook.

3.1 Pre-Job Preparation

The following information should be reviewed prior to sampling activities and should be made available for reference in the field as necessary. This information is useful when determining the sampling order, pump intake depth, purge, and recharge rates, and it can facilitate troubleshooting.

- A list specifying the monitoring wells to be sampled.
- Information describing well location, using site-specific or topographic maps and descriptions tied directly to prominent field markers (positional information or maps are also valuable under severe weather conditions).
- A list of the analytical requirements for each sampling location.
- Prior depth-to-groundwater measurements.
- Previous pump placement depths for sampling location with no dedicated pump.
- Previous pump settings and pumping and drawdown rates.
- Previous field data results for each monitoring well, if known.

Prior to initiating sampling activities, the sample collection team will ensure that the following activities have been completed:

a. Verify that an adequate supply of equipment and materials, necessary for completing the planned sampling activities, is available. Refer to Table 1 for an example checklist of purging and sampling equipment and materials.
b. Ensure appropriate laboratory-provided bottleware is available for both the compliance samples and for Quality Control (QC) samples, and that there has been thorough coordination with the analytical laboratory.
c. Review project record documents in an effort to determine the project-specific requirements, procedures, and goals.

3.2 Water-Level Measurements

Prior to pump placement or sample collection, an initial depth-to-water (DTW) level will be measured. For monitoring wells screened across the water table, this measurement will be used to determine the required depth of the pump intake (typically, mid-point of the saturated screen length). The following procedure will be used to measure the water levels:

a. Inspect the well head area for evidence of damage or disturbance. Record notable observations in the field logbook.
b. Open the protective outer cover of the monitoring well. Remove debris that has accumulated around the riser near the well plug. If water is present above the top of the riser and well plug, then remove the water prior to opening the well plug. Do not open the well until the water above the well head has been removed.

c. Well plugs will be left open for an adequate time period to allow the water level to equilibrate prior to measuring the water level. The amount of time is dependent on groundwater recharge rates (5 minutes - 10 minutes is usually sufficient).
d. Using an electronic water-level indicator, accurate to 0.01, determine the distance between the top of the well casing (or established point of reference, usually a V-notch or indelible mark on the well riser) and the surface of the standing water present in the well. If no mark is visible on the well riser, take water level measurements from the north side of the riser.
e. Document the DTW reading in the field logbook.
f. Decontaminate the water-level indicator in accordance with FGMI-ENVSAMPLE-SOP-05.

3.3 Well Purging

Wells must be purged prior to sampling to ensure that representative groundwater is obtained from the water-bearing unit. If the well has been previously sampled in accordance with this SOP, then the depth to the pump intake and the pumping rates will be duplicated to the maximum extent practical during subsequent sampling events.

3.3.1 Calculate Purge Volumes

Based on DTW measurements and total well depth (TWD) measurements, the volume of standing water in the well must be calculated using the following procedures.

a. Subtract DTW from TWD to calculate the length of the standing water column in the well.
b. Multiply the length of the standing water column by the volume calculation (gallons per linear feet of depth) based on the inner casing diameter (see example list below) to determine the total standing water volume; this represents one well volume.

DIAMETER OF CASING (inches)	GALLONS PER LINEAR FOOT	LINEAR FEET PER GALLON
1.00	0.041	0.509
2.00	0.1632	6.1275
2.50	0.2550	3.9216
3.00	0.3672	2.7233
3.50	0.4998	2.0008
4.00	0.6528	1.5319
4.25	0.7369	1.3570
4.50	0.8362	1.2104
4.75	0.9206	1.0862
5.00	1.0200	0.9804
5.25	1.1246	0.8892
5.50	1.2342	0.8102
5.75	1.3489	0.7413
6.00	1.4688	0.6808
6.25	1.5938	0.6276
6.50	1.7238	0.5801
6.75	1.8590	0.5379
7.00	1.9992	0.5002
7.25	2.1445	0.4663
7.50	2.2950	0.4357
7.75	2.4505	0.4081
8.00	2.6112	0.3830

d. Multiply the well volume calculated in the previous step by 3 in order to obtain the respective total purge volume (the minimum volume is three standing well volumes) (ADEC, 2010). For wells with multiple casing diameters (such as open bedrock holes), calculate the volume for each segment. Take the sum of the values and multiply by 3 to determine the minimum and maximum purge volumes, respectively.

e. Although volume-averaged sampling involves purging a specified volume of water rather than basing purge completion on the stabilization of water quality indicator parameters, measuring, and recording water-quality indicator parameters during purging provides information that can be used for assessment and remedial decision-making purposes. Indicator parameters are pH, specific conductance, and temperature.

d. Fully document the volume calculation in the field logbook.

3.3.2 Purge the Monitoring Well

Most groundwater monitoring wells at Fort Knox are equipped with permanent pumps. For monitoring wells with permanent pumps follow steps *a-c* and *l-o* below. For monitoring wells with no pump follow steps *d-o* below.

a. Connect the sampling valve piping or sampling hose to the outlet of the sounding tube. Each of these devices has two outlets with one designed to connect the in-line filter for sample filtration.

b. Turn on the generator and plug in the power cord for the pump.

c. Record the time groundwater beings to discharge and record in the field logbook as the “purge start time”.
d. Determine the appropriate pump to be used for purging for monitoring wells that do not have permanently installed or dedicated pumps; when there is a large volume of water to be purged, use of a variable speed electric submersible pump is preferred (US EPA, 2013).
e. Adjust the reel support pins (on bar below roller) so that the roller is centered over the well opening. Lift and hang the portable pump on the well casing by resting the support pins against the inside of the well casing.
f. Unlock the reel by pulling the pin lock mechanism outward and turning.
g. Using the operating handle, gently reel down the pump to the necessary level and lock the reel in place. The cable is marked every five feet.
h. DO NOT power the converter until the extension cord is connected. Connect the extension cord to the electrical box. Connect the other end of the extension cable to the converter.
i. Connect the discharge hose to the discharge port.
j. Power up the converter (220/240 V generator), turn the frequency control knob to approximately mid-range (12 o’clock position) and start the pump by moving the start/stop switch to the “start” position. Adjust the speed dial to the desired frequency or flow rate.
k. Set the pump immediately above the top of the well screen or 1 – 1 ½ meters (3-5 feet) below the top of the water table (US EPA, 2013). Lower the pump if the water level drops during purging.
l. During well purging, monitor the water-quality indicator parameters using a properly calibrated water quality meter as follows:,:
1. Initially, within 3 minutes of startup.
2. After each well volume is purged, and then
3. Immediately before purge completion.
m. Record the pump discharge rates (gpm) and pump settings in the field logbook. Also, record any changes in the pump settings and the time at which the changes were made.
n. Maintain controlled pumping rates to avoid over pumping or pumping the well to dryness, if possible. If necessary, adjust pumping rates, pump set depth, or extend pumping times to remove the desired volume of water (US EPA, 2013).
o. Upon reaching the desired purge water volume initiate sample collection.. It is preferred to collect samples within 1 hour of purging (ADEC, 2010), but acceptable for collection up to 24 hours after purging. Do not collect samples more than 24 hours after completion of purging (US EPA, 2013).

Note: The removal of three well volumes of water may not be practical in wells with slow recovery rates. If a well is pumped to near dryness at a rate less than 1.9 L/min (0.5 gpm), the well will be allowed to completely recover prior to sampling. If necessary, the preferred 1-hour limit may be exceeded to allow for sufficient recovery, but samples must be collected within 24 hours of purge completion.

3.4 Sampling

Samples should be collected as soon as possible after purging so that possible well casing or other influences are minimized. At no time should there be more than 24 hours between purging and sampling. The following procedure will be followed for the collection of groundwater samples.

3.4.1 Sampling with Submersible Pump (permanent or portable pump)

a. Using the valve lever on either the sampling valve piping or hose to restrict the flow rate as to not overfill the sample containers.
b. Remove the end of the tubing from the flow-through cell or over-topping cell used to measure water quality parameters, if applicable.
c. Minimize turbulence when filling sample containers by allowing the liquid to run gently down the inside of the bottle.
d. Immediately seal each sample and when all bottles are filled, place the samples in a cooler to maintain sample temperature preservation requirements in accordance with procedures outlined in the FGMI-ENVSAMPLE-SOP-02 (Sample Handling, Packing, and Shipping).
e. Note the sample identification and sample collection time on field logbook, or data sheet and, on Chain-of-Custody Record (refer to FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures).
f. Once sampling is complete, retrieve the sample pump and associated sampling equipment and decontaminate in accordance with procedures outlined in the FGMI-ENVSAMPLE-SOP-05.
g. Close and secure the well. Clean up and remove debris left from the sampling event.

3.4.2 Sampling with a Bailer

a. Attach new or decontaminated bailer (see FGMI-ENVSAMPLE-SOP-05) to the rope. Rope used will be new and disposed of after use.
b. Ensure the bailer is appropriately sized to fit into the well without binding on the well casing. If the well was purged using a bailer, the same bailer used for purging may be used for sampling within the same well.
c. Remove bailer from protective sleeve while retaining the cover and removable drain tip.
d. Securely attach a line (wire, chord, or rope) to the top of the bailer ensuring that the line is of sufficient length for the bailer to reach the desired water level.
e. Lower the bailer into the well until the bailer contacts the surface of the water.
f. Allow the bailer to sink until the unit is filled with water or until the unit touches the well bottom.
g. Retrieve the bailer to the top of the well while listening to ensure the check valve is not leaking water back into the well. If the check valve is leaking it may be necessary to bounce the unit up and down on the line to seal the valve.
h. With the bailer stopcock closed, insert the drain tube to displace the ball valve. Carefully fill each sample bottle from the drain using the stopcock to meter the flow.
i. Immediately seal each sample and when all bottles are filled, place the samples on ice in a cooler to maintain sample temperature preservation requirements in accordance with procedures outlined in the FGMI-ENVSAMPLE-SOP-02 (Sample Handling, Packing, and Shipping).
j. Note the sample identification and sample collection time on field logbook, or data sheet and, on Chain-of-Custody Record (refer to FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures).
k. Once sampling is complete, place used bailer back into sleeve and dispose of properly.

l. Close and secure the well. Clean up and remove debris left from the sampling event.

3.4.3 Filtration of Groundwater Samples

It may be necessary to collect dissolved inorganic constituents samples. The collection of dissolved inorganic samples will be collected as determined by the Environmental Manager or designee. This is accomplished by filtering the sample as follows.

a. After collecting samples utilizing a pump as described in Section 3.4.1, attach a disposable in-line 0.45 μm filter to the tubing.
b. Allow a minimum of three filter volumes of groundwater to run through filter.
c. Fill sample bottle(s).
d. Ensure bottle(s) is labeled correctly and marked as a filtered sample.
e. After filtered samples have been collected, close and secure well as detailed in Section 3.4.1.

3.5 Investigation-Derived Waste

Investigation-Derived Waste (IDW) associated with sampling activities includes excess purge water, decontamination fluids, disposable sampling equipment, and disposable PPE. These materials must be disposed of properly and in accordance with applicable project record documents, laws, regulations, and guidance.

3.6 Sample Handling, Packing, and Shipping

Samples will be marked, labeled, packaged, and shipped in accordance with FGMI-ENVSAMPLE-SOP-02.

3.7 Field Quality Control Samples

Field QC samples may include equipment rinsate blanks, and field duplicate samples. Refer to FGMI-SOP-03 (Quality Control Sampling Procedures) for a description of common field QC samples, the associated collection method, and the applicable QC sample frequency.

3.8 Field Logbook Documentation

Field logbooks will be maintained by the FGMI Environmental Technician to record daily activities. The minimum requirements for field documentation are discussed in FGMI-ENVSAMPLE-SOP-01.

The FGMI Environmental Supervisor will review the field logbook entries for completeness and accuracy and will indicate this review by initialing each page of the logbook. The Field Team Leader is responsible for completion of the required data collection forms.

3.9 Decontamination and Cleanup

Decontamination of sampling equipment will be performed in a manner consistent with FGMI-ENVSAMPLE-SOP-05.

4.0 REFERENCES

- Alaska Department of Environmental Conservation (ADEC). Division of Spill Prevention and Response Contaminated Sites Program. *Draft Field Sampling Guidance.* May 2010.
- Fairbanks Gold Mining, Inc. *FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures*, July 2015.
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-02 Sample Handling, Packing, and Shipping Procedures*, July 2015.
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-03 Quality Control Sampling Procedures*, July 2015.
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-05 Decontamination of Equipment Procedures*, July 2015.
- US EPA. Region 4, Groundwater Sampling Operating Procedure. Document Number SESDPROC-301-R3, March 2013.

I have read FGMI-ENVSAMPLE-SOP-06, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the FGMI Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	**Signature**	**Company**	**Date**

Table 1: Groundwater Sampling Equipment & Material Checklist	
Item Description	**CHECK**
Health & Safety	
Nitrile gloves	
Hard hat	
Steel-toed boots	
Hearing protection	
Field first-aid kit	
Eyewash	
Safety glasses	
Paperwork	
Project record documents	
Well construction data, location map, field data from previous sampling events	
Chain-of-Custody forms and custody seals	
Field logbook	
Measuring Equipment	
Flow measurement supplies (*e.g.*, graduated cylinder and stop watch)	
Electronic water-level indicator	
Sampling Equipment	
Monitoring well keys	
Tools for well access (*e.g.,* socket set, wrench, screw driver, t-wrench)	
Laboratory-supplied certified-clean bottleware, preserved by laboratory (if necessary)	
Sample filtration device and filters	
Submersible pump	
Stainless steel clamps to attach sample lines to pump	
Decontamination and Waste Management Equipment	
Decontamination equipment and supplies (See FGMI-SOP-05)	
Packaging and shipping supplies (See FGMI-SOP-02)	

End of Procedure

Fairbanks Gold Mining, Inc.		
Surface Water Sampling Procedures **FGMI-ENVSAMPLE-SOP-07**		
Management Endorsement:		**Synopsis:** This document defines the Fairbanks Gold Mining, Inc.(subsidiary of Kinross Gold Mining Corporation) minimum procedures for surface water sampling for the Fort Knox Mine, Fairbanks, Alaska.
Bartly Kleven Environmental Manager Fairbanks Gold Mining, Inc. ______________________		**Published by:** Fairbanks Gold Mining, Inc. Copyright is owned by Fairbanks Gold Mining, February 3, 2021

Revision Record			
Change Date	**Remove**	**Insert**	**Description of Change(s)**
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide technical requirements and operational guidelines for surface water sampling activities associated with Fairbanks Gold Mining, Inc. (FGMI) Alaska Pollutant Discharge Elimination System (APDES) and Waste Management permit requirements. The SOP is applicable for sampling streams, wastewater conveyances, lakes, ponds, and shallow areas, such as wetlands or drainage ditches and can also apply to sampling large-body surface waters (where applicable). This SOP should be used in conjunction with other FGMI project record documents as necessary.

Surface waters generally fall into two categories - flowing surface waters and still or stagnant waters. APDES and Waste Management permit samples will be collected from both of these categories of surface water as described in this SOP. Specific considerations associated with sampling each type of surface water encountered are discussed in the following sections. Sampling situations vary widely; therefore, the FGMI Environmental Manager must determine the appropriate method for collecting representative surface water samples.

2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks should be thoroughly evaluated prior to conducting field activities.

It is preferred that personnel do not enter waterways to collect samples. However, if conditions require entering a waterway, personnel should use the United States Geological Survey (USGS) rule of thumb - do not wade into flowing water when the product of depth (in feet) and velocity (in feet per second) equals 10 or greater (US Geological Survey, variously dated). If flow data are unavailable, personnel should not exceed a water depth of knee height. Every attempt should be made to utilize a sampling device, such that personnel entry into the waterbody is avoided. A dock or bridge may be employed for sample locations a considerable distance from the shoreline. Water safety hazards and associated precautions should be thoroughly considered and understood prior to conducting sampling activities in the vicinity of surface water of any type (moving, still or frozen).

Personnel will wear powder-free nitrile gloves while performing the procedures described in this SOP. Specifically, powder-free nitrile gloves will be worn while preparing and handling sample bottleware and during sample collection and packing. Sample labeling, packing, and shipping will be conducted in accordance with FGMI-ENVSAMPLE-SOP-02 (Sample Handling, Packing, and Shipping Procedures).

Reusable field sampling equipment should be decontaminated in accordance with FGMI-ENVSAMPLESOP-05 (Decontamination of Sampling Equipment Procedures) prior to use.

2.1 Personnel Training

Personnel responsible for conducting surface water sampling must read FGMI-ENVSAMPLE-SOP-07, understand the SOP contents, and agree to comply with the SOP. After reviewing this SOP, personnel will sign the signature page (page 10) in order to document their review willingness to comply and understanding of the SOP.

3.0 PROCEDURES

This section describes general operating procedures and methods associated with field documentation activities. In the event that these procedures cannot be performed as written in this SOP, field personnel must contact the FGMI Environmental Manager to obtain approval for the deviation to the procedure prior to conducting sampling activities to the extent practicable. The FGMI Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations will be recorded in the field logbook.

Surface water samples will be collected at locations that are specified in APDES or Waste Management permits. Surface water samples will be collected prior to the collection of any sediment, benthic, or fish samples to avoid contamination of the sample by agitation of the bottom sediments. Consideration should be given to using a container large enough to collect samples for both field and laboratory analysis. Do not pre-rinse laboratory-provided, certified-clean, sample containers. The following devices are generally used for surface water sampling:

- Laboratory-supplied sample bottle.
- Extended pond dipper sampler.
- Flow/Velocity meter.
- Water quality parameter measurement instrumentation.
- Water bottle sampler.
- Handheld or portable Global Positioning System (GPS), to identify sample location.

In addition, the following equipment may be needed for surface water sampling:

- Peristaltic pump and associated tubing.
- Kemmerer depth sampler.

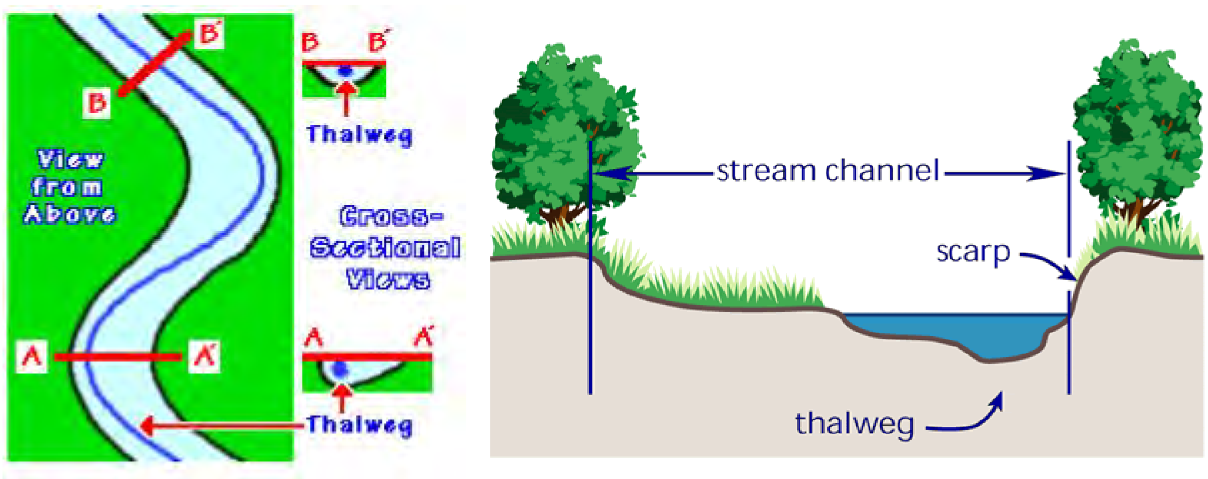
3.1 Pre-Job Preparation

The sample collection personnel will ensure that the following activities have been completed prior to mobilizing to the site:

a. Evaluate weather conditions, and adjust equipment and plans accordingly.
b. Obtain equipment necessary for completing the sampling activities (see Table 1 for an example checklist of equipment and materials needed for sampling).
c. Ensure appropriate laboratory-provided bottleware is available for both the required analyses and for quality control (QC) samples and that there has been appropriate coordination with the analytical laboratory.
d. Obtain location and coordinates of the permit specified sampling location.
e. Conduct a site reconnaissance to identify points of entry/access limitations, health and safety concerns, and sample locations.
f. Review FGMI-ENVSAMPLE-SOP-04 (Field Instrumentation Operation and Calibration Procedures) if field parameters need to be collected as part of the surface water sampling.

3.2 Sampling Flowing Surface Waters (Rivers, Streams, or Drainage Ditches)

Consult the applicable permit to determine sample collection location. If project-specific requirements do not specify a sampling location, the preferable sampling location of flowing water bodies is where the water is well mixed laterally and vertically. These locations are characterized by fast moving or turbulent waters. Sites immediately below riffle areas are generally representative of the entire flow. In the case of calmer waters, the preferred sampling location is the thalweg (area of highest flow rate).



a. Begin by selecting the farthest downstream sampling location. In general, downstream samples should be collected first, followed by upstream samples. This order minimizes the disturbance of bottom sediments impacting subsequent sample locations.
b. A single sample at mid-depth and the mid-point of the main current, conditions permitting is adequate for most streams where there is good lateral and vertical mixing.
c. Prior to sample collection, measure the required field parameters at each sample location as described in FGMI-ENVSAMPLE-SOP-04. Samples should be collected as close to the same location as possible from one sampling event to the next.
d. Measured field parameters will be recorded in the field logbook.

3.2.1 Grab (or Discrete) Sample Collection

3.2.1.1 Water Bottle Sampler or Dip Sampler

Whenever practicable grab samples should be collected directly into a laboratory-supplied sample bottle which is referred to as a water bottle sampler. It may be necessary at times to utilize a dip sampler, which is a fixed length or extendable pole which is able to secure the laboratory-supplied sample bottle and allows the sampler to safely collect the sample into the laboratory-supplied sample bottles. A water bottle sampler or dip sampler may be used to collect surface water samples at a limited depth or at the surface. When the laboratory-supplied sample bottle is unpreserved, proceed as follows.

a. Prior to sample collection inspect the sampling point for evidence of visible debris or material that may inadvertently impact the sample. Remove if present and document in the field logbook. Samples should be collected as close to the same location as possible from one sampling event to the next.
b. Lower the capped unpreserved sample container to the desired depth. Point mouth of sample container upstream/against the flow. Use caution not to disturb sediment during sample collection.
c. Remove the cap allowing the sample container to fill.
d. Replace the cap and remove the container from the water.

Note: When using sample bottles containing preservatives, first fill a separate, clean, unpreserved bottle as defined in steps a through c above, then follow the step below.

e. Immediately decant from the clean, unpreserved bottle or dip sampler into the sample bottle containing preservative.
f. Secure the lid and complete the sample label in accordance with FGMI-ENVSAMPLE-SOP-01 (Field Documentation Procedures).
g. Immediately place the sample in the sample cooler as described in FGMI-ENVSAMPLE-SOP-02.

In the winter months, it may be necessary to remove ice prior to sample collection as described below:

h. Clear snow from an area of the ice large enough for the sampling equipment.
i. Drill or chisel a hole in the ice.
j. After breaking through the ice, remove ice chips with a properly decontaminated container and discard.
k. Approximately three hole volumes of water should be flushed from the hole prior to sample collection. This is often accomplished when breaking through the ice and water upwells through the hole. If needed, use a properly decontaminated container or laboratory-supplied sample bottle to remove additional water. Approximate this volume based on the dimensions of the hole cut through the ice and the ice thickness.
l. Follow steps *a-g* above for sampled collection.

Note: If a surface film is suspected (or visible), the surface of the water will be sampled by gently lowering the sample bottle horizontally into the water with the mouth of the bottle directed upstream, taking reasonable measures to avoid suspended/floating debris.

If any other container is used to retrieve water from the designated location for sampling, this container will be decontaminated in accordance with FGMI-ENVSAMPLE-SOP-05. This container will also be included in the collection of the rinsate blank as described in FGMI-ENVSAMPLE-SOP-03 (Quality Control Sampling Procedures).

Discrete Samples at a Specified Depth

In the event the collection of a discrete sample at a certain depth is required, a Kemmerer depth sampler or peristaltic pump and associated tubing should be used. A Kemmerer depth sampler is comprised of an open tube that is allowed to float between its top and bottom caps. At a desired sample depth, a weighted messenger is sent down the associated towline compressing the top cap into the tube and into the bottom cap, thereby closing the sample tube on both ends.

A peristaltic pump is comprised of a flexible tube fitted inside a circular pump casing (though linear peristaltic pumps have been made). A rotor with a number of "rollers" attached to the external circumference compresses the flexible tube. As the rotor turns, the part of tube under compression closes, thereby forcing the fluid to be pumped to move through the tube.

If a depth-specific sample is not required, a water bottle sampler or dip sampler may be used to collect surface water samples.

3.2.1.2 Kemmerer (or equivalent) Depth Sampler

a. Lower the properly decontaminated Kemmerer depth sampler to the appropriate depth.
b. Once at the desired depth, use the weighted messenger or similar trigger to close the sampling device.
c. Fill the appropriate certified-clean bottleware.
d. Secure the lid and complete the sample label in accordance with FGMI-ENVSAMPLE-SOP-01.
e. Immediately place the sample in the sample cooler as described in FGMI-ENVSAMPLE-SOP-02.

3.2.1.3 Peristaltic Pump (or equivalent) Sampler (For Inorganic Sampling)

a. Use new, certified-clean, disposable Silastic®, Teflon®, Tygon®, or equivalent tubing.
b. Use dedicated tubing and inert weights at each sampling location. Inert weights must be constructed of solid PVC so there is no potential to cross-contaminate the sample.
c. Lower the weighted peristaltic pump tubing to the appropriate depth.
d. Once at the desired depth, turn on the pump and begin purging for approximately 1 minute to 2 minutes before sampling.
e. Fill the appropriate certified-clean bottleware.
f. Secure the lid and complete the sample label in accordance with FGMI-ENVSAMPLE-SOP-01.
g. Immediately place the sample in the sample cooler as described in FGMI-ENVSAMPLE-SOP-02.

3.3 Special Sampling Considerations

Whole Effluent Toxicity Samples

Whole effluent toxicity (WET) samples are collected and used to conduct chronic toxicity tests on a specific species. Collect WET samples in laboratory provided containers as grab samples. Triple rinse the containers with source (sample) water before filling with sample water. To minimize the loss of toxicity due to volatilization of constituents, fill the containers in a manner that leaves no headspace between the contents and the lid.

3.4 Sample Documentation

Field logbooks to record daily activities, including sample collection and tracking information, will be maintained by the sampling team. Information will be entered into the field logbook by the appropriate field team member. Entries will be made in indelible ink.

In addition to the minimum requirements discussed in FGMI-SOP-01, the field logbooks will contain the following:

- Sample identification code and/or number.
- Water depth and location of sample (*e.g.*, surface, mid-depth).
- Water characteristics (*e.g.*, turbidity, color, temperature, flow rate, ice).
- Description and sketch of sample locations in the water body.
- Any changes in sampling locations and reasons (these changes are also to be annotated on maps).
- Description of any photographs should they be taken.

3.5 Investigation-Derived Waste

Investigation-Derived Waste (IDW) associated with sampling activities includes decontamination fluids, disposable sampling equipment, and disposable Personal Protective Equipment (PPE).

3.6 Sample Handling, Packing, and Shipping

Samples will be marked, labeled, packaged, and shipped in accordance with FGMI-ENVSAMPLE-SOP-02.

3.7 Field Quality Control Samples

Field quality control (QC) samples include equipment rinsate blanks, and field duplicate samples. Refer to FGMI-ENVSAMPLE-SOP-03 for a description of common field QC samples, the associated collection method, and the applicable QC sample frequency.

3.8 Decontamination and Cleanup

Decontamination of sampling equipment will be performed in a manner consistent with FGMI-ENVSAMPLE-SOP-05.

4.0 REFERENCES

- US Geological Survey, variously dated*, National Field Manual for the Collection of Water-Quality Data: US Geological Survey Techniques of Water-Resources Investigations, Book 9, Chaps. A1-A9.
- US EPA. Region 4, Surface Water Sampling. Document Number SESDPROC-201-R3, February 2013.
- Fairbanks Gold Mining, Inc. *FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures,* July 2015.
- Fairbanks Gold Mining, Inc. *FGMI- ENVSAMPLE-SOP-02 Sample Handling, Packing, and Shipping Procedures*, July 2015.
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-03 Quality Control Sampling Procedures*, July 2015
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-04 Field Instrumentation Operation and Calibration Procedures*, July 2015.
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-05 Decontamination of Sampling Equipment Procedures*, July 2015.
- US EPA Region 4, Wastewater Sampling. Document # SESDPRCO-306-R3. February 2013.

*Citation information is for the online manual and its individually updated chapters. All versions that were published previously in a printed format have been superseded by the online manual (http://pubs.water.usgs.gov/twri9A).

I have read FGMI-ENVSAMPLE-SOP-07, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the FGMI Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	**Signature**	**Company**	**Date**

Table 1: Surface Water Sampling Equipment & Materials Checklist	
Item Description	**CHECK□**
Health & Safety	
Nitrile gloves	
Hard hat	
Steel-toed boots	
Hearing protection	
Field first-aid kit	
Eyewash	
Safety glasses	
US Coast Guard-approved flotation device	
Sufficient length of rescue line	
Paperwork	
Sampling plan/Scope-of-Work/project guidance documents	
Location map, field data from previous sampling events	
Field logbook	
Chain-of-Custody forms and custody seals	
Equipment	
Laboratory-Supplied Sample Bottles	
Dip Sampler	
Ice Chisel or Ice Auger	
Kemmerer Depth Sampler	
Peristaltic Pump	

End of Procedure

Fairbanks Gold Mining, Inc.		
Activated Carbon Scrubber Bed Material Sampling Procedures **FGMI-ENVSAMPLE-SOP-10**		
Management Endorsement:		**Synopsis:** This document defines Fairbanks Gold Mining, Inc. (subsidiary of Kinross Gold Mining Corporation) minimum procedures for activated carbon scrubber bed material sampling for the Fort Knox Mine, Fairbanks, Alaska.
Bartly Kleven Environmental Manager Fairbanks Gold Mining, Inc ____________________		**Published by:** Fairbanks Gold Mining, Inc.
		February 3, 2021

Revision Record			
Change Date	**Remove**	**Insert**	**Description of Change(s)**
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide technical requirements and operational guidelines for activated carbon scrubber bed material (carbon bed) sampling activities associated with environmental and/or compliance sampling activities associated with the Fairbanks Gold Mining, Inc. (FGMI) Title V Air Quality Control Operating Permit Number AQ0053TVP02 (air permit). These requirements are for the Fort Knox Mine, Fairbanks, Alaska. This SOP should be used in conjunction with other FGMI project record documents as necessary.

The SOP is applicable for collection of grab samples from the onsite carbon beds and compositing of the grab samples for chemical analysis.

Field personnel conducting the composite sampling activities are required to be familiar with the procedures provided in this SOP, as well as standard industry practices. The SOP is designed to be the appropriate method for collecting representative samples in a variety of situations.

2.0 GENERAL CONSIDERATIONS

Carbon bed samples are to be collected for mercury analysis to assess the carbon loading of the material relative to the design capacity of the carbon. The design capacity shall be calculated as specified in the FGMI air permit and Title 40 of the Code of Federal Regulations Part 63, Subpart A. The required sampling frequency is as follows:

- Initial sampling shall be conducted in each carbon bed 90 days after replacement of the carbon, and quarterly thereafter
- When the carbon loading reaches 50% of the design capacity, monthly sampling shall be performed until 90% of the carbon capacity is reached

Potential safety hazards associated with the planned tasks should be thoroughly evaluated prior to conducting field activities. Sampling personnel shall contact Mill Control prior to sample collection to verify the air emissions system has been shut down and the temperature of the system is at a safe level to collect samples. The use of a ladder is necessary to access the sample collection locations. Sampling personnel shall use caution on ladders and maintain three points of contact when ascending and descending ladders. Due to the limited space available on the working platforms limit the size of the sample team to no more than three individuals.

Personnel will wear powder-free nitrile gloves and safety glasses while performing the procedures described in this SOP. Powder-free nitrile gloves will be worn while preparing and handling sample containers and during sample collection and packing. At a minimum, nitrile gloves must be changed prior to the collection of each sample and as often as necessary to prevent the possibility of cross-contamination with the sample, the sample bottleware, or the sampling equipment. This not only protects the sample from contamination, it helps protect the sampler from contact exposure to potential contamination present on the materials used and being collected.

Reusable field sampling equipment shall be decontaminated in accordance with FGMI-ENVSAMPLE-SOP-05 (Decontamination of Sampling Equipment Procedures) prior to use.

2.1 Personnel Training

Personnel responsible for conducting carbon bed sampling must read FGMI-ENVSAMPLE-SOP-10, understand the contents of this SOP, and agree to comply with the SOP. After reviewing this SOP, personnel will sign the signature page (page 10) in order to document their review, willingness to comply with, and understanding of the SOP.

3.0 PROCEDURES

This section documents general operating procedures and methods associated with carbon bed sampling activities. In the event these procedures cannot be performed as written in this SOP, field personnel must contact the FGMI Environmental Manager or designee to obtain approval for the deviation from the procedure prior to conducting sampling activities to the extent practicable. The FGMI Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations will be recorded or identified in the field logbook (e.g., reference to individual who approved deviation and method the approval was communicated).

3.1 Carbon Bed Sampling

Carbon bed samples shall be collected at the frequency specified in the operating permit (see Section 2.0). Representative samples shall be collected from the inlet and exit of the carbon bed as described below. Prior to sampling activities review the Sampling Equipment and Materials Checklist (Table 1) shown at the end of this procedure.

3.1.1 Carbon Bed Grab Sample Collection

a. Contact Mill Control to verify the air emissions system has been shut down using the proper shut-down procedure.
b. Following the FGMI Lockout/Tagout protocol (FGMI-OPG 11 *Lock Out Tag Out Try Out*), apply assigned locks to properly de-energize the system prior to sample collection.
c. Inspect ladders for damage or defects prior to use. Report any damage or significant wear to site Health and Safety and remove the ladder from use.
d. Access the top hatch of the Mercury Scrubber Carbon Tank utilizing the ladder on the side of the tank.
e. Don appropriate respiratory protection prior to exposing the activated carbon bed. Minimum respiratory protection is a half-face respirator with a cartridge filter that meets NIOSH P100 criteria.
f. Remove the bolts from the hatch and carefully open the hatch being aware of pinch point hazards.
g. Measure the distance from the bottom of the hatch opening to the top of the activated carbon bed to determine the total depth of the carbon bed.

Note: The total height of the Mercury Scrubber Carbon Tank is approximately 12 feet (ft.). The distance from the bottom of the tank to the bottom screen is constant at three feet. Calculate the depth of the activated carbon bed using the following formula:

Distance from top of tank to top of carbon (ft.) – 9 ft. = depth of carbon bed

a. Prepare the sampling device (grain sampler or equivalent) by covering all sample ports except the bottom (end of sampler) sample port. The sampling device shall be marked in a manner that allows the sampler to know the depth of the exposed sampling port.
b. Ensure the sampling device has been properly decontaminated in accordance with FGMI-ENVSAMPLE-SOP-05 (Decontamination of Sampling Equipment Procedures).
c. The access hatch is square, and the corners of the open access hatch shall be used as reference points for sample collection by using the corners as a guide to insert the sampling device into the carbon bed at an angle (approximately 20-40 degrees). In order to collect a representative sample from the inlet and outlet of the carbon bed, four samples will be collected from the bottom foot of the carbon bed (inlet), and four samples will be collected from the top foot of the carbon bed (outlet) using the calculated depth of the carbon bed as determined above.
d. Insert the sampling device into the activated carbon bed to collect samples from both the top 12-18 inches (outlet) and bottom 12-18 inches (inlet) of the carbon bed (as measured).
e. Remove the sampling device from each of the four locations and empty the collected sample into a new, clean rock bag.
f. Composite the 4 outlet samples into one new, clean rock bag. Composite the 4 inlet samples into another new, clean rock bag.
g. At times it may be difficult to manually insert a sampling device into the carbon bed due to consolidation of the material. When necessary use a properly decontaminated soil auger attached to a hammer drill to penetrate the carbon bed. At the same time advance the sampling device next to the soil auger to the desired depth to collect the sample.
h. Note the sample collection date, time, and location in the field logbook in accordance with FGMI-ENVSAMPLE-SOP-01 (Field Documentation Procedures).
i. Carbon bed samples will only be collected or handled while wearing clean nitrile gloves. Nitrile gloves will be donned before collection of the first sample and changed between samples and sampling locations, or more frequently if needed.

3.1.2 Collection of Carbon Bed Composite Samples

a. After completing collection of the inlet and outlet grab samples (4 subsamples from each depth) from the carbon bed, the samples shall be thoroughly homogenized prior to collecting an aliquot for chemical analysis.
b. To the degree possible, carbon bed samples will be homogenized to create a representative sample prior to transferring the into sample jars.
c. Thoroughly mix the carbon bed grab samples in the rock bag used for collection until a consistent physical appearance has been obtained. This mixing can be done by kneading the material from the outside of the bag or using a properly decontaminated spatula to mix the material.
d. Transfer appropriate volumes of mixed material into certified-clean, laboratory-supplied bottleware.
e. Don appropriate respiratory protection during homogenization and sample collection.
f. Seal the containers properly, place them in resealable plastic bags, and immediately store them upright in a sample cooler.
g. Note the sample identification and sample collection time in the field logbook and on the Chain-of-Custody (COC) form in accordance with FGMI-ENVSAMPLE-SOP-01 (Field

Documentation Procedures). Sample identifications, names, and numbers should be consistent throughout the COC protocol and field documentation.

3.2 Sample Documentation

Field logbooks to record daily activities, including sample collection and tracking information, will be maintained by the Environmental Technician. It is the responsibility of the Environmental Technician to complete the field logbook. Information will be entered into the field logbook by the appropriate Environmental Technician and entries will be made in indelible ink.

In addition to the minimum requirements discussed in FGMI-ENVSAMPLE-SOP-01(Field Documentation Procedures), the field logbooks will contain the following:

- Sample identification code and/or number.
- Location of sample (*e.g.*, mercury scrubber carbon tank location and unique identifier).
- Distance from top of carbon bed to the top of the mercury scrubber carbon tank and calculated depth of carbon bed.

3.3 Investigation-Derived Waste

Investigation derived waste (IDW) associated with sampling activities includes excess collected activated carbon bed material, decontamination fluids, disposable sampling equipment, and disposable Personal Protective Equipment (PPE). Excess collected carbon bed material is to be returned to the mercury abatement scrubber tanks.

3.4 Sample Handling, Packing, and Shipping

Samples will be marked, labeled, packaged, and shipped in accordance with FGMI-ENVSAMPLE-SOP-01 (Field Documentation Procedures) and FGMI-ENVSAMPLE-SOP-02 (Sample Handling, Packing and Shipping Procedures).

3.5 Field Quality Control Samples

Field quality control (QC) samples may include field duplicate samples. Refer to FGMI-ENVSAMPLE-SOP-03 (QC Sampling Procedures) for a description of common field QC samples, the associated collection method, and the applicable QC sample frequency.

3.6 Decontamination and Cleanup

Decontamination of sampling equipment will be performed in a manner consistent with FGMI-ENVSAMPLE-SOP-05 (Decontamination of Sampling Equipment Procedures).

4.0 REFERENCES

- Fairbanks Gold Mining. *FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures.* July 2015.
- Fairbanks Gold Mining. *FGMI- ENVSAMPLE-SOP-02 Sample Handling, Packing, and Shipping Procedures*. July 2015.
- Fairbanks Gold Mining. *FGMI- ENVSAMPLE-SOP-03 Quality Control Sampling Procedures.* July 2015.
- Fairbanks Gold Mining. *FGMI- ENVSAMPLE-SOP-04 Field Instrument Operation and Calibration Procedures*. July 2015.
- Fairbanks Gold Mining. *FGMI- ENVSAMPLE-SOP-05 Decontamination of Sampling Equipment Procedures.* July 2015.
- Fairbanks Gold Mining Standard/Safety Operating Procedure. OPG-*11Lock Out Tag Out Try Out*. January 2008.
- United States Environmental Protection Agency Title 40 of the Code of Federal Regulations Part 63, Subpart A

I have read FGMI-ENVSAMPLE-SOP-10, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the Fairbanks Gold Mining Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	**Signature**	**Company**	**Date**

Table 1: Activated Carbon Scrubber Bed Material Sampling Equipment and Materials Checklist	
Item Description	**CHECK** ✓
Health and Safety	
Nitrile gloves	
Hard hat	
Steel-toed boots	
Hearing protection	
Respiratory protection	
Field first-aid kit	
Eyewash	
Safety glasses	
Saranex/Tyvek suits and booties (if necessary)	
Lock-out/Tag-out Lock	
Paperwork	
Applicable SOPs	
Location map	
Field logbook	
Chain-of-Custody forms and custody seals	
Equipment	
Rock Sample Bags	
Grain sampler	
Digital camera	
Hand auger	
Sampling scoops or trowels	
Homogenization vessel	
Hammer drill	

End of Procedure

<table>
<tr><td colspan="3">Fairbanks Gold Mining, Inc.</td></tr>
<tr><td colspan="3">Reverse Osmosis System
Sampling Procedures
FGMI-ENVSAMPLE-SOP-12</td></tr>
<tr><td colspan="2">Management Endorsement:</td><td>Synopsis:
This document defines the Fairbanks Gold Mining, Inc. (subsidiary of Kinross Gold Mining Corporation) minimum procedures for reverse osmosis system sampling for the Fort Knox Mine, Fairbanks, Alaska.</td></tr>
<tr><td rowspan="3">Bartly Kleven
Environmental Manager
Fairbanks Gold Mining, Inc.

_______________________</td><td rowspan="3"></td><td>Published by:
Fairbanks Gold Mining, Inc.</td></tr>
<tr><td>Copyright is owned by Fairbanks Gold Mining,</td></tr>
<tr><td>February 3, 2021</td></tr>
</table>

Revision Record			
Change Date	Remove	Insert	Description of Change(s)
	Page Number(s)		

TABLE OF CONTENTS

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide technical requirements and operational guidelines for collection of water samples from reverse osmosis (RO) systems at the Kinross Fort Knox mine. Samples collected from the RO system include the discharge sample associated with Fairbanks Gold Mining, Inc. (FGMI) Alaska Pollutant Discharge Elimination System (APDES) permit requirement, feed water samples and permeate samples. The SOP is applicable for sample collection of feed water, permeate water and discharge water from the RO system.

Specific considerations associated with sampling from the RO system are discussed in the following sections.

2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks should be thoroughly evaluated prior to conducting field activities.

Personnel will wear powder-free nitrile gloves while performing the procedures described in this SOP. Specifically, powder-free nitrile gloves will be worn while preparing and handling sample bottleware and during sample collection and packing. Sample labeling, packing, and shipping will be conducted in accordance with FGMI-ENVSAMPLE-SOP-02 (Sample Handling, Packing, and Shipping Procedures). Personnel are also required to wear hearing protection when inside the RO system building when the system is operating.

Reusable field sampling equipment is to be decontaminated in accordance with FGMI-ENVSAMPLESOP-05 (Decontamination of Sampling Equipment Procedures) prior to use.

2.1 Personnel Training

Personnel responsible for conducting discharge water sampling from the RO system must read this SOP, understand the SOP contents, and agree to comply with the SOP. After reviewing this SOP, personnel are to sign the signature page (page 8) in order to document their review willingness to comply and understanding of the SOP.

3.0 PROCEDURES

This section describes general operating procedures and methods associated with field activities. In the event that these procedures cannot be performed as written in this SOP, field personnel must contact the FGMI Environmental Manager, or designee, to obtain approval for the deviation to the procedure prior to conducting sampling activities to the extent practicable. The FGMI Environmental Manager is responsible for determining whether or not the deviation has the potential to affect data reliability. Documentation of approved deviations are to be recorded in the field logbook.

Discharge water samples will be collected from the location specified in the APDES permit. Additional samples (feed water and permeate) will be collected from the appropriate valves contained in the RO system. The following devices are generally used for RO system water sampling:

- Laboratory-supplied sample bottle.
- Water quality parameter measurement instrumentation.

3.1 Pre-Job Preparation

The sample collection personnel are to verify that the following activities have been completed prior to mobilizing to the site:

a. Evaluate weather conditions, and adjust equipment and plans accordingly.
b. Obtain equipment necessary for completing the sampling activities (see Table 1 for an example checklist of equipment and materials needed for sampling).
c. Verify that appropriate laboratory-provided bottleware is available for both the required analyses and for quality control (QC) samples and that there has been appropriate coordination with the analytical laboratory.
d. Review applicable SOPs that are applicable to RO system sample collection (see References section of this SOP).

3.2 RO System Sample Collection

Due to the configuration of the RO system and the discharge sample point being located in the same structure as the other sample points and process equipment, cleanliness and minimizing the potential for cross contamination is of the utmost importance when sampling from the discharge location. In order to meet these objectives, the permitted discharge sample is to be the first sample from the RO system.

Once entering the RO system enclosure proceed with sample collection as follows.

a. Inspect the RO system enclosure for visible changes from the last sampling event. This may include addition of new equipment, ongoing maintenance or signs of recent maintenance, active caustic treatment of discharge water or any other observations made by the sampling team. Document observations in the field logbook.
b. Inspect the are immediately surrounding the sample locations within the RO system enclosure for accumulation of dust and document either the presence, or absence of dust in the field logbook.
c. Use plastic sheeting to cover the ground or working surface that will be used for sampling equipment and sample containers or otherwise conduct the sampling in such a manner that minimizes the potential of cross contamination.

Field Measurements

a. Consult the applicable permit and/or work plan to determine water quality parameters that are to be recorded in the field.
b. Calibrate water quality monitoring equipment and collect required field parameter data at each sample location as described in FGMI-ENVSAMPLE-SOP-04.

c. Record these field parameters in the field logbook.

Sample Collection

The FGMI APDES permit requires the collection of samples from the RO systems. Multiple parameters are monitored from samples collected depending on the permit requirements. The permit includes the collection of samples for trace-level metals analysis from the discharge sample locations. The detection limits for trace-level metals analyses require that samples be collect in a manner that minimizes the potential for contamination from sample containers, sampling equipment, dust, dirt, or human contact. The guidance used to develop the trace-metals sampling procedures below is performance based. Alternative sampling procedures or techniques may be used, as long as neither samples nor blanks show signs of contamination. Alternative sampling techniques should be closely evaluated against results obtained from the following procedures before determining the alternate procedure is equivalent. Equivalency shall be determined by the Kinross Environmental Manager.

3.2.1 Trace-Level Metals Sampling Procedure

To conduct trace-level metals sampling, there must be two people present. One member of the two-person sampling team is designated as "Dirty Hands" and the second member is designated as "Clean Hands." Contact involving the sample bottle is handled by "Clean Hands." "Dirty Hands" is responsible for the preparation of the sample (except the sample container), operation of any sampling equipment, and for other activities that do not involve direct contact with the sample.

The designated "Dirty Hands" field personnel wears a minimum of three pairs of non-powdered nitrile gloves. The designated "Clean Hands" field personnel wears a minimum of two pairs of non-powdered nitrile gloves. If at any point during sample collection either team member inadvertently touches other surfaces or materials that could contribute to cross contamination the outer pair of gloves will be removed.

a. Begin by collecting the discharge sample (APDES permit location) first.
b. Samples are to be collected from the sample port (valve/faucet) directly into the laboratory supplied sample containers.
c. Position a bucket or other collection vessel under the sample port to capture water not collected in sample containers if necessary.
d. Collect the trace-level metals analysis sample first as described in procedures *e-p* below.
e. "Dirty Hands" opens the sample port and removes his/her outer pair of gloves. Allow the water to flow for 1 minute prior to sample collection. Adjust the flow from the sample port so a steady stream is obtained but the flow rate is low enough to avoid inadvertently overfilling sample containers
f. "Dirty Hands" removes the double bagged sample bottleware from the cooler and opens the outer bag without touching the inner bag. "Dirty Hands" manipulates the inner bag and the bottle to the top of the outer bag.
g. "Clean Hands" opens the inside bag without touching the outside of the outer bag, removes the bottle, closes the inner bag, and gently pushes the inner bag completely back into the outer bag.
h. "Dirty Hands" closes the outer bag and removes his/her outer pair of gloves.
i. "Clean Hands" uncaps the sample bottle and immediately places the uncapped bottle under the sample stream. Allow the stream of water from the sample port to run down

the inside wall of the sample container by angling the sample container to prevent loss of preservative from pre-preserved sample containers. Do not overfill the sample containers.

j. “Clean Hands” immediately caps the sample bottle after the bottle has been filled.
k. “Clean Hands” wipes the outside dry with Kimwipes® or equivalent.
l. “Dirty Hands” records the sample time and sampler’s initials on the prepared label in accordance with FGMI-SOP-01 (Field Documentation Procedures).
m. “Dirty Hands” opens the outer resealable plastic bag.
n. “Clean Hands” opens the inner resealable plastic bag, inserts the filled sample bottle and re-seals the inner resealable plastic bag.
o. “Dirty Hands” seals the outer resealable plastic bag and places the sample in the cooler in order for the samples to be maintained at the temperature recommended by the laboratory as described in FGMI-SOP-02.

Note: These samples should not be removed from the resealable bags after collection and any handling of the samples should be minimized.

p. For collection of field blank samples for trace-metals analysis the procedure mirrors the procedures described above with “Dirty Hands” pouring the laboratory supplied DI water into the new sample container. See FGMI-ENVSAMPLE-SOP-03 (Quality Control Sampling Procedures) for field QC sampling frequency.
q. When collecting samples for analysis at multiple laboratories fill sample containers from each lab alternately by thirds by parameter following the procedures described in FGMI-ENVSAMPLE-SOP-03 for split samples

3.2.2 Additional Parameter Sampling Procedure

a. After completion of the trace-level metals analysis samples the additional required samples are to be collected as described in procedures *b-f* below.
b. “Clean Hands” is to don clean, disposable nitrile gloves and retrieve the sample containers for sample collection. If the sample containers are in a plastic bag “Dirty Hands” dons clean, disposable nitrile gloves and opens the bag and allows “Clean Hands” to retrieve the sample containers.
c. “Clean Hands” carefully place the sample container under the sample port and fill the container. Allow the stream of water from the sample port to run down the inside wall of the sample container by angling the sample container to prevent loss of preservative from pre-preserved sample containers. Do not overfill the sample containers.
d. ”Clean Hands” secure the sample container lids and completes the sample label in accordance with FGMI-SOP-01 (Field Documentation Procedures).
e. ”Clean Hands” places the samples in a clean sealable plastic bag and places the samples in the cooler in order for the samples to be maintained at the temperature recommended by the laboratory as described in FGMI-SOP-02.
f. Repeat the sample collection procedures above for the permeate sample location and then the feed water sample location as required.
g. When collecting samples for analysis at multiple laboratories fill sample containers from each lab alternately by thirds by parameter following the procedures described in FGMI-ENVSAMPLE-SOP-03 for split samples.

3.3 Sample Documentation

Maintain field logbooks to record daily activities, including sample collection and tracking information. Information is to be entered into the field logbook by the appropriate field team member. Make entries in indelible ink.

In addition to the minimum requirements discussed in FGMI-SOP-01, enter the following information into the field logbooks:

- Sample identification code and/or number.
- Sample water characteristics (*e.g.*, turbidity, color, odor).
- Observed change in conditions within the RO system enclosure
- Information gathered from Fort Knox engineering (see Section 3.2)
- Source of feed water to the RO system
- RO system permeate ORP measurement(s)
- Description of any photographs should they be taken.

3.4 Investigation-Derived Waste

Investigation-Derived Waste (IDW) associated with sampling activities includes decontamination fluids, disposable sampling equipment, and disposable Personal Protective Equipment (PPE).

3.5 Sample Handling, Packing, and Shipping

Mark, label, package, and ship samples in accordance with FGMI-ENVSAMPLE-SOP-02.

3.6 Field Quality Control Samples

Field quality control (QC) samples include field blanks, field duplicate, and split samples. Refer to FGMI-ENVSAMPLE-SOP-03 for a description of common field QC samples, the associated collection method, and the applicable QC sample frequency.

3.7 Decontamination and Cleanup

Perform decontamination of sampling equipment in a manner consistent with FGMI-ENVSAMPLE-SOP-05.

4.0 REFERENCES

- Fairbanks Gold Mining, Inc. *FGMI-ENVSAMPLE-SOP-01 Field Documentation Procedures,* July 2015.
- Fairbanks Gold Mining, Inc. *FGMI- ENVSAMPLE-SOP-02 Sample Handling, Packing, and Shipping Procedures*, July 2015.
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-03 Quality Control Sampling Procedures*, July 2015
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-04 Field Instrumentation Operation and Calibration Procedures*, July 2015.
- Fairbanks Gold Mining, Inc. *FGMI - ENVSAMPLE-SOP-05 Decontamination of Sampling Equipment Procedures*, July 2015.
- US EPA Region 4, Wastewater Sampling. Document # SESDPRCO-306-R3. February 2013.

I have read FGMI-ENVSAMPLE-SOP-12, understand the SOP contents, and agree to comply with the SOP. In the event I notice activities that are non-compliant with the SOP, I will bring the non-compliance issues forward to the FGMI Environmental Manager. A copy of this page will be distributed to the Fairbanks Gold Mining, Inc. Project File.

Printed Name	Signature	Company	Date

Table 1: Surface Water Sampling Equipment & Materials Checklist	
Item Description	**CHECK□**
Health & Safety	
Nitrile gloves	
Hard hat	
Steel-toed boots	
Hearing protection	
Field first-aid kit	
Eyewash	
Safety glasses	
Paperwork	
Sampling plan/Scope-of-Work/project guidance documents	
Location map, field data from previous sampling events	
Field logbook	
Chain-of-Custody forms and custody seals	
Indelible ink pen/marker	
Equipment	
Laboratory-Supplied Sample Bottles	
Plastic sheeting	
Water quality meter(s)	
Bucket	

End of Procedure

Appendix C

Wildlife Mortality Reporting Form

WILDLIFE MORTALITY REPORT FORM

Fairbanks Gold Mining Inc.
Fort Knox Mine
P.O. Box 73726
Fairbanks, Alaska 99707-3726

Date:

WAD Cyanide:

Identification	Number	Species Identification
Raptors		
Songbird		
Upland Game		
Waterfowl		
Shorebird		
Mammal		
Other		

Reporter:

Title:

Phone:

Email To:

U.S. Fish & Wildlife Service
1412 Airport Way
Fairbanks, Alaska 99701
ryan_cote@fws.gov

Alaska Department of Fish and Game
1300 College Road
Fairbanks, Alaska 99701-1599
audra.brase@alaska.gov

Alaska Department of Environmental Conservation
Northern Regional Office
610 University Avenue
Fairbanks, Alaska 99709
tim.pilon@alaska.gov