FORT KNOX MINE

RECLAMATION AND CLOSURE PLAN

Prepared By:

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November 2013 R2

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Submitted to:

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Fairbanks, Alaska 99709

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LIST OF ABBREVIATIONS

ACOE	Army Corp of Engineers
ADNR	Alaska Department of Natural Resources
ac-ft	acre-feet
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Division of Fish and Game
ADNR	Alaska Department of Natural Resources
AMSL	above mean sea level
ARD	acid rock drainage
BMP	Best Management Practice
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CIC	Carbon-In-Columns
COO	Chief Operating Officer
cm/sec	centimeters per second
FA	Financial Assurance
FGMI	Fairbanks Gold Mining, Inc.
FWR	Fresh Water Reservoir
GVEA	Golden Valley Electric Association
HDPE	high density polyethylene
HDR	HDR Alaska
INCO	Company name-patented cyanide destruction process
KGC	Kinross Gold Corporation
LCRS	Leachate Collection and Recovery System
LLDPE	Linear Low Density Polyethylene
MHTLO	Mental Health Trust Land Office
mg/L	milligrams per liter
MSHA	Mining Safety & Health Administration
MWS	Maximum Water Surface
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NWS	Normal Water Surface
PCMS	Process Component Monitoring System
PJD	Preliminary Jurisdictions Determination
PMC	Plant Materials Center, ADNR
PMP	Probable Maximum Precipitation
ppm	parts per million
PSS	palustrine scrub-shrub
QA/QC	Quality Assurance/Quality Control
RVP	Regional Vice President
SRCE	Standardized Reclamation and Closure Estimator
SWS	Schlumberger Water Services
TDS	total dissolved solids
TSF	Tailings Storage Facility
USACE	United States Army Corps of Engineers
WAD CN	weak acid dissociable cyanide
WEWG	Wetlands Evaluation Working Group
WSR	Water Supply Reservoir

1 INTRODUCTION

1.1 Purpose

Fairbanks Gold Mining Inc. (FGMI), a wholly owned subsidiary of Kinross Gold Corporation (KGC), has prepared this reclamation and closure plan to replace the plan previously prepared by Schlumberger Water Services (SWS). FGMI has updated and revised the plan to address reclamation, monitoring and post-mining land use for the Fort Knox Mine. This plan is submitted to:

- Alaska Department of Natural Resources, Division of Mining (ADNR) in accordance with AS 27.19.010 et. seq. and 11 AAC 97.100 et. seq.
- Alaska Department of Environmental Conservation (ADEC), Division of Air and Water Quality, as required by Waste Management Permit 2006-DB0043
- U.S. Army Corps of Engineers (ACOE) as required by the Clean Water Act Section 404 Permit No. N-920574, Fish Creek 23

The Fort Knox Mine reclamation and closure plan is designed to return land disturbed by mining and ore processing operations to a stabilized, near-natural condition that will ensure the long-term protection of land and water resources. Additional goals include: reducing the effects of disturbance during mining, implementation of concurrent reclamation where appropriate, reducing or eliminating long-term management requirements, management of the dams for the protection of life and property, and meeting state and federal regulatory requirements. The plan describes the schedule for reclamation, general reclamation procedures, and the methods for achieving the final closure requirements and objectives. In addition, the plan serves as a basis for calculating reclamation costs and the amount of the financial assurance.

Final reclamation will include the waste rock dumps, the tailings impoundment, facility sites, the heap leach pad and all other disturbance on the Millsite Lease area. Reclamation will begin upon cessation of mining and milling operations. Final reclamation will be completed as expeditiously as feasible. Notification, in writing, of final closure will be provided to the ADNR, DEC, and ACOE within 90 days after cessation of mining and milling operations (Millsite Permit ADL 414960 & ADL 414961, Item #15).

Due to the constantly changing regulatory framework and the introduction of new reclamation methods, the reclamation plan may be amended as deemed necessary (11AAC 97.330 Amendment of Reclamation Plan).

Access by Federal and State regulatory personnel to the Fort Knox Mine for routine inspections will be honored by FGMI, with the request that visitors contact mine security to gain access. All visitors are requested to contact mine security to ensure their safety. 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 that routine inspections be conducted during weekdays when administration and process managers are available to answer questions and, if necessary, accompany visitors to various process components.

1.2 Applicant Information

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President & COO:	Brant Hinze
Senior Vice President Environment and Permitting:	Rick Baker
Executive Vice President & CFO:	Tony Giardini
Vice President Office Services& Corp Secretary:	Shelley M. Riley

Fairbanks Gold Mining, Inc. is a wholly owned subsidiary of Kinross Gold Corporation

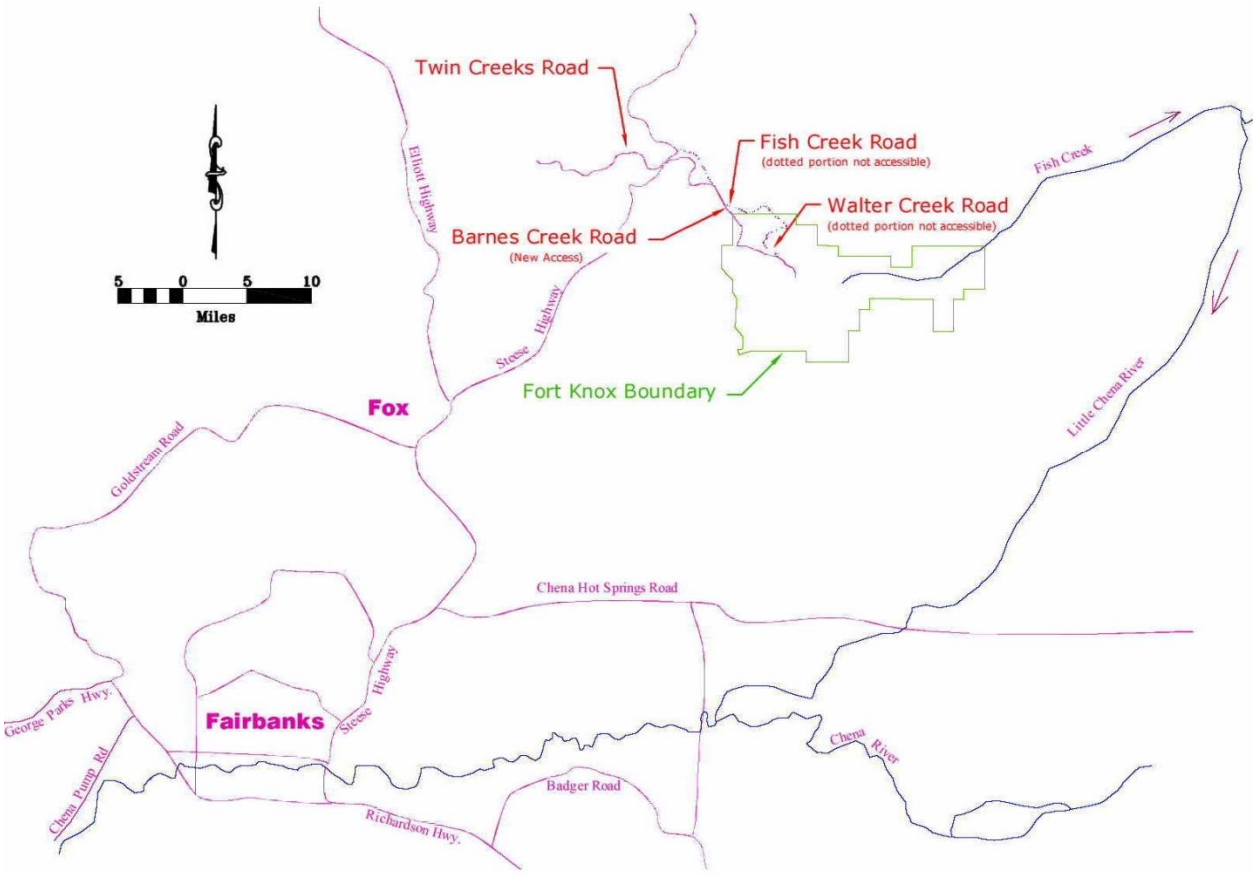
Alaska Registered Agent

Name: Fairbanks Gold Mining, Inc.
Address: c/o C. T. Corporation System (Agent)
240 Main Street, Suite 800
Juneau, Alaska 99801

1.3 Location and Land Status

The project site is located approximately 15 air miles northeast of Fairbanks, Alaska in the Fish Creek drainage, as shown on Figure 1.1. More specifically, the project area is located in portions of Sections 4-5, 8-12, 13-17, 20-23, and 26-27, T2N, R2E, Fairbanks Meridian; and Sections 7-8 and 17-19, T2N, R3E, Fairbanks Meridian.

Figure 1.1 Fort Knox Location



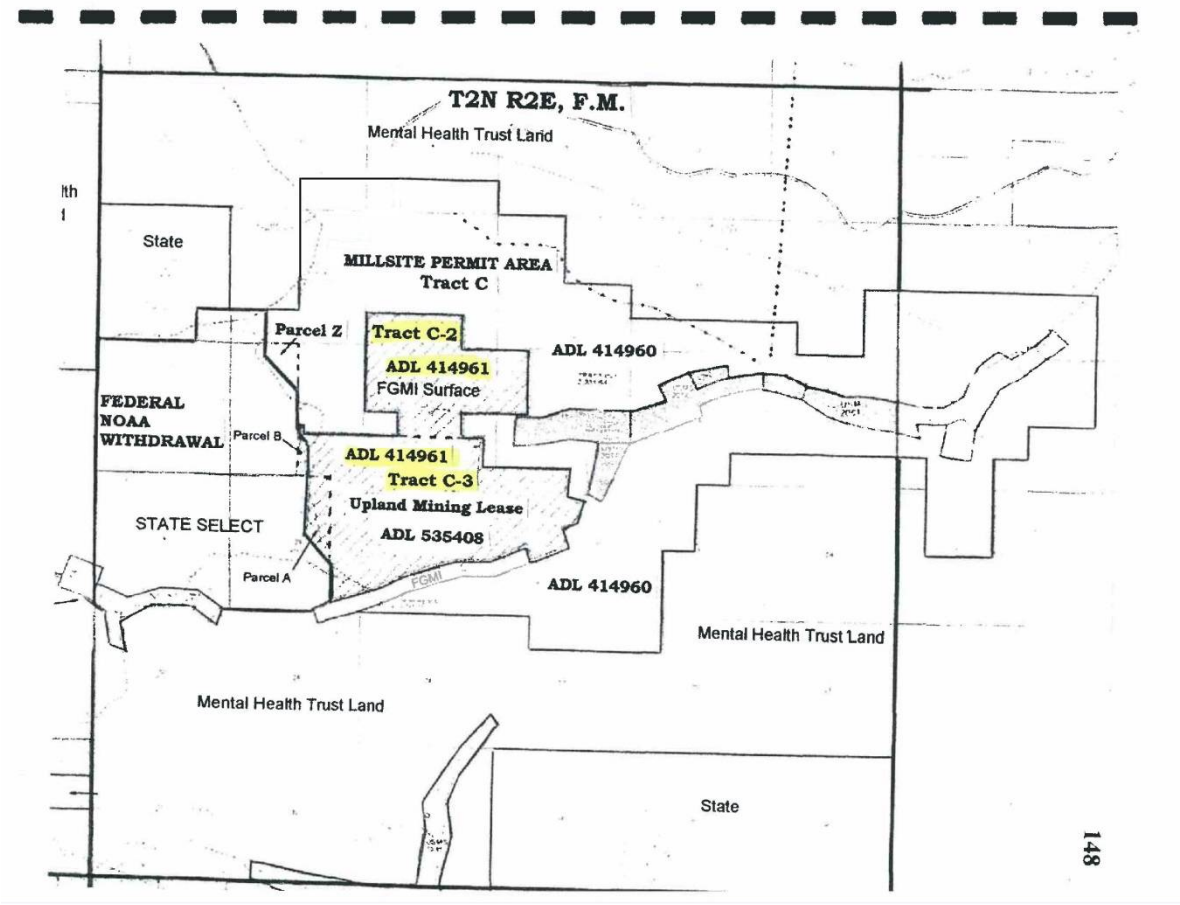
The project area encompasses approximately 8,001 acres. The project area includes the Amended and Restated Millsite Lease, the Upland Mining Lease, and private land. The Amended and Restated Millsite Lease (amending and restating the Millsite Permit effective as of February 15, 1994, ADL # 414960 & 414961) contains approximately 5,828 acres. FGMI holds 121 acres of private land. FGMI holds the surface rights to 1,772 acres which were purchased from MHTLO in 2008. In December of 2011 an application to purchase an additional 280 acres from MHTLO was submitted as a part of Phase 8 and Heap Leach expansion projects, title of the property was conveyed to Fort Knox on December 14, 2012.

FGMI submitted an application for an Upland Mining Lease (ADL #535408) covering tentatively approved lands on December 4, 1992. These lands include 48 state mining claims owned by Melba Creek Mining, Inc., an Alaska corporation, and FGMI, a Delaware corporation. FGMI, on December 4, 1992, applied for two surface leases; the Surface Lease A (ADL #414960) and

Surface Lease B (ADL #414961) were tentatively approved in the vicinity of the Fort Knox lode gold deposit. ADNR issued a Millsite Permit (ADL Nos. 414960 and 414961) and Upland Mining Lease (ADL 535408) on February 15, 1994.

On July 8, 2002 the Amended and Restated Millsite Lease (amending and restating the Millsite Permit effective as of February 15, 1994, ADL # 414960 & 414961) became effective and authorized gold-bearing ores derived from outside the Millsite Lease area to be processed through the Fort Knox mill and tailings facilities. The locations of the Upland Lease and Millsite Lease areas are illustrated in Figure 1.2.

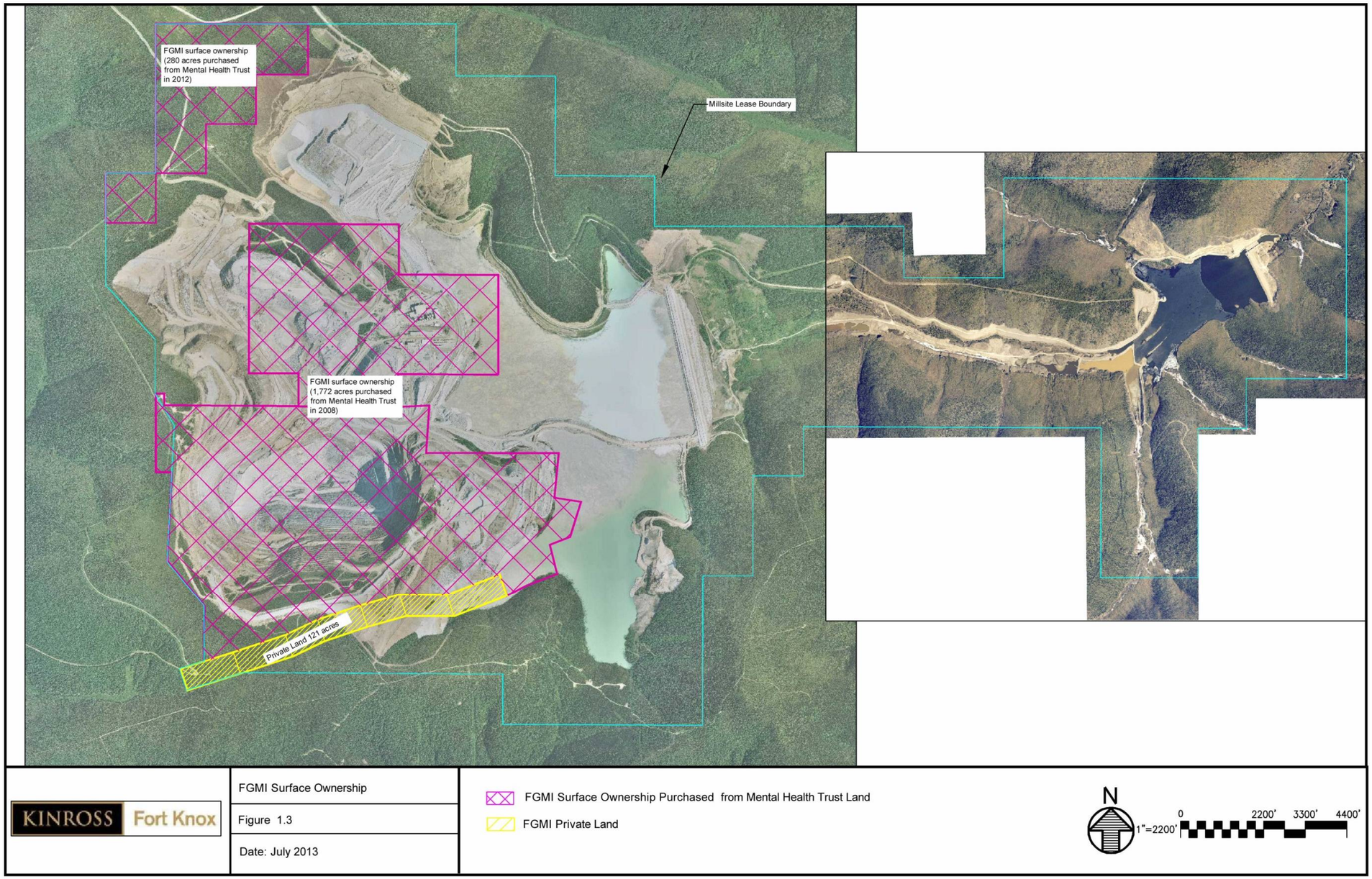
Figure 1.2 Upland and Millsite Lease Areas



Private land included within the Fort Knox project area consists of 121.2 acres of patented claims purchased by FGMI. The narrow block of patented claims adjacent to, but not included in, the Upland Mining Lease or the Millsite Lease, were conveyed to FGMI and Melba Creek Mining, Inc. via warranty deed in August 1993. The location of the private land is identified in Appendix C.

An agreement was reached with the National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Land Management (BLM) to release 63 acres from the NOAA withdrawal for expansion of the Fort Knox pit. In 2008 the land was conveyed to the State of Alaska who in turn conveyed it to the Mental Health Trust Land Office (MHTLO). As part of this agreement, a 19-acre easement was established at the ridgeline to prevent any activity that could impact the activities of NOAA. In 2008, FGMI reached an agreement with MHTLO to purchase their surface interest within the Millsite Lease area. The purchase was finalized in May 2008. Appendix C contains the claim descriptions and a detailed claim map. Figure 1.3 outlines the surface and private area that is now owned by FGMI.

Figure 1.3 FGMI Surface and Private Land Ownership

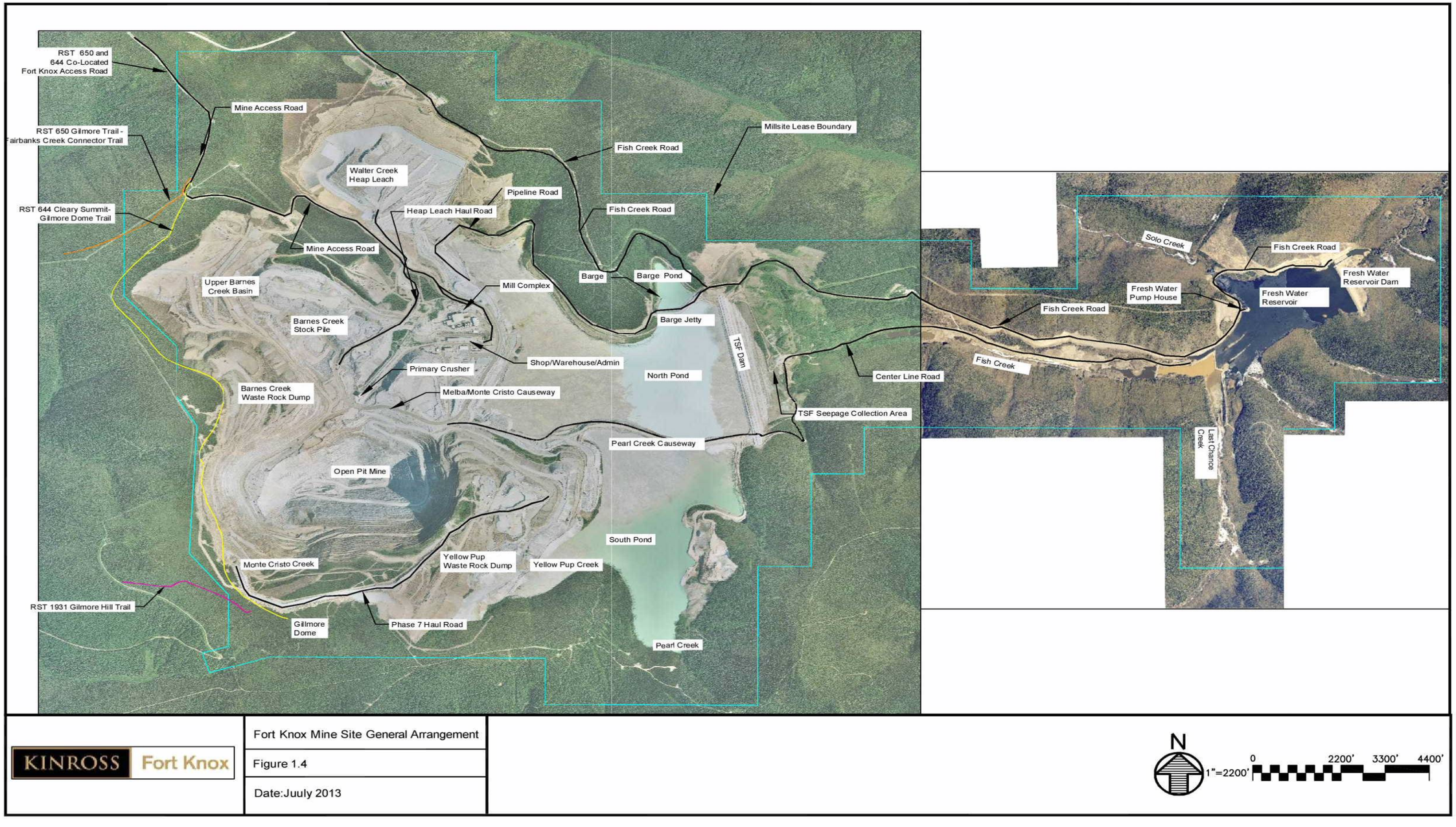


There is no federal land within the project boundaries. The closest residence to the project area is approximately 1.75 miles from the project boundary and is located at Cleary Summit. Surface and mineral land descriptions are provided in Appendix C.

The orebody and the majority of the project area are located on claims belonging to the State of Alaska. Private land and mineral rights in the project area along Fish Creek, which were originally patented to placer miners under the Federal Mining Law of 1872, have been purchased by FGMI. The patented private lands along Fish Creek were conveyed to the State of Alaska, at the time the Millsite Permit was issued.

The center of the ore body is located on the north side of Gilmore Dome on the ridge between Melba and Monte Cristo Creeks. The mineralized zone is elongated east-west extending across both creeks. The project is located entirely within the Fish Creek drainage. In addition to Melba and Monte Cristo Creeks, the named tributaries of Fish Creek in the project area include Barnes Creek, Pearl Creek, Yellow Pup Creek, Walter Creek, Last Chance Creek, and Solo Creek (Figure 1.4).

Figure 1.4 General Arrangement



1.4 History of Fort Knox Mine

On July 22, 1902, Italian prospector Felix Pedro discovered gold in the Interior of Alaska. Just 19 days after making this initial discovery, Pedro staked a discovery claim on Fish Creek downstream from what is now known as the Fort Knox ore body. Intermittent drift mining occurred throughout Fish Creek valley prior to 1917 when a dredge was erected by the Tanana Valley Mining Co. (Shannon and Wilson, 1985). In the 1930s, the upper reaches of Pearl Creek and Yellow Pup Creek were mined by slackline scraper and dragline. In 1963 hydraulic stripping and bulldozer-dragline mining took place along Fish Creek, Barnes Creek and Pearl Creek (CH2M Hill, 1993). The Fairbanks Mining District has produced, from 1880 through 2004, an estimated 11,506,646 ounces of gold. Placer deposits account for 8,188,517 ounces and lode deposits for 3,318,129 ounces (Szumigala & Hughes, 2004). For a more complete discussion of the placer mining history of the Fort Knox area, see History of Mining on Upper Fish Creek, Fairbanks, Alaska (Higgs and Sattler, 1994).

In 1984, geologists discovered visible gold in the granite and noted the potential importance of the Fort Knox deposit. Between 1987 and 1990, Monte Cristo Mining, Inc.; the Fort Knox Limited Partnership; Gilmore Mining, Inc; Fairbanks Gold, Ltd.; Fairbanks Gold, Inc.; and Gilmore, Inc. were involved for varying lengths of time in the exploration and pre-development program. In January 1992, Amax Gold Inc. acquired ownership of the Fort Knox project, and FGMI, an Amax Gold Inc. subsidiary, was established as the project operator.

In 1994, the environmental review (CH2M Hill, 1993) for Fort Knox was completed and in accordance with National Environmental Protection Act (NEPA) an Environmental Assessment was finalized. The required permits were issued in 1994, and the next year construction began. The first gold pour occurred in December of 1996. Kinross Gold Corp. and Amax Gold Inc. merged in 1998 and Fairbanks Gold Mining, Inc. became a wholly owned subsidiary of Kinross Gold Corporation, a Toronto based corporation. In 1999, the first million ounces of gold were produced at Fort Knox, and in 2002, the second million ounces were produced. In April 2011 Fort Knox poured its 5 millionth ounce of gold

2 PROJECT DESCRIPTION

FGMI operates the Fort Knox Mine located northeast of Fairbanks, Alaska. The mine site is located in the upper headwaters of Fish Creek Valley, approximately four miles southeast of Cleary Summit. The project site is accessible by the Twin Creeks road. The Fort Knox Mine operations include an open-pit mine, a heap leach facility and related milling facilities to recover gold.

Operational designs, from 2012 and forward are based on a deposit and stockpile of 84,875,000 tons of mill-grade ore and 236,709,000 tons of heap leach-grade ore. Mining production averages 179,000 tons per day (including ore and waste rock) over the life of the mine. The mill process ore at an average rate of 39,000 tons per day and the heap leach is loaded at a rate of 72,000 tons per day. Currently milling is projected through 2017 and mining through 2020. Heap leach activities are projected to continue through 2029.

Fort Knox employs roughly 550 employees. The mine operates two shifts, 24 hours per day, 365 days per year. There are no living accommodations at the project site. The mine wide daily electrical power requirement ranges between 32 and 35 Megawatts, and is supplied by a power line extending from the Golden Valley Electric Association (GVEA) substation at Gold Hill to the mine site, a distance of approximately 29 miles.

2.1 Existing Facilities and Conditions

2.1.1 *Mill Facilities*

The higher grade gold ore mined from the Fort Knox pit is processed by the mill or stockpiled for future processing. As part of the beneficiation procedures, the higher grade ore that is mined is processed by the mill or stockpiled for future processing. This ore is delivered to a gyratory crusher with a crushing capacity of 72,000 tons per day. The crushed ore is transported by conveyor belt to the coarse ore stockpile, Ore from the stockpile is conveyed to a SAG mill. The product discharges from the SAG mill has a typical top size of 3 ½“, reporting to a double deck screen deck with ¾” and ½” screen openings. The plus ¾” material is fed, to a short head crusher where it is crushed to approximately 3/8”. The crushed material is conveyed to a reject stock pile for use as over liner on the heap leach pad. The minus ¾” material from the SAG screen deck, and discharge from the two ball mills, is pumped to a series of hydro cyclones. The overflow of the cyclones, reports to a pre-leach thickener for leaching, and underflow from the reports to two ball mills for further particle size reduction.

The ore slurry from the pre-leach thickener is sent through a series of seven leach tanks where the gold is extracted with a cyanide solution. The discharge of the leach circuit passes through a series of six gallon tanks containing activated carbon. The gold in solution is absorbed by the carbon. Gold is removed from the carbon through a process of stripping, using an elevated concentration of cyanide, increased temperature, and pressure. The gold is recovered from solution by the process of electrowinning.

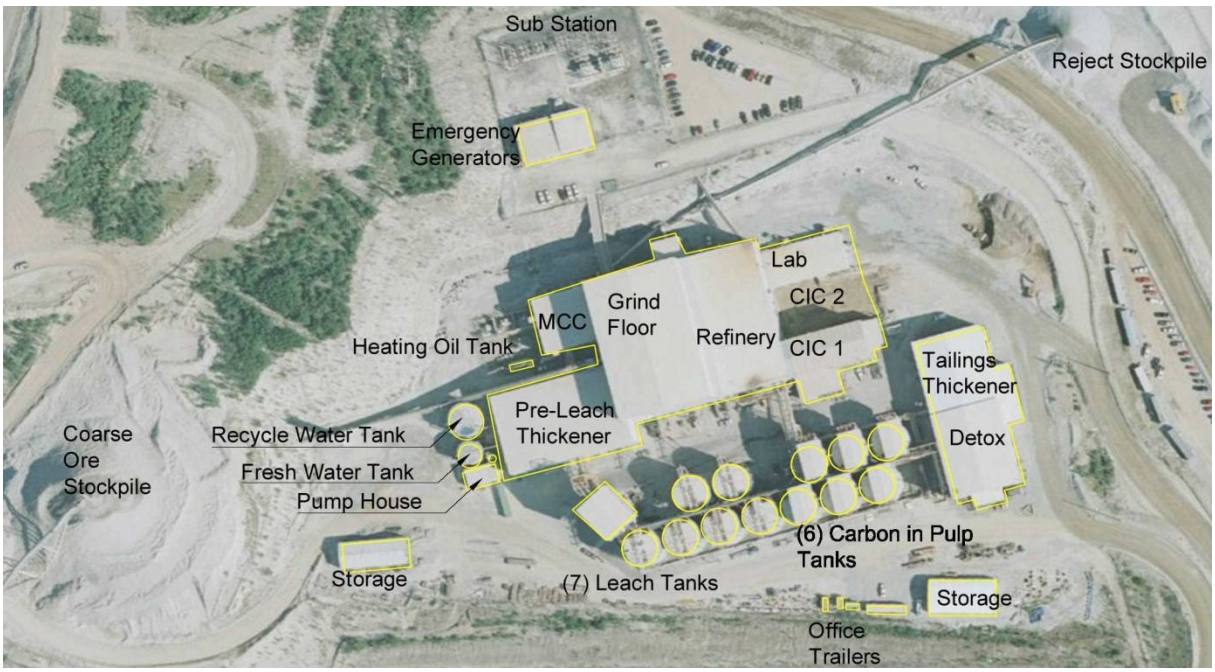
After leaching and gold recovery the remaining slurry goes to a tails wash thickener where cyanide and heat is recovered and returned to the grinding circuit. The slurry from the underflow of the thickener is diluted with solution from the tail storage facility.
The cyanide concentration in tailings material discharged to the tailings impoundment complies with requirements of the Waste Management Permit which limits the weak acid dissociable

cyanide (WAD CN) concentration to a monthly average of 10 parts per million (ppm)with a maximum of 25 ppm.

The cyanide concentration in the tailings is maintained within permit limits using the INCO process when necessary. The INCO process combines sodium meta-bisulfite and copper sulfate with air, in an agitated tank, to destroy the cyanide. Typically, maintaining the cyanide concentration in discharged tailings material does not require the use of the INCO process, but is controlled by the recovery of cyanide solution and the addition of freshwater to the thickened tailings. Tailings are piped to the impoundment from the mill and deposited sub-aerially using multiple discharge points.

The condition of the structures associated with the mill facility is in sound working order. Most of the structures were a part of the original mill construction with exception to the Carbon in Column 1 and 2 (CIC) and the tailings thickener. The following Figure 2.1 identifies the buildings that make up the mill complex.

Figure 2.1 Mill Complex



2.1.2 *Tailings Storage Facility*

The permitted area of the tailings impoundment encompasses approximately 1,556 acres including areas of tailings material deposition, the tailings embankment (121 acres), and the interceptor well system below the embankment. The final placement of tailings material is projected to cover approximately 976 acres. A primary objective of the construction and operation of the tailings storage facility is the protection of life and property. To achieve this objective, FGMI:

1. Designed the dam to standards for a Class I dam even though designated a Class II
2. Implemented an aggressive QA/QC program to insure achievement of design standards during construction

3. Manages quantity of water in the TSF utilizing a comprehensive water balance model
4. Maintains an emergency action plan
5. Performs daily inspections of the dam
6. Engineer of Record reviews the geotechnical and instrumentation data that documents dam performance quarterly
7. Engineer of Record inspects the dam annually
8. Periodic Dam Safety inspection is performed every three years by the Engineer of Record
9. Maintains the TSF Operations and Maintenance manual

To maintain the primary objective of protection of life and property downstream the documents listed above will be updated and modified for the closure configuration.

During operations, the water in the tailings impoundment contains higher levels of certain analytes (above Alaska Water Quality Standards). Therefore, the tailings impoundment water is not discharged. The TSF is operated as a zero discharge facility. The mill recycles water from the tailings impoundment for reuse in the beneficiation process. After mining, milling and heap leaching activities cease, a spillway will be constructed. When the water meets discharge standards, the TSF spillway will convey seasonal surface water runoff to Fish Creek. The TSF will continue to be operated as a zero discharge facility until the heap leach facility is successfully closed. The tailings impoundment is an unlined facility. Process solution that passes through the bottom of the tailings impoundment is transported with groundwater flow downstream. In addition, water passing through the rock fill of the tailings dam encounters the filter zone of the engineered core which transports it down to the highly fractured bedrock beneath the dam.

Tailings Embankment

The tailing dam is an engineered-fill embankment. A starter dam with a seal zone crest elevation of 1,323 feet and crest length of 2,400 feet was completed in 1996. In 1997 the first phase raise brought the seal zone up to 1,341 feet and the crest length to 2,625 feet. In 1998 the seal zone level was brought-up to 1,389 feet and the crest length was 3,000 feet. In 2001 the seal zone level was brought-up to 1,407 feet and the crest length was 3,440 feet. In 2002 the seal zone level was brought-up to 1,428 feet and the crest length was 3,550 feet. The 2004 lift raised the seal zone level to 1,453 feet and the crest length was 3,810 feet. In 2006 the embankment was taken to an elevation of 1,488 with an additional 6-foot frost cap to provide an ultimate elevation of 1494. Due to the limitations in the quantity of material available for construction and existing facilities (including the seepage recovery sump and wells) at the downstream toe of the embankment make further downstream construction extremely difficult. The TSF expansion required construction in 2010 to prepare for the 2011 lift. Construction in 2010 included an excavation into the existing upstream face of the embankment through the seal and filter zones to elevation 1466.0 fmsl (corresponding to the top of the base working platform) with construction of a modified centerline raise that tied into and reversed the slope of the seal and filter/transition zones above this. The construction above elevation 1466.0 fmsl brought the top of the seal elevation to the 1488 fmsl elevation. Construction continued during 2011, raising the seal zone elevation to 1515 fmsl with an additional three feet of camber and six feet of frost protection. . The height from the downstream toe to seal zone crest is approximately 351 feet. The downstream face of the embankment has a slope of 1.8H: 1V and the upstream face has a slope of 2.25H:1V to elevation 1,443 feet, where it changes to 2.78:1 to the ultimate embankment crest. Raise heights were set to provide adequate freeboard.

The embankment contains a relatively impervious seal zone constructed of highly weathered schist. Sand filter zones are located upstream and downstream of the seal zone, followed by a downstream transition zone constructed of weathered schist. Upstream and downstream random rock fill zones complete the embankment cross section. The upstream face has a riprap layer for wave erosion protection. Borrow materials came from the reservoir basin and the surrounding area.

Design of the embankments included an assessment of their stability and potential displacement resulting from earthquake loadings. The design ensures that the embankment will continue to function following an earthquake inducing horizontal accelerations up to 0.27 g.

Twenty-eight (28) vibrating wire piezometers are installed within the embankment and foundation. Piezometer P-28 was damaged after installation but was not re-installed due to its location beneath the embankment. The cables for the piezometers are run to the seepage collection sump building located near the center of the downstream toe of the embankment. The various piezometers are read by manually dialing a multiplexer to the appropriate channel. Readings indicate frequency and temperature at the piezometer. The frequency and temperature readings are recorded and used to calculate the hydrostatic pressure (head) in feet of water. In addition to the 28 original piezometers, 6 additional piezometers were installed in to monitor the south abutment and 11 more in the working base platform constructed in 2010.

Quarterly reports completed by Knight Piésold on the TSF dam instrumentation review continue to support previous assessments of the performance of the tailings impoundment embankment drain system (Knight Piésold 2013b). The initial summary findings were performed by Water Management Consultants and Knight Piésold (WMC 2005; Knight Piésold, 2010). Vibrating wire piezometers were placed within the embankment during initial construction and to monitor the dam raise. Data is collected from the piezometers weekly by the Environmental Technicians. The data indicates that the seal and filter zones comprising the engineered core of the dam are functioning as designed. Key points illustrated by the data include:

1. Pressures within the filter zone on the upstream face are increasing as the elevation of the tailings, water level increases through time, but they progressively decrease through the seal zones.
2. There is little to no head build-up in the filter at the base of the embankment indicating that the drainage system is functioning properly. Data confirms the piezometric elevations are approximately equal to their corresponding tip elevations
3. There is a significant head drop across the seal zone indicating that the low permeability layer is effectively controlling the flow rate through the impoundment and allows higher permeability layers located downstream of the seal zone to drain. The current head loss is approximately 290 feet.
4. There is no increase in pressure within the random fill downstream of the filter and seal zones indicating that the random fill is draining as designed and the underlying bedrock has sufficient permeability to dissipate pressure.

Specific surface and groundwater quality and quantity data for the project area and projected post-mining water quality information is addressed in the *Fort Knox Project Water Resources Management Plan* (FGMI 1994), *Fort Knox Mine Tailings Facility Closure Management Plan* (Water Management Consultants, 2005; Schlumberger Water Services,2011) and *Fort Knox Closure Management Plan for the Proposed Heap Leach Facility* (Water Management Consultants,2006).The current status of the zero-discharge system and water quality monitoring are tracked through quarterly reports submitted to ADEC.

Tailings Discharge Line

Three, 24-inch diameter, HDPE, tailing discharge lines, each designed to handle 50,000 tons per day of solids, have been installed to carry tailing material from the mill to the impoundment. They are designated as the “Walter Creek Line,” the “Main Pond Line,” and the “Pearl Creek Line” (Figure 2.3). Tailing slurry from the cyanide detox building can be directed to any one of these lines, depending on maintenance requirements, season, and depositional objectives. All three tails lines will be utilized to keep adequate water depth at the barge.

Tailings will be spigotted off the face of the dam. The spigot pipe will be left in place and perforated as the tailings begin to build up around the pipe. Sub-aerial deposition is expected to produce tailing beach slopes of 0.5 to 1.0 percent.

Barge and Pipeline

A floating barge located in the northeast corner of the tailing pond is used to pump water from the tailing pond to the mill. The barge is equipped with four, 400 hp pumps pumping at approximately 8,900 gpm. Pumping is on an as need basis with the pumping controlled either by radio telemetry from the mill or manually by the Pond Operator. Additionally, the barge is equipped with a flow meter, pressure gauges, a surge anticipator, and a pond deicing system that allows high-pressure water to be released through jets around the barge. The barge is enclosed by a heated building. Reclaim water is pumped to the process water tank at the mill through a 20-inch (O.D.) HDPE pipeline. Automatic and manual drain valves allow the entire reclaim pipe line to be drained during power outages, maintenance, and barge relocations.

Seepage Collection System

The seepage moves through the fractured bedrock and is captured by a large lined sump at the downstream toe of the tailings dam. An interceptor system consisting of a series of drains and wells is designed to capture any seepage that is not captured by the sump to maintain the zero-discharge status of the facility. The seepage water from the interceptor system is pumped to the lined sump at the toe of the dam. The interceptor system consists of a series of 12 pump-back wells and a dedicated drain immediately downgradient of the tailings dam. Water from the sump is pumped back to the tailings impoundment. Seepage is currently pumped back to the tailings impoundment at a rate of 1,700 to 1,800 gpm. Reference Figure 2.2 for an overview of the interceptor and monitoring well locations. Immediately downstream from the interceptor system are three monitoring wells that monitor groundwater quality to insure that no process solution escapes the interceptor system.

Figure 2.2 Interceptor and Monitoring Well Locations

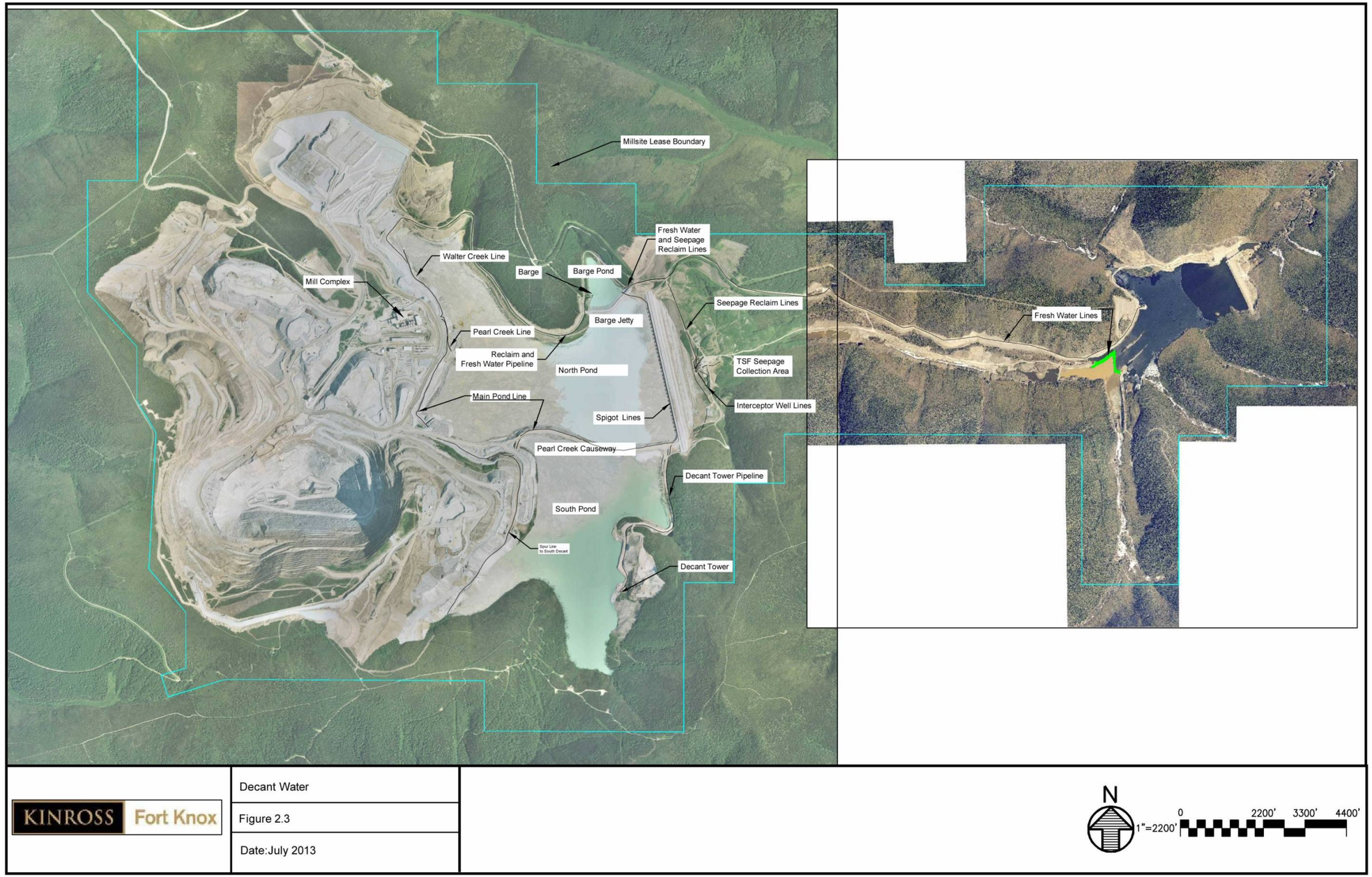
2.1.3 *Decant Water*

Water is used to slurry tailings which is discharged to the tailings impoundment by gravity flow or pumping. The water accumulates in the North Pond, South Pond and Barge Pond where it is ultimately pumped back to the mill for reuse in the processing of ore. Water quality in all three of these ponds is controlled by the following factors:

1. chemistry of the mill feed (ore)
2. chemical reagents used to process the ore
3. effluent treatment processes
4. dilution by the freshwater reservoir when makeup water is added
5. up gradient run-on
6. direct precipitation
7. geochemical processes
8. seasonal effects (ice cover, sublimation and evaporation).

Figure 2.2 on the following page displays the location and names of the North Pond, South Pond and the Barge Pond.

Figure 2.3 Decant Water



Decant water quality has changed over time due principally to the mill feed. From 1996 until early 2001, the mill feed was exclusively Fort Knox ore. Decant water quality in the during this period was characterized by an alkaline pH of 8.8, total dissolved solids (TDS) concentration of approximately 800 milligrams per litre (mg/L) and relatively low concentrations of metals.

From early 2001 until January 2005, the mill processed a mixture of ore from the Fort Knox deposit and from the nearby True North deposit. True North tailings contained higher concentrations of antimony, selenium, and arsenic relative to historical levels. The True North ore required additional cyanide to process the ore. To minimize the concentrations of free and WAD CN in the decant water, the INCO cyanide detoxification unit was used more frequently. This process is catalyzed by copper ions, which are added to the detoxification unit as copper sulfate and resulted in increased copper concentrations in the decant water. The INCO treatment for the blended ore also increased the sulfate and nitrate concentrations in the decant water. In 2002, FGMI minimized the use of the detoxification unit and managed cyanide through the use of tailings thickeners and volatilization. This led to a reduction in ammonia concentrations.

From 2006 to present, the decant water quality reflects exclusively Fort Knox ore feed. Concentrations of constituents, including sulfate, nitrate, ammonia, antimony, arsenic, copper, and selenium, have returned to pre-True North levels.

Analytes concentrations of the decant water also change over time as the volume of impounded water changes. During the winter, dilution from surface water run-on and rainfall is at a minimum, which results in increased concentrations of analytes. During the spring breakup, concentrations tend to decrease in response to dilution from surface water run-on. After breakup, concentrations vary with the amount of fresh make-up water added from the freshwater reservoir as make up for the mill (Water Management Consultants 2005).

2.1.4 *Seepage Water*

The seepage flow regime through the engineered filter zones and along the geosynthetic lined toe drain is collected in a geosynthetic lined sump at the toe of the dam. The seepage that combines with groundwater and migrates around the primary collection zone is captured downgradient by a series of twelve interceptor wells and the 501 drain. Table 2-1 lists all of the wells associated with the seepage interceptor system. Surface water is collected in site 801. All seepage captured by the interceptor system is pumped back to the lined sump which in turn pumps seepage water back to the Barge Pond alternating between two pumps located within the lined sump. Groundwater quality samples collected from MW-5, MW-6 and MW-7 confirms all seepage continues to be captured. Groundwater samples were also collected from MW-8 in 2007 and 2008. These samples confirmed that the seepage is completely captured. However, due to freezing, the well was abandoned with approval by DEC. The seepage collection sump is located at the base of the tailings dam and consists of two 63-inch diameter by 50-feet long, perforated HDPE pipes set vertically. Two 450-hp pumps vertical turbine pumps, one set on top of each pipe, pump seepage back to the tailing pond. Pumps are turned on and off by a level controller with one pump providing backup to the other. A building houses the pumps and the piezometer readout box

In 2008 additional interceptor wells and standpipe piezometers were installed to collect additional water and to track the water elevation surrounding the piezometers PZ08-04 has

cracked and is no longer in service. Piezometers PZ08-11 is dry most of the year and PZ08 and 09 are typically frozen.

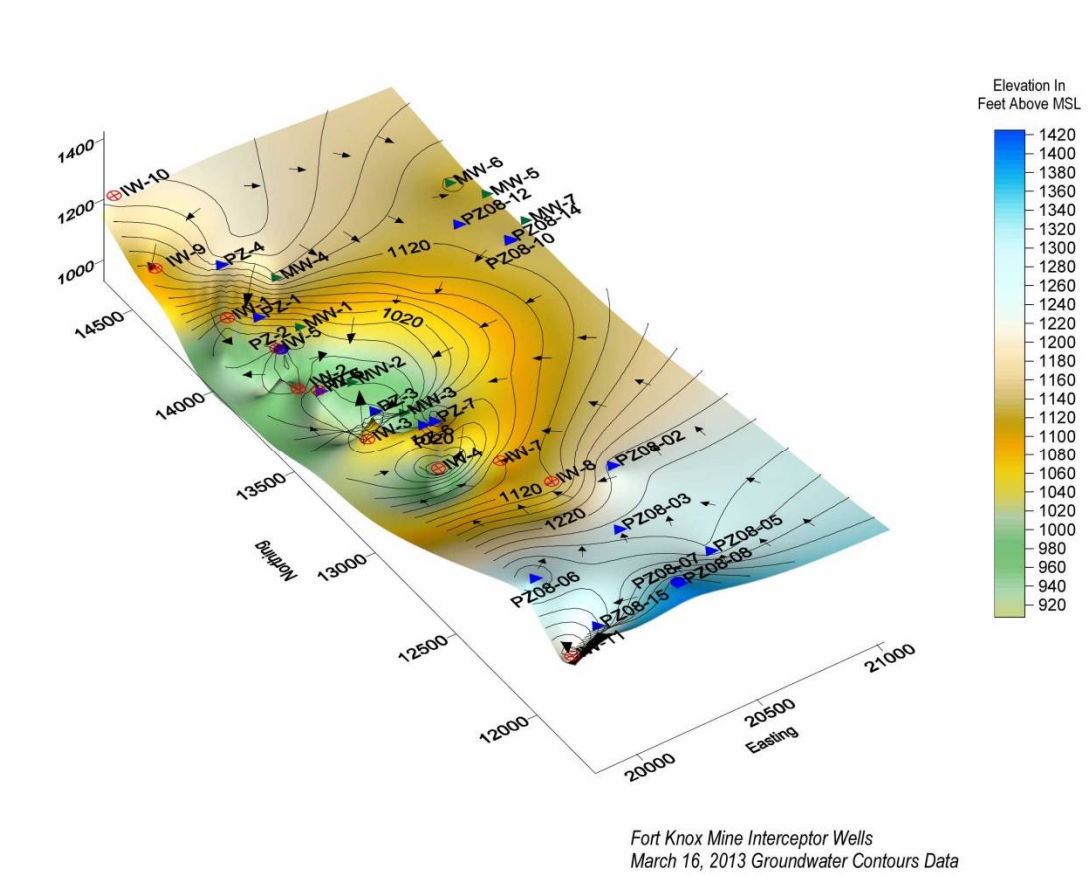
Table 2-1 Wells Associated with the Seepage Interceptor System

Interception Wells	Purpose
IW-1	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system.
IW-2	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system.
IW-3	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
IW-4	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
IW-5	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
IW-6	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
IW-7	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
IW-8	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
IW-9	Provide water level data for the interception system.
IW-10	Provide water level data for the interception system.
IW-11	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
MW-1	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
MW-3	Intercept and collect underflow from the TSF and maintain zero discharge and provide water level data for the interception system
401	Intercept and collect water flowing near the surface.
PZ-1	Provide water level data for the interception system.
PZ-2	Provide water level data for the interception system.
PZ-3	Provide water level data for the interception system.
PZ-4	Provide water level data for the interception system.
PZ-5	Provide water level data for the interception system.
PZ-6	Provide water level data for the interception system.
PZ-7	Provide water level data for the interception system.
PZ08-01	Provide water level data for the interception system.
PZ08-02	Provide water level data for the interception system.
PZ08-03	Provide water level data for the interception system.
PZ08-05	Provide water level data for the interception system.
PZ08-06	Provide water level data for the interception system.
PZ08-07	Provide water level data for the interception system.
PZ08-08	Provide water level data for the interception system.
PZ08-09	Provide water level data for the interception system.

PZ08-10	Provide water level data for the interception system.
PZ08-11	Provide water level data for the interception system.
PZ08-12	Provide water level data for the interception system.
PZ08-13	Provide water level data for the interception system.
PZ08-14	Provide water level data for the interception system.
PZ08-15	Provide water level data for the interception system.
MW-2	Provide water level data for the interception system.
MW-4	Provide water level data for the interception system.
MW-5	Groundwater compliance well.
MW-6	Groundwater compliance well.
MW-7	Groundwater compliance well.

The water elevation in the interceptor wells, monitoring wells, and piezometers verifies a cone of depression at the base of the TSF dam exists. The drawdown of the well that pump influence each other to provide double redundancy to the interceptor system. The entire system has been studied to ensure operation will not be significantly impacted if individual components are removed or disabled (Water Management Consultants, 2009). Figure 2.4 illustrates the ground water contours and the direction of flow.

Figure 2.4 Interceptor Wells and Associated Water Elevations



Composite seepage water quality samples for total concentrations have been collected quarterly for the waste management permit since the tailings impoundment went into operation in 1996. Samples for dissolved concentrations were collected from 1996 until August of 2003.

Based on a comparison of the seepage and decant water chemistries, the bulk of the water entering the seepage recovery system originates from the tailings impoundment. A comparison of the current chloride concentrations in the decant and seepage water suggests that groundwater from beneath the tailings impoundment is mixing with the seepage of the decant water. The strong correlation between temporal variations in chloride concentration also indicates a relatively short travel time through the drain system. The short travel time is due to the direct connection of the decant water with the drain system for the tailings dam. Seepage modeling indicates that once the tailings beach is extended to its final width, the seepage from the tailings impoundment will decrease and the water quality at the toe of the dam will be influenced more heavily by the groundwater water quality.

The seepage has an average pH of approximately 7.7 and an average TDS of 498 mg/L. Seepage water is a calcium/sodium-sulfate type solution. The water quality of the seepage is generally better than the decant water. The difference in concentrations between the decant water and the seepage water for a given constituent vary considerably. Several of the constituents are attenuated through the tailings, including: ammonia, copper, cyanide (total and WAD), iron, and manganese.

Table 2.2 summarizes the change in concentrations for selected parameters measured in the decant and seepage water.

Table 2-2 Comparison of Decant Water and Seepage Water

Parameter	Decant Water (mg/L) Average (2006-2012)	Seepage Water (mg/L) Average (2006-2012)	Percent Difference (%)
pH (H^+ ion)	8.2	7.7	-6%
Chloride	35	28	-20%
Sulfate	176	206	17%
Ammonia as N	4.0	0.53	-87%
WAD Cyanide	1.2	0.034	-97%
Total Antimony	0.069	0.045	-35%
Total Arsenic	0.037	<0.0005	-99%
Total Cadmium	<0.0001	<0.0001	0%
Total Copper	0.16	<0.01	-94%
Total Iron	0.87	0.16	-82%
Total Manganese	0.088	0.44	400%
Total Selenium	0.0011	<0.003	-94%

The manganese concentrations increase between the decant water and seepage water; this is due to elevated background concentrations of manganese in groundwater.

2.1.5 *Water Reservoir*

The downstream water reservoir including the dam, causeway, and spillway complex, encompasses approximately 173 acres and is located on Fish Creek approximately three miles below the tailings impoundment. Overall the structures associated with the water reservoir are in good working order.

The fresh water reservoir dam is a zoned fill embankment that contains a relatively impervious seal zone constructed of highly weathered schist Sand filter zones are located upstream and downstream of the seal zone followed by upstream and downstream transition zones constructed of weathered schist. Upstream and downstream random rockfill zones complete the embankment cross section. The upstream face has a riprap layer of wave erosion protection. The embankment includes a grout curtain installed in the bedrock below the seal zone cot off trench and a gravel drain incorporated into the downstream toe of the embankment. The toe drain is directed to a sump to collect seepage passing through the embankment for recycling back to the reservoir if required.

There is a concrete open channel spillway with a low flow channel adjacent to the dam. The low flow channel provides protection by reducing the build-up of ice in the spillway chute during winter months.

A low-level outlet system consisting of a primary valve on the upstream end of a 30-inch outlet pipe located in a valve house situated on the dam crest adjacent to the spillway. The valve is manually operated and is provided for drainage of the reservoir for maintenance and repairs and can provide additional drainage in emergency situations.

Solo creek causeway is an embankment crossing Solo Creek to accommodate access road to the dam. A single galvanized corrugated steel pipe was installed to carry flow from Solo Creek to the reservoir. In 2012 the pipe collapsed, FGMI is currently working on a design to allow water to flow through the causeway again.

The fresh water pump house houses the infrastructure that pumps make-up water from the reservoir to the Barge Pond and mill. Three are two lines one for each destination. The Make-up water is used for the beneficiation process of the gold ore. The two lines run parallel to the Fish Creek Road on the surface. Vegetation that grows around the pipeline is removed for inspection as needed.

2.1.6 *Walter Creek Heap Leach Facility*

The Walter Creek Heap Leach Facility is located in the upper end of the Walter Creek drainage upstream from the tailings impoundment. Excluding the haul road and access roads, the heap leach facility will ultimately cover approximately 485 acres and will have a capacity of approximately 307 million tons. The heap leach is being constructed in seven stages as a valley-fill type of facility.

Ore for the heap leach will consist of run-of-mine rock from the Fort Knox Pit and various stockpiles. There is an estimated, 33.5 million tons of B-grade ore and 106.9 million tons of C-grade ore located in the Barnes Creek and Fish Creek stockpiles that are actively being loaded to the heap leach. Phase 8 of the pit has an estimated 100,625 tons of ore that will be leached. There are no plans for milling Phase 8 ore. The ore is characterized by relatively high permeability that will promote solution flow and drainage for rapid rinsing at closure.

In-heap storage of process solution and storm water is accomplished by an embankment at the downstream toe of the heap. The mechanical quality of the rock used for construction of the in-heap storage embankment is similar to the mechanical quality of the rock that has been used to construct the downstream random fill for the tailings dam. The liner system for the valley fill consists of 12 inches of engineered sub-base with a permeability of 10^{-5} centimeters per second (cm/sec) over the entire basin. The composite liner system beneath the in-heap storage Pond is double-lined with an 80 mil, double-sided, LLDPE geomembrane liner, then a leachate recovery system, then the primary LLDPE liner. Beyond the limits of the in-heap storage reservoir, there will be a single 80 mil LLDPE liner overlaying the sub-base. Overlaying the LLDPE liner, is 36 inches of cover material consisting of crushed rock and placed with a network of drainpipe to maintain low head pressures on the liner and promote a rapid flow of solution to the in-heap storage reservoir.

A Leachate Collection and Recovery System (LCRS), constructed in conjunction with the double liner in the area of the in-heap storage reservoir, provides leak detection. A Process Component Monitoring System (PCMS), constructed under the main header lines for the solution collection system, provides leak detection in those areas of high head where leaks would be most likely to occur. An underdrain system consisting of a network of drainage channels containing drain rock will route water from seeps and springs under the sub-liner to the tailings impoundment.

Barren solution will be applied on the heap leach using drip emitters. The solution will flow through the run-of-mine ore. Pregnant solution will flow to the in-heap storage reservoir, which has a maximum capacity of 113,800,000 gallons. The pregnant solution that collects in the in-heap storage reservoir is pumped to the two Carbon-In-Columns (CIC) plants using pumps located in the in-heap storage reservoir. Barren solution and pregnant solution will be pumped in separate pipes between the heap leach pad and CIC 1 and CIC 2 plants through a lined corridor. Loaded carbon is processed in the Fort Knox mill facilities.

2.1.7 *Water and Solution Storage*

During operations, the North Pond, South Pond and the Barge Pond will be managed to contain an accumulated volume of 8,146 ac-ft while maintaining 3 feet of freeboard (Knight Piésold 2010). The volume includes:

- Operations Pond storage volume (6,600 ac-ft).
- The 100-year, 24-hour, rain-on-snow storm event (518 ac-ft).
- Average annual snowmelt (720 ac-ft).
- Walter Creek Heap Leach design release event (308 ac-ft).

The TSF will be operated such that there is always available storage volume for the Heap Leach design release event, providing for complete storage of solution from the heap leach pad in the TSF (downstream of the heap leach pad) should there be a complete failure of the Walter Creek in-heap storage dam liner system. The design, location, and nature of the heap leach pad material results in negligible risk of a ‘landslide’ type of wave exceeding the 3-ft freeboard depth.

2.1.8 *Miscellaneous Sites*

Roads

Service roads and major trails are identified in Figure 2.5. Due to the changing nature of haul roads they are not included in this figure with exception to Phase 7 and Heap Leach Haul Roads. FGMI will continue to work with ADNR easement section to resolve trail easement issues.

Pipelines

The major pipelines on the site are the dewatering, freshwater, heap leach, decant, and seepage reclaim (Figure 2.6). Depending on operations the pipelines have been reconfigured to serve operational requirements. Internal operations and maintenance programs ensures the integrity of all lines.

Figure 2.5 Current Roads and Trails

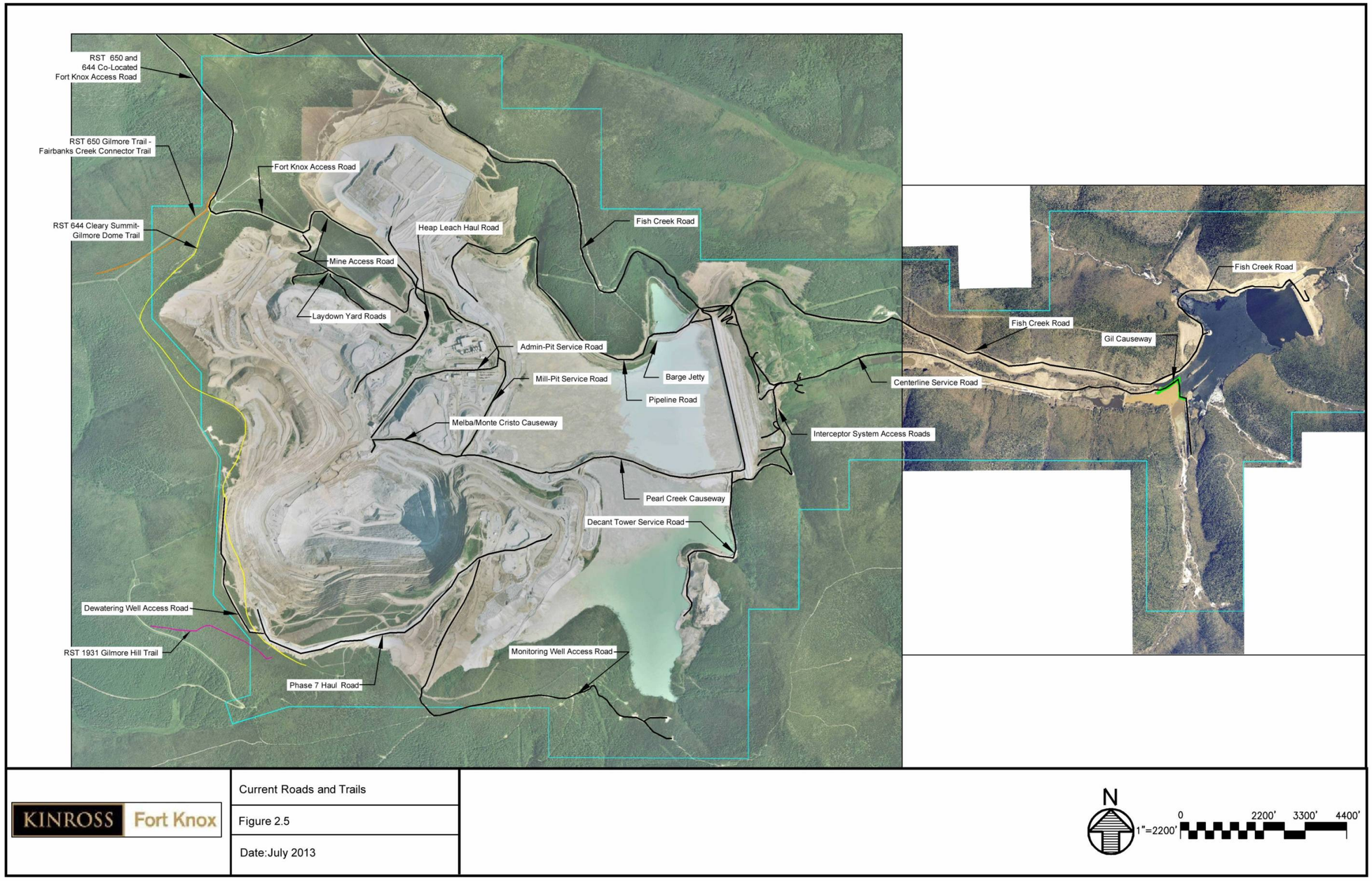
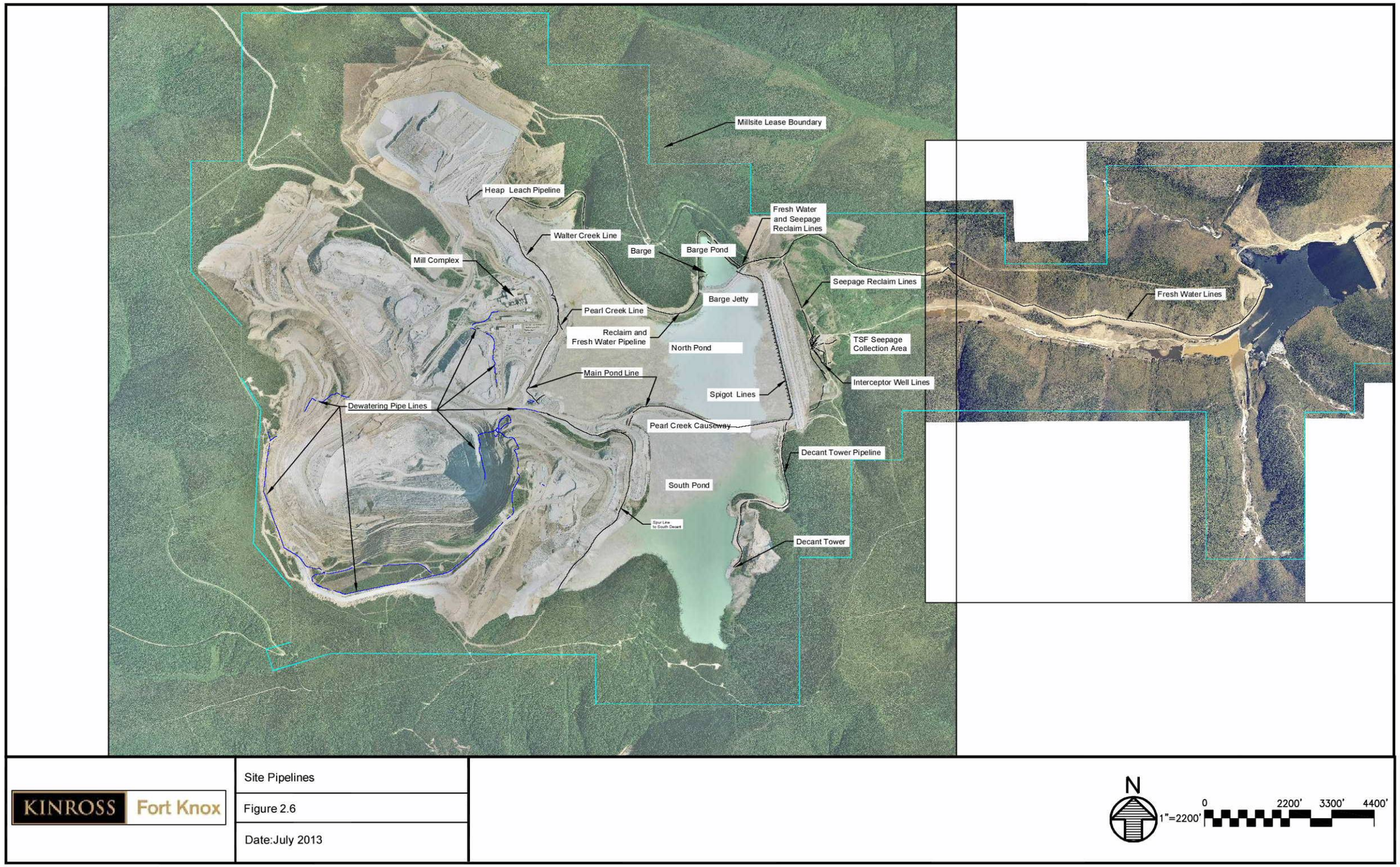


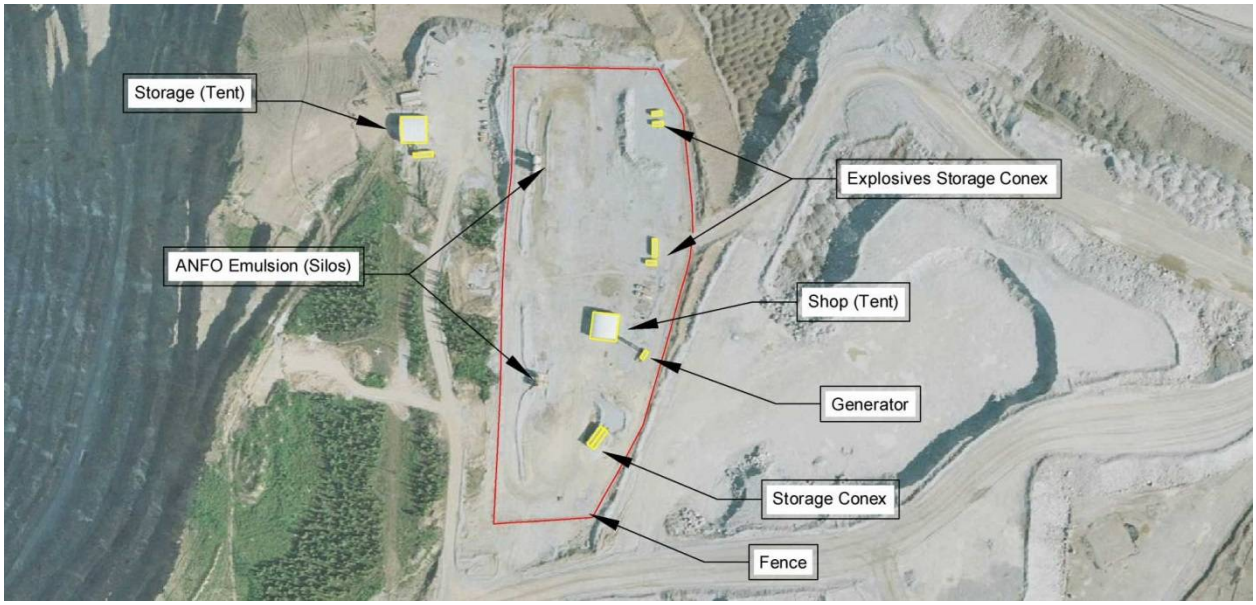
Figure 2.6 Site Pipelines



Powder Mag Storage

The powder mag area (Figure 2.7) is located between Yellow Pup WRD and the pit. All explosives are stored within the fenced area and are restricted to authorized personnel. The reclamation of this area is included with the Yellow Pup WRD. The structures associated with the powder mag area are within FGMI's surface ownership boundary.

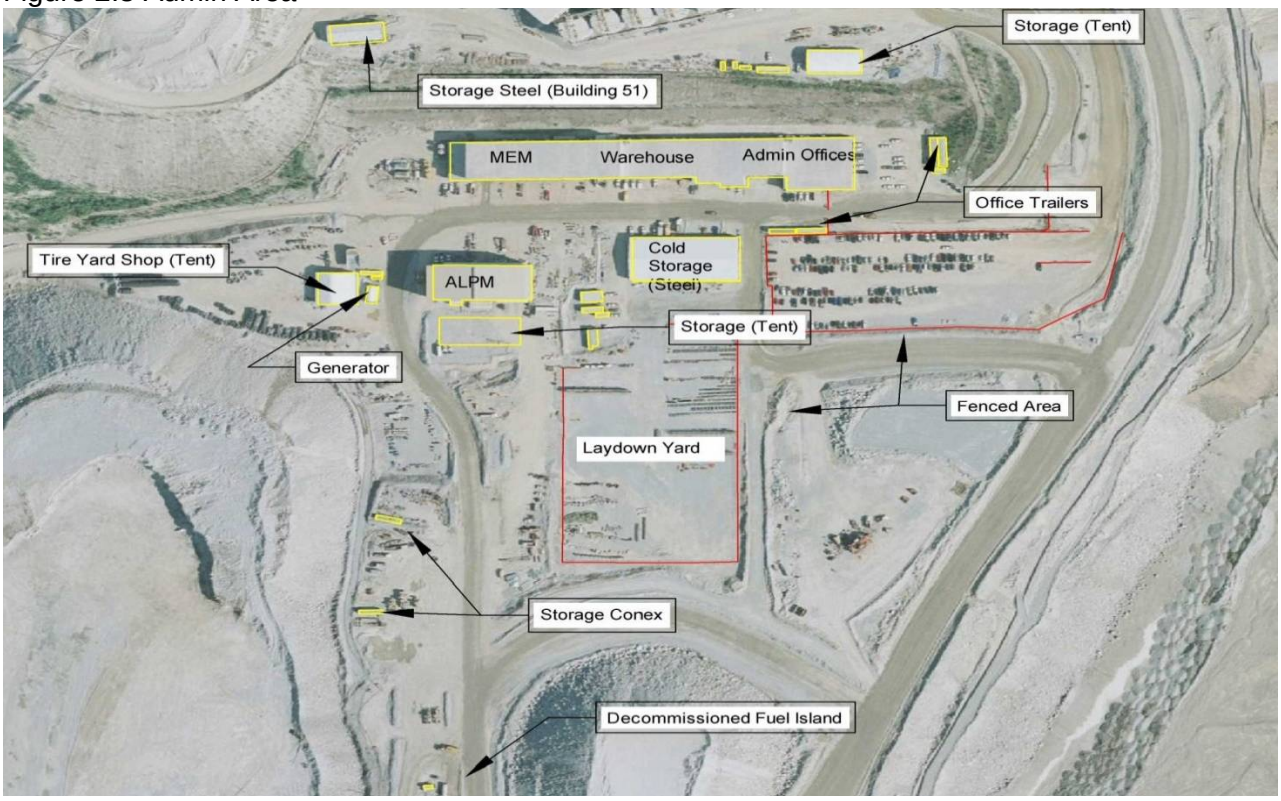
Figure 2.7 Explosives Storage



Admin Area

The administration area includes the admiration offices, warehouse, and mobile equipment maintenance (Figure 2.8). The support outbuildings and spaces have been reconfigured over the years to accommodate operational changes. The assembly line preventative maintenance (ALMP) shop has undergone structural upgrades of internal components, (stairs and storage platform) to bring them up to seismic design specifications. The buildings are maintained by FGMI personnel.

Figure 2.8 Admin Area



Laydown Yard

Historically the laydown yard has been utilized to store equipment that is no longer in use. In 2011 the area was cleared of old equipment. Exploration occupies the core shed for logging core. The core shed building used to be warm storage for the mills critical components. Heap leach erected a tent structure to accommodate their operational needs. Various departments utilize conex units to store miscellaneous items. Lastly, drilling contractors use the laydown yard as a base for their operations. Reference Figure 2.9 for the location of structures and storage conex.

Heap Leach Pad

The heap leach structures located on the heap leach pad are shown on Figure 2.10. These structures support pumping operations.

Figure 2.9 Laydown Yard

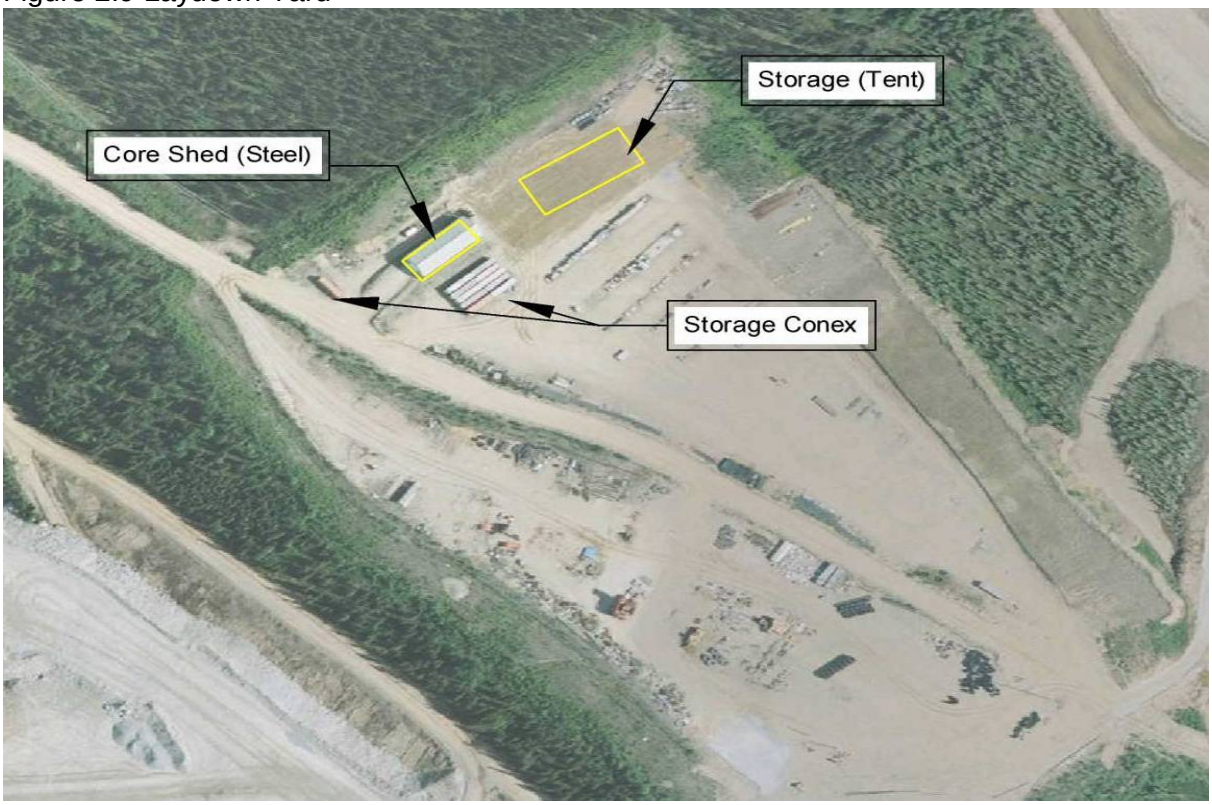
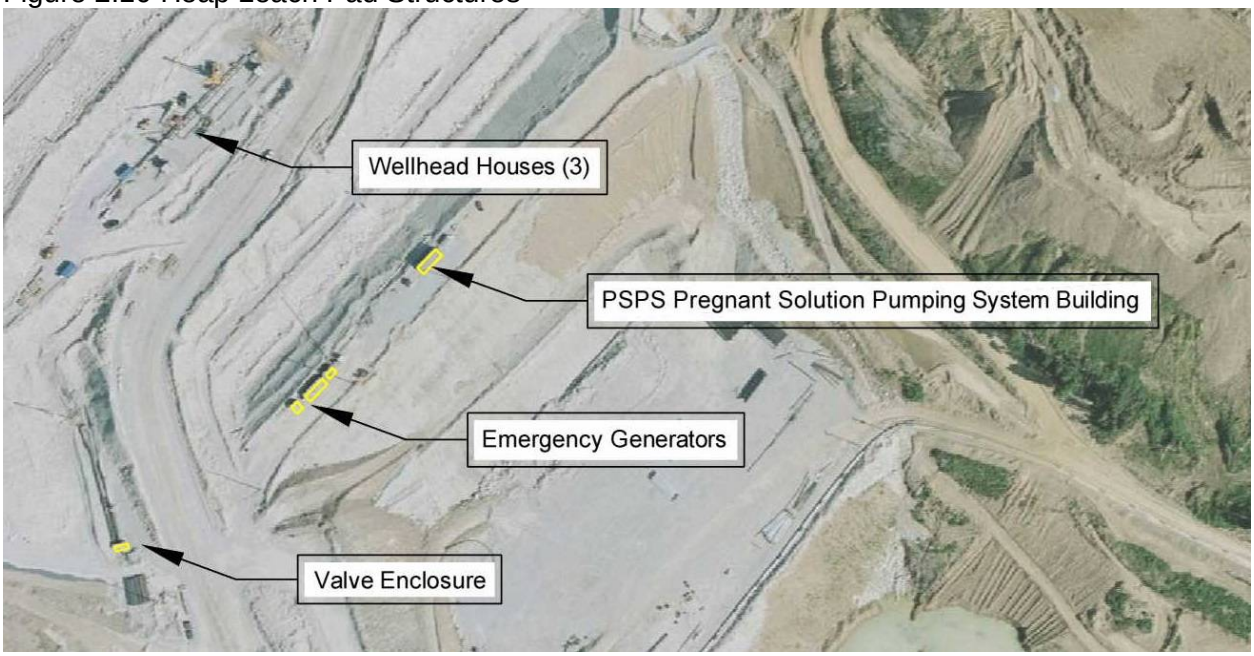


Figure 2.10 Heap Leach Pad Structures



2.2 General Environmental Information

The Fort Knox project area is in the Yukon-Tanana Uplands, characterized by rounded, even topped ridges with gentle slopes. The deposit is located on the north flank of Gilmore Dome at elevations ranging between 1,000 and 2,100 feet.

The Fairbanks mining district is a celebrated placer gold camp. Although a significant mining district in terms of total production, it had only limited lode production until the discovery and development of the Fort Knox deposit in the 1990s. Since the 1930s, extensive placer mining has occurred in the project area. Tailings piles, ponds, levees, channels and ditches have been constructed along the valley floor, extending from approximately midway up Monte Cristo Creek downstream to the confluence of Solo and Fish Creeks. Monte Cristo, Barnes, Yellow Pup, Pearl, Fish and Last Chance Creeks have been placer mined in the past. As a result of this placer mining, the thick cover of loess and alluvium covering the valley floor has been removed. Solo Creek and a major portion of Upper Barnes Creek have not been impacted by placer mining.

2.2.1 *Geology*

The Fort Knox mine is located in the Fairbanks Mining District, in the northeast part of the Yukon-Tanana Upland. The mining district is divided into four metamorphosed stratigraphic groups; the Chatanika sequence, the Fairbanks Schist, the Chena River sequence, and the Birch Hill sequence.

The area of the mine is underlain by the Fairbanks Schist unit and the Cleary Sequence of the Fairbanks Schist unit. The Fairbanks Schist consists largely of muscovite-quartz schist and micaceous quartzite. The Cleary Sequence consists of calcareous actinolitic greenschist, impure marble, muscovite quartz schist, and potassium feldspar white schist. The schist is host to younger granitic intrusions, such as the one outcropping at the mine site. The Fairbanks Schist and other metamorphic rocks range in age from late Precambrian to lower Palaeozoic. The intrusive granodiorites and quartz monzonite are most likely Cretaceous to Tertiary in age (Knight Piésold, 1994).

The Gilmore Dome pluton, which consists of granodiorite and quartz monzonite, is present in the pit area of the mine site. Prior to opening the pit, granodiorite outcropped in the Melba and Monte Cristo Creeks and is the main host rock for the gold mineralization of the Fort Knox deposit. This pluton has intruded into the Fairbanks Schist, which makes up the upper portion of the pit wall.

Mineralization occurs in quartz and pegmatite veins, stock work zones, and mineralized shear zones. Gold occurs in and along the margins of quartz veins, quartz-filled shears, and sericite altered fractures within the granite. Pre-mineralization fractures resulting from magmatic doming provided conduits for mineralizing fluids. Stockwork veins (randomly oriented) strike west-northwest with variable dips. Shear zones generally strike northwest and dip moderately to the southwest or are northeast striking with dips northwest to southeast.

Gold mineralization in the quartz-filled shears is distributed relatively evenly, and individual gold grains are generally less than 100 microns in size.

The stockwork veins are more erratic in gold particle size and distribution. Both gold mineralized occurrences have markedly low sulfide content.

2.2.2 *Climate*

The site is located in the interior basin of Alaska, with a continental sub-arctic climate with the warmest summers and the lowest record winter temperatures in the state. Annual precipitation ranges from 13 to 22 inches (America North, 1992). Historically the wettest months include June to September with August usually being the wettest. The driest months are historically February through April.

2.2.3 *Vegetation, Soils and Permafrost*

The area is predominantly forested. Well-drained soils of the uplands and alluvial plains are covered mainly with white spruce (*Picea glauca*) and a mixture of broadleaf trees such as paper birch (*Betula paprifera*) and quaking aspen (*Populus tremuloides*). The climax forest on well-drained soils in the area is white spruce.

The moderately well-drained and imperfectly drained soils may support forests similar to those on the well-drained soils, but more commonly black spruce (*Picea mariana*) and willow (*Salix spp.)* are found. Mosses (*Sphagnum spp.*), along with horsetail (*Equisetum spp*.) and grass, typically cover the ground. Shrubs such as willow, however, are also prevalent.

The poorly drained soils with a high permafrost table generally support communities of black spruce, willow, and alder (*Alnus spp*.). A thick moss mat, principally Sphagnum spp., covers the ground. Lichens such as *Cladonia spp*. and *Peltigera spp*. are common in the moss mat also. This mat supports a dense cover of shrubs, primarily bog birch (*Betula glandulosa*), spirea (*Spirea beauverdiana*), Labrador tea (*Ledum decumbens*), cranberry (*Vaccinium vitis-idaea*), and blueberry (*Vaccinium uliginosum*). Tussocks of cottongrass (*Eriophorum spp*.) are also common, especially along the toe slopes.

Poorly drained soils with a high permafrost table may be found on the northern exposures of the mountain slopes, especially those areas that are concave or broken. Spindly black spruce and a thick moss mat are typical on these sites. Permafrost is discontinuous throughout the project area, and does not exist on some north-facing mountain slopes where it normally would be expected. South-facing slopes receive much more radiation from the sun, and generally support white spruce, paper birch, and quaking aspen (America North, 1992).

Data collected from exploration boreholes and thermistors installed in the area of the tailings embankment prior to construction indicate the presence of localized permafrost. Temperature surveys of the monitoring wells indicate that frozen conditions exist mostly on north-facing slopes and in shaded areas on the valley floor. Thermistor readings indicated that temperatures ranged from 1 to 10°C. The majority of soil and rock temperatures in frozen areas ranged from 0 to -1°C indicating warm permafrost. Data collected during drilling suggests that at some locations the bedrock aquifer may be frozen to significant depths (in excess of 100 ft). Frozen bedrock in the embankment area was left in place prior to construction. Because the permafrost was warm the rate of thaw was likely rapid once seepage from the facility began (Knight Piésold, 1994).

There are no known federal or state threatened or endangered plants or wildlife species inhabiting any portion of the Fort Knox site (ENSR Corporation, 2006).

2.2.4 *Surface Water*

The principal surface water features in the mine area include:

- Solo Creek
- Last Chance Creek
- Fish Creek
- Barnes Creek
- Pearl Creek
- Monte Cristo Creek
- Melba Creek
- Walter Creek
- Yellow Pup Creek

Fish Creek is the major stream in the area and all the other streams identified above are tributary to it. As a result of the extensive historic placer mining, the morphology of the drainage bottoms of several of the creeks have been significantly altered.

Mine development to date, places site facilities in the drainages named above. The open pit sits in the historic location of the Melba and Monte Cristo Creek beds. The Barnes Creek and Yellow Pup Waste Rock Dumps and the Walter Creek Heap Leach are named for the creek beds where they are located. The TSF embankment crosses the Fish Creek Drainage with tailings and decant water extending into the Pearl Creek, Yellow Pup Creek, Barnes Creek, and Walter Creek tributaries. Solo Creek and Last Chance Creek enter the Fish Creek Drainage downstream of the TSF, at the location of the Fresh Water Reservoir.

2.2.5 *Groundwater*

The groundwater conditions across the site have been defined through various investigations prior to and during operations. Preliminary work was completed during pre-feasibility (EBA, 1990) and initial design activities (JCHA, 1992a, 1992b, and 1996). The two principal hydrostratigraphic units in the mine area are the alluvium that underlies stream valleys and the fractured bedrock. The following sections provide a detailed description of each unit.

2.2.6 *Alluvium*

In its undisturbed state, the alluvium typically consists of a thin layer of organic soils, moss and vegetation, underlain by organic silts with occasional channel deposits of sand and gravel, which is then underlain by a layer of poorly-sorted gravel.

The surficial thin layer of organic soils, moss and vegetation contains the modern day drainage systems. Underlying the surficial layer is a 25- to 35-ft thick layer of organic silt with occasional channel deposits of sand and gravel. This deposit of organic silt is also restricted to the valley floor and ranges in width from approximately 400 to 1,800 ft and has an estimated thickness of up to 35 ft, which pinches out at the valley edges. Grain sizes in the underlying gravel material range from as large as 1- to 2-ft diameter boulders, to sand and gravel in a matrix of fine silts and clay overlying an erosional, mineralized surface of weathered bedrock. Restricted to the valley floor, this mineralized, gold-bearing gravel deposit varies in width from an estimated 200 ft up to 1,200 ft and has an estimated thickness of up to 25 ft along the valley axis. The basal gravel layer pinches out along the valley edges. It is reported that both the basal gravel and the overlying organic silts had been mostly permanently frozen in their undisturbed state.

As the basal gravel deposits have historically been the primary economic placer gold-bearing deposit in the region, most of the valley fill described above has been modified. Soils and the organic silts have been removed to access the gold-bearing gravels. The gold-bearing gravels in turn were reworked and washed to remove the gold. The tailings produced from this procedure were deposited in the mined-out portions of the valley. In many places these tailings were used to construct settling ponds to settle out silt and clay from placer mining discharge. As a result, much of the modern-day alluvium consists of a heterogeneous mix of poorly sorted material grading from coarse gravel to fine silts and clay often found in a somewhat inverted stratigraphy where the course-grained gravels overlie fine-grained silts and sands. Numerous pockets of predominantly fine-grained materials from the old settling ponds exist throughout the valley. Similarly, local lenses of well-sorted and well-stratified sands and gravel deposited by stream flow are also present. Much of this reworked valley fill may now be thawed and subject only to seasonal frost action (Water Management Consultants, 2005).

2.2.7 *Bedrock*

The underlying bedrock aquifer consists primarily of schist (referred to as the Fairbanks schist). This schist is host to younger granitic intrusions, such as the one outcropping at the Fort Knox mine site.

The upper portion of the bedrock (ranging up to 100 ft in thickness) is highly weathered. The degree of weathering depends on the original lithologic content of the bedrock and exposure. Weathering characteristics consist of intense fracturing, alteration of primary minerals to clays and oxides (such as iron oxide), dislocation from soil creep and the filling of fractures with sand, silt, and clay.

Movement of groundwater in the bedrock aquifer occurs down valley through structural zones that act as conduits. The degree of fracturing observed during the drilling of bedrock monitoring wells was variable, as indicated by the range of hydraulic conductivities calculated from pump test data ranging from 280 to 0.28 ft/day (10^{-2} to 10^{-5} cm/sec). The greatest fracturing, and hence higher hydraulic conductivities, is found in the valley floor locations. Hydraulic conductivities are observed to be lower in wells completed at the hillside locations. This is related to two factors:

1. The greater degree of fracturing observed in the valley floor is related to the shallow depth to bedrock and more intense weathering.
2. The greater degree of fracturing observed in the valley floor is likely related to shear zones that control the development of local drainages. Based on drilling completed as part of initial site characterization, the estimated depth of effective fracturing below the permafrost in the bedrock is expected to be 300 to 500 ft. Below this depth, fracture frequency and permeability decrease significantly.

Data from pumping tests also indicate that the bedrock fracture systems at most of the locations are directly connected with the overlying alluvial aquifer system. Water level declines observed in alluvial wells completed adjacent to bedrock pumping wells were relatively instantaneous and similar in magnitude, suggesting a strong hydraulic connection between the alluvial system and the underlying fractured bedrock (Water Management Consultants, 2005 and 2009).

2.2.8 *Background Water Chemistry*

Background chemistry for surface water and groundwater reflects the mineralized nature of the rocks within the Fish Creek drainage and the historical placer mining activity that occurred in the area. Pre-mining groundwater within the Fish Creek drainage has circum-neutral pH values and is generally a calcium-bicarbonate compositional type. Values of TDS and alkalinity are low to moderate. Shallow bedrock and alluvial groundwater compositions are generally similar as a result of the hydraulic connection between the two systems. Deep bedrock groundwater tends to be more variable in composition as a result of compartmentalization. Background sampling indicates that metals present in concentrations above the Alaska state water quality standards include arsenic, cadmium, copper, iron, manganese, and zinc.

Because of the inter-connection between the surface water and groundwater systems the pre-mining chemical character of the two are similar. Background surface water is characterized by circum-neutral pH values, low TDS values, moderate alkalinity and the presence of trace metals in relatively high concentrations. Metals that are present in background concentrations that exceed numerical water quality standards include arsenic, cadmium, copper, iron, manganese, selenium and zinc (Water Management Consultants, 2005).

3 FORT KNOX WETLANDS

3.1 Department of the Army Section 404 Permit

The original 404 permit POA-1992-574, was issued to Fairbanks Gold Mining Inc. on May 5, 1994, subsequently 22 modifications have been issued. Permit modification 21, POA-1992-574-M21, in summary clarified the reclamation work that has occurred to date and the future tailings reclamation and revegetation is sufficient to fulfill the mitigation requirements for work permitted through the 18th modification of the original permit. Figure 3.1 identifies the developed wetlands and Figure 3.2 identifies the 54 acres of undeveloped wetlands, 623 acres of uplands and, 699 acres open water in the Tailings Storage Facility. Figure 3.4 identifies the location of the undeveloped 5.9 acres in the north wetlands complex.

Based on the October 2010 Preliminary Jurisdictional Determination (PJD) and accounting for the compensatory mitigation of 16.3 acres, 6.6 acres and 0.28 acres in permit modification 18, 19 and 22 respectively there remains 17.51 acres of wetlands identified. Figure 3.3 identifies the wetland locations and acreage.

Permit modification requests for future disturbances will continue to be submitted to ADNR and Corps of Engineers for review and evaluation.

Figure 3.1 Developed Wetlands

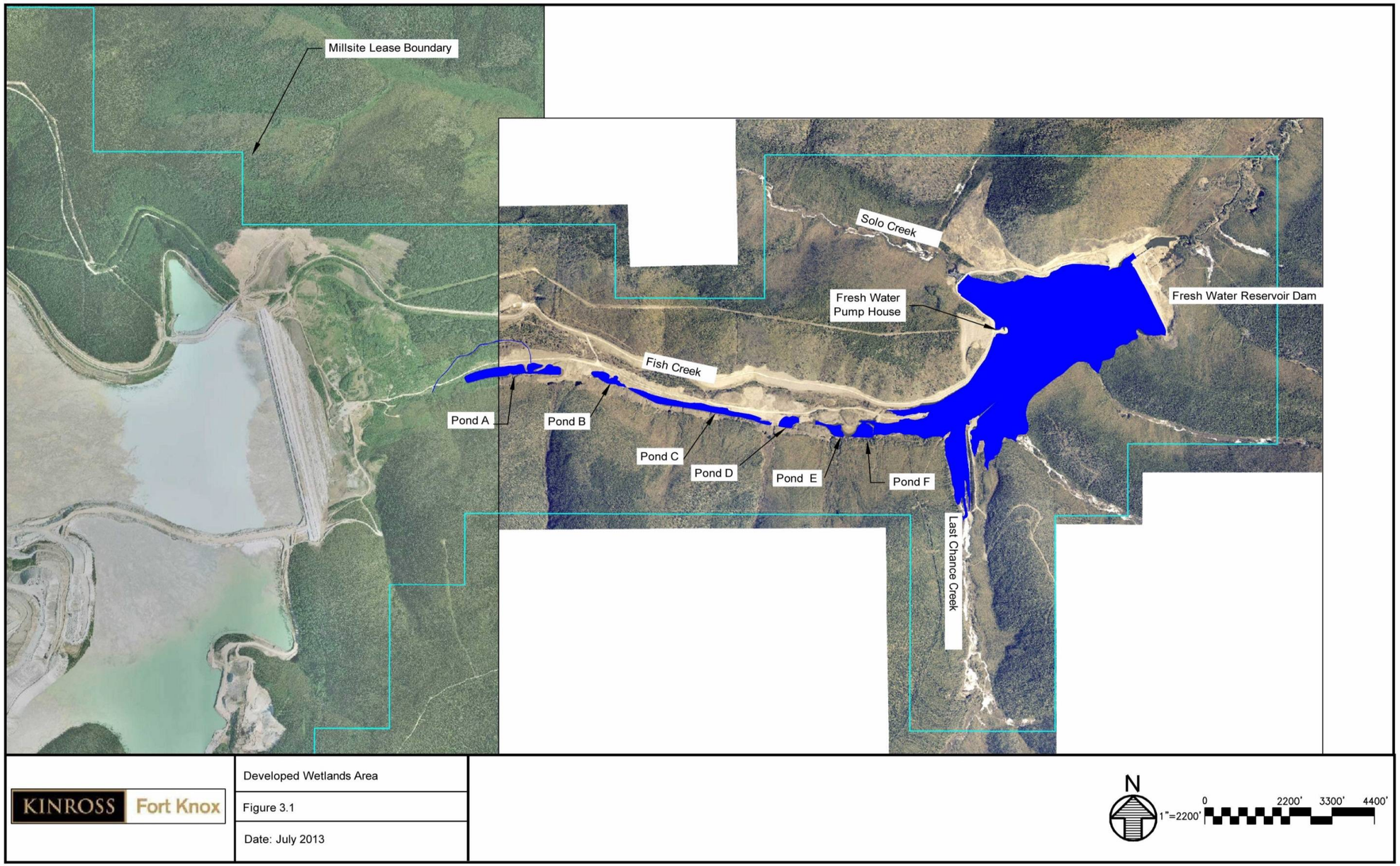


Figure 3.2 Undeveloped Wetlands Area

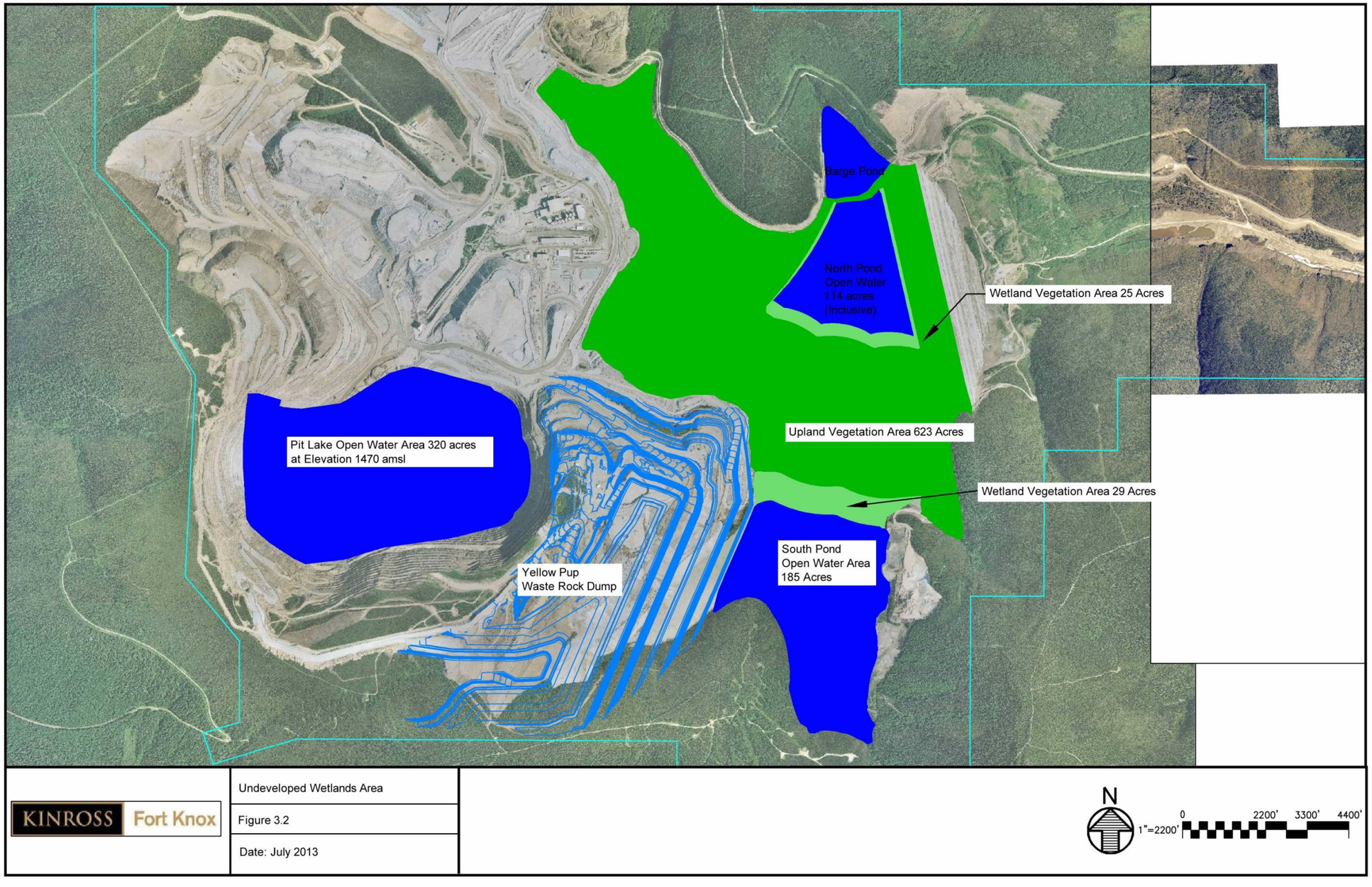
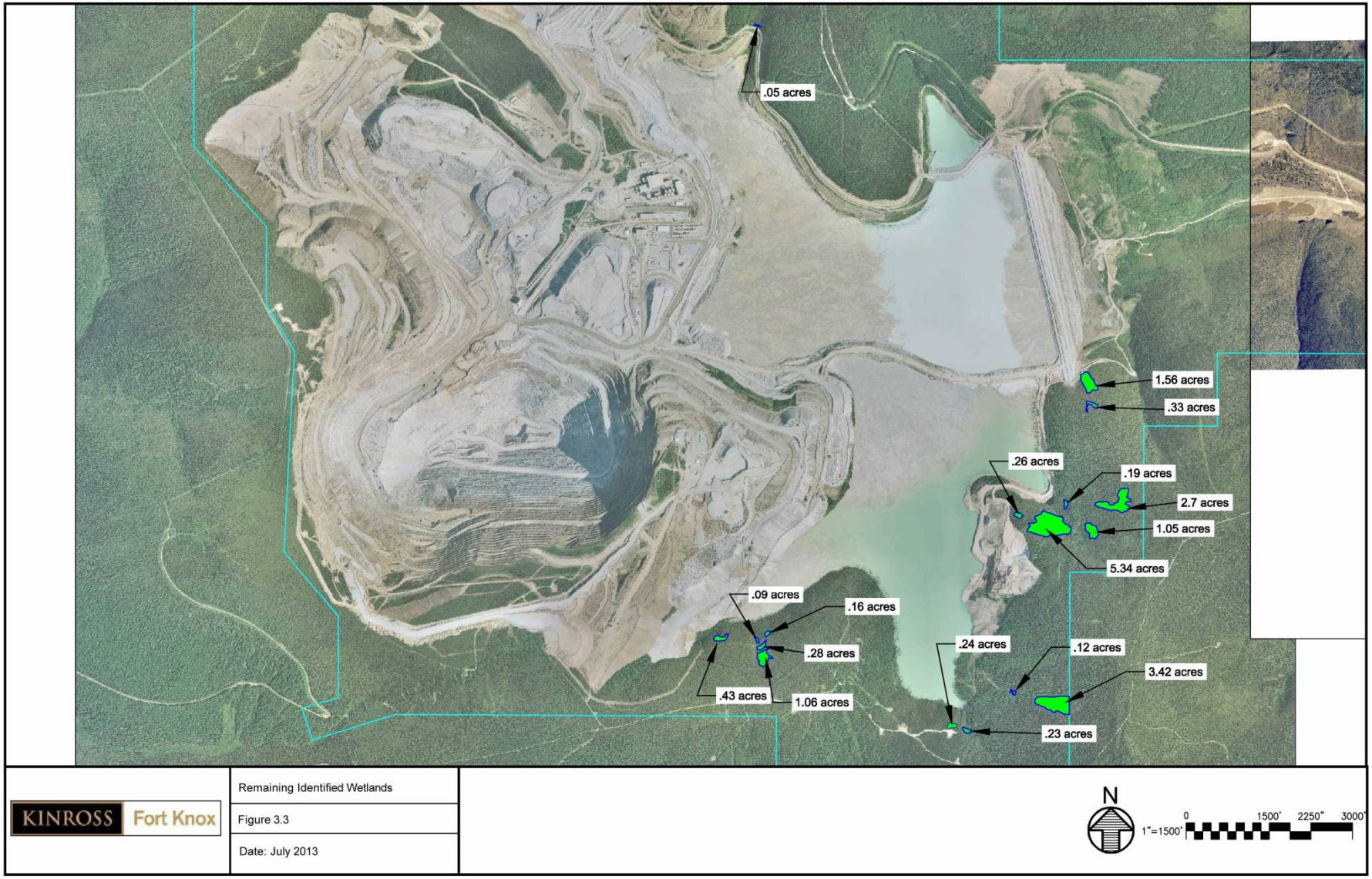


Figure 3.3 Remaining Identified Wetlands



3.2 Fish Creek Valley Developed Wetlands Delineation

In order to fulfill mitigation requirements of the Section 404 permit, creation and enhancement of wetlands and other waters on the Fort Knox Mine site began in 1997.

Historical placer mining operations along the south side of the Fish Creek Valley were modified to pond water in the area between the tailings monitoring wells and the upper limit of the water supply reservoir. These wetlands and ponds were designed to offset wetland impacts from previous disturbance and the construction of project components. In addition, this wetland area was created to assist in the enhancement and maintenance of the long-term water quality in Fish Creek. Development and enhancement of the wetlands included construction of new ponds and improving existing ponds. A total of six ponds were developed that promoted development of wetland vegetation (emergent, riparian shrub scrub and forested).

Specific criteria for the south pond system included:

1. Recontouring of placer mining disturbances has established a series of channels, wetlands and shallow ponds in Fish Creek between the tailings impoundment and the water reservoir.
2. Organic material cleared from past placer mining activities was placed in designated portions of the ponded areas to aid in the re-establishment of vegetation.
3. Natural invasion by native species was encouraged and has been successful in the creation of this wetland.
4. Flow-through structures have been designed as passive sediment traps and to decrease velocity of channel flows sufficiently to prevent down cutting and channel migration.
5. Continuous monitoring of these structures allows for modification and improvement prior to final closure. The flow regime through these developed wetlands will remain fairly constant throughout the mine life and after final closure.

The development and enhancement of wetlands and water resources include:

1. A series of wetlands and connecting channels designated as Ponds A-F created in the Fish Creek valley between the tailings dam and the water supply reservoir.
2. The water supply reservoir and stilling basin.
3. Last Chance Creek floodplain enhancement activities.

3.3 Engineered Wetland System on the North Side of Fish Creek

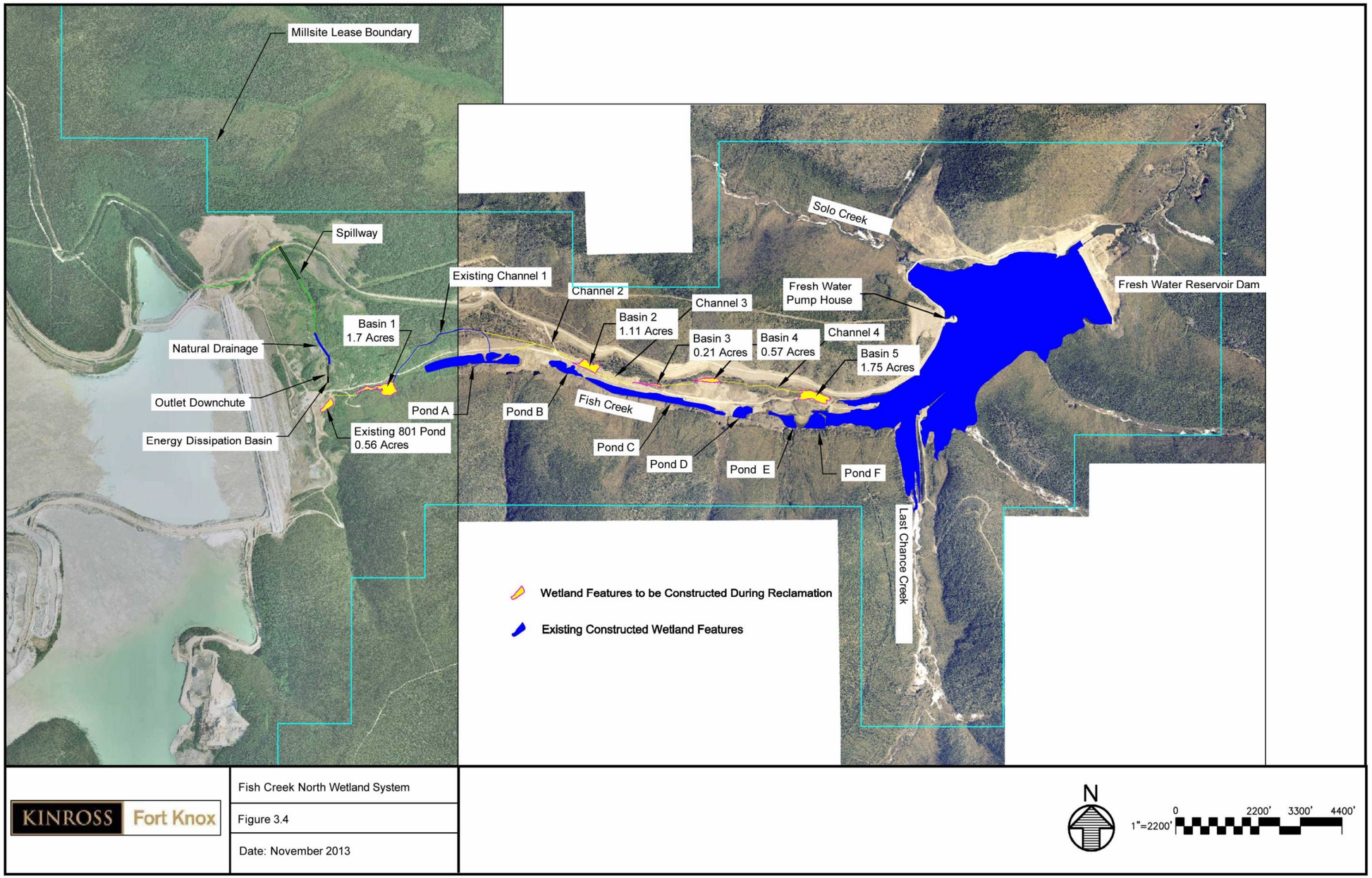
The intent of the north wetlands complex is to convey water flow from the tailings dam spillway system, after water quality standards have been met for the heap leach facility. The wetland system will be constructed on the north side of Fish Creek where placer mining has completely disturbed the original stream morphology. The wetland system is illustrated in Figure 3.4. Currently there is some surface water flow occurring in the area planned for construction of the north wetland system. The channel, energy dissipation basin and wetlands to be constructed from the north abutment of the tailings dam to the water supply reservoir will be designed to pass spring breakup and storm events. In addition to the additional wetland habitat that will be provided, the design will help to dissipate energy from storm water runoff and minimize impacts from storm events on the existing developed wetlands located along the south side of the valley. The wetland system will be separated from the developed ponds on the south side of the drainage by an existing ridge developed during placer mining.

The wetland system will consist of a series of interconnected detention basins, which will ultimately terminate above the freshwater reservoir. A series of basins and channels will provide retention volume for sediment control, followed by alternating basin/channel systems to create alternating aerobic/anaerobic conditions. The wetland system will discharge into the west end of the Fresh Water Reservoir.

The basins will be excavated to depths ranging from 3 to 6 ft depending on the local topographic gradients. The total storage capacity of the detention basins is approximately 5 to 7 acre-ft. The geometry of the basins has been defined based on the existing topography and the gradient of the drainage. The conveyance channel interconnecting the basins will be approximately 14-ft wide with a trapezoidal cross-section. The channel side slopes will be 3H:1V. It is likely that the channel bottom will be comprised of placer tailings (coarse gravel to cobbles) and will not require significant armoring or erosion control. Riprap will be placed where local ground conditions require stabilization and erosion control.

The contoured slopes along the edges of the wetland system will be seeded and fertilized to encourage natural invasion of native species.

Figure 3.4 Fish Creek North Wetland System



3.4 Fishery Development and Enhancement

The primary land use objectives for reclaiming Fort Knox are the development of wildlife habitat and the fishery potential throughout the mine site, but particularly in the developed Fish Creek wetlands and the water supply reservoir. In cooperation with ADF&G, Division of Habitat and ADNR, FGMI has strived to maximize the potential for development of a fishery resource within the water supply reservoir and the associated Fish Creek wetlands. Design of the project facilities (i.e., road crossing of Solo Creek, development of wetlands upstream of the freshwater lake, material borrow sites adjacent to and connected to the reservoir lake) and the construction plans for the freshwater dam were developed to facilitate the establishment of a fishery resource in the water supply reservoir. The long-term goal is to establish a productive and sustaining fishery resource upon completion of mining and reclamation.

A two-year fisheries study, initiated in 1992, was conducted to gather baseline data on fisheries resources, water quality and quantity, and benthic invertebrates in that portion of Fish Creek proposed for mine development. Based on sample results, it was documented that, Arctic grayling (Thymallus arcticus), burbot (Lota lota) , slimy sculpin (*Cottus cognatus*) and round whitefish (Prosopium cylindracuem) occur in a limited area of Fish Creek upstream of the proposed water supply reservoir. Arctic grayling spawn, rear, and over-winter in the upstream area of Fish Creek drainage near Solo and Last Chance Creeks. Spawning was confirmed by the presence of adult and young-of-the-year Arctic grayling.

Since November 1995, when FGMI began impounding water within the water supply reservoir, the Alaska Division of Fish and Game (ADF&G, Division of Habitat) has been monitoring both the fishery and water quality. Arctic grayling have successfully spawned in the wetland complex every year since 1999 and have used most of the wetland complex in the majority of years, but in 2002, 2006 and 2007, access to spawning habitat was limited. In 2004 and 2005, Arctic grayling successfully spawned in Last Chance Creek. The decrease of spawning habitat in the wetland complex and the lack of spawning in Last Chance Creek during other years was due to the presence of beaver dams and cold water temperatures caused by extensive aufeis that lasted beyond the Arctic grayling spring spawning period.

The 2012 Length-frequency distribution and assessment of spawning condition (e.g., ripe, spent) continues to indicated that in 2009 there were more fish in spawning condition than in either 2007 or 2008 (Ott and Morris, 2009). Self-sustaining populations of Arctic grayling and burbot have been established in the Fort Knox fresh water reservoir. The post-mining goal for the Arctic grayling population was set at 800 to 1,600 fish >200 mm prior to construction the spring 2011 estimated population for Arctic grayling >200 mm was 7,378 fish (using spring 2011 as the mark event and spring 2012 as the recapture event). As predicted based on the spring catch in 2011(Ott and Morris 2012), the Arctic grayling population increased substantially since the 2010 estimate of 3,223 fish. The 2011 population estimate is slightly less than the previous highest estimate of 7,926 fish in 2005.

A goal for the burbot population was not set prior to construction, but a self-sustaining population currently exists (Ott and Morris, 2009). In 2012 a total of 140 burbot were caught in the water supply reservoir and developed wetlands. The burbot ranged from 175 to 975mm in length, 61 were larger than 400mm (Ott and Morris, 2012)

4 SURFACE DISTURBANCE AND LAND USE

4.1 Surface Disturbance

4.1.1 *Placer and Other Mining Disturbances as of August 1992*

Placer mining that occurred in the project area since 1917 disturbed a substantial portion of the valley bottom along the entire length of Fish Creek. Considerable placer mining disturbance was also apparent along Monte Cristo, Barnes, Pearl, Yellow Pup, and Last Chance Creeks. Generally, the disturbances extended across valley bottoms and ranged in depth from about 10 to 40 feet. Many of these areas had ice-rich permafrost that was thawed by hydraulic mining. Year-round placer operations occurred during 1991, 1992, and 1993.

Prior to construction of the Fort Knox Mine facilities, placer or other mining activity had disturbed approximately 904 acres within the Millsite Permit area. Of this, approximately 367 acres was classified as historically disturbed (characterized by some revegetation), and 511 acres as recently disturbed (characterized by a lack of vegetation). An additional 26 acres were characterized by large sediment settling ponds. These acreage figures did not include areas encompassed by roads, trails, historic ditches, cabin sites, and small, localized disturbances.

4.1.2 *Reclamation of Pre-mining Disturbances*

Construction of the tailings impoundment and the water reservoir has stabilized the existing placer disturbances and greatly improved water quality. Both structures have increased the retention time of average surface flows and storm events, thus moderating total suspended solids and turbidity in Fish Creek. Reclamation during and directly after construction of the dams concentrated on the existing placer disturbances between the tailings impoundment and the water reservoir. Construction, development and enhancement of the area resulted in a wetland complex that includes a series of sedimentation ponds and the revegetation of the area.

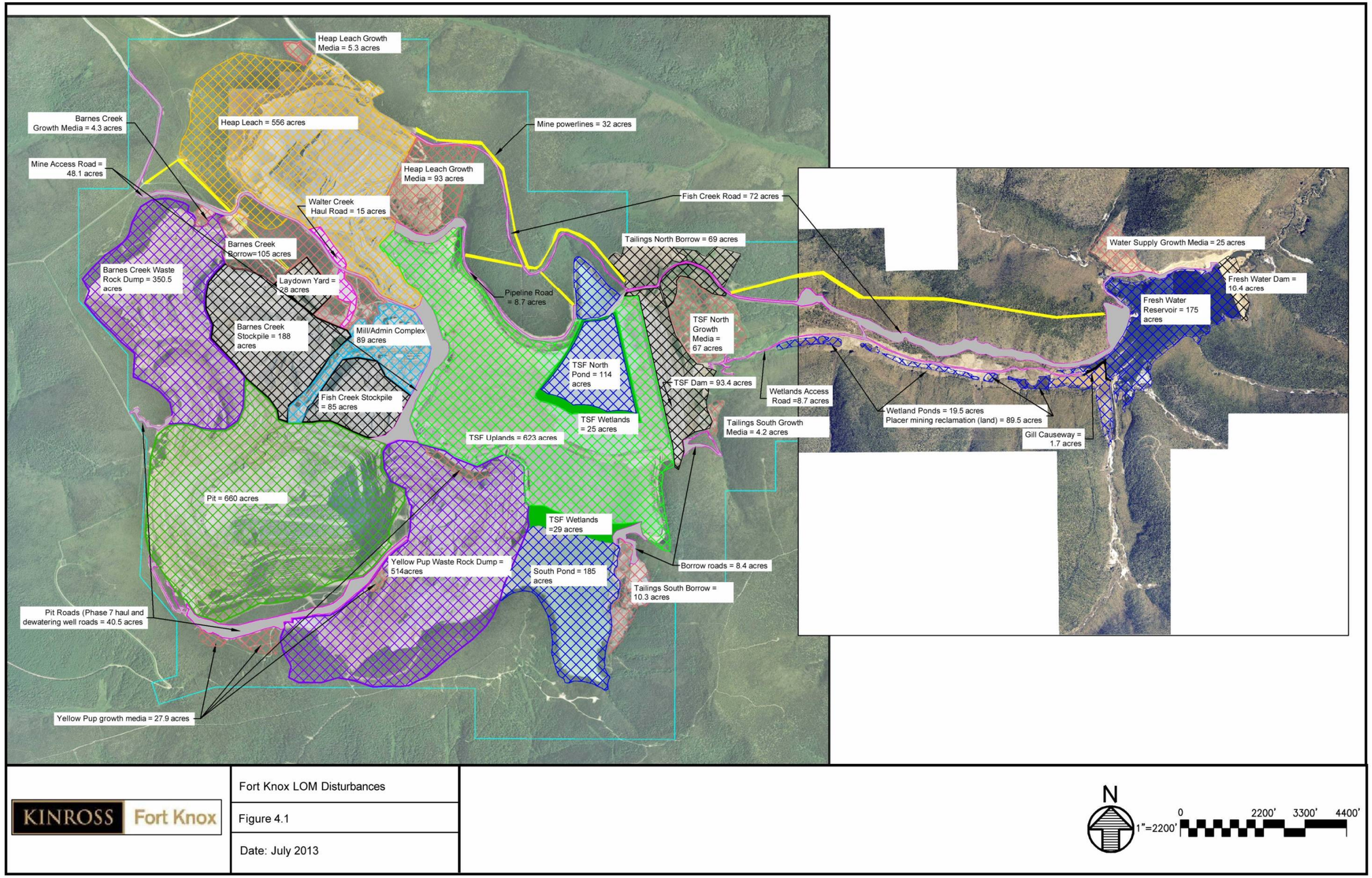
4.1.3 Fort Knox Mine Disturbance

The two-dimensional area disturbances listed in Table 4.1 include State and private lands over the life-of-mine of the Fort Knox Mine operations. These acreages reflect life-of-mine disturbance within the millsite lease boundary. Figure 4.1 outlines the acreage of disturbance.

Table 4-1 Areas and acreage of disturbance

Location	Acres Disturbed
Waste Rock Dumps	864.5
Heap Leach	556.0
Roads	203.0
Pit	660.0
Buildings Complexes and Laydown yards	117.0
GM Stockpiles*	226.7
Borrow Areas	213.0
TSF Surface	976.0
TSF Dam Crest and Surrounding Area	93.4
Ore Stockpiles	273.0
FGMI Power Lines	32.0
Developed Wetlands	99.0
Water Supply Reservoir & Dam	191.4
Total	**4,505.0**

Figure 4.1 Life of Mine Disturbances



4.2 Land Use

4.2.1 *Land Use Prior to Fort Knox*

Mining activities have been continuous in the Fish Creek drainage since 1902. Mineral exploration and placer mining produced the greatest visible impact to surface features including cuts, tailings mounds, sediment ponds and areas damaged by erosion. Recreational uses of the area included hiking, biking, berry picking, cross country skiing, snowmobiling, dog mushing, horseback riding, trapping, and small/large game hunting.

The site supports those wildlife species typically inhabiting taiga (sub-arctic evergreen forest). Avian species include numerous migratory birds and raptors. Mammals range from small shrews, voles, mice, lemmings, red squirrels, porcupine, and snowshoe hare to larger species including fox, wolves, black bear, brown bear, and moose.

4.2.2 *Land Use During Fort Knox Operations*

State surface land use authorizations allow limited access by the general public. Restricted access is due to the inherent hazards associated with the operation of large mine equipment and process components. Compliance with requirements of MSHA regulations limits access to personnel trained to recognize hazards and observe safety rules to insure the health and safety of employees and visitors. In order to ensure the safety of mine employees and the public, all hunting, fishing, and trapping within the Millsite Lease area are prohibited.

4.2.3 *Post-mining Land Uses*

The Fort Knox operation will alter the landscape of the site for the long-term. The pit will be reclaimed as a lake that will ultimately cover approximately 320 acres, creating a source of open water in a landscape that contains very few large bodies of water.

The water supply reservoir and developed wetlands with their associated open water have altered, diversified, and increased the functional value (Buell & Moody, 2005) of the reclaimed area.

These areas will continue to be of great interest to ADF&G and the ACOE for their potential for fish and wildlife resources. Future reclamation will produce both wetland and upland sites to increase productivity of post-mining land use as wildlife habitat.

5 RECLAMATION PRACTICES

FGMI's long-term goals for reclamation performed during and after mining and milling operations are to contour, stabilize, and revegetated disturbed areas in order to return the land to a safe, stable and productive condition. FGMI is contouring and stabilizing disturbed areas to create ground conditions that promote vegetation development and provide conditions for colonization by native species. Native grass species available commercially are used for rapid soil stabilization.

The objectives of the reclamation and closure plan are:

1. Stabilization and protection of soil materials from wind and water erosion.
2. Stabilization of steep slopes through contouring to provide rounded land forms with erosion control.
3. Establishment of long-term, self-sustaining vegetation communities conducive to natural invasion and succession.

FGMI will continue working with ADNR, Division of Agriculture Plant Materials Center, and Alaska Department of Fish and Game to achieve the successful implementation and subsequent evaluation of both concurrent and long-term reclamation activities. FGMI considers reclamation to be a progressive process that includes the design, construction, operation, and closure of the mining operation. Reclamation will or has occurred in the following phases, with some overlap:

1. Reclamation completed during and directly after process component construction (includes interim reclamation to stabilize and maintain viability of topsoil stockpiles).
2. Reclamation concurrent with mining.
3. Final reclamation will commence upon cessation of mining, milling and heap leach operations. Final reclamation will include removal of process components, contouring, and placement of growth media unless otherwise approved by ADNR, and revegetation.
4. Passive reclamation (Phase II Reclamation) will consist of monitoring and maintenance, including water management as necessary, until the reclamation performance standards and the water quality standards established by the Waste Management Permit issued by the Alaska Department of Environmental Conservation are achieved. After water quality standard and revegetation requirements are achieved, the Agreement for Funding Post-Reclamation Obligations (Appendix B) is triggered.

The general reclamation procedures are discussed in Section 5.2. The details and procedures for area specific reclamation such as the pit, waste rock dumps, tailings impoundment, heap leach facility, etc. are discussed in Section 6.

5.1 Schedule of Reclamation Activities

5.1.1 *Reclamation Schedule*

The planned schedule for major reclamation activities is provided in Appendix A. Under the current plan, milling is projected to cease during 2017 and mining will cease in 2020. The heap leach operation will continue to have ore loaded through 2020. Cyanide solution will continue for two years after the final ore is loaded on the pad. An additional two years of leaching without applying cyanide is projected to follow the cyanide leaching phase. Following economic leaching, four years of rinsing is expected before the solution will meet water quality standards. Once rinsing is complete and DEC approves, the heap leach liner will be punctured to prevent future ponding within the pad. Three months of draindown are expected, during this time the facility will be regraded and growth media placed. Closure of the heap leach pad is projected to be completed in 2029.

By 2018 or after the overliner material for heap leach is stockpiled, the crusher and the conveyor will be removed and the areas reclaimed. When the pit dewatering wells are no longer required, they will be decommissioned, this activity is currently scheduled to start in 2021. The waste rock dumps are also scheduled for reclamation in 2021.

Cover placement on the tailings impoundment is projected to begin in 2017. However, the tailings impoundment will be maintained as zero discharge facility until closure of the heap leach facility is completed. The placement of growth media and revegetation of the upland area of the tailings surface will occur as conditions allow. The tailings impoundment dam crest will remain intact to provide emergency containment for the heap leach for so long as the heap leach is in operation. Seepage collected at the toe of the tailing dam will be returned to the Barge Pond then pumped to the pit until acceptable water quality for discharge has been achieved, at which point the seepage pump house complex can be demolished. The tailings barge will be removed after pumping from the Barge Pond to the pit is no longer required. The tailings impoundment spillway may be constructed in phases as conditions allows however, water from the Barge Pond will not be allowed to discharge through the spillway until the heap leach water meets water quality standards.

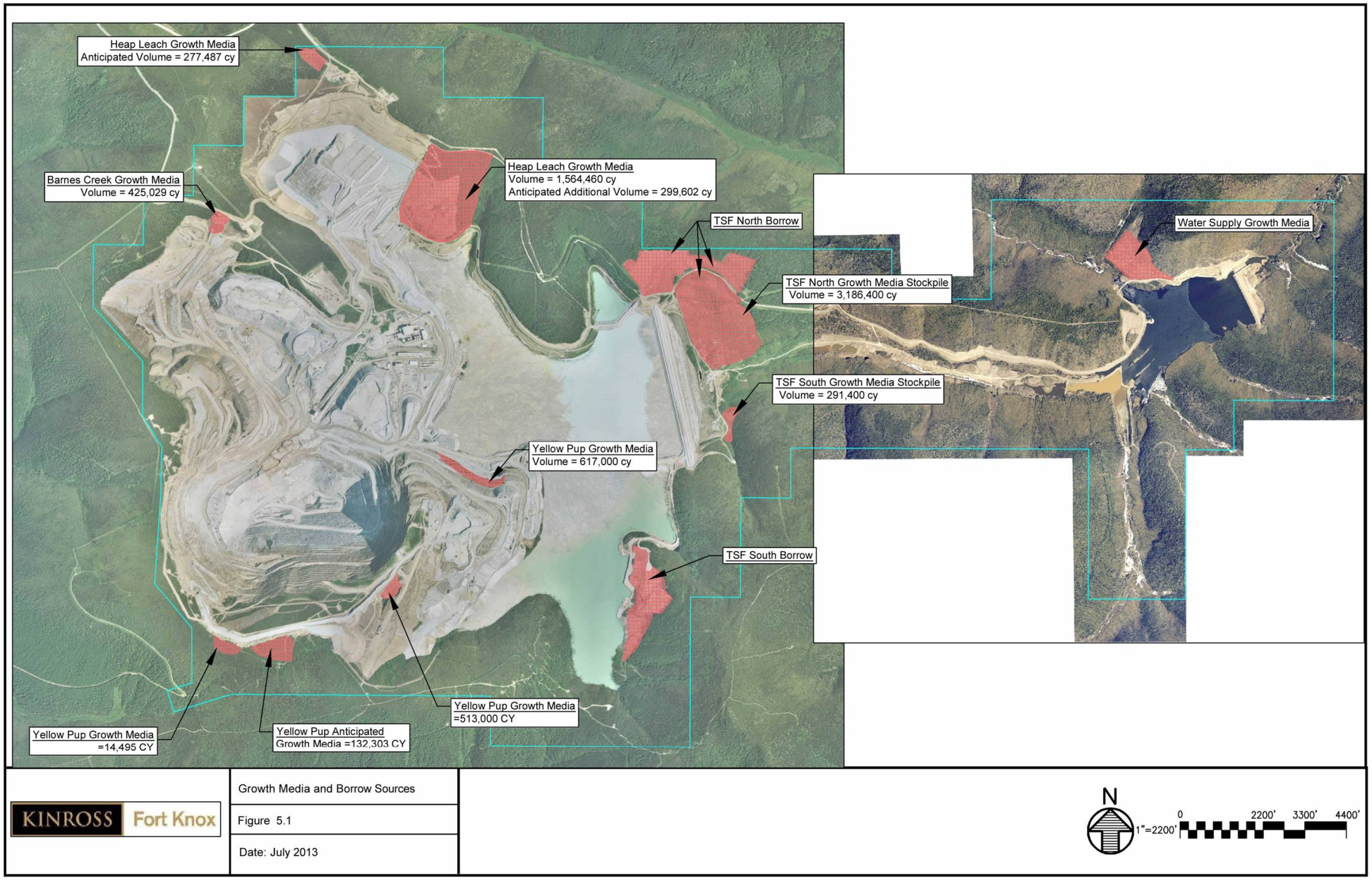
In 2018, the wetland system on the north side of Fish Creek Valley is projected to be in place. The various roads remaining on the mine site will be reclaimed (pending agreement with ADNR) when they are no longer required for mining, reclamation, and post-closure activities.

Post-closure monitoring will begin for each mine facility when reclamation of that facility is successfully completed and will continue until final bond release. After ten years of post-closure monitoring demonstrating successful reclamation and closure, that area subject to the Agreement for Funding Post Reclamation Obligations (Appendix B) will be turned over to the Organization in accordance with the agreement.

5.1.2 *Reclamation of Construction Sites*

During stripping operations for construction of the process components (tailings dam, freshwater dam, mill site, crusher, heap leach pad, maintenance shops, etc.) growth media was selectively stockpiled. Topsoil and overburden stripping will continue as the ore body, waste rock dumps and heap leach facilities are fully developed. Growth media will continue to be stockpiled throughout the mine life. Growth media stockpiles will be located near their sites of origin or in areas of future need. Figure 5.1 provided on the following page illustrates the location of existing and planned growth media stockpiles. Interim seeding and fertilizing of the growth media stockpiles will occur to stabilize and protect stockpiled material for use during final reclamation. Areas disturbed during construction that would not be re-disturbed during operations have been concurrently reclaimed, as will be any future areas they may be disturbed for construction.

Figure 5.1 Growth Media and Borrow Source Locations



5.1.3 *Concurrent Reclamation*

FGMI currently implements interim reclamation at inactive areas within the mine site, such as borrow areas, until final reclamation can be completed. Soil stabilization and erosion control measures are used on all disturbed and unprotected areas prior to the end of a normal operating season. Opportunities for concurrent reclamation of waste rock dumps and overburden dumps have not occurred to date, as these sites have remained active. Small areas of the waste rock dumps have been used for temporary revegetation trial plots. However, these sites have become active again. Trial plots on deposited tailings have been short lived since tailings deposition has not reached its maximum elevation. Concurrent reclamation will take place when opportunity allows. These opportunities will increase as Fort Knox nears the end of mine life.

5.1.4 *Final Reclamation*

Under the current mine plan, milling is projected to continue through 2017, mining will continue through 2020, and production from heap leach is planned through 2024. Final reclamation, including contouring, placement of growth media (unless otherwise approved by ADNR), and revegetation will be initiated immediately after cessation of mining, heap leaching, or milling operations at each facility. Completion of final reclamation within 2 to 5 years of the initiation of closure activities at each facility is anticipated for all facilities. Reclamation will be implemented concurrently with operations as mining activities allow. Written notification of final closure will be given to the ADNR and ACOE within 90 days after cessation of mining, heap leaching, and milling operations. The notice will state the date on which final reclamation activities will begin.

5.1.5 *Temporary Closure*

Temporary closure means the cessation of the mining, heap leaching, and milling operations for a period of not more than three years. If conditions require temporary closure to extend beyond three years, final reclamation will begin, unless an extension is requested by FGMI and approved by ADNR. Temporary closure scenarios that require modifications to the plan of operations, reclamation plan or 404 Permit will be coordinated with the appropriate Federal and State agencies for approval.

Temporary closure may include planned and unplanned cessation of the mining, heap leaching, and milling processes. Planned temporary closures, which have specific conditions defining their beginning and end, include, but are not limited to, the following:

1. Interruptions in the active beneficiation processes to provide planned periods of inactivity for metallurgical or operating reasons.
2. Any other planned condition that would interrupt the active beneficiation process including modification to process components or suppressed metal market conditions.
3. Change in ownership requiring the temporary cessation of operations while operating permits are transferred to the new owner/operator.

Unplanned temporary closures may include, but are not limited to, the following:

1. Closure because of unforeseen weather events.
2. A failure in a major system component or a process failure that causes the fluid management system, or a portion of it, to shut down.
3. The cessation of operations due to litigation.

5.2 General Reclamation Procedures

The primary components of reclamation for the Fort Knox Reclamation Plan include earthwork, growth media placement, seedbed preparation, fertilizing, seeding, and monitoring. FGMI will manage these components keeping in mind that the ultimate goal is to achieve a stable, revegetated post-mining land surface that will promote natural invasion by native plants. FGMI will continue to work in coordination with ADF&G, Division of Habitat to develop and enhance the fish and wildlife potential throughout the project area.

5.2.1 *Earthwork*

Waste rock dumps and the heap leach facility will require major grading, contouring, and revegetation. Other disturbed areas will be revegetated; some may require regrading. Growth media will be applied if revegetation efforts do not successfully achieve 70% cover. Generally, slopes will be graded to 2.5H:1V or shallower. For the purposes of Financial Assurance (FA) calculations a slope of 3H:1V was used.

Earthwork will utilize heavy equipment typical to the industry. It is anticipated that the equipment list will include (or equivalents thereof): D10N Cat., D9N Cat., D8L Cat., rubber-tired scraper, water truck, and motor graders. Other equipment such as (but not limited to) front-end loaders, track and tire mounted backhoes, and haul trucks may be substituted for or included with this general equipment list. Equipment needs and use must and will remain dynamic, as specific conditions require during implementation of the plan.

5.2.2 *Control of Sedimentation*

Implementation of Best Management Practices (BMPs) to control erosion during active mining will be designed to minimize re-disturbance during reclamation. The BMPs will be consistent with those measures and practices identified in Alaska Department of Transportation and Public Facilities, *Alaska Storm Water Guide*, December 2011.

Temporary control devices will be removed when the site-specific potential for erosion has been minimized through earthwork or revegetation.

5.2.3 *Growth Media*

"Growth media" is defined herein as all native soil (in-place) material with the physical and chemical properties capable of germinating and sustaining vegetation growth with or without amendments. At the Fort Knox site, the term "growth media" is interchangeable with the terms "topsoil" and "overburden". Overburden material, suitable for use as growth media, is the unconsolidated material that lies between the topsoil horizon (where present) and bedrock and exhibits no chemical characteristics that will inhibit vegetation development.

Growth media (topsoil and overburden) will be stockpiled at Fort Knox in anticipation of future reclamation needs. Table 5.1 provides a summary of growth media salvaged and that planned for salvage as operations progress. Growth media application depth will be at a depth that will achieve successful vegetation establishment. The FA accounts for 12” of growth media. Growth media will be hauled and placed by dump truck and spread by a dozer. Highly compacted areas such as equipment lots and roads will be ripped in a linear fashion prior to growth media placement if it is required. The above Figure 5.1 illustrates the location of growth media stockpiles and borrows areas that exist and are planned. A survey to determine the amount of growth media available will be done after the dam raise and heap leach construction has been completed. A portion of the growth media stockpiled and borrow sources have been utilized

due to its suitability for use as engineered seal and filter material for the tailings dam and engineered sub-base for the heap leach. The required growth media amount is 3,560,925 cy. All growth media stockpiles will be used with exception to tailings north. The borrow sources are shown on Figure 5.2, but the volumes are not included.

Table 5-1 Estimated Growth Media Volumes

Site	Volume (CY)
Yellow Pup GM Stockpile	1,276,798
Walter Creek GM Stockpile	2,141,590
Tailings South GM Stockpile	291,400
Tailings North GM Borrow Area	3,186,400
Barnes Creek	425,029
Total	**7,321,176**

5.2.4 *Seedbed Preparation*

Mine and mine related disturbances can result in compacted surfaces unsuitable for revegetation. Thus, preparation of a seedbed suitable for plant germination and growth can be a critical task in any successful land reclamation project.

At Fort Knox, the general method of seedbed preparation will be ripping or scarifying on the contour 12 to 18 inches deep using a D8N or D10 CAT (or equivalent) equipped with a 2 or 3-shank ripper. The FA accounts for the use of a D10 CAT.

Ripping will occur along contours of sloped areas to promote erosion control in addition to creating a suitable seedbed. The specific site will be prepared for seeding by ripping on the contour to roughen the surface. A broken, roughened surface will serve to trap moisture, reduce wind shear, minimize surface erosion by increasing infiltration, and create micro-habitats conducive to seed germination and development.

5.2.5 *Fertilizer and Fertilization*

Prepared seedbeds will be fertilized prior to, after, or during the seeding operation. Specific fertilization requirements will depend on the quality of growth media used. Growth media will be tested for standard soil agricultural constituents including nitrogen, phosphorus and potassium. Based on available field-testing and soil test results at Fort Knox, the general recommended rate of fertilizer application will range from 100 to 300 pounds per acre of 20N-20P-10K for a spring seeding or 10N-20P-10K for a fall seeding. The FA accounts for 300 pounds per acre and the spring fertilizer ratio. Final fertilizer and application rates for the tailings will consider information acquired from current reclamation and soil tests.

5.2.6 *Seed and Seeding*

The grass seed mix presently used at Fort Knox is listed in Table 5.2. The primary purpose of this seed mix is to achieve quick vegetative cover that will help minimize soil erosion. Forb species that may be considered in the future for revegetation include: Silverberry, Lupin, Oxytropis, Wild Sweet Pea, Sweetbroom, Burnet, Siberian Aster, Goldenrod, Alpine Milk Vetch, Wild Sage, Dragonshead Mint and Wild Rhubarb. However, these varieties are not currently available commercially, and a commercial source must be located if they are to be incorporated in the seeding mix. The seed mix may change over time in response to such factors as internal

and external research results, changes in technology, changes in land management philosophy, and commercial availability. Native species will be the preferred mix. However, other species may be used in some years due to availability or if deemed to better meet the post-mining land use criteria and approved by ADNR.

Table 5-2 Seed Mix

Seed Type	Mix %
Arctared Fescue	50%
Gruening Alpine Bluegrass	20%
Tundra Glaucous Bluegrass	20%
Nortran Tufted Hairgrass	10%

Seeding will be accomplished using broadcast methods that may include but not be limited to hand broadcasting, dozer or off-road vehicle mounted broadcasting and aerial broadcast application. The application rate for broadcast seeding using the presently proposed grass seed mix will be 9 pounds of pure live seed per acre. The rate has been reduced based on successful results of revegetation efforts at True North and discussions with Plant Materials Center. The need for mulch application will be evaluated if seed germination becomes a limiting factor in the reestablishment of vegetation.

5.2.7 *Revegetation Timing*

Seeding will be conducted as soon as possible following seedbed preparation. Ground conditions suitable for large scale earthwork occur primarily during the spring and summer months. Research and experience with concurrent reclamation will be used to evaluate the potential of dormant seeding. Generally, seeding is implemented after spring break up until mid-July. Such seeding allows the seed to take advantage of the summer moisture period. However, actual experience has shown that all seedbed preparation on large-scale mine reclamation projects cannot and does not occur at one point in time. Thus, while every effort will be made to conduct the majority of seeding after spring breakup and before mid-July, seeding actually may occur during spring, summer or fall. If a seeding is unsuccessful for any reason, the area will be reseeded the following year.

5.2.8 *Fort Knox Vegetative Restoration Studies*

FGMI currently uses a native grass seed mix ratio, seed application rate and fertilizer rate recommended by the Plant Materials Center with approval from ADNR. The grass mix was developed during the construction of the wetlands below the tailings impoundment and is still being used for concurrent reclamation projects. Planting of dormant willow cuttings and encouraging the natural invasion of adjacent native species are methods used in the past to promote species diversity. However, an increase in plant species diversity was recommended to improve the wildlife habitat surrounding the developed wetlands in the environmental audit of 2003 (Golder, 2004). Opportunities to increase species diversity in all areas of the mine site will continue to be pursued.

5.2.9 *Revegetation Cover Criteria*

A vegetative cover criterion of 70 percent will be achieved prior to requesting final release of financial assurance for each reclaimed area. The 70 percent vegetative cover criteria shall be determined a minimum of three years after the last application of topsoil, seed, fertilizer, or any water in addition to natural precipitation. A method approved by ADNR will be used to determine percent cover. The 70 percent cover criteria may be waived upon the concurrence of ADNR or the land owner for specific areas that are deemed stable, have minimal potential to adversely impact surface water quality, and are consistent with the post mining land use.

For a seeding determined to be unsuccessful, FGMI will implement appropriate action, which could include reseeding the area, fertilization, and/or placement of growth media on the site.

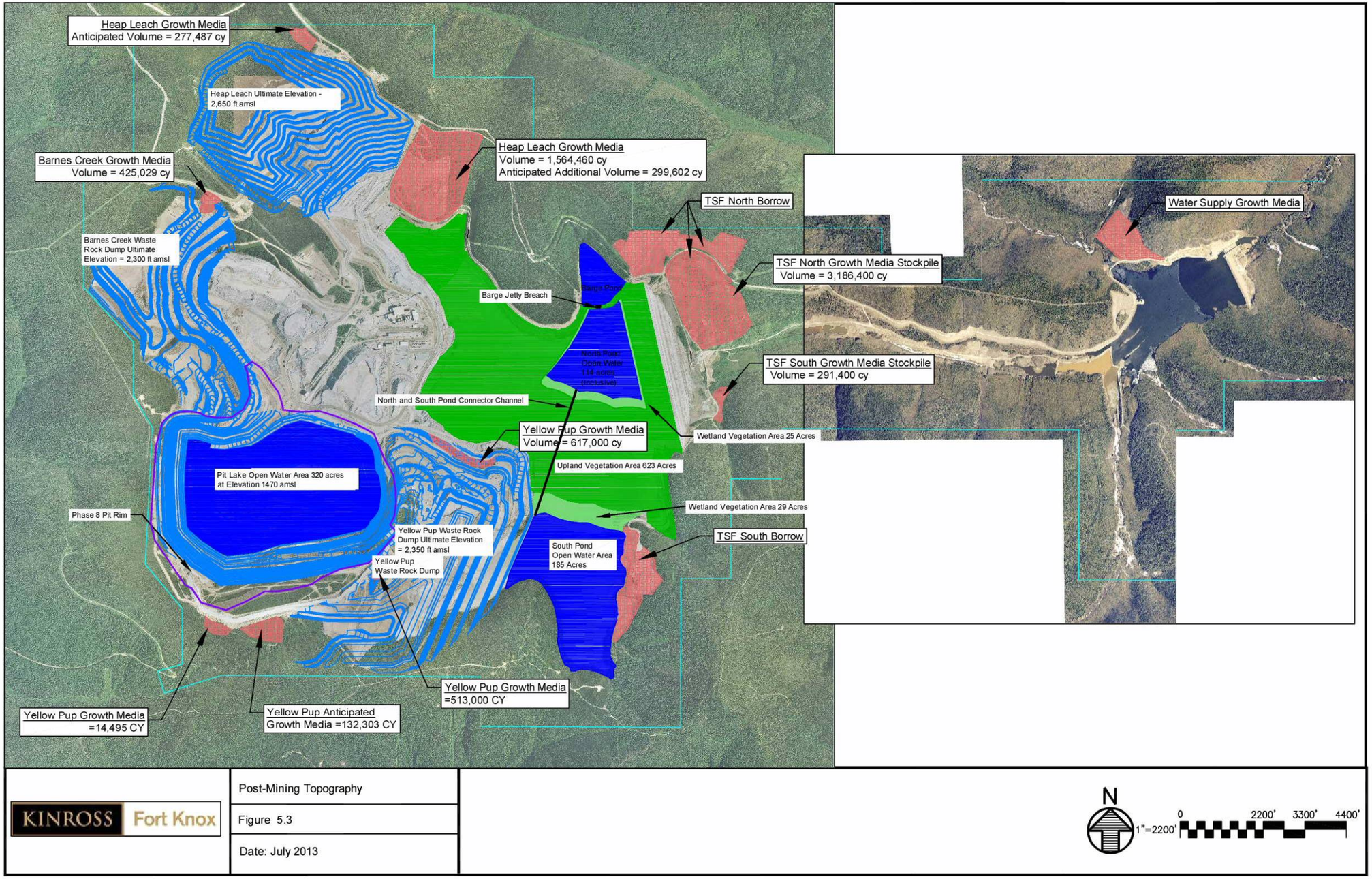
5.3 Pre-mining and Pre-reclamation Topography

Figure 5.2 is an aerial photo of the Fish Creek Valley showing pre-development ground conditions and topography at the Fort Knox Mine site.

Figure 5.2 Pre-Development Condition

Figure 5.3 illustrates the post-mining topography before reclamation occurs. Post-reclamation topography on the Fort Knox Mine site will consist of a rolling landform that blends with the hills along the south and north sides of Fish Creek. In addition to the creation of open water areas within the pit, developed wetlands (North and South Ponds), and fresh water reservoir, a large, relatively flat, tailings impoundment with uplands, wetlands and open water will further diversify the post-mining topography and habitat.

Figure 5.3 Post-Mining Topography



5.3.1 *Drainage*

Pre-mining site drainage was and remains eastwards down Fish Creek Valley to the confluence with Fairbanks Creek and eventually to the Little Chena River. Melba and Monte Cristo Creeks, Barnes, Pearl, Yellow Pup, Walter, Last Chance, and Solo Creeks are all named tributaries to Fish Creek within the project boundaries (Figure 1.4). Post-mining drainage patterns will be similar in overall gradient and direction. The lower reaches of Melba and Monte Cristo Creeks will be removed during mining, and the drainage area will become part of the pit. Surface water that flows into the pit will combine with groundwater inflows after pit dewatering ceases will form a pit lake that will eventually migrate to the groundwater through the fractured bedrock and under the tailings impoundment. During the construction of the heap leach pad all surface water is conveyed around the pad via conveyance channels that report to the tailings impoundment. No perimeter diversions were deemed necessary for the Ultimate Stage 7 leach pad configuration based on the limited contributing watershed area (knight Piésold 2013b). When present surface water on the heap leach pad that does not evaporate will infiltrate the growth media cover, excess water will migrate through the pad and be absorbed by the ore with the remaining reporting to the tailings impoundment. The heap leach underdrain system will capture water from, springs and seeps occurring beneath the heap leach pad and discharge to the tailings impoundment. Pearl Creek and Yellow Pup Creek will have tailings deposited in the lower reaches of their drainage basin. In addition a portion of the Yellow Pup drainage will be filled with waste rock. Surface and groundwater will continue to flow from the drainage basins into the tailings impoundment.

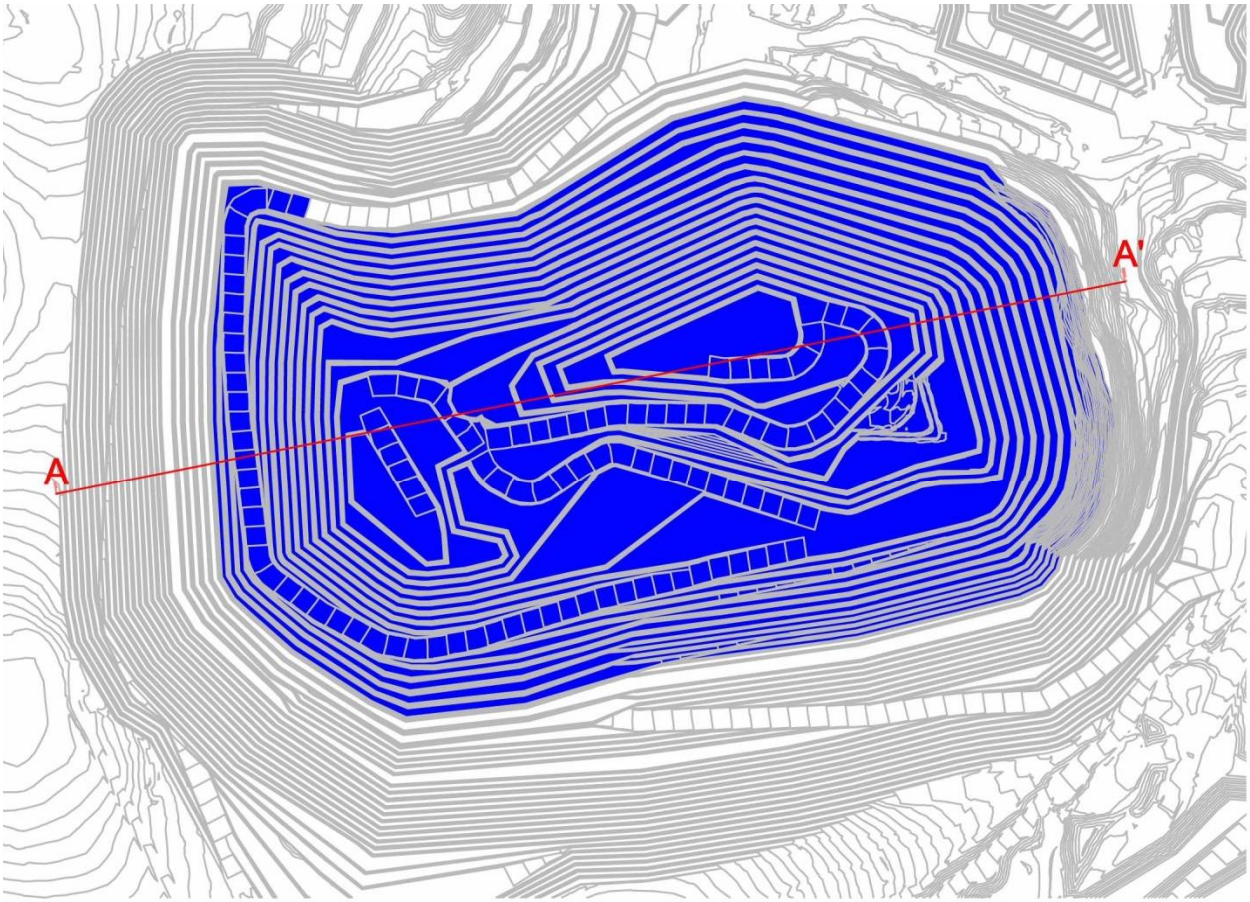
Storm flows and perennial flows will feed into the water bodies on the tailings impoundment and discharge seasonally through the tailings impoundment spillway once it has been constructed. The tailings impoundment spillway discharges into an energy dissipation basin. Water will flow from the energy dissipation basin through constructed wetlands on the north side of the Fish Creek channel and continue to the freshwater reservoir. Solo Creek and Last Chance Creek will continue to discharge into the fresh water reservoir. The freshwater reservoir will discharge through the spillway at the north end of the dam to lower Fish Creek at the eastern property boundary.

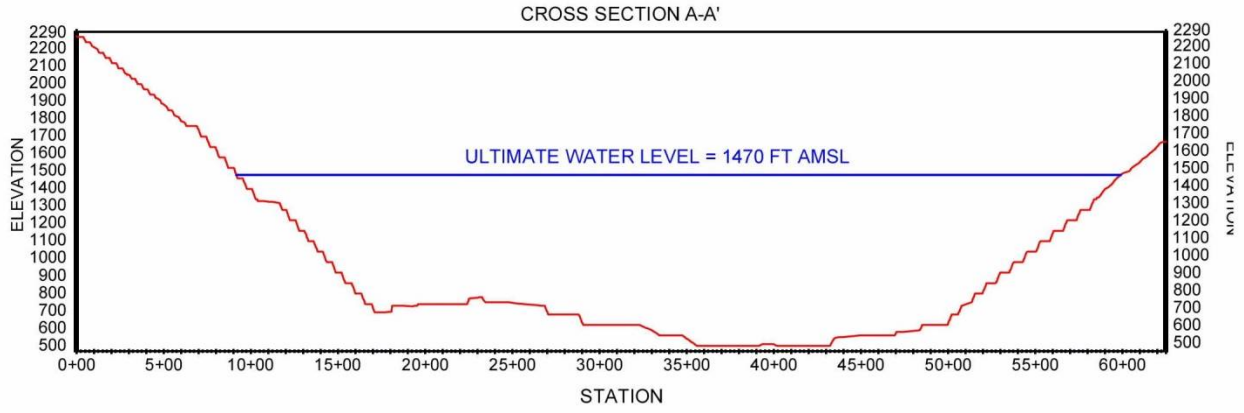
5.3.2 *Pit Slope Stability*

Pit slopes are designed to maximize overall slope and maintain safe operating conditions during mining. The pit has three different rock types. In the upper reaches of the pit is schist, which is removed as waste rock. Benches in the schist are 20-30 feet wide with a 38 degree overall slope angle. Below the schist is weathered granite. Benches in the weathered granite are 30-40 feet wide with a 32 degree overall slope. Lastly, the granite rock type has benches 15-20 feet wide with a 45 degree overall slope angle.

Figure 5.4 illustrates a cross section of the final mine pit (post reclamation) with the pit lake water level at 1,470-foot elevation. As the pit fills with water, the walls of the pit will be subject to localized failures. During this time the general public will not be allowed to access the site. While the pit is filling to its final elevation, the pore pressure will increase within the pit walls creating unstable conditions. Once the pit lake reaches its final elevation, the pore pressure within the pit walls will equilibrate resulting in stable pit walls and water will start to flow through the fractured bedrock under the TSF

Figure 5.4 Pit Lake Cross Section





5.3.3 *Acid Rock Drainage Potential*

FGMI has evaluated overburden, ore and waste rock for potential to generate acid rock drainage (ARD). The acid/base accounting analysis and humidity cell testing during baseline studies indicated no potential for acid generation. Both static and kinetic testing of materials indicates no potential for acid formation in the waste rock, open pit or tailings impoundment. Results of analysis from baseline studies are further supported by the quarterly submittals of the Fort Knox Mine Compliance Sampling Data.

Water quality will continue to be monitored and annual characterization of overburden, waste rock, and ore will continue over the life of the operation and throughout final reclamation. Historical data confirms there is low ARD potential. If FGMI becomes aware of acid formation occurring or the potential thereof, the issue will be managed according to BMPs specific to ARD. If routine characterization of material indicates a potential for acid rock drainage, then a specific management plan for material handling will be developed by FGMI. This plan will be submitted to ADNR and ADEC for approval, and the reclamation plan modified according to 11 AAC 97.240.

5.4 Public Access

Public access to the Fort Knox site will be restricted until both reclamation and closure are complete, after which public access to the site will be managed by the State of Alaska. The existing Fish Creek road will remain to provide access to the fresh water reservoir. Roads to be left in place following completion of reclamation will be determined by Fort Knox and ADNR.

Public safety is a principal concern in closure and reclamation of mining operations. The Fort Knox pit high wall interceptor ditches and safety berms will remain in place to restrict access to the pit area. Generally, berms four to six feet in height will be utilized to restrict access to the steeper highwall sections of the pit and other potentially hazardous areas. Signs will be posted to provide additional warning of potentially hazardous areas.

Pre-mining public easements or RS2477 trails that have been disturbed or will be due to mining activities are addressed with the ADNR Easement section. Working with the ADNR, FGMI has identified routes that provide equal or better access than the original trails for a portion of the trails that have been disturbed and is proceeding with the realignment process. For the remaining trails and portions thereof FGMI will undergo the same process.

5.5 Financial Assurance Release

Upon completion of successful reclamation, FGMI will submit a request for bond release of the reclamation financial assurance annually, on an area by area basis. The SRCE Model, which was used to calculate the FA will be run annually to define the appropriate amount of financial assurance that should be in place. The financial assurance amount will be adjusted up down depending on results. Successful reclamation is interpreted from Article 02 Reclamation Performance Standards 11AAC97.200.

6 FACILITY SPECIFIC RECLAMATION AND CLOSURE

A comprehensive water balance model has been used to evaluate the reclamation alternatives for specific facilities. Based upon the results of this evaluation, an overall, integrated water management and reclamation strategy has been developed to ensure runoff and drainage water quality will not adversely impact designated use standards in the receiving waters. In the long term, the general reclamation activities described in Sections 4 and 5 are directed at creating self-sustaining vegetation communities that will provide protection for water resources. The objective of this strategy is to allow Fort Knox to achieve the designated post-mining land uses as soon as possible after mining and milling are finished.

6.1 Water Management

The goal of the water management plan will be to protect designated use standards in the receiving water. The strategy is based on model predictions, and as such, it will be subject to review and refinement during the closure period as actual conditions become known.

6.1.1 *Receiving Water Beneficial Use*

By default, natural waters in Alaska are protected for all designated uses established by regulation. Prior to construction of the Fort Knox mine, baseline water quality in Fish Creek was affected by naturally occurring iron, manganese, and arsenic as well as by extensive historic alluvial placer mining operations, with seven parameters having values exceeding the state maximum contaminant levels for drinking water, and three others just below those levels (CH2M Hill, 1993). Since construction of the mine, surface water quality in Fish Creek has improved, in large part due to successful reclamation of pre-existing placer mining disturbance in the Fish Creek drainage between the Fort Knox tailings storage facility and the fresh water reservoir. The Fish Creek water supply reservoir now supports a robust population of grayling and burbot (Ott and Morris, 2012).

6.1.2 *Mine Site Surface Water*

The tailings impoundment is considered a treatment facility during operation and closure. It is operated as a zero discharge facility, and as such, the water quality standards for the state's designated uses do not apply (CH2M Hill 1993, p 4-27). As outlined in the original environmental assessment (CH2M Hill 1993) for the project, the pond in the tailings impoundment can be used as a habitat resource for wildlife (fish, migratory birds, and mammals) would be considered only after reclamation is complete, depending on characterization of the tailings during operations (CH2M Hill 1993, p 2-70). The original environmental assessment identified one pond. The current plan includes three bodies of water in the tailings impoundment, South Pond, North Pond, and the Barge Pond. The North and South Ponds will be connected by a narrow flat bottom channel. The North Pond and Barge Pond are separated by a rockfill embankment, termed Barge Pond jetty. The jetty serves as a tailing retention dyke that allows subsurface water to freely flow between North Pond and the Barge Pond.

Schlumberger Water Services has evaluated observed water quality trends to date. Long term predictions indicate that the water quality of the decant water (any surface water from the tailings impoundment) pit lake, and heap leach drainage will meet the water quality standards. There may be some constituents in which the natural condition of the groundwater and surface water in Fish Creek is of lower quality than the criteria for discharge. As a result, site-specific criteria for some constituents that take into account background conditions as outlined in 18 AAC 60.825 have been established. Once water quality standards are met, seasonal discharges from the Barge Pond will be routed to a wetland system developed on the north side of Fish Creek. The wetland system will not be used as a means of treatment to meet water quality standards. All water reporting to the wetlands will meet standards prior to discharge from the tailings impoundment. When standards are achieved, the mine will enter the post-closure monitoring phase. Incorporation of the wetland system will not influence the post-closure monitoring period since it is planned to receive water that meets water quality standards.

6.1.3 *Mine Site Water Management Strategy Summary*

Fort Knox utilizes an Operational Water Balance model (Figure 6.1) that maps past and current water flows throughout the site to predict future water volumes for water operations and management purposes. The Closure Water Balance model was created by modifying the current Operational Water Balance model to reflect closure and post-closure site water flows and is described in the Fort Knox Pit Lake Evaluation (Schlumberger Water Services, 2013). Figures 6.2 through 6.4 illustrate the changing flows in the Closure Water Balance as closure and post-closure activities occur. A timeline of major activities and the corresponding water body stage heights and water quality concentrations are summarized in Table 6.1.

Table 6-1 Timeline of major activities and the corresponding water facility stage heights and water quality concentrations.

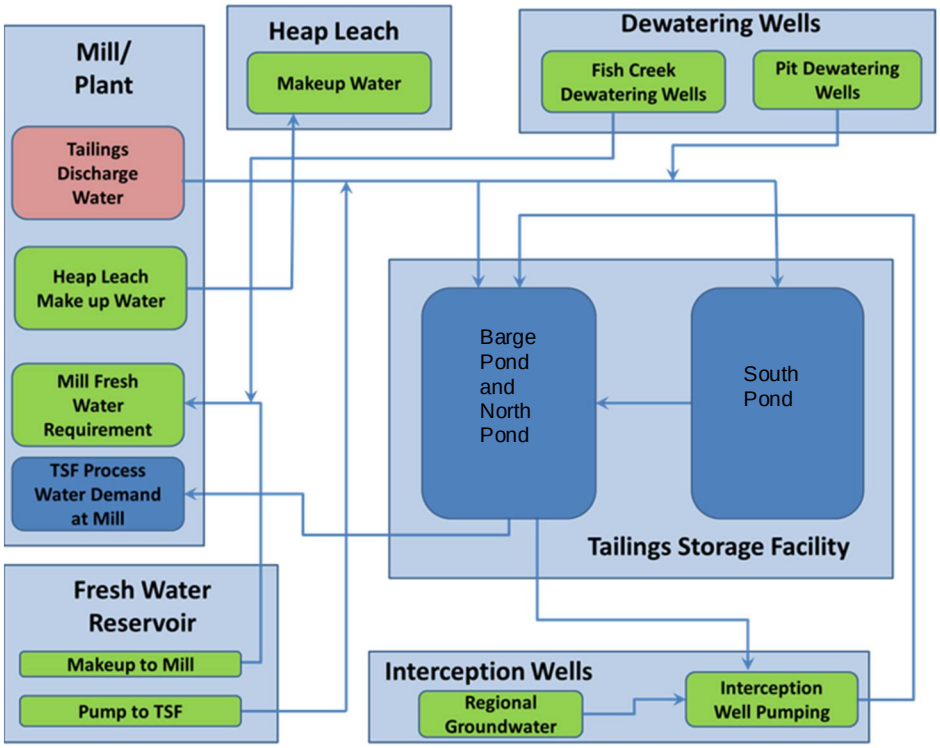
Year		Event	North Pond Stage (ft)	South Pond Stage (ft)	Pit Lake Stage (ft)	Pit Lake Water Quality			
						WAD-CN (mg/l)	As (mg/l)	Sb (mg/l)	Mn (mg/l)
						0.0052 mg/l	0.01 mg/l	0.006 mg/l	0.05 mg/l
2017	↑	Milling Ends	1530.1	1520	822.08				
2019									
2020	↓	Mining Ends HL at ultimate configuration							
2021	↑	Active Leaching with CN							
2022	↓		1530.4	1529.5	950.56	0.01	0.001	0.011	0.043
2023	↑	Leaching Continues with no additional CN							
2024	↓								
2025	↑	HL Rinsing Begins	1528.1	1529.7	1055.8	0.008	0.0035	0.0089	0.054
2026									
2027									
2028	↓	Heap Leach Rinse Ends/Interception Ends							
2029	↑↓	Heap Leach Draindown and Closure Complete							
2030									
2067		Pit Lake outflow	1529.7	1529.8	1470	0.0049	0.0088	0.0058	0.034

The key current, closure and post-closure water flows and water management activities across the mine site designed to protect all designated uses in the water supply reservoir on Fish Creek and captured in the Closure Water Balance are as follows:

Current Water Flow Onsite

Figure 6.1 is a schematic of the current Operational Water Balance model representing the current flow onsite. The mill process water is sourced from the Barge Pond. Fish Creek Dewatering wells supply freshwater for the mill pump gland water and any additional freshwater required for the Mill is taken from the FWR. The FWR also supplies any additional water to the TSF for mill process water if TSF volumes are low. Tailings discharge into both the North and South TSF depending on the tailings deposition plan. The Water Transfer Station is located in the South Pond and transfers water to the North Pond in order minimize water elevation differences between the Ponds and to increase the North Pond water volume and ensure sufficient process water supply to the Mill. Water required for heap leach processes, primarily makeup water, is supplied via the Mill and the Mill's internal process water circuit. The seepage interception sump, downstream of the TSF Dam pumps water into the Barge Pond. Other inflows into the TSF impoundment include Pit Dewatering Wells, precipitation, and surface runoff.

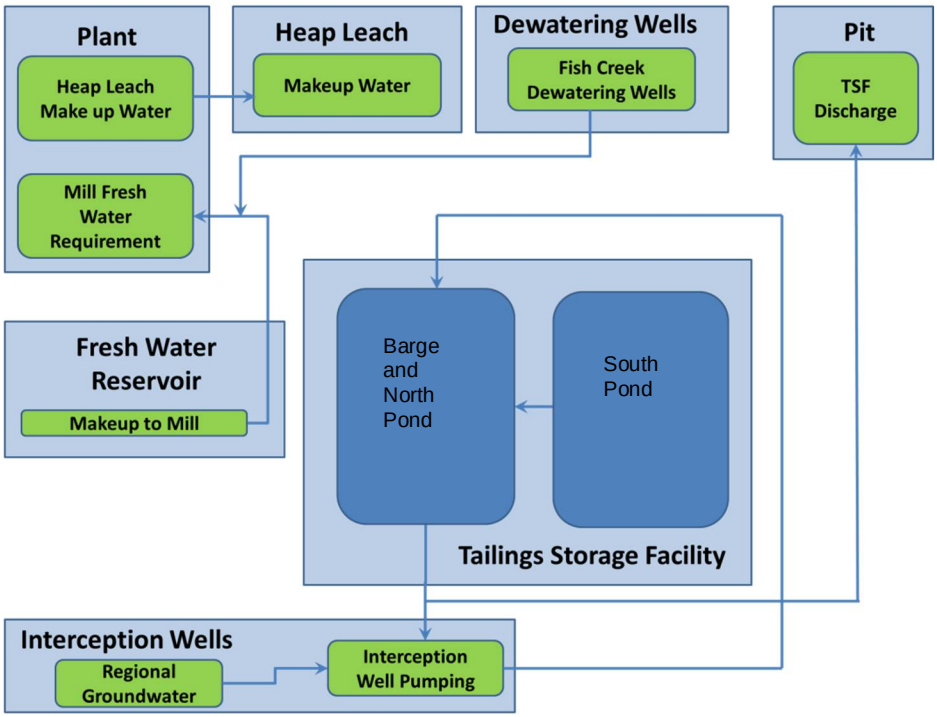
Figure 6.1 Current Operational Water Balance Schematic during mining operations prior to closure



End of Milling and Mining

Figure 6.2 illustrates the water flow onsite following the end of milling and mining as depicted in the Closure Water Balance model. With the cessation of milling, the discharge of tailings to the TSF will end. All water needed for processing gold through the Heap Leach circuit will continue to come from the Barge Pond.

Figure 6.2 . Closure Water Balance Schematic after milling and mining cessation and during economic leaching.



The only inflows into the Barge Pond will be water from the Interception System and precipitation and surrounding surface runoff. During this time, the Interception System will continue to operate and provide containment by maintaining the existing cone of depression at the toe of the facility. Therefore the TSF will continue to function as a zero-discharge facility until the heap leach meets water quality standards.

With the continued operation of the Interception System and the inflow of precipitation and surface runoff, the stage height of the TSF ponds will need to be monitored to assure that it is operating within design constraints such as freeboard, PMF, and 100 year/24 hour rain on snow event. Water will be pumped to the pit from the Barge Pond to reduce the volume and facilitate achieving water quality standards.

The TSF impoundment and associated embankment dam were designed to account for operational deposition of tailings for the life of the mine, process or operations water, extreme precipitation events, and freeboard. At the end of milling and thus the end of tailings deposition, there will be enough capacity in the TSF impoundment to account for the operational water volume of 6,600 ac-ft, 1,238 ac-ft of runoff water from the 100 year 24 hour rainfall plus snowmelt event, 308 ac-ft of heap leach in-Pond solution storage, and 716 ac-ft of additional

capacity. This volume of water would meet the maximum water surface (MWS) elevation of 1537. The elevation at which the North Pond and Barge Pond contains only the normal operating water is 1535 ft and is termed the normal water surface (NWS) elevation. The top of the impervious zone (seal zone) is 1540 ft and therefore the required 3 ft of freeboard is accounted for between the MWS and impervious zone top (Knight Piésold, 2010). The Closure Water Balance model calculates the amount of water that must be pumped to the pit in order to ensure that the NWS elevation is never exceeded. Financial Assurance pumping costs are based on these volumes.

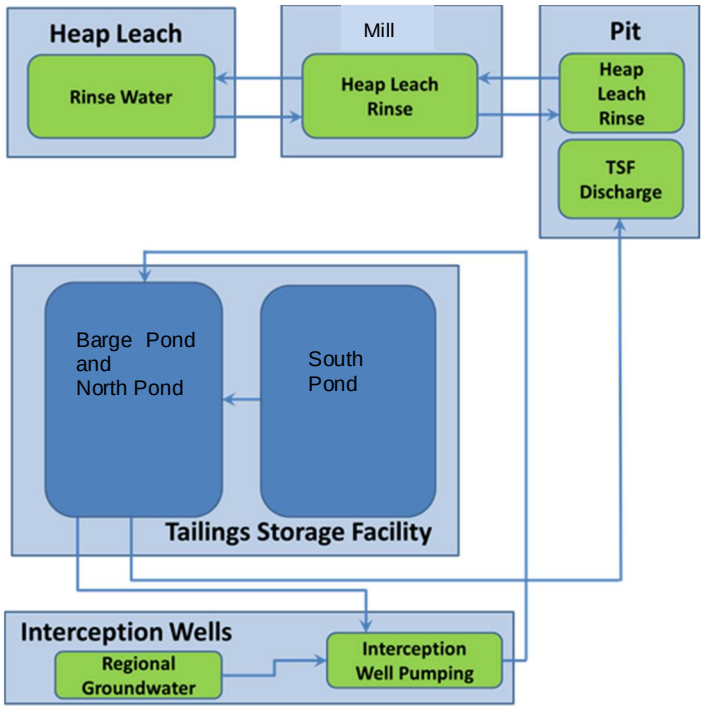
Fresh surface water runoff will be allowed to accumulate in all three Ponds within the tailings impoundment. Once the Barge Pond recovers to an elevation of approximately 1529.7 ft amsl pumping to the pit can recommence providing adequate contingency storage in the Barge Pond and North Pond until the heap leach pad has been rinsed to water quality standards.

During this time the heap leach will operate in the economic leaching phase where no additional cyanide will be applied to the heap and the solution will circulate through the CIC in order to maximize cyanide consumption and gold complexation.

Heap Leach Rinsing

The onsite flows during the rinsing stage of the heap leach are depicted in Figure 6.3. When the economic leaching phase of the heap leach is complete, rinsing of the heap leach will commence which entails the application of pit water to the ore until water quality standards are achieved. Specifically, a circuit will be formed between the heap leach and the pit via the mill allowing for the heap leach water to be initially mixed and diluted with pit water and pit water to rinse the heap leach of residual compounds.

Figure 6.3 . Closure Water Balance Schematic after milling and mining cessation and during economic leaching.



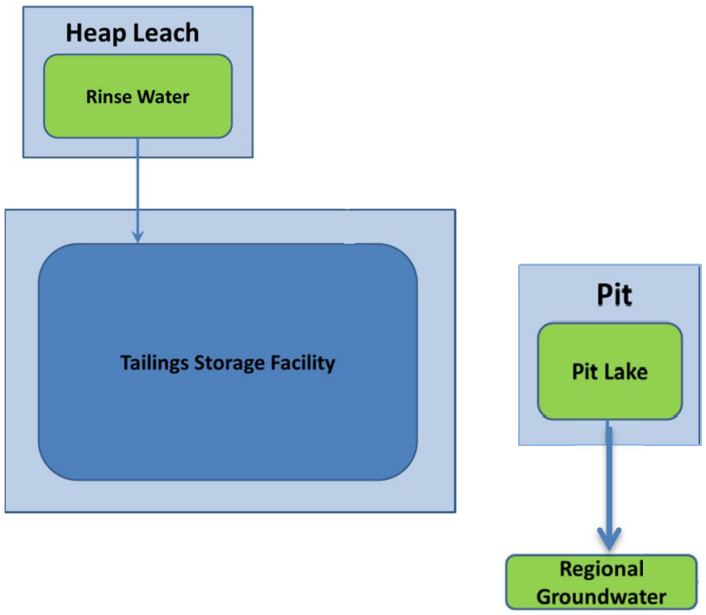
To determine the length of rinsing time required in order to meet water quality standards for CN as well as other constituents of concern, the Closure Water Balance was used to calculate mixing fractions over a number of time steps. These mixing fractions were then used in a geochemical modeling software package, PHREECQ, which applies reaction equations and rates to the constituents present in the water to determine chemical composition and therefore chemical concentration at the designated time steps. Therefore, it is expected that water quality standards can be achieved in four years. During the rinsing phase water quality samples will continue to be analyzed. If necessary a cyanide destruct process and the addition of ferrous sulfate will be employed to ensure water quality standards are met.

During the rinsing phase, seepage collection through the Interception System at the toe of the tailings dam will continue to be pumped to the Barge Pond until it can be demonstrated that water quality standards have been met. Once the water meets water quality standards, the Interception System including the interceptor wells will be decommissioned and seepage from the dam will flow to Fish Creek. Additionally to maintain permitted water elevations, water will continue to be pumped from the Barge Pond to the pit as needed. The volumes are derived from the water balance and are used to calculate FA.

Heap Leach Drain Down and Pit Lake Outflow

In Figure 6.4, the Closure Water Balance model water flow during heap leach draindown and Pit Lake outflow is depicted. The pit lake will flow through the fractured bedrock and will migrate to the groundwater. The Closure Water Balance model anticipates that heap leach water will meet water quality standards in 2028 at which time rinsing will be completed and the heap leach pad will be punctured and drainage will flow by gravity to the North Pond.

Figure 6.4 Closure Water Balance Schematic at Pit Lake Outflow which coincides with when water quality standards are met.



6.2 Tailings Storage Facility Reclamation and Closure

The tailings impoundment and associated appurtenances are permitted under Waste Management Permit 2006-DB0043 by ADEC for operation, closure (reclamation), and post-closure monitoring. Reclamation goals for the tailings impoundment are as follows:

1. Establish a mixture of aquatic, wetland, and upland habitat
2. Ensure that water quality meets applicable standards as described in Section 6.1
3. Establish a productive post-mining land use (wildlife habitat)

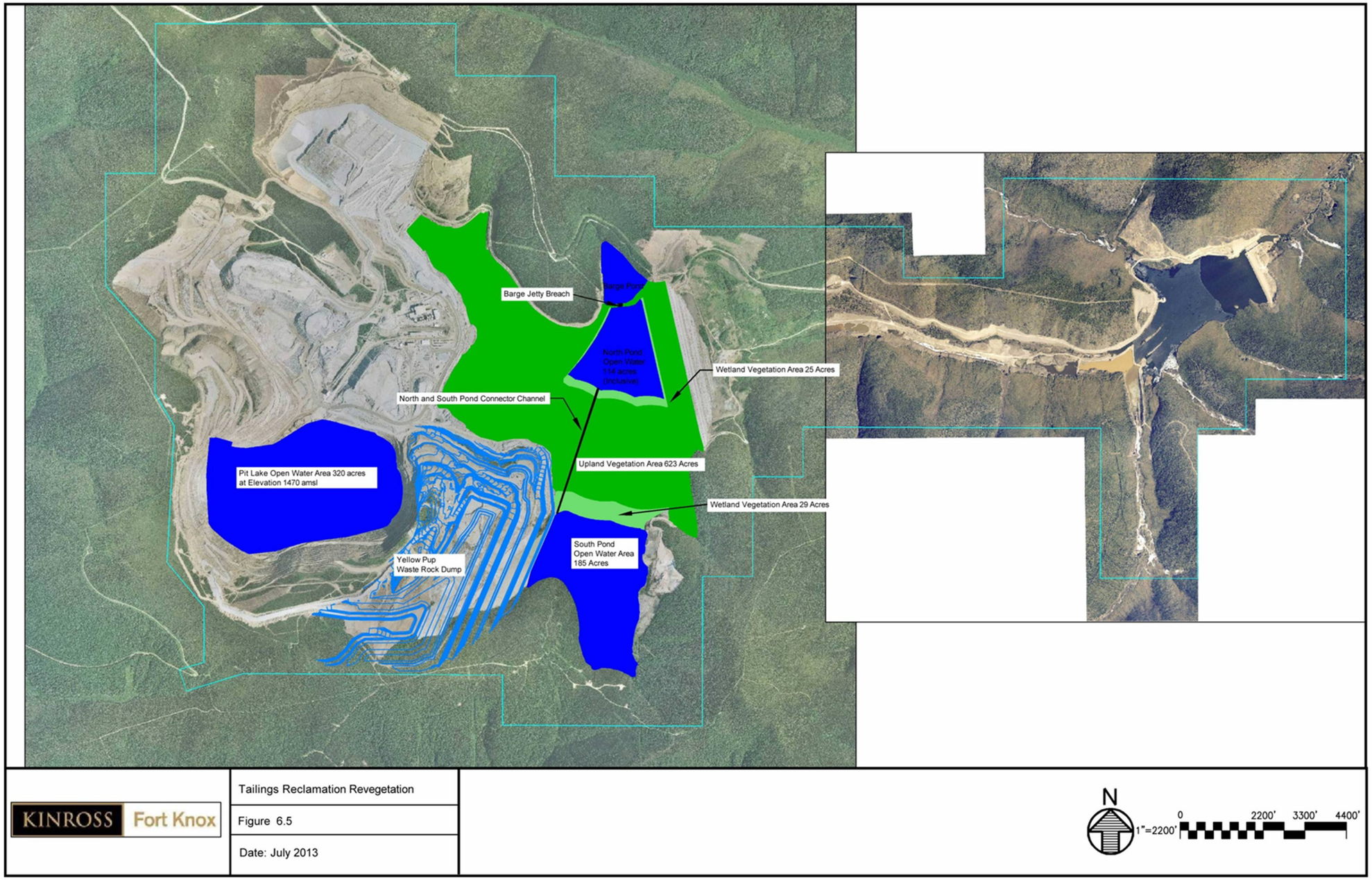
Based on the analyses presented in the report Fort Knox Mine Tailings Facility Closure Management Plan (Water Management Consultants 2005; Schlumberger Water Services, 2010), a closure plan has been developed that describes the activities that will be performed to allow final stabilization of the tailings. Closure activities will begin when milling ceases.

6.2.1 *Closure Sequence*

1. Reclamation of the tailings impoundment will be integrated with the overall mine water management strategy. Operational measures during the last two to three years of mill production will be implemented to prepare for efficient closure of the tailings.
2. During operations, tailings will be deposited from the upstream face of the tailings dam in order to create a “beach” along the dam. This will push the North Pond away from the dam, reducing seepage through the dam and enhance the long term stability of the dam.
3. During operations, use of fresh water for process make-up will be reduced or eliminated. The goal at closure is to minimize the volume of water in the Barge Pond to the operational minimum.
4. At the point in time when milling is complete, the volume of water remaining in the Barge Pond will be reduced by pumping to the pit. Pumping of the Barge Pond water will continue to maintain freeboard until the heap leach has met water quality standards. Based on the closure water balance, the volume of water required to be pumped will reduce over time, this is accounted for in the FA calculations.
5. The Barge Pond, North Pond and South Pond water quality will improve as the impoundment fills with runoff from precipitation. All the Ponds (Barge, North, and South) are expected to meet water quality standards before the heap leach meets water quality standards.
6. Based upon long-term average climate conditions, it is expected that the Barge Pond level will reach the spillway invert elevation by the end of 2031, however pumping will continue as required to maintain water levels until water quality standards have been met as discussed in item number 4.
7. The spillway will be constructed within five years after production from the pit is concluded.
8. The Barge Pond will fill to the level of the spillway invert elevation allowing water to pass through and migrate to the north wetlands complex. Seasonal water level fluctuations in the Barge and North Pond will be approximately 3 ft, and South Pond elevation is expected to be approximately 3 ft and 1 ft The source of fresh water for the North Pond and South Pond will be precipitation and runoff from areas upgradient of the tailings impoundment.

9. The surface of the tailings not permanently covered by water will be reclaimed to include upland (dry cover), and a transition zone of wetland vegetation in the zone between the areas of open water and uplands (Figure 6.5)

Figure 6.5 Tailings Reclamation Revegetation



6.2.2 *Tailings Surface*

The maximum elevation of tailings against the upstream face of the Tailings Dam is approximately 1,540 ft amsl. South of the Pearl Creek Causeway, the tailings surface grades towards the south, creating low points in the Pearl and Yellow Pup drainages.

The 2010 tailings deposition plans are being revised by Knight Piésold with the following objectives:

1. Accommodate tailing facility operations with planned construction.

2. Optimize tailing deposition and storage in the heads of the Barnes Creek and Walter Creek drainages without trapping water on the north side of the Pearl Creek Causeway.

3. Optimize tailing deposition and storage from the Pearl Creek Causeway to the south, creating the South Pond in the heads of the Pearl Creek and Yellow Pup Creek drainages.

4. Deposit tailings from the crest of the Tailings Dam embankment to minimize seepage and buttress the upstream face for slope stability. Based on current projections, the final tailing surface will have elevations ranging from about 1,540 ft amsl to a low point about 1,514 ft amsl. The beach on the upstream face of the Tailings Dam will be approximately 4,100 feet long and 800 feet wide. The beach effectively isolates the free water surface from the crest of the seal zone thus decreasing the seepage potential through the toe of the dam and reduces the pressure head in the filter and seal zones.

A cross-connection channel will be constructed between the North and South Ponds. The channel is a trapezoidal cross-section the bottom width is 10 ft, side slopes are 4H: 1V, and the length is approximately 7,000 ft. The depth of the channel will range from 5 to 15 feet depending on the depth of tailings, the bottom elevation will remain constant at 1530 (i.e. longitudinal slope = 0%). The channel will be constructed by excavating tailings then lined with waste rock. The south end of the channel will be located near the interface of the South Pond and Yellow Pup waste rock dump, it will cut through the rockfill structure of the Pearl Creek Causeway continuing to the North Pond. The channel will maintain the South Pond at elevation 1530 or below. During the design storm event some of the storm surge in the North Pond will flow and accumulate in the South Pond since the North Pond will peak sooner and higher than the South Pond according to hydrologic simulations. Peak flows reporting to the South Pond contributed to filling the South Pond but did not overtop the causeway to the north pool and did not contribute to the peak flow reporting to the tailings dam spillway (Schlumberger Water Services, 2011).

The North Pond and Barge Pond water elevation will fluctuate seasonally approximately 3 feet, between 1527 ft and 1530 feet with a corresponding surface area of 93 acres to 114 acres. The South Pond elevation will fluctuate seasonally between 1529 ft. and 1530 feet. Water stored in the South Pond will be allowed to drain down to elevation 1530 ft amsl by the cross connection channel.

Upland vegetation will be established along the margins of the facility where tailings have dewatered sufficiently to allow access. Reclamation of upland areas will utilize the general reclamation techniques described in Section 4, with the addition of an average of 2 feet of waste rock overlaying the tailings with exception to the Pearl Creek Causeway. The Pearl Creek Causeway will be ripped prior to growth media placement. Growth media will be placed over the

top of the waste rock cover (including Pearl Creek Causeway) to encourage vegetative growth. If additional growth media is required to establish a vegetative cover, the remaining growth media stockpiles will be utilized. In the event all the growth media stockpiles are depleted select areas directly above the final tailings will be partially stripped of organics the resulting growth media will be spread over the tailings surface. This reclamation method will provide suitable growth media, woody debris on the tailings surface, and open the borrow areas to the establishment of early succession vegetation (grasses and willows) that has a higher habitat value for the larger terrestrial species present at the site. The open water areas are a function of final topography dictated by operational parameters during milling operations. The locations of the ponds away from the upstream dam face will reduce seepage through the dam. Wetland vegetation will form in the transition zones between the ponds and upland vegetation where water will be present for the majority of the year (Schlumberger Water Services 2011). Figure 6.5 illustrates the projected distribution of open water, wetland and upland habitat.

6.2.3 *Tailings Spillway*

The spillway design is intended to provide a concept level design and the basis for financial assurance calculations. To reiterate, at no time will water be allowed to enter Fish Creek until water quality standards have been met. This design will be re-evaluated at closure and a detailed design will be developed at that time to account for closure conditions. Possible design modifications due to conditions existing at closure may include revising spillway inlet elevations, relocating channels, and changing size and locations of settling basins. The concept design can be found in Appendix E.

The TSF spillway and spillway discharge channels were designed to Standard 1 as defined by the Inflow Design Floods for Dams and Reservoirs, "…structural designs will be such that the dam will safely pass an IDF computed from probable PMP occurring over the watershed above the dam site" (USACE,2001). Schlumberger Water Services developed flood hydrographs for the Probable Maximum Precipitation (PMP) then peaked the PMP by 25% to arrive at the Inflow Design Flood (IDF), i.e. the design storm event. The design storm event was modeled using HEC-HMS software vs. 3.4, in accordance with Guidelines for Cooperation with the Alaska Dam Safety Program Revision 1, 2005.

The design of spillway inlet elevation incorporated several levels of conservativeness to maintain minimum freeboard allowances. The minimum freeboard allowance includes 1 foot below the seal zone to account for spillway ice blockage and spring runoff, and 5 feet above the seal zone to account for wind generated wave runup. The peak flow elevation from the design storm event does not exceed six feet in flow depth over the spillway.

The spillway is designed to assure the safety of the dam in the closed configuration and includes the following objectives:.

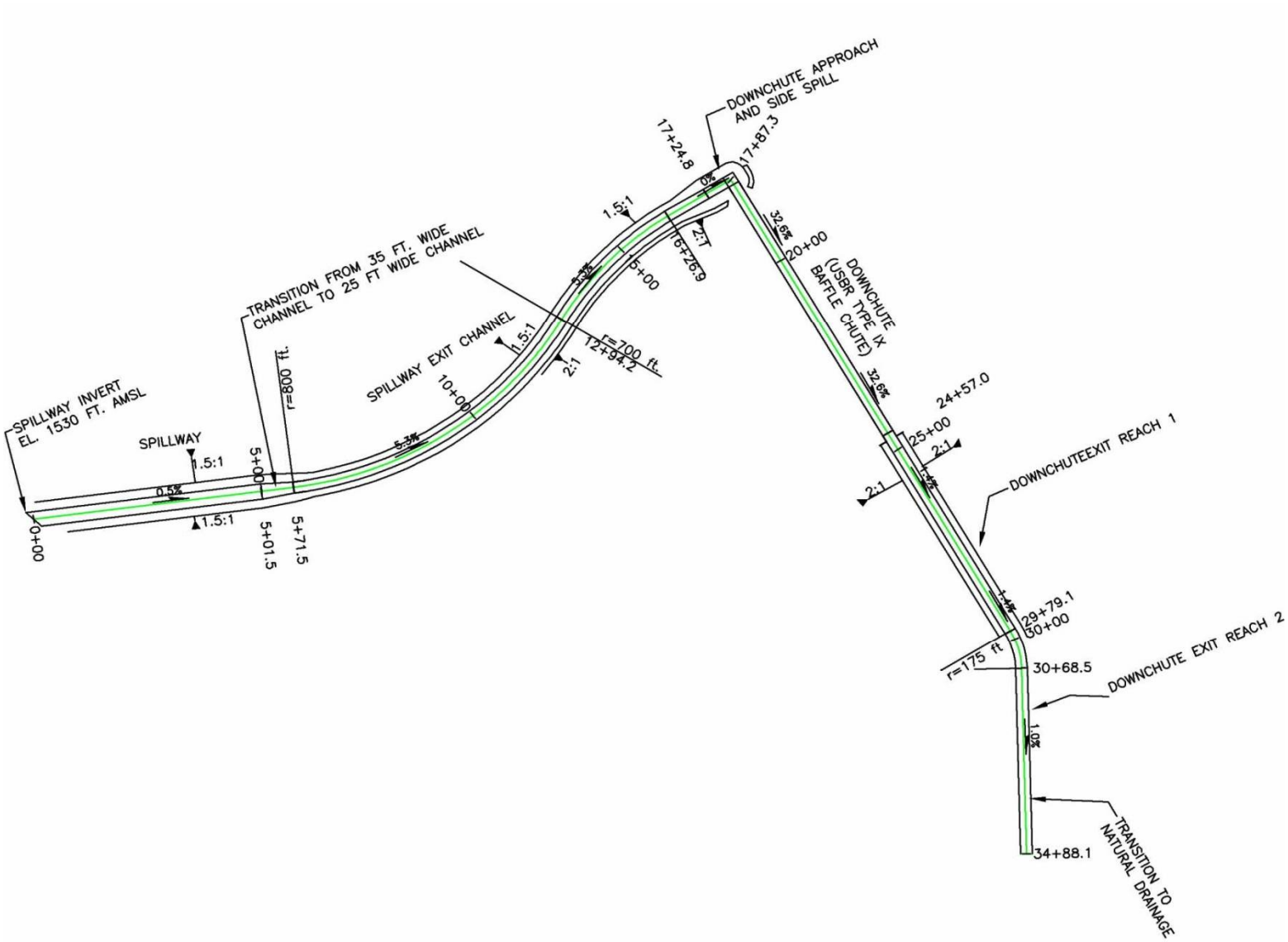
1. Pass the design storm below the dam seal zone with adequate freeboard.
2. Prevent erosion of the spillway and associated conveyance channels while routing the design storm over the TSF dam embankment and abutments.
3. Minimize the volume of water retained behind the dam during normal condition.
4. Reduce construction costs associated with earthworks and erosion protection in the spillway and outlet channels.
5. Provide a spillway structure that will not require frequent and intensive maintenance.

6. Maximize the surface area of the North and South Pond to protect and stabilize the surface of tailings.
7. Maximize the North and South Pond perimeters to provide areas suitable for wetland development.

The spillway system segments are listed below, Figure 6.6 illustrates the different segments.

1. A 70 ft bottom-width trapezoidal weir shaped channel will be constructed through the barge jetty. The channel inlet elevation is 1528 and level through the jetty. The channel connects the Barge Pond and North Pond. The storm event water volume will flow unimpeded to the tailings dam spillway.
2. The tailings dam spillway section is positioned behind the barge jetty adjacent and perpendicular to the north abutment of the tailings dam. The 35 foot bottom-width trapezoidal weir spillway will be constructed in competent native bedrock with an inlet elevation of 1530. The inlet elevation is set so the storm event flow depth over the spillway does not exceed six feet and to minimize the pool volume retained behind the dam during normal conditions.
3. The spillway exit channel routs the flow from the spillway easterly approximately 1,150 feet at a 5.3 percent slope directing flow away from tailings dam embankment.
4. The channel then enters the downchute approach and side spill turning 90 degrees southward to the baffle chute. The downchute approach is a small section of concrete-lined channel approximately 170 feet in length used to return the design flow to appropriate entrance velocity for baffle chute hydraulics.
5. The USBR-type baffle chute drop section consists of a concrete-lined chute studded with baffle blocks limiting the storm event flow velocities to 4 ft/s down the 660 foot long chute sloped at 32 percent.
6. The flow then enters downchute exit reach 1, a 500 foot channel, sloped at 1.4 percent. After exit reach 1 flow enters exit reach 2 a 500 foot channel with a 1 percent slope which daylights in an existing Fish Creek drainage tributary. Both channel sections are riprap lined.
7. The flow follows the natural drainage until it encounters an outlet downchute and an energy dissipation basin before entering the north wetland system.
8. The storm flows discharging from the spillway will be intercepted upstream of the wetlands located in the Fish Creek drainage and conveyed around them via conveyance channels and settling basins as described in Section 3.3

Figure 6.6 Spillway Design



6.2.4 *Tailings Embankment*

The downstream face of the tailings embankment is constructed of run of mine ore that is durable rock, resilient to erosion. The downstream face of the tailings embankment will not be capped with growth media. Vegetation that grows on the embankment will be removed every five years and is included in the FA calculations.

6.3 Seepage Interception System

The water quality in the seepage interception system reflects both natural groundwater and tailings seepage quality. Water quality modeling indicates that development of a tailings beach, as described in Section 6.2.2, will reduce the rate of seepage from the tailings and consequently improve seepage water quality in the short term. Seepage water quality is predicted to further improve in the initial period following cessation of operations. The seepage interception system will continue to operate, and the seepage water will be pumped to the Barge Pond until water quality standards have been met.

If during the initial closure period water quality trends indicate discontinuation of seepage collection could affect designated uses in the water supply reservoir, Passive treatment alternatives will be evaluated.

Closure of the seepage collection system will include:

1. Discontinuation of pumping from the seepage collection gallery and wells.
2. Removal of pumps, piping, and surface structures for salvage or disposal.
3. Plugging and decommission of the seepage collection wells.
4. Puncture the sump liner at frequencies and locations that will accommodate the maximum discharge at closure and long term seepage estimates.

6.4 Pit Lake

The pit is initially creating a hydraulic sink (Schlumberger Water Services, 2011). The pit will fill up relatively quickly at the beginning of closure due to the volume of water pumped from the Barge Pond and rinse water from the heap leach pad. When the water in the pit has reached the elevation of 1470, the level of tailings will be higher than the pit lake water elevation. Once the pit lake has reached the final elevation of 1470 the water will flow through the fractured bedrock and under the TSF.

Treatment alternatives have been evaluated for implementation during the initial years of pit filling to aid in controlling potentially elevated metals concentrations in the pit lake resulting from tailings decant/seepage water addition. Treating the pit lake with 40 tons of ferrous sulfate results in the formation of ferric hydroxide (ferrihydrite) which co-precipitates cyanide, arsenic, antimony and other metals at circum-neutral pH values (Schlumberger Water Services, 2012). Selective adsorption of metals to this secondary mineral phase removes these constituents from the water column thereby reducing concentrations in the pit lake. This treatment alternative will be implemented while water is being pumped from the Barge Pond and heap leach, when metal concentrations are at their highest. The treatment will be injected directly to the lines carrying the water to the pit. All constituents in the final pit lake are projected to be below their respective standards with treatment (Schlumberger Water Services, 2013).

Table 6.2 provides a summary of the expected pit lake quality at the time of closure

Table 6-2 Predicted pit lake quality at full recovery

Parameter	Water Quality Standard (mg/L)	Model Predicted (2012) Pit lake concentration (mg/L)
pH, std units	6.5 - 8.5	7.6
Alkalinity, as CaCO,	NS	75
Chloride	NS	7.3
Fluoride	NS	0.272
Nitrate, as N	10	3.6
Nitrite, as N	1	<0.01
Ammonia	2.43-6.67	<0.01
Sulfate, as SO42-	250	60
WAD-cyanide	0.0052	0.0049
Antimony	0.006	0.0058
Arsenic	0.01	0.0088
Barium	2	0.0067
Cadmium	0.0003	<0.0001
Calcium	NS	26
Chromium	0.01	<0.006
Copper	0.009	<0.003
Iron	1	<0.06
Lead	0.0025	<0.0001
Magnesium	NS	3.5
Manganese	0.05	0.034
Mercury	0.00077	<0.0002
Phosphorus	NS	<0.05
Potassium	NS	2.3
Selenium	0.005	0.0015
Silver	0.003	<0.001
Sodium	NS	19
Zinc	0.12	0.009
Hardness (Ca, Mg)	NS	80

A pit lake water quality evaluation has been submitted to state regulatory agencies annually from 2006 through 2012. Similar pit lake evaluations are anticipated to be conducted once every year until final pit lake quality meets compliance standards to:

1. Provide a summary of site conditions relevant to short- and long-term pit lake quality using updated information (i.e. water quality data, mine plans, etc.).
2. Illustrate the data and methodology used to evaluate pit lake quality.
3. Evaluate the sensitivity of the pit lake quality evaluations in terms of waters projected to be pumped to the pit in the near future and pit wall runoff water quality.

4. Demonstrate the viability of the current reclamation approach from a water quality perspective.
5. Identify an appropriate treatment and/or management alternative that can be implemented to manage water quality, if required.

6.5 Heap Leach Closure

The proposed method of closure for the Fort Knox heap leach is based on site-specific conditions, facility design, currently available test work, and the technical analyses completed as part of closure planning. The supporting data and concepts for the closure of the heap leach is provided in *Fort Knox Mine Closure Management Plan for Proposed Heap Leach Facility* (Water Management Consultants, 2006). Key aspects of the site and operation that are considered for closure include the following:

1. The climate at the site is characterized by moderate precipitation, moderate evaporation, and cold temperatures. As a result, the long-term drainage from the heap leach after closure is predicted to be minimal.
2. Laboratory test work shows that cyanide concentrations will decrease rapidly through recirculation with freshwater if reagents are not added to maintain process-level concentrations.
3. The tailings impoundment is located directly down gradient from the heap leach and will be used as an integral part of the long-term solution management scheme.
4. To facilitate closure management, solution from the heap leach will be combined with pit lake water leaching has ended.
5. The facility will be regraded to an overall 3:1 slope and covered with growth media. The regrading design will include erosion control measures as necessary to avoid loss of growth media.
6. The underdrain water quality will be monitored by 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. In addition, monitoring will continue in the PCMS and LCRS systems during early stages of closure. Post-closure discharge from the drainage system will be monitored.

6.5.1 *Heap Leach Closure Procedures and Schedule*

The closure schedule will include the following components:

1. Residual leaching until uneconomic.
2. Solution recirculation/rinsing to remove cyanide and achieve water quality standards.
3. Pump draindown from rinsing to the pit.
4. Once standards are achieved, puncture the liner of in-heap storage pond and allow water to flow to the tailings impoundment.
5. Remove of structure associated with pumping operations.
6. Regrade the pad, place growth media, and scarify and seed.

6.5.2 *Residual Leaching*

Following completion of mining in the pit and final placement of ore on the pad, it is anticipated that there will be 2 years of leaching with cyanide or until it is no longer economically feasible. Gold recovery is projected to continue for approximately 2 years after the last application of cyanide. The criteria for advancing to the rinsing phase will be based on the economics of gold recovery. Heap leach facilities often continue to economically recover gold for a number of years after the addition of cyanide is discontinued. During this period, barren solution will be recirculated to the heap while processing continues to recover gold held in solution inventory. The exact duration of residual leaching will be dependent on continuing gold recovery.

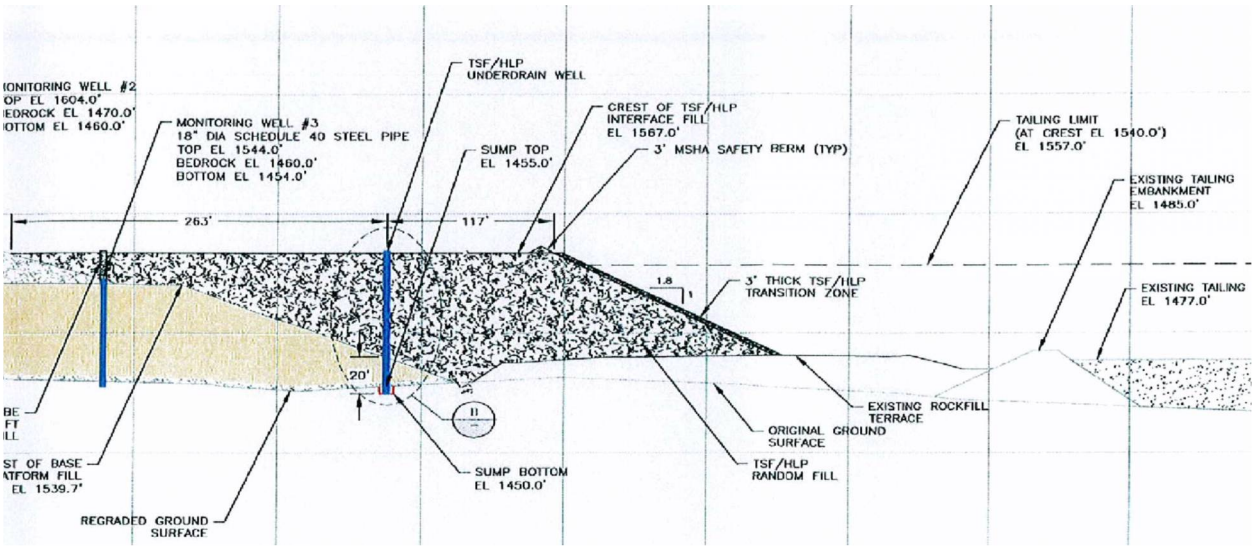
6.5.3 *Solution Recirculation and Rinsing*

Since there is anticipated to be an extended period of residual leaching without the addition of cyanide, rinsing will likely be of short duration. The rinsing rate will be 16,000 gpm. The actual duration of this step will be controlled by the time required for the water quality to achieve levels suitable for discharge to the tailings impoundment. Rinsing of the heap leach will entail applying water pumped from the pit to the heap leach via the mill then pumping the rinse water collected in the in-heap storage pond to the pit via the mill. This phase of rinsing is projected to have duration of four years.

6.5.4 *Release of Draindown to the Tailings Impoundment*

After Water Quality Standards have been met and following approval by ADEC, preparation for releasing the heap leach water to the tailings impoundment will begin. The pit to the heap leach pumping circuit will be will be terminated, however the heap leach to the pit pumping circuit will continue until he in-heap storage pond is pumped down to a level that is operationally practical. The water remaining in the in-heap storage impoundment will be released by penetrating the primary and secondary liners of the LCRS and the prepared sub-base utilizing a drilling rig. A minimum of three holes will be drilled to allow the water to drain by gravity through the ground water underdrain system that interfaces with the tailings impoundment. The permeability of the tailings is less than the underdrain system so the draindown water may pool on the downstream side of the heap leach dam for a short period of time while the water drains through the tailings and migrates to the North Pond. The design elevation of the tailings at the interface is 1557, ten feet below the crest of the TSF/Heap Leach interface fill, see Figure 6.7 below.

Figure 6.7 TSF/Heap Leach Interface



6.5.5 *Release of Minor Long-term Seepage to the Tailings Impoundment*

Long-term seepage from the heap leach will flow by gravity to the tailings impoundment and be managed according to the closure plan for that facility. The surface of the tailings impoundment will be a combination of impounded water, wetland, and upland vegetation (Water Management Consultants 2006; Schlumberger Water Services, 2010). Discharge from the heap leach pad will mix with the water impounded on the surface of the tailings impoundment after water quality standards have been met.

6.5.6 *Regrading and Cover*

Following completion of rinsing, the heap will be regraded to an overall 3H:1V slope (accounted for in the FA calculation). Approximately twelve inches of growth media will be placed unless otherwise approved by ADNR. The growth media will be sourced from stockpiles created during facility construction. The growth media will be scarified and seeded subsequent to placement. An erosion control method is to scarify and seed the growth media, which slows down water migration and allows the water to permeate the ground aiding the success of revegetation. The financial assurance accounts for twelve inches of growth media.

6.5.7 *Heap Leach Road Tunnel*

Following regrading and growth media placement of the Heap Leach, reclamation of the Heap Leach Road tunnel will begin. The material overlaying the multi-plate tunnel will be excavated to allow access to disassemble the multi-plate tunnel. Excavated material will be graded into the surrounding area and access road. The multi-plate tunnel will be disassembled and removed off site. Growth media placement in this area will occur at the same time that the remainder of the Heap Leach is reclaimed. The growth media will be sourced from stockpiles created during facility construction. The growth media will be ripped, seeded and fertilized subsequent to placement.

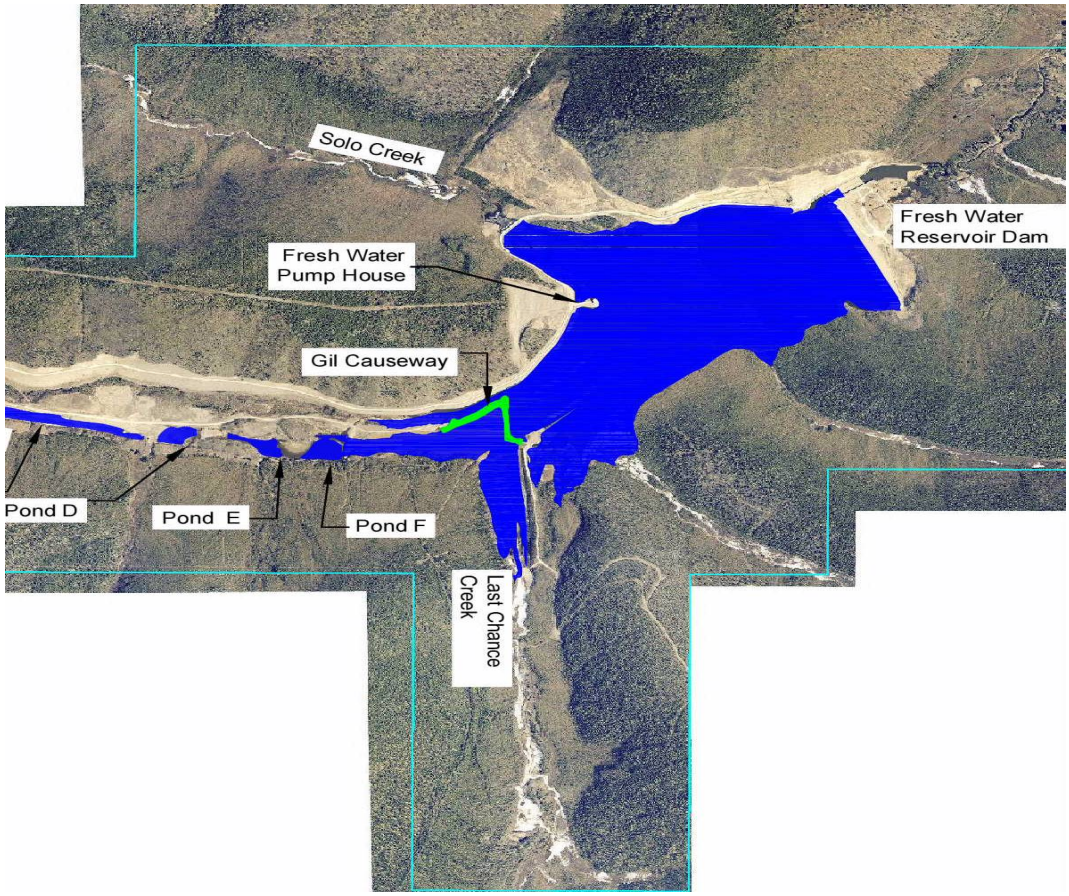
6.6 Water Supply Reservoir, Solo Creek Causeway and Gil Causeway

FGMI will leave the water supply reservoir and Solo Creek causeway in place to allow for the long-term use (and maintenance) as a recreational lake and wetland area Following reclamation and closure of the project process components, the dam, access road and Solo Creek Causeway will be maintained according to the terms defined in the Agreement for Funding Post-Reclamation Obligations between FGMI, ADNR and ADF&G (Appendix B).

The Gil Causeway (Figure 6.8) will be breached to allow the free movement of fish from the main lake body into upper reaches of the lake and Last Chance Creek. The Gil Causeway Reclamation Plan (Appendix D) was submitted to ADF&G, DIVISION OF HABITAT on March 29, 2001. It describes the removal of the existing four culverts along the Gill Causeway to restore the original Fish Creek channel as nearly as can be replicated while working below the level of the water in the reservoir. Material removed will be placed along remaining portions of the causeway to create additional shoreline, which will be contoured, ripped and seeded if required. The remaining road surface and safety berms will be graded and revegetated.

The lake will not be available for public use until final reclamation and a period of post-closure monitoring (approximately ten years) is complete and the area is transferred to the State.

Figure 6.8 Gil Causeway

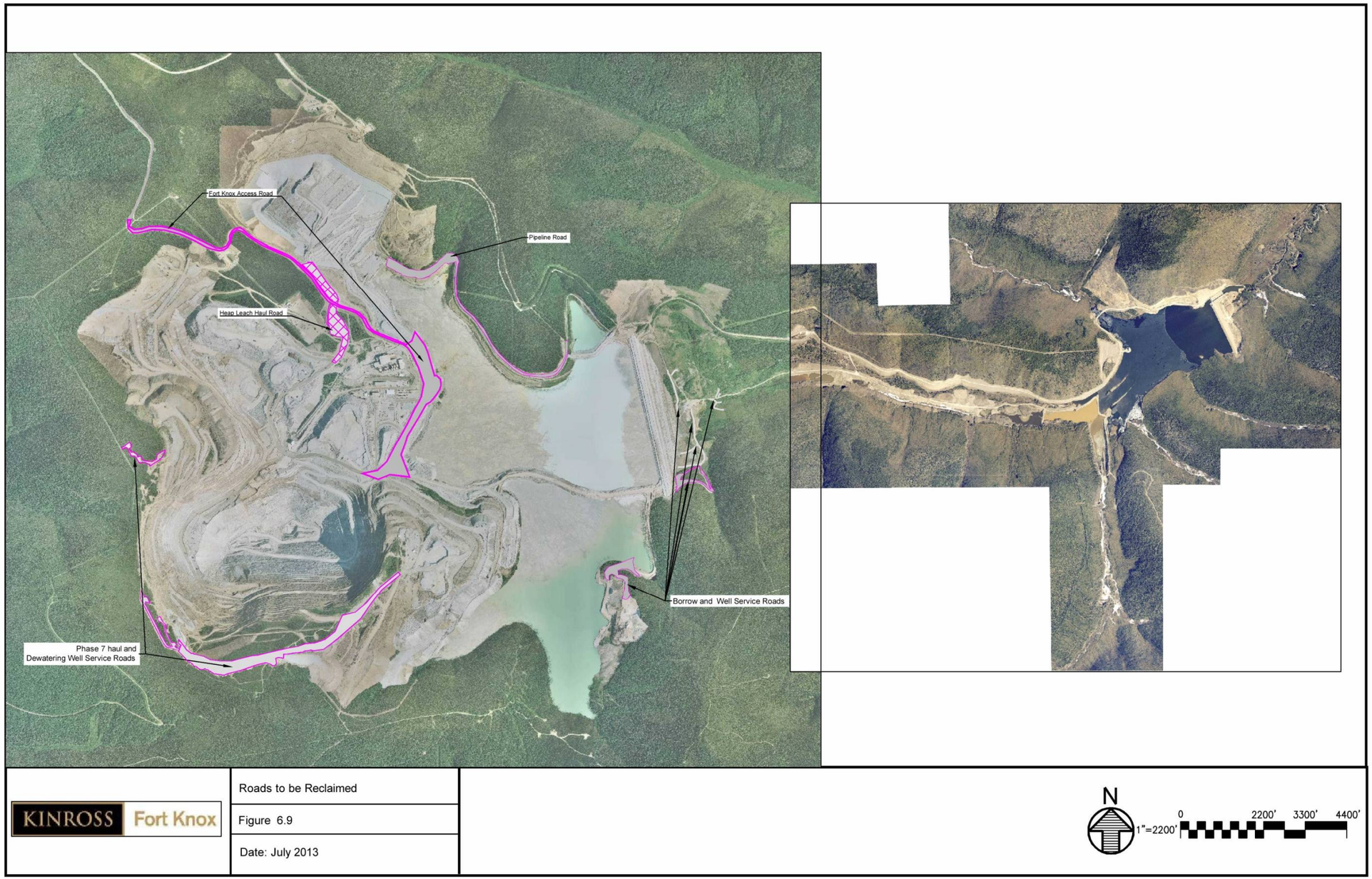


6.7 Roads

The roads to be reclaimed will be determined by FGMI and ADNR. For purpose of this reclamation plan, FGMI has assumed the following:

1. Access to the mine pit and mill areas will be provided via service roads. These roads will consist of the Fort Knox access road and a service road (Mill-Pit Service Road) from the mill complex to the pit. Access to the developed wetlands and water supply reservoir will be available using the Fish Creek Road and Centerline Service Road. A service road linking various points within the site will be necessary to provide access for maintenance and long-term monitoring. These permanent roads and access roads are illustrated in Figure 7.1 along with post-closure sample locations.
2. Roads planed for reclamation are identified in Figure 6.9. These sections of roads were not reclaimed with other areas; a comparison can be made with Figure 4.1. The drawing provided in Appendix F provides the details used in the cost calculations. Roads will be individually analyzed by ADNR and FGMI to determine which will remain permanently.
3. Reclamation procedures will be similar for all types of roads that are to be reclaimed. Culverts will be removed; natural drainage areas restored or stabilized and roadbeds will be graded where necessary to provide adequate drainage. Following grading, roadbeds will be scarified/ripped and revegetated. If determined necessary for successful revegetation, growth media will be placed. Check dams to manage surface runoff and control erosion, and berms to restrict human access will be incorporated where necessary.
4. Fish Creek Road, RST 650 Gilmore Trail-Fairbanks Creek Connector Trail, and RST 644 Cleary Summit-Gilmore Dome Trail will remain after closure. The RST road configuration is an ongoing effort with ADNR easement section.
5. Spur roads and locking gates off Fish Creek Road will be installed. Gates that are currently used around the mine site will be removed and relocated for this purpose. Long term maintenance of the spur roads is included in the financial assurance calculation.

Figure 6.9 Roads to be Reclaimed



6.8 Open Pit / Melba Monte Cristo Causeway

During active mining, reclamation activity in and around the open pit will be limited to controlling erosion on the haul roads. After pit dewatering ceases, the pit will fill with water. The ultimate water surface elevation in the pit will be approximately 1470 feet amsl and will cover approximately 320 acres.

The Melba/Monte Cristo Causeway is constructed of schist and granite bedrock mined from the open pit at Fort Knox. This material, as tested by Knight Piésold during design of the tailings impoundment, has a coefficient of permeability of 560 feet/day (2×10^{-1} cm/sec). Due to the permeable nature of the material in the causeway, any water flowing over the crest of the pit at the original ground surface will continue to flow through the causeway and report to the TSF. Since the flow will be subsurface and along the ancestral drainage which reports to the TSF, there will not be a need to establish an outflow channel.

6.9 Waste Rock Dumps

Upon cessation of mining at Fort Knox, the waste rock dumps will contain approximately 440 million tons of waste rock. Figure 1.4 provided at the beginning of the document, illustrates the location of the Barnes Creek and Yellow Pup waste rock dumps. The area calculated for financial assurance is based on current life of mine plans. The SRCE model estimates the waste rock dump is 893 acres (surface area) requiring reclamation. It should be noted Fish Creek WRD and a portion of Barnes Creek WRD have been repurposed as low grade stockpiles, which is being loaded on the heap leach pad. Reclamation of waste rock dumps will be initiated once that they are no longer required for waste rock disposal. FGMI will concurrently reclaim inactive dumps that will not be subject to future disturbance. Based on the current mining schedule, concurrent reclamation of waste rock dumps is scheduled to begin in 2021.

Reclamation of the waste rock dumps will entail recontouring and growth media placement. The crests of the waste rock dumps will be rounded with material pushed outward to establish a slope of approximately 2.5H:1V or flatter (FA calculations uses a final slope of 3H:1V). Large boulders that are uncovered during sloping may be left on the surface to provide topographic diversity, microhabitats for wildlife and vegetation, and to break the linear appearance of the final slope. Growth media will be placed at a depth that will promote successful revegetation. Successful revegetation is verifying that there is a 70% cover three years after the last application of seed and fertilize.

When final sloping, contouring, and growth media placement (if required) have been completed, waste rock dumps will be ripped along the contour. Contour ripping will reduce the erosion potential by reducing smooth slope length with the series of furrows created that will also increase infiltration. Ripping on the contour will provide micro-habitats for increased moisture retention and seed germination. Brush berms and/or sedimentation berms will be constructed at the toe of dumps where feasible.

Waste rock dumps will be revegetated following completion of earthwork. Due to the rocky, irregular nature of the final slopes, broadcast-seeding methods will be utilized. Seed and fertilizer will be applied as discussed in Section 5.2.

6.10 Building and Equipment Sites

Buildings remaining at Fort Knox when the mine ceases production will include the mill building, portable office buildings, truck shop, warehouse, and other buildings as listed in Table 6.3. As facility components of the site are decommissioned, materials, equipment, and some buildings

will be removed. Currently, the buildings planned for removal include the tailings barge, tailings seepage building, primary crusher, belt conveyor / drive tower, bulk fuel, and the water reclaim freshwater pump house and heap leach structures all of which are accounted for in the FA estimate. The majority of the buildings and structures are located within FGMI surface ownership boundaries (Figure 6.10) Equipment, and piping not needed for the reclamation and monitoring process will be utilized at another mining site, sold, salvaged or disposed in an approved manner. Past experience indicates that most equipment will be either utilized at other facilities or sold. The remaining buildings will be left in place and put to alternate uses that have yet to be determined.

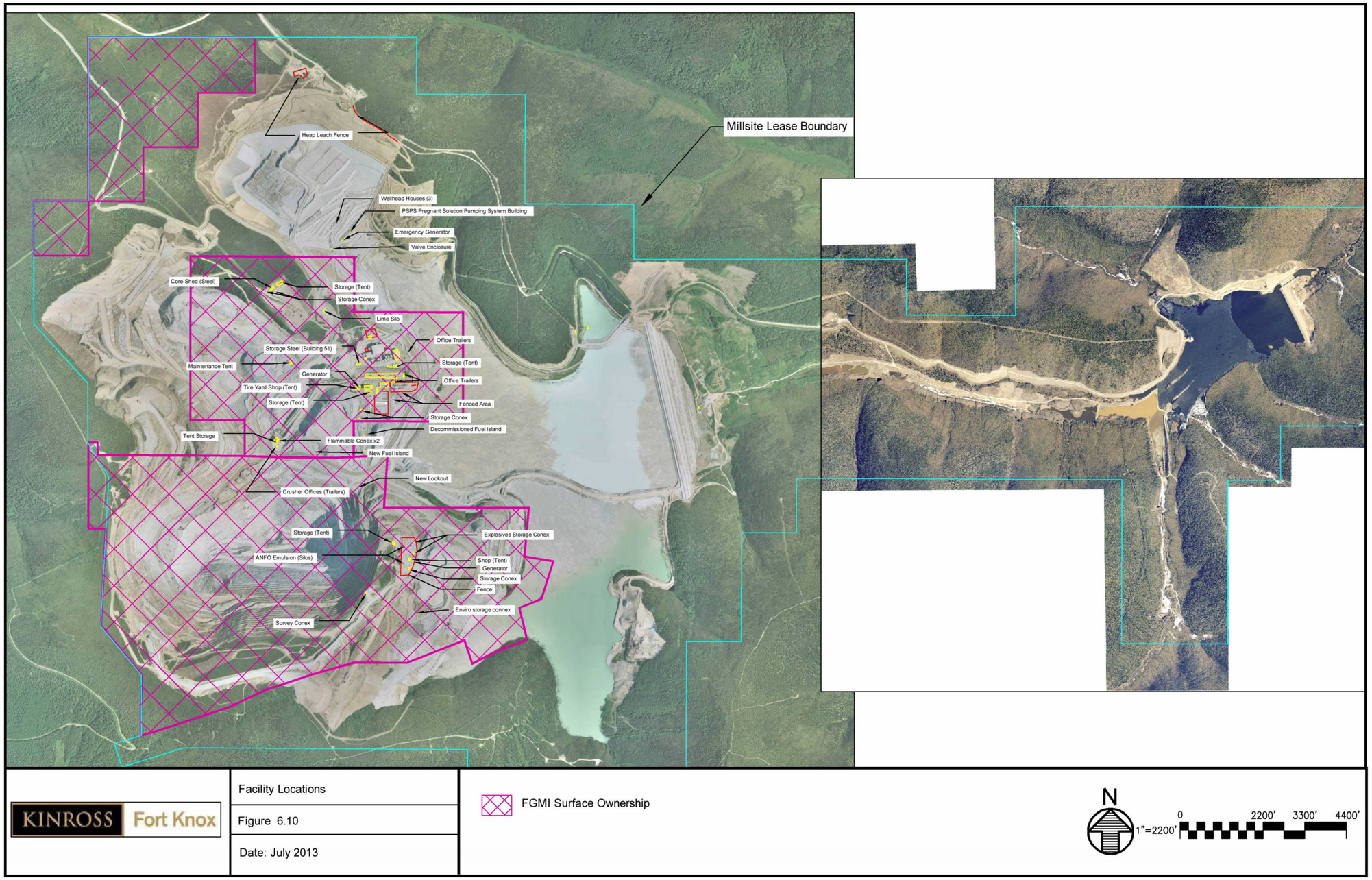
Table 6-3 List of Fort Knox buildings (or building sites) at completion of mining

Building	Area (ft^2)
Mill Complex	245,865
Administration Office	16,500
Warehouse	26,800
Truck Shop	26,800
Cold storage building	20,430
Building 51	4,230
Seepage Reclaim*	1,230
TSF Barge*	1,020
Fresh Water Pump House*	930
Core Shed	4,075
Emergency Generators	6,525
Tent Structures	34,570
ALPM Shop	15,425
Total	**404,400**

*Buildings to be removed

Reclamation of building and equipment sites outside FGMI surface ownership areas will follow procedures as previously outlined. Sites will be graded for proper drainage, ripped and scarified, and revegetated. Reclamation of the building and equipment sites will include placement of growth media where necessary to support vegetation and revegetation. Sites will be revegetated following procedures previously outlined.

Figure 6.10 Surface Ownership



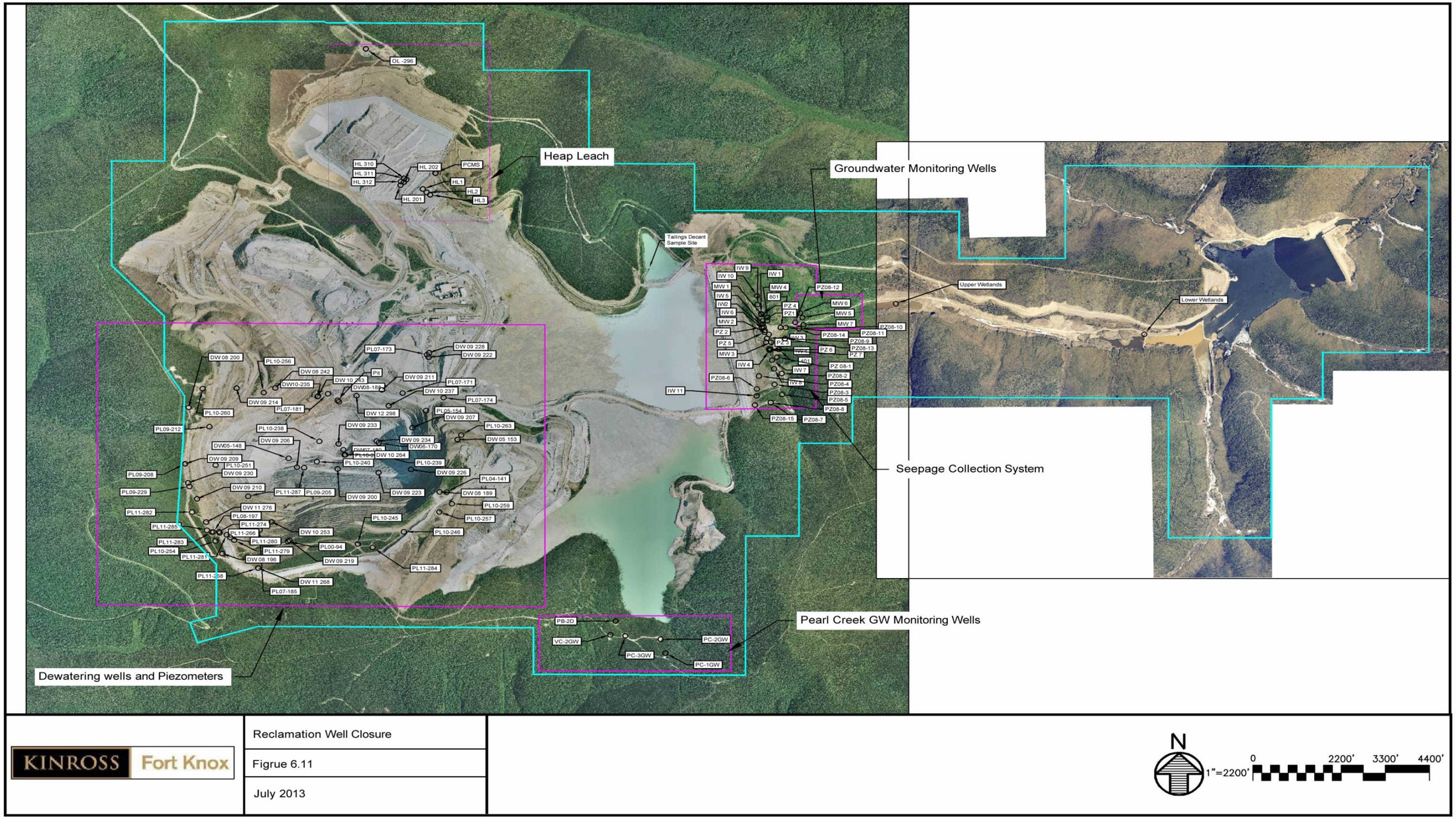
6.11 Wells and Well Closure

Because of the need for constant dewatering of groundwater from the pit during operation, several wells have been drilled at Fort Knox. All wells existing at the time of closure will be plugged and decommissioned when no longer required. Figure 6.11 shows current locations of existing wells and piezometers. Well decommissioning will be conducted according to ADEC regulations (18 AAC 80.015) in effect for all wells at the time of decommissioning.

Decommissioning procedures will include:

1. Removal of pumps and piping
2. Plugging of the well with an approved sealing material at total depth
3. Removal of the collar
4. Minor grading around the well site
5. Revegetation

Figure 6.11 Wells Locations



6.12 Miscellaneous Sites

Fence Removal

The mill, MEM shop, explosives area and heap leach areas are fenced with approximately 2,500 feet of 8-foot high chain-link. The fence around the heap leach is the only fencing that is accounted for the FA calculation due to its location outside FGMI's surface ownership boundary The 2,500 feet of fencing will be removed and salvaged, buried in the permitted landfill or buried in an approved landfill.

Power Distribution

One primary substation and two secondary substations service Fort Knox from the substations there are numerous transformers that distribute power further. When electrical power requirements are no longer necessary, the overhead power lines and transformers located outside FGMI surface ownership boundary will be removed from the site. The transformers that will be removed includes one from each of the following sites, heap leach, freshwater reservoir, seepage reclaim building and Barge Pond. All overhead power lines located on the Millsite Lease will be removed unless approved to remain by ADNR and agreed to by FGMI. All materials removed will be salvaged or disposed in an approved facility.

Material Borrow Areas

During initial site construction and periodic raises to the tailings dam, several material borrow areas were used to provide the necessary construction material (road base, riprap, seal, and filter materials). All borrow areas disturbed will be reclaimed with the exception of the following:

1. Borrow Area #8 is located adjacent to the north side of the water reservoir spillway. This rock-terraced area provides potential nesting habitat for swallows and raptors.
2. Borrow Area #11, located directly west of the fresh water pump station, has been designated as a post-closure parking area for day users expected at the water supply reservoir.

7 MONITORING

The Fort Knox Mine Monitoring Plan (FGMI Inc., 2012) gives a detailed description of the monitoring requirements for the site, including the TSF, the heap leach, the pit lake, the stream corridor/wetlands and the water supply reservoir. The monitoring plan includes:

1. Water quality sampling procedures and analytical profiles and sampling schedules.
2. Characterization of acid rock drainage and processed tailings.
3. Monitoring of inert solid waste landfills.
4. Potable water monitoring requirements.
5. Wildlife mortality reporting procedures.
6. Documentation, record keeping and reporting requirements.
7. Quality assurance/quality control manual.

The closure monitoring plan will include water quality sampling, water level measurements, and observations of the success of revegetation. The frequency of sampling events will be adjusted as appropriate between the reclamation and closure, and post-closure phases based on observed improvements in water quality. Table 7.1 summarizes the monitoring program.

During the closure process, groundwater quality will continue to be assessed at the existing monitoring wells.

During the reclamation and closure phase, the Barge Pond will be sampled on a quarterly basis. After pre-stabilization, seasonal water discharges will begin from the tailings impoundment (Section 6.2). Discharges will flow into the wetland system on the north side of Fish Creek Valley. Currently, there is minimal water flow in the north side of Fish Creek and it is expected take a number of years, depending on the seasonal water flow, for the wetland system to reach hydraulic equilibrium. During this phase, water may not be present at the terminus of the northern wetland system.

Table 7-1 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
Barge Pond	Qtr	Complete	Qtr	Complete	Qtr	Complete
Pit lake	Qtr	Complete	Annual	Complete	Annual	Complete
Seepage collection system	Monthly	Complete	Qtr[1]	Complete	NA	NA
Groundwater monitoring wells	Monthly	Complete	Qtr	Complete	Annual	Complete
Surface water monitoring point	NA	NA	Monthly	Indicator	Monthly	Indicator

1 Only if operational

After seasonal discharge from the Barge Pond begins, it is estimated that 2 to 3 years will be required for the wetland system to reach equilibrium and allow monitoring at the terminus of the system on a consistent basis. Once this occurs, water quality will be monitored near the terminus of the wetland system at a surface water monitoring point (a point of monitoring to be specified by ADEC) on a monthly basis during active flow for the first two years. Monthly samples will be analyzed for the indicator parameters summarized in Table 7.1.

The interceptor and monitoring wells will be sampled quarterly until the seepage collection system is decommissioned. Once the seepage collection system is shutdown, the monitoring wells will be sampled quarterly for the following two years. At the end of two years and pending demonstration that the system will not be required in the future, the interceptor wells will be decommissioned per ADEC regulations. The monitoring wells will be sampled annually beginning in year six. All samples will be analyzed for analytes in Table 7.1. The water quality in the pit will be monitored on a quarterly basis throughout the reclamation and closure period when the decant water and heap leach rinse water is being pumped to the pit. Sampling will occur annually thereafter.

Water Level Monitoring

Groundwater levels will be monitored in the interceptor wells and monitoring wells on a quarterly basis. Prior to decommissioning the interceptor well system, water levels will be monitored concurrent with each water quality sampling event. Pond elevations will be measured on a quarterly frequency until the spillway invert elevation is reached.

Inspection of Surface Stabilization

Visual observation of revegetation success will be performed on an annual basis during the pre-stabilization phase. Inspection for erosion and formation of gullies will be completed quarterly.

Heap Leach

The Fort Knox Monitoring Plan, (FGMI, Inc. 2012) outlines the operational monitoring and response plan in detail. The principal components of the operational monitoring plan include the LCRS, PCMS, underdrain system, pregnant solution composition and pond levels.

Table 7-2 Summary of monthly and quarterly analyte lists

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

Note: Monthly sampling analyte list will be used as indicator parameters per Table 7.1.

The operational monitoring of solution chemistry and levels will continue while recirculation/rinsing of the heap leach is in progress. During the recirculation/rinsing period samples will be collected on a quarterly basis to assess the composition and the rate at which the solution chemistry is improving. Recirculation/rinsing will continue until water quality is suitable for discharge to the tailings impoundment.

Once solution composition is suitable for discharge to the tailings impoundment, monitoring of the heap leach LCRS and PCMS and the underdrain system will no longer be required (Table 7.3). The underdrain system will be sampled on a semi-annual basis for the Profile II list of analytes (Table 7.4). The underdrain system will be sampled via monitoring wells in the heap leach embankment base platform, bench, and crest. These monitoring wells will be used to monitor the waters in the underdrain during the active life of the heap leach pad ending the quarter after water quality standards have been met.

Table 7-3 Summary of Heap Leach closure monitoring requirements

Identification	Parameter	Frequency
LCRS	WAD CN/pH	Quarterly (during rinsing)
PCMS	WAD CN/pH	Quarterly (during rinsing)
Groundwater Underdrain (via monitoring wells)	Profile II WAD CN/pH	Quarterly (during rinsing))
Residual Solution (via Storage Pond recovery wells	Profile II WAD CN/pH	Quarterly (during rinsing)
Closure Drainage	Profile II	Quarterly (during rinsing)
Preg Solution	WAD CN/pH	Quarterly (during rinsing)
In-Heap Storage Pond	Elevation	Continuous (automatic)

Table 7-4 Analytical profile II–groundwater inorganic parameters

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

* Dissolved

7.1 Post-Closure Maintenance and Monitoring

7.1.1 *Post Closure Monitoring*

Monitoring systems for process components will remain in place until each specific facility has been chemically stabilized to the satisfaction of the agencies. The long-term monitoring will occur in the Barge Pond and down gradient of the facility at the surface water and groundwater monitoring points. The water quality monitoring locations, roads that will remain and dam security access gates and spur roads are illustrated on Figure 7.1.

7.1.2 *Post Closure Maintenance*

Once physical reclamation has started, temporary diversions and sedimentation control systems will be monitored on a routine basis by FGMI personnel. These systems will be cleaned, repaired, and altered as necessary. Long-term or permanent diversions and the safety fencing and signage will be monitored and maintained as needed until the reclamation sureties have been released.

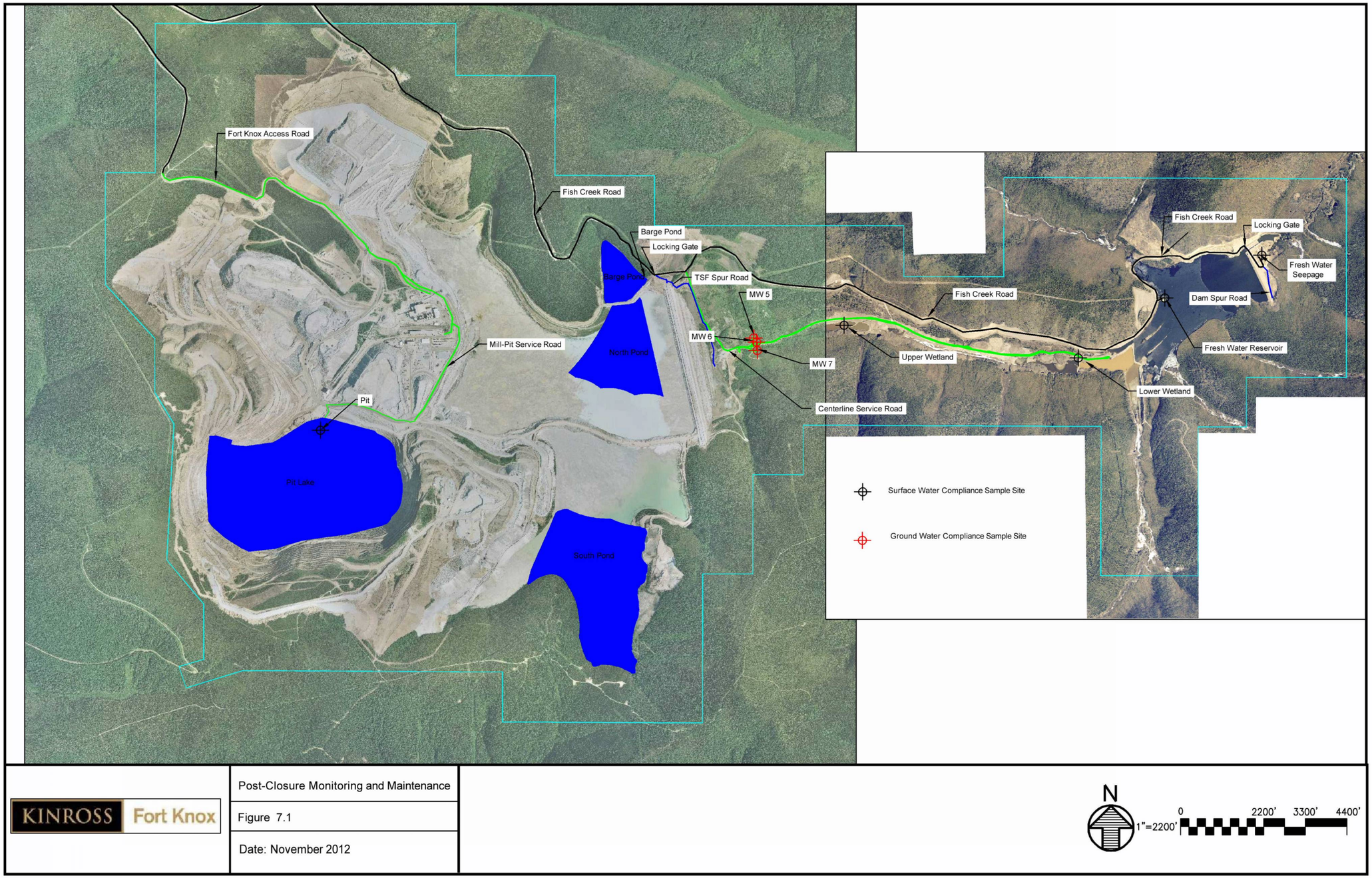
Success of reclamation will be monitored by visual observation to identify erosion problems. Remedial action to correct instability will be taken as soon as feasible following detection of substantial erosion or loss of growth media. Vegetation success will be monitored qualitatively by visual inspection on an on-going basis by FGMI and ADNR personnel. When warranted, quantitative data will be collected. Quantitative analyses will be conducted late in the growing season (August). The performance criterion for vegetation success is outlined in Section 5.2. FGMI will request release of the reclamation surety when significant reclamation work is completed on an area by area basis at a maximum occurrence of once per year (as per **11 AAC 97.435**). In no event will the release of financial assurance requested reduce the financial assurance amount to less than the estimated cost of completing reclamation and closure responsibilities.

7.1.3 *Long Term Inspections, Maintenance and Repair*

The Fort Knox Tailings Storage Facility Dam and the Freshwater Reservoir Dam will remain in place after closure. An application to for a Certificate of Approval to Abandon a Dam will be submitted to Alaska Dam Safety for both dams. In general the long-term inspection, maintenance and repair scope for both dams will be the same. Of significance is the inspection occurring on annual basis. A 100 year schedule of maintenance and repair activities has been developed, however the annual inspection may dictate a change to the schedule. The items identified for maintenance and repair costs are, erosion repair, clearing woody growth, rill erosion repair, replacement of armor stone, dam crest repair, seal cracks, refurbish spalling, replace spillway, repair spillway erosion, repair construction joints, repair channel rip rap and maintain spur roads and security gates that provide access to the dam crest and toe. The exclusive purpose for these activities is to maintain dam safety indefinitely. The funding for these items is discussed in subsection 9.2.

The mine site is surrounded by State lands accessible to the general public for their safety warning signs will be installed around the pit rim perimeter warning of the dangers. The signs will be installed on 100 foot intervals in front of the safety berm. The funding for the initial installation, long term annual inspection, maintenance and repair is included in the financial assurance calculation.

Figure 7.1 – Post-Closure Monitoring Locations, Roads to Remain, Dam Security Gates and Spur Access Roads



8 APPLICANT STATEMENT OF RESPONSIBILITY

FGMI recognizes its responsibility in the use of public (State) lands and accepts that responsibility in agreeing to reclaim the Fort Knox site. FGMI will meet the requirements of its reclamation plan and return the site to a safe and stable condition consistent with the approved post-mining land use. FGMI will meet required local, State, and Federal regulations regarding reclamation of any surface area affected by the mining and processing operations. Reclamation activities and post-reclamation maintenance of remaining structures (tailings dam, water supply reservoir, Solo Creek causeway, and access roads) are FGMI's responsibility. In the event a new operator/land owner assumes control of the Fort Knox Mine, at that time, the new operator or land owner will agree to assume responsibility for the reclamation and maintenance of any affected land and structures that are the subject of this plan or existing permits. The new operator/land owner will request transfer of all applicable state and federal permits. The new operator/land owner will provide evidence that a surety acceptable to the ACOE will be filed with ADNR that will cover reclamation of disturbed land, including privately owned and State land and post-reclamation maintenance of remaining structures.

9 ESTIMATE OF RECLAMATION AND CLOSURE COSTS

9.1 Reclamation Cost Estimates and Financial Assurance Adjustment

The total estimated cost to reclaim the Fort Knox site is $ $96,164,867. Table 9.1 provides a breakdown by activity costs comprising the estimate. Alaska Department of Environmental Conservation apportionable amount of financial assurance is $64,028,719 of this amount $45,646,859 includes direct costs, mobilization/demobilization and $18,381,860 as indirect costs.

Table 9-1 Reclamation and closure cost estimate

Total Cost		$96,164,867
DIRECT COSTS		
Waste Rock Dumps		$6,525,813
Heap Leach		$2,508,837
Building Demo		$860,795
Roads & Laydown Yards		$633,307
North Wetlands Complex and Spillway		$2,772,751
Growth Media Stockpiles		$50,675.00
Pit Safety Berm		$122,849
Water Management*		$42,417,979
TSF Earthwork		$4,136,806
Closure Studies and Reports		$1,177,000
Pipeline & Powerline Removal		$1,423,918
Fence Removal		$12,050
Well Closure*		$526,103
Post-Closure Monitoring*		$616,193
Road Maintenance		$538,608
Pit Water Treatment*		$2,059,504
TSF Maintenance		$1,052,925
WSR Maintenance		$518,830
Pit Rim Warning Signs and Maintenance		$241,307
Dam Security Gate Install		$11,002
Mobilization/Demobilization		$349,861
TOTAL DIRECT COSTS		$68,557,113

* ADEC portion of the direct costs

INDIRECT COSTS

Engineering/Redesign	4.00%	$2,742,285
Contractor Profit & Overhead	15.00%	$10,283,567
Performance Bond	3.00%	$2,056,713
Contract Administration	8.00%	$5,484,569
Contingencies	15.00%	$6,855,711
Insurance Premiums	1.50%	$184,909
TOTAL INDIRECT COSTS	40%	$27,607,754

Direct costs were calculated using quotes from local contractors, RS Means tables, and Little Davis-Bacon wage rates. These estimates include contractor profit and overhead, mobilization and demobilization fees, and contingencies. We will account for in inflation by increasing our financial assurance by the CPI-U for Anchorage of the previous year.

FGMI will reclaim affected land as contemporaneously as practicable. The plan and cost estimate provides the ADNR, ADEC and FGMI an opportunity to review and, if necessary, modify the reclamation plan as required under provision of the Millsite Lease and Waste Management Permit.

Under the provisions of 11 AAC 97.0320.(a), FGMI will file an Annual Activity Report that includes the volume of material mined in that year, the total acreage reclaimed in that year, and a statement as to whether the reclamation plan is on schedule.

Reclamation plans typically are updated to account for the additional disturbance planned to occur during the next five years. However, since during the next five years FGMI will initiate all currently planned disturbances, all planned disturbance is included in the cost estimate. The cost estimates provided represent life of mine or total reclamation costs for the Fort Knox Mine based on current plans for mining.

The reclamation-related financial assurance for the area within the boundaries covered by Waste Management Permit 2006-DB0043 for the purposes of reclamation and post-closure monitoring (Figure 1.2) will be held by ADEC, as permitted under 11 AAC 97.400 (3). The portion of the financial assurance applicable to the Waste Management permit is estimated to be and includes costs for pumping, monitoring, treatment and well decommissioning. The reclamation estimate and financial assurance amount will be adjusted every five-years during permit renewal or when the operation has a significant change in the Plan of Operations.

Since the various facilities such as the pit, the tailings impoundment, the waste rock dumps, and the water supply reservoir have different reclamation requirements, successful reclamation will be achieved much more rapidly for some facilities than others. FGMI will seek surety release on an area by area basis annually as successful reclamation is completed as required in 11 AAC 97.435.

9.2 Agreement for Funding Post-reclamation Obligations

FGMI, ADNR and ADF&G have entered into an agreement (Appendix B) for funding post-reclamation obligations. These obligations include functions that would not have been FGMI's responsibility in absence of the agreement. The agreement calls for the establishment of an "Organization" to be utilized for the purpose of determining and financing all maintenance obligations reasonably required to be performed after completion of final reclamation and post-closure monitoring. The bonding obligation began following the issuance of the Dam Safety Certificate of Approval to operate the water supply reservoir dam.

9.2.1 *Long Term Maintenance and Repair of TSF and WSR*

WHPacific was contracted to produce a report (Appendix F) that identified the tasks that would be necessary to consider in developing an estimate of the long term maintenance and repair costs for the TSF and WSR dams. For each task identified they suggested the frequency for the task and estimated the cost. The spread sheets in Appendix F identify the tasks, costs and frequency. Additional costs not addressed by WHPacific include the TSF

spillway and inspection costs. The inspection costs are based on recent costs to FGMI for these services.

Since the WHPacific costs were prepared in the latter part of 2009, the costs were escalated to account for inflation through 2012 using the Anchorage CPI-U, the semi-annual 2013 CPI-U data will be available in August of 2013. The inflation calculator spreadsheet provided on the State of Alaska Department of Labor and Workforce Development website at http://laborstats.alaska.gov/cpi/inflationcalc.htm was used to determine the 2012 value of the 2009 costs provided by WHPacific.

To determine the level of initial funding required ensuring that funds will be available for the identified costs in perpetuity, methodology similar to what was done for Red Dog Mine was utilized. The following assumptions were used to arrive at the fund value:

- The State of Alaska can achieve a nominal rate of return of 8% on the invested fund.
- The long term inflation rate will be 3.5%.
- The management and treasury fees will be 0.2%
- The real rate of return will be 4.3%.
- The NPV was based on 100 years.

Based on these costs, the initial fund required for the TSF is $1,052,925. The initial fund required for the WSR is $518,830.

A. It is understood that should the nature of the operation change a modified or supplemental plan of operations and reclamation may be required.

B. It is understood that approval of this reclamation plan does not constitute:

   1. Certification of ownership to any person named herein; and

   2. Recognition of the validity of any mining claim herein.

C. It is understood that a financial assurance equivalent to the estimated cost of performing the agreed upon reclamation measures will be required before this plan can be approved. Financial assurance and any financial assurance reduction amounts will be set on a site-specific basis by ADNR in coordination with the cooperating agencies.

D. It is understood that any information provided with this plan or provided in the future, that is marked Confidential will be treated as such by the agency in accordance with that agency's laws, rules and regulations.

E. FGMI will fund the required Environmental Audit to determine if any environmental liabilities exist as a direct or indirect result of the Fort Knox Mine.

Fairbanks Gold Mining, Inc. has reviewed and agrees to comply with all conditions in the plan of reclamation. Fairbanks Gold Mining, Inc. understands that the bond will not be released until ADNR gives written approval of the reclamation work.

FAIRBANKS GOLD MINING, INC.

By: Delbert Parr

Title: Environmental Mgr.

Signature: Delbert Parr

Date: Nov. 12, 2013

11 REFERENCES

Alaska Department of Natural Resources (ADNR), Adopted 1985, Updates 1991. Tanana Basin Area Plan for State Lands. ADNR , Fairbanks, Alaska.

America North Inc., 1992. Fort Knox Gold Project, Environmental Baseline Report, Volume 1. America North Inc., Fairbanks, Alaska.

America North/EMCON, Inc. 1992. Fort Knox Project Jurisdictional Wetland Survey November 1992. American North/EMCON, Inc., Anchorage, Alaska with assistance from Resource Data, Inc. and Three Parameters Plus.

Buell. J.W. and Moody C.A. 2004. Wetlands Aquatic Functional Value Analysis.

Buell. J.W. and Moody C.A. 2005. Re-Assessment of Functions and Values for Wetlands and Aquatic Features associated with the Fort Knox Mine, Fairbanks, Alaska as of July 2004. Buell & Associates, Inc. Portland, Oregon.

Buell, J.W. 1993. Fort Knox Project Wetlands Evaluation and Analysis. Prepared for FGMI Buell & Associates, Inc. Portland, Oregon.

CH2M Hill. 1993. Fairbanks Gold Mining, Inc.'s Fort Knox Mine Environmental Assessment. CH2M Hill, Anchorage, Alaska.

DeFrancesco, D. 2004. Delineation of Fort Knox Gold Mine Created Wetlands. Golder Associates, Inc. Redmond, Washington.

DOT, 2011. Alaska Storm Water Guide, Alaska Department of Transportation and Public Facilities.

Doubek, 2004. Fort Knox Mine Fairbanks, Alaska, Ultimate Pit Lake Infilling Study. Doubek HydroLogic, Denver, Colorado.

EBA, 1990. Prefeasibility Studies Report, Fairbanks Gold Mining Inc., Fort Knox Project. EBA Engineering Inc., Anchorage, Alaska.

ENSR Corporation, 2006. Walter Creek Heap Leach Facility/Fort Knox Mine Environmental Assessment, Fairbanks Alaska.

FGMI Inc., 1994. Fort Knox Project Water Resources Management Plan. Fairbanks Gold Mining Inc., Environmental Department, Fairbanks, Alaska.

FGMI Inc., 2005. Quality Assurance/Quality Control and Field Procedures Manual. Fairbanks, Gold Mining Inc., Environmental Department, Fairbanks, Alaska.

FGMI Inc., 2012. Fort Knox Mine Monitoring Plan. Fairbanks Gold Mining Inc., Environmental Department, Fairbanks, Alaska.

Golder, 2004. Five-Year Environmental Audit Fort Knox Mine. Golder and Associates Inc., Anchorage, Alaska.

HDR Alaska, Inc. 2010. Preliminary Jurisdictional Determination Fort Knox Mine, Fairbanks, Alaska. December 2010.

Higgs A.S. and Sattler R.A., 1994. History of Mining on the Upper Fish Creek, Fairbanks, Alaska. Northern Land Use Research, Fairbanks, Alaska.

JCHA, 1992a. Summary of Preliminary Operational Study Runs for a Surface Water Storage Facility to Meet the Fort Knox Project Water Demands. John C. Halepaska and Associates Inc., Consulting Ground Water Engineers, Littleton, Colorado.

JCHA, 1992b. Surface and Ground Water Hydrology for the Fort Knox Project. John C. Halepaska and Associates Inc., Consulting Ground Water Engineers, Littleton, Colorado.

JCHA, 1996. Tailings Storage Facility Interceptor Well Collection System, Fort Knox Mine, Fairbanks, Alaska. John C. Halepaska and Associates Inc., Consulting Ground Water Engineers, Littleton, Colorado.

Knight Piésold, 1994. Fort Knox Project Design of Tailings Storage Facility and Water Reservoir. Knight Piésold and Co. Denver, Colorado.

Knight Piésold, 2005. Fairbanks Gold Mining, Inc. Walter Creek Valley Fill Heap Leach Facility Design Report Issued for Agency Review, November 30, 2005. Knight Piésold and Co. Denver, Colorado.

Knight Piésold, 2010. Fairbanks Gold Mining, Inc. Fort Knox Project Tailing Storage Facility Expansion Detailed Design Report, February 3, 2010. Knight Piésold and Co. Denver, Colorado.

Knight Piésold 2013 a. Fairbanks Gold Mining, Inc. Fort Knox Walter Creek Valley Fill Heap Leach Facility Expansion Pre-Feasibility Study Revision3t, April 30 2013. Knight Piésold and Co. Denver, Colorado.

Knight Piésold 2013 b. Fairbanks Gold Mining, Inc. Report through Q1 2013 Geotechnical and Hydraulic Instrumentation Records for the Tailing Storage Facility, Water Reservoir Dam and Walter Creek Heap Leach Facility, June 10, 2013. Knight Piésold and Co. Denver, Colorado.

National Park Service, 2003. Fire Monitoring Handbook. Fire Management Program Center, National Interagency Fire Center. United States Department of the Interior.

Ott, A.G. and W.A. Morris, 2009. Arctic Grayling and Burbot Studies at the Fort Knox Mine, 2010. Alaska Department of Natural Resources Tech. Rept. 09-05. Office of Habitat Management and Permitting. Juneau.

Ott, A.G. and W.A. Morris, 2012. Arctic Grayling and Burbot Studies at the Fort Knox Mine, 2012. Alaska Department of Natural Resources Tech. Rept. 12-09. Office of Habitat Management and Permitting. Juneau.

Shannon & Wilson, 1985. Placer Mining Wastewater Treatment Technology Project, Phase 2 Report, Laboratory Study, Pilot Study, Field Study. Prepared for the ADEC by Shannon & Wilson, Inc. Fairbanks, Alaska.

Schlumberger Water Services 2011. Fort Knox Mine Tailings Facility Closure Management Plan, April 2011 Schlumberger Water Services, Inc. Denver, Colorado.

Schlumberger Water Services 2012. Fort Knox pit lake evaluation 2012 update treatment provisions. Schlumberger Water Services, Inc. Denver, Colorado

Schlumberger Water Services 2013. Fort Knox pit lake evaluation 2012 update. Schlumberger Water Services, Inc. Denver, Colorado

Szumigala D.J. and Hughes R.A., 2004. Special Report 59 Alaska's Mineral Industry 2004. Division of Geological & Geophysical Surveys in cooperation with Office of Economic Development and Division of Mining, Land & Water. Fairbanks, Alaska, Appendix G.

U.S. Army Corps of Engineers, USACE. 2001. Inflow Design Floods for Dams and Reservoirs. ER1110-8-2(FR), March 1, 2004.

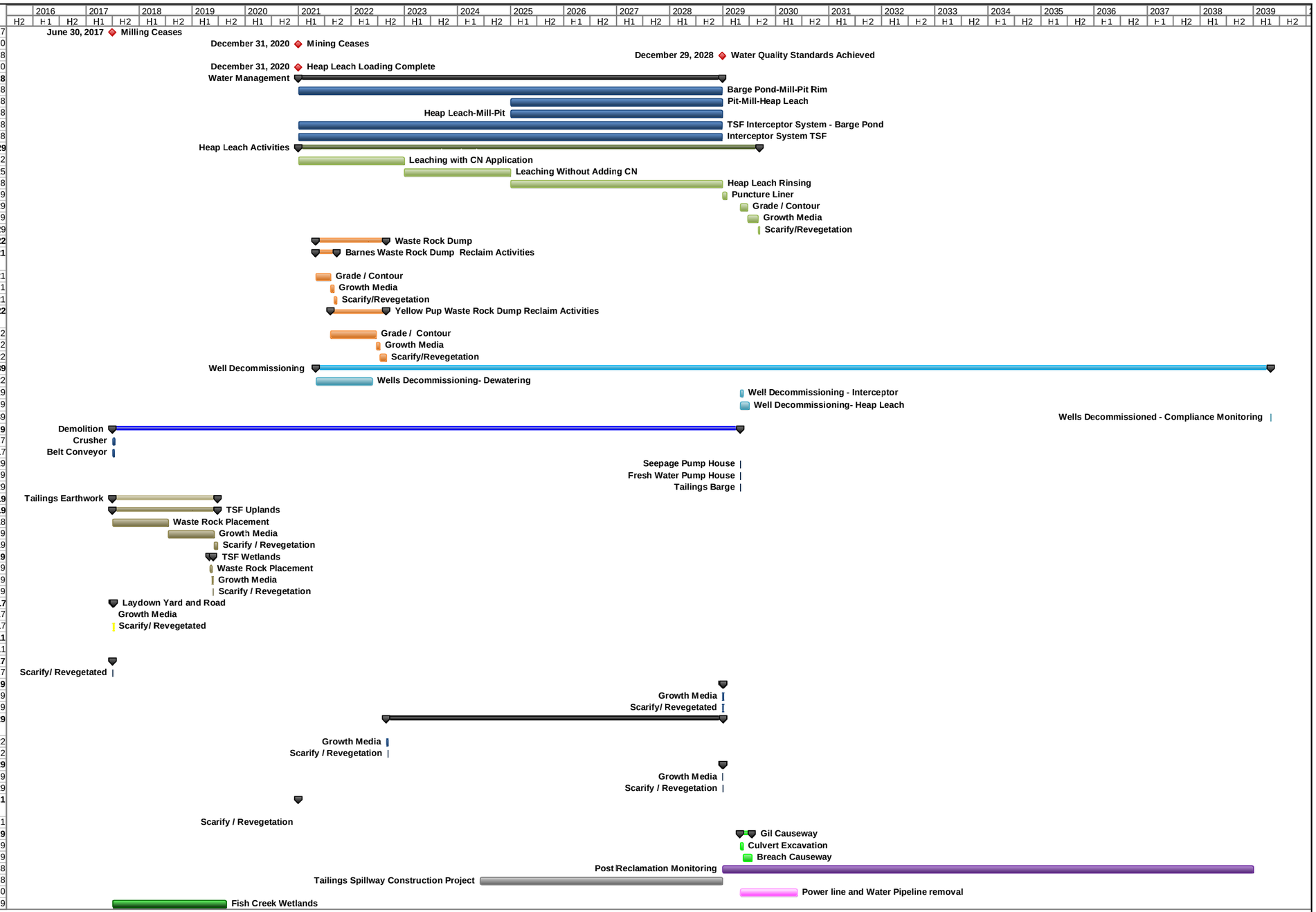
Water Management Consultants, 2005. Fort Knox Mine Tailing Facility Closure Management Plan. Water Management Consultants, Inc. Denver, Colorado.

Water Management Consultants, 2006. Fort Knox Mine Closure Management Plan for Proposed Heap Leach Facility. Water Management Consultants, Inc. Denver, Colorado

Water Management Consultants, 2009 Interception System Evaluation Update. Water Management Consultants, Inc. Denver, Colorado

Appendix A – Reclamation Schedule

ID	Task Name	Start	Finish
1	Milling Ceases	Fri 6/30/17	Fri 6/30/17
2	Mining Ceases	Thu 12/31/20	Thu 12/31/20
3	Water Quality Standards Achieved	Fri 12/29/28	Fri 12/29/28
4	Heap Leach Loading Complete	Thu 12/31/20	Thu 12/31/20
5	**Water Management**	**Thu 12/31/20**	**Fri 12/29/28**
6	Barge Pond-Mill-Pit Rim	Fri 1/1/21	Fri 12/29/28
7	Pit-Mill-Heap Leach	Wed 1/1/25	Fri 12/29/28
8	Heap Leach-Mill-Pit	Wed 1/1/25	Fri 12/29/28
9	TSF Interceptor System - Barge Pond	Thu 12/31/20	Thu 12/28/28
10	Interceptor System TSF	Thu 12/31/20	Thu 12/28/28
11	**Heap Leach Activities**	**Fri 1/1/21**	**Tue 9/11/29**
12	Leaching with CN Application	Fri 1/1/21	Fri 12/30/22
13	Leaching Without Adding CN	Fri 12/30/22	Wed 1/1/25
14	Heap Leach Rinsing	Wed 1/1/25	Fri 12/29/28
15	Puncture Liner	Fri 12/29/28	Sun 1/28/29
16	Grade / Contour	Tue 5/1/29	Wed 6/20/29
17	Growth Media	Wed 6/20/29	Sat 9/1/29
18	Scarify/Revegetation	Sat 9/1/29	Tue 9/11/29
19	**Waste Rock Dump**	**Sat 5/1/21**	**Tue 8/30/22**
20	**Barnes Waste Rock Dump Reclaim Activities**	**Sat 5/1/21**	**Wed 9/22/21**
21	Grade / Contour	Sat 5/1/21	Tue 8/10/21
22	Growth Media	Tue 8/10/21	Thu 9/2/21
23	Scarify/Revegetation	Thu 9/2/21	Wed 9/22/21
24	**Yellow Pup Waste Rock Dump Reclaim Activities**	**Tue 8/10/21**	**Tue 8/30/22**
25	Grade / Contour	Tue 8/10/21	Sun 6/19/22
26	Growth Media	Sun 6/19/22	Fri 7/15/22
27	Scarify/Revegetation	Fri 7/15/22	Tue 8/30/22
28	**Well Decommissioning**	**Mon 5/3/21**	**Tue 5/3/39**
29	Wells Decommissioning- Dewatering	Mon 5/3/21	Tue 5/24/22
30	Well Decommissioning - Interceptor	Tue 5/1/29	Tue 5/22/29
31	Well Decommissioning- Heap Leach	Tue 5/1/29	Fri 6/29/29
32	Wells Decommissioned - Compliance Monitoring	Sun 5/1/39	Tue 5/3/39
33	**Demolition**	**Sat 7/1/17**	**Thu 5/3/29**
34	Crusher	Sat 7/1/17	Sat 7/15/17
35	Belt Conveyor	Sat 7/1/17	Tue 7/11/17
36	Seepage Pump House	Tue 5/1/29	Wed 5/2/29
37	Fresh Water Pump House	Tue 5/1/29	Thu 5/3/29
38	Tailings Barge	Tue 5/1/29	Wed 5/2/29
39	**Tailings Earthwork**	**Sat 7/1/17**	**Tue 6/25/19**
40	**TSF Uplands**	**Sat 7/1/17**	**Tue 6/25/19**
41	Waste Rock Placement	Sat 7/1/17	Wed 7/18/18
42	Growth Media	Wed 7/18/18	Thu 5/30/19
43	Scarify / Revegetation	Thu 5/30/19	Tue 6/25/19
44	**TSF Wetlands**	**Wed 5/1/19**	**Sun 5/26/19**
45	Waste Rock Placement	Wed 5/1/19	Thu 5/16/19
46	Growth Media	Thu 5/16/19	Fri 5/24/19
47	Scarify / Revegetation	Fri 5/24/19	Sun 5/26/19
48	**Laydown Yard and Road**	**Mon 7/3/17**	**Tue 7/11/17**
49	Growth Media	Mon 7/3/17	Wed 7/5/17
50	Scarify/ Revegetated	Wed 7/5/17	Tue 7/11/17
51	**Pipeline road**	**Fri 4/29/11**	**Fri 4/29/11**
52	Scarify/ Revegetated	Fri 4/29/11	Fri 4/29/11
53	**Barnes Creek Borrow**	**Sat 7/1/17**	**Mon 7/3/17**
54	Scarify/ Revegetated	Sat 7/1/17	Mon 7/3/17
55	**Fort Knox Access Road**	**Sat 12/30/28**	**Sat 1/6/29**
56	Growth Media	Sat 12/30/28	Sat 1/6/29
57	Scarify/ Revegetated	Sat 12/30/28	Thu 1/4/29
58	**Phase 7 Haul Road and Dewatering Access Roads**	**Tue 8/30/22**	**Wed 1/3/29**
59	Growth Media	Tue 8/30/22	Wed 9/7/22
60	Scarify / Revegetation	Wed 9/7/22	Mon 9/12/22
61	**Heap Leach Haul Road**	**Sat 12/30/28**	**Wed 1/3/29**
62	Growth Media	Sat 12/30/28	Mon 1/1/29
63	Scarify / Revegetation	Mon 1/1/29	Wed 1/3/29
64	**Dewatering, Borrow Access, FC Well Access Roads**	**Fri 1/1/21**	**Sat 1/2/21**
65	Scarify / Revegetation	Fri 1/1/21	Sat 1/2/21
66	**Gil Causeway**	**Tue 5/1/29**	**Thu 7/19/29**
67	Culvert Excavation	Tue 5/1/29	Sun 5/20/29
68	Breach Causeway	Mon 5/21/29	Thu 7/19/29
69	Post Reclamation Monitoring	Sat 12/30/28	Fri 12/31/38
70	Tailings Spillway Construction Project	Wed 6/5/24	Fri 12/29/28
71	Power line and Water Pipeline removal	Tue 5/1/29	Mon 5/27/30
72	Fish Creek Wetlands	Sat 7/1/17	Fri 8/23/19



Appendix B – Agreement for Funding Post-Reclamation Obligations

AGREEMENT FOR FUNDING POST-RECLAMATION OBLIGATIONS

This agreement is made and entered into this 15TH day of FEBRUARY, 1994, by and between FAIRBANKS GOLD MINING, INC. ("FGMI"), a Delaware corporation, and the STATE OF ALASKA, Department of Natural Resources, Divisions of Land and Mining ("DNR") and the Department of Fish and Game ("ADF&G").

R E C I T A L S:

WHEREAS, pursuant to AS 38.05.255, FGMI has applied for a millsite permit from DNR for operation of the Fort Knox Mine Project ("the Project"); and

WHEREAS, in accordance with such application DNR has issued FGMI Millsite Permit ADL Nos. 414960 and 414961 (the "Millsite Permit"); and

WHEREAS, pursuant to AS 27.19 and the Reclamation Plan, FGMI is required to perform reclamation on lands which are subject to the Millsite Permit (the "Permit Area"), which Permit Area is depicted on Exhibit A hereto; and

WHEREAS, the Project requires the construction of a tailings dam, a water supply dam, and certain other facilities within the Permit Area, all of which facilities are depicted on Exhibit B hereto; and

WHEREAS, construction, operation and maintenance of such facilities require: a permit from the Army Corps of Engineers ("COE") pursuant to Section 404 of the Clean Water Act ("the Section 404 Permit"); Certificates of Approval to Operate the water

supply dam (the "Water Dam Approval to Operate") and the tailings dam, conveyer crossing and Melba/Monte Cristo Rock Dump (collectively the "Tailings Dam Approval to Operate") from DNR, three Fish Habitat Permits (the "Fish Habitat Permits") from ADF&G; and a Solid Waste Disposal Permit ("the Solid Waste Disposal Permit") from the Alaska Department of Environmental Conservation ("DEC") for a tailings impoundment (collectively the "Permits"); and

WHEREAS, AS 27.19.030(b) provides:

> In reviewing a reclamation plan for state, federal, or municipal land under (a) of this section, the commissioner may consider, after consultation with the Commissioners of Environmental Conservation and Fish & Game and with the concurrence of the miner and landowner, uses to which the land may be put after mining has been completed, including trails, lakes, recreation sites, fish and wildlife enhancement, commercial, and agricultural uses;

and

WHEREAS, the Reclamation Plan provides that following cessation of mining and milling operations in the Permit Area, FGMI will immediately initiate and complete within two years active reclamation ("Phase I Reclamation") followed by a period of passive reclamation now estimated to be 10 years ("Phase II Reclamation"), such reclamation phases having the meanings set forth in the Reclamation Plan; and

WHEREAS, DNR, ADF&G, and FGMI desire that the portion of the Permit Area depicted on Exhibit C hereto, or an area substantially similar thereto, be managed as a public

use/recreation site (the "Public Use Site") following completion of Phase II Reclamation by FGMI; and

WHEREAS, DNR has issued a Final Finding and Decision that the Project is in the best interests of the State of Alaska and has agreed to use its best efforts to amend the Tanana Basin Area Plan to classify the Public Use Site as public recreation and wildlife habitat to facilitate its eventual use by the public; and

WHEREAS, use of the area as a public use/recreation site requires the construction of a more substantial water supply dam than would otherwise be required by the Project, which dam, along with certain other facilities, hereinafter defined as "Improvements", will require monitoring and maintenance after DNR approval of completion of Phase II Reclamation by FGMI; and

WHEREAS, the parties desire to leave the water supply dam and lake in place in perpetuity, to provide mitigation that might otherwise be required under the Section 404 Permit and the Fish Habitat Permits under AS 16.05.840-.850; and

WHEREAS, the fulfillment of all provisions of this agreement satisfies Sections 4.2.4(3) and 4.2.6(2) and (3) of the Reclamation Plan; and

WHEREAS, it is thus in the mutual benefit of the State and FGMI that the Improvements remain in place; and

WHEREAS, it is not in the best interests of the State for the monitoring and maintenance of the Improvements and the Permits to create a financial burden on the State; and

WHEREAS, FGMI is willing to construct the Improvements and provide funds for the monitoring and maintenance thereof following completion of Phase II Reclamation only on the condition that FGMI be released from any and all Future Obligations, as hereinafter defined, under the Transferred Permits, as hereinafter defined, pursuant to Sections 4 and 5 hereto, including any future reclamation obligations; and

WHEREAS, the Solid Waste Disposal Permit and the Reclamation Plan provide that post-closure monitoring and maintenance may be required to continue in the Permit Area, which activities may continue for a period of thirty (30) years or longer; and

WHEREAS, FGMI, ADF&G, and DNR have agreed that the most desirable form of organization to accomplish the post-closure monitoring and maintenance in the Permit Area following completion of Phase II Reclamation by FGMI, would be best determined in the latter stages of Phase II Reclamation.

NOW, THEREFORE, the parties agrees as follows:

1. Definitions.

(a) "Maintenance Obligations" means the performance of all inspections, repairs and other activities that would be FGMI's obligations in the absence of this Agreement necessary to (1) maintain the Improvements in a condition for the protection of the public health and safety and (2) maintain the Transferred Permits in compliance with applicable law until termination or expiration. Exhibit D attached hereto contains a list of

Maintenance Obligations currently contemplated. This list may be revised during the term of this Agreement as mutually agreed between DNR and FGMI or as determined through arbitration as hereinafter provided.

(b) "Post-closure monitoring and maintenance" means monitoring and maintenance occurring after DEC's determination under the Solid Waste Disposal Permit that the criteria for permanent closure have been met and after the 70% vegetative cover criteria has been achieved pursuant to the Reclamation Plan.

(c) "Reclamation Plan" means the Fort Knox Project Reclamation Plan as approved by DNR and COE prior to or concurrently with the execution hereof and as amended and approved by DNR from time to time hereafter.

(d) "State" means DNR for all purposes of administering this Agreement.

(e) "Transferred Permits" has the meaning set forth in Section 4.1.

(f) "Future Obligations" means those legally enforceable duties under the Transferred Permits that arise following the fulfillment of all conditions under Sections 4 and 5 of this agreement (hereinafter referred to as the "Effective Date of Transfer") except that FGMI is not relieved of liability that accrues following the Effective Date of Transfer which arises out of operations conducted under the Transferred Permits prior to the Effective Date of Transfer.

(g) "Improvements" means those facilities identified in Exhibit B.

2. FORMATION OF ORGANIZATION. Not less than 90 days prior to the anticipated completion of Phase II Reclamation, the State and FGMI shall agree upon the organization to perform the Maintenance Obligations as provided in this Agreement and to hold and invest principal and to disburse the income from FGMI's funding of the post-reclamation expenses as set forth in this Agreement. The State and FGMI may elect (i) to form a nonprofit corporation at FGMI's expense; (ii) that FGMI endow a statutory fund (such as, but not limited to, the "fish and game fund" under AS 16.05.100 (Section 17 art I ch 9 SLA 1959; am Section 3 ch 132 SLA 1984)); (iii) to use a combination of the above or (iv) to use another mutually agreeable organizational form (the preferred funding mechanism being hereafter referred to as "Organization"). The State and FGMI intend that such Organization shall be formulated so that it shall not be considered the alter ego of FGMI under Alaska law. Within 10 days following the decision on the form of the Organization, the State and FGMI shall commence establishment of the Organization and diligently proceed to create the Organization, if necessary. If a nonprofit corporation is utilized the State and FGMI shall agree upon the contents of the Articles of Incorporation and Bylaws that are consistent with this Agreement unless otherwise agreed. If a statutory fund is to be endowed or other organization utilized, the endowment shall not be used except as specified in this Agreement unless the DNR and the agency with control over the

statutory fund utilized and FGMI agree otherwise. If a statutory fund is utilized the agency controlling the statutory fund shall agree to the terms of the endowment

2.1 Purpose. Subject to the terms of this Agreement, the Organization shall be utilized for the purpose of determining and financing all Maintenance Obligations reasonably required to be performed under this Agreement after completion of Phase II Reclamation by FGMI, and to perform those administrative functions necessary and directly related to the existence and purpose of the Organization.

3. APPLICATIONS BY FGMI. Not more than 180 days after the State and FGMI determine and create the Organization pursuant to section 2, FGMI shall diligently and in good faith make all applications and take all reasonable steps necessary (a) to obtain termination or abandonment of the Millsite Permit, the Tailings Dam Approval to Operate and the Fish Habitat Permit for the wetlands and fish barrier; (b) to obtain, to the fullest extent possible, termination or abandonment of the Section 404 Permit and the Solid Waste Disposal Permit, and, to the extent FGMI is unable to obtain full termination and abandonment of such permits, to seek transfer to the Organization of the unterminated and unabandoned portion of such permits; and (c) to seek transfer to the Organization of the Water Dam Approval to Operate, the Fish Habitat Permits for the Solo Creek Causeway and culvert battery and the water supply dam. FGMI may transfer the permits listed in (b) and (c) above to the Organization provided that the Organization is adequately funded as

provided in this Agreement and that the relevant agency approves transfer. The transfer shall be subject to Section 5.2 of this Agreement. The State shall cooperate fully and in good faith with FGMI to effect the transfer of the permits as provided in this Agreement.

4. TRANSFERS. Subject to Sections 3 and 5, FGMI shall transfer to the Organization the following:

4.1 Permits. The permits listed in Section 3 (b) and (c) above (the "Transferred Permits"). The Organization shall assume all Future Obligations under such permits from and after the Effective Date of Transfer.

4.2 Funds. The sum established in accordance with Section 7 of this Agreement, which shall be deposited into a mutually acceptable depository in the name of the Organization;

4.3 Maintenance Records. FGMI's historical records relating to Maintenance Obligations; and

4.4 Other Obligations. Such other permits or obligations, other than Maintenance Obligations, which may arise during the course of the Project provided that the State and FGMI agree in writing and the additional responsibilities are adequately funded as provided in this Agreement.

5. CONDITIONS TO TRANSFER. FGMI's obligation to make the transfers set forth in Section 4 is subject to the satisfaction of the following conditions prior to or simultaneously with FGMI's satisfaction of its obligations under Section 4.

5.1 Termination of Permits. The permits listed in Section 3(a), and, to the extent not transferred to the Organization under Section 4.1, the permits listed in Section 3(b), shall have been terminated or abandoned.

5.2 Transfer of Permits. The Transferred Permits shall have been transferred to the Organization in accordance with Section 4.1 and FGMI released from Future Obligations thereunder. FGMI shall be responsible for satisfying any reasonable conditions required or permitted by law imposed by the permitting agency for transfer of the permits.

5.3 Release of Reclamation Bond. DNR shall have released FGMI from any undertaking or security posted pursuant to the Millsite Permit and given written approval of the reclamation work.

5.4 Release of Solid Waste Disposal Permit Bond. DEC shall have released FGMI from any undertaking or security pursuant to the Solid Waste Disposal Permit.

5.5 Release of Bond Under Section 6 of this Agreement. DNR shall have released FGMI from the undertaking set forth in Section 6 of this Agreement.

5.6 Final Determination of Funding Amount. The amount to be transferred to the Organization by FGMI pursuant to Section 4.2 of this Agreement shall have been finally determined in accordance with Section 7 of this Agreement.

6. SECURITY FOR FUNDING. Upon the issuance of the Water Dam Approval to Operate, FGMI shall deliver to DNR a bond in

the amount of $667,000 as security for FGMI's funding obligation pursuant to Section 4.2 of this Agreement. The $667,000 bond amount covers FGMI's bonding obligation under this section for the first year following issuance of the Water Dam Approval to Operate. The bond shall be adjusted annually for years 2 through the first five year anniversary of the Millsite Permit for inflation and such other factors as DNR and FGMI agree. Subsequently the amount of such bond shall be adjusted as follows:

(a) Not less than 90 days prior to the fifth anniversary of the issuance of the Millsite Permit, and each successive fifth year anniversary thereafter until its termination, FGMI shall transmit to DNR all historical records and future projections of costs, if any, relating to Maintenance Obligations which have not been previously transmitted under this Section 6 (a).

(b) Not more than 30 days after transmittal of the records pursuant to Section 6 (a), DNR and FGMI shall meet for the purpose of adjusting the anticipated amount of funding which, if invested on the expiration date of the succeeding bond, would be sufficient to generate an amount of income that would adequately fund the Maintenance Obligations in perpetuity. This process will yield an anticipated bond amount for the first year of each five year period. DNR and FGMI shall meet annually within each five year period to adjust the amount of the bond based upon then current information on inflation and upon such other factors as DNR and FGMI may agree. If DNR and FGMI reach an agreement on the

amount, the amount of the succeeding bond shall be adjusted to the agreed upon amount.

(c) If DNR and FGMI are unable to reach agreement under Section 6 (b), the adjusted amount of the bond shall be determined under the Alaska Uniform Arbitration Act, in accordance with Section 8 of this Agreement.

(d) The bond proceeds shall be payable to DNR upon the occurrence of any of the following:

(1) the filing of a petition in bankruptcy by or against FGMI, or the commencement of any proceeding by or against FGMI under any federal or state insolvency or other law for the relief of debtors, in either case which is not dismissed within 60 days, or the insolvency of FGMI;

(2) DNR's termination of the Millsite Permit for breach thereof;

(3) FGMI's material breach of this Agreement; or

(4) failure of FGMI or its successors to renew the bond prior to fifteen (15) days before the bond's expiration. In the event the adjusted amount of the bond is in arbitration at such time, the bond shall be initially renewed at the existing amount and subsequently adjusted as determined by the arbiter.

(e) Any proceeds from the bond described in this section shall be applied to FGMI's obligations under this Agreement.

7. PROCEDURE FOR DETERMINING AMOUNT OF FUNDING. The sum to be transferred to the Organization under Section 4.2 of this Agreement shall be an amount which, if invested at the time of such funding, shall be sufficient to adequately fund the Organization's Maintenance Obligations in perpetuity, as determined in accordance with this Section 7.

(a) For the purpose of assisting DNR and FGMI in determining the adequacy of funding of the Organization, the parties shall use the information obtained in (1) the environmental audits required under Section 12 (Environmental Audit) of the Millsite Permit and (2) other appropriate audit performed by a contractor hired by FGMI and approved by DNR to give an opinion concerning (i) the costs to be incurred by the Organization in performing the Maintenance Obligations and (ii) such other matters as agreed upon by DNR and FGMI, which may include the need for insurance. The contractor shall be hired not less than 180 days prior to the completion of Phase II Reclamation.

(b) Not more than 180 or less than 120 days prior to completion of Phase II Reclamation by FGMI, FGMI shall transmit to DNR all historic records and projections of future costs relating to Maintenance Obligations, which have not previously been transmitted pursuant to Section 6 (a) of this Agreement.

(c) Not more than 30 days after transmittal of the records pursuant to Section 7 (a), the State and FGMI shall meet for the purpose of determining the amount to be transferred to the Organization pursuant to Section 4.2 of this Agreement.

(d) If the State and FGMI reach agreement under Section 7 (c), the amount to be transferred shall be the amount agreed upon. If the State and FGMI are unable to agree on the amount to be transferred to the Organization under Section 4.2 and this Section 7, the State and FGMI shall proceed to arbitrate the dispute under Section 8. The arbitration shall determine the amount which, if invested at the time of transfer, would be sufficient to generate an amount of income adequate to fully fund the Maintenance Obligations in perpetuity.

8. Arbitration. (a) If the State and FGMI are unable to agree on the scope of Maintenance Obligations under section 1(a), the annual inflation adjustment of the bond under Section 6, the adjusted bond amount at five-year intervals under Section 6 or the amount of funding of the Organization under Section 7 (including the need for insurance), the State and FGMI shall arbitrate the dispute under the Alaska Uniform Arbitration Act. The State and FGMI each party shall select an arbiter and the two arbiters shall jointly select a third arbiter.

(b) When resolving the foregoing disputes the State and FGMI and the arbiters shall use the following principles:

(1) The total funding shall be the sum of the following:

(a) A principal amount sufficient to generate income on a continuing basis and in perpetuity to pay those costs reasonably anticipated to perform the Maintenance Obligations;

(b) A principal amount reasonably anticipated to generate sufficient annual income to invest in principal at the end

of each fiscal year to offset the effect of inflation on the principal; and

(c) An amount to be used to pay the Maintenance Obligations until the Organization can accumulate sufficient income to pay the reasonably anticipated Maintenance Obligations as they arise, if any such monies are needed.

(2) All Maintenance Obligations shall be performed in accordance with local, state, and federal laws and to protect the public health and safety.

(3) The costs shall be based on contracting with third parties to perform the Maintenance Obligations, or on having the work performed by government employees, as appropriate.

(4) A reasonable estimate of future inflation shall be utilized.

(5) A reasonable rate of net return on principal resulting from conservative investments shall be utilized.

(6) Only income from the principal may be used to fund expenses and inflation proof.

(7) Any responsibility that is undertaken by the Organization that would be the responsibility of FGMI in the absence of this Agreement shall be adequately funded.

(8) FGMI shall not be required to fund any function that would not have been its responsibility in the absence of this Agreement.

(9) The scope of the Maintenance Obligations shall be those functions (a) necessary for physical maintenance of the

Improvements for the protection of the public health and safety; (b) required to maintain the Transferred Permits in compliance with applicable law; and (c) those administrative functions necessary and directly related to the existence and purpose of the Organization.

(10) When determining the need for insurance the parties and arbiters shall consider applicable law requiring insurance, insurance or self-insurance carried by or available to the Organization and the cost thereof, the likelihood of the event or activities that the insurance would cover, the cost of the insurance and such other reasonable considerations as the parties or arbiters deem appropriate. The intent of this provision is not to require insurance but to ensure that the need for insurance is adequately assessed and appropriate funding required if insurance is so determined to be needed by the Organization.

(11) The monitoring and maintenance of the Improvements and the Transferred Permits shall not create a financial burden on the State.

9. FAILURE OF CONDITIONS PRECEDENT. In the event that any of the conditions set forth in Section 5 of this Agreement remain unsatisfied as of one year after completion of Phase II Reclamation by FGMI, unless such period is extended by mutual agreement or unless such condition shall have been waived in writing by the State and/or FGMI, as appropriate, FGMI shall prepare an amendment to the Reclamation Plan to provide for post-closure monitoring and maintenance in substitution of this

Agreement within 180 days of the above date and the bond requirements under Section 6 shall remain in effect until DNR's approval of the amendment to the Reclamation Plan.

10. Mutual Indemnity. Simultaneously with the satisfaction of the requirements under Sections 4 and 5 thereof, the Organization and FGMI shall provide the following indemnifications. The Organization shall defend and indemnify FGMI against any and all claims, liabilities, demands, causes of action, damages, judgments, penalties, fines, and administrative actions resulting from the acts or omissions of the Organization within or relating to the Permit Area from and after the transfer of the Transferred Permits to the Organization. FGMI shall defend and indemnify the Organization against any and all claims, liabilities, demands, causes of action, damages, judgments, penalties, fines, and administrative actions resulting from the acts or omissions of FGMI within or relating to the Permit Area prior to the transfer of the Transferred Permits to the Organization.

11. Public Use Site. DNR shall seek to amend the Tanana Basin Area Plan to classify the Public Use Site as public recreation and wildlife habitat to facilitate public access and recreation. DNR agrees that following Phase II Reclamation the public shall be granted access for public use and recreation to the maximum extent allowed by law.

12. Notice: Administering Agency. DNR is the agency responsible for administering this Agreement and is the agency FGMI shall contact concerning any questions arising hereunder. DNR

shall contact and coordinate with such other state agencies as necessary for implementation of or questions arising under this Agreement. Any Notices to be given under this Agreement shall be given to FGMI at 701 Bidwill Avenue, Fairbanks, Alaska 99701 (for UPS delivery), or P.O. Box 73726, Fairbanks, Alaska 99707 (for mail delivery), or FAX no (907) 451-4305, and to DNR at: Department of Natural Resources, Division of Mining, Attention: Director, 3601 "C" Street, Suite 880, Anchorage, AK 99501, or P.O. Box 107016, Anchorage, Alaska 99510-7016 (for mail delivery), or FAX no. (907) 563-1853 or such other address as provided in writing to the other party.

13. Assignment. FGMI may assign all or part of its rights and delegate its obligations under this agreement solely as provided in this section. FGMI only may assign its rights and delegate its obligations under this agreement to the assignee of its interest under the Millsite Permit and in the same proportion as thereunder. No transfer permitted by this section shall, as between the State and FGMI, relieve FGMI of any liability, whether accruing before or after such transfer, which arise out of Permit operations conducted prior to such transfer. No transfer of an interest under this agreement is binding on the State without the express written approval of DNR. In the event of a transfer by FGMI of less than its entire undivided interest in, to, or under this agreement, FGMI and its transferee shall act and be treated as one party, except that DNR shall be required to deliver copies of all notices permitted or required under this agreement to all

parties holding interests under this agreement pursuant to transfers which have been approved by DNR as provided in this section. Transfer of all or any of FGMI's interest in, to, or under this Agreement does not relieve Amax Gold Inc. or any succeeding guarantor under the guaranty executed in conjunction with the Millsite Permit unless the requirements for such transfer of the guaranty as provided therein have been satisfied.

14. Successors. This agreement shall be binding on and inure to the benefit of the parties and their successors.

15. Monies Payable in U.S. Money. All sums payable under this agreement must be paid in money of the United States of America.

16. Severability of Clauses of Agreement. If any clause, or provision, herein contained, shall be adjudged to be invalid, it shall not affect the validity of any other clause or provision of this agreement.

17. Waiver. No delay or omission in the exercise of any right or remedy of either party shall impair such right or remedy or be construed as a waiver of such right or remedy.

18. Corporate or Partnership Authority. FGMI shall deliver to DNR upon the execution of this agreement a certified copy of a resolution of its board of directors authorizing execution of this agreement and naming the officers that are authorized to execute this agreement on behalf of the corporation. The State shall be entitled to rely upon the authority of the persons identified in the resolution to continue to act on behalf

of the corporation until otherwise notified in writing by the corporation.

19. Venue; Controlling Law. The venue for any administrative appeal or civil action relating to this agreement shall be in Fairbanks, Alaska. This agreement shall be interpreted in accordance with the law of the State of Alaska.

20. Modification of Agreement. This agreement shall not be modified except in writing executed by the parties.

21. Exhibits. All exhibits referred to herein are attached to this agreement and incorporated by reference.

22. Interpretation. This agreement shall be interpreted according to the fair intent of the agreement as a whole. This agreement has been jointly drafted by the parties following negotiations and the rule of contract interpretation construing an instrument against the drafter shall not be applied.

23. Headings. The section headings in this agreement shall have no effect on its interpretation.

STATE OF ALASKA
Department of Fish and Game

By: _____ Date: _____
Frank Rue
Director, Habitat and Restoration Division

ACKNOWLEDGMENT

STATE OF ALASKA)
) ss.
FIRST JUDICIAL DISTRICT)

The foregoing instrument was acknowledged before me this _____ (date) by Frank Rue, Director, Habitat and Restoration Division.

SUBSCRIBED AND SWORN TO before me this _____ day of _____, 1994

_____
Notary Public, State of Alaska
My commission expires: _____

STATE OF ALASKA
Department of Natural Resources

By: _____ Date: FEB. 15, 1994
Richard A. LeFebvre
Project Manager

ACKNOWLEDGMENT

STATE OF ALASKA)
FOURTH) ss.
~~THIRD~~ JUDICIAL DISTRICT)

The foregoing instrument was acknowledged before me this February 15, 1994 (date) by Richard A. LeFebvre, Project Manager, Department of Natural Resources

~~SUBSCRIBED AND SWORN TO before me this _____ day of _____, 1994~~

Christopher C Mullen
Notary Public, State of Alaska
My commission expires: 1-31-95

FAIRBANKS GOLD MINING, INC.
a Delaware corporation

By: Kenneth R Pohle
Kenneth R. Pohle
President

Date: Feb. 15, 1994

ACKNOWLEDGMENT

STATE OF ALASKA)
) ss.
FOURTH JUDICIAL DISTRICT)

The foregoing instrument was acknowledged before me this February 15, 1994 (date) by Kenneth R. Pohle, President of Fairbanks Gold Mining, Inc., a Delaware corporation, on behalf of the corporation.

Christopher C Mullen
Notary Public, State of Alaska
My commission expires: 1-31-95

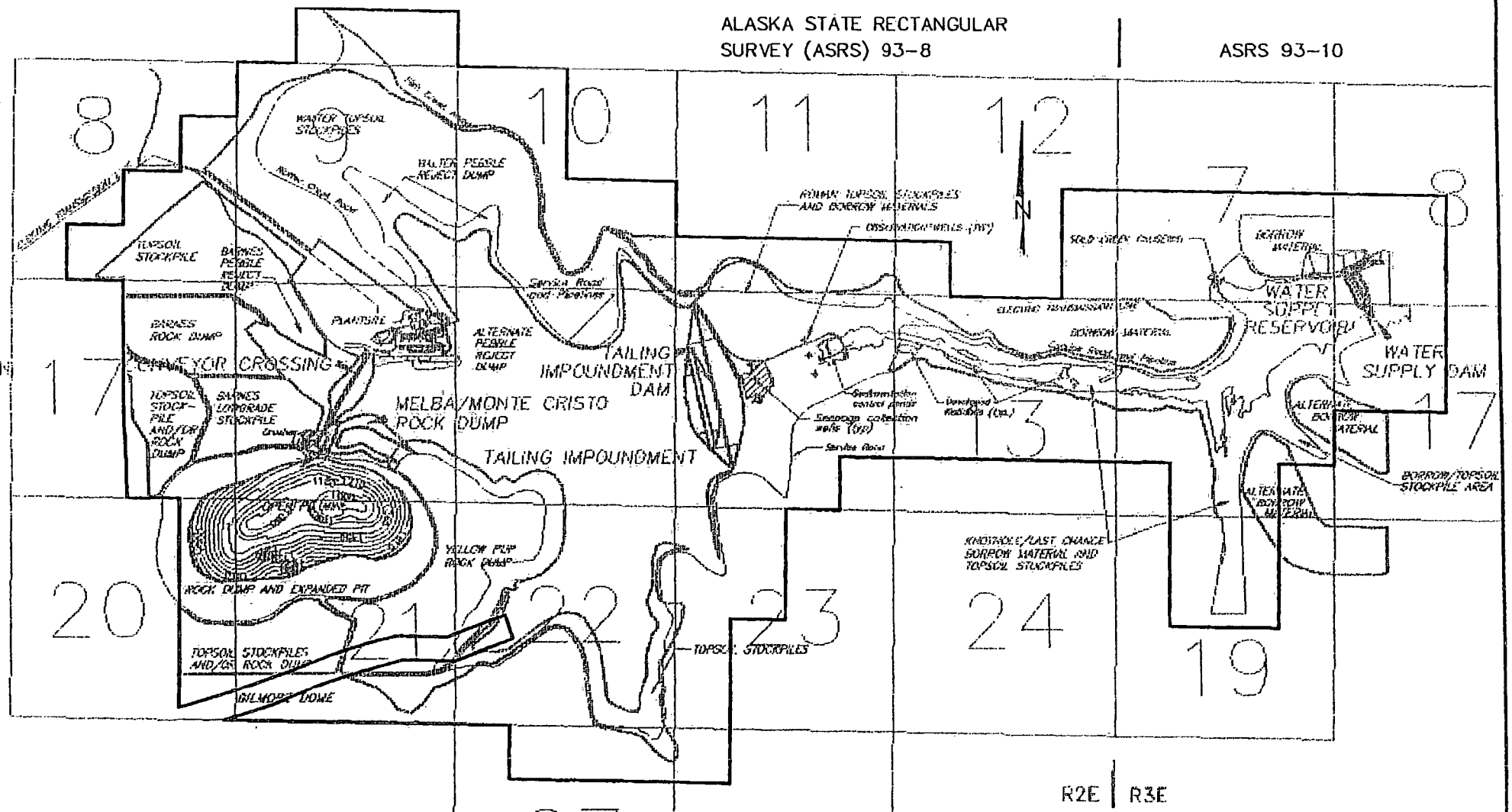
Exhibit "A"

Attached to and made part of the Agreement For Funding Post-Reclamation Obligations between Fairbanks Gold Mining, Inc. and the State of Alaska, Department of Natural Resources, Divisions of Land and Mining and the Department of Fish and Game dated February 15, 1994.

The Permit Area is that real property identified on the plat appended to this exhibit.

MILLSITE PERMIT AREA

ADL 414960
ADL 414961



FAIRBANKS GOLD MINING, INC.
FORT KNOX PROJECT
FAIRBANKS, ALASKA

MILLSITE PERMIT AREA
EXHIBIT A

DRAWING NUMBER	SCALE	DATE
MPEXHA.DWG	1" = 3500'	2/8/94

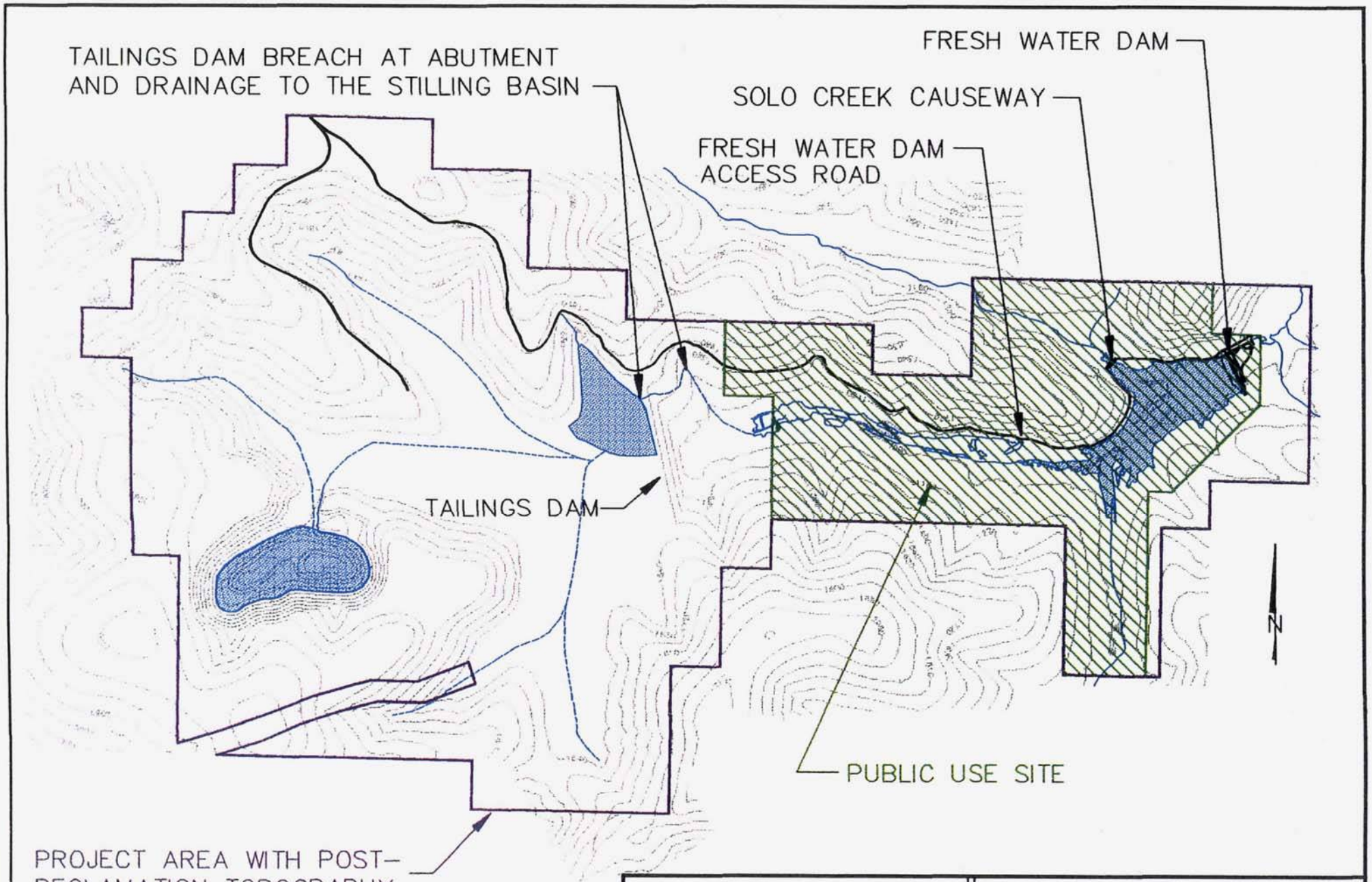
Exhibit "B"

Attached to and made part of the Agreement For Funding Post-Reclamation Obligations between Fairbanks Gold Mining, Inc. and the State of Alaska, Department of Natural Resources, Divisions of Land and Mining and the Department of Fish and Game dated February 15, 1994.

The Improvements are:

1. Fresh water dam
2. Fresh water dam access road
3. Solo Creek Causeway
4. Tailings dam
5. Tailings dam breach at abutment
6. Tailings dam drainage to the stilling basin
7. Such other roads as are necessary for access to the Improvements as determined by the parties upon implementation of this agreement.

The Improvements identified as 1 and 4 above are depicted on the plat attached to Exhibit A. The Improvements identified as 5 and 6 above are shown on the plat attached to Exhibit B. The Improvements identified as 2, 3, and 7 are not specifically identified on the plats attached to the Exhibits.



FAIRBANKS GOLD MINING, INC.
FORT KNOX PROJECT
FAIRBANKS, ALASKA

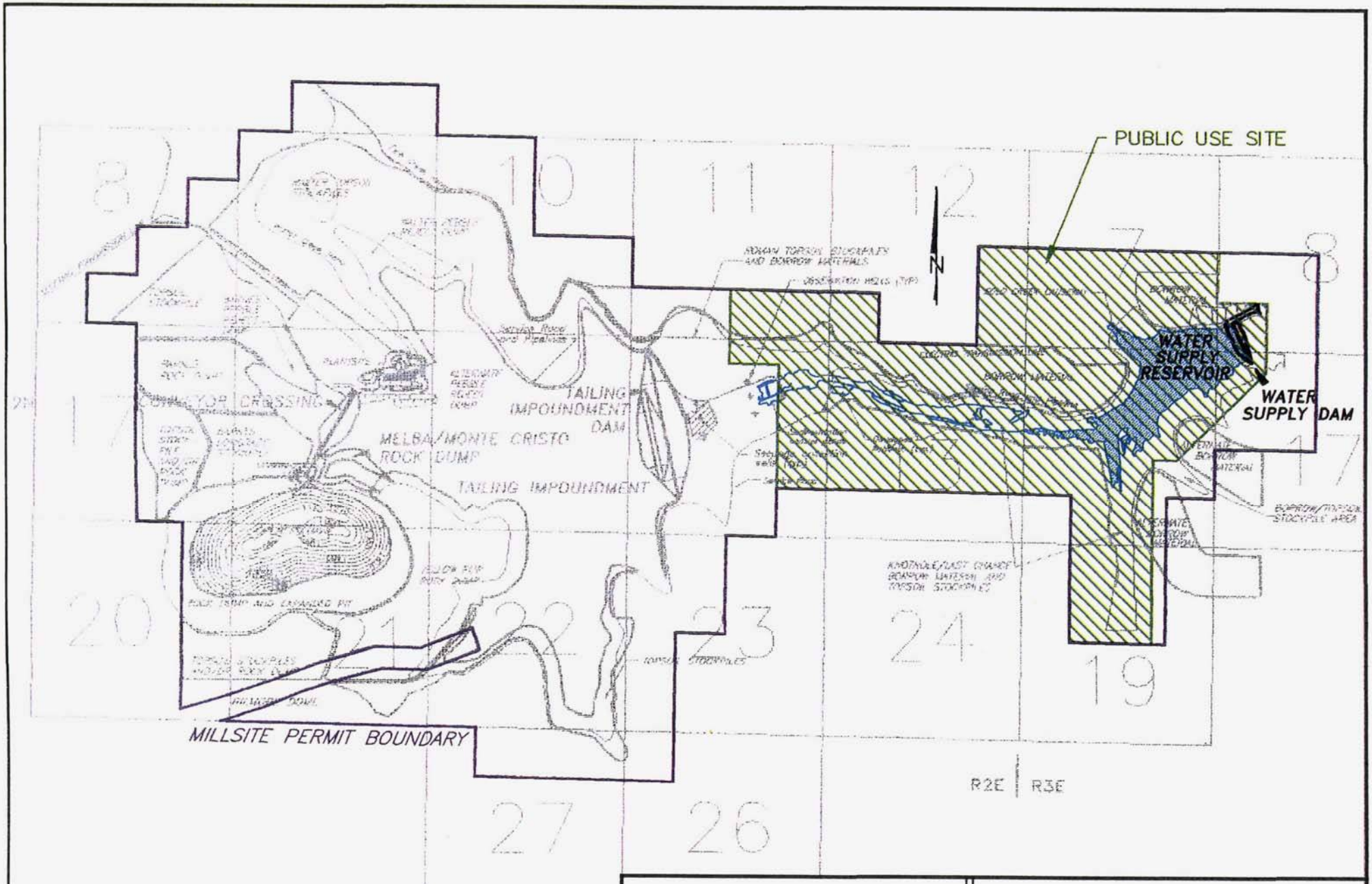
MANAGEMENT PLAN FOR PROJECT
EXHIBIT B

DRAWING NUMBER	SCALE	DATE
MPEXHB.DWG	1" = 3500'	2/15/94

Exhibit "C"

Attached to and made part of the Agreement For Funding Post-Reclamation Obligations between Fairbanks Gold Mining, Inc. and the State of Alaska, Department of Natural Resources, Divisions of Land and Mining and the Department of Fish and Game dated February 15TH, 1994.

That portion of the Permit Area desired as a Public Use Site by the parties is identified on the attachment to this exhibit.



FAIRBANKS GOLD MINING, INC.
FORT KNOX PROJECT
FAIRBANKS, ALASKA

PROPOSED PUBLIC USE SITE
(APPROX. 1820 ACRES)
EXHIBIT C

DRAWING NUMBER	SCALE	DATE
MPEXHC.DWG	1" = 3500'	2/15/94

Exhibit "D"

Attached to and made part of the Agreement For Funding Post-Reclamation Obligations between Fairbanks Gold Mining, Inc. and the State of Alaska, Department of Natural Resources, Divisions of Land and Mining and the Department of Fish and Game dated February 15, 1994.

[FTKNOX] A:LONGTERM.5

ESTIMATED LONG–TERM DAM MAINTENANCE SCHEDULE & COSTS

Item	Interval (frequency)	Unit	Price (US$/unit)	Quantity (units)	Cost (US$)	Cost Subtotals (US$)
Monitoring – Piezometer	3 per Year	HR	$40	6	$240	$720
Monitoring – Survey	2 per Year	HR	$100	8	$800	$1,600
Inspection & Evaluation	3 Years	LS	$2,333	1	$2,333	$2,333
Maintenance Supervision	1 per Year	HR	$47	16	$747	$747
Maintenance 140G Motor Grader	1 per Year	HR	$76.05	32	$2,434	$2,434
Maintenance 950F Loader	1 per Year	HR	$72.97	32	$2,335	$2,335
Maintenance D5H Dozer	1 per Year	HR	$66.37	32	$2,124	$2,124
Mobilize/Demobilize	1 per Year	LS	$750.00	1	$750	$750
Tax Return & Audit	1 per Year	LS	$1,000.00	1	$1,000	$1,000
Subtotal 1 Year						*$14,043*
Surface Water Monitoring & Labor	5 Years	LS	$1,100	1	$1,100	
Subtotal 5 Year						*$1,100*
Clean & Repair Weep Holes	10 Years	LS	$3,800	1	$3,800	
Subtotal 10 Year						*$3,800*
Repair/Replace Gate	30 Years	LS	$2,600	1	$2,600	
Subtotal 30 Year						*$2,600*
Install/Replace Outlet Insert	50 Years	FT	$52	565	$29,380	
Repair Spillway Concrete/Joints	50 Years	CY	$371	678	$251,353	
Repair Stilling Basin Concrete	50 Years	CY	$371	53	$19,478	
Repair/Replace Trash Racks	50 Years	LS	$3,140	1	$3,140	
Subtotal 50 Year						*$303,350*
Clean & Repair Dam Faces	100 Years	AC	$2,500	7	$17,500	
Subtotal 100 Year						*$17,500*
Other Maintenance	Unknown					
Subtotal Other						

ASSUMPTIONS:

1. Only routine maintenance is required, with trouble shooting completed during mine life (approximately 16 years).
2. Engineer/Piezometer Technician includes travel (2 hr.), recording piezometers (2 hr.), and inspect (2 hr.) tailing and water dams.
   Surveying includes travel (2 men @ 2 hr.), surveying (2 men @ 5 hr.), and note reduction and brief report (1 man @ 2 hr.).
3. Inspection includes analysis and report at 3 year intervals. (3*$2,333=$7,000 per inspection)
4. Equipment rates in the Fairbanks Mining District with salvage, interest, insurance, fuel, lube, tires, cutting edges, operator, fringe benifits, and ten percent profit.
5. Maintain 4000 feet of road, tailings diversion, stilling basins and causeways.
6. 380 weep holes, approximately 2 ft. each, redrill at $5.00 per foot.
7. Gate (intake) is rebuilt for new cost ($2,600 new cost).
8. Valve (outlet) is removed during reclamation ($14,500 new cost).
9. Repair trash racks (1256 lb.) at $2.50 per pound.
10. 28 in., SDR 32.5, 50 psi, HDPE Plexco outlet pipe insert ($40/ft new cost, $12/ft installation).
11. Remove ($71/cy) and replace ($300/cy) 25% of original spillway and stilling basin reinforced concrete.
12. Water monitoring occurs in years 5, 10, 15 and 20 only.

01/25/94 K. Brown

Appendix C – Surface and Mineral Land Descriptions and Claims Maps

STATE UPLAND MINING LEASES

"DIT" LEASE – 2013 PAYMENT = $425.-

ADL 528271
100.0 acres

This lease expires on 8/31/2019 and was recorded in Book 667, Pages 914-922 on 6/22/1990.

FORMER CLAIMS:

DIT 1	ADL 509517
DIT 2	ADL 509518
DIT 3	ADL 509519

"FT. KNOX" LEASE

ADL 535408, 1,183.5 acres.
This lease expires 2/14/2014, it can be extended.

PAYMENT HISTORY:

A double payment of $5,030 was made on 8/31/2010, and therefore DNR did not bill FGMI for the rent in 2012. Per advice of counsel Joe Perkins, an extra payment of $5,030 was made to DNR on 11/29/2012.

The issue of refunds and lease payments should be settled between DNR, FGMI, and the Mental Health Trust. See details on pages 142-146.

FORMER CLAIMS:

DISCOVERY YELLOW PUP	ADL 323728
YELLOW PUP #15	ADL 320607
YELLOW PUP #16	ADL 319075
FORT KNOX # 5	ADL 321080
FORT KNOX # 6	ADL 321081
FORT KNOX # 7	ADL 321082
FORT KNOX # 8	ADL 321083
FORT KNOX # 9	ADL 321084
FORT KNOX # 11	ADL 321086
FORT KNOX # 12	ADL 321087
FORT KNOX # 13	ADL 321088
FORT KNOX # 14	ADL 321089
FORT KNOX # 15	ADL 321090
FORT KNOX # 16	ADL 321091

"FT. KNOX" LEASE ADL 535408 (continued)

FORMER CLAIMS:

FORT KNOX # 17	ADL 321092
FORT KNOX # 18	ADL 321093
FORT KNOX # 19	ADL 321094
FORT KNOX # 20	ADL 321095
FORT KNOX # 21	ADL 321096
FORT KNOX # 30	ADL 352816
FORT KNOX # 31	ADL 352817
FORT KNOX # 32	ADL 530898
FORT KNOX # 33	ADL 530899
FORT KNOX # 34	ADL 352820
FORT KNOX # 35	ADL 352821
FORT KNOX # 38	ADL 352824
FORT KNOX # 39	ADL 352825
FORT KNOX # 40	ADL 352826
FORT KNOX # 41	ADL 352827
FORT KNOX # 42	ADL 352828
FORT KNOX # 43	ADL 352829
FORT KNOX # 44	ADL 352830
FORT KNOX # 45	ADL 352831
FORT KNOX # 46	ADL 352832
FORT KNOX # 47	ADL 352833
FORT KNOX # 48	ADL 352834
FORT KNOX # 49	ADL 352835
FORT KNOX # 52	ADL 530902
FORT KNOX # 53	ADL 352839
FNE 93	ADL 527279
FNE 94	ADL 527280
FNE 95	ADL 527281
FNE 96	ADL 527282
FNE 97	ADL 527283
FNE 98	ADL 527284
FNE 99	ADL 527285
NA 600A	ADL 531613
FORT KNOX 31	ADL 352817
FORT KNOX 32	ADL 530898
FORT KNOX 33	ADL 530899

"FT. KNOX" LEASE ADL 535408 (continued)

FORMER CLAIMS:

FORT KNOX 36
JJP 31
JJP 32
JJP 33

ADL 530900
ADL 559460
ADL 559461
ADL 559462

Quitclaim Deed. On May 22, 2008, FGMI purchased from the Alaska Mental Health Trust Authority the surface estate of Tracts C-2, C-3, and Parcel A (1,771.91 acres) as recorded in Fairbanks Document 2008-011345-0.

MILLSITE PERMIT ADL 414960 (STATE LAND)

Issued by: The Millsite Permit was issued by DNR on February 15, 1994.

Expiration: 2/15/2024

Land: 5,796.56 acres. Note that DNR's Case Abstract dated 1/10/2012 does not reflect the increased acreage of 31.733 acres by the addition of parcel Z as described in the Second Amendment.

Payment: $81,120.00 by Feb 15. (Combined payment includes ADL 414961).

History: The original document was recorded on March 24, 1994 in Fairbanks Book 846, Pages 123 – 176 and includes both Millsite Permit ADL 414960 (for the non-Mental Health Trust lands) and Millsite Permit ADL 414961 (for the Mental Health Trust lands).

Amended and restated Millsite Lease effective January 1, 2002 (un-recorded).

Addendum to above restated Millsite Lease dated July 3, 2007 (un-recorded).

The First Amendment to this Millsite Permit was recorded in Fairbanks Recording District on November 12, 2008 as Document 2008-022517-0 and pertains to Parcels A and B within Millsite Permit ADL 414961 (Documents 2008-005820-0).

The Second Amendment to the Millsite Lease was recorded in Fairbanks Recording District on June 3, 2011 as Document 2011-009684-0. This amendment adds Parcel Z (31.733 acres) to the Millsite Lease. Parcel Z is located in the NW ¼ of Sec. 17, T2N R2E, and was TA'ed to state ownership on May 25, 2011 and recorded as Fairbanks Document 2011-009818-0 on June 6, 2011.

Within Parcel Z are claims NA 900 (ADL 527224) and NA 901 (ADL 527225). Rent of $45 for each of these two claims were paid on October 30, 2012 to keep the claims current through September 1, 2013. As of January 8, 2013 DNR's records still incorrectly show these claims as state selected.

MILLSITE PERMIT ADL 414961 (MHT LANDS)

Issued by: The Millsite Permit was issued by DNR on February 15, 1994, and closed in DNR's records as of 11/18/2008. **Reason:** Parcel sold to lessee (FGMI), lease terminated upon purchase per Mike Franger (MHT).

UPLAND MINING LEASE ADL 535408

Issued by: This Upland Mining Lease was issued by DNR on February 15, 1994.

Expiration: February 15, 2014 unless the lease is timely extended.

Land: With the addition of Parcel A (62.954 acres) and the deletion of Parcel B (19.055 acres) the lease is currently at 1,183.5 acres (at $4.25/acres).

Payment: Normally $5,030.- by September 1. However, a double payment of $5,030 was made on 8/31/2010 and another payment of $5,030 made on 8/30/2011. Since no rent was owed for 2012, DNR did not bill FGMI for the rent in 2012. Nevertheless, per advice of counsel Perkins a payment of $3,050 was made to DNR on 11/29/2012. This payment issue needs to be settled between DNR, Mental Health Trust, and FGMI.

History: The original document was recorded in the Fairbanks Recording District on March 24, 1994 in Book 846, Pages 101 – 122. Page 117 shows the location of the Upland Mining Lease within Millsite Permit boundary, and page 118 shows the location of the individual mining claims (both pages are attached).

Amended and restated Millsite Lease effective January 1, 2002 (un-recorded).

Addendum to above restated Millsite Lease dated July 3, 2007 (un-recorded).

The entire Tract C was patented to the State of Alaska on November 28, 2007 (patent No. 50-2008-0087) and recorded as Fairbanks Document 2007-029412-0.

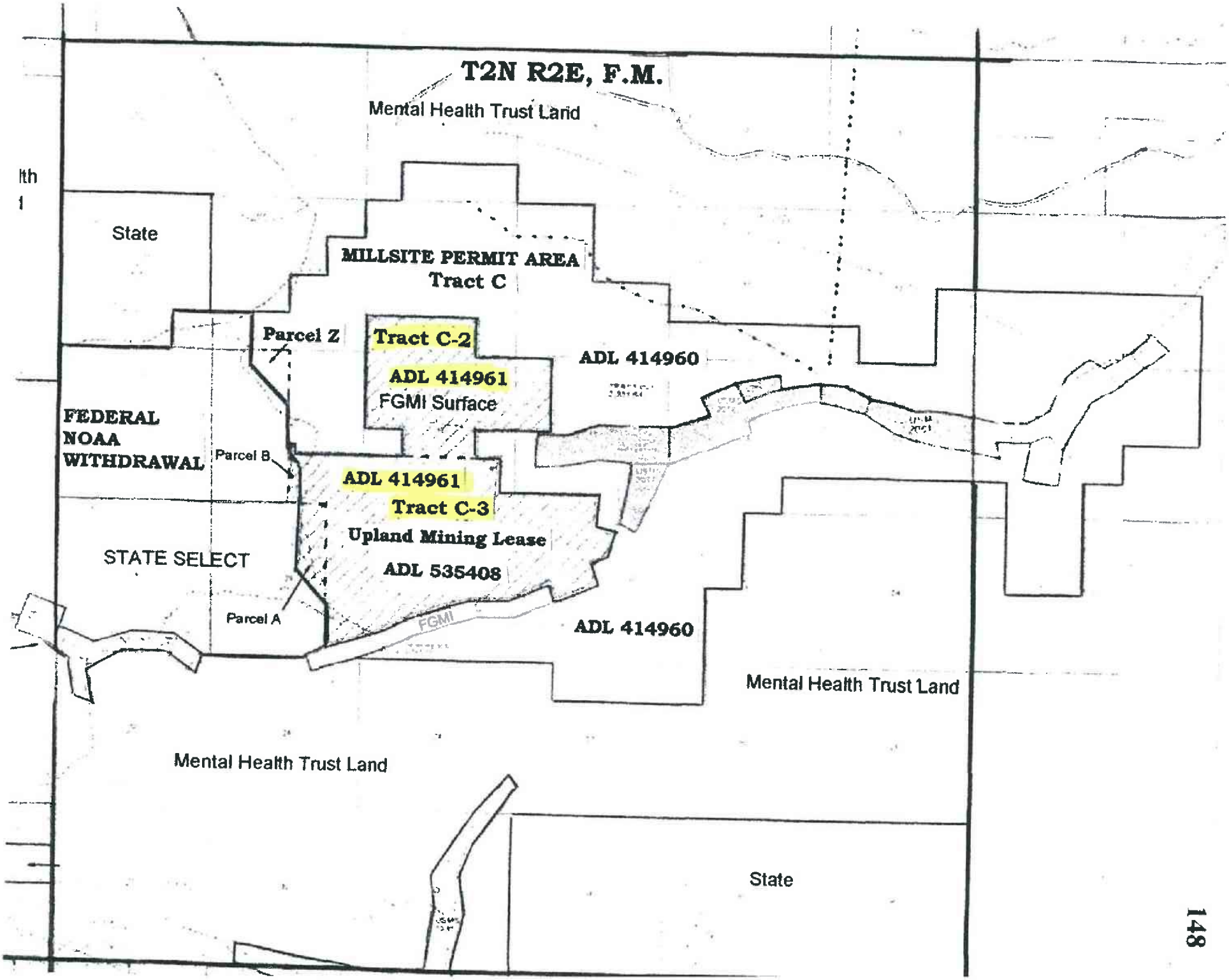
The First Amendment to this Lease was recorded in Fairbanks Recording District on November 12, 2008 as Document 2008-022516-0. In this document:

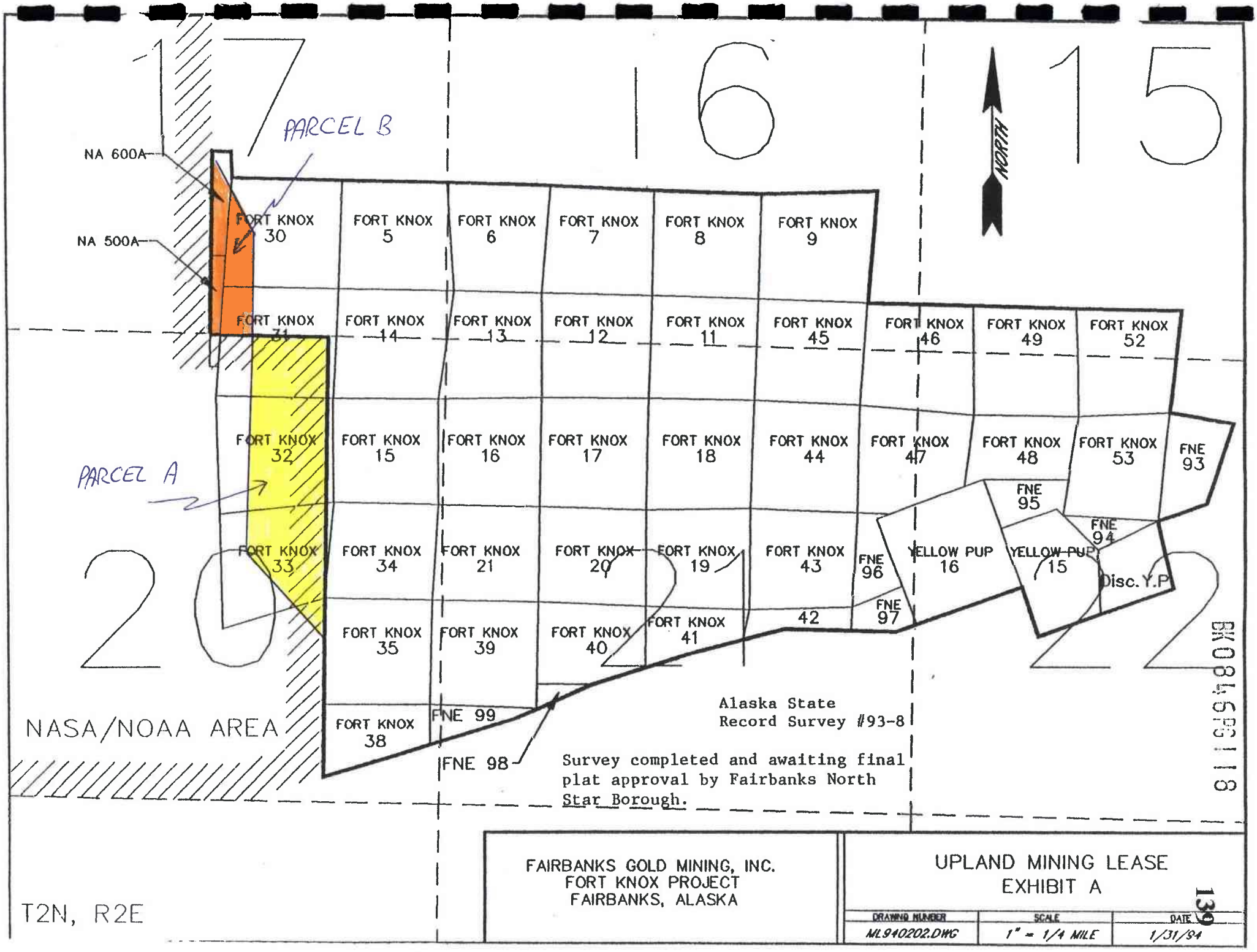
1) DNR conveyed all of its interest in the Lease to the Alaska Mental Health Trust.

2) Parcel A (62.954 acres) is added to the lease.

3) Parcel B (19.055 acres) is deleted from the lease.

Parcel A was TA'ed to the state on January 15, 2008 and recorded on January 22, 2008 as Document 2008-001083-0. This parcel was subsequently conveyed from DNR to the Alaska Mental Health Trust Authority on March 28, 2008 and recorded as Document 2008-005820-0.


T2N R2E, F.M.
Mental Health Trust Land
State
MILLSITE PERMIT AREA
Tract C
Parcel Z
Tract C-2
ADL 414961
FGMI Surface
ADL 414960
FEDERAL
NOAA
WITHDRAWAL
Parcel B
ADL 414961
Tract C-3
Upland Mining Lease
ADL 535408
STATE SELECT
Parcel A
FGMI
ADL 414960
Mental Health Trust Land
Mental Health Trust Land
State



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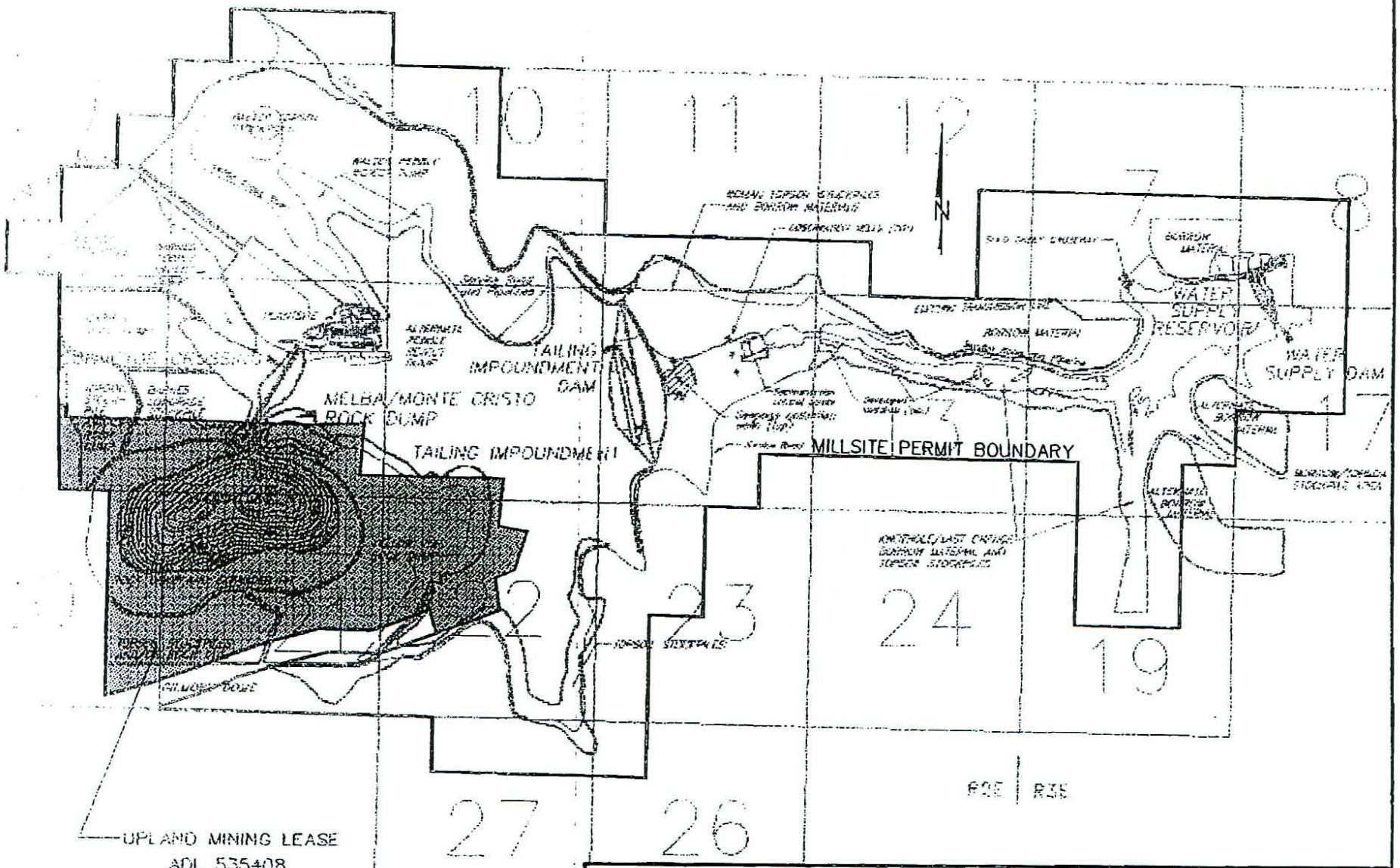


FAIRBANKS GOLD MINING, INC.
FORT KNOX PROJECT
FAIRBANKS, ALASKA

UPLAND MINING LEASE
EXHIBIT A

DRAWING NUMBER	SCALE	DATE
UPLEASE.DWG	1" = 3500'	2/15/94

State of Alaska
Alaska Mental Health Trust Authority
Quitclaim Deed

Record this document in the
Fairbanks Recording District

No. 676

The GRANTOR, the **ALASKA MENTAL HEALTH TRUST AUTHORITY**, a public corporation within the Department of Revenue (AS 47.30.011 et seq.), by its agent pursuant to AS 37.14.009(a)(2), the Alaska Mental Health Trust Land Office, Department of Natural Resources, whose address is 2600 Cordova Street, Suite 100, Anchorage, AK 99503, pursuant to AS 38.05.801 and regulations promulgated thereunder, for TEN AND NO/100 DOLLARS and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, hereby conveys and quitclaims to the GRANTEE, **FAIRBANKS GOLD MINING, INC.**, without warranty, all right, title and interest of the Grantor, if any, in the following described real property situated in Sections 4, 5, and 8, Township 2 North, Range 2 East, Fairbanks Meridian, in the Fairbanks Recording District, Fourth Judicial District, State of Alaska, and more particularly described as follows:

SW1/4SW1/4 SECTION 4; S1/2SE1/4 SECTION 5; AND N1/2NE1/4, SW1/4NE1/4, NE1/4SW1/4 SECTION 8, TOWNSHIP 2 NORTH, RANGE 2 EAST, FAIRBANKS MERIDIAN CONTAINING 280 ACRES, MORE OR LESS.

TOGETHER with all the tenements thereon, if any; and all rights of the Grantor to any and all hereditaments and appurtenances thereto belonging or in anyway appertaining.

SUBJECT to valid existing rights, including reservations, easements, and exceptions in the U.S. Patent or other state or federal conveyance, and in acts authorizing the issue thereof; easements, rights-of-way, covenants, conditions, reservations, notes on the plat, and restrictions of record, if any; and encumbrances or interests of record noted on the records maintained by the Department of Natural Resources, or otherwise existing on or before June 24, 1994, the date that the land was designated as Mental Health Trust Land pursuant to Section 40, Chapter 5 FSSLA 1994, as amended by Chapter 1, SSSLA 1994.

In particular, the property is encumbered by upland mining lease MHT 9400275 in SW1/4SW1/4 Section 4 and S1/2SE1/4 Section 5, and state mining claims ADL 321158, 321159, 321165, and 321169 in N1/2NE1/4, SW1/4NE1/4. NE1/4SW1/4 Section 6, Township 2 North, Range 2 East, Fairbanks Meridian.

The Grantor hereby expressly saves, excepts and reserves out of the grant hereby made, unto itself, its lessees, successors, and assigns forever, all oils, gases, coal, ores, minerals, fissionable materials, geothermal resources, and fossils of every name, kind or description, and which may be in or upon said land above described, or any part thereof, and the right to explore the same for such oils, gases, coal, ores, minerals, fissionable material, geothermal resources and fossils. The Grantor also hereby expressly saves and reserves out of the grant hereby made, unto itself, its lessees, successors, and assigns forever, the right to enter by itself, its or their agents, attorneys, and servants upon said land, or any part of parts thereof, at any and all times for the purpose of opening, developing, drilling and working mines or wells on these or other land and taking out and removing therefrom all such oils, gases, coal, ores, minerals, fissionable materials, geothermal resources, and fossils, and to that end it further expressly reserves out of the grant hereby made, unto itself, its lessees, successors, and assigns forever, the right by its or their agents, servants and attorneys at any and all times to erect, construct maintain, and use all such buildings, machinery, roads, pipelines, power lines, and railroads, sink such shafts, drill such wells, remove such soil, and to remain on said land or any part thereof for the foregoing purposes and to occupy as much of said land as may be necessary or convenient for such purposes, hereby expressly reserving to itself, its lessees, successors, and assigns, as aforesaid, generally all rights and power in, to and over said land, whether herein expressed or not, reasonably necessary or convenient to render beneficial and efficient the complete enjoyment of the property and rights hereby expressly reserved.

Executed this 14th day of December, 2012

GRANTOR: **ALASKA MENTAL HEALTH TRUST AUTHORITY**

By: M. Menefee

Marcie Menefee, Deputy Director
Alaska Mental Health Trust Land Office

STATE OF ALASKA)
) ss.
THIRD JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this 14th day of December, 2012, personally appeared Marcie Menefee, known to me to be the Deputy Director of the Trust Land Office, and who acknowledged to me that she executed the foregoing instrument, on behalf of the Trust Land Office, as agent for the Alaska Mental Health Trust Authority, freely and voluntarily and for the purposes therein stated.

Witness my hand and official seal the day and year in this certificate first above written.

ANNA M. SOLORZANO
My Commission Expires
NOTARY PUBLIC
With Office
STATE OF ALASKA

Notary Public for the State of Alaska
My Commission Expires: w/office

MHT QCD
MHT 9400441
Parcel No. F70015 (portion)

Location Index:

Official State Business – NO CHARGE

AFTER RECORDING, RETURN DOCUMENTS TO:

ORIGINAL TO GRANTEE:

Fairbanks Gold Mining, Inc.
P.O. Box 73726
Fairbanks, Alaska 99707

CERTIFIED COPIES TO:

Trust Land Office
2600 Cordova Street, Suite 100,
Anchorage, AK 99503

ccc

A L A S K A

2012-025893-0 12

Recording Dist: 401 - Fairbanks
12/19/2012 1:17 PM Pages: 1 of 4

THIS COVER SHEET HAS BEEN ADDED TO THIS DOCUMENT TO PROVIDE SPACE FOR THE RECORDING DATA. THIS COVER SHEET APPEARS AS THE FIRST PAGE OF THE DOCUMENT IN THE OFFICIAL PUBLIC RECORD.

DO NOT DETACH

August 23, 2001

Ownership
TOWNSHIP 2N RANGE 2E OF THE FAIRBANKS MERIDIAN, ALASKA

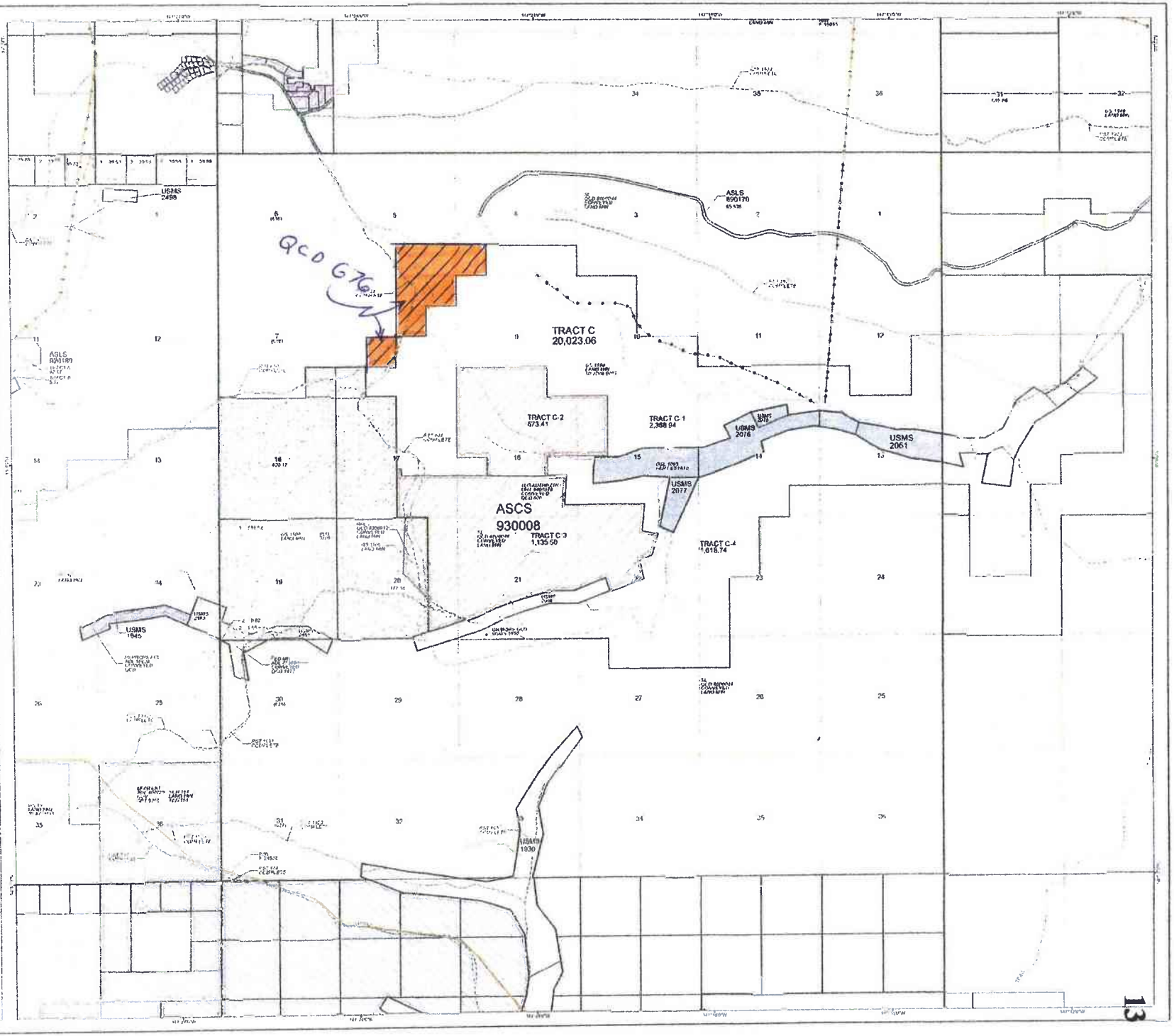
Alaska State Plane Zone 3
North American Datum 1983
1:31,680
1 inch equals 2,640 feet

State Tentatively Approved or Patented Land
Other State Acquired Land
State Selected Land
ANILCA Top Filed Land
Navigable Water
RS2477 Route

Mental Health Trust Land
Municipal Entitlement and Municipal Tideland
Native Allotment
Other Federal Action
Management Right
Agreement, Settlement, or Reconveyance
Land Disposal

Highway
Secondary Road
Trail
Railroad
Electrical
Telephone
Pipeline
Borough Boundary
Recording District
Conservation System Unit
Incorporated City Boundary
Protracted Section Line
National Geodetic Survey Monument
State Control Survey Monument
State and Federal Survey Monument
Airstrip
Survey Boundary
Hydrography
Alaska Seaward Boundary

Vicinity Map



A PRODUCT OF THE
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
LAND RECORDS INFORMATION SECTION

GRAPHIC ILLUSTRATION ONLY.
SOURCE DOCUMENTS REMAIN THE OFFICIAL RECORD.

PUBLISHED DATE 3-6-2009 REFER TO

FOR NEW PENDING ACTIONS AFFECTING THIS MAP

CHECKED BY Reyanldo Lovanig

APPENDIX D

Gil Causeway Reclamation Plan

FAIRBANKS GOLD MINING, INC.

a subsidiary of

KINROSS GOLD CORP.

FORT KNOX MINE

March 29, 2001

Mr. Alvin G. Ott
Regional Supervisor, Habitat Division
Alaska Department of Fish & Game
1300 College Road
Fairbanks, AK 99701-1599

RE: Gil Causeway Reclamation Plan

Dear Mr. Ott:

Fairbanks Gold Mining, Inc. (FGMI) constructed and currently maintains the Gil Causeway through the water storage reservoir (WSR) as authorized by the Alaska Department of Fish and Game (ADF&G) in Fish Habitat Permit FG98-III-0109. Fish Habitat Permit FG98-III-0109 has been amended four times to allow for additional culverts being placed in the causeway. Currently the causeway contains a 78-inch diameter culvert at approximately elevation 1007 M.S.E., two 48-inch culverts at the 1016 elevation, and one 10-foot culvert at the 1010 elevation. The road elevation is currently constructed to the 1022 elevation where it crosses the old Fish Creek channel. This letter is being submitted to fulfill the requirements of Fish Habitat Permit FG98-III-0109 requiring FGMI to submit a rehabilitation plan for the causeway. FGMI currently intends to use the causeway for several more years to facilitate ongoing exploration drilling at the Gil project. ADF&G will be given a minimum of 30 days advance notice prior to rehabilitation work commencing at the Gil causeway.

The Fort Knox Mine location is shown on the attached Figure 1. Figure 2 shows the location of the Gil Causeway in relation to the WSR, developed wetlands, tailing impoundment, and the Fort Knox mining/milling operation. FGMI will remove the existing culverts from the causeway and restore the original Fish Creek channel as nearly as can be replicated while working below the water level in the reservoir. FGMI intends to remove the soil in the causeway, near the 78-inch culvert, to the lowest level possible using a CAT 350 track mounted excavator, bottom of the channel is expected to be at approximately the 1007 elevation. By removing the soil in the vicinity of the 78-inch culvert, FGMI will re-establish fish passage through the causeway in the area of the old Fish Creek channel. The slopes of the excavation required to re-establish the Fish Creek drainage would be constructed at a maximum of 3 horizontal to 1 vertical. A cross section showing the proposed excavation of the

P.O. Box 73726 • #1 Fort Knox Road • Fairbanks, Alaska 99707-3726 USA
Telephone: (907) 488-4653 • Facsimile: (907) 490-2290

causeway in the vicinity of the 78-inch culvert has been included as Figure 3. Material removed from the causeway will be placed along the remaining portions of the causeway to create additional shoreline. Once the excavated material has dried sufficiently, final contouring of the material will commence, followed by contour ripping of the area and seeding, if required, with the approved FGMI seed mix.

Safety Berms along the existing roadway above the high water mark will be graded to blend into existing topography. The road surface will be ripped on the contour to provide a suitable seed bed and the roads seeded with the approved FGMI seed mix. Broadcast seeding methods will be utilized for both the excavated material and the roadways with an application rate of 11 pounds per acre.

To clarify the sequence of reclamation activities, FGMI will begin the reclamation process by removing the ten-foot diameter culvert, re-contouring the area on the south side of the causeway up to the 78-inch culvert, ripping the area and roadway as needed, and broadcast seeding as required. Removal of the 78-inch culvert and excavation of the soil in the causeway would follow completion of the reclamation on the south side of the causeway. The material excavated would be placed along the existing roadway north and west of the 78-inch culvert. Following the excavation of the causeway near the existing 78-inch culvert, the two 48-inch culverts would be removed and the excavated area backfilled. The excavated material would be allowed to dry and graded in conjunction with the surrounding area, ripped on the contour, and seeded as required.

FGMI appreciates the assistance and cooperation the Alaska Department of Fish and Game has rendered in developing the fishery in the Water Storage Reservoir and developed wetlands, along with the wildlife and waterfowl habitat in these areas. FGMI anticipates a continued cooperative effort through operation and reclamation of the Fort Knox Mine site. If you have any questions or require additional information, please call me at (907) 488-4653.

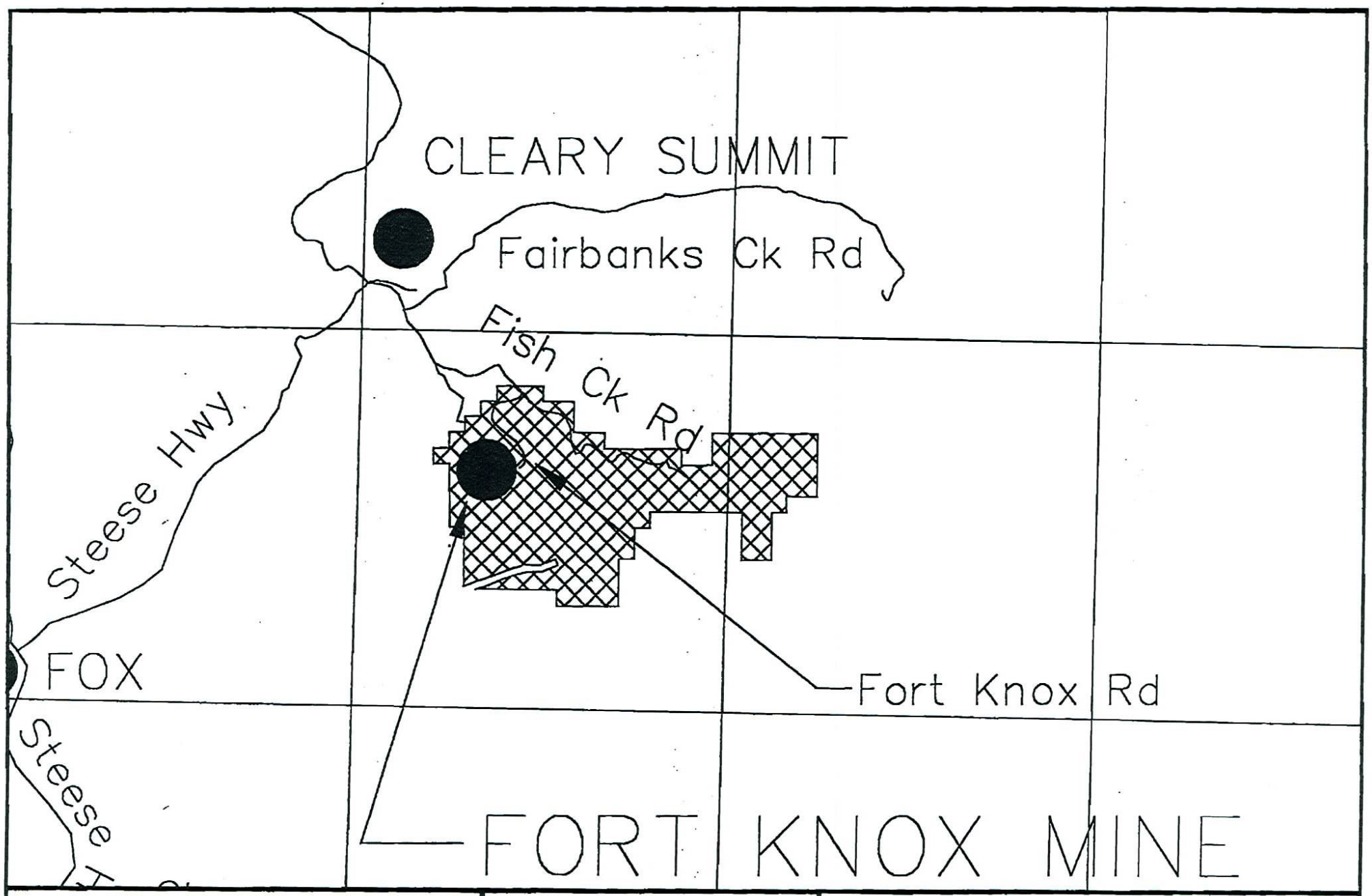
Respectfully,

Clyde D. Gillespie

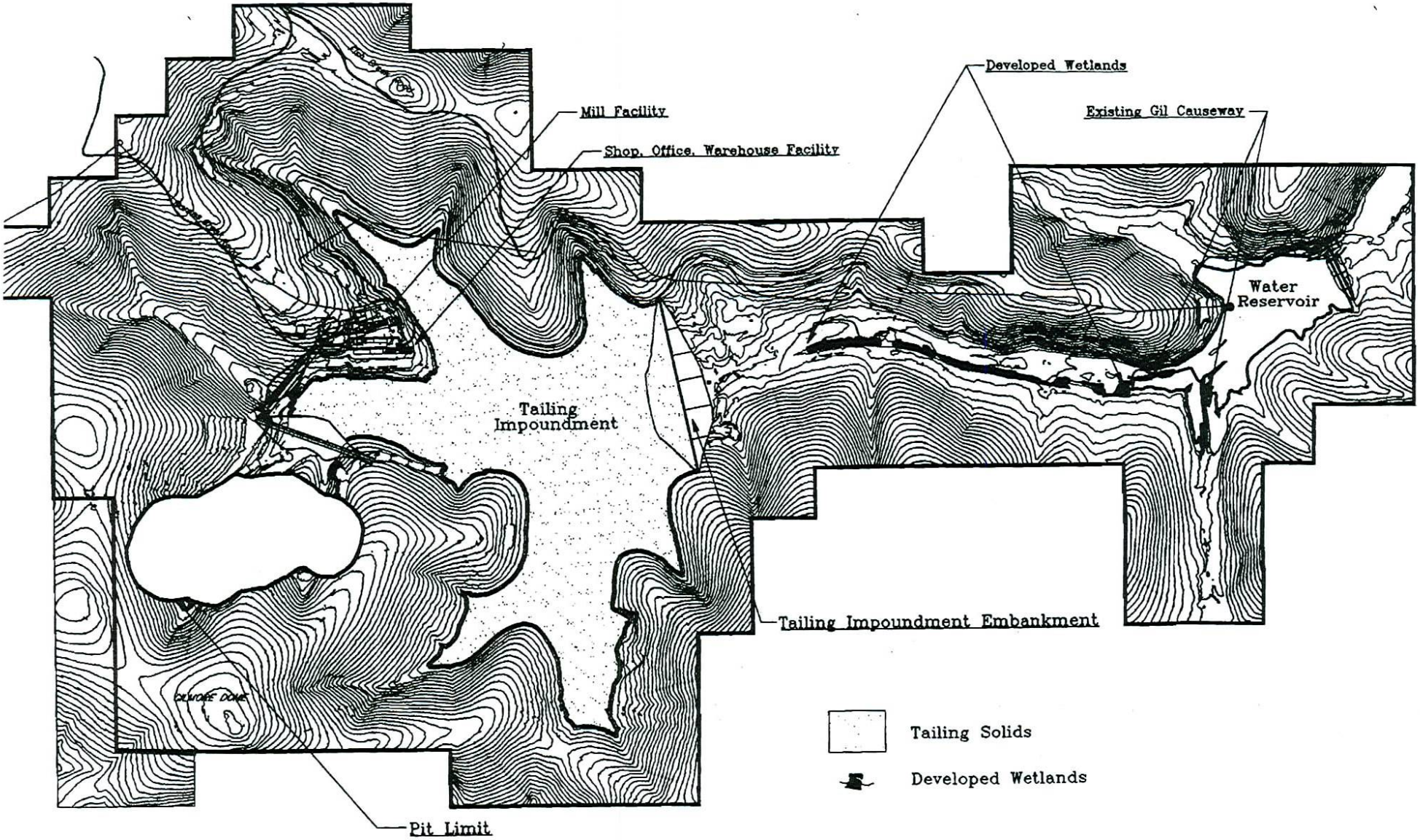
Clyde D. Gillespie
Senior Environmental Engineer

xc: (with attachments)
Steve Planchon, ADNR, Mental Health Land Trust Unit, Anchorage
Richard LeFebvre, ADNR, Division of Land, Anchorage
Bob Loeffler, ADNR, Division of Mining & Water Management, Anchorage

Jim Voden, ADNR, Division of Mining & Water Management , Fairbanks
Pete McGee, ADEC, Fairbanks
Leroy Phillips, U.S. Army Corps of Engineer, Fairbanks
Cindi Godsey, U.S. Environmental Protection Agency, Anchorage
Keith Mueller, U. S. Fish & Wildlife Service, Fairbanks
Rick Baker, FGMI
Bob Farneski, FGMI
Tom Irwin, FGMI
Bill Jeffress, FGMI
Doug Nicholson, FGMI
Dawn Sofich, FGMI
Warren Woods, FGMI



Fairbanks Gold Mining, Inc. a subsidiary of Kinross Gold U.S.A. Inc.	Fort Knox Mine	FORT KNOX MINE SITE LOCATION MAP
	Dwg:ftkxloc.dwg	Date:3/12/01 Scale:1"=30,000' Figure 1

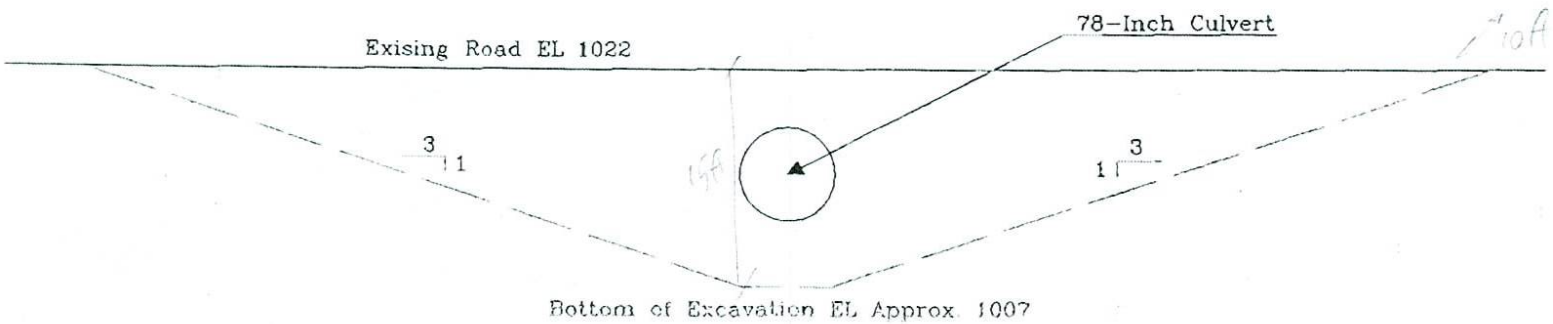


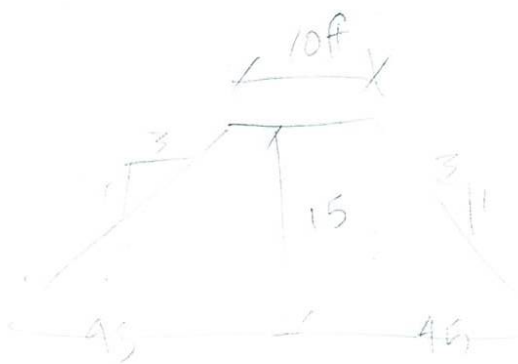
FORT KNOX MINE
GIL CAUSEWAY REHABILITATION

Fort Knox Mine

Fairbanks Gold Mining, Inc.

Gil Causeway Channel Excavation





1022
1010
12

30 10 30

FORT KNOX MINE
GIL CAUSEWAY REHABILITATION

Date:03/28/01, Scale: 1" = 10' Figure 3

Fort Knox Mine

Fairbanks Gold Mining, Inc.
Kinross Gold U.S.A., Inc.

Appendix E – TSF Spillway Concept Design

This calculation describes the hydrology design for the Tailings Storage Facility (TSF) spillway. The TSF is designed to be a no-discharge facility during the operational life of the mine. Current closure plans for the site indicate that the spillway will be constructed after heap leach activities cease and the heap leach facility has been reclaimed.

The design of the spillway has been developed from final tailings deposition drawings provided by Knight Piesold on December 1, 2010, shown in Figure A.1.

OBJECTIVES:

The design of the spillway is intended to provide a feasibility level design that is suitable for the Fort Knox mine reclamation plan and can be used as a basis for bond assurance calculations. The final pool geometry, embankment height and downstream topography are expected to change during the course of mine operations and final design must be re-evaluated at closure and detailed design engineering developed at that time.

The spillway is expected to optimize a number of objectives without compromising dam safety. The optimization of these objectives is reflective of closure design goals as well. Key objectives are listed below:

- Pass the design storm below the dam seal zone with adequate freeboard,
- Prevent erosion of the spillway and associated conveyance channels while routing the design storm over the embankment and abutments,
- Minimize the volume of water retained behind the dam during normal conditions to reduce the consequences of dam failure,
- Reduce construction costs associated with earthworks and erosion protection in the spillway and outlet channels,
- Provide a spillway structure that will not require frequent and intensive maintenance,
- Maximize the surface area of the pool to protect and stabilize the surface of the tailings, and
- Maximize the pool perimeter to provide areas suitable for wetlands development.

APPROACH:

The design of the spillway was performed using hydraulic modeling tools with inputs developed from the current and anticipated conditions at the mine. The anticipated final deposition plan of the tailings embankment and proposed spillway structures were used to construct a simulation in USACE Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS). The peak flows output by this model were used to determine the hydraulic performance of spillway and various channels and erosion protections specified by the design. A discussion of the individual methods used is presented in the calculations section below.

The cross connection channel between the South Tailings pond and North Tailings pond (Figure 1) was assumed to be a flat channel that would allow bi-direction flow. In the model, the cross connection channel will act as a normal broad crested weir when the stage in the South Tailings pool is higher than that in the North. When the reverse is true, there will be backflow through the spillway, which is not supported by the HEC-HMS model. This behavior was simulated in the HEC-HMS by recording the flow from the North Tailings pool through an auxiliary spillway to a sink element and providing a matching

inflow to the South Tailings pool from a source element, thus preventing a circular loop in the flow schematic while simulating the bi-directional flow of the connection channel.

Simulating the behavior of the spillway flow from the South to the North required the stage of the North Tailings pool to act as the tailwater for discharge from the South, while the stage of the South Tailings pool was required to act as the tailwater for the auxiliary discharge from the North. The model was iteratively run while recording the stages of the both tailings pools and the outflow from the auxiliary spillway. These recordings were used as input to determine the spillway flows for the next iteration. The process was repeated until there was no discernable change in the water surface elevations between iterations.

The rockfill jetty separating the North TSF pool from the Barge pool will be breached at the time of the spillway development. The Jetty will be breached to allow storm flows to pass unimpeded from the North TSF pool through the Barge pond to the spillway. A simulation incorporating the Barge Jetty breach with tailwater impacts was incorporated into the HEC-HMS, but with a 70 foot wide spillway the elevation drop across the jetty was found to be negligible and the two ponds were combined with no discernable change in the performance of the primary spillway.

The spillway is designed to convey the peak flow resulting from design storm event with a maximum water surface elevation below the dam seal zone (elevation 1540 ft), assuming that the TSF reservoir is full to one foot above spillway invert elevation at the time of the storm event to account for blockage from ice, snow, or other debris

ASSUMPTIONS:

- 100-year, 24-hour rainfall event equals 3.6 inches (Halepaska 1992b).
- PMP, 24-hour rainfall event equals 11.2 inches as shown on Figure A-2 (Miller 1963). The Design IDF curve was increased by 25% (to 14.0 inches) to account for the use of the SCS unit hydrograph method, which was developed using smaller storm events (USACE 1991).
- SCS Type I rainfall synthetic distribution as shown on Figure A-3 (USSCS 1986).
- SCS Curve Number (CN) = 70 for undisturbed woods in good condition and HSG B, CN = 65 for brush, forbs and grass in good condition HSG C, and CN = 100 for open water (Haan 1994).
- Initial Abstraction = 1 inch (Dames & Moore 1991).
- Manning's Roughness (n) = 0.040 for riprap channel lining.
- The water elevation in the North Tailings pond is full to the spillway elevation plus one foot of impounded water due to potential for spillway blockage caused by ice or debris (one foot of impounded water above spillway elevation at the time of the design storm).
- Water elevation in the pit lake was set to 1620 ft.
- Water elevation in the South Tailings pond is set to equal the elevation in the North tailings pond.
- A constant spring melt flow of 16 cfs is entering the impoundment.

CALCULATIONS:

The peak flow resulting from the Design storm event was calculated using the 14-inch adjusted PMP event was modeled using the USACE Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) computer program. Basins were delineated within the site as shown on Figure A.1.

The PMP storm event was routed through the watershed sub-basins using the unit hydrograph method and Muskingum-Cunge routing. Time of concentration (T_C) was estimated by adding the travel time along the hydraulic length for sheet and shallow concentrated flow to the travel time for portions of the hydraulic length dominated by channel flow. The channel flow length was estimated by applying Manning's equation, while the travel time for sheet and shallow concentrated flow was estimated by multiplying flow length by calculated flow velocity using the TR-55 method (USDA 1986). Lag time (T_L) was calculated as 0.6 times T_C.

Basin areas, lag time, and curve numbers (CNs) were entered into HEC-HMS modeling software version 3.4 (USACE 2009) and routed to calculate the peak flow, volume, and water surface elevation for the site facilities. The model was used to predict the attenuation of the design storm through the tailings pool and predict peak flow, elevations and storage in the TSF during the design storm event.

Peak flows from the HEC-HMS model were input into a spreadsheet that evaluated hydraulic parameters using Manning's equation for normal flow, reporting flow velocity, flow depth, wave run up, shear stress and available freeboard for each channel in the design.

As described above, an iterative approach was needed to simulate the tailwater and backflow behavior exhibited by the cross connection channel between the South and North Tailings ponds. The cross connection channel had the net effect of increasing the attenuation of the storm surge in the North Tailings pool by utilizing storage in the South Tailings pond during the peak storage period in the North Tailings pool. When evaluating the cross connection channels for erosion protection, flow depth in the channels was determined from the tailwater elevation less the spillway invert, instead of Mannings equation as the channels have no slope.

Riprap erosion protection was developed using two methods, Design of Rock Chutes (Robinson 1998) for steep channels (>2% but less than 40%) and USACE mild method (USACE, 1994) for mild channels (<2%).

A steep downchute is required to pass the peak flow down the north abutment with minimum construction effort. A USBR Type IX baffled downchute was chosen to achieve the maximum elevation drop while preventing extremely high velocity flows and necessarily large hydraulic jump structures associated with smooth downchutes (FHWA, 2006).

Input and output from the HEC-HMS model are presented in Tables A.1, A.2 and A.3 and Attachment A. Hydraulic analysis is presented in Tables A.4, A.5 A.6 and A.7 with key hydraulic parameters presented in Attachment B.

REFERENCES:

Dames and Moore. 1991. *Ft. Knox Gold Mine Baseline Water Resource Evaluation Report*

FEMA. 2004. *Federal Guidelines for Dam Safety – Selecting and accommodating inflow design floods for dams.* April 2004.

FHWA, 2006. *Hydraulic Design of Energy Dissipators for Culverts and Channels*, Hydraulic Engineering Circular Number 14, 3rd Ed. Nov. 14, 2006.

Haan C.T., B. J. Barfield, and J.C. Hayes. 1994. *Design hydrology and sedimentology for small catchments.* San Diego CA : Academic Press Inc.

Halepaska, John C. and Associates, 1992a. *Summary of Preliminary Operational Study Runs for a Surface Water Storage Facility to Meet the Ft. Knox Project Water Demand* March 1992.

HEC-HMS Hydrologic Modeling System [computer software] August 2009 US Army Corps of Engineers Version 3.4.

Knight Piesold. 1994. *Fort Knox Project Design of Tailing Storage Facility and Water Reservoir* (Design Submittal No. 3) February 7,1994. Denver, CO.

Knight Piesold. 2010. *Fort Knox Tailing Storage Facility Expansion* (Anticipated Tailings Beach Configuration at Expanded Capacity) December 1, 2010. Denver, CO.

Miller, J.F. 1963. "Probable Maximum Precipitation and rainfall-frequency data for Alaska," (U.S. Department of Commerce Technical Paper 47) Washington D.C. : U.S. Weather Bureau.

Robinson, 1998. *Rock Chutes on Slopes between 2 and 40%*. K.M. Robinson, K.C. Kadavy, C.E. Rice. Presented at July 1998 ASAE Annual International Meeting, Paper No. 982136.

U.S. Army Corps of Engineers (USACE). 1994. *Engineering and Design – Hydraulic Design of Flood Control Channels.* EM 1110-2-1601. June 30, 1994.

U.S. Army Corps of Engineers (USACE). 1998. *Engineering and Design – Runoff from Snowmelt.* EM 1110-2-1406, March 31, 1998. USACE.

U.S. Army Corps of Engineers (USACE). 2001. *Inflow Design Floods for Dams and Reservoirs.* ER1110-8-2(FR), March 1, 2004. USACE.

U.S. Army Corps of Engineers (USACE). 2004. *Engineering and Design - General Design and Construction Considerations for Earth and Rock-Fill Dams.* EM 1110-2-2300, July 30, 2004. USACE.

U.S. Bureau of Reclamation (USBR). 1977. *Design of small dams 2nd ed.* Washington D.C. : United States Government Printing Office.

U.S. Soil Conservation Service (USSCS). 1986. Urban hydrology for small watersheds, 2nd edition (USSCS Technical Release Number 55). Washington D.C.: United States Department of Agriculture.

TABLE A.1
BASIN SUMMARY TABLE

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJECT NO.: 2903

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

DESIGN STORM: 1.25xPMP -YEAR RECURRENCE INTERVAL

STORM DURATION (hours)	2-YEAR DEPTH (in)	1.25xPMP -YEAR DEPTH (mm) (in)	Storm Distribution	Model Units
24	1.13	14.00	PMP	Imperial

SUBBASIN ID	AREA (ac)	CN = 70 Undisturbed woods (ac)	CN = 65 Reveg'd Facility (ac)	CN = 65 Reveg'd Tailings (ac)	CN = 100 Open Water (ac)	Composite SCS Curve No.	S = 1000/CN-10	Unit Runoff Q (in)	Runoff Volume (ac-ft)
Pit Watershed	866.92	423.45	112.58		330.89	CN = 81	2.38	11.50	831.07
S TSF PearlCrk	1356.53	423.81	313.30	378.25	241.17	CN = 73	3.74	0.28	0.38
N TSF FishCrk	1405.84	420.13	651.33	283.65	50.73	CN = 68	4.76	0.94	1.31
N TSF BarnesCrk	888.16	570.38	84.16	199.06	34.56	CN = 70	4.37	0.66	0.58
Barge Pond Basin	170.10	141.81			28.30	CN = 75	3.34	0.11	0.02
Heap Leach	313.62	0.00	313.62			CN = 65	5.38	1.44	0.45
Spillway Exit Basin	41.81	41.81				CN = 70	4.29	0.60	0.02
Baffle Chute Basin	37.10	37.10				CN = 70	4.29	0.60	0.02
Baffle Exit Basin	71.96	71.96				CN = 70	4.29	0.60	0.04
Total:	5152.03								833.91

TABLE A.2
BASIN TIME OF CONCENTRATION CALCULATIONS

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJECT NO.: 2903

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

					Flow Segment 1							Flow Segment 2						
SUBBASIN ID	Basin Area (sq mi)	Composite Curve Number	Total Lag (0.6*Tc) (min)	Total Travel Time (min)	Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)	Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)
Pit Watershed	1.354559	81	44.2	74	Sheet	200	0.065	J	Heavy Woods		68.37	Shallow	1968	0.172	U	Unpaved		4.90
S TSF PearlCrk	2.119578	73	41.7	70	Sheet	200	0.087	J	Heavy Woods		60.84	Shallow	1610	0.194	U	Unpaved		3.78
N TSF FishCrk	2.196625	68	36.2	60	Sheet	200	0.180	J	Heavy Woods		45.49	Shallow	2180	0.250	U	Unpaved		4.50
N TSF BarnesCrk	1.387744	70	39.4	66	Sheet	200	0.190	J	Heavy Woods		44.51	Shallow	1210	0.240	U	Unpaved		2.55
Barge Pond Basin	0.265781	75	32.1	53	Sheet	200	0.140	J	Heavy Woods		50.30	Shallow	1455	0.300	U	Unpaved		2.74
Heap Leach	0.490031	65	24.8	41	Sheet	300	0.050	H	Range		24.55	Shallow	180	0.050	U	Unpaved		0.83
Spillway Exit Basin	0.065328	70	28.1	47	Sheet	200	0.218	J	Heavy Woods		42.13	Shallow	1734	0.218	U	Unpaved		3.84
Baffle Chute Basin	0.0580	70	30.9	52	Sheet	200	0.180	J	Heavy Woods		45.49	Shallow	2475	0.180	U	Unpaved		6.03
Baffle Exit Basin	0.1124	70	28.9	48	Sheet	200	0.226	J	Heavy Woods		41.53	Shallow	1666	0.226	U	Unpaved		3.62

Notes:
(1) Refer to Attachment B for Flow calculations, Roughness Condition descriptions and Tc Coefficients

TABLE A.2
BASIN TIME OF CONCENTRATION CALCULATIONS

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJECT NO.: 2903

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

					Flow Segment 3							Flow Segment 4						
SUBBASIN ID	Basin Area (sq mi)	Composite Curve Number	Total Lag (0.6*Tc) (min)	Total Travel Time (min)	Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)	Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition[1]		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)
Pit Watershed	1.354559	81	44.2	74	Channel	440	0.150	G	Grass-lined	1.00	0.45							
S TSF PearlCrk	2.119578	73	41.7	70	Channel	3190	0.050	G	Grass-lined	2.00	3.53	Channel	1535	0.250	R	Riprap	1.00	1.38
N TSF FishCrk	2.196625	68	36.2	60	Channel	4700	0.015	G	Grass-lined	2.00	9.49	Channel	865	0.250	R	Riprap	1.00	0.78
N TSF BarnesCrk	1.387744	70	39.4	66	Channel	4450	0.004	G	Grass-lined	2.00	16.41	Channel	2450	0.250	R	Riprap	1.00	2.20
Barge Pond Basin	0.265781	75	32.1	53	Channel	615	0.280	G	Grass-lined	1.00	0.46							
Heap Leach	0.490031	65	24.8	41	Shallow	800	0.250	U	Unpaved		1.65	Channel	3250	0.020	G	Grass-lined	0.50	14.32
Spillway Exit Basin	0.065328	70	28.1	47	Channel	585	0.057	R	Riprap	1.50	0.84							
Baffle Chute Basin	0.0580	70	30.9	52														
Baffle Exit Basin	0.1124	70	28.9	48	Channel	900	0.010	R	Riprap	1.50	3.08							

Notes:
(1) Refer to Attachment B for Flow calculations, Roughness Condition descriptions and Tc Coefficients

TABLE A.2
BASIN TIME OF CONCENTRATION CALCULATIONS

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJECT NO.: 2903

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

					Flow Segment 5							Flow Segment 6						
SUBBASIN ID	Basin Area (sq mi)	Composite Curve Number	Total Lag (0.6*Tc) (min)	Total Travel Time (min)	Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition(1)		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)	Type of Flow	Length (ft)	Slope (ft/ft)	Roughness Condition(1)		Typical Hydraulic Radius (Channel Only) (ft)	Travel Time (min)
Pit Watershed	1.354559	81	44.2	74														
S TSF PearlCrk	2.119578	73	41.7	70														
N TSF FishCrk	2.196625	68	36.2	60														
N TSF BarnesCrk	1.387744	70	39.4	66														
Barge Pond Basin	0.265781	75	32.1	53														
Heap Leach	0.490031	65	24.8	41	Channel	2475	0.250	R	Riprap	1.00	2.22							
Spillway Exit Basin	0.065328	70	28.1	47														
Baffle Chute Basin	0.0580	70	30.9	52														
Baffle Exit Basin	0.1124	70	28.9	48														

Notes:
(1) Refer to Attachment B for Flow calculations, Roughness Condition descriptions and Tc Coefficients

TABLE A.3
FLOW RESULTS FROM HEC-HMS

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJECT NO.: 2903

Date:	3/14/11
By:	DPH
Chkd:	

HEC-HMS - Hydrologic Watershed Model Simulation Summary Report

Model Description: Basin: TSF Nov30 Dep Mar2011 update & Met: PMP * 1.25 & Control: Control 1
Basin Model: TSF Nov30 Dep Mar2011 update
Meteoroloic Model: PMP * 1.25
Control Specs: Control 1
Start of Run: 31Dec2004, 24:00
End of Run: 02Jan2005, 24:00
Compute Time: 02Jan2005, 24:00

Global Model Simulation Summary Table

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak Outflow	Outflow Volume (ACRE-FT)	Peak Inflow (CFS)	Time of Peak Inflow	Peak Stage (FT)	Peak Volume (ACRE-FT)
Baffle Chute Basin	0.058	126.12	01Jan2005, 10:24	30.24				
Baffle Exit	8.05005	1,422.09	01Jan2005, 13:06	2,516.72				
Baffle Exit Basin	0.1124	252.44	01Jan2005, 10:24	58.61				
Baffle Outlet	7.93765	1,378.54	01Jan2005, 13:18	2,458.11				
Barge Pond Basin	0.26578	605.12	01Jan2005, 10:24	146.67				
Bottom of Baffle	7.93765	1,378.58	01Jan2005, 13:12	2,458.65				
Heap Leach	0.49003	1,109.91	01Jan2005, 10:18	240.25				
Junction-2	3.55118	4,256.89	01Jan2005, 10:30	1,118.21				
N TSF BarnesCrk	1.38774	2,631.47	01Jan2005, 10:36	723.61				
N TSF FishCrk	2.19662	4,256.89	01Jan2005, 10:30	1,118.21				
N TSF Pool	7.81432	1,332.76	01Jan2005, 13:30	2,394.81	8,218.20	01Jan2005, 10:36	1,535.93	1,744.34
Over BarnesCrk TSF	1.87778	3,529.39	01Jan2005, 10:42	963.74				
Over TSF FishCrk	3.55118	4,159.64	01Jan2005, 10:36	1,118.12				
Pit	1.35456	0	31Dec2004, 24:00	0	2,775.62	01Jan2005, 10:36	1,620.17	186,384.34
Pit-TSF	3.55118	4,206.66	01Jan2005, 10:30	1,118.22				
Pit Watershed	1.35456	2,775.62	01Jan2005, 10:36	795.6				
Return from N	0	380.75	01Jan2005, 13:30	277.27				
Return to S TSF	0	380.79	01Jan2005, 13:30	280.73				
Sink-1	0	380.79	01Jan2005, 13:30	280.73				
Sink-2	8.05005	1,422.09	01Jan2005, 13:06	2,516.72				
Spillway Exit Basin	0.06533	148.06	01Jan2005, 10:24	34.06				
Spring Breakup	0	16	31Dec2004, 24:00	63.47				
S TSF PearlCrk	2.11958	4,075.99	01Jan2005, 10:36	1,144.07				
S TSF Pool	2.11958	298.87	02Jan2005, 02:42	556.7	4,255.34	01Jan2005, 10:36	1,535.21	4,655.76
Top of Baffle	7.87965	1,356.54	01Jan2005, 13:24	2,428.40				
TSFSpillway1	7.81432	1,332.74	01Jan2005, 13:30	2,394.34				

Table A.4
Channel Hydraulic Calculations

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJ NO.: 2903

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

			Channel Design Geometry							Channel Roughness Parameters				
Reach Designation	**Q1.25xPMP from HEC-HMS (cfs)**	**HEC HMS Element ID for Q**	**Channel Length (ft)**	**Bed Slope (ft/ft)**	**Left Side Slope (H:1V)**	**Right Side Slope (H:1V)**	**Bottom Width (ft)**	**Maximum Channel Depth (ft)**	**Channel Curvature Radius (ft)**	**Riprap Calculation Methodology**	**Design Channel Lining**		**Mannings 'n' for Capacity (Depth Calculation)**	**Mannings 'n' for Stability (Velocity Calculation)**
Spillway Approach (Jetty Cut)	1332.76	N TSF Pool	82	0.001	2.5	2.5	70.0	15.0	0	USACE Mild	R	Riprap	0.040	0.035
Spillway (Rock Cut)	1332.76	N TSF Pool	571	0.005	2.5	2.5	35.0	8.0	0	USACE Mild	R	Riprap	0.040	0.035
Spillway Exit Reach 1	1332.74	TSFSpillway1	723	0.053	2.5	2.5	25.0	6.0	800	Robinson	R	Riprap	0.040	0.035
Spillway Exit Reach 2	1356.54	Top of Baffle	333	0.053	2.5	2.5	25.0	6.0	700	Robinson	R	Riprap	0.040	0.035
Downchute Approach Side Spill	1356.54	Top of Baffle	50	0.001	2.5	2.5	25.0	10.0	0	USACE Mild	R	Riprap	0.040	0.035
Downchute Exit Reach 1	1422.09	Baffle Exit	522	0.014	2.5	2.5	25.0	6.0	0	USACE Mild	R	Riprap	0.040	0.035
Downchute Exit Reach 2	1422.09	Baffle Exit	509	0.010	2.5	2.5	25.0	6.0	175	USACE Mild	R	Riprap	0.040	0.035
Downchute	1356.54	Top of Baffle	270	0.090	4.0	4.0	30.0	6.0	0	Robinson	R	Riprap	0.040	0.035
TSF Connection Channel (S to N)	298.87	S TSF Pool	1200	0.000	3.0	3.0	10.0	15.0	0	USACE Mild	R	Riprap	0.040	0.035
TSF Connection Channel (N to S)	380.79	Return to S TSF	1200	0.000	3.0	3.0	10.0	15.0	0	USACE Mild	R	Riprap	0.040	0.035
Barge Pool Connection	1332.76	N TSF Pool	100	0.000	3.0	3.0	70.0	15.0	0	USACE Mild	R	Riprap	0.040	0.035

Table A.4
Channel Hydraulic Calculations

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJ NO.: 2903

Date:	3/14/2011
By:	DPH
Chkd:	
Apprvd:	

	Hydraulic Calculations					Channel Evaluations							
Reach Designation	**Maximum Velocity (ft/sec)**	**(3)Maximum Normal Flow Depth (ft)**	**Froud Number**	**Wave Runup at Channel Bends (ft)**	**Normal Depth Shear Stress (lbs/sq ft)**	**(1)Available Freeboard (ft)**		**Top Width of Channel (ft)**	**Top Width of Flow (ft)**	**Flow Width at Median Depth (ft)**	**(2)Channel is Stable?**	**Calculated Nominal Riprap Size D_{50} (in)**	**Hydraulic Jump Conjugate Depth (ft)**	**Minimum Hydraulic Jump Length (ft)**
Spillway Approach (Jetty Cut)	3.4	5.1	0.30	0.00	0.3	9.9		145.0	95.7	82.8	See Calc	6		
Spillway (Rock Cut)	6.8	4.6	0.64	0.00	1.4	3.4		75.0	58.2	46.6	See Calc	6		
Spillway Exit Reach 1	16.1	2.8	1.93	0.25	9.4	2.9		55.0	39.1	32.1	See Calc	18		
Spillway Exit Reach 2	16.2	2.8	1.94	0.29	9.5	2.9		55.0	39.2	32.1	See Calc	18		
Downchute Approach Side Spill	4.0	8.2	0.30	0.00	0.5	1.8		75.0	66.1	45.6	See Calc	6		
Downchute Exit Reach 1	10.4	4.2	1.04	0.00	3.7	1.8		55.0	46.2	35.6	See Calc	10		
Downchute Exit Reach 2	9.2	4.6	0.89	0.19	2.9	1.2		55.0	48.2	36.6	See Calc	10		
Downchute	17.7	2.2	2.43	0.00	12.2	3.8		78.0	47.3	38.7	See Calc	24	3.90	19.0
TSF Connection Channel (S to N)	3.0	4.29	0.32	0.00	0.0	10.7		100.0	35.7	22.9	See Calc	6		
TSF Connection Channel (N to S)	3.8	4.36	0.40	0.00	0.0	10.6		100.0	36.1	23.1	See Calc	6		
Barge Pool Connection	2.7	5.69	0.22	0.00	0.0	9.3		160.0	104.1	87.1	See Calc	6		

(1) **< Vel. Head** indicates that the remaining freeboard is less than 1/2 the velocity head ($V^2/2g$) suggesting water may splash out.
< 1ft indicates freeboard is less than recommended value
(2) **Unstable V** indicates that calcuated velocities exceeds the recommended maximum
See Calc - refer to appropriate Riprap sizing calculation
(3) Normal flow depths for connection channels taken from corresponding tailwater elevation less spillway invert instead of Mannings equation.

Table A.4
Channel Hydraulic Calculations

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJ NO.: 2903

Date:	3/14/2011
By:	DPH
Chkd:	
Apprvd:	

Reach Designation	Channel Quantities						
	Channel Surface Perimeter (per unit length) (ft)	Channel Bank Full Volume (cy)	Channel Surface Area (ac)	Minimum Riprap Thickness (1.5 x D_{50}) (ft)	Riprap Volume (cy)	Recommended Riprap Filter	Filter Thickness (in)
Spillway Approach (Jetty Cut)	150.8	132,225	0.28	0.8	343	Fabric	
Spillway (Rock Cut)	78.1	251,240	1.02	0.8	1,238	Fabric	
Spillway Exit Reach 1	57.3	173,448	0.95	2.3	3,452	Fabric	
Spillway Exit Reach 2	57.3	79,848	0.44	2.3	1,589	Fabric	
Downchute Approach Side Spill	78.9	25,000	0.09	0.8	110	Fabric	
Downchute Exit Reach 1	57.3	125,304	0.69	1.3	1,385	Fabric	
Downchute Exit Reach 2	57.3	122,160	0.67	1.3	1,351	Fabric	
Downchute	79.5	87,480	0.49	3.0	2,384	Fabric	
TSF Connection Channel (S to N)	104.9	990,000	2.89	0.8	3,496	Fabric	
TSF Connection Channel (N to S)	104.9	990,000	2.89	0.8	3,496	Fabric	
Barge Pool Connection	164.9	172,500	0.38	0.8	458	Fabric	

Table A.5a
Robinson Method Riprap Size Calculation

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJECT NO.: **2903**

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

Reach Designation	Robinson Design of Rock Chutes Riprap Calculations for Steep Riprap (Bed Slopes >2% but <40%)						
	Design Flow Q (cms)	Flow Concentration Factor	Unit Width Flow q (cms/m)	Calculated Particle Size D_{50} (2) (mm)	Factor of Safety	Calculated Riprap Size D_{50} (in)	Nominal Riprap Size D_{50} (in)
Spillway Exit Reach 1	37.733	1.25	4.828	340	1.20	16.09	18
Spillway Exit Reach 2	38.407	1.25	4.904	343	1.20	16.22	18
Downchute	38.407	1.25	4.074	471	1.20	22.25	24

Design of Rock Chutes (ASAE Paper No. 982136 7/98)
Determine unit flow at incipient motion for rock particle size
(1) Unit flow rate is Q/ median width, adjusted by a flow concentration factor of
1.25 (USACE steep riprap method recommends a factor of 1.25)
(2) Bed Slope < 10%, $q = 9.76e\text{-}7\ D_{50}^{1.89}\ S^{-1.50}$
10%<= Bed Slope <= 40%, $q = 8.07e\text{-}6\ D_{50}^{1.89}\ S^{-0.58}$
1.2 Factor of Safety over incipient motion

Table A.5b
U.S. Corps of Engineers (mild) Method Riprap Size Calculation

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJECT NO.: **2903**

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

Reach Designation	USACE Method Riprap Calculations for Mild Riprap (Bed Slopes <2%)							
	Design Flow Q (cfs)	Normal Flow Depth d (ft)	Depth Averaged Velocity V (fps)	Velocity Distribution Coefficient C_V	Channel Side Slopes Correction K_1	Calculated Particle Size D_{30} (ft)	Riprap Size D_{50} (in)	Nominal Riprap Size D_{50} (in)
Spillway Approach (Jetty Cut)	1332.8	5.13	3.42	1.00	0.95	0.04	0.56	6
Spillway (Rock Cut)	1332.8	4.64	6.77	1.00	0.95	0.20	3.14	6
Downchute Approach Side Spill	1356.5	8.23	3.99	1.00	0.95	0.05	0.73	6
Downchute Exit Reach 1	1422.1	4.23	10.37	1.00	0.95	0.60	9.34	10
Downchute Exit Reach 2	1422.1	4.63	9.22	1.39	0.95	0.60	9.42	10
TSF Connection Channel (S to N)	298.9	4.29	3.05	1.00	0.97	0.03	0.42	6
TSF Connection Channel (N to S)	380.8	4.36	3.79	1.00	0.97	0.05	0.72	6
Barge Pool Connection	1332.8	5.69	2.69	1.00	0.97	0.02	0.29	6

Note: Normal flow depths for connection channels taken from corresponding tailwater elevation less spillway invert instead of channel flow calculations

USACE Paper EM 1110-2-1601, 6/30/94

$$D_{30} = S_f C_s C_V C_T d \left[\left(\frac{\gamma_w}{\gamma_s - \gamma_w} \right) \frac{V}{\sqrt{K_1 g d}} \right]^{2.5}$$

Inputs below as determined in EM 1110-2-1601, 6/30/94

1.1	S_f: Minimum safety factor of 1.1 for moderate debris impact
0.3	C_s: Value of 0.30 for angular rock
165	γ_s: Density of solids (pcf)
2.2	Cg: Gradation Coefficient (D_{85}/D_{15})
1.5	T: Riprap Thickness (x D_{50})
1.000	C_T: Correction for thickness > 1.5 * D_{50}

Note: A C_V of 1.25 should be used downstream of concrete channels due to the difference in velocity profiles
C_V = 1.283 - 0.2 log(Radius/Median Flow Width) outside of bends

Riprap D50 determined as recommended in EM 1110-2-1601, 6/30/94

$$D_{50} = D_{30} \left(\frac{D_{85}}{D_{15}} \right)^{1/3}$$

Table A.6
Hydraulic Engineering Circular Number 14, 3rd Ed.
USBR Type IX Baffled Apron Design Calculation

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJ NO.: 2903

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

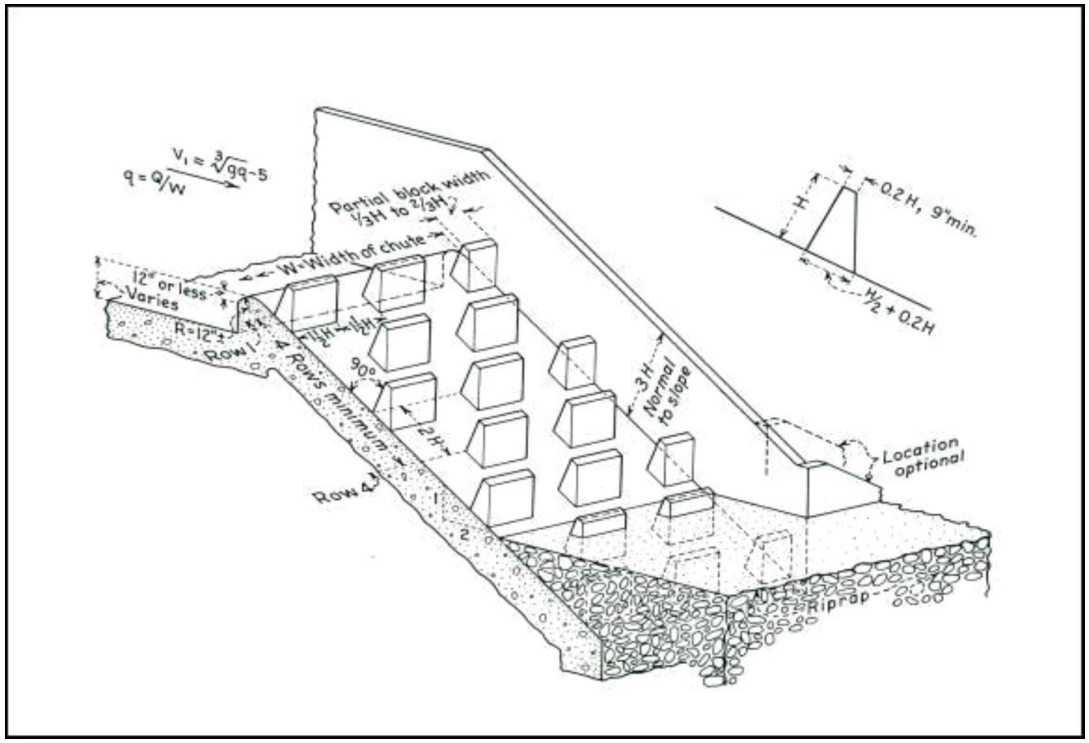
HMS Element	Bottom of Baffle	
Design Q	1378.58	cfs

Assume a side spill approach channel, so
approach velocity is near zero
Velocity is less than 5 ft/sec

Chute Width (B) =	25	ft
Chute Slope (s)=	32.6%	
unit discharge (q)=	55.14	cfs/sec/ft
Critical Velocity (Vc)=	12.11	ft/sec

Discharge velocity is less than 60 cfs/ft

Critical Depth (yc)	q/Vc	4.55	ft
Baffle Height (Hb)	0.8 yc	3.64	ft
Baffle Width =	1.5 Hb	5.46	ft
Baffle Spacing	1.5 Hb	5.46	ft
Row Vertical Drop dh	0.89 Hb	3.24	ft
Row Spacing dx (plan)		9.95	ft
Minimum Sidewall Hw	3 Hb	10.93	ft
Exit Velocity	Vc/3	4.04	ft/sec



ISBR Type IX Baffled Apron (Peterka, 1978)

Table A.7
Calculation of Hydraulic Jump Conjugate Depth and Jump Length

Fairbanks Gold Mining Inc. Fort Knox Mine
Spillway Design
PROJECT NO.: **2903**

Date:	3/14/11
By:	DPH
Chkd:	
Apprvd:	

Upstream Reach Designation	Hydraulic Jump Calculation								
	Design Flow Q (cfs)	Froud Number	Bottom Width (ft)	Left Side Slope (H:1V)	Right Side Slope (H:1V)	Upstream Flow Depth (d_1) (ft)	Conjugate Depth (d_2) (ft)	Jump Length to Depth Ratio	Length of Jump (ft)
Downchute	1356.5	2.43	30.0	4.0	4.0	2.17	3.90	4.73	19.00

Hydraulic Jump Length Calculation
Hydraulic Design of energy Dissipators for Culverts and Channels, Hydraulic Engineering Circular Number 12, 3rd Edition
U.S. Department of Transportation, Federal Highway Administration

Method iteriative solves for d_2 such that Upstream Momentum is equal to downstream momentum

Momentum Equation in a Hydraulic Jump

Where:

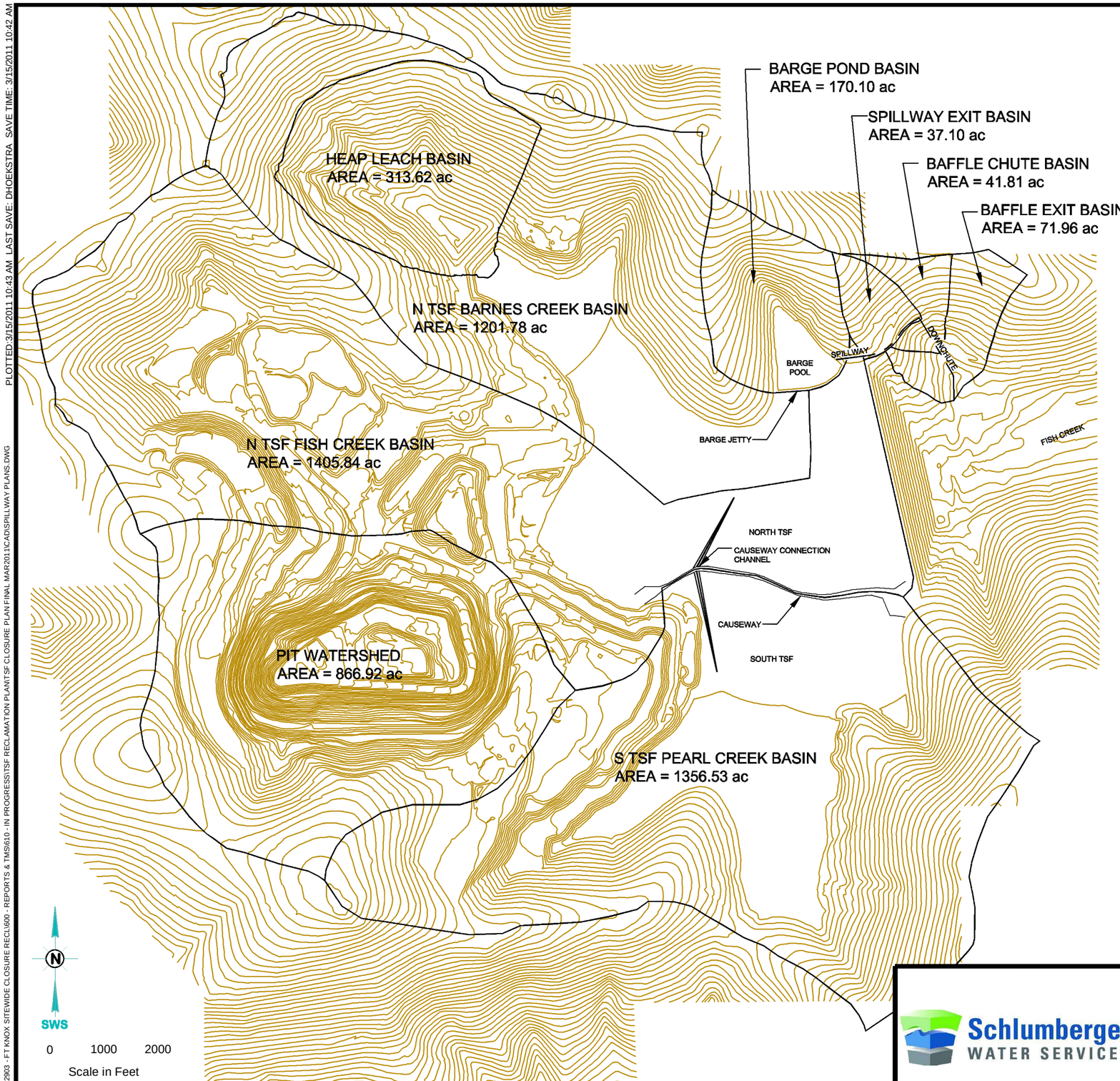
O = Flow
g = gravity
A_1, A_2 = Cross-sectional Flow Area (upstream and downstream)
Y_1, Y_2 = Depth to Centroid of Cross Section Area (upstream and downstream)

Centroid of a Trapezoid is calculated as follows

Where:

h = flow depth
T_w = Top width of cross section
B_w = Bottom width of cross section

Length of the Hydraulic Jump based on graphic form from U.S. Bureau of Reclamation, Design of Small Dams



Schlumberger WATER SERVICES

WATERSHED BOUNDARIES	
CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANGEMENT PLAN
JOB: 2903 FILE: Spillway Plans	DRAWN: DPH CHECKED: CP
DATE: MAR 14, 2011	FIGURE: A.1

PLOTTED:3/15/2011 10:43 AM LAST SAVE: DHOEKSTRA SAVE TIME: 3/15/2011 10:42 AM
P:\2903 - FT KNOX SITEWIDE CLOSURE RECL\600 - REPORTS & TMS\610 - IN PROGRESS\TSF RECLAMATION PLAN\TSF CLOSURE PLAN FINAL MAR2011\CAD\SPILLWAY PLANS.DWG

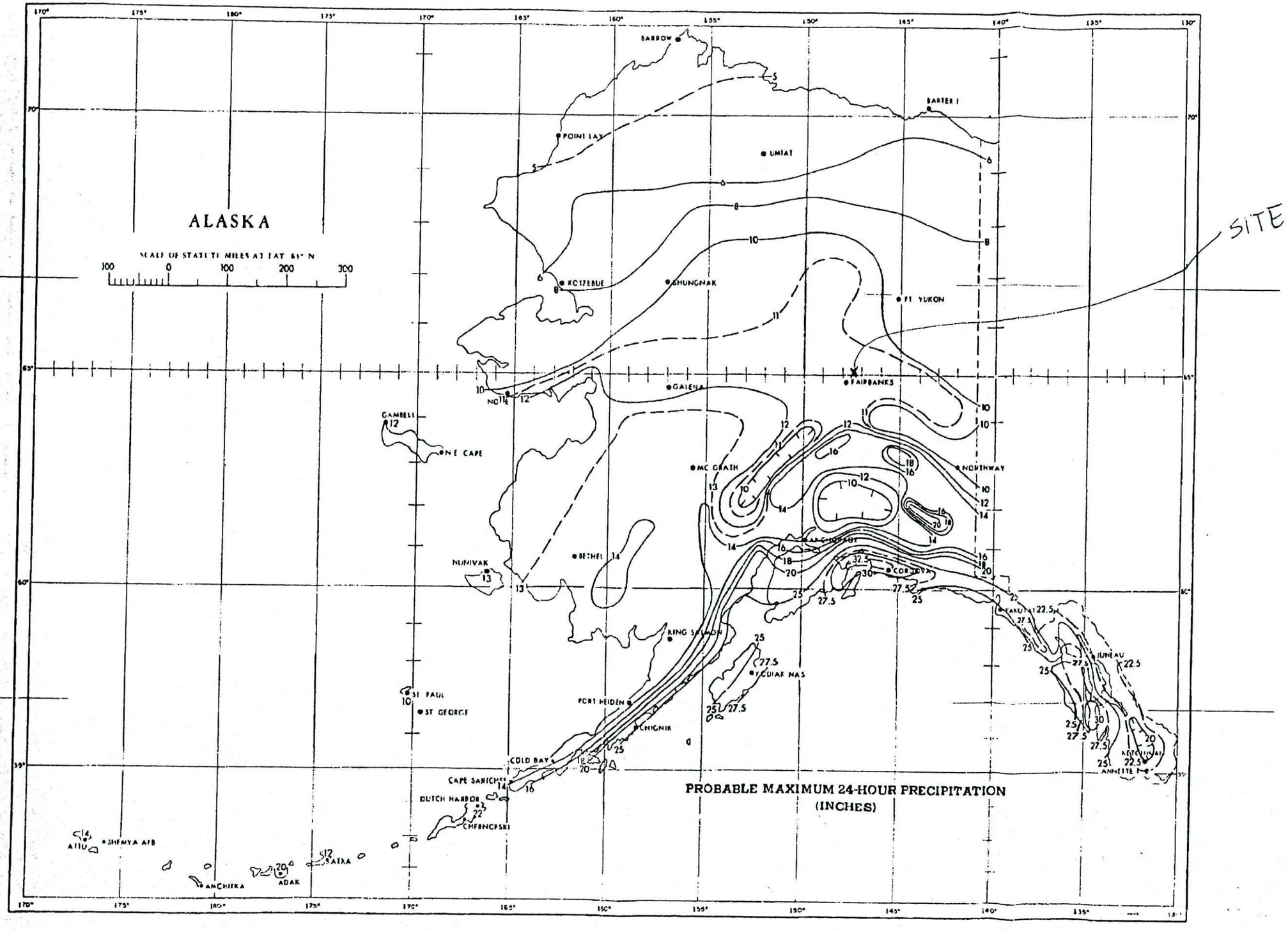


FIGURE 2-12.—Probable maximum 24-hr. point precipitation, in inches.

FIGURE A.2
24-hour PMP for Alaska

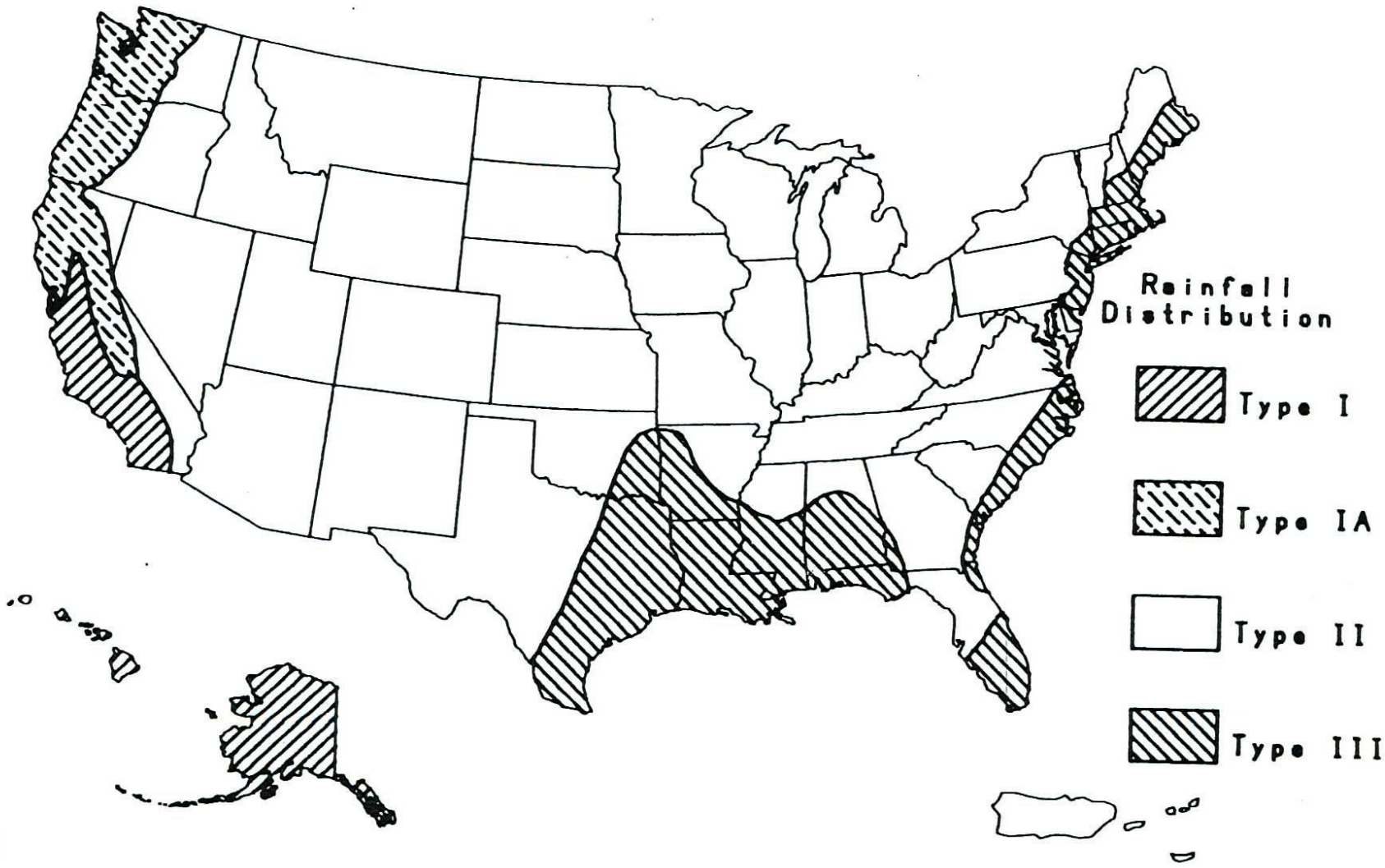
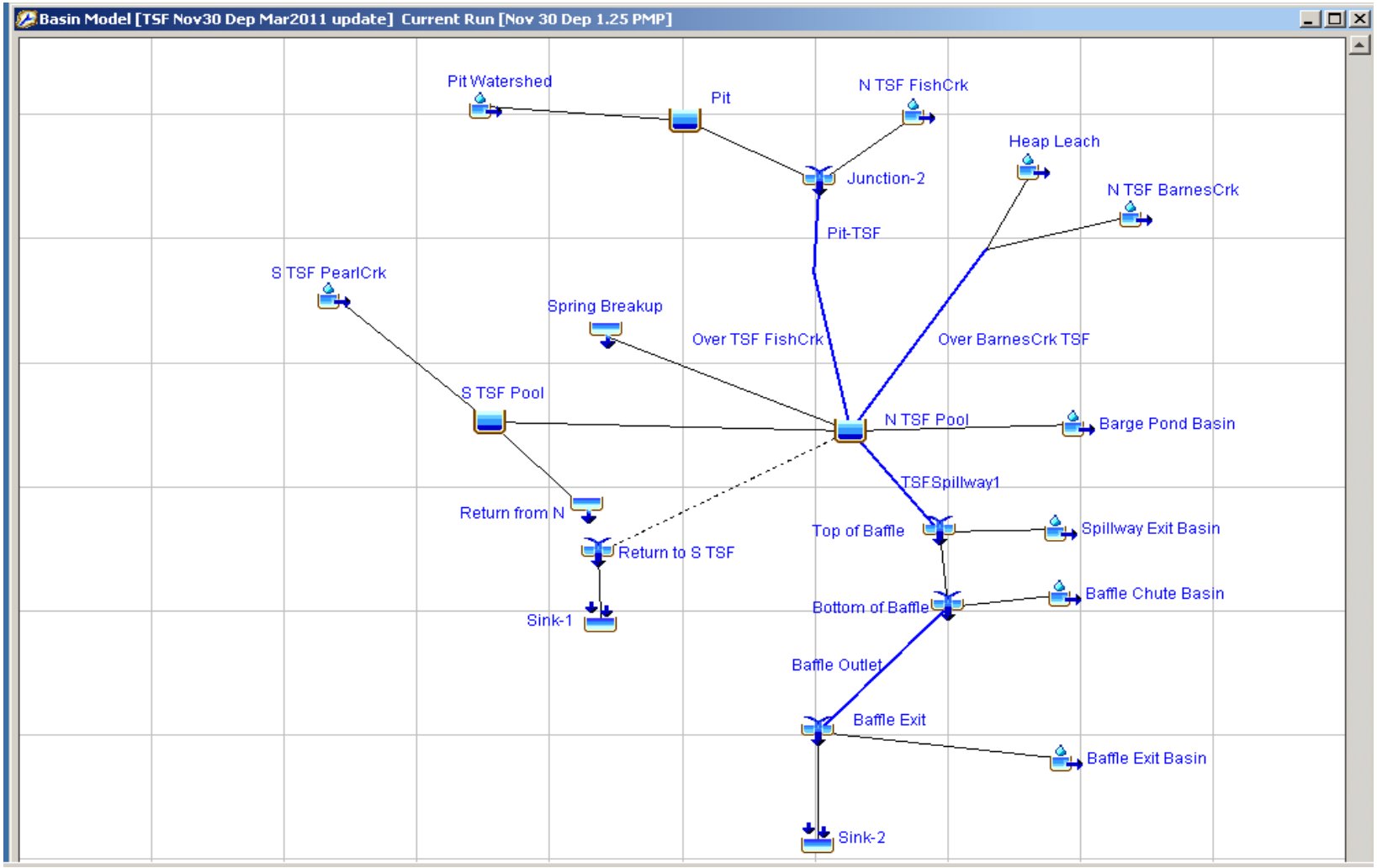


Figure B-2.—Approximate geographic boundaries for SCS rainfall distributions.

FIGURE A.3

Attachment A
HEC-HMS Screen Captures and Inputs

HEC-HMS Basin Model Schematic



ATTACHMENT A
HEC-HMS - Hydrologic Watershed Model Input Report

Basin Model: TSF Nov30 Dep Mar2011 update
Model Description: 1545 crest revised by KP Sep 2010 - reduced Pond
Last Update: 9 March 2011
HMS Version: 3.4
System Units: English

Basin Input Data - SCS CN Loss and SCS Unit Hydrograph Transform

Subbasin	Area (sq mi.)	% imper.	Ia	CN	SCS lag (min)
N TSF FishCrk	2.19662	0.0	1	68	36.2
Pit Watershed	1.35456	0.0	1	81	44.2
S TSF PearlCrk	2.11958	0.0	1	73	41.7
N TSF BarnesCrk	1.38774	0.0	1	70	39.4
Heap Leach	0.49003	0.0	1	65	24.8
Barge Pond Basin	0.26578	0.0	1	75	32.1
Spillway Exit Basin	0.06533	0.0	1	70	28.1
Baffle Chute Basin	0.05800	0.0	1	70	30.9
Baffle Exit Basin	0.11240	0.0	1	70	28.9

Channel Reach Input Data - Routing Parameters

Reach	Method	Shape	Length (ft)	Slope (ft/ft)	Mannings n	Bot. Width (ft)	Slide Slopes (H:1V)
Pit-TSF	Muskingum Cunge	Trapezoid	2,565.0	0.010	0.035	10	3.0
Over TSF FishCrk	Muskingum Cunge	Trapezoid	2,720.0	0.004	0.035	50	15.0
Over BarnesCrk TSF	Muskingum Cunge	Trapezoid	6,150.0	0.005	0.035	50	15.0
TSFSpillway1	Muskingum Cunge	Trapezoid	1,720.0	0.050	0.040	25	2.5
Baffle Outlet	Muskingum Cunge	Trapezoid	950.0	0.010	0.040	25	2.5

Reservoir Input Data - Controled Outflow Routing

Reservoir: Pit
Elevation-Area Table: Pit
Initial Elevation: 1620
Main Tailwater: None

Spillway Type	Outlet	Crest Length (ft)	Crest Elev. (ft)	Coefficient
Broad-Crested Spillway	Main	100	1625	2.63

Dam Top Type	Outlet	Crest Length (ft)	Crest Elev. (ft)	Coefficient
Level Dam	Main	5280	1630	2.63

Reservoir: S TSF Pool
Elevation-Storage Table: S TSF Nov30 Dep
Initial Elevation: 1531
Main Tailwater: Specified Stage **Stage Gage:** N TSF Stage

Spillway Type	Outlet	Crest Length (ft)	Crest Elev. (ft)	Coefficient
Broad-Crested Spillway	Main	10	1530	2.64

Reservoir: N TSF Pool
Elevation-Storage Table: N TSF Nov30 Dep
Initial Elevation: 1531
Main Tailwater: None
Auxiliary Tailwater: Specified Stage **Stage Gage:** S TSF Stage

Spillway Type	Outlet	Crest Length (ft)	Crest Elev. (ft)	Coefficient
Broad-Crested Spillway	Main	35	1530	2.64
Broad-Crested Spillway	Auxiliary	10	1530	2.64

Dam Top Type	Outlet	Crest Length (ft)	Crest Elev. (ft)	Coefficient
Level Dam	Auxiliary	4360	1545	2.64

Schlumberger Water Services
1875 Lawrence St. Suite 500
Denver CO 80202
tel: (303) 297-9005
http://www.water.slb.com

Attachment B
Time of Concentration and Mannings Flow Coefficients

TR-55 (1986)

Sheet Flow Travel time (SCS Upland Method)

$$T_t = \frac{0.007\,(n'\,L)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

Where: T_t = travel time (hr); n' = roughness coefficient; L = flow length (ft);

P_2 = 2-yr storm depth (inches); s = slope (ft/ft)

flow velocity = $L/(60T_t)$

Flow Type	Surface Type	roughness n	Surface Description	Short Description
Sheet/Overland Flow	A	0.011	Smooth surfaces (concrete, asphalt, gravel, bare soil)	Smooth
	B	0.05	Fallow (no residue)	Fallow
	C	0.06	Cultivated soils: Residue cover <= 20%	Cover<20%
	D	0.17	Cultivated soils: Residue cover > 20%	Cover>20%
	E	0.15	Grass: Short grass prairie	Short Grass
	F	0.24	Grass: Dense grasses	Dense Grass
	G	0.41	Grass: Bermuda grass	Bermuda Grass
	H	0.13	Range (natural)	Range
	I	0.40	Woods: Light underbrush	Light woods
	J	0.80	Woods: Heavy underbrush	Heavy Woods

Shallow Concentrated Flow Velocity (SCS Upland Method)

$v = mS^{0.5}$

Where: v = velocity (fps); m = roughness coeffient; S = slope

Flow Type	Surface Type	Roughness m	Surface Description	Short Description
Shallow Conc. Flow	P	20.3282	Paved Surfaces	Paved
	U	16.1345	Unpaved Surfaces	Unpaved

Channel Flow Velocity (Mannings Velocity)

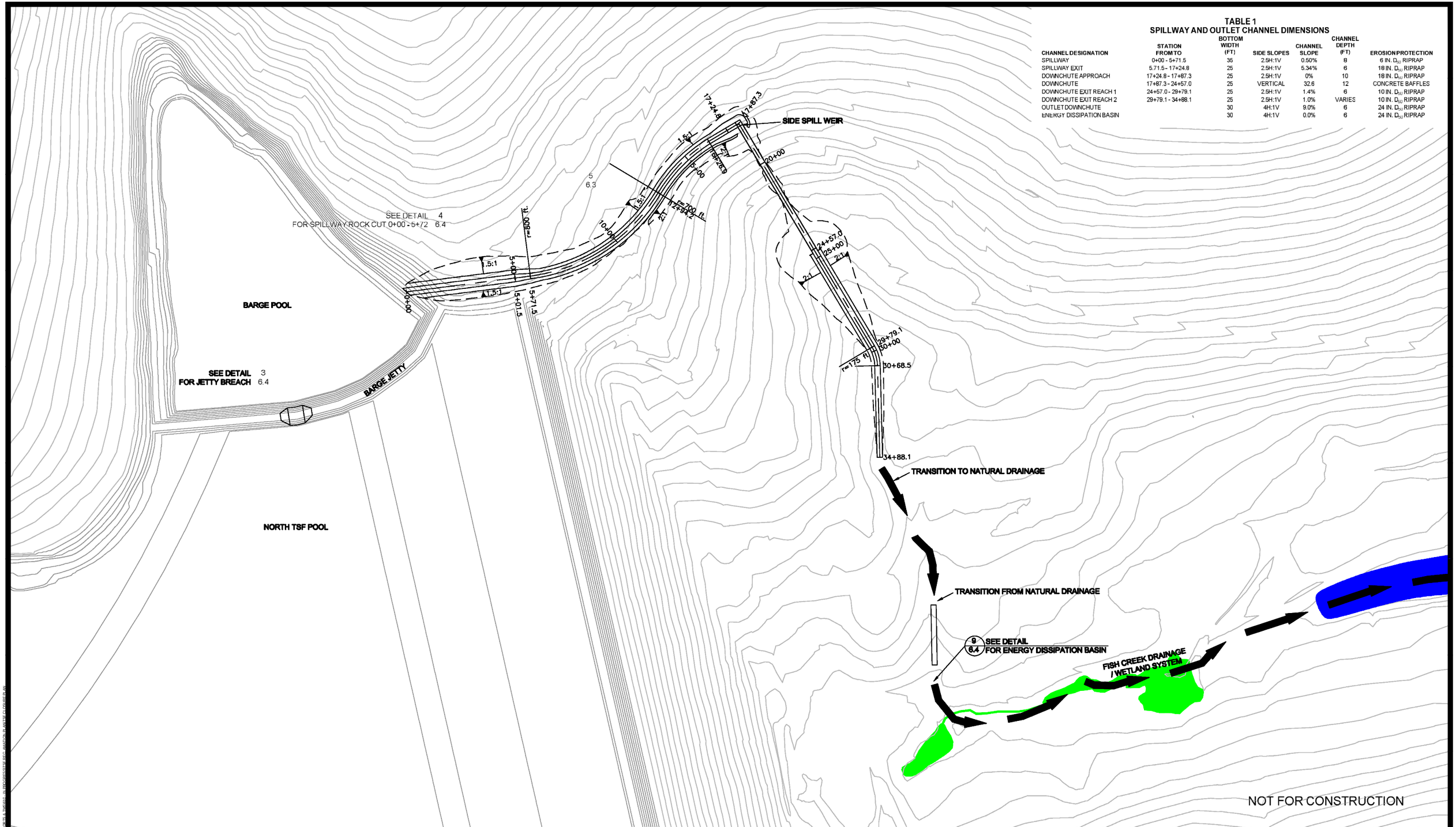
$v = C_f/n\ Rh^{2/3}S^{1/2}$

Where: v = velocity (mps); n = roughness coeffient; Rh = Hydraulic Radius (m), S = slope (m/m), C_f=Imperial/Metric conversion factor

Conduit Type	Mannings n for Depth	Mannings n for Velocity	Material	Maximum Velocity (ft/sec)
A	0.026	0.026	ACB	25.0
C	0.024	0.022	CSP	50.0
E	0.025	0.022	Earth-lined	3.0
G	0.035	0.030	Grass-lined	5.0
I	0.017	0.013	Ductile Iron	50.0
P	0.014	0.012	Plastic	25.0
R	0.040	0.035	Riprap	
T	0.035	0.030	Turf Reinf.	10.0
Z	0.015	0.015	Concrete	25.0

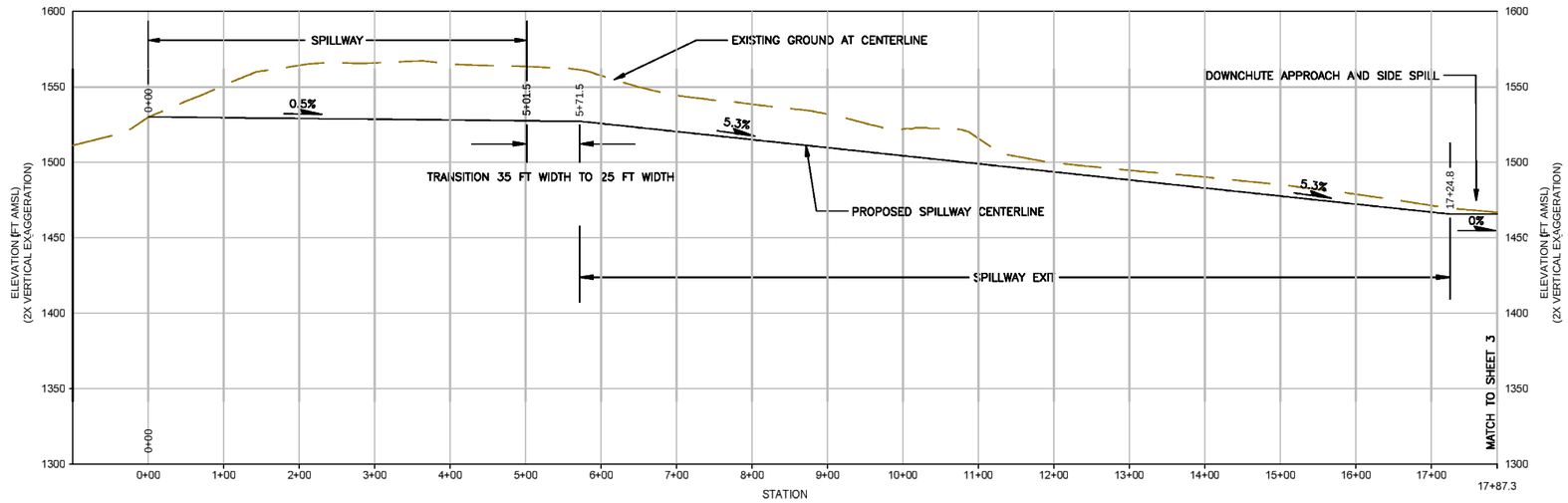
TABLE 1
SPILLWAY AND OUTLET CHANNEL DIMENSIONS

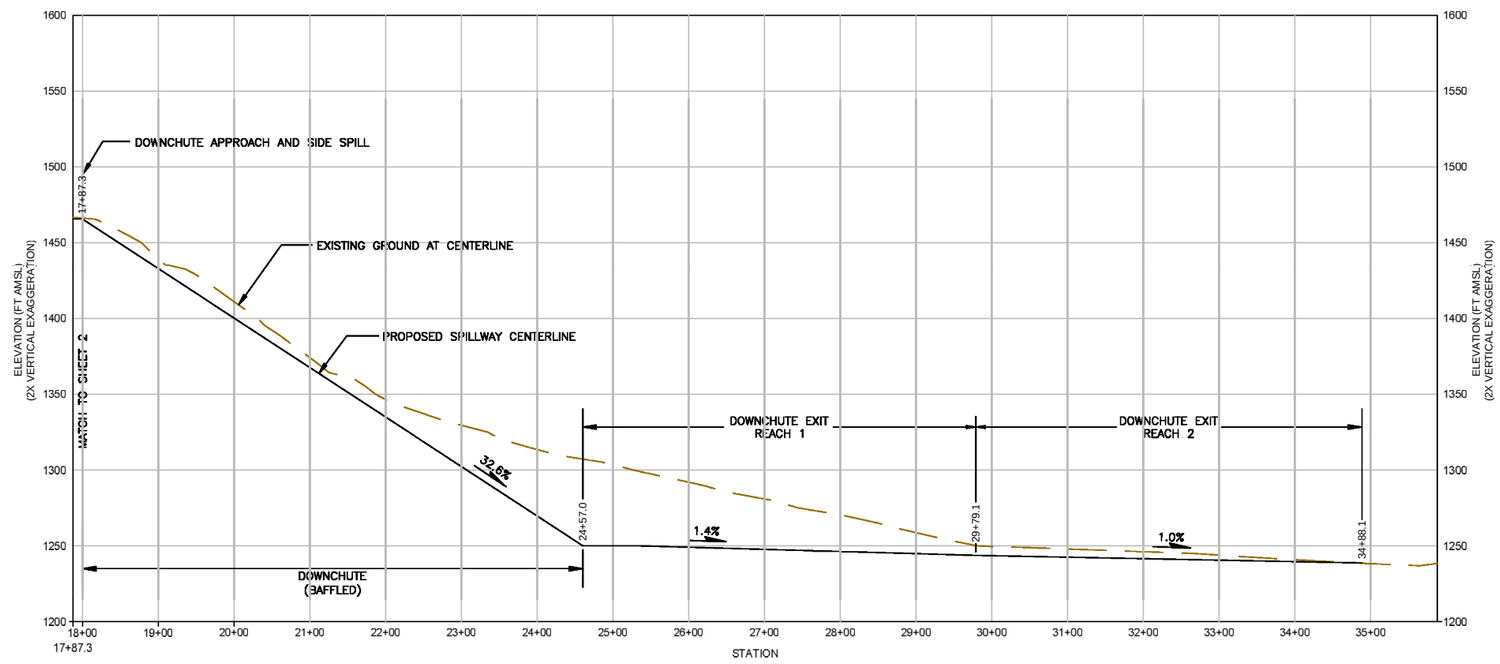
CHANNEL DESIGNATION	STATION FROM TO	BOTTOM WIDTH (FT)	SIDE SLOPES	CHANNEL SLOPE	CHANNEL DEPTH (FT)	EROSION PROTECTION
SPILLWAY	0+00 - 5+71.5	35	2.5H:1V	0.50%	8	6 IN. D_{50} RIPRAP
SPILLWAY EXIT	5.71.5 - 17+24.8	25	2.5H:1V	5.34%	6	18 IN. D_{50} RIPRAP
DOWNCHUTE APPROACH	17+24.8 - 17+87.3	25	2.5H:1V	0%	10	18 IN. D_{50} RIPRAP
DOWNCHUTE	17+87.3 - 24+57.0	25	VERTICAL	32.6	12	CONCRETE BAFFLES
DOWNCHUTE EXIT REACH 1	24+57.0 - 29+79.1	25	2.5H:1V	1.4%	6	10 IN. D_{50} RIPRAP
DOWNCHUTE EXIT REACH 2	29+79.1 - 34+88.1	25	2.5H:1V	1.0%	VARIES	10 IN. D_{50} RIPRAP
OUTLET DOWNCHUTE		30	4H:1V	9.0%	6	24 IN. D_{50} RIPRAP
ENERGY DISSIPATION BASIN		30	4H:1V	0.0%	6	24 IN. D_{50} RIPRAP



Schlumberger WATER SERVICES

SPILLWAY SYSTEM FT KNOX CLOSURE MANAGEMENT PLAN	
CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANAGEMENT PLAN
JOB: 2903	DRAWN: RN CHECKED: ACP
DATE: MARCH 2011	PLAN: 6.2





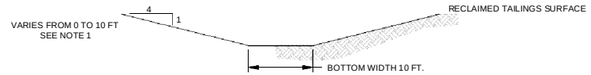
NOTE1:
LONGITUDINAL SLOPE OF SPILLWAY SYSTEM SECTIONS 'SPILLWAY CHANNEL' AND 'SPILLWAY CUTE-3 MAY VARY WITH SITE TOPOGRAPHY.

NOT FOR CONSTRUCTION

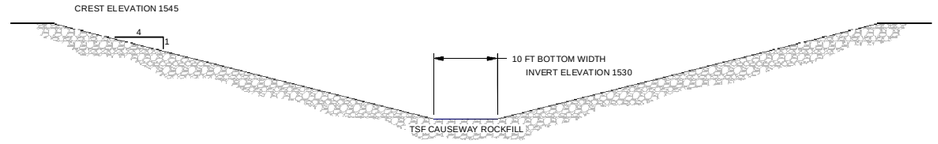
0 100 200
Scale in Feet

Schlumberger WATER SERVICES

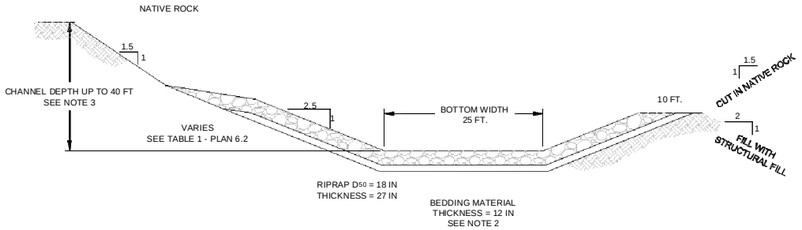
SPILLWAY SYSTEM PROFILE FT KNOX CLOSURE MANAGEMENT PLAN	
CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANAGEMENT PLAN
JOB: 2903	DRAWN: RN CHECKED: ACP
DATE: MARCH 2011	PLAN: 6.3



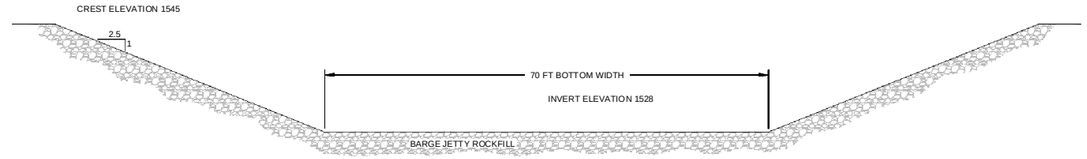
1 CAUSEWAY CONNECTION CHANNEL
6.4 NOT TO SCALE



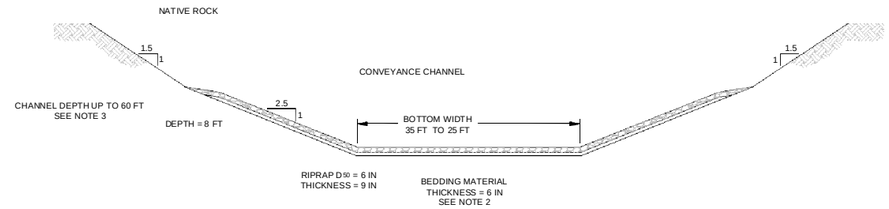
2 TSF CAUSEWAY BREACH
6.4 NOT TO SCALE



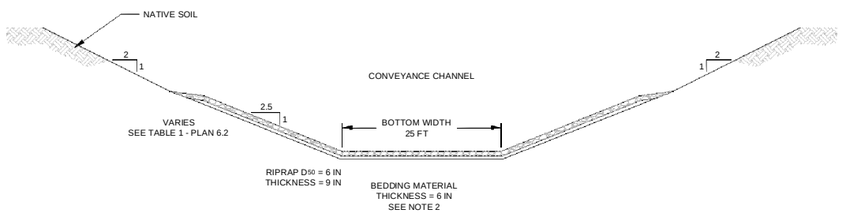
5 SPILLWAY EXIT 5+72 - 17+87
6.4 NOT TO SCALE



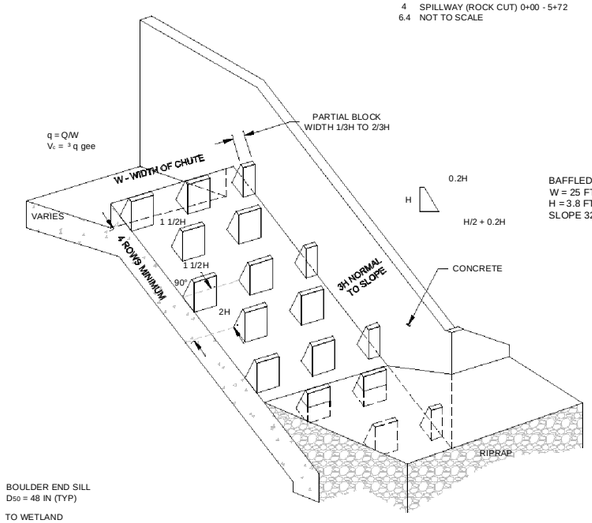
3 JETTY BREACH
6.4 NOT TO SCALE



4 SPILLWAY (ROCK CUT) 0+00 - 5+72
6.4 NOT TO SCALE

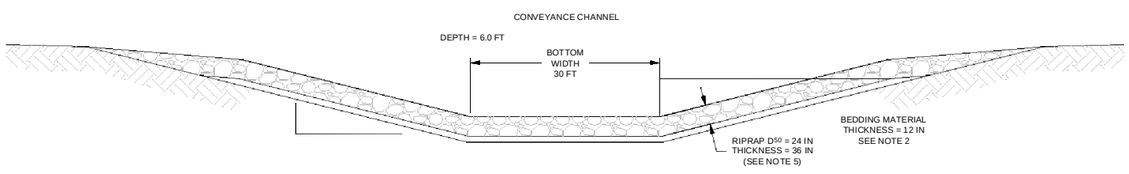


7 DOWNCHUTE EXIT 29+79 - 34+88
6.4 NOT TO SCALE



BAFFLED APRON DIMENSIONS (SEE NOTE 4)
W = 25 FT
H = 3.8 FT
SLOPE 32.6%%

6 SPILLWAY DOWNCHUTE BAFFLED APRON 17+87 - 24+57
6.4 NOT TO SCALE



8 OUTLET DOWNCHUTE CHANNEL
6.4 NOT TO SCALE

NOTES:

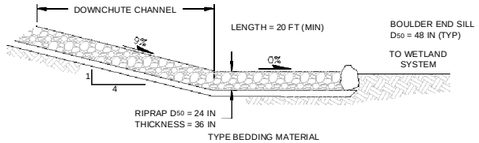
1. CAUSEWAY DRAIN CHANNEL INCREASES IN DEPTH FROM 0 FT TO 5 FT AS IT APPROACHES THE CAUSEWAY AND DECREASES FROM 5 FT TO 0 FT AS IT APPROACHES THE NORTH POND AT A LONGITUDINAL SLOPE OF 0%. TAILINGS ADJACENT TO THE CAUSEWAY WILL BE REMOVED TO ALLOW WATER TO FLOW THROUGH THE CAUSEWAY ROCKFILL.

2. RIPRAP BEDDING THICKNESS HAS BEEN ESTIMATED. RIPRAP BEDDING LAYER THICKNESS AND GRADATION WILL BE SELECTED BASED ON FINAL RIPRAP AND SUBGRADE PROPERTIES.

3. TSF SPILLWAY CHANNEL THROUGH DAM NORTH ABUTMENT PROVIDES RIPRAP PROTECTION TO A DEPTH OF 8 FEET THROUGHOUT. TSF SPILLWAY EXIT CHANNEL PROVIDES RIPRAP PROTECTION TO A DEPTH OF 6 FEET THROUGHOUT. BAFFLE DOWNCHUTE APPROACH PROVIDES RIPRAP PROTECTION TO A DEPTH OF 10 FT THROUGHOUT. CHANNEL CUT MAY BE DEEPER, UP TO AN ADDITION 50 FT, DEPENDING ON THE EXISTING GROUND SURFACE AND WILL NOT REQUIRE EROSION PROTECTION.

4. BAFFLED APRON DIMENSIONS ARE PROVIDED FOR ESTIMATING PURPOSES. FINAL CONSTRUCTION -LEVEL DESIGN WILL OPTIMIZE APRON DIMENSIONS FOR CONSTRUCTION EASE AND HYDRAULIC OPERATION.

5. OUTLET DOWNCHUTE HAS A LONGITUDINAL SLOPE = 9.0% AND REQUIRES RIPRAP LINING D50 = 18 IN. THE ENERGY DISSIPATION BASIN WILL HAVE IDENTICAL EROSION PROTECTION REQUIREMENTS WITH A LONGITUDINAL SLOPE OF 0%.



9 ENERGY DISSIPATION BASIN
6.4 NOT TO SCALE

NOT FOR CONSTRUCTION

Schlumberger WATER SERVICES

TYPICAL SPILLWAY SYSTEM DETAILS
FORT KNOX CLOSURE MANAGEMENT PLAN

CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANAGEMENT PLAN
JOB: 2903	DRAWN: RN CHECKED: ACP
DATE: MARCH 2011	PLAN: 6.4

SPILLWAY

PROJECT BOUNDARY

CHANNEL 2

CHANNEL 4

MONITORING STATION

FRESH WATER RESERVOIR

FISH CREEK

TSF SEEPAGE
COLLECTION AREA

NOT FOR CONSTRUCTION

N

SWS

0 500 1000

Scale in Feet

Schlumberger
WATER SERVICES

PLAN VIEW OF WETLAND SYSTEM
FT KNOX CLOSURE MANAGEMENT PLAN

CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANAGEMENT PLAN
JOB: 2903	DRAWN: RN CHECKED: ACP
DATE: MARCH 2011	PLAN: 6.5

Appendix F – SRCE Financial Assurance Calculations

Fort Knox Reclamation and Closure Plan July (2013)
Financial Assurance Discussion and Documentation

1 INTRODUCTION

The Financial Assurance cost estimate is based on the Fort Knox Reclamation and Closure Plan, dated July 2013 and the current life of mine projections. The financial assurance was calculated utilizing the Standardized Reclamation Cost Model (SRCE). This model standardizes productivity, area and volume calculations, it also provides worksheets to accommodate site specific reclamation requirements. The SRCE User Manual was the guiding document for the development of this estimate, a copy of the manual can be downloaded from the website http://www.nvbond.org .

Costs presented in this estimate are representative of the costs that would be incurred if a third party contractor were to perform the work.

The cost data for the Fort Knox Financial Assurance (FA) are as follows:

- Equipment Costs
- Labor Rates
- Reclamation Material Costs
- Misc. Unit Costs
- Indirect costs

The project data for reclamation activities that utilized the SRCE standardized approach are associated with the following tabs within the model:

- Other User
- Expl. Roads & Pads
- Waste Rock Dumps
- Heap Leach
- Roads
- Haul Material
- Foundations & Buildings
- Other Demo & Equipment Removal
- Sediment & Drainage Control
- Yards, Etc.
- Misc. Costs
- Construction Management

The site specific elements are computed on the following user tabs:

- User 1- Equipment Mobilization/Demobilization
- User 2-Water Treatment
- User 3-Well Closure
- User 4-Ground and Surface Water Sampling
- User 5-Spillway Construction
- User 6-Pumping Costs
- User 7-Long Term TSF Dam Maintenance and Repair Costs
- User 8-Long Term WSR Dam Maintenance and Repair Costs

- User 9 Long Term Pit Rim Warning Signs
- User 10 -Dam Security Gates

2 COST DATA

The cost data file is a user populated file that is then imported into the SRCE project data file. Cost data for this estimate was obtained from several sources including, the State of Alaska, vendors, contractors and mine data. To preserve contractors competitive edge, the company s name is not listed.

2.1 Equipment Costs

The majority of the equipment costs are based on rental rates provided from Equipment Watch. The remaining costs are based on NC Machinery Co., 730 Old Steese Highway, Fairbanks and contractor rates. The rental rates utilized unless otherwise noted are based on a 200 hour monthly minimum. See Appendix A

2.2 Labour Rates

Labor rates were taken from Alaska Department of Labor & Workforce Development Laborers & Mechanics Minimum Rates of Pay, Issue 25. Laborer rates categorized in class code N2101-N1206 represents applicable wage rate categories due to the location of Fort Knox. The base hourly rate was selected for each job classification. The fringe benefits vary between job classifications, the group average was used.

The work schedule for reclamation activities is assumed to be one 12 hour shift 7 days a week, a blanket overtime factor of $9.91/ hour was applied. To account for the indirect costs associated with employees $10.21 per hour (21% burden rate) is included as an additional markup. The burden rate accounts for Social Security, Medicaid, Unemployment Insurance. Liability and Workers Compensation Insurance. Refer to Alaska Department of Natural Resources & Department of Environmental Conservation, Draft Mine Closure and Reclamation Cost Estimation Guidelines, November 3, 2009.

2.3 Reclamation Material Costs

Seed mixture and fertilizer costs were provided from Alaska Mill and Feed the cost incudes freight delivery charges to site (Appendix B). Off-road diesel delivered to site is the 2012 yearly average paid by Fort Knox. Reference Appendix B for additional back-up.

2.4 Misc. Unit Costs

Revegetation will be accomplished by aerial broadcasting of seed and fertilizer. The rates for seeding and fertilizing is based on a quote from a contractor that has worked in Alaska and includes labor for flight crew and ground crew, lodging, meals, aircraft rental (wet rate) and contractor mark-ups.

Power cost are based the current agreed amount of 0.1649 per kWh between GVEA and FGMI. Appendix C is the copy of GVEA bill dated 05/01/2013.

2.5 Indirect Costs

Indirect costs were calculated for engineering/redesign, contractor profit and overhead, performance bonds, payment bonds, contract administration, contingencies, insurance premiums, and contract administration. These direct cost markup s are based on the Bureau of Land Management Guidelines for Reviewing Reclamation Cost Estimates see Appendix D, and Alaska Department of Natural Resources Draft Mine Closure and Reclamation Cost Estimation Guidelines

3 PROJECT DATA

The project data entered into the SRCE spread sheet is analyzed by a combination of simple geometric formulas and visual basic code to calculate outputs. Equipment productivities are calculated primarily by data provided in the Caterpillar Performance Handbook followed by Means Heavy Construction Cost Data 2006, and productivity data collected form actual work performed in the field.

Project data inputs (volumes, areas, and distances) were determined using AutoCAD Civil3D based on the life of mine contours. The ID Code references the section number of the Reclamation and Closure plan where additional information can be found. In general haul distances are from the centroid of the source to the destination centroid. The average ripping distance is the average of the greatest width and length of a footprint area.

3.1 Other User

The Other User tab summarizes the site specific elements, categorizes facility type, and assigns the site specific estimates to a cost type which is then captured on the summary sheet. A discussion of site specific elements is found in Section 4.

3.2 Expl. Roads & Pads

Pearl Creek well access road reclamation is estimated in this tab.

3.3 Waste Rock Dumps and Heap Leach

The Fort Knox mine has two major waste rock dumps. They are named Barnes Creek and Yellow Pup waste rock dumps. Reclamation of these dumps involves regrading to a approximate 3H:1V slope, placing 12 inches of growth media on the regraded surface, ripping on contour, seeding and fertilizing.

Inputs for waste rock dumps are identified by name and their corresponding elevation. The Fort Knox mining department redesigned each waste rock dump for reclamation. The bench height , footprint of the horizontal step-out of the bench below, along with the waste rock at the angle of repose, when regraded to a 3:1 slope will encompass the footprint of the dump plus the material pushed from the lowest bench sloping at a 3:1.

The Walter Creek heap leach pad reclamation efforts and inputs are the same as the waste rock dumps.

3.4 Roads

Roads that will be reclaimed include the Pipeline road, Phase 7 Haul road and dewatering access roads, borrow access roads, and Heap Leach haul road. Other roads not identified above that exist within the footprint of other facilities and are reclaimed with those facilities. Oversized drawings with SRCE inputs were Hand delivered to ADNR on 7/16/2013.

3.5 Haul Material

The Tailings Storage facility closure is a two part closure, water management and tailings cover. Figure 6.5 of the Reclamation and Closure plan illustrates the areas of open water and the areas requiring a waste rock cover. It is anticipate the cover material (borrow source) will come from Yellow Pup waste rock dump. Water management is discussed below in Section 4.6.

3.6 Foundations & Buildings and Other Demo & Equipment Removal

The majority of the buildings are located within FGMI surface ownership, reference Figure 6.10 in the Reclamation and Closure plan. Since the structures on the surface are not located on State land the buildings do not have to be removed, reference 11AAC97.210. From a safety standpoint outdoor conveyor systems and the fuel tank farm will be demolished/decommissioned.

The Foundations and Buildings tab accounts for the demolition of the structures. The input values were taken from construction drawings. Reference Appendix E

The Other Demo & Equipment Removal tab accounts for the selective demo of the structures. The quantity and units inputs are associated with number of pieces taken from a cost estimate prepared by Estimations in 2008. Labour and equipment costs are based on RS Means crew B8, which is linked to the fleets and crews tab.

3.7 Sediment & Drainage Control

The earthwork associated with the TSF spillway, and north wetlands complex estimate is found on the Sediment & Drainage tab. The TSF spillway concept design is located in Appendix F of this document, Section 6.2.3 and Appendix E of the Reclamation and Closure plan. The structural component of the spillway is discussed in Section 4.5 of this document. The north wetland complex is discussed in section 3.3 and Figure 3.4 of the Reclamation and Closure plan.

3.8 Yards, Etc.

The Yards, Etc. Tab was used for calculating costs associated with regrading roads and seeding and fertilizing growth media piles.

3.9 Misc. Costs

Removal of pipelines and power lines, and substation (sectionalizer) is estimated using the Misc. Cost tab.

3.10 Construction Management

Road Maintenance during reclamation is included

4 USER SHEETS

4.1 User 1- Equipment Mobilization/Demobilization

Mobilization and demobilization is assumed to be a one-time occurrence. The estimate uses RS Means crew, which includes, light duty truck driver, flatbed truck driver, equipment rental rate, pilot car lowbed trailer and truck trailer. Depending on the size of equipment being moved the number of pilot cars is adjusted accordingly. The labour equipment cost are linked to the Fleets(crews) tab.

4.2 User 2-Water Treatment

Fort Knox contracts a third party firm to perform a yearly pit lake study predicting water quality over a period of one hundred years, analysing historical and the current years water quality data of the dewatering well in the pit, heap leach and the TSF. Based on early analysis it is predicted the pit lake surface will be an elevation 1470 amsl, the pre-mining/historic water table elevation. Up to this point the pit will act as a hydraulic sink. Implementing the water treatment program, water quality standards will be met prior to the pit water entering the subsurface aquatic systems.

In addition to the engineers estimate, hydrated ferrous sulfate costs were added. Anchorage Consumer Price Index for the years 2007 through 2013 was applied to account for inflation. In Appendix G you will find the engineers estimate. In the 2012 Fort Knox pit lake evaluation 2012 update treatment provisions by Schlumberger Water Services, the amount of $FeSo_4$ was reduced to 40 tones.

Ferrous sulfate cost were provided by Univar in Anchorage Alaska 907-344-7444 the cost included delivery to site.

4.3 User 3-Well Closure

Well closure includes pit dewatering wells, piezometers, interceptor wells, and monitoring wells. Wells will be backfilled with a stemming/bentonite clay mixture and sealed at the surface with a bentonite clay surface seal. Locations are shown in Appendix H .

Labor and equipment rates quotes for well closure and liner puncture are from a contractor that has performed work in interior Alaska and includes markup.

Well dimension were taken from well logs.

There are three additional wells that will be installed around the heap leach, there location has not been determined yet. The future wells (HL-4, HL-5 and HL-6) are accounted for with an assumed depth and diameter.

4.4 User 4-Ground and Surface Water Sampling

Table 7.1 of the Reclamation and Closure plan provides a list of monitoring location type, sample parameter and frequency. Section 7.3.1 details heap leach sampling requirements. Appendix I of this document identifies the location of the sampling locations as does Figure 7.1 in the RCP.

4.5 User 5-Spillway Construction

User 5 captures the structural component of the TSF spillway system. The material quantities and dimensions are based on the preliminary design reference Appendix F. RS Means was used to determine crew size, equipment and productivity rates. Costs associated with those items are linked to the Fleets (Crews) tab. The earthwork component is found on the Sediment & Drainage Control tab.

4.6 User 6-Pumping Costs

Water management of the TSF, heap leach and the pit is a very significant component of the closure of the Fort Knox Mine. The following is a summary of the pumping routes and costs for achieving water quality standards after residual leaching is complete. Appendix J is a drawing of the routes.

The pumping routes are:

1. CIC1 and CIC2 to heap leach-This is an existing pipeline route, water will be transported utilizing the pipes within the lined pipeline corridor.
2. Heap Leach to Pit Rim via CIC1 and CIC2
3. Interceptor wells to seepage sump-The interceptor wells and Seepage Sump are currently operational at their long-term pumping rates, the actual power draw is used to determine costs.
4. Seepage Sump to Barge Pond - Seepage Sump are currently operational at their long-term pumping rates, the actual power draw is used to determine costs, this was applied for three years. The last year is it will be running for approximately 4 month out of the year.
5. Barge Pond to Detox to Pit Rim water will be routed through detox then to the pit. The amount of water that will be pumped was determined using the closure water balance model.
6. Pit to CIC1 and CIC 2-Water will be transferred by new pumps to a lift station then to CIC 1 and 2

4.7 User 7-Long Term TSF Dam Maintenance and Repair Costs

Costs are captured from an estimate provided by WHPacific the ACPI from 2009-2012 was applied, reference Appendix G in the Reclamation and Closure plan.

4.8 User 8-Long Term WSR Dam Maintenance and Repair Costs

Costs are captured from an estimate provided by WHPacific, the ACPI from 2009-2012 reference Appendix G in the Reclamation and Closure plan.

4.9 User 9 Long Term Pit Rim Warning Signage

This sheet accounts for long term warning signage around the pit rim, the variables used for calculating the NPV of the long term dam maintenance were used. Appendix B contains the back-up pricing.

5 REFERENCES

Alaska Department of Natural Resources & Department of Environmental Conservation, Draft Mine Closure and Reclamation Cost Estimation Guidelines, November 3, 2009.

State of Alaska, Department of Labor and Workforce Development, Wage & our Administration Laborers & Mechanics Minimum Rates of Pay, Issue 25

Aalytica Alaska Labs, Fairbanks Alaska

Bureau of Land Management, Instruction Memorandum No. 2003-082, Reclamation Cost Estimates for Notices and Plans of Operations, Indirect Costs, March 1, 2004.

Fort Knox Mine Reclamation Plan (2013), Fairbanks Gold Mining, Inc., Fairbanks, Alaska, July 2012.

Appendix A

Schedule C

Equipment List & Charge-out Rates for Provisional Sum Work Items & Extra Work Performed on a T&M Basis, All as Approved in Advance by Construction Manager

Transport to & From Site is not included.

				Rates		
Equipment	Owned/ Rental	Location	Hourly	Daily	Weekly	Monthly
Pickup 4 x 4	Owned	Anchorage	$ 13.00	$ 104.00	$ 657.00	$ 1,908.00
1 Tn Flatbed	Owned	Anchorage	$ 21.00	$ 168.00	$ 1,025.00	$ 3,531.00
Mechanic Truck	Owned	Anchorage	$ 43.00	$ 344.00	$ 2,170.00	$ 6,441.00
Fuel/Lube Truck	Owned	Anchorage	$ 68.00	$ 544.00	$ 3,371.00	$ 10,354.00
4 Mgal Water Truck	Owned	Anchorage	$ 52.00	$ 416.00	$ 2,571.00	$ 8,140.00
Highway Tractor w/ Lowboy	Owned	Anchorage	$ 135.00	$1,080.00	$ 6,890.00	$ 19,033.00
Caterpillar 740 Articulated Truck or Equal	Own/Rent	Fairbanks	$ 146.00	$1,168.00	$ 7,569.00	$ 19,455.00
Caterpillar D6H Dozer	Owned	Anchorage	$ 122.00	$ 976.00	$ 5,968.00	$ 19,574.00
Caterpillar D8T Dozer/Ripper	Owned	Fairbanks	$ 186.00	$1,488.00	$ 9,228.00	$ 28,316.00
Caterpillar D9N/R Dozer/Ripper	Owned	Anchorage	$ 234.00	$1,872.00	$ 11,317.00	$ 38,538.00
Caterpillar D10N/R r/Ripper	Owned	Fairbanks	$ 283.00	$2,264.00	$ 13,615.00	$ 47,058.00
Caterpillar 966 Loader	Owned	Anchorage	$ 90.00	$ 720.00	$ 4,361.00	$ 14,785.00
Caterpillar 980 Loader	Owned	Anchorage	$ 119.00	$ 952.00	$ 5,775.00	$ 19,330.00
Caterpillar 14G/H Motor Grader	Owned	Anchorage	$ 104.00	$ 832.00	$ 5,157.00	$ 16,101.00
Caterpillar 320/330 Excavator	Own/Rent	Fairbanks	$ 105.00	$ 840.00	$ 5,151.00	$ 16,918.00
Caterpillar 345 Excavator	Owned	Anchorage	$ 153.00	$1,224.00	$ 7,322.00	$ 25,720.00
Caterpillar 365 Excavator	Owned	Anchorage	$ 249.00	$1,992.00	$ 12,090.00	$ 40,768.00
Klien 10-12 Mgal Water Tank	Owned	Anchorage	$ 15.00	$ 120.00	$ 873.00	$ 1,252.00

Transport to & from site for extra work will be actual Lowboy hours times the above rate plus permit and pilot car costs or negotiated in advance.

Schedule C (cont'd)

1. Payment will be made to the Contractor for the rental and operation of all construction equipment and tools with a value greater than $2,500.00 in replacement value.
2. When equipment is required which does not reasonably resemble any of the equipment having rental rates shown here the rental rate shall be negotiated and agreed upon in writing before commencing the use of that equipment.
3. The rental rate price shall include fuel, lubricants, repair, parts and service, maintenance, applicable taxes, overhead and profit, and transport to and from the site.
4. Operators are to be included in the labour charge-out rates.
5. Payment shall be limited to actual hours of use.
6. The Contractor must indicate on the list of equipment set out below, the equipment presently owned or rented and be prepared to supply proof of commitment of listed equipment to this project at the time of Tendering. Also, indicate present location of the listed equipment.

SCHEDULE D

MARK-UPS ON REIMBURSABLES

The mark-up on materials, equipment, subcontracts and equipment rentals purchased by the Contractor as an extra shall be subject to no more than ten (10%) percent of the invoice less tax.

Agreed at 10%

CONSUMABLES

Cost of all Contractor's consumables to be included in the labour charge-out rate, including ropes, chains, tarps and the like.

Agreed & Included

Appendix B

Jennifer Pyecha

Subject: FW: Budgets

From: Jason Chu
Sent: Wednesday, November 21, 2012 10:40 AM
To: Jennifer Pyecha
Subject: Budgets

Jennifer,

Concrete Delivery: $180.00/CY
Rebar Supply FOB Mine from AK Steel: $0.75/lb

Let me know if you need anything else.

Thanks

KINROSS Fort Knox
Jason Chu | Capital Projects Engineer | Fairbanks Gold Mining, Inc.
PO Box 73726 Fairbanks, AK 99707
Direct Tel: (907) 490-6122 Fax: (907) 490-2290 Email: jason.chu@kinross.com

QUOTE

POWERHOUSE Signs
A Division of Ridge Co., LLC

Powerhouse Signs
2630 Van Horn Rd.
Fairbanks, AK 99709
ph: 907.452.5660
fax: 907.452.4640

Name:	FAIRBANKS GOLD MINING ATTN: HEATHER	NO:	Q5014
Address:	1 FORT KNOX ROAD	Quote Date	10/11/2013
	FAIRBANKS, AK 99712	Inquiry Date	
Job#	Phone:	Sales Person	FARRAH

QTY	DESCRIPTION	PRICE	AMOUNT
220	1.5"X6' PERFORATED STEEL TUBING	$ 36.00	$ 7,920.00
			$ -
1	LUMP SUM ALL HARDWARE	$ 250.00	$ 250.00
	440 BOLTS - WILL SUPPLY 500		
	440 NUTS - WILL SUPPLY 500		
	880 WASHERS - WILL SUPPLY 1000		
	LEAD TIME 8 WEEKS FOR THE 1.5" X 6'		
	PRICE FOR 2"X6' IS $39 EA (2-3 WEEKS LEAD TIME)		
	PRICE FOR 2.5"X6' IS $47.70 EA (IN STOCK IN FAIRBANKS)		
		TOTAL	$ 8,170.00

WE ARE PLEASED TO SUMMIT THE ABOVE QUOTATION FOR YOUR CONSIDERATION. SHOULD YOU PLACE AN ORDER BE ASSURED IT WILL RECEIVE OUR PROMPT ATTENTION. THIS QUOTATION IS VALID FOR __**30**__DAYS THEREAFTER IS IS SUBJECT TO CHANGE WITHOUT NOTICE.

Acceptance of Quote: _____

As of April 1st Powerhouse Signs is under new ownership. We look forward to doing business with you!

Appendix C

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC.
P.O. Box 71249, Fairbanks, Alaska 99707-1249
(907)452-1151 or 1-800-770-4832

SERVICE ADDRESS		PHONE
2000 Walter Creek Rd		(907)452-1151
BILLING DATE	**DUE DATE**	**AMOUNT DUE**
05/01/2013	05/28/2013	$3,802,183.00
ACCOUNT NUMBER		**PLEASE ENTER AMOUNT ENCLOSED**
53799		$

Fairbanks Gold Mining Inc
PO Box 73726
Fairbanks, AK 99707-3726

GOLDEN VALLEY ELECTRIC ASSOCIATION
PO BOX 71249
FAIRBANKS AK 99707-1249

☐ Check here if you have updated your phone, address or e-mail. Note changes on reverse sic

☐ Check here if paying by Credit Card. Provide the required card information on reverse side

DATABAR FORM # 7110 3/26/13 *Please detach and return this stub. This stub ensures that your payment is processed accurately.*

GOLDEN VALLEY ELECTRIC ASSOCIATION, INC. | PO BOX 71249 FAIRBANKS ALASKA | (907)452-1151 or 1-800-770-4832
Rate Schedule: GS3 Industrial Service **District #: 4** **Electronic Voting #:** **BB**

ACCOUNT	NAME	SERVICE LOCATION	BILL DATE	DUE DATE
53799	FAIRBANKS GOLD MINING INC	2000 WALTER CREEK RD	05/01/2013	05/28/2013

METER #	SERVICE PERIOD	PREVIOUS READ	CURRENT READ	MULTIPLIER	USAGE
72281	03/29/2013 - 04/30/2013	36739	37562	28000	23044000 KWH
		0.000	1.283	28000	35924.000 KW
		8519	8807	28000	8064000 KVARH (0.94 pf)

Wire Instructions: Due 5 business days after receipt of bill.
Golden Valley Account #729681006312
Route & Transit #12500879
KeyBank Anchorage, AK

PREVIOUS BALANCE	**3,701,986.11**
Total Payments	-3,701,986.11
BALANCE FORWARD	**0.00**
NEW CHARGES	
Customer Charge	295.00
Fuel & Purchased Power 23044000 kwh @ 0.11078	2,552,814.32
Utility Charge 23044000 kwh @ 0.02425	558,817.00
Demand Charge 35924 kw @ 18.85	677,167.40
Regulatory Cost Charge 23044000 kwh @ 0.00056	13,088.99
SUBTOTAL	**3,802,182.71**
TOTAL DUE	**3,802,182.71**
Good¢ents Donation	0.29

Amount Due $3,802,183.00

USAGE COMPARISONS

	DAYS	KWH	KWH/DAY	COST/DAY
Current Billing Period	32	23044000	720125	118,818.21
Previous Billing Period	29	22344000	770483	127,654.69
Same Period Last Year	31	22624000	729806	127,351.84

Jennifer Pyecha

From: Ray Bronson
Sent: Wednesday, April 03, 2013 10:58 AM
To: Jennifer Pyecha
Subject: LOM Power Cost
Attachments: LOM Power.xls

LOM power consumption and cost as requested.

Ray Bronson
Superintendent, Financial Planning & Analysis
Phone: (907) 490-2268
VOIP: 8162268
Cell: 907-388-0948
E-Mail: ray.bronson@kinross.com

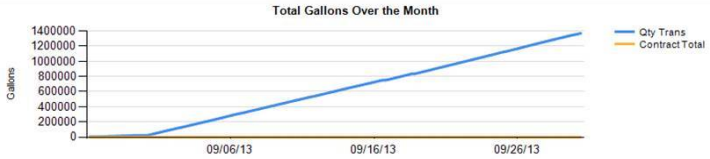
KINROSS Fort Knox

Description	Units	Year1 --	Year2 --	Year3 --	Year4	Year5	Year6	Year7	Year8	Year9	Year10	Year11
		0	0	0								
LOM Summary												
Fort Knox 2012 MRMR		**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Expense Detail												
Expense Detail												
Total Power Cost	USD	45,203,222	45,735,653	45,740,326	47,995,240	47,995,240	8,891,813	8,891,813	8,896,376	7,226,256	7,226,256	7,226,256
Power Consumption	kWh	274,125,060	277,353,868	277,382,205	291,056,643	291,056,643	53,922,458	53,922,458	53,950,130	43,822,050	43,822,050	43,822,050
Cost per kWh		0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649	0.1649

Customer Sales Report Detail (Month to Date)

Fairbanks Gold Mining, Inc.

Contains Activity From 09/01/2013 Through 09/30/2013



Trans ID	Trans Date	Type	In/Out	Location	Party	Consignee	Vehicle	Driver	Product	Pkg	Quantity	Mtr Tkt	Inv Nbr	Unit Price	Fed Tax Rate	Fed Tax Billed	State Tax Rate	State Tax Billed	Delivery Rate	Delivery Amount	Other Rate	Other Billed	Invoiced (X-local tax)
205957	Sep 1 2013 6:30AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,624.4	1-372210	40035	3.493226	0.001000	8.62	0.080000	689.95	0.000000	0.00	0.000000	0.00	30,841.98
205958	Sep 1 2013 7:28AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,319.8	1-372211	40036	3.493226	0.001000	9.32	0.080000	745.58	0.000000	0.00	0.000000	0.00	33,328.82
205959	Sep 1 2013 8:40AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,216.7	1-372212	40037	3.493226	0.001000	9.22	0.080000	737.34	0.000000	0.00	0.000000	0.00	32,960.14
205960	Sep 1 2013 10:10AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,617.6	1-372213	40038	3.493226	0.001000	8.62	0.080000	689.41	0.000000	0.00	0.000000	0.00	30,817.67
205963	Sep 1 2013 11:31AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,330.2	1-372218	40039	3.493226	0.001000	9.33	0.080000	746.42	0.000000	0.00	0.000000	0.00	33,366.02
205966	Sep 1 2013 1:14PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,217.1	1-372223	40040	3.493226	0.001000	9.22	0.080000	737.37	0.000000	0.00	0.000000	0.00	32,961.56
205978	Sep 2 2013 6:17AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,514.0	1-372246	40042	3.493226	0.001000	8.51	0.080000	681.12	0.000000	0.00	0.000000	0.00	30,447.18
205982	Sep 2 2013 8:47AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Bruce Hawk	DF2 LS	bulk	9,419.7	1-372253	40044	3.493226	0.001000	9.42	0.080000	753.58	0.000000	0.00	0.000000	0.00	33,686.08
205987	Sep 2 2013 9:57AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,511.5	1-372258	40045	3.493226	0.001000	8.51	0.080000	680.92	0.000000	0.00	0.000000	0.00	30,438.23
205995	Sep 2 2013 12:48PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Bruce Hawk	DF2 LS	bulk	9,423.6	1-372276	40046	3.493226	0.001000	9.42	0.080000	753.89	0.000000	0.00	0.000000	0.00	33,700.02
206012	Sep 3 2013 6:10AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,514.7	1-372307	40057	3.493226	0.001000	8.51	0.080000	681.18	0.000000	0.00	0.000000	0.00	30,449.68
206017	Sep 3 2013 8:00AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	7,211.2	1-372312	40058	3.493226	0.001000	7.21	0.080000	576.90	0.000000	0.00	0.000000	0.00	25,788.20
206028	Sep 3 2013 9:55AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,215.3	1-372324	40059	3.493226	0.001000	9.22	0.080000	737.22	0.000000	0.00	0.000000	0.00	32,955.13
206032	Sep 3 2013 10:42AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,511.1	1-372333	40060	3.493226	0.001000	8.51	0.080000	680.89	0.000000	0.00	0.000000	0.00	30,436.81
206054	Sep 3 2013 1:25PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,201.3	1-372356	40061	3.493226	0.001000	9.20	0.080000	736.10	0.000000	0.00	0.000000	0.00	32,905.05
206063	Sep 3 2013 2:45PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,303.5	1-372368	40062	3.493226	0.001000	9.30	0.080000	744.28	0.000000	0.00	0.000000	0.00	33,270.53
206080	Sep 4 2013 6:06AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,513.6	1-372407	40077	3.493226	0.001000	8.51	0.080000	681.09	0.000000	0.00	0.000000	0.00	30,445.75
206089	Sep 4 2013 7:54AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,205.7	1-372416	40078	3.493226	0.001000	9.21	0.080000	736.46	0.000000	0.00	0.000000	0.00	32,920.80
206110	Sep 4 2013 9:37AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,507.4	1-372446	40079	3.493226	0.001000	8.51	0.080000	680.59	0.000000	0.00	0.000000	0.00	30,423.58
206131	Sep 4 2013 1:44PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,202.4	1-372486	40080	3.493226	0.001000	9.20	0.080000	736.19	0.000000	0.00	0.000000	0.00	32,908.98
206137	Sep 4 2013 2:33PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,500.6	1-372494	40081	3.493226	0.001000	8.50	0.080000	680.05	0.000000	0.00	0.000000	0.00	30,399.26
206144	Sep 4 2013 6:07PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,200.8	1-372503	40082	3.493226	0.001000	9.20	0.080000	736.06	0.000000	0.00	0.000000	0.00	32,903.26
206153	Sep 5 2013 6:10AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,516.2	1-372525	40092	3.493226	0.001000	8.52	0.080000	681.30	0.000000	0.00	0.000000	0.00	30,455.05
206158	Sep 5 2013 7:26AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF2 LS	bulk	9,708.3	1-372532	40093	3.493226	0.001000	9.71	0.080000	776.66	0.000000	0.00	0.000000	0.00	34,718.15
206174	Sep 5 2013 10:05AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,504.4	1-372552	40094	3.493226	0.001000	8.50	0.080000	680.35	0.000000	0.00	0.000000	0.00	30,412.84
206179	Sep 5 2013 11:18AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF2 LS	bulk	9,763.4	1-372564	40095	3.493226	0.001000	9.76	0.080000	781.07	0.000000	0.00	0.000000	0.00	34,915.19
206225	Sep 6 2013 8:19AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,216.7	1-372655	40108	3.493226	0.001000	9.22	0.080000	737.34	0.000000	0.00	0.000000	0.00	32,960.14
206232	Sep 6 2013 9:26AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF2 LS	bulk	9,716.1	1-372667	40109	3.493226	0.001000	9.72	0.080000	777.29	0.000000	0.00	0.000000	0.00	34,746.05
206246	Sep 6 2013 1:28PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,204.6	1-372691	40110	3.493226	0.001000	9.20	0.080000	736.37	0.000000	0.00	0.000000	0.00	32,916.85
206247	Sep 6 2013 2:03PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF2 LS	bulk	9,762.7	1-372692	40112	3.493226	0.001000	9.76	0.080000	781.02	0.000000	0.00	0.000000	0.00	34,912.70
206262	Sep 6 2013 5:26PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,209.9	1-372713	40113	3.493226	0.001000	9.21	0.080000	736.79	0.000000	0.00	0.000000	0.00	32,935.80
206268	Sep 7 2013 6:04AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,512.6	1-372729	40114	3.493226	0.001000	8.51	0.080000	681.01	0.000000	0.00	0.000000	0.00	30,442.18
206274	Sep 7 2013 8:55AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	7,212.8	1-372739	40115	3.493226	0.001000	7.21	0.080000	577.02	0.000000	0.00	0.000000	0.00	25,793.91
206277	Sep 7 2013 10:00AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,508.0	1-372742	40116	3.493226	0.001000	8.51	0.080000	680.64	0.000000	0.00	0.000000	0.00	30,425.73
206278	Sep 7 2013 10:32AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Clay Murphy	DF2 LS	bulk	9,206.9	1-372743	40117	3.493226	0.001000	9.21	0.080000	736.55	0.000000	0.00	0.000000	0.00	32,925.08
206289	Sep 7 2013 2:32PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,205.6	1-372761	40119	3.493226	0.001000	9.21	0.080000	736.45	0.000000	0.00	0.000000	0.00	32,920.44
206300	Sep 8 2013 6:06AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,519.5	1-372787	40121	3.493226	0.001000	8.52	0.080000	681.56	0.000000	0.00	0.000000	0.00	30,466.85
206305	Sep 8 2013 8:46AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,219.2	1-372796	40123	3.493226	0.001000	9.22	0.080000	737.54	0.000000	0.00	0.000000	0.00	32,969.07
206306	Sep 8 2013 9:43AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,515.6	1-372797	40125	3.493226	0.001000	8.52	0.080000	681.25	0.000000	0.00	0.000000	0.00	30,452.91
206308	Sep 8 2013 1:49PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,216.5	1-372799	40126	3.493226	0.001000	9.22	0.080000	737.32	0.000000	0.00	0.000000	0.00	32,959.42
206313	Sep 8 2013 5:35PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,220.5	1-372804	40127	3.493226	0.001000	9.22	0.080000	737.64	0.000000	0.00	0.000000	0.00	32,973.72
206328	Sep 9 2013 6:06AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,525.9	1-372834	40140	3.493226	0.001000	8.53	0.080000	682.07	0.000000	0.00	0.000000	0.00	30,489.74
206335	Sep 9 2013 8:29AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,326.2	1-372845	40141	3.493226	0.001000	9.33	0.080000	746.10	0.000000	0.00	0.000000	0.00	33,351.72
206351	Sep 9 2013 9:45AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,517.4	1-372878	40142	3.493226	0.001000	8.52	0.080000	681.39	0.000000	0.00	0.000000	0.00	30,459.34
206360	Sep 9 2013 12:27PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,317.4	1-372901	40143	3.493226	0.001000	9.32	0.080000	745.39	0.000000	0.00	0.000000	0.00	33,320.24
206377	Sep 9 2013 4:38PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,317.0	1-372932	40144	3.493226	0.001000	9.32	0.080000	745.36	0.000000	0.00	0.000000	0.00	33,318.82
206387	Sep 10 2013 4:08AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,515.4	1-372947	40154	3.493226	0.001000	8.52	0.080000	681.23	0.000000	0.00	0.000000	0.00	30,452.19
206413	Sep 10 2013 9:05AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,507.7	1-372983	40156	3.493226	0.001000	8.51	0.080000	680.62	0.000000	0.00	0.000000	0.00	30,424.66
206420	Sep 10 2013 9:51AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,204.6	1-372993	40157	3.493226	0.001000	9.20	0.080000	736.37	0.000000	0.00	0.000000	0.00	32,916.85
206444	Sep 10 2013 3:13PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Curtiss Smith	DF2 LS	bulk	9,196.8	1-373029	40159	3.493226	0.001000	9.20	0.080000	735.74	0.000000	0.00	0.000000	0.00	32,888.96
206465	Sep 11 2013 6:08AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,511.1	1-373069	40178	3.493226	0.001000	8.51	0.080000	680.89	0.000000	0.00	0.000000	0.00	30,436.81
206472	Sep 11 2013 8:40AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Curtiss Smith	DF2 LS	bulk	9,209.6	1-373085	40179	3.493226	0.001000	9.21	0.080000	736.77	0.000000	0.00	0.000000	0.00	32,934.73
206479	Sep 11 2013 9:36AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,503.8	1-373098	40180	3.493226	0.001000	8.50	0.080000	680.30	0.000000	0.00	0.000000	0.00	30,410.70
206497	Sep 11 2013 1:26PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Curtiss Smith	DF2 LS	bulk	9,212.6	1-373129	40181	3.493226	0.001000	9.21	0.080000	737.01	0.000000	0.00	0.000000	0.00	32,945.46
206504	Sep 11 2013 2:07PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,508.1	1-373142	40182	3.493226	0.001000	8.51	0.080000	680.65	0.000000	0.00	0.000000	0.00	30,426.09
206520	Sep 11 2013 6:47PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Curtiss Smith	DF2 LS	bulk	9,217.5	1-373176	40183	3.493226	0.001000	9.22	0.080000	737.40	0.000000	0.00	0.000000	0.00	32,962.99
206534	Sep 12 2013 6:15AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,519.6	1-373206	40187	3.493226	0.001000	8.52	0.080000	681.57	0.000000	0.00	0.000000	0.00	30,467.21
206545	Sep 12 2013 9:21AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	7,209.4	1-373220	40188	3.493226	0.001000	7.21	0.080000	576.75	0.000000	0.00	0.000000	0.00	25,781.75
206549	Sep 12 2013 10:58AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,509.3	1-373224	40189	3.493226	0.001000	8.51	0.080000	680.74	0.000000	0.00	0.000000	0.00	30,430.37
206564	Sep 12 2013 3:13PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,203.7	1-373248	40190	3.493226	0.001000	9.20	0.080000	736.30	0.000000	0.00	0.000000	0.00	32,913.63
206567	Sep 12 2013 3:47PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,505.9	1-373253	40191	3.493226	0.001000	8.51	0.080000	680.47	0.000000	0.00	0.000000	0.00	30,418.21
206579	Sep 13 2013 6:50AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,219.4	1-373281	40200	3.493226	0.001000	9.22	0.080000	737.55	0.000000	0.00	0.000000	0.00	32,969.78
206594	Sep 13 2013 9:02AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF2 LS	bulk	9,315.3	1-373301	40201	3.493226	0.001000	9.32	0.080000	745.22	0.000000	0.00	0.000000	0.00	33,312.74
206598	Sep 13 2013 10:38AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,213.2	1-373305	40202	3.493226	0.001000	9.21	0.080000	737.06	0.000000	0.00	0.000000	0.00	32,947.61
206619	Sep 13 2013 1:30PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF2 LS	bulk	9,313.9	1-373322	40203	3.493226	0.001000	9.31	0.080000	745.11	0.000000	0.00	0.000000	0.00	33,307.72
206625	Sep 13 2013 2:37PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,213.3	1-373331	40204	3.493226	0.001000	9.21	0.080000	737.06	0.000000	0.00	0.000000	0.00	32,947.96
206642	Sep 13 2013 5:22PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF2 LS	bulk	9,314.2	1-373354	40205	3.493226	0.001000	9.31	0.080000	745.14	0.000000	0.00	0.000000	0.00	33,308.80
206657	Sep 14 2013 6:18AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,522.1	1-373384	40206	3.493226	0.001000	8.52	0.080000	681.77	0.000000	0.00	0.000000	0.00	30,476.14
206658	Sep 14 2013 7:24AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 018	Clay Murphy	DF2 LS	bulk	8,570.4	1-373385	40207	3.493226	0.001000	8.57	0.080000	685.63	0.000000	0.00	0.000000	0.00	30,648.87
206661	Sep 14 2013 9:50AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 HS	bulk	9,646.6	1-373388	40208	3.283871	0.001000	9.65	0.000000	0.00	0.000000	0.00	0.000000	0.00	31,706.22
206665	Sep 14 2013 10:59AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,518.6	1-373392	40209	3.493226	0.001000	8.52	0.080000	681.49	0.000000	0.00	0.000000	0.00	30,463.64

Trans ID	Trans Date	Type	In/Out	Location	Party	Consignee	Vehicle	Driver	Product	Pkg	Quantity	Mtr Tkt	Inv Nbr	Unit Price	Fed Tax Rate	Fed Tax Billed	State Tax Rate	State Tax Billed	Delivery Rate	Delivery Amount	Other Rate	Other Billed	Invoiced (X-local tax)
206667	Sep 14 2013 11:31AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 018	Clay Murphy	DF2 LS	bulk	8,567.6	1-373394	40210	3.493226	0.001000	8.57	0.080000	685.41	0.000000	0.00	0.000000	0.00	30,638.86
206676	Sep 14 2013 3:16PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	9,214.4	1-373407	40211	3.493226	0.001000	9.21	0.080000	737.15	0.000000	0.00	0.000000	0.00	32,951.89
206687	Sep 15 2013 6:11AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,537.5	1-373435	40212	3.493226	0.001000	8.54	0.080000	683.00	0.000000	0.00	0.000000	0.00	30,531.22
206690	Sep 15 2013 9:06AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	8,938.7	1-373440	40213	3.493226	0.001000	8.94	0.080000	715.10	0.000000	0.00	0.000000	0.00	31,965.97
206691	Sep 15 2013 9:45AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,528.6	1-373441	40214	3.493226	0.001000	8.53	0.080000	682.29	0.000000	0.00	0.000000	0.00	30,499.40
206695	Sep 15 2013 1:53PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF2 LS	bulk	8,924.0	1-373448	40215	3.493226	0.001000	8.92	0.080000	713.92	0.000000	0.00	0.000000	0.00	31,913.39
206707	Sep 16 2013 6:10AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,545.8	1-373476	40216	3.493226	0.001000	8.55	0.080000	683.66	0.000000	0.00	0.000000	0.00	30,560.90
206719	Sep 16 2013 9:29AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,374.5	1-373490	40217	3.493226	0.001000	9.37	0.080000	749.96	0.000000	0.00	0.000000	0.00	33,524.44
206723	Sep 16 2013 10:16AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF2 LS	bulk	8,536.8	1-373497	40218	3.493226	0.001000	8.54	0.080000	682.94	0.000000	0.00	0.000000	0.00	30,528.71
206741	Sep 16 2013 1:59PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF2 LS	bulk	9,327.2	1-373518	40219	3.493226	0.001000	9.33	0.080000	746.18	0.000000	0.00	0.000000	0.00	33,355.30
206766	Sep 17 2013 7:05AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,743.7	1-373567	40248	3.633226	0.001000	8.74	0.080000	699.50	0.000000	0.00	0.000000	0.00	32,492.74
207019	Sep 17 2013 7:05AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	-8,743.7	1-373567	40248	3.633226	0.001000	-8.74	0.080000	-699.50	0.000000	0.00	0.000000	0.00	-32,492.74
207020	Sep 17 2013 7:05AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	8,743.7	1-373567	40289	3.493226	0.001000	8.74	0.080000	699.50	0.000000	0.00	0.000000	0.00	31,268.62
206775	Sep 17 2013 8:55AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	7,434.4	1-373578	40249	3.633226	0.001000	7.43	0.080000	594.75	0.000000	0.00	0.000000	0.00	27,627.20
207021	Sep 17 2013 8:55AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	-7,434.4	1-373578	40249	3.633226	0.001000	-7.43	0.080000	-594.75	0.000000	0.00	0.000000	0.00	-27,627.20
207022	Sep 17 2013 8:57AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	7,434.4	1-373578	40290	3.493226	0.001000	7.43	0.080000	594.75	0.000000	0.00	0.000000	0.00	26,586.38
206788	Sep 17 2013 10:33AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF1 LS	bulk	9,354.1	1-373597	40250	3.633226	0.001000	9.35	0.080000	748.33	0.000000	0.00	0.000000	0.00	34,761.06
207023	Sep 17 2013 10:33AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031		DF1 LS	bulk	-9,354.1	1-373597	40250	3.633226	0.001000	-9.35	0.080000	-748.33	0.000000	0.00	0.000000	0.00	-34,761.06
207024	Sep 17 2013 10:33AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031		DF1 LS	bulk	9,354.1	1-373597	40291	3.493226	0.001000	9.35	0.080000	748.33	0.000000	0.00	0.000000	0.00	33,451.49
206802	Sep 17 2013 12:32PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,735.3	1-373617	40252	3.633226	0.001000	8.74	0.080000	698.82	0.000000	0.00	0.000000	0.00	32,461.52
207025	Sep 17 2013 12:32PM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	-8,735.3	1-373617	40252	3.633226	0.001000	-8.74	0.080000	-698.82	0.000000	0.00	0.000000	0.00	-32,461.52
207026	Sep 17 2013 12:32PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	8,735.3	1-373617	40292	3.493226	0.001000	8.74	0.080000	698.82	0.000000	0.00	0.000000	0.00	31,238.58
206817	Sep 17 2013 2:26PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,702.5	1-373686	40253	3.633226	0.001000	9.70	0.080000	776.20	0.000000	0.00	0.000000	0.00	36,055.76
207027	Sep 17 2013 2:26PM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	-9,702.5	1-373686	40253	3.633226	0.001000	-9.70	0.080000	-776.20	0.000000	0.00	0.000000	0.00	-36,055.76
207028	Sep 17 2013 2:26PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	9,702.5	1-373686	40293	3.493226	0.001000	9.70	0.080000	776.20	0.000000	0.00	0.000000	0.00	34,697.41
206818	Sep 17 2013 3:01PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF1 LS	bulk	9,642.5	1-373687	40255	3.633226	0.001000	9.64	0.080000	771.40	0.000000	0.00	0.000000	0.00	35,832.79
207029	Sep 17 2013 3:01PM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031		DF1 LS	bulk	-9,642.5	1-373687	40255	3.633226	0.001000	-9.64	0.080000	-771.40	0.000000	0.00	0.000000	0.00	-35,832.79
207030	Sep 17 2013 3:01PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031		DF1 LS	bulk	9,642.5	1-373687	40294	3.493226	0.001000	9.64	0.080000	771.40	0.000000	0.00	0.000000	0.00	34,482.84
206836	Sep 18 2013 6:08AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,751.7	1-373722	40260	3.633226	0.001000	8.75	0.080000	700.14	0.000000	0.00	0.000000	0.00	32,522.46
207031	Sep 18 2013 6:08AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	-8,751.7	1-373722	40260	3.633226	0.001000	-8.75	0.080000	-700.14	0.000000	0.00	0.000000	0.00	-32,522.46
207032	Sep 18 2013 6:08AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	8,751.7	1-373722	40295	3.493226	0.001000	8.75	0.080000	700.14	0.000000	0.00	0.000000	0.00	31,297.23
206842	Sep 18 2013 7:43AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,752.4	1-373728	40261	3.633226	0.001000	9.75	0.080000	780.19	0.000000	0.00	0.000000	0.00	36,241.19
207035	Sep 18 2013 7:43AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	-9,752.4	1-373728	40261	3.633226	0.001000	-9.75	0.080000	-780.19	0.000000	0.00	0.000000	0.00	-36,241.19
207036	Sep 18 2013 7:43AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	9,752.4	1-373728	40296	3.493226	0.001000	9.75	0.080000	780.19	0.000000	0.00	0.000000	0.00	34,875.86
206851	Sep 18 2013 9:40AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,747.4	1-373739	40262	3.633226	0.001000	8.75	0.080000	699.79	0.000000	0.00	0.000000	0.00	32,506.48
207039	Sep 18 2013 9:40AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	-8,747.4	1-373739	40262	3.633226	0.001000	-8.75	0.080000	-699.79	0.000000	0.00	0.000000	0.00	-32,506.48
207040	Sep 18 2013 9:40AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	8,747.4	1-373739	40297	3.493226	0.001000	8.75	0.080000	699.79	0.000000	0.00	0.000000	0.00	31,281.85
206871	Sep 18 2013 12:19PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,752.4	1-373775	40263	3.633226	0.001000	9.75	0.080000	780.19	0.000000	0.00	0.000000	0.00	36,241.19
207041	Sep 18 2013 12:19PM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	-9,752.4	1-373775	40263	3.633226	0.001000	-9.75	0.080000	-780.19	0.000000	0.00	0.000000	0.00	-36,241.19
207042	Sep 18 2013 12:19PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	9,752.4	1-373775	40298	3.493226	0.001000	9.75	0.080000	780.19	0.000000	0.00	0.000000	0.00	34,875.86
206908	Sep 19 2013 6:07AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,758.9	1-373841	40283	3.633226	0.001000	8.76	0.080000	700.71	0.000000	0.00	0.000000	0.00	32,549.22
207043	Sep 19 2013 6:07AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	-8,758.9	1-373841	40283	3.633226	0.001000	-8.76	0.080000	-700.71	0.000000	0.00	0.000000	0.00	-32,549.22
207044	Sep 19 2013 6:08AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	8,758.9	1-373841	40299	3.493226	0.001000	8.76	0.080000	700.71	0.000000	0.00	0.000000	0.00	31,322.98
206917	Sep 19 2013 8:46AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,760.2	1-373854	40284	3.633226	0.001000	9.76	0.080000	780.82	0.000000	0.00	0.000000	0.00	36,270.18
207045	Sep 19 2013 8:46AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	-9,760.2	1-373854	40284	3.633226	0.001000	-9.76	0.080000	-780.82	0.000000	0.00	0.000000	0.00	-36,270.18
207046	Sep 19 2013 8:46AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	9,760.2	1-373854	40300	3.493226	0.001000	9.76	0.080000	780.82	0.000000	0.00	0.000000	0.00	34,903.75
206936	Sep 19 2013 10:34AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,751.5	1-373878	40285	3.633226	0.001000	8.75	0.080000	700.12	0.000000	0.00	0.000000	0.00	32,521.72
207047	Sep 19 2013 10:34AM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	-8,751.5	1-373878	40285	3.633226	0.001000	-8.75	0.080000	-700.12	0.000000	0.00	0.000000	0.00	-32,521.72
207048	Sep 19 2013 10:34AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	8,751.5	1-373878	40301	3.493226	0.001000	8.75	0.080000	700.12	0.000000	0.00	0.000000	0.00	31,296.51
206951	Sep 19 2013 1:22PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,754.8	1-373890	40286	3.633226	0.001000	9.75	0.080000	780.38	0.000000	0.00	0.000000	0.00	36,250.10
207049	Sep 19 2013 1:22PM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	-9,754.8	1-373890	40286	3.633226	0.001000	-9.75	0.080000	-780.38	0.000000	0.00	0.000000	0.00	-36,250.10
207050	Sep 19 2013 1:22PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009		DF1 LS	bulk	9,754.8	1-373890	40302	3.493226	0.001000	9.75	0.080000	780.38	0.000000	0.00	0.000000	0.00	34,884.43
206963	Sep 19 2013 2:56PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,750.8	1-373909	40287	3.633226	0.001000	8.75	0.080000	700.06	0.000000	0.00	0.000000	0.00	32,519.11
207051	Sep 19 2013 2:56PM	CREDIT	In	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	-8,750.8	1-373909	40287	3.633226	0.001000	-8.75	0.080000	-700.06	0.000000	0.00	0.000000	0.00	-32,519.11
207052	Sep 19 2013 2:56PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027		DF1 LS	bulk	8,750.8	1-373909	40303	3.493226	0.001000	8.75	0.080000	700.06	0.000000	0.00	0.000000	0.00	31,294.00
206980	Sep 20 2013 6:43AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,766.8	1-373943	40306	3.493226	0.001000	9.77	0.080000	781.34	0.000000	0.00	0.000000	0.00	34,927.36
206981	Sep 20 2013 7:51AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF1 LS	bulk	9,763.5	1-373944	40307	3.493226	0.001000	9.76	0.080000	781.08	0.000000	0.00	0.000000	0.00	34,915.55
207002	Sep 20 2013 11:22AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,763.5	1-373978	40308	3.493226	0.001000	9.76	0.080000	781.08	0.000000	0.00	0.000000	0.00	34,915.55
207015	Sep 20 2013 1:11PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF1 LS	bulk	8,420.6	1-373996	40309	3.493226	0.001000	8.42	0.080000	673.65	0.000000	0.00	0.000000	0.00	30,113.17
207079	Sep 21 2013 6:09AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,777.7	1-374104	40310	3.493226	0.001000	8.78	0.080000	702.22	0.000000	0.00	0.000000	0.00	31,390.21
207086	Sep 21 2013 9:25AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,783.9	1-374116	40311	3.493226	0.001000	9.78	0.080000	782.71	0.000000	0.00	0.000000	0.00	34,988.50
207092	Sep 21 2013 9:58AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Clay Murphy	DF1 LS	bulk	9,577.1	1-374123	40312	3.493226	0.001000	9.58	0.080000	766.17	0.000000	0.00	0.000000	0.00	34,248.96
207094	Sep 21 2013 10:49AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,769.5	1-374125	40313	3.493226	0.001000	8.77	0.080000	701.56	0.000000	0.00	0.000000	0.00	31,360.89
207103	Sep 21 2013 2:05PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,773.2	1-374136	40314	3.493226	0.001000	9.77	0.080000	781.86	0.000000	0.00	0.000000	0.00	34,950.25
207123	Sep 22 2013 6:05AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,779.3	1-374180	40315	3.493226	0.001000	8.78	0.080000	702.34	0.000000	0.00	0.000000	0.00	31,395.92
207124	Sep 22 2013 7:21AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Clay Murphy	DF1 LS	bulk	9,584.9	1-374181	40316	3.493226	0.001000	9.58	0.080000	766.79	0.000000	0.00	0.000000	0.00	34,276.85
207131	Sep 22 2013 9:39AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,786.9	1-374190	40317	3.493226	0.001000	9.79	0.080000	782.95	0.000000	0.00	0.000000	0.00	34,999.23
207138	Sep 22 2013 10:14AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,776.1	1-374199	40318	3.493226	0.001000	8.78	0.080000	702.09	0.000000	0.00	0.000000	0.00	31,384.49
207139	Sep 22 2013 2:48PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,789.4	1-374200	40319	3.493226	0.001000	9.79	0.080000	783.15	0.000000	0.00	0.000000	0.00	35,008.18
207151	Sep 23 2013 6:11AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,775.6	1-374227	40341	3.493226	0.001000	8.78	0.080000	702.05	0.000000	0.00	0.000000	0.00	31,382.70
207168	Sep 23 2013 9:36AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	9,857.1	1-374263	40342	3.493226	0.001000	9.86	0.080000	788.57	0.000000	0.00	0.000000	0.00	35,250.29
207183	Sep 23 2013 11:03AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,767.0	1-374278	40343	3.493226	0.001000	8.77	0.080000	701.36	0.000000	0.00	0.000000	0.00	31,351.94
207191	Sep 23 2013 12:57PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF1 HS	bulk	9,594.0	1-374291	40344	3.283871	0.001000	9.59	0.000000	0.00	0.000000	0.00	0.000000	0.00	31,533.33
207195	Sep 23 2013 2:28PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	9,873.9	1-374296	40345	3.493226	0.001000	9.87	0.080000	789.91	0.000000	0.00	0.000000	0.00	35,310.35
207220	Sep 24 2013 6:09AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,724.3	1-374333	40365	3.493226	0.001000	8.72	0.080000	697.94	0.000000	0.00	0.000000	0.00	31,199.23
207235	Sep 24 2013 9:05AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF1 LS	bulk	9,665.0	1-374354	40366	3.493226	0.001000	9.67	0.080000	773.20	0.000000	0.00	0.000000	0.00	34,563.31
207260	Sep 24 2013 11:11AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,769.8	1-374390	40367	3.493226	0.001000	8.77	0.080000	701.58	0.000000	0.00	0.000000	0.00	31,361.95
207285	Sep 24 2013 1:52PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF1 LS	bulk	9,650.2	1-374437	40368	3.493226	0.001000	9.65	0.080000	772.02	0.000000	0.00	0.000000	0.00	34,510.38
207298	Sep 24 2013 3:35PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	9,877.4	1-374452	40369	3.493226	0.001000	9.88	0.080000	790.19	0.000000	0.00	0.000000	0.00	35,322.88
207306	Sep 24 2013 6:05PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Bruce Hawk	DF1 LS	bulk	9,677.5	1-374464	40370	3.493226	0.001000	9.68	0.080000	774.20	0.000000	0.00	0.000000	0.00	34,608.01
207322	Sep 25 2013 6:06AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,776.3	1-374501	40375	3.493226	0.001000	8.78	0.080000	702.10	0.000000	0.00	0.000000	0.00	31,385.20
207326	Sep 25 2013 7:42AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	7,815.4	1-374504	40376	3.493226	0.001000	7.82	0.080000	625.23	0.000000	0.00	0.000000	0.00	27,948.90
207343	Sep 25 2013 9:56AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,773.4	1-374527	40377	3.493226	0.001000	8.77	0.080000	701.87	0.000000	0.00	0.000000	0.00	31,374.82
207355	Sep 25 2013 1:12PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	9,877.8	1-374541	40378	3.493226	0.001000	9.88	0.080000	790.22	0.000000	0.00	0.000000	0.00	35,324.31
207377	Sep 26 2013 6:08AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,765.0	1-374591	40395	3.493226	0.001000	8.77	0.080000	701.20	0.000000	0.00	0.000000	0.00	31,344.80
207383	Sep 26 2013 8:12AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,770.4	1-374601	40396	3.493226	0.001000	9.77	0.080000	781.63	0.000000	0.00	0.000000	0.00	34,940.23
207385	Sep 26 2013 8:48AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	10,003.7	1-374604	40397	3.493226	0.001000	10.00	0.080000	800.30	0.000000	0.00	0.000000	0.00	35,774.54
207409	Sep 26 2013 12:59PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,767.5	1-374644	40398	3.493226	0.001000	9.77	0.080000	781.40	0.000000	0.00	0.000000	0.00	34,929.86
207412	Sep 26 2013 1:34PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	10,013.2	1-374649	40399	3.493226	0.001000	10.01	0.080000	801.06	0.000000	0.00	0.000000	0.00	35,808.52

Trans ID	Trans Date	Type	In/Out	Location	Party	Consignee	Vehicle	Driver	Product	Pkg	Quantity	Mtr Tkt	Inv Nbr	Unit Price	Fed Tax Rate	Fed Tax Billed	State Tax Rate	State Tax Billed	Delivery Rate	Delivery Amount	Other Rate	Other Billed	Invoiced (X-local tax)
207454	Sep 27 2013 8:22AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 009	Curtiss Smith	DF1 LS	bulk	9,755.3	1-374718	40413	3.493226	0.001000	9.76	0.080000	780.42	0.000000	0.00	0.000000	0.00	34,886.23
207463	Sep 27 2013 9:19AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Fifer	DF1 LS	bulk	8,709.3	1-374729	40414	3.493226	0.001000	8.71	0.080000	696.74	0.000000	0.00	0.000000	0.00	31,145.59
207469	Sep 27 2013 9:50AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF1 LS	bulk	9,750.3	1-374736	40415	3.493226	0.001000	9.75	0.080000	780.02	0.000000	0.00	0.000000	0.00	34,868.34
207487	Sep 27 2013 12:58PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Curtiss Smith	DF1 LS	bulk	9,746.4	1-374760	40416	3.493226	0.001000	9.75	0.080000	779.71	0.000000	0.00	0.000000	0.00	34,854.41
207494	Sep 27 2013 2:08PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF1 LS	bulk	9,747.4	1-374771	40417	3.493226	0.001000	9.75	0.080000	779.79	0.000000	0.00	0.000000	0.00	34,857.98
207519	Sep 28 2013 6:14AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,733.1	1-374816	40418	3.493226	0.001000	8.73	0.080000	698.65	0.000000	0.00	0.000000	0.00	31,230.71
207535	Sep 28 2013 9:39AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF1 LS	bulk	9,761.5	1-374837	40419	3.493226	0.001000	9.76	0.080000	780.92	0.000000	0.00	0.000000	0.00	34,908.41
207537	Sep 28 2013 10:20AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,750.2	1-374840	40420	3.493226	0.001000	8.75	0.080000	700.02	0.000000	0.00	0.000000	0.00	31,291.87
207551	Sep 28 2013 1:54PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF1 LS	bulk	9,805.1	1-374859	40421	3.493226	0.001000	9.81	0.080000	784.41	0.000000	0.00	0.000000	0.00	35,064.33
207569	Sep 29 2013 6:10AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,760.1	1-374890	40422	3.493226	0.001000	8.76	0.080000	700.81	0.000000	0.00	0.000000	0.00	31,327.27
207577	Sep 29 2013 9:09AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Curtiss Smith	DF1 LS	bulk	9,765.6	1-374900	40423	3.493226	0.001000	9.77	0.080000	781.25	0.000000	0.00	0.000000	0.00	34,923.07
207581	Sep 29 2013 9:49AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,756.3	1-374907	40424	3.493226	0.001000	8.76	0.080000	700.50	0.000000	0.00	0.000000	0.00	31,313.67
207590	Sep 29 2013 2:14PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,756.9	1-374919	40425	3.493226	0.001000	8.76	0.080000	700.55	0.000000	0.00	0.000000	0.00	31,315.82
207594	Sep 29 2013 2:50PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 014	Curtiss Smith	DF1 LS	bulk	9,761.3	1-374926	40426	3.493226	0.001000	9.76	0.080000	780.90	0.000000	0.00	0.000000	0.00	34,907.69
207610	Sep 30 2013 6:15AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,766.6	1-374958	0	3.493226	0.001000	8.77	0.080000	701.33	0.000000	0.00	0.000000	0.00	31,350.52
207630	Sep 30 2013 9:59AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	9,871.0	1-374974	0	3.493226	0.001000	9.87	0.080000	789.68	0.000000	0.00	0.000000	0.00	35,299.98
207634	Sep 30 2013 10:35AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 031	Bruce Hawk	DF1 LS	bulk	5,524.0	1-374987	0	3.493226	0.001000	5.52	0.080000	441.92	0.000000	0.00	0.000000	0.00	19,754.54
207636	Sep 30 2013 11:30AM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 027	Larry Cook	DF1 LS	bulk	8,764.2	1-374989	0	3.493226	0.001000	8.76	0.080000	701.14	0.000000	0.00	0.000000	0.00	31,341.93
207663	Sep 30 2013 2:22PM	SALE	Out	NORTH_POLE	PSI_NP	2010 Fairbanks Gold	Truck 037	Robert Tolman	DF1 LS	bulk	9,870.4	1-375041	0	3.493226	0.001000	9.87	0.080000	789.63	0.000000	0.00	0.000000	0.00	35,297.84
Trans Count	**218**									**Total Qty**	**1,370,400.3**											**Total Qty**	**5,055,027.52**

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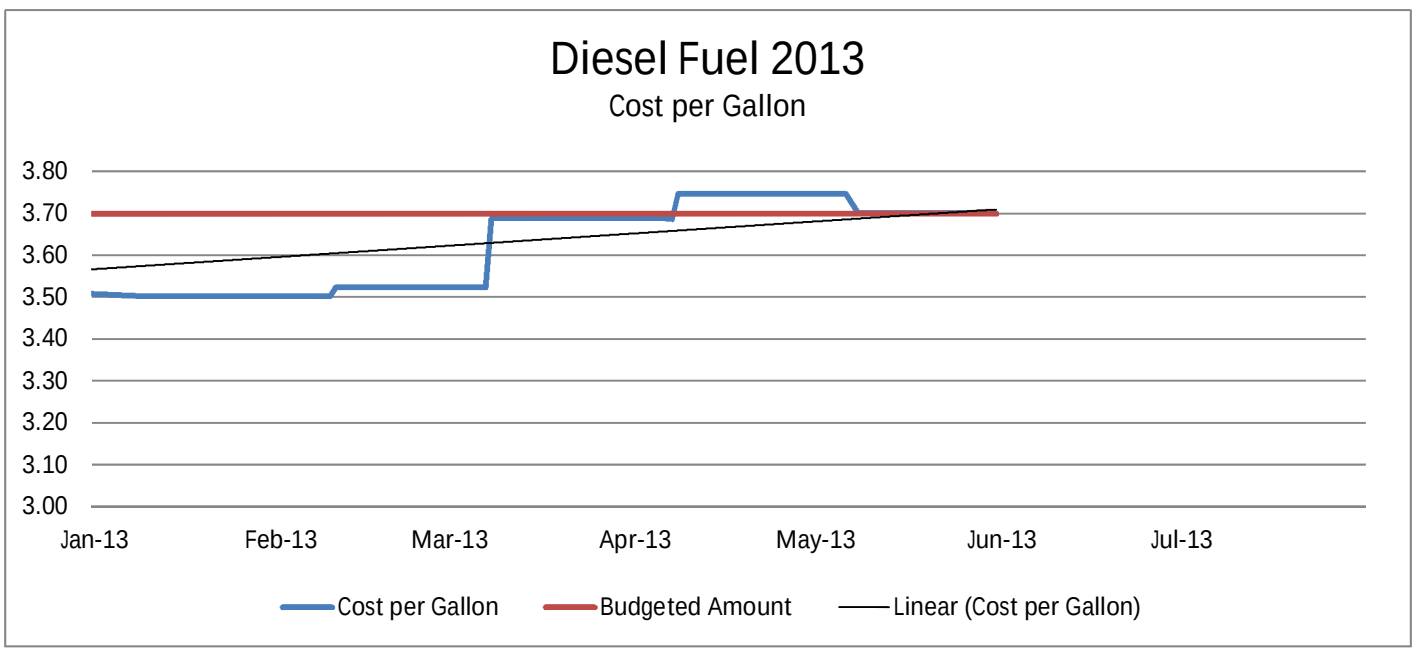


Appendix D

Guidelines for Reviewing Reclamation Cost Estimates

BLM's Review Responsibilities

New or Modified Operation – When submitting a new Notice or Plan of Operations, the operator must provide the Bureau of Land Management (BLM) with a reclamation cost estimate (RCE) that meets the requirements of 43 CFR 3809.552(a) and 3809.554(a), and must be acceptable to the BLM as required by 43 CFR 3809.554(b). Where an existing Notice or Plan of Operations is proposed to be modified, the operator must provide the district/field office with an estimate of the reclamation costs for all components of the existing and proposed operation that will be affected by the modification.

The BLM will review the operator's RCE to determine if the operator has identified and incorporated all applicable reclamation and administrative costs (identified below). In performing the review of the operator's RCE, the responsible district/field office will notify the operator, in writing, of any deficiencies or additional information needed in order for the BLM to complete the review. It is not the BLM's responsibility to calculate the reclamation cost for an operator, but the district/field office, at the BLM manager's discretion, may assist the operator in identifying costs to be included in the estimate and in developing the cost estimate. Although not required, the BLM should encourage the operators to submit the RCE both in hard copy and in a standardized electronic format that can be easily updated with current costs by the BLM for future reviews.

Reclamation Cost Estimate for Part of an Operation – Where the district/field manager authorizes an operator to provide the BLM with a financial guarantee under 43 CFR 3809.553 that covers only the current or proposed phase of the operation ("phased financial guarantee"), the operator must prepare a RCE for the phase of the operation to be covered by the financial guarantee. The RCE for a phased financial guarantee must conform to the same standards as the RCE for a financial guarantee for the entire operation. In addition to providing the RCE for the proposed phase, the operator must also prepare a separate RCE for all operations proposed in the Plan of Operations. The district/field manager's decision on the amount of the required financial guarantee will identify both the RCE for all operations proposed in the Plan of Operations and the RCE for the part or phase of operations that is being authorized. The amount of the required financial guarantee that the operator must provide the BLM will be based on the RCE for the part or phase of the operation where the authorized incremental operations are to occur.

Long-Term Funding Mechanisms – When a trust fund or other funding mechanism is required under 43 CFR 3809.552(c), the operator must provide the district/field office with a cost estimate for the monitoring, construction, operation, maintenance, replacement and other activities for the required facilities, treatment or other needs documented in the Plan of Operations. The operator's estimate must project when the cost obligations will occur. For recurring costs, such as maintenance of a water treatment facility, the frequency, timing and duration of the obligation should be estimated for each cost component. The operator's cost estimate prepared for post-reclamation obligations (PRO) to be covered under 43 CFR 3809.552(c) must be documented separate from the RCE prepared under 43 CFR 3809.554(a). The cost estimates for PRO should be reviewed by the BLM in the same manner and with the same degree of scrutiny and detail that

is used in reviewing estimates for financial guarantees for reclamation obligations under 43 CFR 3809.552(a).

Periodic Review – It is the BLM's responsibility to conduct a periodic review of the cost estimates for all reclamation, closure, and post-reclamation requirements. As required by 43 CFR 3809.552(b) and 3809.553(b), the BLM's review ensures the amount of the required financial guarantee for ongoing operations continues to meet the requirements of the regulations and all reclamation, closure, and post-reclamation requirements in the accepted Notice or approved Plan of Operations.

Unless the operator is proposing a modification to the Notice or Plan, the existing RCE does not reflect authorized operations, or additional information is needed, the BLM's review will consist of an evaluation and update of the operator's cost estimates on file. Where additional information is necessary to complete the review or a revised cost estimate is required, the district/field manager will direct the operator to provide that information. The BLM may find it helpful to request an updated RCE from the operator to facilitate its review if the RCE on file is not in a readily update-able format such as an electronic, standardized spreadsheet to which current unit costs may be readily applied.

Reclamation Cost Estimate Assumptions and Conditions

The cost estimate must be based on the following assumptions and conditions:

- The estimate must cover all relevant operation, maintenance, and administrative costs for all reclamation identified in the filed Notice or approved Plan of Operations [43 CFR 3809.301(b), 3809.401(d) and 3809.552(a)].

- Costs must be estimated as if the BLM were hiring a third-party contractor to perform all required reclamation [43 CFR 3809.552(a)].

- Costs must include the use of offsite equipment as if the project area was vacated, and the estimate must include all associated mobilization and demobilization costs [43 CFR 3809.554(a)].

- The estimate must include, when applicable, all interim maintenance required to keep the area of operation in compliance with applicable safety and environmental requirements while reclamation contracts are developed and executed [43 CFR 3809.552(a)].

- The estimate must cover costs to construct and maintain any long-term treatment facilities or post-closure structures required by the filed Notice or approved Plan of Operations [43 CFR 3809.552(a)].

- Labor costs must be based on federally mandated labor rates, as required by the Davis-Bacon Act [40 U.S.C. 3141 et seq.] and the Federal Acquisition Regulations [43 CFR 22.403-1] for contracts over $2,000. If the reclamation and cost estimate is solely for the dismantling, demolition, or removal of improvements, then contracting is under the Service Contract Act [43 CFR 22.1002] and Davis-Bacon wage rates do not apply. If construction, alteration, or repair of the improvements is contemplated, even if such work is under a separate contract, then the Davis-Bacon wages apply (see www.access.gpo.gov \davisbacon).

Maximum Reclamation Cost – The RCE must reflect the maximum cost of reclamation for the proposed disturbance to be covered by the financial guarantee. The point of maximum reclamation costs is often when there is the greatest area of disturbance, greatest volume of materials needing special handling, or some other factor or combination of factors escalating the cost to reclaim. The maximum cost of reclamation is generally not at the end of the project life.

Unless the district/field manager authorizes a phased financial guarantee under 43 CFR 3809.553, the financial guarantee must cover all of the operations described in the Notice or Plan. In reviewing the operator's cost estimate where the financial guarantee will cover all of the operations in the notice or plan, the BLM must make sure the RCE reflects the maximum reclamation obligation, including the BLM's cost to administer the reclamation contract.

Inflation – Inflation can, over time, become a significant factor in the amount of the required financial guarantee. To minimize the potential impact inflation can have on the amount of the financial guarantee needed to cover the current reclamation cost, the district/field office must review, on a periodic basis, the cost estimates for all ongoing operations as addressed in this IM. The maximum allowable time period between reviews is discussed below.

Reclamation, Closure, Mitigation and Monitoring

The reclamation operating and maintenance (O&M) costs reflect the direct current costs of reclamation based on the filed Notice or approved Plan of Operations. Where applicable, reclamation and closure tasks that should be identified are interim O&M; hazardous materials; water treatment; demolition, removal and disposal; earthwork; drill hole plugging; revegetation; mitigation; and post-reclamation costs of long-term operation, maintenance, and monitoring.

Interim Operation and Maintenance – If an operator abruptly ceases operations, the BLM may need to contract with a third party to maintain the area of operation in compliance with applicable safety and environmental requirements. The RCE must include the cost of providing immediate site O&M, where appropriate.

Interim O&M costs may vary significantly depending on the individual site needs and may include labor, equipment, and materials for pumping of fluids to prevent overflow of process ponds, costs for support equipment and electricity to operate the pumps, and site security. There

is no set time period to use in estimating the costs for the care and maintenance of a site prior to the start of reclamation; much depends on the BLM's ability to obtain access to the financial guarantee, especially in bankruptcy cases. It is a good rule-of-thumb to allow for a minimum of six months of interim O&M by a contractor. Large operations or project areas with limited seasonal access may warrant a longer time period.

Hazardous Materials – The RCE must include the cost of decontaminating, neutralizing, disposing, treating or isolating hazardous materials used, produced, or stored on the site. The estimated cost for handling hazardous materials should assume, unless otherwise documented, that the materials are properly stored and labeled.

If upon site inspection, the BLM determines that the operator is using, producing or storing material on site that could be hazardous, e.g., unlabeled barrels, and if the BLM is unsuccessful in getting the operator to properly manage those materials, the BLM must update the RCE to reflect the potentially higher cost of disposing of such material. This distinction is important as the disposal of properly managed hazardous materials may be a fraction of the disposal cost for materials not properly stored and identified.

Water Treatment – The RCE must identify all necessary construction and maintenance water treatment costs needed to ensure that mine discharge or drainage will meet relevant standards. The cost of long-term, post-reclamation operation, maintenance, and replacement requirements may be addressed in a trust fund established under 43 CFR 3809.552(c) (see Attachment 2 – *Guidelines for Establishing a Long-Term Funding Mechanism*).

Mine Facilities – The RCE must include the costs of demolition, removal, and disposal of all mine facilities, immobile equipment, and materials from the project area. No salvage value for structures, equipment, or materials is allowed in the cost estimate.

The RCE must exclude disposal costs for those facilities that have been approved in writing by the BLM for post-reclamation BLM use. The RCE must also exclude the removal and disposal costs for operable mobile equipment, e.g., trucks, dozers, etc., from the cost estimate. However, if the BLM determines upon site inspection that the mobile equipment is inoperable and the BLM is unsuccessful in getting the operator to repair or remove the inoperable equipment from the project area, the BLM must update the RCE to include the cost of removing and disposing of any inoperable equipment.

Earthwork – The RCE must include the costs of all required earthwork. The cost estimate must address the cost of hauling, placement, regarding, and backfilling to reclaim mine features, including roads that have not been specifically identified and approved to remain open.

Drill Hole Plugging – The RCE must include the cost of plugging, capping, and isolation of drill holes, including exploration, production and monitoring holes, and water monitoring and piezometer wells, where applicable. In determining the plugging costs, it must be considered whether drill holes encounter water, water under artesian pressure, or are dry. Proposed plugging must meet all applicable Federal and state requirements.

Where the operator is proposing drilling, the RCE must include, at a minimum, the estimated cost of plugging the maximum number of drill holes that may be open at one time. In determining the number of drill holes that may be open at any one time, there can never be less one drill hole for each drill rig that will be working in the project area. Where the submitted Notice or approved Plan of Operations calls for drill holes to be plugged, but does not specifically require the drill holes be plugged before the drill rig has been moved from the drill pad, the RCE must include the plugging cost for all drill holes identified in the Notice or Plan of Operations or the plugging cost for all drill holes authorized in a particular phase of an operation where the financial guarantee is being phased under 43 CFR 3809.553(a).

For all drill holes, and water, monitoring and piezometer wells authorized to be left open for an interim period, the estimated plugging cost must be included in the RCE.

Revegetation – The RCE must include the cost of obtaining the seed mix specified in the reclamation plan and the cost of soil preparation, such as ripping or harrowing, soil amendments such as mulching or fertilizer, application of the seed mix, noxious weed control, and placement of tree and shrub seedlings, if required in the Notice or Plan. The RCE must also include the cost for hauling and placement of growth medium, if not addressed under earthwork.

Mitigation – The RCE must include costs of reclamation work for mitigation, which may include avoiding, minimizing, rectifying and reducing, or eliminating the operation's impact, or compensating for the impact, that are required in the Plan of Operations. The RCE must also include that cost of any deferred mitigation the BLM is requiring the operator to perform. For example, if the operator is required to develop 5 acres of wetlands to compensate for disturbance elsewhere on the project area, until that wetland development is completed the RCE must include the cost of that mitigation.

Post-Reclamation Costs – The RCE must include the costs of meeting any long-term construction, operation, maintenance, or replacement of any treatment facilities and infrastructure that are not addressed in a trust fund established by 43 CFR 3809.552(c) (see Attachment 2 – *Guidelines for Establishing a Long-Term Funding Mechanism*).

Identified Costs

In calculating the cost to perform these interim operations, reclamation, closure, mitigation, and monitoring tasks, the operator's estimate must identify the current O&M costs relating to reclamation including:

- Equipment rental or acquisition costs
- Equipment operation costs
- Equipment maintenance costs
- Cost of operating supplies

- Labor costs for operations, maintenance and supervision
- Site maintenance including roads, infrastructure, power lines, fences and monitoring facilities
- Reclamation materials acquisition costs
- Mobilization and demobilization costs

Data and References

Data and reference sources that may be useful in preparing and reviewing the RCE are:

- Applicable parts of the Office of Surface Mining *Handbook for Calculation of Reclamation Bond Amounts* (Office of Surface Mining, Department of the Interior (http://www.wrcc.osmre.gov/))
- BLM's *Solid Minerals Reclamation Handbook*, H-3042-1
- *Caterpillar Performance Handbook* (Caterpillar Inc., Peoria, IL 61629 (www.cat.com));
- Products and services by CostMine (MineInfo USA, CostMine, 1120 N. Mullan Rd. Suite 100, Spokane Valley, WA 99206 (http://costs.infomine.com/))
- *R.S. Means Site Work & Landscaping Cost Data* and *R.S. Means Heavy Construction Cost Data* (RSMeans, 63 Smiths Lane, Kingston, MA 02364-9988 (http://www.rsmeans.com/index.asp))
- EquipmentWatch's *Cost Reference Guide* and *Rental Rate Blue Book for Construction Equipment* (Penton Media, Inc., EquipmentWatch, 1735 Technology Drive, Suite 410, San Jose, CA 95110-1333 (http://www.equipmentwatch.com/))

The user of these and other reference materials must to be cognizant of how to apply the data to the RCE. For example, the cost estimate must reflect the BLM's cost to have a third-party contractor perform the work; owner/operator cost data does not reflect the BLM's contracting cost.

BLM Administrative Costs

The district/field office must ensure the cost of reclamation is estimated as if the BLM were hiring a contractor to perform all required reclamation. This will include costs that the operator does not normally encounter. The BLM reviewer must to pay particular attention to costing standards that are based, in part, on the Federal Acquisition Regulations (48 CFR parts 1-53). The responsible BLM specialist must coordinate with the state office procurement analyst concerning current labor wages, contracting requirements, and advice on various types of contracts, contract language, and administration.

This document contains suggested percentages for some of these administrative costs. Unless otherwise noted, these percentages are rules-of-thumb and not specified by regulation or law. Figures or percentages, other than those listed below, should be included in a calculation if they are explicitly addressed in a Federal-State agreement regarding the financial guarantee and/or are required by Federal or State law.

In reviewing the operator's RCE, the district/field office may need to determine what administrative costs the operator has included with their reclamation O&M costs. For example, operator's labor cost estimates may include base pay, payroll loading, overhead and profit. A typical dozer operator rate in Idaho, in 2002, was $37.59 to $40.25 per hour. This rate included the base pay plus 14.6 percent payroll loading, 10 percent overhead, and 6 percent profit. To avoid overlooking or double counting any of the identified administrative costs, e.g., contractor profit, the operator must document what administrative costs are included in the labor costs or other O&M costs. This may be done by itemizing the cost estimates or by providing the BLM with a statement that identifies the specific administrative costs that are included in the estimated O&M costs.

Unless otherwise noted, the administrative cost categories identified below should be included in the RCE.

Engineering, Design and Construction Plan – An engineering, design, and construction (ED&C) plan provides the details needed for contracting the reclamation construction work. Where appropriate, the RCE should reflect the costs to prepare such a plan. Should the operator fail to reclaim, the BLM may need to undertake a number of tasks including:

- Prepare maps and plans to show the extent of required reclamation.
- Survey of topsoil and growth medium stockpiles to determine amount of material available.
- Sample and analyze waste rock, tails, heap material, surface and ground water, etc.
- Sample and analyze topsoil and waste piles to determine whether special handling or treatment is necessary.
- Evaluate structures to determine requirements for demolition and removal.
- Evaluate storm water facilities and process solutions or water impoundments to determine if treatment, clean out, or other improvements are necessary.
- Prepare an environmental analysis or site studies before reclamation may commence.

Not all operations will require a line item for an ED&C plan in the RCE. Specifically, notice-level and some other small or uncomplicated operations may not require the BLM to develop detailed engineering information.

The actual cost of developing the ED&C plan will depend to a great extent on the specifics, including reclamation complexities, of the proposed operation. The amount or percentage to apply should be based on available data within the state. Absent specific local or state data, the BLM should estimate the cost for an ED&C plan, where necessary, as four to eight percent of the estimated reclamation operation and maintenance costs, depending on the size of the operation.

Contingency – The contingency allowance is for cost overruns that regularly occur but cannot be ascertained when an operation is being reviewed. Contingency costs generally reflect the level of detail and completeness of the cost estimate, as well as the level of uncertainty in the assumptions used for the RCE.

Development of an ED&C plan reduces the amount of operational unforeseen circumstances and costs. However, contingency costs are not intended to account for changes in the scope of the operation or unforeseeable or unanticipated events such as earthquakes, labor strikes, or floods. An operator may not be required to provide a financial guarantee to address unanticipated events or worst-case scenarios.

Where the proposed operation involves a relatively small, uncomplicated reclamation effort, and development of an ED&C plan is not anticipated, there may not be a need to include a contingency line item in the RCE. Contingency costs would generally not be required for notice-level operations.

The RCE should include a contingency allowance for all operations with estimated reclamation operation and maintenance costs over $100,000. Federal and state agencies that routinely prepare construction cost estimates apply contingencies, ranging from 3 to 45 percent of the O&M costs. The amount or percentage required should be based on available reclamation or construction contract information within your state. Absent specific local or state data, the BLM should calculate the contingency cost, where applicable, as four to ten percent of the estimated reclamation operation and maintenance costs, depending on the size of the operation.

Contractor Profit – Government contracts generally include a line item for prime contractor's profit over and above the estimated reclamation O&M costs. The operator's RCE must account for prime contractor's profit.

The RCE should use state or local contract information to determine the amount or percentage of prime contractor's profit. Where state law specifies an amount or percentage, the BLM should use that figure. Absent specific local or state data, the RCE should estimate contractor profit as 10 percent of the estimated reclamation O&M costs.

The line item for prime contractor's profit should not be added where O&M costs already include the contractor's profit. In such cases, the operator's reclamation operating and maintenance estimate must document or itemize the inclusion of the prime contractor's profit.

Liability Insurance – The RCE should include the cost of obtaining contractor's liability insurance. The RCE may contain a separate line item for liability insurance premium, or the RCE can itemize the insurance premium in the reclamation operating and maintenance estimate. The contractor's liability insurance premium should be estimated as 1.5 percent of the estimated labor costs for the project and included in the RCE.

Payment and Performance Bonds – Federal construction contracts exceeding $100,000 require payment of premiums for both a performance bond and a payment bond, as required by the Miller Act, and must be included in the cost estimate (40 U.S.C. 3131 to 3134). A set amount equal to three percent of the estimated contract cost should be used to calculate the payment of premiums for both a performance bond and a payment bond.

BLM Contract Administration – Contract administration costs include the BLM's labor and operations costs for the district/field and state offices to administer the contract. These costs must be included in the RCE. The amount required to cover the BLM's contract administration costs will depend to a great extent on the specifics, including reclamation complexities, of the proposed operation. Absent available state or local data, estimate the BLM's contract administration and inspection cost for reclamation contracts using 6 to 10 percent of the estimated O&M costs, depending on the size and complexity of the proposed operation. Generally, the larger the amount of the financial guarantee, the lower the percentage needed for contract administration.

Where data is available, the state or district/field office should review their records to determine appropriate costs. Generally, the larger the amount of the financial guarantee the lower the percentage needed for contract administration.

BLM Indirect Costs – The BLM's indirect costs for contract administration must be included in the amount of the required financial guarantee. The indirect cost rate is a fixed 21 percent of the estimated BLM contract administration cost; therefore, the indirect costs may range from 1.26 to 2.1 percent of O&M costs (21 percent of the 6 to 10 percent contract administration costs).

If the BLM is required to administer a reclamation contract under a forfeited financial guarantee, these indirect cost funds are to remain within the state where the reclamation work will be done. The funds will be available to pay for within-state indirect costs (building rental, telephone, etc.) associated with the project and any project support needed from other offices such as the National Operations Center contract officers or inspectors.

Federal-State Agreement – If a Federal-State agreement through 43 CFR 3809.200 provides for joint administration or deferral of the administration of financial guarantees to the State, the RCE may reflect the State's administrative costs for contracting the required reclamation under certain situations. The Federal-State agreement must specify that the amount of the financial guarantee must be calculated based on the completion of both Federal and State reclamation requirements as required by 43 CFR 3809.203(d), must be redeemable by the Secretary, and the BLM must concur in the approval, release, or forfeiture of a financial guarantee for public lands.

Reclamation Cost Estimating Tools

Summary sheets, checklists, and cost models are available to assist the operator in developing and district/field office reviewing the cost estimate. Individual BLM state offices or district/field offices may develop their own tools to support the reclamation cost estimating process.

Standardized reclamation cost estimating processes that include standardized unit costs, schedules, spreadsheets and models are useful tools that provide simplified, efficient, defensible and consistent means of estimating reclamation costs for both Notices and Plans of Operations. Where appropriate, state, district, and field offices are encouraged to develop processes based on standardized unit costs to facilitate the review and approval of the operator's RCE. A process that uses standardized costs may be developed, based on local and/or regional costs, to reclaim typical activities, features, and facilities (roads, drill pads, drill-holes, trenches, pits, structures, site stabilization, revegetation, etc.) for specific kinds of terrain (topography).

Where a standardized reclamation cost estimating process is used, the amount of a financial guarantee must be sufficient to meet the requirements of 43 CFR 3809.552(a) and 3809.554(a). The assumptions used in developing the cost inputs must be consistent with both state and Federal regulations and laws. Determining consistency with state and Federal regulations and laws goes beyond the applicable environmental requirements. The assumptions used must also be consistent with applicable contracting requirements, such as Federal Acquisition Regulations (48 CFR parts 1-53). For example, under Federal contracting the BLM cannot require an operator to work double shifts. As such, the RCE should not be based on the assumption that the reclamation contractor will conduct the work using a double shift.

Where a BLM state or district/field office develops a standardized reclamation cost process for estimating the amount of the required financial guarantee for Notices or Plans, the standardized inputs, schedules, spreadsheets, and models must be reviewed annually to ensure the cost inputs remain current.

Periodic Review

The BLM must provide a periodic review of RCEs for all ongoing operations (43 CFR 3809.552(b)). The periodic review by the district/field office ensures the current RCE and the amount of the required financial guarantee continue to meet the requirements of 43 CFR 3809.552(a), 3809.552(c) and 3809.554(a). If there is a change in the required amount of the financial guarantee or the review was conducted at the request of the operator, the district/field manager must issue a decision as to the amount of the required financial guarantee. If the RCE does not require an adjustment, i.e., a decision is not issued, the authorized officer will add a statement to the case file certifying that the cost estimate(s) and financial guarantee(s) have been reviewed in conformance with review periods described below, and the estimate(s) and guarantee(s) continue to meet the requirements of the regulations. Where a financial guarantee is deemed to be inadequate, the authorized officer must take action to rectify the situation.

The following establishes the maximum time the BLM may allow to elapse between reviews. The BLM has the authority under 43 CFR 3809.552(b) and 3809.553(b) to review the RCE more frequently than the schedule listed below at the discretion of the district/field manager. The manager should perform these reviews whenever becoming aware of significant changes to the site conditions and should monitor the adequacy of the RCE through the inspection program.

<u>Notices</u> - Reclamation cost estimates for Notice operations must be reviewed at time of extension under 43 CFR 3809.333, i.e., every 2 years.

Plans of Operations - Reclamation cost estimates for Plans of Operations must be reviewed at least every 3 years.

State Requirements - Where the BLM has an agreement under 43 CFR 3809.200 with the State that requires a review more frequently than every 2 years for Notices and/or every 3 years for Plans of Operations, reviews must be conducted in conformance with that agreement.

Modifications - Where the Notice or Plan of Operations is modified, a review must be conducted at the time of modification. The review will focus on how the modification affects the existing RCE on file. The review need not be for all aspects of the operation. However, unless the RCE for the entire operation is reviewed, the review for the Notice or Plan modification does not substitute for the required 2-year review for a Notice or 3-year review for a Plan of Operations, as required above.

Phased Coverage - Where the financial guarantee is for a part of the operations, as provided under 43 CFR 3809.553, the BLM must review the RCE at least annually. The district/field office review must cover the RCE for each authorized increment of the operation.

Trust Funds - Cost estimates for PRO established under 43 CFR 3809.552(c) must be reviewed at least every 3 years. The district/field office must review, adjust as necessary, the cost estimates and other assumptions used in determining the amount of funds needed in the long-term funding mechanism.

The district/field office must also monitor the growth of all trust funds. At least once per year, the responsible district/field office must review the financial statements to ensure growth of the fund is keeping pace with the assumptions used to determine the amount needed in the fund. The funding level in the trust fund may be adjusted annually at the discretion of the district/field manager. However, the funding level must be increased at least every 3 years when the growth of the available funds is not keeping pace with the amount needed to address all anticipated PRO.

Review Results and Decisions

The district/field manager must issue a decision that establishes the amount of the required financial guarantee. The decision must be provided to the operator following the completion of the review of the RCE with a copy provided to the BLM office responsible for adjudication of the financial guarantee.

Acceptable Review Results – When the district/field office receives an acceptable RCE or the district/field office independently estimates the amount of the reclamation costs, the district/field manager must provide the operator with a written decision as to the amount of the required financial guarantee. The decision must state the amount of the financial guarantee to be provided ($0.50 or more rounded up to the nearest whole dollar and less than $0.50 rounded down to the nearest whole dollar), the types of financial instruments that are acceptable to the BLM, and that any adversely affected party may appeal the decision on the amount of the required financial guarantee under 43 CFR 3809.800 through 3809.809.

The decision on the amount of the financial guarantee must make it clear that the line items contained in an acceptable RCE are not to be considered spending constraints should a financial guarantee be forfeited. The line items listed are solely for the purpose of arriving at a total financial guarantee amount. This total amount may be spent however the BLM deems necessary to implement the reclamation plan.

New and Modified Operations - For a new or modified Notice or Plan, the district/field manager's decision must also state that an operator may not begin operations in any areas not covered by the existing financial guarantee without first providing the BLM with an acceptable financial guarantee that meets the requirements of 43 CFR 3809.551 thru 3809.572. No activity greater than casual use on lands not covered by the existing financial guarantee is authorized until the BLM has accepted and obligated the operator's financial guarantee.

Ongoing Operations - Following the periodic review for an ongoing operation, the district/field manager must notify the operator, with a copy to the BLM office responsible for adjudicating financial guarantees, as to the amount of the change in the required financial guarantee. A written decision will be issued any time there is a change in the amount of the required financial guarantee as a result of the review or the review was conducted at the request of the operator. This requirement applies to financial guarantees under 43 CFR 3809.552(a), 3809.552(c), and 3809.554(a).

For ongoing operations under an existing Notice and Plan, the decision must state: 1) the amount of the required financial guarantee, 2) any change (increase or decrease) in the amount of the required financial guarantee, 3) that the operator has 60 days from receipt of the decision to submit an acceptable financial guarantee if the amount has increased, and 4) that failure to provide an acceptable financial guarantee in the new amount within the specified timeframe will result in an enforcement action against the operator for failure to maintain an acceptable financial guarantee. This requirement to ensure the financial guarantee is adequate to cover all operator obligations, including post-reclamation requirements, applies to financial guarantees under 43 CFR 3809552(a), 43 CFR 3809.552(c), and 43 CFR 3809.553.

Extended Notice - For a Notice extension under 43 CFR 3809.333, where the amount of the required financial guarantee has increased, the decision must also state: 1) that the Notice is conditionally extended subject to meeting the financial guarantee requirements, 2) that failure to provide an acceptable financial guarantee within 60 days will result in the Notice expiring immediately upon conclusion of the timeframe, and 3) that upon expiration of the Notice, all activities, other than reclamation, are unauthorized and must cease. The Notice expires should the operator fail to provide the required financial guarantee within the timeframe.

Unacceptable Review Results – If the district/field office finds the operator has incorrectly calculated O&M costs, or finds that the estimate is based on out-of-date cost data that does not reflect the actual cost of reclamation, the district/field manager must notify the operator, in writing, of its unacceptability, and identify the deficiencies or errors that led to that conclusion. The BLM must advise the operator to incorporate the administrative costs outlined above if they are not included in the estimate.

Where the RCE for a new Notice is not acceptable to the BLM, the Notice will not be considered complete as required under 43 CFR 3809.301.

Ongoing Operations - For ongoing operations, where the district/field office lacks the information necessary to determine the adequacy of the RCE on file, the district/field manager must notify the operator of the deficiencies or errors and include a due date when the information or revised RCE must be submitted. The notification to the operator must include a statement that failure to provide the required information within the specified timeframe will result in an enforcement action against the operator for failure to maintain an acceptable financial guarantee.

Extended Notice - For Notices to be extended under 43 CFR 3809.333, where the district/field office lacks the information necessary to determine the adequacy of the existing RCE, the district/field manager must notify the operator that within 30 days from receipt of the notification all requested information must be provided to the BLM office. The Notice will be conditionally extended pending district/field office receipt of the required information. Failure to provide the required information within the 30-day period will result in the Notice expiring.

Decrease the Amount – Where the existing amount of the financial guarantee exceeds the district/field manager's determination as to the amount of the required financial guarantee, the operator may request the BLM decrease the amount of the required financial guarantee. Any request by the operator for a reduction in the amount of the financial guarantee must be made to the BLM office responsible for adjudicating the financial guarantee.

Appeal of Decisions – All decisions relating to the acceptability or unacceptability of a financial guarantee are subject to appeal under the provisions of 43 CFR 3809.800. Any adversely affected party may elect to seek a State Director Review (SDR) under 43 CFR 3809.800(a) or appeal directly to the Office of Hearings and Appeals (OHA) under 43 CFR 3809.801.

Appeal to OHA of a district/field manager's decision must be filed in the office that issued the decision. The district/field office then forwards the Notice of Appeal to OHA. Appeals must be filed by the appellant with the office that issued the decision within 30 days of receipt of the decision.

Request for an SDR are filed with the office of the state director within 30 days of the district/field manager's decision. If the review and evaluation of the financial guarantee and/or financial instrument was conducted by the state office, a request for state director review under 43 CFR 3809.806 may not be accepted.

Appendix E

Fairbanks Gold Mine, Fort Knox Gold Project
Utilizing Davis Bacon Wage Rates
Fairbanks, Alaska

Demolition Cost Estimate
Concept Level
Aug 29, 2008

ESTIMATIONS
1225 E. International Airport Road, Suite 205
Anchorage, Alaska 99518
907.561.0790

Prepared for:
Fairbanks Gold Mining, Inc
P O Box 73726
Fairbanks, Alaska 99707-3726
907.488.4653

General Information

Estimate Based On Current Costs

Documents

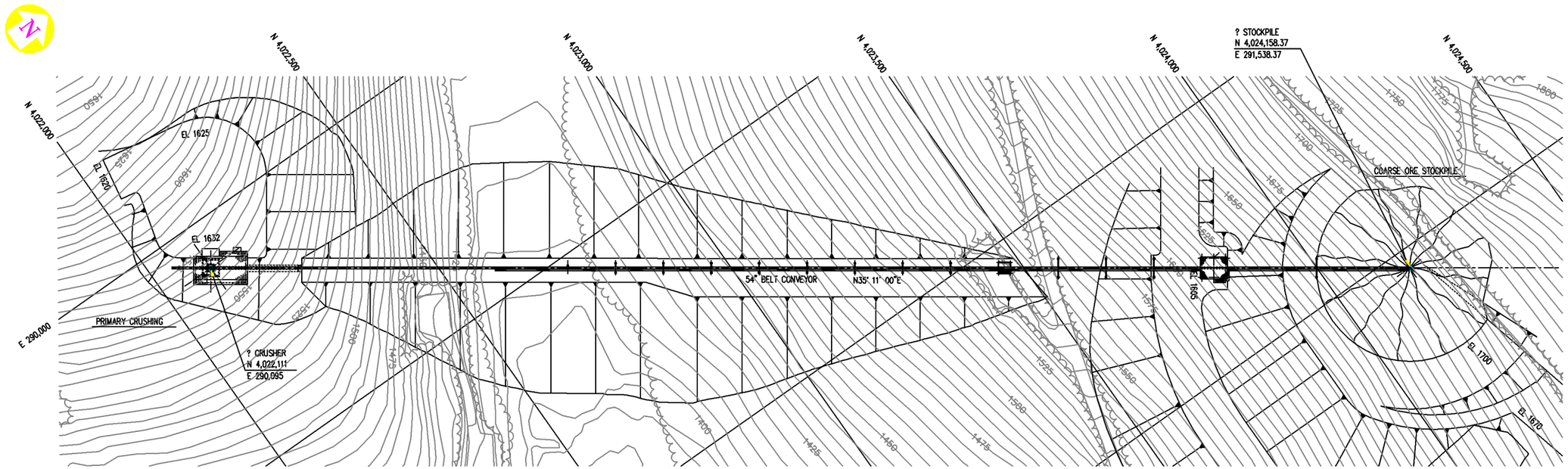
Photos and notes taken during site visit.
Original 1995 construction drawings (CAD drawings provided on disk), from Ford, Bacon and Davis, Inc.

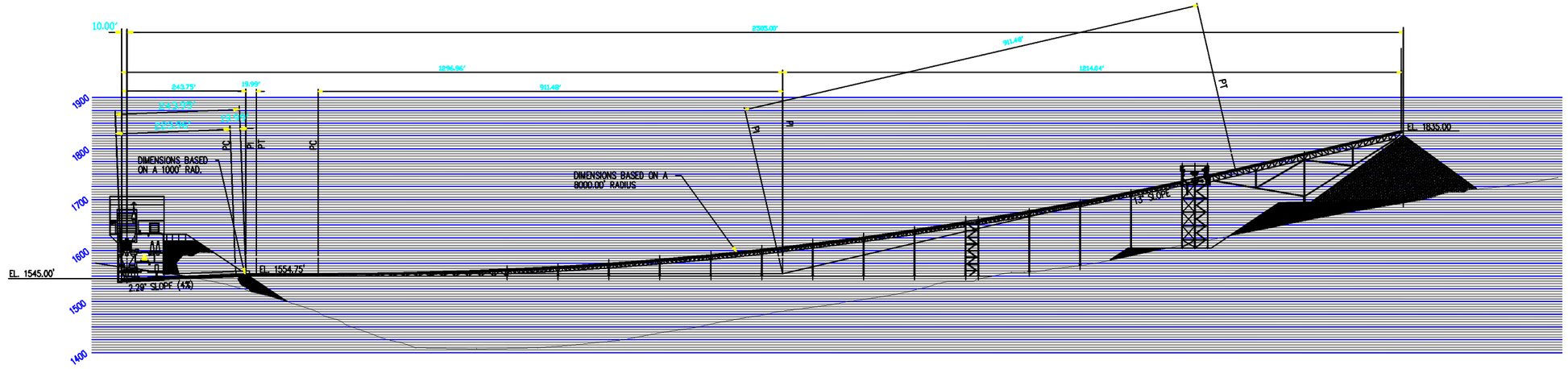
Notes and Assumptions

1. All cost for mobilizing, support during construction, and demobilization are included in the estimate.
2. Labor rates include all payroll taxes, fringe benefits, and workers compensation insurance, using Davis Bacon Wages
3. Subcontractor markup is applied on a line by line basis and shows up in the far right column of the detail sheets. The column is titled "Total Cost w/OH&P".
4. Materials storage area will be designated near each project.
5. Hazmat not included. Tanks to be cleaned by others prior to starting demo work.

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
34											
35	**2. Belt Conveyor**										
36											
37	**Planning, Preparation**										
38	Plan Demolition Work, Analyze Drawings & Site Conditions	42	HRS			1.000	41.6	$2,992		$2,992	$2,992
39	**Remove Conveyor, Equipment**										
40	Decommission, Disconnect	20	HRS			1.000	20.0	$1,438		$1,438	$1,438
41	Remove Conveyor Belt, Struct Framing, Hardware, Rollers, Misc Equipment	2,550	LF			0.300	765.0	$55,019	$38,250	$93,269	$93,269
42	**Demo Support Towers**										
43	Steel Open Truss Web Towers	64	EA			16.000	1,020.0	$73,358		$73,358	$73,358
44	**Debris Handling**										
45	Stockpile At Site In Truckable Loads	357	TONS			0.300	107.1	$7,703	$4,284	$11,987	$11,987
46	**Mobilization, Operations and Profit**										
47	**Operation Costs**	10%									$18,304
48	Room & Board - 10% Of Crew	23	MDAYS	$110.00	$2,530					$2,530	$2,530
49	**Profit**	8%									$16,310
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69	**Subtotal: 2. Belt Conveyor: Cost based on 41,580 LF**				$2,530		1,953.7	$140,510	$42,534	$185,574	**$220,189**
70	Average Unit Price For this division is: $5.30 per LF										
71	Average Labor Rate For this division: $71.92 per hour										

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
72											
73	**3. Conveyor Drive Tower**										
74											
75	**Planning, Preparation**										
76	Plan Demolition Work, Analyze Drawings & Site Conditions	8	HRS			1.000	8.4	$604		$604	$604
77	**Remove Building End Walls**										
78	Remove Building End Walls To Allow Crane Access, Removal Of Equipment	1,920	SF			0.030	57.6	$4,143		$4,143	$4,143
79	**Remove Exterior Structure**										
80	Remove Exterior Stairs, Supports, Catwalks, Equip Attached To Bldg Exterior	16	HRS			1.000	16.0	$1,151		$1,151	$1,151
81	**Remove Distributed Systems, Devices**										
82	Decommission, Disconnect Mech, Elec	8	HRS			1.000	8.4	$604		$604	$604
83	Remove Distributed Piping, Ductwork, Wiring, Devices, Smaller Equipment, Etc. Clear Access To Major Items	8	HRS			1.000	8.4	$604		$604	$604
84	**Remove Major Equipment**										
85	Demo Equipment, Cut Into Transportable Sized Pieces, Assumes Equipment Bolted Together, Cut Bolts	4	PIECES			8.000	32.0	$2,301	$960	$3,261	$3,261
86	**Demo Building**										
87	Demolish Building, Structural Steel Mtl Skin	2,112	SF			0.048	101.4	$7,293	$5,839	$13,132	$13,132
88	**Debris Handling**										
89	Stockpile At Site In Truckable Loads	58	TONS			0.300	17.4	$1,251	$696	$1,947	$1,947
90	**Mobilization, Operations and Profit**										
91	**Operation Costs**	10%									$2,545
92	Room & Board - 10% Of Crew	3	MDAYS	$110.00	$330					$330	$330
93	**Profit**	8%									$2,266
94											
95											
96											
97											
98											
99											
100											
101											
102	**Subtotal: 3. Conveyor Drive Tower: Cost based on 2,112 SF**				$330		249.6	$17,951	$7,495	$25,776	**$30,586**
103	Average Unit Price For this division is: $14.48 per SF										
104	Average Labor Rate For this division: $71.92 per hour										





SCALE

100 0 50 100 200 400

(FEET)
1"=100'

REVISIONS					
NO	DESCRIPTION	DATE	BY	CHK	APP

REFERENCE DRAWINGS	
DRAWING NO	TITLE

ISSUE RECORD				
DATE	ISS	REV	TO	FOR

ENGR RECORD	BY	DATE
DRAWN	EJC	11-22-94
CHECKED		
ELEC CHECK		
INST CHECK		
MECH CHECK		
PIPING CHECK		
STRUCT CHECK		
SQUAD LEADER		
CHIEF ENG/DES		
PROJECT ENG		
APPROVED		
APPROVED		

FAIRBANKS GOLD MINING, INC.
FORT KNOX GOLD PROJECT
FAIRBANKS, ALASKA

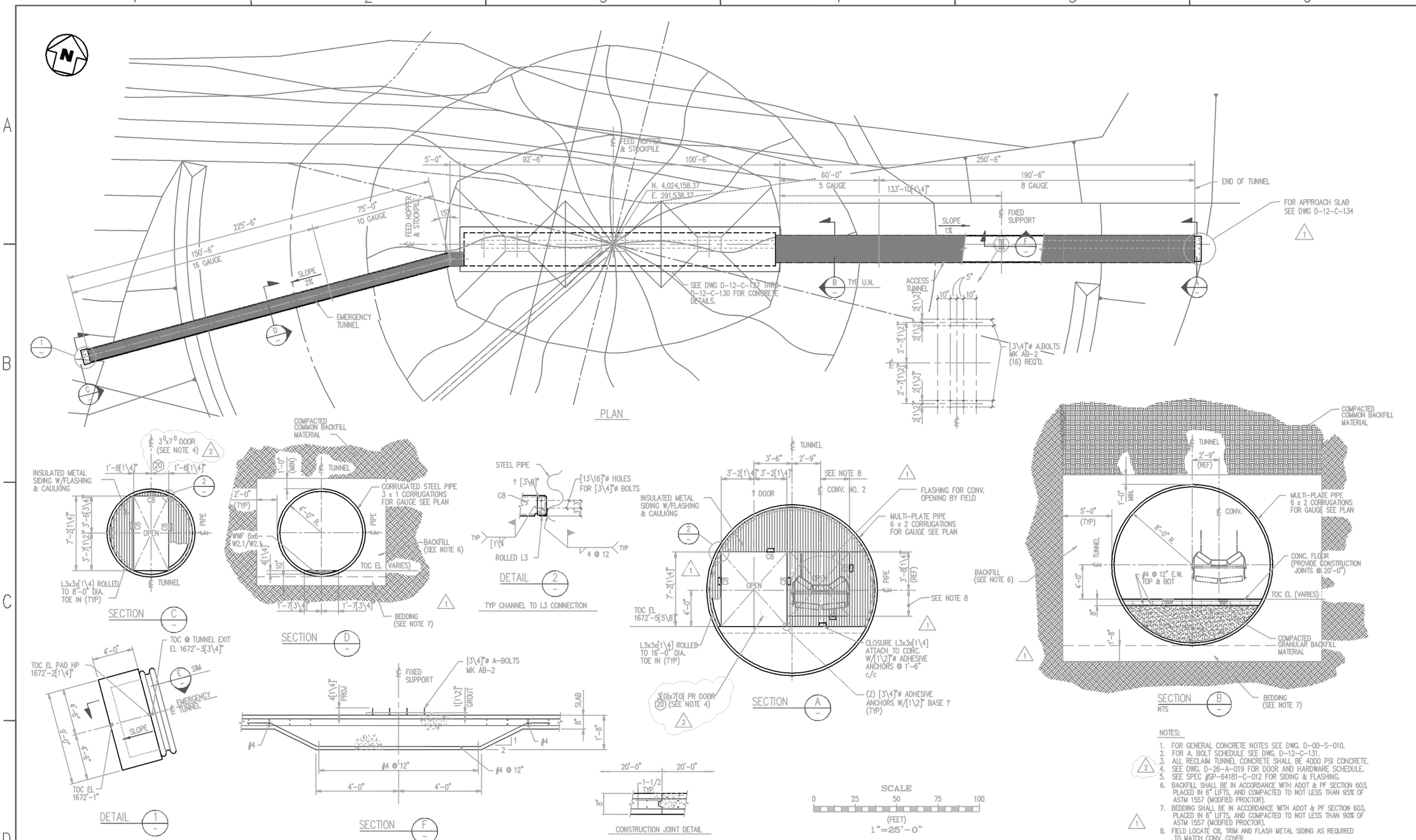
Ford, Bacon & Davis
INCORPORATED

TITLE
OVERLAND CONVEYOR
GENERAL ARRANGEMENT
PRELIMINARY DESIGN PROFILE

FOR

SCALE	JOB NO	FBDT CAD CONTROL NO	DRAWING NO	REV
1"=100'	64181	4181M15A	SK-M-001	A

OFB22A



NOTES:

1. FOR GENERAL CONCRETE NOTES SEE DWG. D-00-S-010.
2. FOR A. BOLT SCHEDULE SEE DWG. D-12-C-131.
3. ALL RECLAIM TUNNEL CONCRETE SHALL BE 4000 PSI CONCRETE.
4. SEE DWG. D-26-A-019 FOR DOOR AND HARDWARE SCHEDULE.
5. SEE SPEC #SP-64181-C-012 FOR SIDING & FLASHING.
6. BACKFILL SHALL BE IN ACCORDANCE WITH ADOT & PF SECTION 603, PLACED IN 6" LIFTS, AND COMPACTED TO NOT LESS THAN 95% OF ASTM 1557 (MODIFIED PROCTOR).
7. BEDDING SHALL BE IN ACCORDANCE WITH ADOT & PF SECTION 603, PLACED IN 6" LIFTS, AND COMPACTED TO NOT LESS THAN 90% OF ASTM 1557 (MODIFIED PROCTOR).
8. FIELD LOCATE C8, TRIM AND FLASH METAL SIDING AS REQUIRED TO MATCH CONV. COVER.

REVISIONS

NO	DESCRIPTION	DATE	BY	CHK	APP
1	ADD BEDDING DETAILS FOR MULTI PLATE & CSP	---	---	---	---
2	REMOVE HOLDS, APPROACH SLAB & SECTION E	8-03-95	GLT	GB	AJM
3	ADDED DOOR SCHEDULE NUMBERS	11-27-95	SDS	DSF	

REFERENCE DRAWINGS

DRAWING NO	TITLE
D-50-M-001	GENERAL ARRANGEMENT PLOT PLAN
D-12-M-123	CONVEYOR 12-CR-002 GENERAL ARRANGEMENT

ISSUE RECORD

DATE	ISS	REV	TO	FOR
5-1-95	1	A	CLIENT/CONTRACTOR	REVIEW
5-1-95	2	A	CONTRACTOR	QUOTE
6-1-95	3	0	CLIENT/CONTRACTOR	CONSTRUCTION
8-03-95	4	1	CLIENT/CONTRACTOR	CONSTRUCTION
11-30-95	5	2	CLIENT/CONTRACTOR	CONSTRUCTION

ENGR RECORD

	BY	DATE
DRAWN	KWO	4-11-95
CHECKED	JA	5/28/95
ELEC CHECK	EEG	6/1/95
INST CHECK	GB	6/1/95
MECH CHECK	EJC	6/1/95
PIPING CHECK	DD	6/1/95
STRUCT CHECK	MAG	6/1/95
SQUAD LEADER	TSG	6/1/95
CHIEF ENG/DES	FH	6/1/95
PROJECT ENG	DMW	6/1/95
CONST. REVIEW	AW	6/1/95
CLIENT APPROVAL	ATM	6/1/95

FORT KNOX
AMAX GOLD INC.
FAIRBANKS GOLD MINING, INC.

FAIRBANKS GOLD MINING, INC.
FORT KNOX GOLD PROJECT
FAIRBANKS, ALASKA

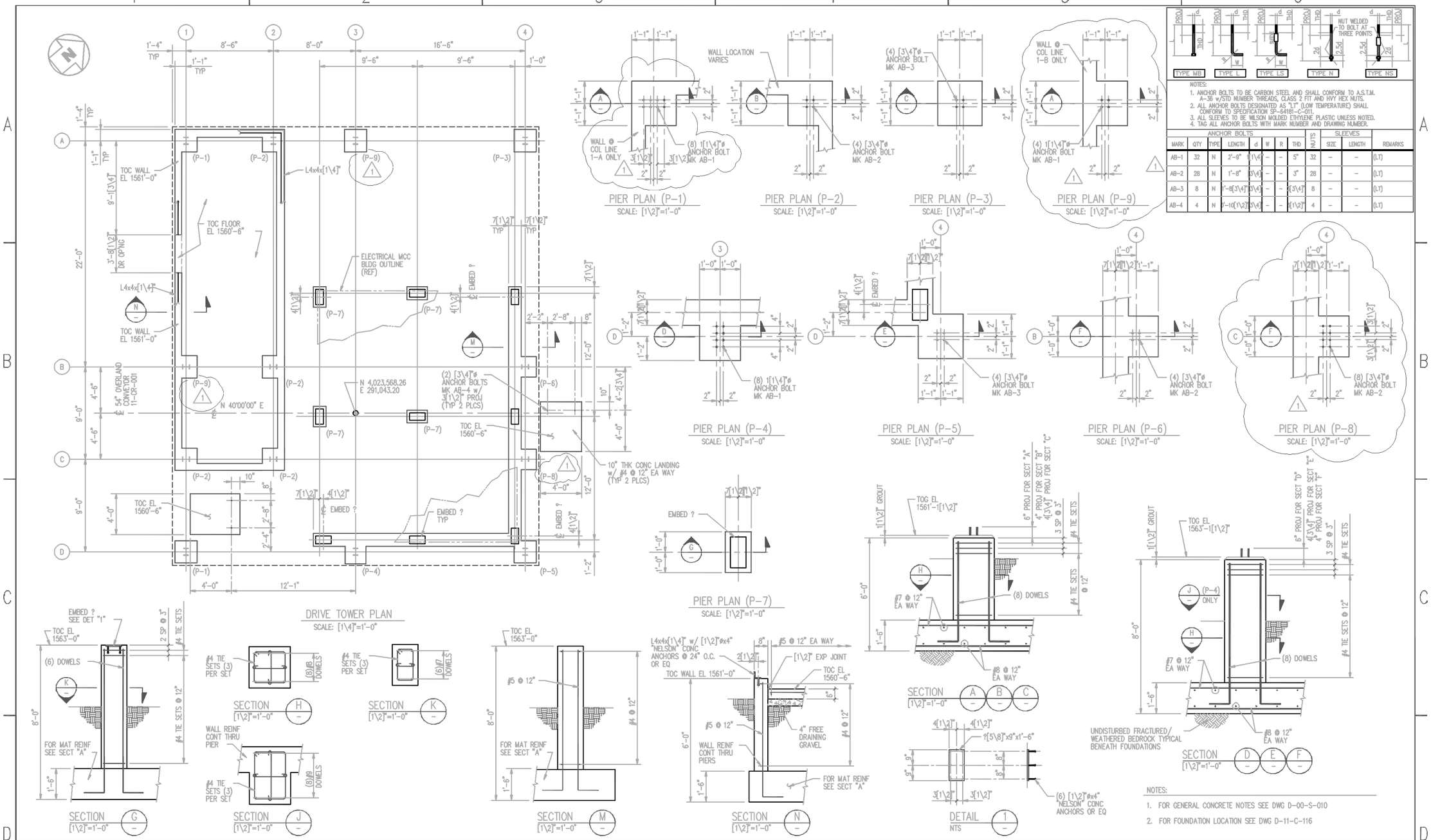
Ford, Bacon & Davis
INCORPORATED

TITLE
RECLAIM TUNNEL
FOUNDATION LOCATION PLAN
CONCRETE

FOR FAIRBANKS GOLD MINING INC. FAIRBANKS, ALASKA

SCALE	JOB NO	FBDT CAD CONTROL NO	DRAWING NO	REV
1"=25'-0"	64181	4181S1AD	D-12-C-126	2

CFB22C



NOTES:
1. ANCHOR BOLTS TO BE CARBON STEEL AND SHALL CONFORM TO A.S.T.M. A-36 w/STD NUMBER THREADS, CLASS 2 FIT AND HVY HEX NUTS.
2. ALL ANCHOR BOLTS DESIGNATED AS "L1" (LOW TEMPERATURE) SHALL CONFORM TO SPECIFICATION SP-64181-C-011.
3. ALL SLEEVES TO BE WILSON MOLDED ETHYLENE PLASTIC UNLESS NOTED.
4. TAG ALL ANCHOR BOLTS WITH MARK NUMBER AND DRAWING NUMBER.

ANCHOR BOLTS								NUTS	SLEEVES		
MARK	QTY	TYPE	LENGTH	d	W	R	THD		SIZE	LENGTH	REMARKS
AB-1	32	N	2'-9"	1[1\4]	–	–	5"	32	–	–	(L1)
AB-2	28	N	1'-8"	[3\4]	–	–	3"	28	–	–	(L1)
AB-3	8	N	1'-8[3\4"]	[3\4]	–	–	[3\4"]	8	–	–	(L1)
AB-4	4	N	2'-10[1\2"]	[3\4]	–	–	[1\2"]	4	–	–	(L1)

NOTES:
1. FOR GENERAL CONCRETE NOTES SEE DWG D-00-S-010
2. FOR FOUNDATION LOCATION SEE DWG D-11-C-116

REVISIONS					
NO	DESCRIPTION	DATE	BY	CHK	APP
1	REV (P-1), ADDED (P-8), (P-9), REV P-#'S	1-11-96	WE	TE	
2					
3					
4					
5					
6					
7					

REFERENCE DRAWINGS	
DRAWING NO	TITLE
101-30-005	GEN. ARRANGEMENT – PLAN (CONV ENG'RG., INC)

ISSUE RECORD				
DATE	ISS	REV	TO	FOR
6-08-95	1	A	CLIENT/CONTRACTOR	REVIEW/COMMENT
7-10-95	2	0	CLIENT/CONTRACTOR	CONSTRUCTION
1-16-96	3	1	CLIENT/CONTRACTOR	CONSTRUCTION

ENGR RECORD		
	BY	DATE
DRAWN	GB	6-06-95
CHECKED	MR	7-11-95
ELEC CHECK	CJH	7-12-95
INST CHECK	EH	7-12-95
MECH CHECK	EJC	7-11-95
PIPING CHECK	DD	7-11-95
STRUCT CHECK	MG	7-11-95
SQUAD LEADER	TSG	7-11-95
CHIEF ENG/DES		
PROJECT ENG	DMW	7-12-95
CONST. REVIEW	TK	7-12-95
CLIENT APPROVAL	AJM	7-12-95

FORT KNOX
AMAX GOLD INC.
FAIRBANKS GOLD MINING, INC.

FAIRBANKS GOLD MINING, INC.
FORT KNOX GOLD PROJECT
FAIRBANKS, ALASKA

Ford, Bacon & Davis
INCORPORATED

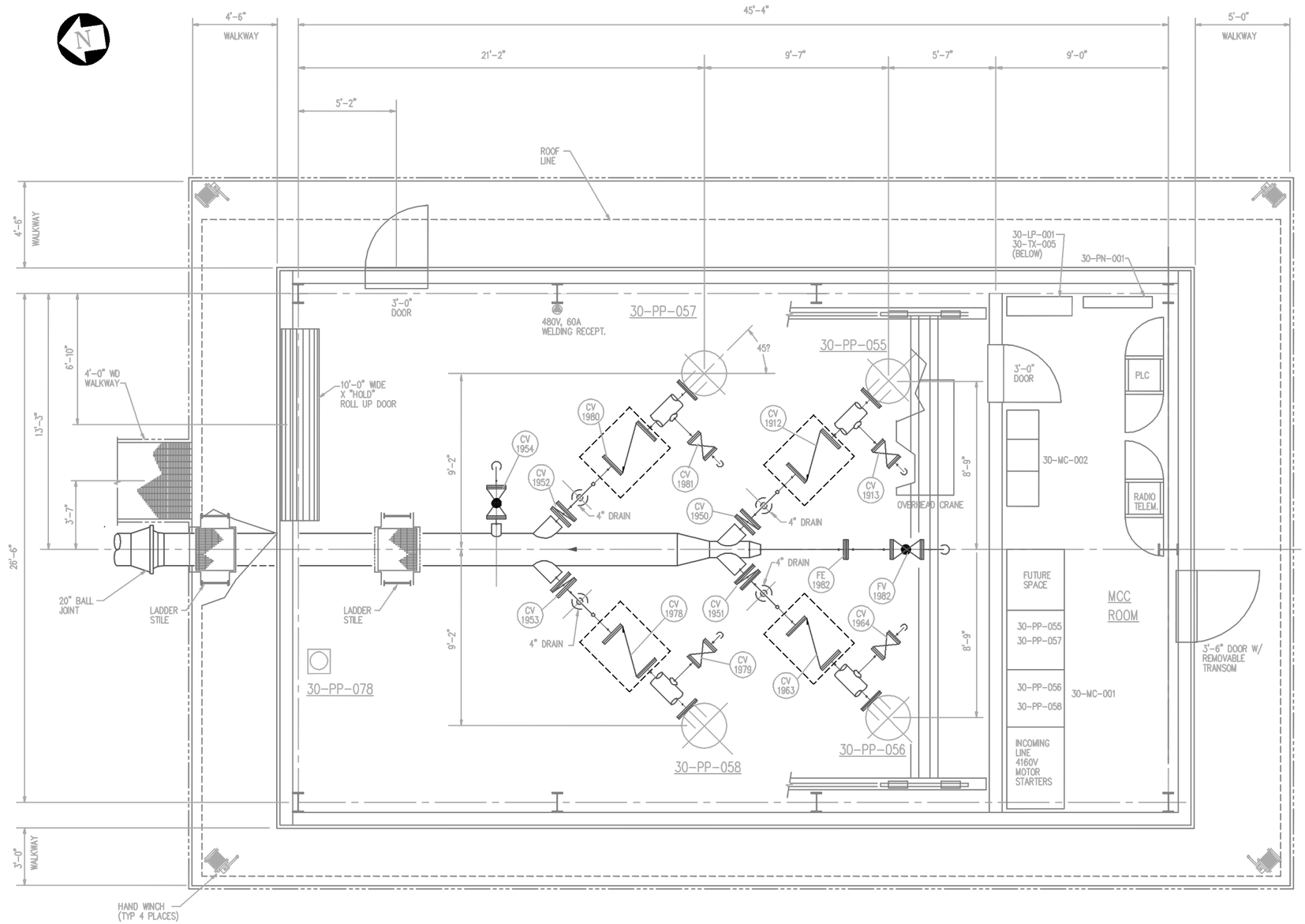
TITLE
OVERLAND CONVEYOR
DRIVE TOWER
PLAN, SECTIONS & DETAILS

FOR FAIRBANKS GOLD MINING, INC. FAIRBANKS, ALASKA

SCALE	JOB NO	FBDT CAD CONTROL NO	DRAWING NO	REV
NOTED	64181	4181S2XC	D-11-C-119	1

CFB22C

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
616											
617	**19. Tailing Barge**										
618											
619	**Planning, Preparation**										
620	Plan Demolition Work, Analyze Drawings & Site Conditions	8	HRS			1.000	7.7	$554		$554	$554
621	**Remove Building End Wall**										
622	Remove Building End Wall To Facilitate Access, Removal Of Equipment	528	SF			0.030	15.8	$1,136		$1,136	$1,136
623	**Remove Exterior Structure**										
624	Remove Exterior Rails, Gangway, Equip Attached To Bldg Exterior	16	HRS			1.000	16.0	$1,151		$1,151	$1,151
625	**Remove Distributed Systems, Devices**										
626	Decommission, Disconnect Mech, Elec	4	HRS			1.000	3.8	$273		$273	$273
627	Remove Distributed Piping, Ductwork, Wiring, Devices, Smaller Equipment, Etc. Clear Access To Major Items	10	HRS			1.000	9.6	$690		$690	$690
628	**Remove Major Equipment**										
629	Demo Major Equipment, Pumps, MCC	6	PIECES			8.000	48.0	$3,452		$3,452	$3,452
630	**Demo Building**										
631	Demolish Building, Structural Steel Mtl Skin	960	SF			0.048	46.1	$3,316	$2,654	$5,970	$5,970
632	**Debris Handling**										
633	Stockpile At Site In Truckable Loads	26	TONS			0.300	7.8	$561	$312	$873	$873
634	**Mobilization, Operations and Profit**										
635	**Operation Costs**	10%									$1,410
636	Room & Board - 10% Of Crew	2	MDAYS	$110.00	$220					$220	$220
637	**Profit**	8%									$1,258
638											
639											
640											
641											
642											
643											
644											
645											
646											
647											
648	**Subtotal: 19. Tailing Barge: Cost based on 960 SF**				$220		154.8	$11,133	$2,966	$14,319	**$16,987**
649	Average Unit Price For this division is: $17.70 per SF										
650	Average Labor Rate For this division: $71.92 per hour										



SCALE
0 1 2 3 4 5 6 7 8 9 10
(FEET)
3/8"=1'-0"

NOTE:
1. FOR GENERAL NOTES SEE DWG. D-10-P-001

REVISIONS

NO	DESCRIPTION	DATE	BY	CHK	APP
A	UPDATED AND ISSUED FOR QUOTE	09/20/95	DD		
B	ISSUED FOR CONSRUCTION	02-01-95	RDW	DD	

REFERENCE DRAWINGS

DRAWING NO	TITLE
D-30-D-119	WATER RECLAIM P&ID

ISSUE RECORD

DATE	ISS	REV	TO	FOR
09/20/95	1	B	VENDOR	QUOTE
02-02-95	2	0	CLIENT/CONTRACTOR	CONSTRUCTION

ENGR RECORD

	BY	DATE
DRAWN	DD	08/22/95
CHECKED		
ELEC CHECK		
INST CHECK		
MECH CHECK		
PIPING CHECK		
STRUCT CHECK		
SQUAD LEADER		
CHIEF ENG/DES		
PROJECT ENG		
CONST. REVIEW		
CLIENT APPROVAL		

FORT KNOX
AMAX GOLD INC.
FAIRBANKS GOLD MINING, INC.

FAIRBANKS GOLD MINING, INC.
FORT KNOX GOLD PROJECT
FAIRBANKS, ALASKA

Ford, Bacon & Davis
INCORPORATED

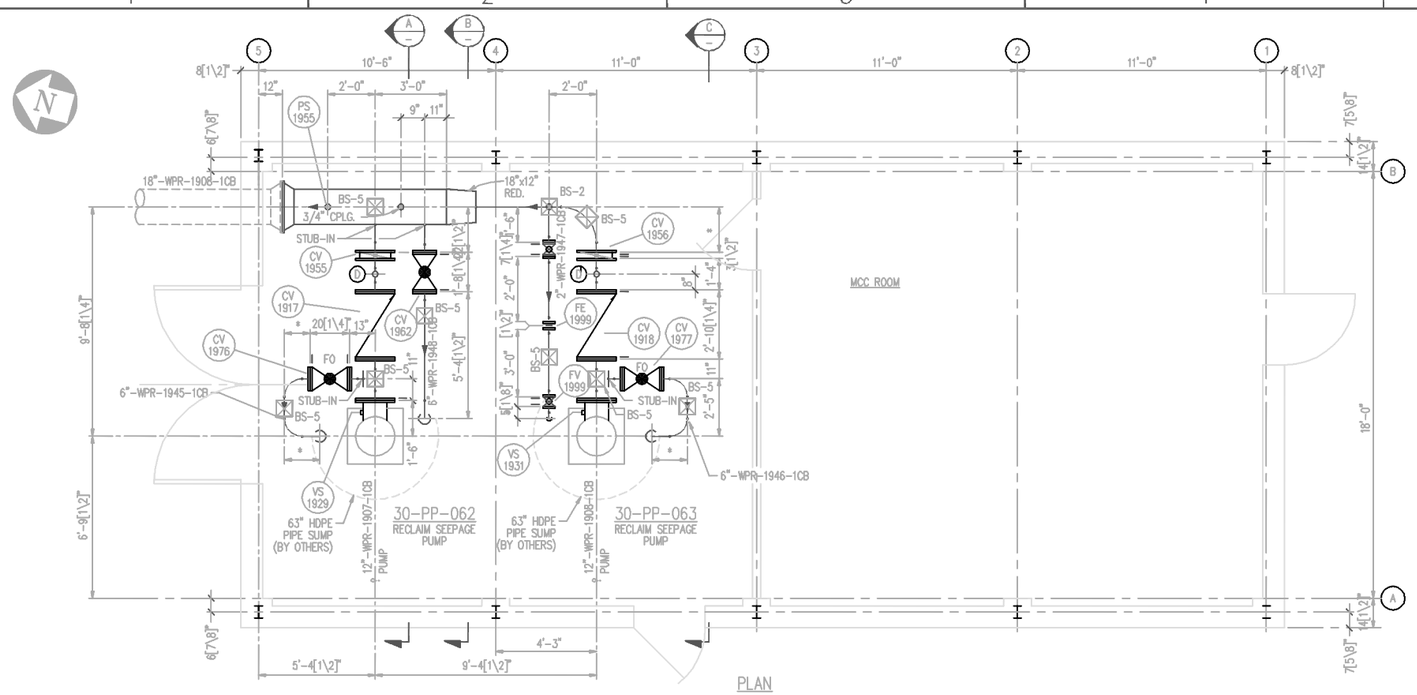
TITLE
PUMP BARGE
PIPING PLAN

FOR FAIRBANKS GOLD MINING INC. FAIRBANKS, ALASKA

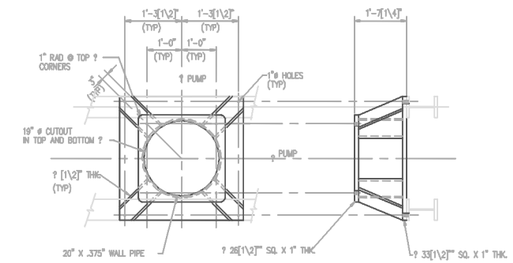
SCALE	JOB NO	FBDT CAD CONTROL NO	DRAWING NO	REV
3/8"=1'-0"	64181	4181P2VB	D-30-P-001	0

CFB22C
XX/XX/XX

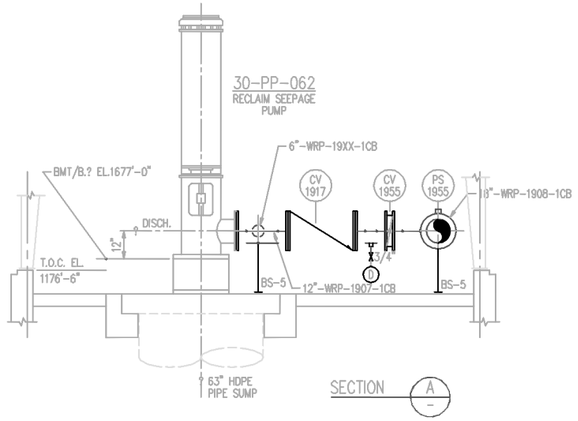
Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
651											
652	**20. Tailing Seepage Building**										
653											
654	**Planning, Preparation**										
655	Plan Demolition Work, Analyze Drawings & Site Conditions	8	HRS			1.000	8.0	$575		$575	$575
656	**Remove Building End Wall**										
657	Remove Building End Wall To Facilitate Access, Removal Of Equipment	288	SF			0.030	8.6	$619		$619	$619
658	**Remove Exterior Structure**										
659	Remove Lights, Louvers, Equipment Attached To Bldg Exterior	8	HRS			1.000	8.0	$575		$575	$575
660	**Remove Distributed Systems, Devices**										
661	Decommission, Disconnect Mech, Elec	4	HRS			1.000	4.0	$288		$288	$288
662	Remove Distributed Piping, Ductwork, Wiring, Devices, Smaller Equipment, Etc. Clear Access To Major Items	8	HRS			1.000	8.0	$575		$575	$575
663	**Remove Major Equipment**										
664	Demo Major Equipment, Pumps, MCC	8	PIECES			12.000	96.0	$6,904		$6,904	$6,904
665	**Demo Building**										
666	Demolish Building, Structural Steel Mtl Skin	640	SF			0.048	30.7	$2,208	$1,769	$3,977	$3,977
667	**Debris Handling**										
668	Stockpile At Site In Truckable Loads	18	TONS			0.300	5.4	$388	$216	$604	$604
669	**Mobilization, Operations and Profit**										
670	**Operation Costs**	10%									$1,412
671	Room & Board - 10% Of Crew	2	MDAYS	$110.00	$220					$220	$220
672	**Profit**	8%									$1,260
673											
674											
675											
676											
677											
678											
679											
680											
681											
682											
683	**Subtotal: 20. Tailing Seepage Building: Cost based on 640 SF**				$220		168.7	$12,132	$1,985	$14,337	**$17,009**
684	Average Unit Price For this division is: $26.58 per SF										
685	Average Labor Rate For this division: $71.91 per hour										



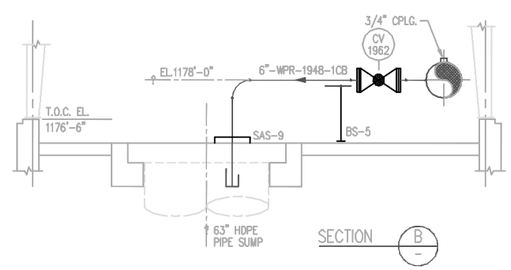
PLAN



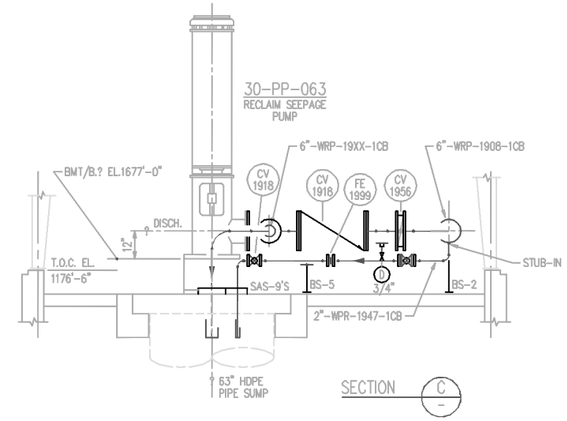
WELDMENT FOR PUMPS 30-PP-062 AND 063



SECTION A



SECTION B



SECTION C

NOTES:

1. FOR GENERAL NOTES SEE DWG.D-10-P-001

SCALE

0 1 2 3 4 5 6 7 8 9 10

(FEET)

3/8"=1'-0"

REVISIONS						REFERENCE DRAWINGS		ISSUE RECORD				
NO	DESCRIPTION	DATE	BY	CHK	APP	DRAWING NO	TITLE	DATE	ISS	REV	TO	FOR
A	ISSUED FOR REVIEW AND COMMENTS	12-13-95	RDW			D-30-C-221	TAILING SEEPAGE PUMP HOUSE FOUNDATION	12-13-95	1	A	CLIENT/CONTRACTOR	REVIEW & COMMENTS
B	ISSUED FOR CONSTRUCTION	01/15/96	RDW			D-30-E-700	TAILING SEEPAGE PUMP HOUSE MCC LAYOUT	01/15/96	2	0	CLIENT/CONTRACTOR	CONSTRUCTION

ENGR RECORD	BY	DATE
DRAWN	RDW	12-06-95
CHECKED		
ELEC CHECK		
INST CHECK		
MECH CHECK		
PIPING CHECK		
STRUCT CHECK		
SQUAD LEADER		
CHIEF ENG./DES		
PROJECT ENG		
CONST. REVIEW		
CLIENT APPROVAL		

FAIRBANKS GOLD MINING, INC.
FORT KNOX GOLD PROJECT
FAIRBANKS, ALASKA

Ford, Bacon & Davis
INCORPORATED

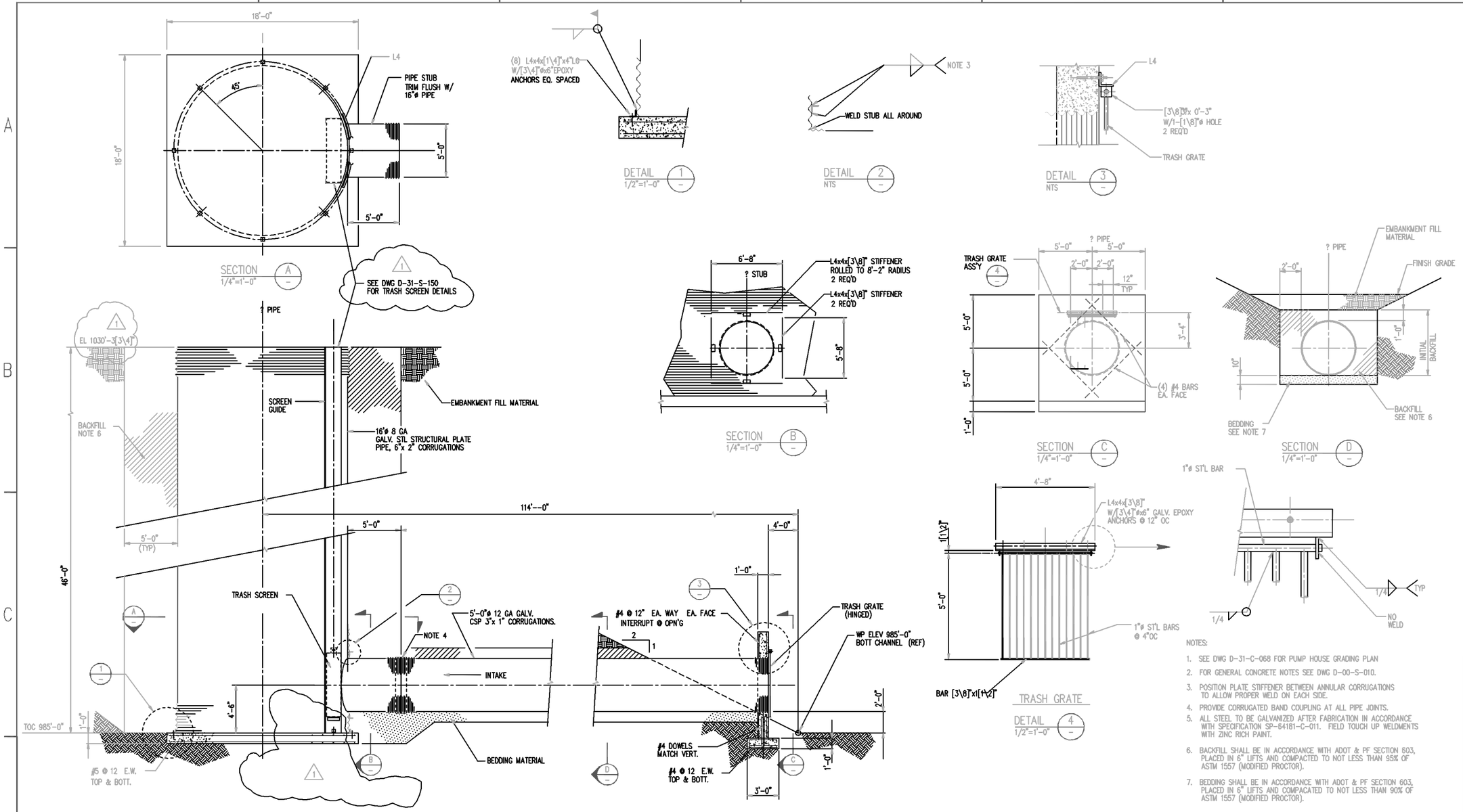
TITLE
TAILING SEEPAGE AREA
PUMP HOUSE PIPING
PLAN @ GRADE

FOR FAIRBANKS GOLD MINING, INC. FAIRBANKS, ALASKA

SCALE	JOB NO	FBDT CAD CONTROL NO	DRAWING NO	REV
3/8"=1'-0"	64181	4181P30B	D-30-P-002	0

GFB22C
01/12/96 13:49

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
686											
687	**21. Water Reclaim Fresh Water Pump House**										
688											
689	**Planning, Preparation**										
690	Plan Demolition Work, Analyze Drawings & Site Conditions	8	HRS			1.000	8.0	$575		$575	$575
691	**Remove Building End Wall**										
692	Remove Building End Wall To Facilitate Access, Removal Of Equipment	800	SF			0.030	24.0	$1,726		$1,726	$1,726
693	**Remove Exterior Structure**										
694	Remove Lights, Louvers, Equipment Attached To Bldg Exterior	8	HRS			1.000	8.0	$575		$575	$575
695	**Remove Distributed Systems, Devices**										
696	Decommission, Disconnect Mech, Elec	8	HRS			1.000	8.0	$575		$575	$575
697	Remove Distributed Piping, Ductwork, Wiring, Devices, Smaller Equipment, Etc. Clear Access To Major Items	16	HRS			1.000	16.0	$1,151		$1,151	$1,151
698	**Remove Major Equipment**										
699	Demo Major Equipment, Pumps, MCC	12	PIECES			12.000	144.0	$10,356		$10,356	$10,356
700	**Demo Building**										
701	Demolish Building, Structural Steel Mtl Skin	1,200	SF			0.048	57.6	$4,143	$3,318	$7,461	$7,461
702	**Debris Handling**										
703	Stockpile At Site In Truckable Loads	33	TONS			0.300	9.9	$712	$396	$1,108	$1,108
704	**Mobilization, Operations and Profit**										
705	**Operation Costs**	10%									$2,353
706	Room & Board - 10% Of Crew	3	MDAYS	$110.00	$330					$330	$330
707	**Profit**	8%									$2,097
708											
709											
710											
711											
712											
713											
714											
715											
716											
717	**Subtotal: 21. Water Reclaim Fresh Water Pump House: Cost based on 1,200 SF**				$330		275.5	$19,813	$3,714	$23,857	**$28,306**
718	Average Unit Price For this division is: $23.59 per SF										
719	Average Labor Rate For this division: $71.92 per hour										



NOTES:

1. SEE DWG D-31-C-068 FOR PUMP HOUSE GRADING PLAN
2. FOR GENERAL CONCRETE NOTES SEE DWG D-00-S-010.
3. POSITION PLATE STIFFENER BETWEEN ANNULAR CORRUGATIONS TO ALLOW PROPER WELD ON EACH SIDE.
4. PROVIDE CORRUGATED BAND COUPLING AT ALL PIPE JOINTS.
5. ALL STEEL TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH SPECIFICATION SP-64181-C-011. FIELD TOUCH UP WELDMENTS WITH ZINC RICH PAINT.
6. BACKFILL SHALL BE IN ACCORDANCE WITH ADOT & PF SECTION 603, PLACED IN 6" LIFTS AND COMPACTED TO NOT LESS THAN 95% OF ASTM 1557 (MODIFIED PROCTOR).
7. BEDDING SHALL BE IN ACCORDANCE WITH ADOT & PF SECTION 603, PLACED IN 6" LIFTS AND COMPACATED TO NOT LESS THAN 90% OF ASTM 1557 (MODIFIED PROCTOR).

REVISIONS

NO	DESCRIPTION	DATE	BY	CHK	APP
1	REMOVED HOLDS, CHANGED T/CMP EL.	12-19-95	KWO	TE	

REFERENCE DRAWINGS

DRAWING NO	TITLE

ISSUE RECORD

DATE	ISS	REV	TO	FOR
8-9-95	1	A	CLIENT/CONTRACTOR	REVIEW & COMMENT
8-16-95	2	0	CLIENT/CONTRACTOR	CONSTRUCTION
12-19-95	3	1	CLIENT/CONTRACTOR	CONSTRUCTION

ENGR RECORD

	BY	DATE
DRAWN	JP	7-20-95
CHECKED	GLT	8-9-95
ELEC CHECK	EEG	8-16-95
INST CHECK	GB	8-16-95
MECH CHECK	EJC	8-16-95
PIPING CHECK	GD	8-16-95
STRUCT CHECK	MAG	8-16-95
SQUAD LEADER	TSG	8-16-95
CHIEF ENG/DES	GB	8-16-95
PROJECT ENG	DW	8-16-95
CONST. REVIEW	TK	8-17-95
CLIENT APPROVAL	AJM	8-17-95

FORT KNOX
AMAX GOLD INC.
FAIRBANKS GOLD MINING, INC.

FAIRBANKS GOLD MINING, INC.
FORT KNOX GOLD PROJECT
FAIRBANKS, ALASKA

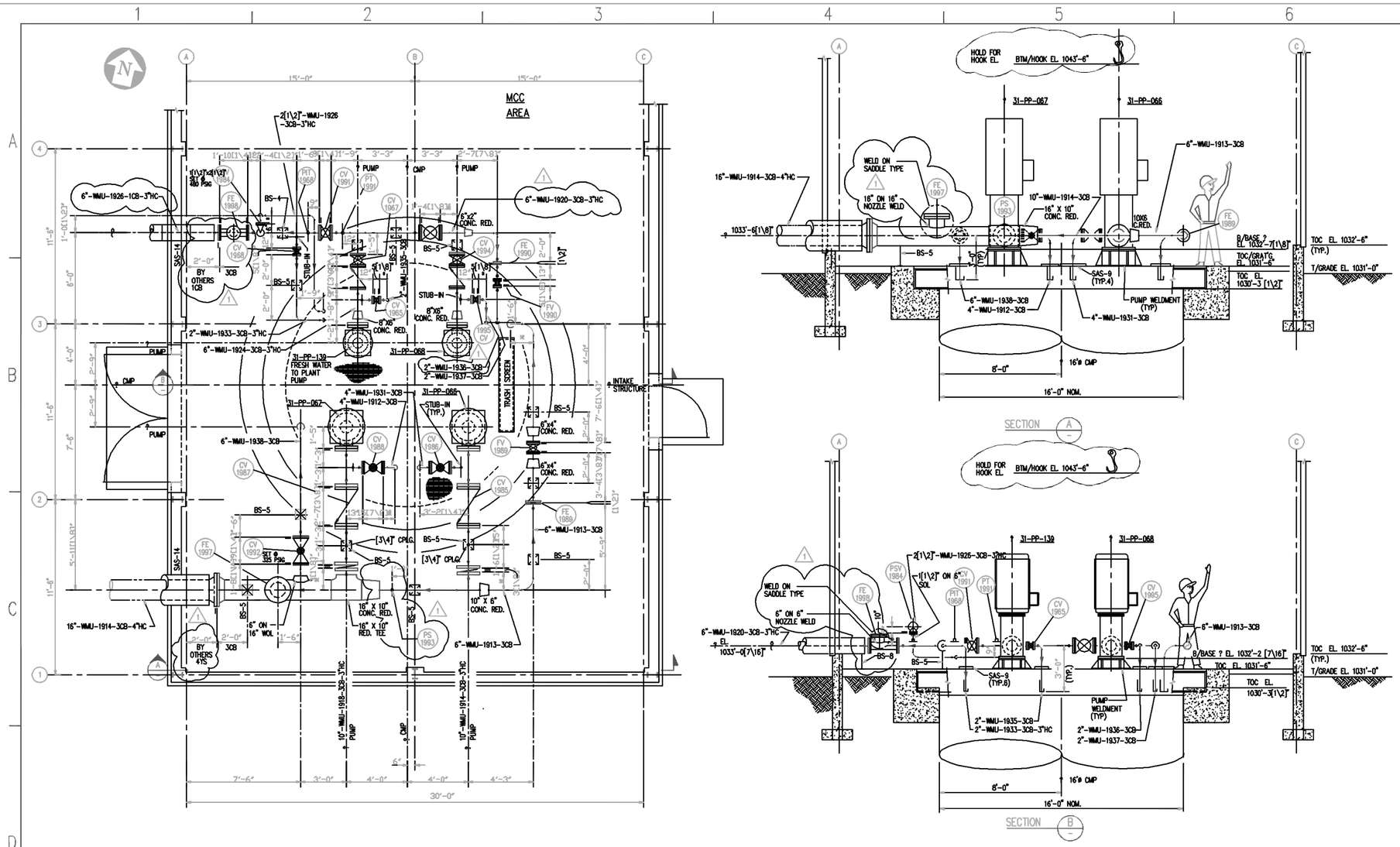
Ford, Bacon & Davis
INCORPORATED

TITLE
FRESH WATER PUMPHOUSE
INTAKE STRUCTURE
SECTIONS & DETAILS

FOR FAIRBANKS GOLD MINING INC. FAIRBANKS, ALASKA

SCALE	JOB NO	FBDT CAD CONTROL NO	DRAWING NO	REV
NOTED	64181	4181C79C	D-31-C-069	1

CFB22C



REVISIONS					
NO	DESCRIPTION	DATE	BY	CHK	APP
1	ISSUED FOR REVIEW AND COMMENT	11-06-95	JPL		
2	ISSUED FOR CONSTRUCTION	01-03-96	NAH	DD	
3	GENERAL PIPING REVISIONS AS NOTED	2/26/96	CG	CG	
4					
5					
6					
7					

REFERENCE DRAWINGS	
DRAWING NO	TITLE
D-31-P-600	FRESH WATER PUMPHOUSE – MCC
D-31-C-224	FRESH WATER PUMPHOUSE – FOUNDATION PLAN
D-31-C-068	FRESH WATER PUMPHOUSE – GRADING PLAN
D-31-S-151	FRESH WATER PUMPHOUSE – PUMP SUPPORT STEEL PLAN

ISSUE RECORD				
DATE	ISS	REV	TO	FOR
11-06-95	1	A	CLIENT/CONTRACTOR	REVIEW AND COMMENT
01-03-96	2	0	CLIENT/CONTRACTOR	CONSTRUCTION
2/26/96	3	1	CLIENT/CONTRACTOR	CONSTRUCTION

ENGR RECORD	BY	DATE
DRAWN	JPL	11-02-95
CHECKED	RDW	1/8/96
ELEC CHECK	RPG	1/8/96
INST CHECK	GB	1/8/96
MECH CHECK	JSN	1/8/96
PIPING CHECK	DD	1/8/96
STRUCT CHECK	RKG	1/8/96
SQUAD LEADER	JF	1/8/96
CHIEF ENG/DES		
PROJECT ENG		
CONST. REVIEW		
CLIENT APPROVAL		

FORT KNOX
FAIRBANKS GOLD MINING, INC.
FORT KNOX GOLD PROJECT
FAIRBANKS, ALASKA

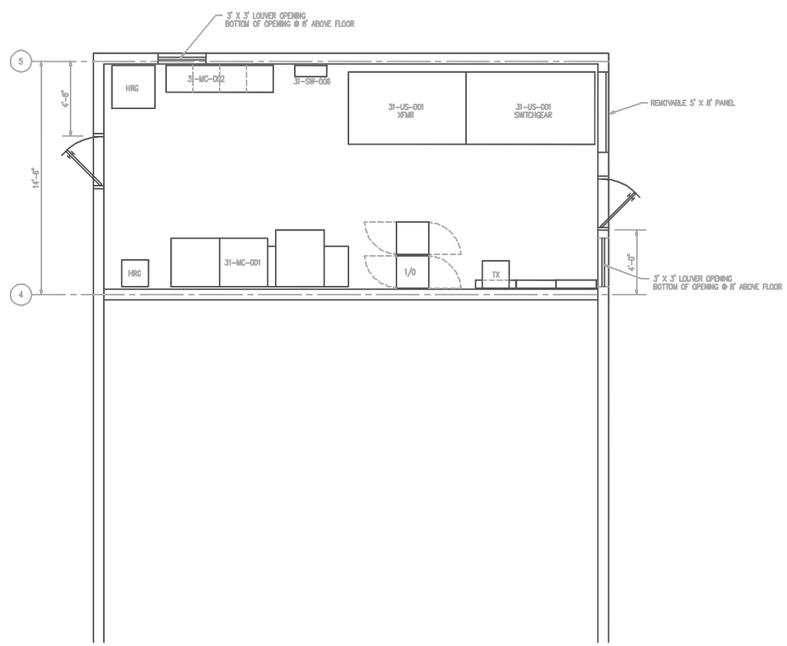
Ford, Bacon & Davis
INCORPORATED

TITLE
WATER RECLAIM AREA
FRESH WATER PUMPHOUSE
PIPING PLAN AND SECTIONS

FOR FAIRBANKS GOLD MINING INC. FAIRBANKS, ALASKA

SCALE	JOB NO	FBDT CAD CONTROL NO	DRAWING NO	REV
1/4"=1'-0"	64181	4181P1DC	D-31-P-001	1

CFB22C



SCALE
0 1 2 3 4 5 6 7 8 9 10
(FEET)
3/8"=1'-0"

REVISIONS						REFERENCE DRAWINGS		ISSUE RECORD					ENGR RECORD		
NO	DESCRIPTION	DATE	BY	CHK	APP	DRAWING NO	TITLE	DATE	RES	REV	TO	FOR		BY	DATE
													DRAWN	JBC	11/28/05
													CHECKED		
													LEAD CHECK		
													SUBT CHECK		
													HIGH SCHOOL		
													PRIMARY CHECK		
													PRIMARY ANNOUNCIATOR		
													PRIMARY LOADING		
													DISP. APPROVAL		
													CONSULT. CHK		
													FINAL REVIEW		
													CLIENT APPROVAL		

KPB2230

FORT KNOX
MINES AND MILLS
PROCESSING PLANT SCHEDULE
FAIRBANKS GOLD MINING, INC.
FORT KNOX GOLD PROJECT
FAIRBANKS, ALASKA

Ford, Bacon & Davis
INCORPORATED

TITLE
FRESH WATER PUMP HOUSE
MCC ROOM LAYOUT

FOR FAIRBANKS GOLD MINING INC. FAIRBANKS, ALASKA

SCALE	JOB NO	FBDT CAD CONTROL NO	DRAWING NO	REV
1/8"	64181	FRESHWTR	SKETCH	

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
578											
579	**18. Bulk Fuel**	**5**	**TANKS**								
580											
581	**Planning, Preparation**										
582	Plan Demolition Work, Analyze Drawings & Site Conditions	8	HRS			1.000	8.0	$575		$575	$575
583	**Remove Distributed Systems, Devices**										
584	Remove Distributed Piping, Valves, Pumps, Equipment	16	HRS			1.000	16.0	$1,151		$1,151	$1,151
585	**Demo Tanks, Avg Size 14' Dia x 34' Long**										
586	Remove Tanks. Cut Into Truckable Sized Pieces	5	EA			24.000	120.0	$8,630	$3,000	$11,630	$11,630
587	**Debris Handling**										
588	Stockpile At Site In Truckable Loads	248	TONS			0.300	74.4	$5,351	$2,976	$8,327	$8,327
589	**Mobilization, Operations and Profit**										
590	**Operation Costs**	10%									$2,168
591	Room & Board - 10% Of Crew	3	MDAYS	$110.00	$330					$330	$330
592	**Profit**	8%									$1,935
593											
594											
595											
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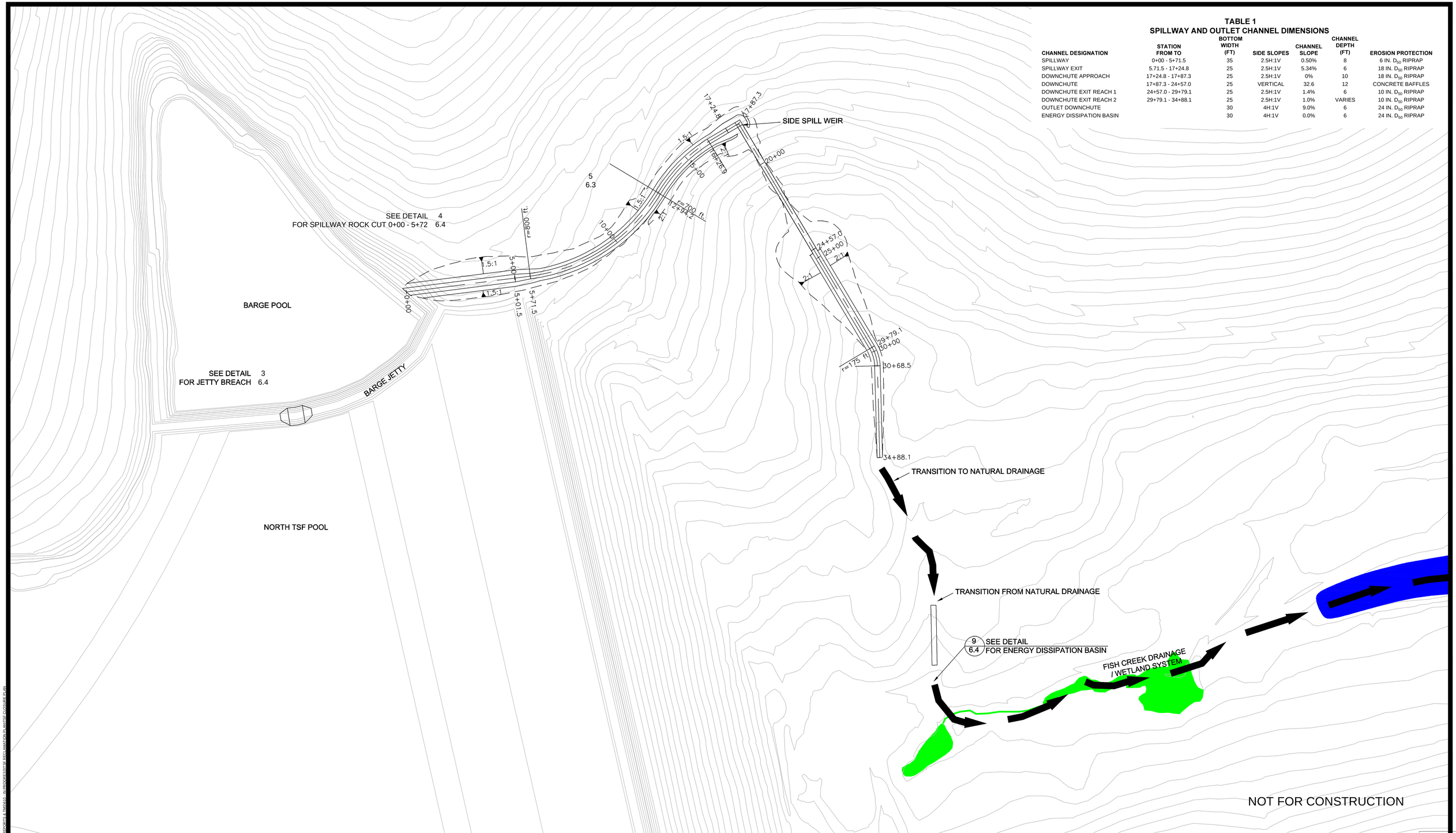
612											
613	**Subtotal: 18. Bulk Fuel: Cost based on 770 SF**				$330		218.4	$15,707	$5,976	$22,013	**$26,116**
614	Average Unit Price For this division is: $33.93 per SF										
615	Average Labor Rate For this division: $71.92 per hour										

Appendix F

TABLE 1
SPILLWAY AND OUTLET CHANNEL DIMENSIONS

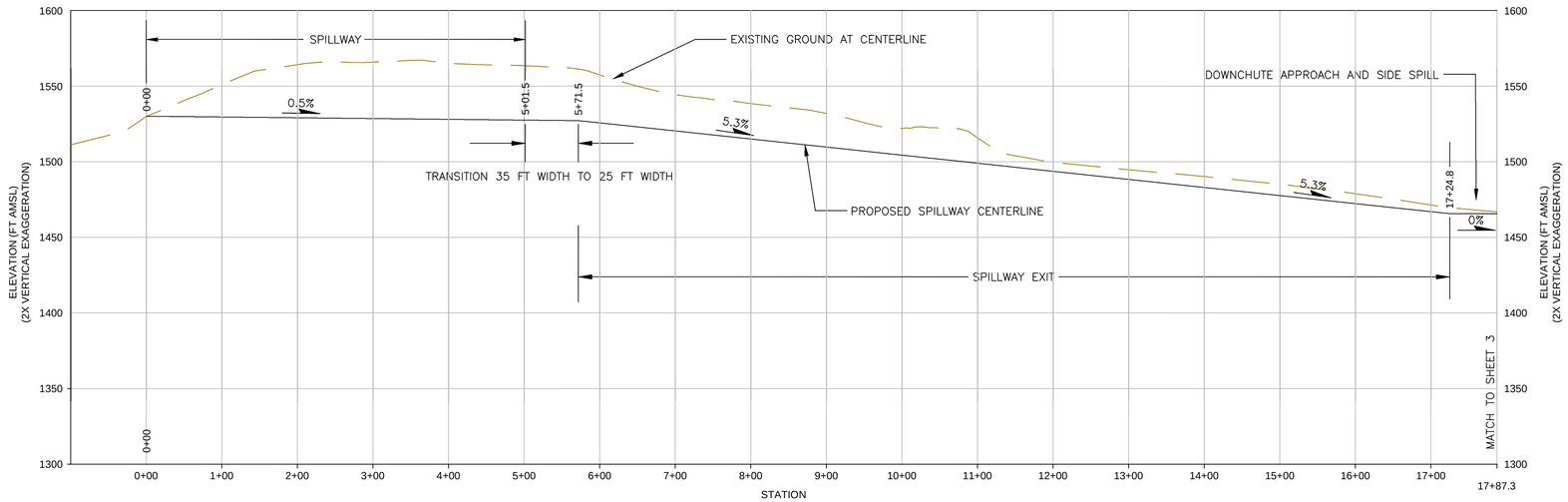
CHANNEL DESIGNATION	STATION FROM TO	BOTTOM WIDTH (FT)	SIDE SLOPES	CHANNEL SLOPE	CHANNEL DEPTH (FT)	EROSION PROTECTION
SPILLWAY	0+00 - 5+71.5	35	2.5H:1V	0.50%	8	6 IN. D_{50} RIPRAP
SPILLWAY EXIT	5.71.5 - 17+24.8	25	2.5H:1V	5.34%	6	18 IN. D_{50} RIPRAP
DOWNCHUTE APPROACH	17+24.8 - 17+87.3	25	2.5H:1V	0%	10	18 IN. D_{50} RIPRAP
DOWNCHUTE	17+87.3 - 24+57.0	25	VERTICAL	32.6	12	CONCRETE BAFFLES
DOWNCHUTE EXIT REACH 1	24+57.0 - 29+79.1	25	2.5H:1V	1.4%	6	10 IN. D_{50} RIPRAP
DOWNCHUTE EXIT REACH 2	29+79.1 - 34+88.1	25	2.5H:1V	1.0%	VARIES	10 IN. D_{50} RIPRAP
OUTLET DOWNCHUTE		30	4H:1V	9.0%	6	24 IN. D_{50} RIPRAP
ENERGY DISSIPATION BASIN		30	4H:1V	0.0%	6	24 IN. D_{50} RIPRAP

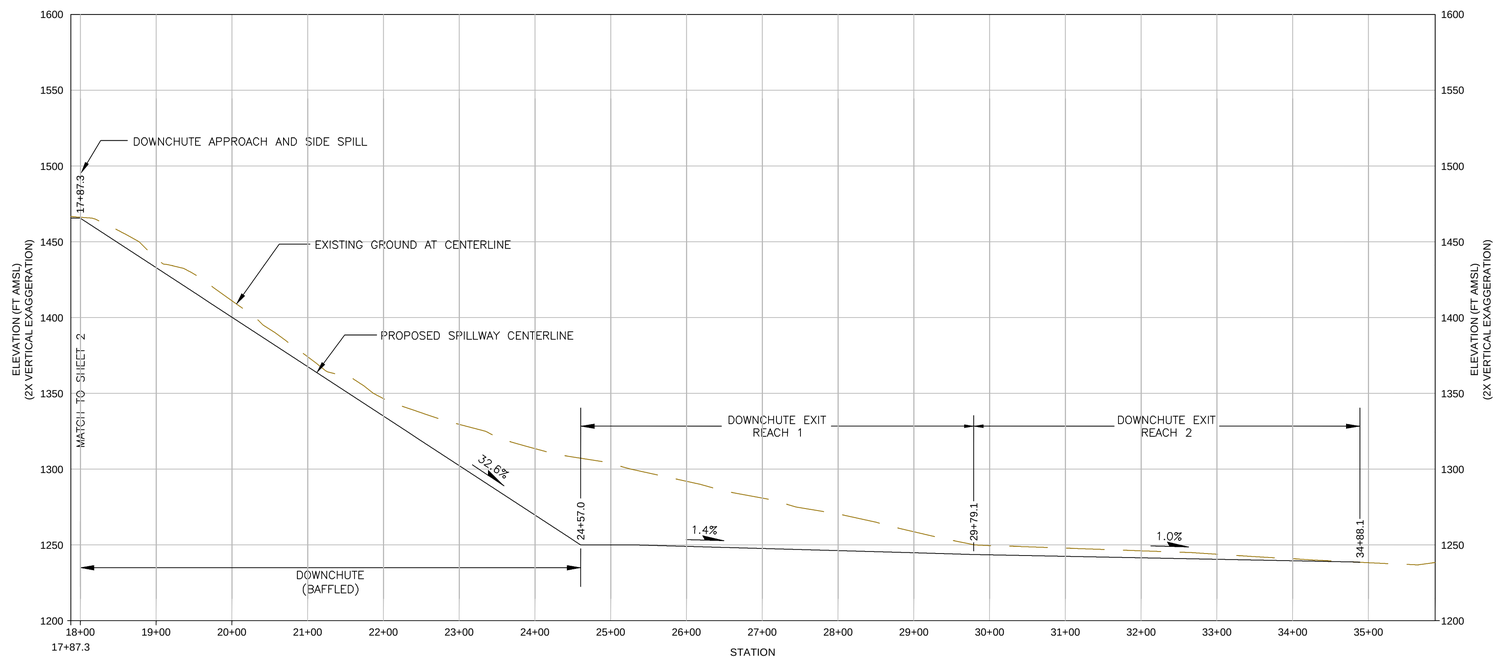


Schlumberger WATER SERVICES

SPILLWAY SYSTEM
FT KNOX CLOSURE MANAGEMENT PLAN

CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANAGEMENT PLAN
JOB: 2903	DRAWN: RN CHECKED: ACP
DATE: MARCH 2011	PLAN: 6.2





NOTE1:
LONGITUDINAL SLOPE OF SPILLWAY SYSTEM SECTIONS 'SPILLWAY CHANNEL' AND 'SPILLWAY CUTE-3 MAY VARY WITH SITE TOPOGRAPHY.

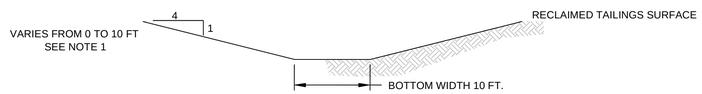
NOT FOR CONSTRUCTION

0 100 200
Scale in Feet

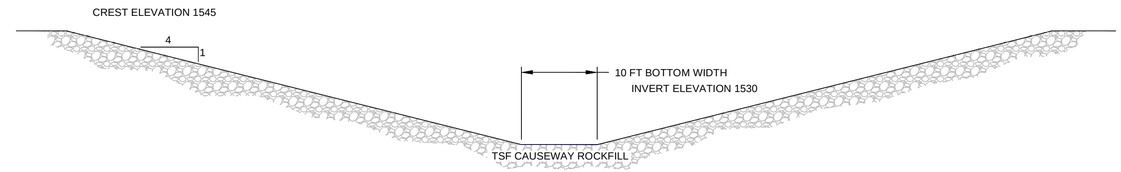
Schlumberger WATER SERVICES

SPILLWAY SYSTEM PROFILE FT KNOX CLOSURE MANAGEMENT PLAN	
CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANAGEMENT PLAN
JOB: 2903	DRAWN: RN CHECKED: ACP
DATE: MARCH 2011	PLAN: 6.3

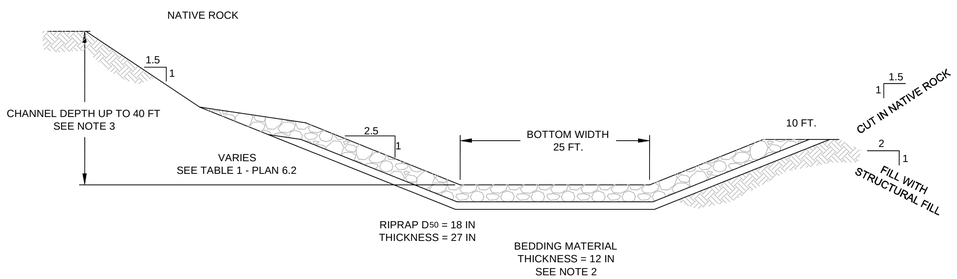
P:\2903 - FT KNOX S.STRUDE & COUGE BECK LOG_REPORTS & TM\SHEET_IN PROGRESS\FIG 6 AVIATION PLOT\FT KNOXSHEE 6 A.DWG



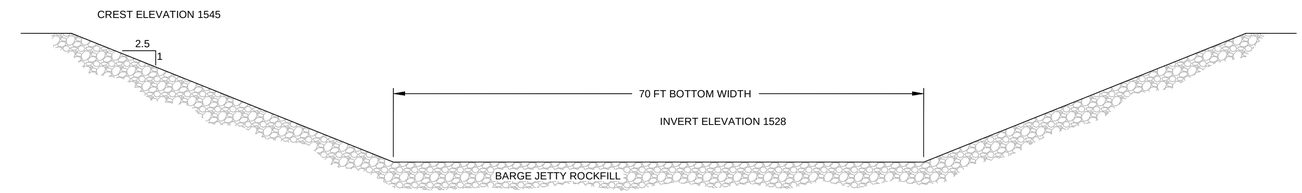
1 CAUSEWAY CONNECTION CHANNEL
6.4 NOT TO SCALE



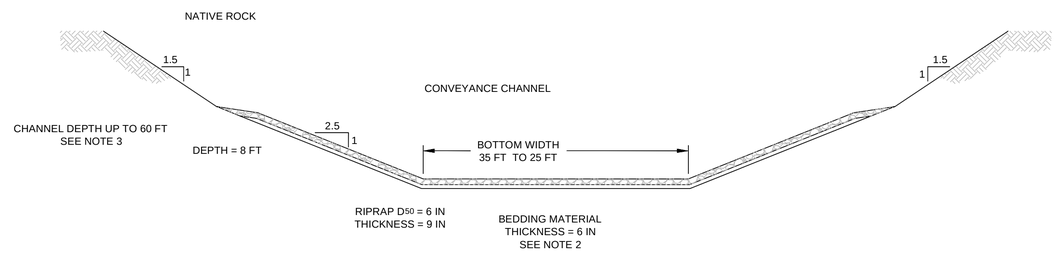
2 TSF CAUSEWAY BREACH
6.4 NOT TO SCALE



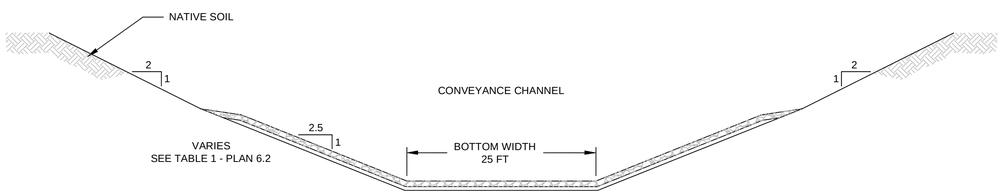
5 SPILLWAY EXIT 5+72 - 17+87
6.4 NOT TO SCALE



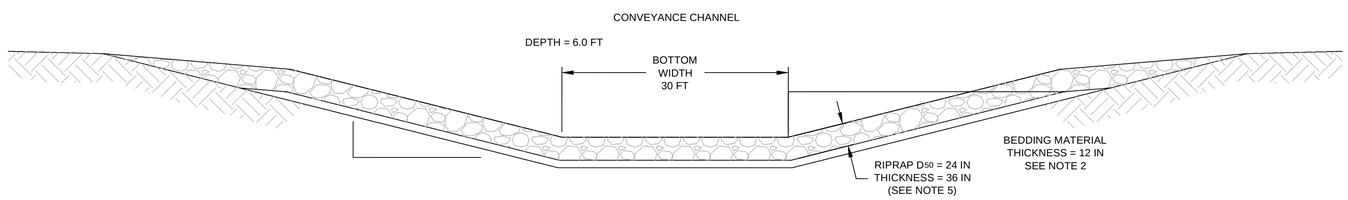
3 JETTY BREACH
6.4 NOT TO SCALE



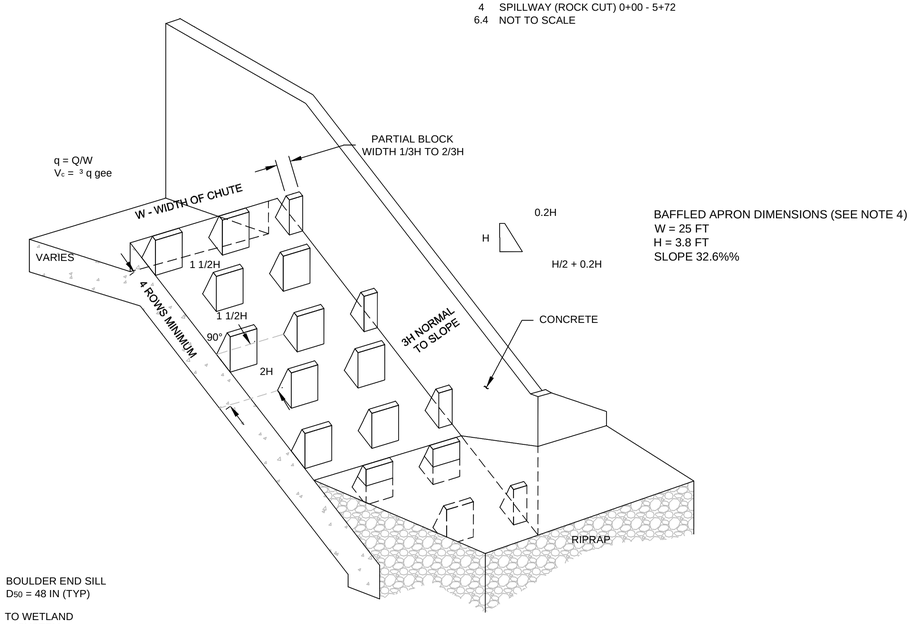
4 SPILLWAY (ROCK CUT) 0+00 - 5+72
6.4 NOT TO SCALE



7 DOWNCHUTE EXIT 29+79 - 34+88
6.4 NOT TO SCALE



8 OUTLET DOWNCHUTE CHANNEL
6.4 NOT TO SCALE



BAFFLED APRON DIMENSIONS (SEE NOTE 4)
W = 25 FT
H = 3.8 FT
SLOPE 32.6%%

6 SPILLWAY DOWNCHUTE BAFFLED APRON 17+87 - 24+57
6.4 NOT TO SCALE

NOTES:

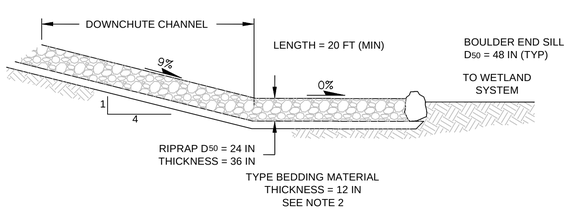
1. CAUSEWAY DRAIN CHANNEL INCREASES IN DEPTH FROM 0 FT TO 5 FT AS IT APPROACHES THE CAUSEWAY AND DECREASES FROM 5 FT TO 0 FT AS IT APPROACHES THE NORTH POND AT A LONGITUDINAL SLOPE OF 0%. TAILINGS ADJACENT TO THE CAUSEWAY WILL BE REMOVED TO ALLOW WATER TO FLOW THROUGH THE CAUSEWAY ROCKFILL.

2. RIPRAP BEDDING THICKNESS HAS BEEN ESTIMATED. RIPRAP BEDDING LAYER THICKNESS AND GRADATION WILL BE SELECTED BASED ON FINAL RIPRAP AND SUBGRADE PROPERTIES.

3. TSF SPILLWAY CHANNEL THROUGH DAM NORTH ABUTMENT PROVIDES RIPRAP PROTECTION TO A DEPTH OF 8 FEET THROUGHOUT. TSF SPILLWAY EXIT CHANNEL PROVIDES RIPRAP PROTECTION TO A DEPTH OF 6 FEET THROUGHOUT. BAFFLE DOWNCHUTE APPROACH PROVIDES RIPRAP PROTECTION TO A DEPTH OF 10 FT THROUGHOUT. CHANNEL CUT MAY BE DEEPER, UP TO AN ADDITION 50 FT, DEPENDING ON THE EXISTING GROUND SURFACE AND WILL NOT REQUIRE EROSION PROTECTION.

4. BAFFLED APRON DIMENSIONS ARE PROVIDED FOR ESTIMATING PURPOSES. FINAL CONSTRUCTION -LEVEL DESIGN WILL OPTIMIZE APRON DIMENSIONS FOR CONSTRUCTION EASE AND HYDRAULIC OPERATION.

5. OUTLET DOWNCHUTE HAS A LONGITUDINAL SLOPE ~ 9.0% AND REQUIRES RIPRAP LINING D50 = 18 IN. THE ENERGY DISSIPATION BASIN WILL HAVE IDENTICAL EROSION PROTECTION REQUIREMENTS WITH A LONGITUDINAL SLOPE OF 0%.



9 ENERGY DISSIPATION BASIN
6.4 NOT TO SCALE

NOT FOR CONSTRUCTION

Schlumberger WATER SERVICES

TYPICAL SPILLWAY SYSTEM DETAILS
FORT KNOX CLOSURE MANAGEMENT PLAN

CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANAGEMENT PLAN
JOB: 2903	DRAWN: RN CHECKED: ACP
DATE: MARCH 2011	PLAN: 6.4

2/2003 - FT KNOX SITEWIDE CLOSURE EIS\1000 - REPORTS & TM\2010 - IN PROGRESS\TSF-REGULATION PLAN\TSF-CLOSURE PLAN

SPILLWAY

PROJECT BOUNDARY

FRESH WATER RESERVOIR

CHANNEL 2

CHANNEL 4

MONITORING STATION

FISH CREEK

TSF SEEPAGE
COLLECTION AREA

NOT FOR CONSTRUCTION

N

SWS

0 500 1000

Scale in Feet

Schlumberger
WATER SERVICES

PLAN VIEW OF WETLAND SYSTEM
FT KNOX CLOSURE MANAGEMENT PLAN

CLIENT: FMGI	PROJECT: FT KNOX CLOSURE MANAGEMENT PLAN
JOB: 2903	DRAWN: RN CHECKED: ACP
DATE: MARCH 2011	PLAN: 6.5

KINROSS Fort Knox

Reclamation Well Closure

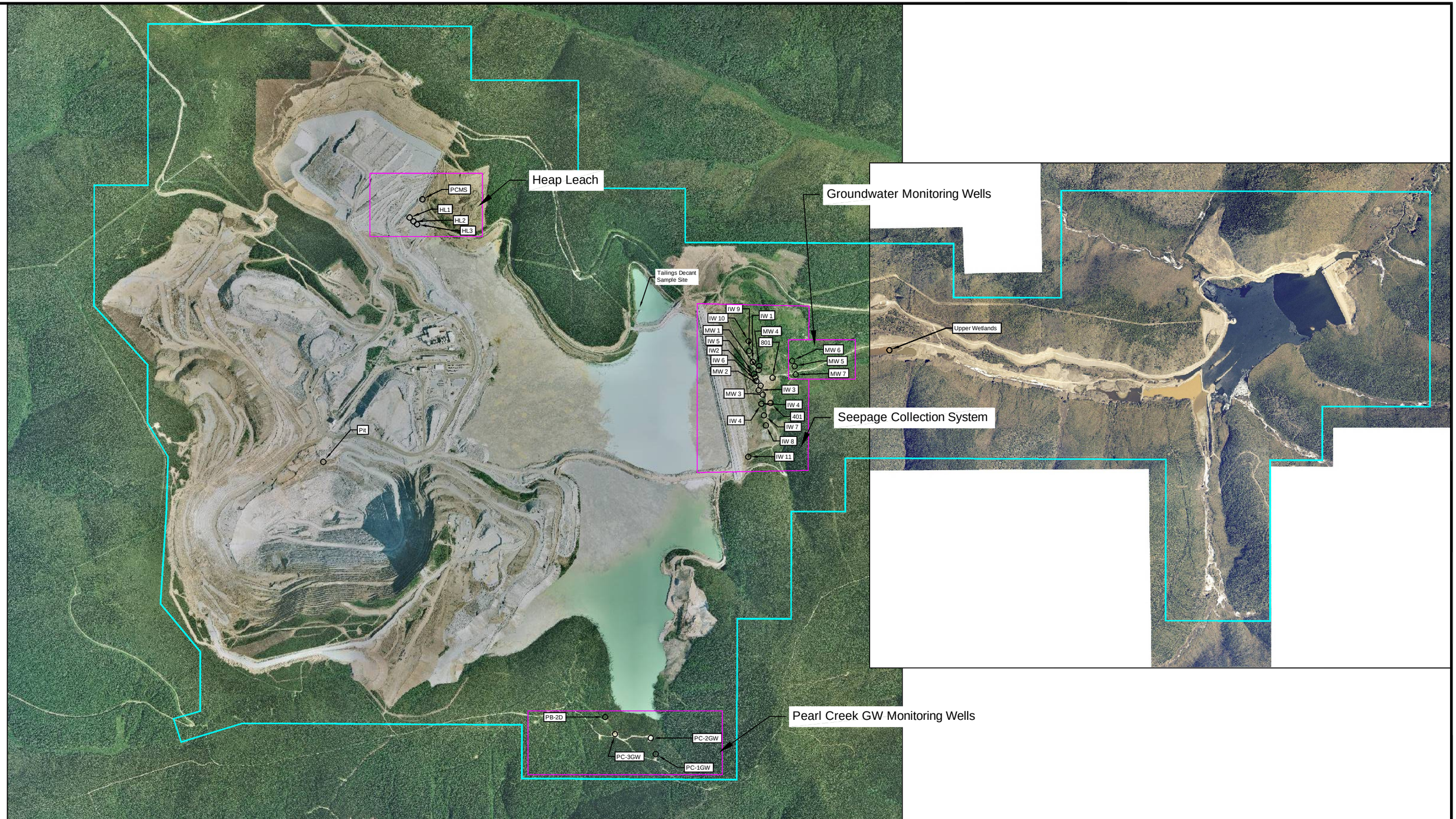
FA Discussion User 3

April 2013

N

1"=2200'

0 2200' 3300' 4400'



KINROSS Fort Knox

Monitoring Locations

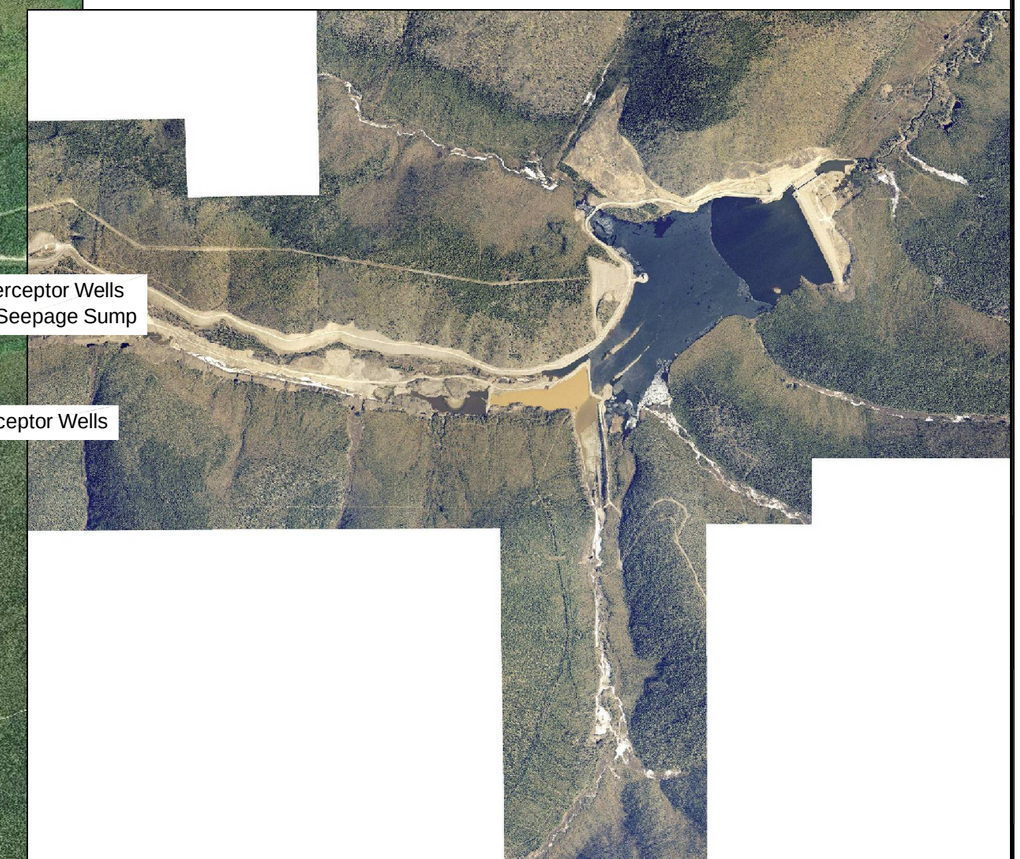
FA Discussion User 4

April 2013

N

1"=2200'

0 2200' 3300' 4400'



KINROSS Fort Knox

Pumping Routes

FA Discussion User 6

April 2013

N

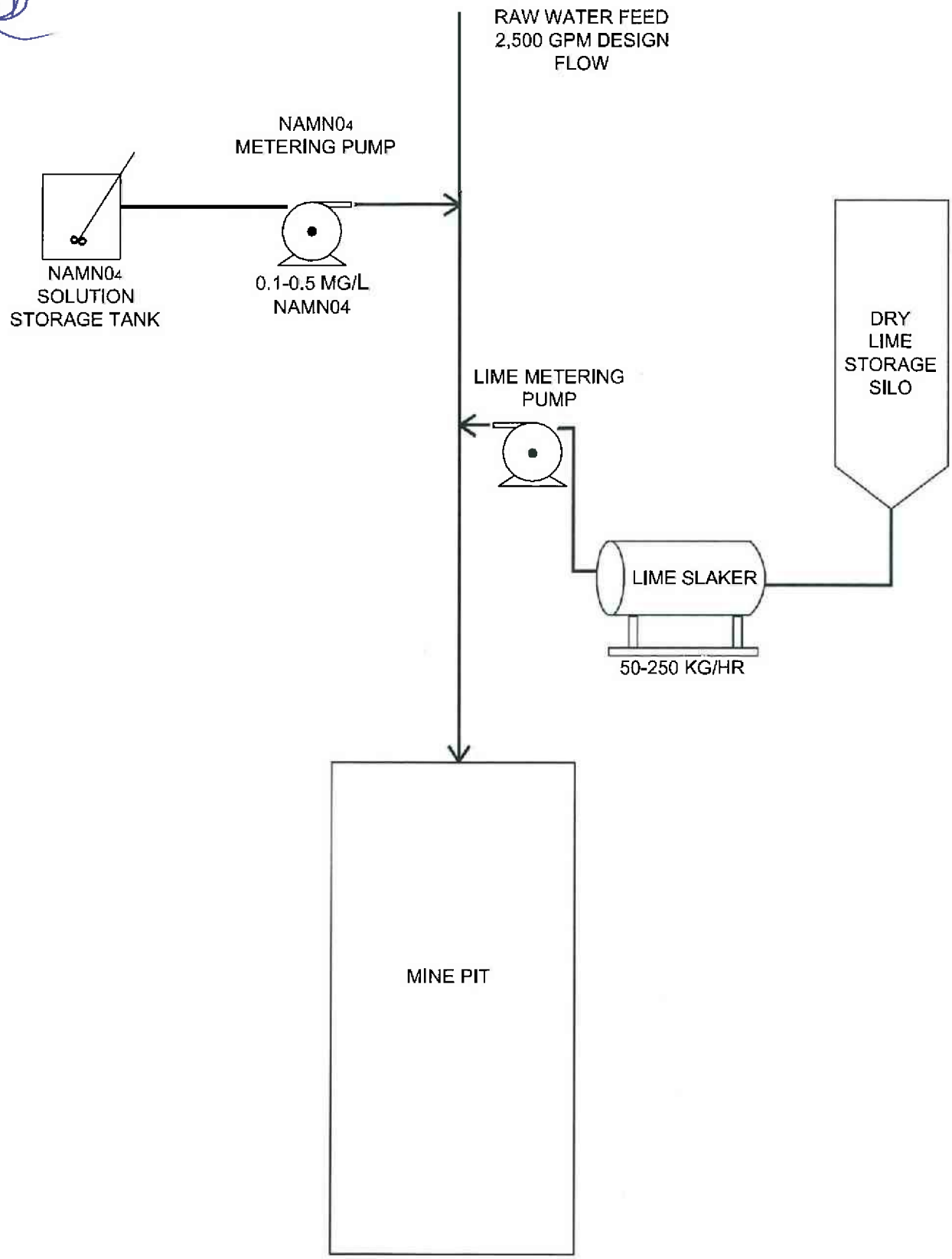
1"=2200'

0 2200' 3300' 4400'

Appendix G

Ft KnoxTreatment Plant-Capital Cost Estimate							
Item No.	Item description	Quantity	Unit	Unit cost	Cost	Vendor/ Manufacturer	Procurement time, FOB factory
A.1	System booster pump-Goulds Model 19BZ 8 x 10, 150 HP, 60 Hz, 1800 rpm	1	ea	$ 19,000	$ 19,000	Goulds	3 weeks
A.2	Control panels, 150 HP	1	ea	$ 9,500	$ 9,500	Furnas	2-3 weeks
A.3	Flowmeters	1	ea	$ 1,200	$ 1,200	McCrometer	2-3 weeks
A.4	Misc. pipe and electrical fittings	2	ea	$ 3,000	$ 6,000		
Step 1 Oxidation							
1.1	Carus carbon-steel mixing and dosing system	1	ea	$ 15,000	$ 45,000	Carus	6 weeks
1.2	Permanganate holding tank	1	ea	$ 2,204	$ 2,204	US Plastic	2-3 weeks
1.3	Injection tubing and valves	1	ea	$ 500	$ 500		2 weeks
1.4	Innovative Sensors Model 11 ORP sensor	1	ea	$ 190	$ 190	Innovative Sensors Inc.	2 weeks
Step 2 pH adjustment							
2.1	Lime slaker (Vertimill-VTM-10-LS)	1	ea	$ 75,000	$ 75,000	Metso	8 weeks
2.2	Silo	1	ea	$ 7,500	$ 7,500	Metso	4 weeks
2.3	Electrical controls	1	ea	$ 1,500	$ 1,500	Furnas	2-3 weeks
2.4	Lime metering pump	1	ea	$ 4,500	$ 4,500	Blue and White	2-3 weeks
Infrastructure							
I.1	Foundation	200	m2	$ 65	$ 13,000	Local contractor	2 weeks
I.2	Plumbing	LS	ea	$ 3,000	$ 3,000		
I.3	Miscellaneous electrical	LS	ea	$ 5,000	$ 5,000		
I.4	Plant construction	LS	ea	$20,000	$ 20,000	Local & import labor	16 weeks
I.5	Engineering	LS		$20,000	$ 20,000		
Subtotal Capital Cost					$ 233,094		
Contingency (15%)					$ 34,964		
Total capital costs					**$ 268,058**		
Notes:	1. All items FOB factory						
	2. Total estimated shipping weight: 7000 kg						

APPENDIX D							
Fort Knox Treatment Plant-Annual Operating Cost Estimate							
Item	Item description	Capacity	Unit	Annual consumption	Unit	Unit cost	Total cost
ELECTRICAL COSTS							
1.1	System booster pumps (2)	224	KW	645,120	KWh	$0.045	$29,030
1.2	Lime slaker	3.8	KW	10,944	KWh	$0.045	$492
Subtotal power costs		227.8	KW	656,064	KW	$0.045	$29,523
CHEMICAL COSTS							
2.1	Sodium permanganate (40 % NaMnO4)	40	lpd	4800	liter	$4.20	$20,160
2.2	Lime (CaO)	1000	kg/d	120	tons	$145	$17,400
Subtotal chemical costs							$37,560
MISCELLANEOUS COSTS							
3.1	Labor	0	person	0	hrs	$12	$0
3.2	Spare parts			1	LS	$10,000	$10,000
3.5	Analytical costs			1	LS	$10,000	$10,000
Subtotal miscellaneous costs							$20,000
Contingency of total (15%)							$13,062
Total Estimated Operating Cost							**$100,145**



WATER MANAGEMENT CONSULTANTS

FT KNOX WATER TREATMENT PLANT PROCESS DIAGRAM			
CLIENT: FGMI		PROJECT: CLOSURE MANAGEMENT PLAN	
JOB: 2717	FILE: FIGURE-5.1.DWG	DRAWN: JJ	CHECKED: JC
DATE: JANUARY 2007		FIGURE: 5.1	

P:\2717 - FT KNOX PERMITTING\DWG\2717-TM_JAN2007\FIGURE-5.1.DWG 1/10/2007

Table 4.1 Pit lake water balance results and mixing percentages

Timestep	Pit lake stage (feet) at end of timestep*	INFLOWS (gpm)						OUTFLOWS (gpm)		TOTAL FLOWS (gpm)		
		Direct precipitation	Pit wall runoff	Surface water runoff	Groundwater inflow	TSF decant (10 percent)	TSF seepage (90 percent)	Evaporation from pit lake	Subsurface outflow	Total inflows	Total Outflows	Net inflows
Through 2 years	1,038	29	130	198	187	170	1534	19	0	2248	19	2229
3 to 5 years	1,082	48	104	198	151	0	0	33	0	501	33	468
6 to 15 years	1,173	61	87	198	130	0	0	42	0	477	42	435
16 to 75 years	1,437	105	38	198	71	0	0	73	0	413	73	340
76 to100 years	1,470	138	4	198	30	0	0	95	137	371	233	138

* The pit lake will fill to the spill-point elevation of 1,470 ft amsl in approximately 88 years.

Timestep	INFLOWS (percent)						
	Direct precipitation	Pit wall runoff	Surface water runoff	Groundwater inflow	TSF decant (10 percent)	TSF seepage (90 percent)	Total inflows
Through 2 years	1.3%	5.8%	8.8%	8.3%	7.6%	68%	100%
3 to 5 years	9.6%	21%	40%	30%	0.0%	0.0%	100%
6 to 15 years	13%	18%	42%	27%	0.0%	0.0%	100%
16 to 75 years	25%	9.2%	48%	17%	0.0%	0.0%	100%
76 to 100 years	37%	1.2%	53%	8.2%	0.0%	0.0%	100%

Table 4.2 Input solution chemistries used for pit lake geochemical modeling

Parameter	Groundwater	Surface Water	Pit Wall Runoff	Pit Wall Runoff	Tailings Decant	Tailings Seepage
	Weighted average data from dewatering wells	Upper Barnes Creek	Average 2002/2004 MWMP " composite waste dump" samples Unscaled	Average 2002/2004 MWMP " composite waste dump" samples Scaled	July 2006 TSF decant sample	Weighted average data from TSF seepage (Aug 2006) and Interception wells (Jul 2006)
pH (su)	8.0	7.0	8.5	8.45	6.6	7.3
Alkalinity as CaCO3	78.59	15	66.5	4.0	42.8	97.5
Ammonia	0.103	0.01	0.95	0.057	5.3	0.93
Antimony	0.0019	0.0025	0.0053	0.00031	0.079	0.038
Arsenic	0.014	0.003	0.013	0.00075	0.0185	0.0044
Barium	0.001	0.005	0.0055	0.00033	0.0282	0.021
Cadmium	0.00015	0.0001	0.00055	0.000033	0.00077	0.0001
Calcium	35.6	4.42	10.1	0.60	65.6	99.6
Chloride	0.524	0.7	4.9	0.29	26.9	19.2
Chromium	0	0.002	0.0025	0.00015	0.005	0.00341
Copper	0.0051	0	0.014	0.00084	0.0508	0.0425
Cyanide	0	0	0.026	0.0015	0.04	0.044
Flouride	0.292	0.06	1.1	0.064	0.5	0.49
Iron	0.13	0.218	0.13	0.0075	0.259	0.19
Lead	0.00071	0.004	0.0013	0.000075	0.002	0.0085
Magnesium	6.49	1.643	1.3	0.078	2.46	19.7
Manganese	0.0445	0	0.0045	0.00027	0.025	0.62
Mercury	0.0002	0.0003	0.00015	0.000009	0.0001	0.0001
Nitrate, as N	0.907	0.25	0.46	0.028	9.88	5.9
Nitrite, as N	0.054	0.01	0.15	0.0090	2.93	0.49
Phosphorus	0.051	0.08	0.13	0.0075	0.065	0.016
Potassium	1.1	0.499	9.1	0.5	14.8	6.4
Selenium	0.007	0.002	0.0038	0.00022	0.005	0.021
Silver	0	0.001	0.0030	0.00018	0.01	0.0069
Sodium	9.3	1.954	17.9	1.1	99.1	52.6
Sulfate	50.5	6.7	3.8	0.22	227	255
Zinc	0.011	0.003	0.0040	0.00024	0.01	0.055

All data is in mg/L, unless otherwise noted
NM - Not measured
ND - Not detected

Table 4.3 Prediction of pit lake composition through time after closure
Input 5,500 ac-ft of TSF decant (550 ac-ft) and seepage (4950 ac-ft) in 2 years

Parameter/ Analyte	Reference standards	Source	Timestep 1 Year 2	Timestep 2 Year 5	Timestep 3 Year 15	Timestep 4* Year 75	Timestep 5 Years 100
pH, std units	6.5 - 8.5	18 AAC 70	7.7	7.7	7.6	7.4	7.4
pe	NS		14	14	14	14	14
Alkalinity, as $CaCO_3$	> 20	Table III chronic	113	98	78	51	50
Chloride	230	Table III chronic	15.4	11.8	6.9	2.5	2.2
Fluoride	4	MCL	0.41	0.34	0.25	0.14	0.14
Nitrate, as N	10	MCL/Table 1	6.6	5.1	3.1	1.2	1.09
Nitrite, as N	1	MCL/Table 1	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia	2.43-6.67	Table VII chronic	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate, as $SO4^{2-}$	250	SDWR	198	155	96	39	35
Total cyanide	0.0052**	Table III chronic	**0.033**	**0.025**	**0.014**	0.0046	0.0039
Antimony	0.006	MCL/Table 1	**0.033**	**0.025**	**0.015**	0.0059	0.0054
Arsenic	0.01	MCL/Table 1	0.00080	0.0012	0.0020	0.0026	0.0027
Barium	2	MCL/Table 1	0.017	0.014	0.0088	0.0048	0.0048
Cadmium	0.00028 H	Table III chronic	0.00015	0.00014	0.00012	<0.0001	0.00010
Calcium	NS		77.0	61.7	40.6	19.1	17.7
Chromium	0.089 H	Table III chronic	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	0.0096 H	Table III chronic	**0.016**	**0.010**	0.0034	<0.003	<0.003
Iron	1	Table III chronic	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	0.0033 H	Table III chronic	0.0023	0.0015	0.0006	0.00016	0.00015
Magnesium	NS		14.5	11.7	7.8	3.9	3.7
Manganese	0.05	Table Va	**0.43**	**0.33**	**0.20**	**0.066**	**0.057**
Mercury	0.002	MCL	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Phosphorus	NS		<0.05	<0.05	<0.05	<0.05	0.054
Potassium	NS		5.7	4.5	2.8	1.3	1.2
Selenium	0.005	Table III chronic	**0.016**	**0.013**	**0.0086**	0.0044	0.0042
Silver	0.0043 H	Table III acute	**0.0056**	**0.0044**	0.0027	0.0012	0.0012
Sodium	NS		22.6	17.6	10.7	4.4	4.1
Zinc	0.124 H	Table III acute	0.039	0.031	0.019	0.008	0.008
TDS	NS		454	366	246	123	115
Hardness	NS		252	202	134	64	59

* Discharge from the pit occurs at Year 88, post filling.

All concentrations are in milligrams per liter, unless otherwise noted.
< Analyte concentration result is below typical analytical detection limits. Value shown is the detection limit.
NS = No standard
Exceedences of the reference standards are highlighted in bold.
** The reference standard applies to WAD cyanide; however, model results report total cyanide.

Applicable water quality standards (WMC, 2005)

18 AAC 70	*Alaska Department of Environmental Conservation Water Quality Standards for fresh water uses, growth and propagation of fish, shellfish and other aquatic life*
MCL	*Maximum Contaminant Level (USEPA, 2004)*
SDWR	*Secondary Drinking Water Regulation (USEPA, 2004)*
Tables 1 - VIIa	*Water Quality Criteria for Toxic and Other Deleterious Organic and Inorganic Substances [Title XVIII, Chapter 70, Alaska Administrative Code (18 AAC 70)]* Table 1 - Drinking water maximum contaminant levels (MCL) Table III - Criteria for freshwater aquatic life Table V - Human health criteria for noncarcinogens Tables VI and VIIa = Specific criteria for ammonia
H	Standard is calculated based on a hardness of 103.7 mg/L as $CaCO_3$. Hardness is calculated based on the average calcium and magnesium concentrations in the lower wetland surface water samples collected between February 2000 and November 2005.

Table 4.4 In-pit treatment with hydrated ferrous sulfate (0.0002 M) for 2 years
Input 5,500 ac-ft of TSF decant (550 ac-ft) and seepage (4950 ac-ft) in 2 years

Parameter/ Analyte	Reference standards	Source	Timestep 1	Timestep 2	Timestep 3	Timestep 4*	Timestep 5
			Year 2	Year 5	Year 15	Year 75	Years 100
pH, std units	6.5 - 8.5	18 AAC 70	7.5	7.5	7.5	7.4	7.4
pe	NS		15	14	14	14	14
Alkalinity, as $CaCO_3$	> 20	Table III chronic	72	68	60	45	45
Chloride	230	Table III chronic	15.4	11.8	6.9	2.5	2.2
Fluoride	4	MCL	0.41	0.34	0.25	0.14	0.14
Nitrate, as N	10	MCL/Table 1	6.6	5.1	3.1	1.2	1.09
Nitrite, as N	1	MCL/Table 1	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia	2.43-6.67	Table VII chronic	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate, as $SO4^{2-}$	250	SDWR	217	169	104	42	37
Total cyanide	0.0052**	Table III chronic	**0.026**	**0.020**	**0.011**	0.0036	0.0030
Antimony	0.006	MCL/Table 1	**0.033**	**0.025**	**0.015**	0.0040	0.0002
Arsenic	0.01	MCL/Table 1	<0.0005	0.0009	0.0021	0.0027	0.0027
Barium	2	MCL/Table 1	0.017	0.014	0.0088	0.0048	0.0048
Cadmium	0.00018 H	Table III chronic	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	NS		77.0	61.7	40.6	19.1	17.7
Chromium	0.056 H	Table III chronic	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	0.0059 H	Table III chronic	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	1	Table III chronic	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	0.0016 H	Table III chronic	<0.0001	<0.0001	0.00011	0.00011	0.00012
Magnesium	NS		14.4	11.6	7.8	3.9	3.7
Manganese	0.05	Table Va	**0.43**	**0.33**	**0.20**	**0.066**	**0.057**
Mercury	0.002	MCL	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Phosphorus	NS		<0.05	<0.05	<0.05	<0.05	0.051
Potassium	NS		5.7	4.5	2.8	1.3	1.2
Selenium	0.005	Table III chronic	**0.016**	**0.013**	**0.0086**	0.0044	0.0042
Silver	0.0016 H	Table III acute	**0.0056**	**0.0044**	0.0027	0.0012	0.0012
Sodium	NS		22.6	17.6	10.7	4.4	4.1
Zinc	0.077 H	Table III acute	0.0077	0.0070	0.0059	<0.005	<0.005
TDS	NS		432	350	237	120	113
Hardness	NS		252	202	133	64	59

* Discharge from the pit occurs at Year 88, post filling.

All concentrations are in milligrams per liter, unless otherwise noted.

< Analyte concentration result is below typical analytical detection limits. Value shown is the detection limit.

NS = No standard

Exceedences of the reference standards are highlighted in bold.

** The reference standard applies to WAD cyanide; however, model results report total cyanide.

Applicable water quality standards (WMC, 2005)

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SDWR	*Secondary Drinking Water Regulation (USEPA, 2004)*
Tables 1 - VIIa	*Water Quality Criteria for Toxic and Other Deleterious Organic and Inorganic Substances [Title XVIII, Chapter 70, Alaska Administrative Code (18 AAC 70)]*
	Table 1 - Drinking water maximum contaminant levels (MCL)
	Table III - Criteria for freshwater aquatic life
	Table V - Human health criteria for noncarcinogens
	Tables VI and VIIa = Specific criteria for ammonia
H	Standard is calculated based on a hardness of 103.7 mg/L as $CaCO_3$. Hardness is calculated based on the average calcium and magnesium concentrations in the lower wetland surface water samples collected between February 2000 and November 2005.

Table 4.5 Prediction of pit lake composition - Increase TSF decant arsenic concentration to 0.90 mg/L
Input 5,500 ac-ft of TSF decant (550 ac-ft) and seepage (4950 ac-ft) in 2 years

Parameter/ Analyte	Reference standards	Source	Timestep 1 Year 2	Timestep 2 Year 5	Timestep 3 Year 15	Timestep 4* Year 75	Timestep 5 Years 100
pH, std units	6.5 - 8.5	18 AAC 70	7.7	7.7	7.6	7.4	7.4
pe	NS		14	14	14	14	14
Alkalinity, as $CaCO_3$	> 20	Table III chronic	113	98	78	51	50
Chloride	230	Table III chronic	15.4	11.8	6.9	2.5	2.2
Fluoride	4	MCL	0.41	0.34	0.25	0.14	0.14
Nitrate, as N	10	MCL/Table 1	6.6	5.1	3.1	1.2	1.09
Nitrite, as N	1	MCL/Table 1	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia	2.43-6.67	Table VII chronic	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate, as $SO4^{2-}$	250	SDWR	198	155	96	39	35
Total cyanide	0.0052**	Table III chronic	**0.033**	**0.025**	**0.014**	0.0046	0.0039
Antimony	0.006	MCL/Table 1	**0.033**	**0.025**	**0.015**	0.0059	0.0054
Arsenic	0.01	MCL/Table 1	**0.063**	**0.047**	**0.027**	0.0093	0.0081
Barium	2	MCL/Table 1	0.017	0.014	0.0088	0.0048	0.0048
Cadmium	0.00018 H	Table III chronic	0.00015	0.00014	0.00012	<0.0001	0.00010
Calcium	NS		77.0	61.7	40.6	19.1	17.7
Chromium	0.056 H	Table III chronic	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	0.0059 H	Table III chronic	**0.013**	0.0077	<0.003	<0.003	<0.003
Iron	1	Table III chronic	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	0.0016 H	Table III chronic	0.0020	0.0012	0.0004	0.00014	0.00014
Magnesium	NS		14.5	11.7	7.8	3.9	3.7
Manganese	0.05	Table Va	**0.43**	**0.33**	**0.20**	**0.066**	**0.057**
Mercury	0.002	MCL	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Phosphorus	NS		<0.05	<0.05	<0.05	<0.05	0.055
Potassium	NS		5.7	4.5	2.8	1.3	1.2
Selenium	0.005	Table III chronic	**0.016**	**0.013**	**0.0086**	0.0044	0.0042
Silver	0.0016 H	Table III acute	**0.0056**	**0.0044**	0.0027	0.0012	0.0012
Sodium	NS		22.7	17.6	10.7	4.4	4.1
Zinc	0.077 H	Table III acute	0.039	0.030	0.019	0.008	0.008
TDS	NS		454	366	246	123	115
Hardness	NS		252	202	134	64	59

* Discharge from the pit occurs at Year 88, post filling.

All concentrations are in milligrams per liter, unless otherwise noted.
< Analyte concentration result is below typical analytical detection limits. Value shown is the detection limit.
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H	Standard is calculated based on a hardness of 103.7 mg/L as $CaCO_3$. Hardness is calculated based on the average calcium and magnesium concentrations in the lower wetland surface water samples collected between February 2000 and November 2005.

Table 4.6 Prediction of pit lake composition - Increase TSF decant arsenic concentration to 0.90 mg/L In-pit treatment with melanterite (0.0002 M) for 2 years

Parameter/ Analyte	Reference standards	Source	Timestep 1 Year 2	Timestep 2 Year 5	Timestep 3 Year 15	Timestep 4* Year 75	Timestep 5 Years 100
pH, std units	6.5 - 8.5	18 AAC 70	7.5	7.5	7.5	7.4	7.4
pe	NS		15	14	14	14	14
Alkalinity, as $CaCO_3$	> 20	Table III chronic	72	67	60	45	45
Chloride	230	Table III chronic	15.4	11.8	6.9	2.5	2.2
Fluoride	4	MCL	0.41	0.34	0.25	0.14	0.14
Nitrate, as N	10	MCL/Table 1	6.6	5.1	3.1	1.2	1.09
Nitrite, as N	1	MCL/Table 1	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia	2.43-6.67	Table VII chronic	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate, as $SO4^{2-}$	250	SDWR	217	169	104	42	37
Total cyanide	0.0052**	Table III chronic	**0.027**	**0.020**	0.004	0.0037	0.0031
Antimony	0.006	MCL/Table 1	**0.033**	**0.025**	**0.015**	0.004	0.002
Arsenic	0.01	MCL/Table 1	<0.0005	0.0010	0.0021	0.0027	0.0028
Barium	2	MCL/Table 1	0.017	0.014	0.0088	0.0048	0.0048
Cadmium	0.00018 H	Table III chronic	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	NS		77.0	61.7	40.6	19.1	17.7
Chromium	0.056 H	Table III chronic	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	0.0059 H	Table III chronic	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	1	Table III chronic	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	0.0016 H	Table III chronic	<0.0001	<0.0001	0.0001	0.00011	0.00012
Magnesium	NS		14.4	11.6	7.8	3.9	3.7
Manganese	0.05	Table Va	**0.43**	**0.33**	**0.20**	**0.066**	**0.057**
Mercury	0.002	MCL	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Phosphorus	NS		<0.05	<0.05	<0.05	<0.05	0.051
Potassium	NS		5.7	4.5	2.8	1.3	1.2
Selenium	0.005	Table III chronic	**0.016**	**0.013**	**0.0086**	0.0044	0.0042
Silver	0.0016 H	Table III acute	**0.0056**	**0.0044**	0.0027	0.0012	0.0012
Sodium	NS		22.7	17.6	10.7	4.4	4.1
Zinc	0.077 H	Table III acute	0.0077	0.0069	0.0059	<0.005	<0.005
TDS	NS		432	350	237	120	113
Hardness	NS		252	202	133	64	59

* Discharge from the pit occurs at Year 88, post filling.

All concentrations are in milligrams per liter, unless otherwise noted.
< Analyte concentration result is below typical analytical detection limits. Value shown is the detection limit.
NS = No standard
Exceedences of the reference standards are highlighted in bold.
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H	Standard is calculated based on a hardness of 103.7 mg/L as $CaCO_3$. Hardness is calculated based on the average calcium and magnesium concentrations in the lower wetland surface water samples collected between February 2000 and November 2005.

Table 4.7 Prediction of pit lake composition through time after closure
Input 5,100 ac-ft of TSF decant (150 ac-ft) and seepage (4950 ac-ft) in 2 years

Parameter/ Analyte	Reference standards	Source	Timestep 1 Year 2	Timestep 2 Year 5	Timestep 3 Year 15	Timestep 4* Year 75	Timestep 5 Years 100
pH, std units	6.5 - 8.5	18 AAC 70	7.7	7.7	7.6	7.5	7.4
pe	NS		14	14	14	14	14
Alkalinity, as $CaCO_3$	> 20	Table III chronic	120	103	80	54	49
Chloride	230	Table III chronic	14.7	11.1	6.4	2.4	2.0
Fluoride	4	MCL	0.40	0.34	0.24	0.15	0.13
Nitrate, as N	10	MCL/Table 1	5.9	4.5	2.7	1.1	0.96
Nitrite, as N	1	MCL/Table 1	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia	2.43-6.67	Table VII chronic	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate, as $SO4^{2-}$	250	SDWR	196	151	92	39	33
Total cyanide	0.0052**	Table III chronic	**0.033**	**0.024**	**0.014**	0.003	0.001
Antimony	0.006	MCL/Table 1	**0.030**	**0.023**	**0.013**	0.0055	0.0001
Arsenic	0.01	MCL/Table 1	0.00058	0.0011	0.0019	0.0025	0.0023
Barium	2	MCL/Table 1	0.016	0.013	0.0083	0.0048	0.0046
Cadmium	0.00018 H	Table III chronic	0.00011	0.00011	0.00010	<0.0001	<0.0001
Calcium	NS		77.7	61.5	39.9	19.6	17.0
Chromium	0.054 H	Table 1	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	0.0058 H	Table III chronic	**0.017**	**0.010**	0.0032	<0.003	<0.003
Iron	1	Table III chronic	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	0.0016 H	Table III chronic	0.0025	0.0016	0.00059	0.00016	0.00014
Magnesium	NS		15.2	12.0	7.9	4.1	3.6
Manganese	0.05	Table Va	**0.46**	**0.35**	**0.20**	**0.069**	**0.056**
Mercury	0.002	MCL	<0.0002	<0.0002	<0.0002	0.00	0.0002
Phosphorus	NS		<0.05	<0.05	<0.05	0.050	0.052
Potassium	NS		5.2	4.0	2.5	1.2	1.1
Selenium	0.005	Table III chronic	**0.016**	**0.013**	**0.0087**	0.0046	0.0041
Silver	0.0015 H	Table III acute	**0.0054**	0.0041	0.0025	0.0012	0.0011
Sodium	NS		20.1	15.4	9.3	4.1	3.6
Zinc	0.074 H	Table III acute	0.041	0.031	0.019	0.009	0.007
TDS	NS		456	364	242	126	111
Hardness	NS		256	203	132	66	57

* Discharge from the pit occurs at Year 88, post filling.

All concentrations are in milligrams per liter, unless otherwise noted.
< Analyte concentration result is below typical analytical detection limits. Value shown is the detection limit.
NS = No standard
Exceedences of the reference standards are highlighted in bold.
** The reference standard applies to WAD cyanide; however, model results report total cyanide.

Applicable water quality standards (WMC, 2005)

18 AAC 70	*Alaska Department of Environmental Conservation Water Quality Standards for fresh water uses, growth and propagation of fish, shellfish and other aquatic life*
MCL	*Maximum Contaminant Level (USEPA, 2004)*
SDWR	*Secondary Drinking Water Regulation (USEPA, 2004)*
Tables 1 - VIIa	*Water Quality Criteria for Toxic and Other Deleterious Organic and Inorganic Substances [Title XVIII, Chapter 70, Alaska Administrative Code (18 AAC 70)]*
	Table 1 - Drinking water maximum contaminant levels (MCL)
	Table III - Criteria for freshwater aquatic life
	Table V - Human health criteria for noncarcinogens
	Tables VI and VIIa = Specific criteria for ammonia
H	Standard is calculated based on a hardness of 103.7 mg/L as $CaCO_3$. Hardness is calculated based on the average calcium and magnesium concentrations in the lower wetland surface water samples collected between February 2000 and November 2005.

Table 4.8 Prediction of pit lake composition through time after closure
Input 8,750 ac-ft of TSF decant (3800 ac-ft) and seepage (4950 ac-ft) in 2 years

Parameter/ Analyte	Reference standards	Source	Timestep 1 Year 2	Timestep 2 Year 5	Timestep 3 Year 15	Timestep 4* Year 75	Timestep 5 Years 100
pH, std units	6.5 - 8.5	18 AAC 70	7.5	7.5	7.5	7.4	7.4
pe	NS		15	15	14	14	14
Alkalinity, as $CaCO_3$	> 20	Table III chronic	76	71	63	49	45
Chloride	230	Table III chronic	19.1	15.9	10.4	4.1	3.4
Fluoride	4	MCL	0.44	0.39	0.29	0.17	0.15
Nitrate, as N	10	MCL/Table 1	10.2	8.5	5.7	2.3	1.90
Nitrite, as N	1	MCL/Table 1	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia	2.43-6.67	Table VII chronic	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate, as $SO4^{2-}$	250	SDWR	208	175	120	52	44
Total cyanide	0.0052**	Table III chronic	**0.035**	**0.029**	**0.019**	0.0045	0.0037
Antimony	0.006	MCL/Table 1	**0.047**	**0.039**	**0.026**	0.0060	0.0055
Arsenic	0.01	MCL/Table 1	0.0027	0.0025	0.0026	0.0028	0.0027
Barium	2	MCL/Table 1	0.021	0.018	0.0123	0.0065	0.0060
Cadmium	0.00019 H	Table III chronic	**0.00034**	**0.00030**	0.00023	0.00014	0.00013
Calcium	NS		73.8	63.3	45.3	22.7	19.5
Chromium	0.090 H	Table 1	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	0.0063 H	Table III chronic	**0.017**	**0.012**	0.0047	<0.003	<0.003
Iron	1	Table III chronic	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	0.0018 H	Table III chronic	0.0015	0.0012	0.0006	0.00019	0.00017
Magnesium	NS		10.8	9.4	7.0	4.0	3.6
Manganese	0.05	Table Va	**0.31**	**0.26**	**0.17**	**0.068**	**0.055**
Mercury	0.002	MCL	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Phosphorus	NS		<0.05	<0.05	<0.05	0.051	0.053
Potassium	NS		8.6	7.2	4.9	2.1	1.8
Selenium	0.005	Table III chronic	**0.013**	**0.011**	**0.0081**	0.0046	0.0041
Silver	0.0018 H	Table III acute	**0.0070**	**0.0059**	0.0040	0.0018	0.0016
Sodium	NS		36.4	30.4	20.2	8.4	7.0
Zinc	0.081 H	Table III acute	0.030	0.026	0.018	0.009	0.008
TDS	NS		444	382	277	145	127
Hardness	NS		229	197	142	73	63

* Discharge from the pit occurs at Year 83, post filling.

All concentrations are in milligrams per liter, unless otherwise noted.
< Analyte concentration result is below typical analytical detection limits. Value shown is the detection limit.
NS = No standard
Exceedences of the reference standards are highlighted in bold.
** The reference standard applies to WAD cyanide; however, model results report total cyanide.

Applicable water quality standards (WMC, 2005)

18 AAC 70	*Alaska Department of Environmental Conservation Water Quality Standards for fresh water uses, growth and propagation of fish, shellfish and other aquatic life*
MCL	*Maximum Contaminant Level (USEPA, 2004)*
SDWR	*Secondary Drinking Water Regulation (USEPA, 2004)*
Tables 1 - VIIa	*Water Quality Criteria for Toxic and Other Deleterious Organic and Inorganic Substances [Title XVIII, Chapter 70, Alaska Administrative Code (18 AAC 70)]*
	Table 1 - Drinking water maximum contaminant levels (MCL)
	Table III - Criteria for freshwater aquatic life
	Table V - Human health criteria for noncarcinogens
	Tables VI and VIIa = Specific criteria for ammonia
H	Standard is calculated based on a hardness of 103.7 mg/L as $CaCO_3$. Hardness is calculated based on the average calcium and magnesium concentrations in the lower wetland surface water samples collected between February 2000 and November 2005.

Table 4.9 In-pit treatment with hydrated ferrous sulfate (0.00075 M) for 2 years
Input 8,750 ac-ft of TSF decant (3800 ac-ft) and seepage (4950 ac-ft) in 2 years

Parameter/ Analyte	Reference standards	Source	Timestep 1 Year 2	Timestep 2 Year 5	Timestep 3 Year 15	Timestep 4* Year 75	Timestep 5 Years 100
pH, std units	6.5 - 8.5	18 AAC 70	7.5	7.5	7.5	7.4	7.4
pe	NS		15	15	14	14	14
Alkalinity, as $CaCO_3$	> 20	Table III chronic	76	71	63	49	45
Chloride	230	Table III chronic	19.1	15.9	10.4	4.1	3.4
Fluoride	4	MCL	0.44	0.39	0.29	0.17	0.15
Nitrate, as N	10	MCL/Table 1	**10.2**	8.5	5.7	2.3	1.90
Nitrite, as N	1	MCL/Table 1	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia	2.43-6.67	Table VII chronic	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate, as $SO4^{2-}$	250	SDWR	**280**	235	158	66	55
Total cyanide	0.0052**	Table III chronic	**0.019**	**0.016**	**0.010**	0.0038	0.0030
Antimony	0.006	MCL/Table 1	**0.047**	**0.039**	**0.026**	0.0050	0.0035
Arsenic	0.01	MCL/Table 1	<0.0005	0.0007	0.0017	0.0025	0.0024
Barium	2	MCL/Table 1	0.021	0.017	0.0122	0.0065	0.0059
Cadmium	0.00019 H	Table III chronic	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	NS		103.9	88.2	61.4	28.5	24.2
Chromium	0.090 H	Table 1	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	0.0063 H	Table III chronic	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	1	Table III chronic	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	0.0018 H	Table III chronic	<0.0001	<0.0001	0.0001	0.00012	0.00013
Magnesium	NS		10.6	9.3	6.9	4.0	3.5
Manganese	0.05	Table Va	**0.31**	**0.26**	**0.17**	**0.068**	**0.055**
Mercury	0.002	MCL	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Phosphorus	NS		<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	NS		8.6	7.2	4.9	2.1	1.8
Selenium	0.005	Table III chronic	**0.012**	**0.011**	**0.0081**	0.0046	0.0041
Silver	0.0018 H	Table III acute	**0.0070**	**0.0059**	0.0040	0.0018	0.0016
Sodium	NS		36.4	30.4	20.2	8.4	7.0
Zinc	0.081 H	Table III acute	<0.005	<0.005	<0.005	<0.005	<0.005
TDS	NS		545	466	331	165	142
Hardness	NS		303	258	182	87	75

* Discharge from the pit occurs at Year 83, post filling.

All concentrations are in milligrams per liter, unless otherwise noted.
< Analyte concentration result is below typical analytical detection limits. Value shown is the detection limit.
NS = No standard
Exceedences of the reference standards are highlighted in bold.
** The reference standard applies to WAD cyanide; however, model results report total cyanide.

Applicable water quality standards (WMC, 2005)

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Tables 1 - VIIa	*Water Quality Criteria for Toxic and Other Deleterious Organic and Inorganic Substances [Title XVIII, Chapter 70, Alaska Administrative Code (18 AAC 70)]* Table 1 - Drinking water maximum contaminant levels (MCL) Table III - Criteria for freshwater aquatic life Table V - Human health criteria for noncarcinogens Tables VI and VIIa = Specific criteria for ammonia
H	Standard is calculated based on a hardness of 103.7 mg/L as $CaCO_3$. Hardness is calculated based on the average calcium and magnesium concentrations in the lower wetland surface water samples collected between February 2000 and November 2005.

Table 4.10 Sensitvity analysis: pit wall runoff scaled data increased by a factor of 10
Input 5,500 ac-ft of TSF decant (550 ac-ft) and seepage (4950 ac-ft) in 2 years

Parameter/ Analyte	Reference standards	Source	Timestep 1 Year 2	Timestep 2 Year 5	Timestep 3 Year 15	Timestep 4* Year 75	Timestep 5 Years 100
pH, std units	6.5 - 8.5	18 AAC 70	7.7	7.7	7.6	7.5	7.5
pe	NS		14	14	14	14	14
Alkalinity, as $CaCO_3$	> 20	Table III chronic	116	103	85	57	55
Chloride	230	Table III chronic	15.5	12.1	7.3	2.8	2.5
Fluoride	4	MCL	0.44	0.40	0.33	0.21	0.20
Nitrate, as N	10	MCL/Table 1	6.6	5.2	3.2	1.3	1.18
Nitrite, as N	1	MCL/Table 1	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia	2.43-6.67	Table VII chronic	<0.01	<0.01	<0.01	<0.01	<0.01
Sulfate, as $SO4^{2-}$	250	SDWR	198	155	96	39	35
Total cyanide	0.0052**	Table III chronic	**0.034**	**0.026**	**0.016**	0.0050	0.004
Antimony	0.006	MCL/Table 1	**0.033**	**0.025**	**0.015**	0.0062	0.0057
Arsenic	0.01	MCL/Table 1	0.001	0.002	0.003	0.0032	0.0031
Barium	2	MCL/Table 1	0.017	0.014	0.0093	0.0051	0.0051
Cadmium	0.00018 H	Table III chronic	0.00017	0.00017	0.00016	0.00013	0.00013
Calcium	NS		77.4	62.3	41.4	19.8	18.2
Chromium	0.056 H	Table III chronic	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	0.0059 H	Table III chronic	**0.016**	**0.010**	0.0036	<0.003	<0.003
Iron	1	Table III chronic	<0.06	<0.06	<0.06	<0.06	<0.06
Lead	0.0016 H	Table III chronic	0.0023	0.0015	0.0006	0.00016	0.00015
Magnesium	NS		14.5	11.7	7.9	4.0	3.8
Manganese	0.05	Table Va	**0.43**	**0.33**	**0.20**	**0.067**	**0.057**
Mercury	0.002	MCL	<0.0002	<0.0002	<0.0002	0.00	0.0002
Phosphorus	NS		<0.05	<0.05	<0.05	0.056	0.060
Potassium	NS		6.0	5.0	3.5	1.8	1.7
Selenium	0.005	Table III chronic	**0.016**	**0.013**	**0.0089**	0.0046	0.0044
Silver	0.0016 H	Table III acute	**0.0057**	**0.0045**	0.0029	0.0014	0.0014
Sodium	NS		23.0	18.2	11.6	5.1	4.7
Zinc	0.077 H	Table III acute	0.039	0.031	0.019	0.008	0.008
TDS	NS		458	374	257	131	123
Hardness	NS		253	204	136	66	61

* Discharge from the pit occurs at Year 88, post filling.

All concentrations are in milligrams per liter, unless otherwise noted.
< Analyte concentration result is below typical analytical detection limits. Value shown is the detection limit.
NS = No standard
Exceedences of the reference standards are highlighted in bold.
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Applicable water quality standards (WMC, 2005)

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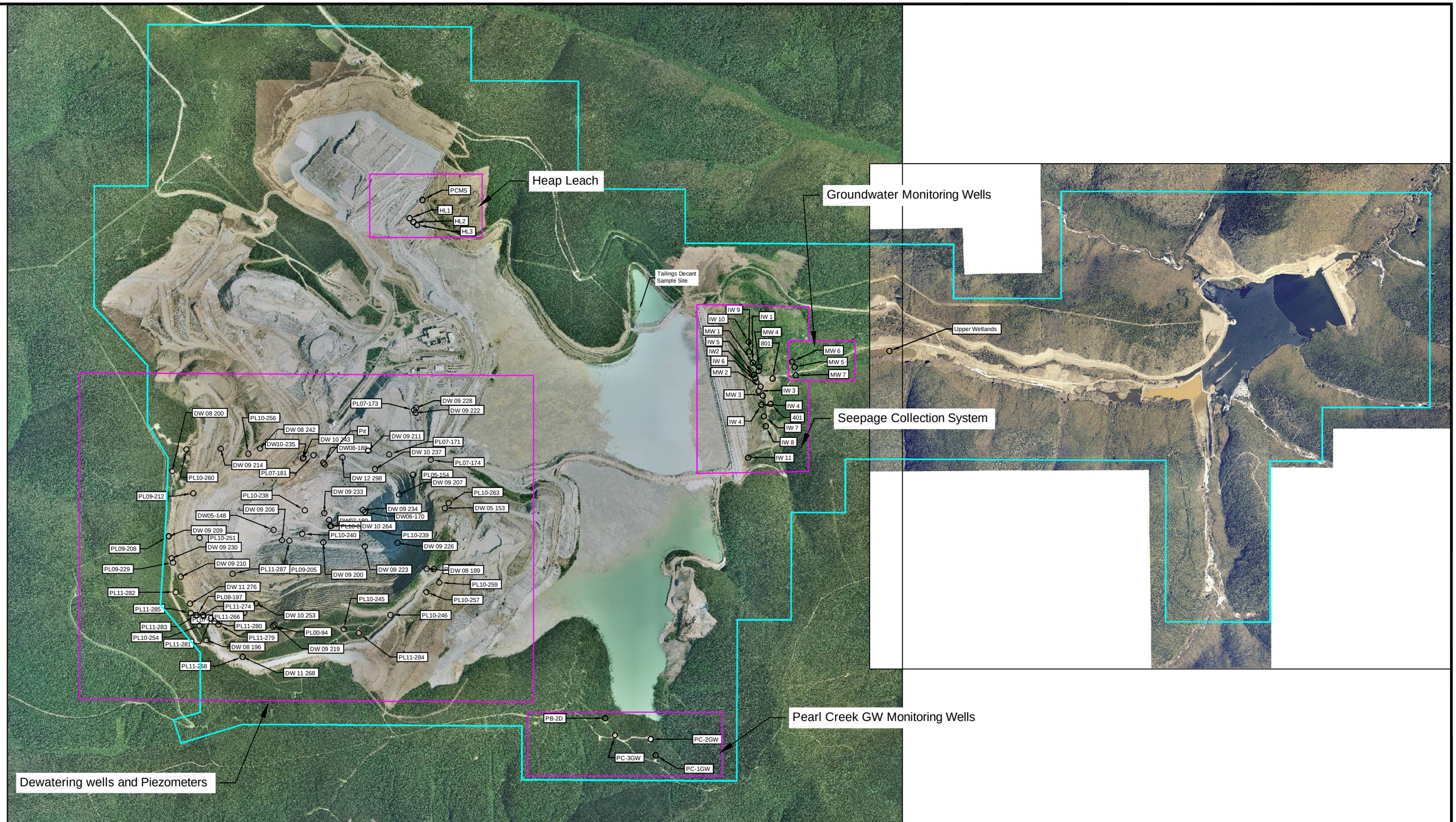
SDWR	*Secondary Drinking Water Regulation (USEPA, 2004)*
Tables 1 - VIIa	*Water Quality Criteria for Toxic and Other Deleterious Organic and Inorganic Substances [Title XVIII, Chapter 70, Alaska Administrative Code (18 AAC 70)]*
	Table 1 - Drinking water maximum contaminant levels (MCL)
	Table III - Criteria for freshwater aquatic life
	Table V - Human health criteria for noncarcinogens
	Tables VI and VIIa = Specific criteria for ammonia
H	Standard is calculated based on a hardness of 59 mg/L as CaCO3.
	Standard is calculated based on a hardness of 103.7 mg/L as $CaCO_3$. Hardness is calculated based on the average calcium and magnesium concentrations in the lower wetland surface water samples collected between February 2000 and November 2005.

Appendix H



KINROSS Fort Knox

Reclamation Well Closure

FA Discussion User 3

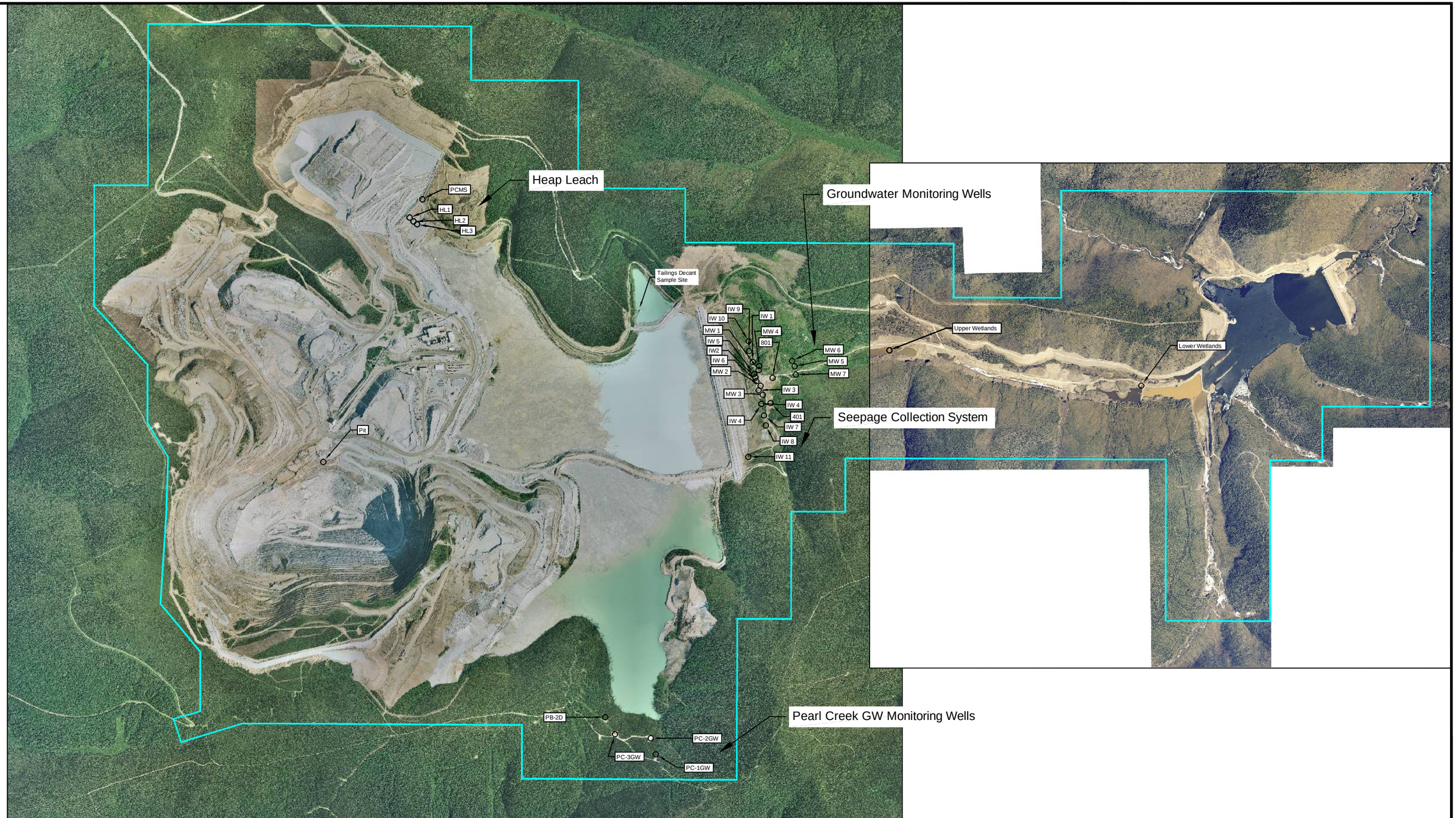
May 2013

N

1"=2200'

0 2200' 3300' 4400'

Appendix I



KINROSS Fort Knox

Monitoring Locations

FA Discussion User 4

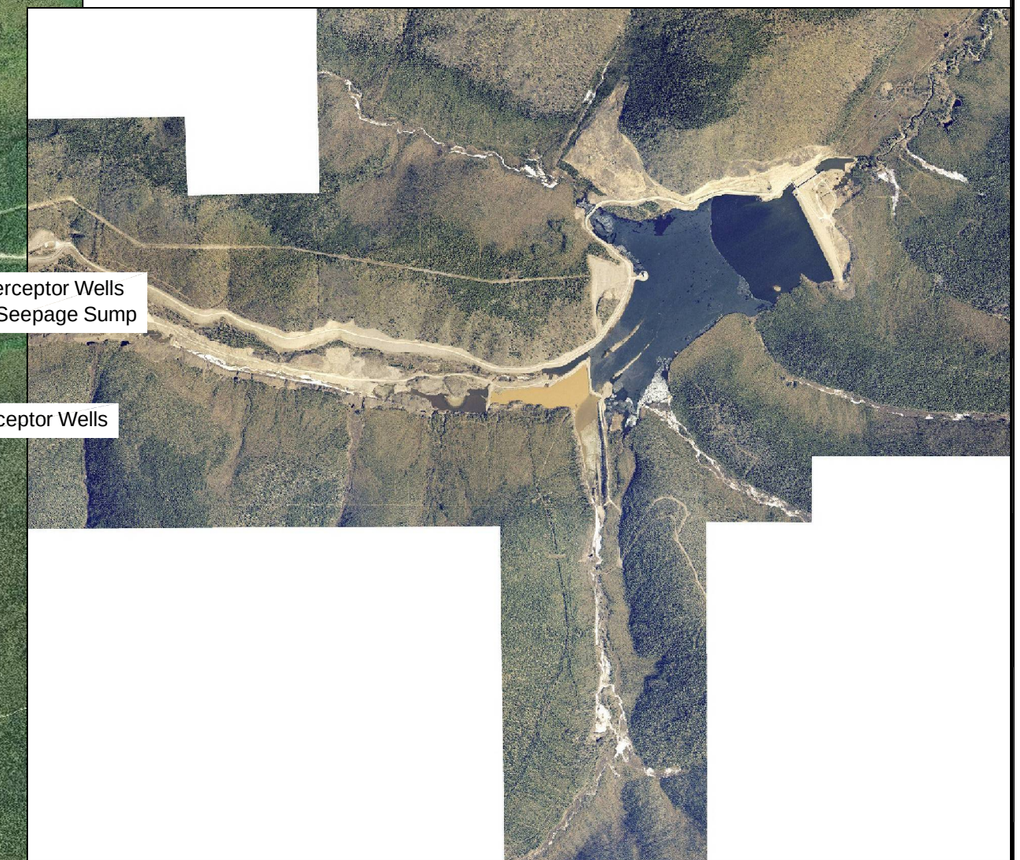
May 2013

N

1"=2200'

0 2200' 3300' 4400'

Appendix J



KINROSS Fort Knox

Pumping Routes

FA Discussion User 6

May 2013

N

1"=2200'

0 2200' 3300' 4400'

Alaska Pump & Supply, Inc.

Item - 4,000 GPM @ 338 Feet of Head

1 EA	Goulds Pump 16RGLC 5 Stage with 416 Stainless Steel Bowl Shaft, Cast Iron Epoxy Intermediate Bowl, Ductile Iron Impellers (Diameter 10.0625 in), Carbon Steel/Rubber Bearing (Suction), 450 Horse Power, 3 Phase, 60 hz, 4160 Volt, 1800 RPM, 20", 316 Stainless Steel Construction Sun Star Type D (water-filled) submersible motors to include: 316 Stainless Steel Construction, 316 Stainless Steel Fasteners and Fittings, Cyanide Duty, with 200 feet #6AWG 5KV Cable Spliced	Package Price Per Pump and Motor w/ 200 Feet of Cable $101,718.00 EA Plus Freight $4,550.00

FOB: Factory, Full Freight to Seattle
Drawings: 4-6 Weeks ARO
Delivery: 18-20 Weeks ARO

Item – Retrofit Existing Unit 16RGLC 4 Stage to 5 Stage 4,000 GPM @ 338 Feet of Head

1 EA	Retrofit Existing Units to 5 Stage with new bowl*, new adapter for 16", 450 Horse Power, 3 Phase, 60 hz, 4160 Volt, 1800 RPM, 20", 316 Stainless Steel Construction Sun Star Type D (water-filled) submersible motors to include: 316 Stainless Steel Construction, 316 Stainless Steel Fasteners and Fittings, Cyanide Duty, with 200 feet #6AWG 5KV Cable Spliced (Parts need to convert existing 4 stage unit to a 5 stage unit: 1 Each *– Rubber Bearing; Impeller (Diameter 10.45 in), Taperlock, Intermediate Bowl, Hex Screw Cap Adapter and Bowl Shaft Barstock) Note: Fairbanks Gold can send a Technician to Alaska Pump to be trained and we will give them the tooling to be able to rebuild the others on-site themselves or for us in the future. Please Advise. Note any additional parts required to rebuild existing units will be as needed, such as bushing, bolts, etc based on wear.	Package Price Per Pump and Motor w/ 200 Feet of Cable $92,808.00 EA Plus Freight $4,550.00 Plus shipping to Alaska Pump & Labor to refit Estimated Labor Pump Only 16-18 hours - $1,600.00 to $1,800.00 Plus $4,000.00 in new Tooling.

FOB: Factory, Full Freight to Seattle
Drawings: 4-6 Weeks ARO
Delivery: 18-20 Weeks ARO

Please Note: See Attachments for the individual items

Regards,

Terry Gorlick
President

This quotation is the sole property of Alaska Pump & Supply, Inc. It is issued to you for your confidential use only. In consideration of this quote, the issued party agrees that this quotation shall not be reproduced or copied or disposed of directly or indirectly, or issued for the purpose other than that for which it has been supplied for without written permission. Alaska Pump & Supply, Inc reserves the right to refuse to sell all or part of the quotation. Quote valid for 30 days unless otherwise noted.

Alaska Pump & Supply, Inc. Terms and Conditions Apply

Closure Cost Estimate
Cost Summary

Project Name: Fort Knox
Project Date: 7/10/2013
Model Version: Version 1.4.1
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Data Cost File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Basis: Alaska

A. Earthwork/Recontouring	Labor (1)	Equipment (2)	Materials	Total
Exploration	$0	$0	$0	$0
Exploration Roads & Drill Pads	$235	$618	$0	$853
Roads	$0	$0	$0	$0
Well Abandonment	$0	$0	$0	$0
Pits	$24,320	$98,529	N/A	$122,849
Quarries & Borrow Areas	$0	$0	$0	$0
Underground Openings	$0	$0	$0	$0
Process Ponds	$0	$0	$0	$0
Heaps	$453,080	$1,859,008	$0	$2,312,088
Waste Rock Dumps	$1,173,158	$4,987,517	$0	$6,160,675
Landfills	$0	$0	$0	$0
Tailings	$0	$0	$0	$0
Foundation & Buildings Areas	$612	$1,440	$0	$2,052
Yards, Etc.	$95,755	$395,764	$0	$491,519
Drainage & Sediment Control	$615,635	$270,890	$0	$886,525
Generic Material Hauling	$1,240,924	$4,863,346	$0	$6,104,270
Other User Costs (from Other User sheet)	$377,362	$111,934	$36,807	$526,103
Other** **Difference between Yellow Pup Earthwork and TSF Cover Placement**	**-$492,918**	**-$1,744,048**		-$2,236,966
Subtotal	**$3,488,163**	**$10,844,998**	**$36,807**	**$14,369,968**
Mob/Demob if included in Other User sheet	$144,065	$205,796	$0	$349,861
Mob/Demob				$0
Subtotal "A"	**$3,632,228**	**$11,050,794**	**$36,807**	**$14,719,829**

B. Revegetation/Stabilization	Labor (1)	Equipment (2)	Materials	Total
Exploration	$0	$0	$0	$0
Exploration Roads & Drill Pads	$0	$738	$866	$1,604
Roads	$0	$0	$0	$0
Well Abandonment				N/A
Pits	$0	$0	$0	$0
Quarries & Borrow Areas	$0	$0	$0	$0
Underground Openings				N/A
Process Ponds	$0	$0	$0	$0
Heaps	$0	$90,535	$106,214	$196,749
Waste Rock Dumps	$0	$168,021	$197,117	$365,138
Landfills	$0	$0	$0	$0
Tailings	$0	$0	$0	$0
Foundation & Buildings Areas	$0	$0	$0	$0
Yards, Etc.	$0	$92,641	$97,365	$190,006
Drainage & Sediment Control	$0	$3,132	$3,675	$6,807
Generic Material Hauling	$0	$124,012	$145,490	$269,502
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Other**				$0
Subtotal "B"	**$0**	**$479,079**	**$550,727**	**$1,029,806**

C. Detoxification/Water Treatment/Disposal of Wastes**	Labor (1)	Equipment (2)	Materials	Total
Process Ponds/Sludge				$0
Heaps				$0
Dumps (Waste & Landfill)				$0
Tailings				$0
Surplus Water Disposal				$0
Monitoring				$0
Miscellaneous				$0
Solid Waste - On Site	$0	$0	N/A	$0
Solid Waste - Off Site				$0
Hazardous Materials				$0
Hydrocarbon Contaminated Soils	$0	$0	$0	$0
Pumping (from Solution Mgmt sheet)	$0	$0	N/A	$0
Evaporation (from Solution Mgmt sheet)	$0	$0	$0	$0
Treatment (from Solution Mgmt sheet)	$0	$0	$0	$0
Decontamination (from Solution Mgmt sheet)	$0	$0	$0	$0
Other User Costs (from Other User sheet)	$6,244,109	$38,739,614	$1,373,179	$46,356,902
Other**				$0
Subtotal "C"	**$6,244,109**	**$38,739,614**	**$1,373,179**	**$46,356,902**

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Closure Cost Estimate
Cost Summary

D. Structure, Equipment and Facility Removal, and Misc.	Labor (1)	Equipment (2)	Materials	Total
Foundation & Buildings Areas	$72,624	$19,002	$0	$91,626
Other Demolition	$0	$0	$0	$0
Equipment Removal	$502,741	$257,845	$0	$760,585
Fence Removal	$9,850	$2,200		$12,050
Fence Installation	$0	$0	$0	$0
Culvert Removal	$5,335	$1,197	N/A	$6,532
Pipe Removal	$1,167,190	$58,353	N/A	$1,225,543
Powerline Removal	$172,335			$172,335
Transformer Removal	$26,040			$26,040
Rip-rap, rock lining, gabions	$0	$0	$0	$0
Other Misc. Costs	$0	$0	$0	$0
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Other**				$0
Subtotal "D"	**$1,956,115**	**$338,597**	**$0**	**$2,294,711**

E. Monitoring	Labor (1)	Equipment (2)	Materials	Total
Reclamation Monitoring and Maintenance	$0	$0	$0	$0
Ground and Surface Water Monitoring	$0	$0	$0	$0
Other User Costs (from Other User sheet)	$349,690	$388,005	$1,702,562	$2,440,257
Subtotal "E"	**$349,690**	**$388,005**	**$1,702,562**	**$2,440,257**

F. Construction Management & Support	Labor	Equipment (2)	Materials	Total
Construction Management	$0	$0	N/A	$0
Construction Support	$0	$0	$0	$0
Road Maintenance	$145,104	$393,504	$0	$538,608
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Other**				$0
Subtotal "F"	**$145,104**	**$393,504**	**$0**	**$538,608**

G. Closure Planning, G&A, Human Resources			Include?	Total
Closure Planning				$1,177,000
General & Administration				$0
Human Resources				$0
Other User Costs (from Other User sheet)	$0	$0	$0	$0
Other**				$0
Subtotal "G"	**$0**	**$0**	**$0**	**$1,177,000**

Subtotal Operational & Maintenance Costs	Labor (1)	Equipment (2)	Materials (3)	Total
Subtotal A through G	**$12,327,246**	**$51,389,593**	**$3,663,275**	**$68,557,113**

** Other Operator supplied costs - additional documentation required.

Indirect Costs			Include?	Total
1. Engineering, Design and Construction (ED&C) Plan (7)				$2,742,285
2. Contingency (8)				$6,855,711
3. Insurance (9)	$184,909			$184,909
4. Performance Bond (10)				$2,056,713
5. Contractor Profit (11)				$10,283,567
6. Contract Administration (12)				$5,484,569
7. Government Indirect Cost (13)				$0
Subtotal Add-On Costs				**$27,607,754**
Total Indirect Costs as % of Direct Cost				40%
GRAND TOTAL				**$96,164,867**

Administrative Cost Rates (%)					
	Cost Ranges for Indirect Cost Percentages				
	<=	<=	<=	>	
1. Engineering, Design and Construction (ED&C) Plan (7)	$500,000	$2,500,000	$25,000,000	$25,000,000	Small Plan
Variable Rate	4%	4%	0.04	4%	0%
	<=	<=	<=	>	
2. Contingency (8)	$500,000	$5,000,000	$50,000,000	$50,000,000	Small Plan
Variable Rate	10%	10%	10%	10%	0%
3. Insurance (9)	1.5%	of labor costs			
4. Bond (10)	3.0%	of the O&M costs if O&M costs are >$100,000			
5. Contractor Profit (11)	15%	of the O&M costs			
	<=	<=	<=	>	
6. Contract Administration (12)	$1,000,000	$15,000,000	$25,000,000	$25,000,000	
Variable Rate	8%	8%	0.08	8%	
0	0%	$0			

RECLAMATION COST ESTIMATION SUMMARY SHEET FOOTNOTES

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Closure Cost Estimate
Other User

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Other Cost Items Calculated Elsewhere

	Description (required)	ID Code	Facility Type	Quantity	Units	Total Capital Cost $	Material Unit Cost $	Labor Unit Cost $	Equipment/ Operating Unit Cost $	Cost Type (select)	Total Cost $	Comments
1	Equipment Mobilization/Demobilization	5.2.1.	Equipment Removal	2	Events	$0	$0.00	$72,032.47	$96,918.22	Mob/Demob	$337,901	See User 1 Tab
2	Closure Monitoring - Water	7.0.	Monitoring/Regulatory Re	1	Events	$0	$0.00	$232,320.00	$383,872.50	E. Monitoring	$616,193	See User 4 Tab
3	Pit Water Treatment	6.4.	H2O Treat Sys Constr - A	15	Events	$379,917	$0.00	$0.00	$111,972.49	C. Water Management	$2,059,504	See User 2 Tab
4	Well Closure	6.11.	Site Facilities - Wells	1	Events	$0	$36,807.44	$377,362.26	$111,933.78	A. Earthwork	$526,103	See User 3 Tab
5	Well Closure and Heap Leach Puncture - Mob/Demob Fee	6.11.	Equipment Removal	1	Events	$0	$0.00	$0.00	$11,960.00	Mob/Demob	$11,960	See User 3 Tab
6	Water Fees	6.1.	Other Water	11	Events	$0	$0.00	$0.00	$550.00	C. Water Management	$6,050	11 Water Rights - Each have a $50 annual fee.
7	Spillway Construction	6.2.3.	Tailings Impoundments	1	Facility	$0	$568,189.64	$1,097,434.29	$213,795.21	C. Water Management	$1,879,419	See User 5 Tab
8	Water Management	6.5.	Heap Leach	1	Events	$425,072	$0.00	$5,146,675.20	$36,840,181.22	C. Water Management	$42,411,928	See User 6 Tab
9	Long Term TSF Dam Maintenance and Repair Costs	9.2.	Other Facilities	1	Events	$0	$1,052,924.57	$0.00	$0.00	E. Monitoring	$1,052,925	See User 7 Tab
10	Long Term WSR Dam Maintenance and Repair Costs	9.2.	Other Facilities	1	Events	$0	$518,830.01	$0.00	$0.00	E. Monitoring	$518,830	See User 8 Tab
11	Pit Rim Warning Signage Initial Install	7.1.3	Pit	1	Event	$0	$23,012.83	$110,500.00	$0.00	E. Monitoring	$133,513	See User 9 Tab
12	Pit Rim Warning Signage In perpetuity	7.1.3	Pit	1	Event		$107,794.45			E. Monitoring	$107,794	See User 9 Tab
13	Dam Security Gate Install	7.1.3	Other Facilities	1	Event			$6,870.00	$4,132.20	E. Monitoring	$11,002	See User 10 Tab
						$804,989	$2,307,559	$7,115,227	$39,445,349		$49,673,123	

Notes: Capital cost is lump sum (i.e. not multiplied by the quantity).
Material, Labor and Equipment/Operating costs are unit costs (i.e. multiplied by the quantity).

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Closure Cost Estimate
Closure Planning

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Closure Plan Management	
	Totals
Technical Studies	$1,177,000
Engineering	$0
Permitting	$0
TOTALS	**$1,177,000**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Closure Plan Studies and Reporting

	Description (required)	ID Code	Type (select type)	Total Cost $	Comments
1	**Pit Lake Evaluation**		**water quality**	**$180,000**	**Yearly Evaluation**
2	**Environmental Audit**		**compliance repo**	**$609,500**	**Environmental Audit - Required by State every five years**
3	**Periodic Dam Safety Inspection - TSF Dam**		**compliance repo**	**$207,500**	**Required every 3 years**
4	**Periodic Dam Safety Inspection - Heap Leach Dam**		**compliance repo**	**$90,000**	**Required every 5 years**
5	**Periodic Dam Safety Inspection - Fresh Water Dam**		**compliance repo**	**$90,000**	**Required every 5 years**
				$1,177,000	

Notes: **Plan durations based on meeting water quality standards, which is four years plus 10 years of post-closure monitoring.**

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Closure Cost Estimate
Expl. Roads & Pads

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Exploration Roads & Pads - Cost Summary	Labor	Equipment	Materials	Totals
Grading Costs	$0	$0	N/A	$0
Cover Placement Cost	$0	$0	N/A	$0
Ripping/Scarifying Cost	$235	$618	N/A	$853
Subtotal Earthworks	**$235**	**$618**		**$853**
Revegetation Cost	$0	$738	$866	$1,604
TOTALS	**$235**	**$1,356**	**$866**	**$2,457**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Maximum grade allowed for dozer: 20 %
Maximum grade allowed for grader: 10 %

Exploration Roads & Pads - User Input

You must fill in ALL green cells and relevant blue cells in this section for each road

	Facility Description		Physical (1) - MANDATORY										User Overrides		Growth Media		
	Description (required)	ID Code	Underlying Ground Slope % grade	Ungraded Slope _H:1V	Cut Slope degrees	Road + Drill Pad Length ft	Road Width ft	Number of Drill Pads	Individual Sump Volume cy	Drill Pad Width ft	Drill Pad Length ft	Slope Replacement Percent %	Regrade Volume (if calculated elsewhere) cy	Disturbed Area (if calculated elsewhere) acres	Growth Media Thickness in	Distance to Growth Media Stockpile ft	Slope from Road to Stockpile % grade
1	**Pearl Creek Well Access Road**		**0.0**	**0.0**	**0.0**	**7,160**	**20.0**	**5**	**0**	**70.0**	**130**	**0%**			**0**	**0**	**0.0**

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. Slope replacement refers to the percentage of cut volumn replaced during regrading.
3. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
4. Sump volume will be applied to all roads on slopes <20%. On slopes >20% pad width (i.e. cut volume) should be adequate to account for sump volume.

Exploration Roads & Pads - User Input (cont.)

You must fill in ALL green cells and relevant blue cells in this section for each road

		Grading				Growth Media				Revegetation				
	Description (required)	Regrade Material Condition (select)	Cut Material Type (select)	Recontouring Equipment Fleet (select)	Additional Hrs for Walk-in (1)	Growth Media Material Type (select)	Growth Media Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Additional Hrs for Walk-in (1)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Scarifying/ Ripping? (select)	Ripping Fleet (select)
1	**Pearl Creek Well Access Road**	**1**	**Clay - Dry**	**Medium Excavat**	**0.0**					**User Mix 5 (fror**	**None**	**Chemical**	**Yes**	**Med Dozer**

Notes:
1. Include one-way hours necessary to walk equipment in from drop-off point to work area
2. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

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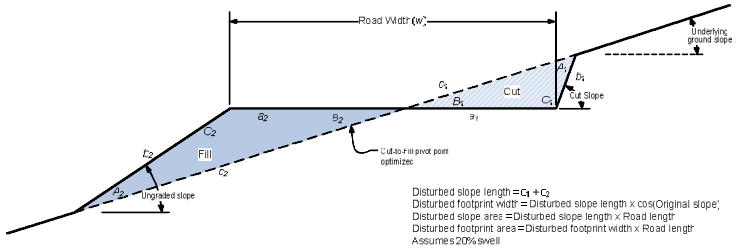
Exploration Roads & Pads - Calculations

Regrading Volume and Footprint Volume



Disturbed slope length = $C_1 + C_2$
Disturbed footprint width = Disturbed slope length x cos(Original slope)
Disturbed slope area = Disturbed slope length x Road length
Disturbed footprint area = Disturbed footprint width x Road length
Assumes 20% swell

Figure 1 - Regrading Volume Calculation

Will not allow dozer for slopes greater than 30%
For dozer regrading push distance = road width
Assumes dozer push is uphill
Assumes minimum push distance of 100 ft

Swell Factor: 1.2

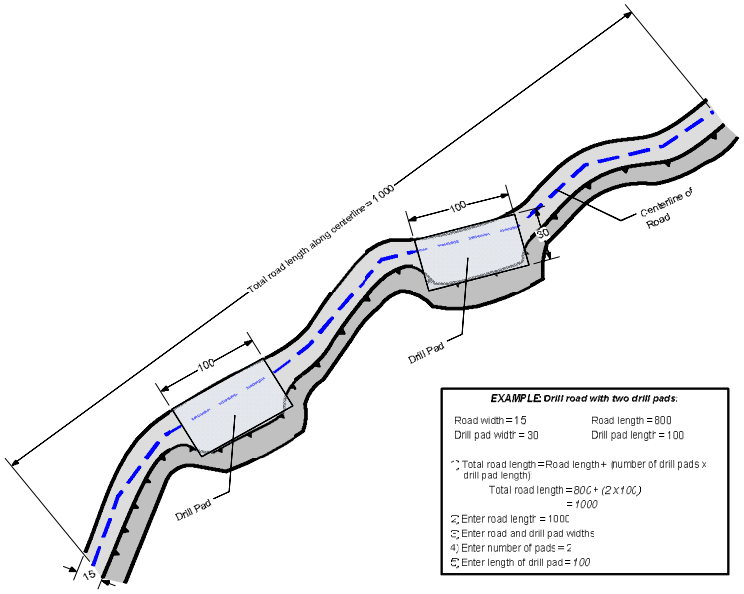
Ripping/Scarifying Calculations

Minimum 1 hr ripping/scarifying time per area
Number of passes = Final Slope length ÷ Grader width
Travel distance = Number of passes x Road length
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)
For dozer regrading assumes push distance = 3 x road width

Revegetation Calculations

Minimum of 1 acre crew time per area

Inputting Exploration Roads and Drill Pads



EXAMPLE: Drill road with two drill pads:

Road width = 15 | Road length = 800
Drill pad width = 30 | Drill pad length = 100

1) Total road length = Road length + (number of drill pads x drill pad length)
Total road length = *800 + (2 x 100)*
= *1000*
2) Enter road length = 1000
3) Enter road and drill pad widths
4) Enter number of pads = 2
5) Enter length of drill pad = *100*

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Exploration Roads & Pads - Regrading Costs

	Description (required)	Total Road Length ft	Total Drill Pad Length ft	Regrading Volume cy	Recontouring Fleet	Equipment Productivity cy/hr	Total Equipment Hours (1) hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	**Pearl Creek Well Access Road**	6,510	650							$0
		6,510	650					**$0**	**$0**	**$0**

(1) Includes walk-in time based on distance and travel speed (see Productivity sheet for speeds)

Exploration Roads & Pads - Growth Media Costs

	Description (required)	Growth Media Volume cy	Growth Media Replacement Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Growth Media Cost $
1	**Pearl Creek Well Access Road**						$0	$0	$0
							$0	**$0**	**$0**

Exploration Roads & Pads - Scarifying/Revegetation Costs

	Description (required)	Surface Area acres	Ripping Hours hrs	Ripping Labor Costs $	Ripping Equipment Cost $	Total Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Pearl Creek Well Access Road**	4.03	3	$235	$618	$853	$0	$738	$866	$1,604
		4.03	3	**$235**	**$618**	**$853**	**$0**	**$738**	**$866**	**$1,604**

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Closure Cost Estimate
Waste Rock Dumps

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Waste Rock Dumps - Cost Summary

	Labor	Equipment	Materials	Totals
Grading Costs	$563,456	$2,562,887	N/A	$3,126,343
Cover Placement Cost	$0	$0	N/A	$0
Topsoil Placement Cost	$563,913	$2,216,346	N/A	$2,780,259
Ripping/Scarifying Cost	$45,789	$208,284	N/A	$254,073
Subtotal Earthworks	**$1,173,158**	**$4,987,517**	**$0**	**$6,160,675**
Revegetation Cost	$0	$168,021	$197,117	$365,138
TOTALS	**$1,173,158**	**$5,155,538**	**$197,117**	**$6,525,813**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Waste Rock Dumps - User Input — **You must fill in ALL green cells in this section for each dump, lift or dump category**

	Facility Description			Physical - MANDATORY									Cover				Growth Media			
	Description (required)	ID Code	Type	Underlying Ground Slope % Grade	Ungraded Slope _H:1V	Final Slope _H:1V	Final Top Slope % Grade	Lift (dump) Height ft	Mid-Bench Length ft	Average Flat Area Long Dimension (ripping distance) ft	Final (Regraded) Dump Footprint acres	Regrade Volume (1) (if calculated elsewhere) cy	Cover Thickness Slopes in	Cover Thickness Flat Areas in	Distance from Cover Borrow ft	Slope from Dump to Cover Borrow % grade	Slope Growth Media Thickness in	Flat Area Growth Media Thickness in	Distance from Growth Media Stockpile ft	Slope from Dump to Stockpile % grade
1	Yellow pup 2350	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	50	5,719	1,977	52.00						12.0	12.0	4,183	1.9
2	Yellow pup 2300	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	5,833	3,196	37.00						12.0	12.0	4,183	1.9
3	Yellow pup 2200	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	100	6,511	3,146	50.00						12.0	12.0	3,356	9.5
4	Yellow pup 2100	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	100	9,188	5,135	72.80						12.0	12.0	3,356	9.5
5	Yellow pup 2000 A	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	4,386	2,149	22.90						12.0	12.0	3,356	9.5
6	Yellow pup 2000 B	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	3,107	1,665	20.30						12.0	12.0	3,356	9.5
7	Yellow pup 1950	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	70	1,838	1,047	8.80						12.0	12.0	3,356	9.5
8	Yellow pup 1900 A	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	4,618	2,321	31.60						12.0	12.0	3,356	9.5
9	Yellow pup 1900 B	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	40	2,067	2,143	45.20						12.0	12.0	3,356	9.5
10	Yellow Pup 1800 B	6.9	Waste Rock Du	0.0	1.3	3.0	5.0	40	4,178	2,018	47.20						12.0	12.0	3,356	9.5
11	Yellow pup 1800 A	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	4,449	2,339	30.80						12.0	12.0	3,356	9.5
12	Yellow pup 1780	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	130	3,014	1,622	18.54						12.0	12.0	2,872	0.3
13	Yellow pup 1700	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	4,239	2,159	32.10						12.0	12.0	2,872	0.3
14	Yellow Pup 1650	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	50	795	588	6.00						12.0	12.0	2,872	0.3
15	Yellow pup 1600	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	3,804	4,159	21.60						12.0	12.0	2,872	0.3
16	Barnes Creek 2300	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	50	6,916	3,124	95.50						12.0	12.0	3,553	-1.7
17	Barnes Creek 2050	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	40	1,146	890	9.90						12.0	12.0	3,553	-1.7
18	Barnes Creek 2250	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	50	7,746	3,344	32.70						12.0	12.0	7,684	-6.4
19	Barnes Creek 2000	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	1,840	1,173	19.20						12.0	12.0	3,553	-1.7
20	Barnes Creek 1900 A	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	50	382	479	4.80						12.0	12.0	3,553	-1.7
21	Barnes Creek 1900 B	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	190	942	590	9.70						12.0	12.0	3,553	-1.7
22	Barnes Creek 1900 C	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	80	1,643	493	9.60						12.0	12.0	7,684	-6.4
23	Barnes Creek 2180	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	100	3,003	2,223	55.00						12.0	12.0	7,684	-6.4
24	Barnes Creek 2200 A	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	2,747	1,528	17.00						12.0	12.0	3,553	-1.7
25	Barnes Creek 2200 B	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	1,455	1,422	10.90						12.0	12.0	3,553	-1.7
26	Barnes Creek 2200 C	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	2,920	1,829	17.60						12.0	12.0	3,553	-1.7
27	Barnes Creek 2100 B	6.9.	Waste Rock Du	0.0	1.3	3.0	5.0	225	2,484	1,190	30.10						12.0	12.0	7,684	-6.4
28	Barnes Creek 2100 A	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	130	2,186	989	18.50						12.0	12.0	3,553	-1.7
29	Barnes Creek 2100 C	6.9.	Waste Rock Du	0.0	1.3	3.0	0.0	100	1,641	1,003	13.60						12.0	12.0	3,553	-1.7

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Underlying ground slope is 0, because target grading surface is the bench below, which has a zero slope
Dump material is a schist, shale was chosen since it has the closest properties to schist on site
Yellow Pup Regrading - Assume three D10's will be used. Total dozer hours required =3,618. With three dozers, Yellow Pup will take 1,206 hrs
Barnes Creek Regrading - Assume three D10's will be used. Total dozer hours required =3,656. With three dozers, Barnes Creek will take 1,219 hrs

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Waste Rock Dumps - User Input (cont.)

You must fill in ALL green cells and relevant blue cells in this section for each dump, lift or dump category

		Grading				Cover		Growth Media		Revegetation								
	Description (required)	Dozing Material Condition (select)	Dump Material Type (select)	Grading Equipment Fleet (select)	Slot/Side-by-Side (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Seed Mix Slopes (select)	Seed Mix Flat Areas (select)	Mulch Slopes (select)	Mulch Flat Areas (select)	Fertilizer Slopes (select)	Fertilizer Flat Areas (select)	Slope Scarify/ Rip? (select)	Flat Area Scarify/ Rip? (select)	Scarify/ Ripping Fleet (select)
1	Yellow pup 2350	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
2	Yellow pup 2300	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
3	Yellow pup 2200	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
4	Yellow pup 2100	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
5	Yellow pup 2000 A	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
6	Yellow pup 2000 B	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
7	Yellow pup 1950	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
8	Yellow pup 1900 A	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
9	Yellow pup 1900 B	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
10	Yellow Pup 1800 B	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
11	Yellow pup 1800 A	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
12	Yellow pup 1780	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
13	Yellow pup 1700	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
14	Yellow Pup 1650	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
15	Yellow pup 1600	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
16	Barnes Creek 2300	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
17	Barnes Creek 2050	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
18	Barnes Creek 2250	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
19	Barnes Creek 2000	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
20	Barnes Creek 1900 A	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
21	Barnes Creek 1900 B	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
22	Barnes Creek 1900 C	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
23	Barnes Creek 2180	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
24	Barnes Creek 2200 A	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
25	Barnes Creek 2200 B	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
26	Barnes Creek 2200 C	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
27	Barnes Creek 2100 B	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
28	Barnes Creek 2100 A	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
29	Barnes Creek 2100 C	1	Shale	Large	No			Topsoil	Large Truck	User Mix 5 (fr	User Mix 5 (fror	None	None	Chemical	Chemical	Yes	Yes	Large Dozer

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Waste Rock Dumps - Calculations

Regrading Volume Calculation

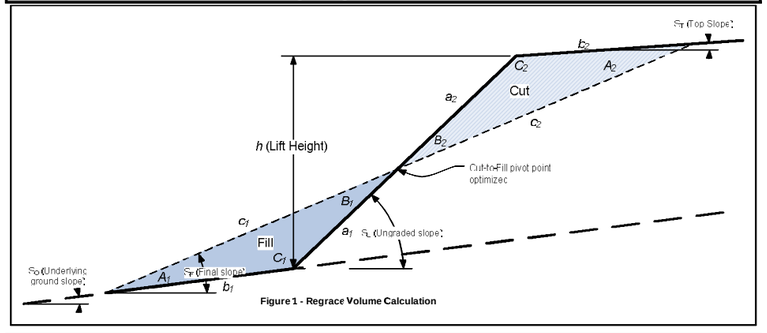

Figure 1 - Regrade Volume Calculation

Final Slope Area and Footprint Area Calculations

Final slope length = $c_1 + c_2$
Final slope area = Final slope length x Mid-bench Length
Final lift height (h_{final}) = ($c_1 + c_2$) x sin(Final slope)
Final slope width (d) = ($c_1 + c_2$) x cos(Final slope)
Final slope footprint = Final slope width x Mid-bench Length
Final flat area = Final footprint – Final slope footprint

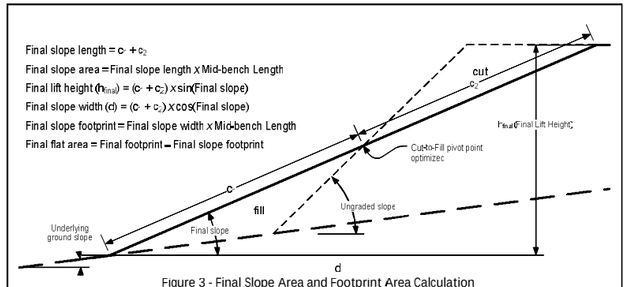

Figure 3 - Final Slope Area and Footprint Area Calculation

Regrading Push Distance Calculation

dozing distance: based on 2/3 final cut slope + 2/3 final fill slope (minimum = 50 ft)

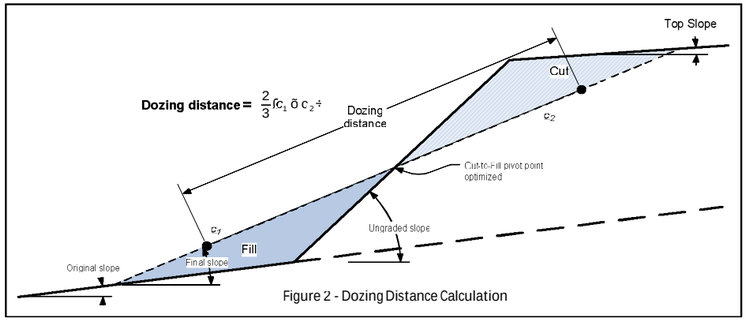

Figure 2 - Dozing Distance Calculation

Ripping/Scarifying Calculations

Minimum 1 hr ripping/scarifying time per dump

Slopes:
Number of passes = Final slope length ÷ Grader width
Travel distance = Number of passes x Mid-bench length
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)
Minimum 1 hr

Flat Areas:
Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

Revegetation: Minimum 1 acre revegetation crew time per area

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Waste Rock Dumps - Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side) x (Altitude Deration)

	Description (required)	Regrading Volume cy	Dozing Distance (see above) ft	Regrading Fleet	Uncorrected Dozer Productivity cy/hr	Grade Correction	Dozing Material	Density Correction	Side-by-Side or Slot Dozing	Total Hourly Productivity cy/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	**Yellow pup 2350**	117,981	82	D10R	1,927	1.6	1.0	1.10	1.0	2,111	56	$4,391	$19,972	$24,363
2	**Yellow pup 2300**	459,079	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	380	$29,796	$135,527	$165,323
3	**Yellow pup 2200**	537,037	163	D10R	1,074	1.6	1.0	1.10	1.0	1,177	456	$35,755	$162,632	$198,387
4	**Yellow pup 2100**	757,840	163	D10R	1,074	1.6	1.0	1.10	1.0	1,177	644	$50,496	$229,683	$280,179
5	**Yellow pup 2000 A**	345,194	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	286	$22,425	$102,002	$124,427
6	**Yellow pup 2000 B**	244,532	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	202	$15,839	$72,043	$87,882
7	**Yellow pup 1950**	70,865	111	D10R	1,489	1.6	1.0	1.10	1.0	1,631	43	$3,372	$15,336	$18,708
8	**Yellow pup 1900 A**	363,454	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	301	$23,601	$107,352	$130,953
9	**Yellow pup 1900 B**	27,254	65	D10R	2,347	1.6	1.0	1.10	1.0	2,571	11	$863	$3,923	$4,786
10	**Yellow Pup 1800 B**	55,088	65	D10R	2,347	1.6	1.0	1.10	1.0	2,571	21	$1,647	$7,490	$9,137
11	**Yellow pup 1800 A**	350,153	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	290	$22,739	$103,429	$126,168
12	**Yellow pup 1780**	400,862	206	D10R	880	1.6	1.0	1.10	1.0	964	416	$32,619	$148,366	$180,985
13	**Yellow pup 1700**	333,625	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	276	$21,641	$98,435	$120,076
14	**Yellow Pup 1650**	15,635	79	D10R	1,989	1.6	1.0	1.10	1.0	2,179	7	$549	$2,497	$3,046
15	**Yellow pup 1600**	299,389	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	248	$19,446	$88,449	$107,895
16	**Barnes Creek 2300**	142,675	82	D10R	1,927	1.6	1.0	1.10	1.0	2,111	68	$5,332	$24,252	$29,584
17	**Barnes Creek 2050**	15,110	65	D10R	2,347	1.6	1.0	1.10	1.0	2,571	6	$470	$2,140	$2,610
18	**Barnes Creek 2250**	159,797	82	D10R	1,927	1.6	1.0	1.10	1.0	2,111	76	$5,959	$27,105	$33,064
19	**Barnes Creek 2000**	144,815	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	120	$9,409	$42,798	$52,207
20	**Barnes Creek 1900 A**	7,513	79	D10R	1,989	1.6	1.0	1.10	1.0	2,179	3	$235	$1,070	$1,305
21	**Barnes Creek 1900 B**	267,633	300	D10R	640	1.6	1.0	1.10	1.0	701	382	$29,953	$136,240	$166,193
22	**Barnes Creek 1900 C**	82,759	126	D10R	1,337	1.6	1.0	1.10	1.0	1,465	56	$4,391	$19,972	$24,363
23	**Barnes Creek 2180**	247,692	163	D10R	1,074	1.6	1.0	1.10	1.0	1,177	210	$16,466	$74,897	$91,363
24	**Barnes Creek 2200 A**	216,199	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	179	$14,035	$63,840	$77,875
25	**Barnes Creek 2200 B**	114,514	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	95	$7,449	$33,882	$41,331
26	**Barnes Creek 2200 C**	229,815	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	190	$14,898	$67,764	$82,662
27	**Barnes Creek 2100 B**	1,037,392	367	D10R	539	1.6	1.0	1.10	1.0	591	1,755	$137,610	$625,921	$763,531
28	**Barnes Creek 2100 A**	290,738	206	D10R	880	1.6	1.0	1.10	1.0	964	302	$23,680	$107,708	$131,388
29	**Barnes Creek 2100 C**	129,153	158	D10R	1,103	1.6	1.0	1.10	1.0	1,208	107	$8,390	$38,162	$46,552
		7,463,793									7,186	**$563,456**	**$2,562,887**	**$3,126,343**

Waste Rock Dumps - Cover and Growth Media Costs

		Cover (lower layer)								Growth Media Placement							
	Description (required)	Cover Volume cy	Cover Replacement Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Cover Labor Cost $	Cover Equipment Cost $	Total Cover Cost $	Growth Media Volume cy	Growth Media Replacement Fleet	Fleet Productivity BCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	**Yellow pup 2350**						$0	$0	$0	85,168	777D/992G	842	2	101	$31,492	$127,582	$159,074
2	**Yellow pup 2300**						$0	$0	$0	68,260	777D/992G	842	2	81	$25,256	$102,318	$127,574
3	**Yellow pup 2200**						$0	$0	$0	84,894	777D/992G	1,088	3	78	$30,365	$118,369	$148,734
4	**Yellow pup 2100**						$0	$0	$0	122,662	777D/992G	1,088	3	113	$43,990	$171,483	$215,473
5	**Yellow pup 2000 A**						$0	$0	$0	51,336	777D/992G	1,088	3	47	$18,297	$71,325	$89,622
6	**Yellow pup 2000 B**						$0	$0	$0	36,365	777D/992G	1,088	3	33	$12,847	$50,079	$62,926
7	**Yellow pup 1950**						$0	$0	$0	15,052	777D/992G	1,088	3	14	$5,450	$21,246	$26,696
8	**Yellow pup 1900 A**						$0	$0	$0	54,047	777D/992G	1,088	3	50	$19,465	$75,878	$95,343
9	**Yellow pup 1900 B**						$0	$0	$0	73,100	777D/992G	1,088	3	67	$26,082	$101,676	$127,758
10	**Yellow Pup 1800 B**						$0	$0	$0	77,053	777D/992G	1,088	3	71	$27,640	$107,746	$135,386
11	**Yellow pup 1800 A**						$0	$0	$0	52,062	777D/992G	1,088	3	48	$18,686	$72,842	$91,528
12	**Yellow pup 1780**						$0	$0	$0	45,883	777D/992G	963	2	48	$14,966	$60,633	$75,599
13	**Yellow pup 1700**						$0	$0	$0	54,450	777D/992G	963	2	57	$17,773	$72,002	$89,775
14	**Yellow Pup 1650**						$0	$0	$0	9,486	777D/992G	963	2	10	$3,118	$12,632	$15,750
15	**Yellow pup 1600**						$0	$0	$0	44,528	777D/992G	963	2	46	$14,343	$58,107	$72,450
16	**Barnes Creek 2300**						$0	$0	$0	155,460	777D/992G	830	2	187	$58,307	$236,217	$294,524
17	**Barnes Creek 2050**						$0	$0	$0	16,940	777D/992G	830	2	21	$6,548	$26,527	$33,075
18	**Barnes Creek 2250**						$0	$0	$0	55,693	777D/992G	1,108	5	50	$27,214	$101,314	$128,528
19	**Barnes Creek 2000**						$0	$0	$0	32,831	777D/992G	830	2	40	$12,472	$50,528	$63,000
20	**Barnes Creek 1900 A**						$0	$0	$0	7,083	777D/992G	830	2	9	$2,806	$11,369	$14,175
21	**Barnes Creek 1900 B**						$0	$0	$0	20,973	777D/992G	830	2	25	$7,795	$31,580	$39,375
22	**Barnes Creek 1900 C**						$0	$0	$0	17,004	777D/992G	1,108	5	15	$8,164	$30,394	$38,558
23	**Barnes Creek 2180**						$0	$0	$0	90,169	777D/992G	1,108	5	81	$44,086	$164,128	$208,214
24	**Barnes Creek 2200 A**						$0	$0	$0	32,154	777D/992G	830	2	39	$12,160	$49,264	$61,424
25	**Barnes Creek 2200 B**						$0	$0	$0	18,650	777D/992G	830	2	23	$7,171	$29,053	$36,224
26	**Barnes Creek 2200 C**						$0	$0	$0	34,170	777D/992G	830	2	41	$12,784	$51,791	$64,575
27	**Barnes Creek 2100 B**						$0	$0	$0	68,631	777D/992G	1,108	5	62	$33,745	$125,629	$159,374
28	**Barnes Creek 2100 A**						$0	$0	$0	33,283	777D/992G	830	2	40	$12,472	$50,528	$63,000
29	**Barnes Creek 2100 C**						$0	$0	$0	22,426	777D/992G	830	2	27	$8,419	$34,106	$42,525
							$0	**$0**	**$0**	1,479,813				1,524	**$563,913**	**$2,216,346**	**$2,780,259**

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Waste Rock Dumps - Scarifying/Revegetation Costs

	Description (required)	Slope Area acres	Flat Area acres	Total Surface Area acres	Final Slope Length ft	Flat Area Long Dimension ft	Ripping/ Scarifying Fleet	Slope Scarifying/ Ripping Hours hrs	Flat Area Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Yellow pup 2350**	21.79	31.00	52.79	166	1,977	D10R	14	20	$2,666	$12,126	$14,792	$0	$9,670	$11,345	$21,015
2	**Yellow pup 2300**	42.31		42.31	316	3,196	D10R	27		$2,117	$9,630	$11,747	$0	$7,750	$9,092	$16,842
3	**Yellow pup 2200**	49.62	3.00	52.62	332	3,146	D10R	32	2	$2,666	$12,126	$14,792	$0	$9,639	$11,308	$20,947
4	**Yellow pup 2100**	70.03	6.00	76.03	332	5,135	D10R	45	4	$3,842	$17,476	$21,318	$0	$13,927	$16,339	$30,266
5	**Yellow pup 2000 A**	31.82		31.82	316	2,149	D10R	20		$1,568	$7,133	$8,701	$0	$5,829	$6,839	$12,668
6	**Yellow pup 2000 B**	22.54		22.54	316	1,665	D10R	14		$1,098	$4,993	$6,091	$0	$4,129	$4,844	$8,973
7	**Yellow pup 1950**	9.33		9.33	221	1,047	D10R	6		$470	$2,140	$2,610	$0	$1,709	$2,006	$3,715
8	**Yellow pup 1900 A**	33.50		33.50	316	2,321	D10R	21		$1,647	$7,490	$9,137	$0	$6,137	$7,200	$13,337
9	**Yellow pup 1900 B**	6.31	39.00	45.31	133	2,143	D10R	4	25	$2,274	$10,343	$12,617	$0	$8,300	$9,737	$18,037
10	**Yellow Pup 1800 B**	12.76	35.00	47.76	133	2,018	D10R	8	22	$2,352	$10,700	$13,052	$0	$8,748	$10,265	$19,013
11	**Yellow pup 1800 A**	32.27		32.27	316	2,339	D10R	20		$1,568	$7,133	$8,701	$0	$5,911	$6,935	$12,846
12	**Yellow pup 1780**	28.44		28.44	411	1,622	D10R	18		$1,411	$6,420	$7,831	$0	$5,210	$6,112	$11,322
13	**Yellow pup 1700**	30.75	3.00	33.75	316	2,159	D10R	19	2	$1,647	$7,490	$9,137	$0	$6,183	$7,252	$13,435
14	**Yellow Pup 1650**	2.88	3.00	5.88	158	588	D10R	2	2	$314	$1,427	$1,741	$0	$1,078	$1,262	$2,340
15	**Yellow pup 1600**	27.60		27.60	316	4,159	D10R	17		$1,333	$6,063	$7,396	$0	$5,056	$5,931	$10,987
16	**Barnes Creek 2300**	26.36	70.00	96.36	166	3,124	D10R	17	45	$4,861	$22,112	$26,973	$0	$17,652	$20,708	$38,360
17	**Barnes Creek 2050**	3.50	7.00	10.50	133	890	D10R	2	4	$470	$2,140	$2,610	$0	$1,923	$2,257	$4,180
18	**Barnes Creek 2250**	29.52	5.00	34.52	166	3,344	D10R	19	3	$1,725	$7,846	$9,571	$0	$6,323	$7,419	$13,742
19	**Barnes Creek 2000**	13.35	7.00	20.35	316	1,173	D10R	8	5	$1,019	$4,636	$5,655	$0	$3,727	$4,374	$8,101
20	**Barnes Creek 1900 A**	1.39	3.00	4.39	158	479	D10R	1	2	$235	$1,070	$1,305	$0	$805	$943	$1,748
21	**Barnes Creek 1900 B**	13.00		13.00	601	590	D10R	8		$627	$2,853	$3,480	$0	$2,381	$2,793	$5,174
22	**Barnes Creek 1900 C**	9.54	1.00	10.54	253	493	D10R	6	1	$549	$2,497	$3,046	$0	$1,931	$2,265	$4,196
23	**Barnes Creek 2180**	22.89	33.00	55.89	332	2,223	D10R	15	21	$2,823	$12,839	$15,662	$0	$10,238	$12,010	$22,248
24	**Barnes Creek 2200 A**	19.93		19.93	316	1,528	D10R	13		$1,019	$4,636	$5,655	$0	$3,651	$4,283	$7,934
25	**Barnes Creek 2200 B**	10.56	1.00	11.56	316	1,422	D10R	7	1	$627	$2,853	$3,480	$0	$2,117	$2,484	$4,601
26	**Barnes Creek 2200 C**	21.18		21.18	316	1,829	D10R	13		$1,019	$4,636	$5,655	$0	$3,880	$4,552	$8,432
27	**Barnes Creek 2100 B**	42.54		42.54	746	1,190	D10R	27		$2,117	$9,630	$11,747	$0	$7,792	$9,142	$16,934
28	**Barnes Creek 2100 A**	20.63		20.63	411	989	D10R	13		$1,019	$4,636	$5,655	$0	$3,779	$4,433	$8,212
29	**Barnes Creek 2100 C**	11.90	2.00	13.90	316	1,003	D10R	8	1	$706	$3,210	$3,916	$0	$2,546	$2,987	$5,533
		668.24	249.00	917.24				424	160	**$45,789**	**$208,284**	**$254,073**	**$0**	**$168,021**	**$197,117**	**$365,138**

Notes: 1) Minimum total ripping hours = 1 (i.e. If total ripping hrs (slope + flat) < 1, then one hour of fleet time is assumed, regardless of acres shown in in scarifying table.)
2) Assumes 50min/hr equipment availability

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Closure Cost Estimate
Heap Leach

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Heap Leach Pads - Cost Summary

	Labor	Equipment	Materials	Totals
Drain Installation	$0	$0	$0	$0
Grading Costs	$94,877	$431,546	N/A	$526,423
Cover Placement Cost	$0	$0	N/A	$0
Topsoil Placement Cost	$333,424	$1,314,759	N/A	$1,648,183
Ripping/Scarifying Cost	$24,779	$112,703	N/A	$137,482
Subtotal Earthworks	**$453,080**	**$1,859,008**	**$0**	**$2,312,088**
Revegetation Cost	$0	$90,535	$106,214	$196,749
TOTALS	**$453,080**	**$1,949,543**	**$106,214**	**$2,508,837**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Heap Leach Pads - User Input

You must fill in ALL green cells and relevant blue cells in this section for each heap, lift or heap category

	Facility Description			Physical (1) - MANDATORY									Cover				Growth Media			
	Description (required)	ID Code	Type	Underlying Ground Slope % grade	Ungraded Slope _H:1V	Final Slope _H:1V	Final Top Slope % grade	Lift (heap) Height ft	Mid-Bench Length ft	Average Flat Area Long Dimension (ripping distance) ft	Final (Regraded) Heap Footprint acres	Regrade Volume (if calculated elsewhere) cy	Cover Thickness Slopes in	Cover Thickness Flat Areas in	Distance from Cover Borrow ft	Slope from Heap to Cover Borrow % grade	Slope Growth Media Thickness in	Flat Area Growth Media Thickness in	Distance from Growth Material Stockpile ft	Slope from Heap to Stockpile % grade
1	Heap Leach 1750	6.5.	Heap Leach	0.0	1.3	3.0	0.0	40	1992	1123	12.10						12.0	12.0	3,415	-11.7
2	Heap Leach 1800	6.5.	Heap Leach	0.0	1.3	3.0	0.0	40	2442	1469	10.10						12.0	12.0	3,415	-11.7
3	Heap Leach 1850 A	6.5.	Heap Leach	0.0	1.3	3.0	0.0	40	699	410.5	2.30						12.0	12.0	3,415	-11.7
4	Heap Leach 1850 B	6.5.	Heap Leach	0.0	1.3	3.0	0.0	40	2369	1342	14.60						12.0	12.0	3,415	-11.7
5	Heap Leach 1900	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	1600	884	4.90						12.0	12.0	3,415	-11.7
6	Heap Leach 1950	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	2984	1548	12.10						12.0	12.0	3,415	-11.7
7	Heap Leach 2000	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	3827	1979	15.30						12.0	12.0	3,415	-11.7
8	Heap Leach 2050	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	3935	2098	15.90						12.0	12.0	3,415	-11.7
9	Heap Leach 2100	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	4534	2216	18.00						12.0	12.0	3,415	-11.7
10	Heap Leach 2150	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	4351	2472	19.00						12.0	12.0	3,415	-11.7
11	Heap Leach 2200	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	6153	3198	25.00						12.0	12.0	3,415	-11.7
12	Heap Leach 2250	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	6759	3389	27.00						12.0	12.0	3,415	-11.7
13	Heap Leach 2300	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	7361	3916	28.50						12.0	12.0	3,415	-11.7
14	Heap Leach 2350	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	7974	3798	30.20						12.0	12.0	3,415	-11.7
15	Heap Leach 2400	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	8297	4053	32.70						12.0	12.0	3,415	-11.7
16	Heap Leach 2450	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	7831	3709	29.80						12.0	12.0	3,415	-11.7
17	Heap Leach 2500	6.5.	Heap Leach	0.0	1.3	3.0	0.0	50	3285	3810	31.80						12.0	12.0	3,415	-11.7
18	Heap Leach 2550	6.5.	Heap Leach	0.0	1.3	3.0	5.0	50	8068	3565	30.70						12.0	12.0	2,132	-11.3
19	Heap Leach 2600	6.5.	Heap Leach	0.0	1.3	3.0	5.0	50	9350	3952	35.70						12.0	12.0	2,132	-11.3
20	Heap Leach 2650	6.5.	Heap Leach	0.0	1.3	3.0	5.0	50	7503	4071	79.60						12.0	12.0	2,132	-11.3

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Heap Leach Regrading - Assume two D10's will be used. Total dozer hours required =1,210. With two dozers, Barnes Creek will take 605 hrs

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Heap Leach Pads - User Input (cont.)

You must fill in ALL green cells and relevant blue cells in this section for each heap, lift or heap category

		Grading				Cover		Growth Media		Revegetation								
	Description (required)	Dozing Material Condition (select)	Heap Material Type (select)	Grading Equipment Fleet (select)	Slot/ Side-by-Side (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Seed Mix Slopes (select)	Seed Mix Flat Areas (select)	Mulch Slopes (select)	Mulch Flat Areas (select)	Fertilizer Slopes (select)	Fertilizer Flat Areas (select)	Slope Scarify/ Rip? (select)	Flat Area Scarify/ Rip? (select)	Scarifying/ Ripping Fleet (select)
1	Heap Leach 1750	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
2	Heap Leach 1800	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
3	Heap Leach 1850 A	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
4	Heap Leach 1850 B	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
5	Heap Leach 1900	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
6	Heap Leach 1950	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
7	Heap Leach 2000	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
8	Heap Leach 2050	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
9	Heap Leach 2100	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
10	Heap Leach 2150	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
11	Heap Leach 2200	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
12	Heap Leach 2250	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
13	Heap Leach 2300	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
14	Heap Leach 2350	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
15	Heap Leach 2400	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
16	Heap Leach 2450	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
17	Heap Leach 2500	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
18	Heap Leach 2550	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
19	Heap Leach 2600	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer
20	Heap Leach 2650	1	Granite - broken	Large	No			Topsoil	Large Truck	User Mix 5 (fro	User Mix 5 (from	None	None	Chemical	Chemical	Yes	Yes	Large Dozer

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Heap Leach Pads - User Input (cont.)

		Solution Collection Ditch Fill							Piping			
	Description (required)	Collection Ditch Length ft	Collection Ditch Top Width ft	Collection Ditch Depth ft	Volume (if calculated elsewhere) cy	Distance from Borrow ft	Slope to Borrow % grade	Drain Rock Equipment Fleet (select)	Solid Pipe Length ft	Solid Pipe Type (select)	Drainage Pipe Length ft	Drainage Pipe Type (select)
1	Heap Leach 1750											
2	Heap Leach 1800											
3	Heap Leach 1850 A											
4	Heap Leach 1850 B											
5	Heap Leach 1900											
6	Heap Leach 1950											
7	Heap Leach 2000											
8	Heap Leach 2050											
9	Heap Leach 2100											
10	Heap Leach 2150											
11	Heap Leach 2200											
12	Heap Leach 2250											
13	Heap Leach 2300											
14	Heap Leach 2350											
15	Heap Leach 2400											
16	Heap Leach 2450											
17	Heap Leach 2500											
18	Heap Leach 2550											
19	Heap Leach 2600											
20	Heap Leach 2650											

Notes:

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Heap Leach Pads - Calculations

Regrading Volume Calculation

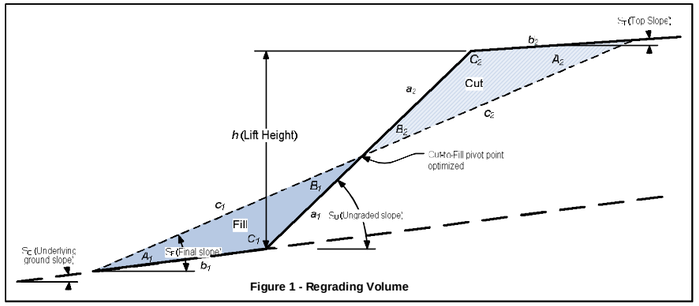

Figure 1 - Regrading Volume

Regrading Push Distance Calculation

dozing distance: based on 2/3 final cut slope + 2/3 final fill slope (minimum = 50 ft)

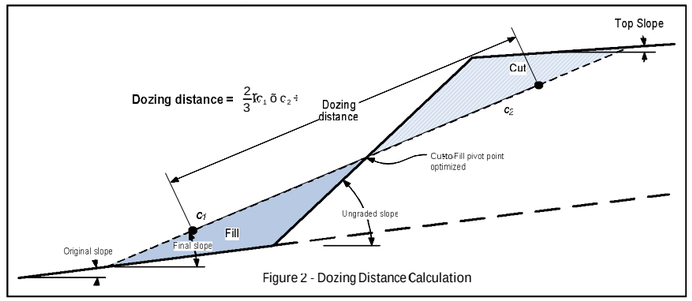

Figure 2 - Dozing Distance Calculation

Ripping/Scarifying Calculations

Minimum 1 hr ripping/scarifying per area

Slopes:

Number of passes = Final slope length ÷ Grader width
Travel distance = Number of passes x Mid-bench length
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

Flat Areas:

Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

Revegetation: Minimum 1 acre revegetation crew time per area

Final Slope Area and Footprint Area Calculations

Final slope length = $c_1 + c_2$
Final slope area = Final slope length x Mid-bench Length
Final lift height (h_{final}) = $(c_1 + c_2)$ x sin(Final slope)
Final slope width (d) = $(c_1 + c_2)$ x cos(Final slope)
Final slope footprint = Final slope width x Mid-bench Length
Final flat area = Final footprint – Final slope footprint

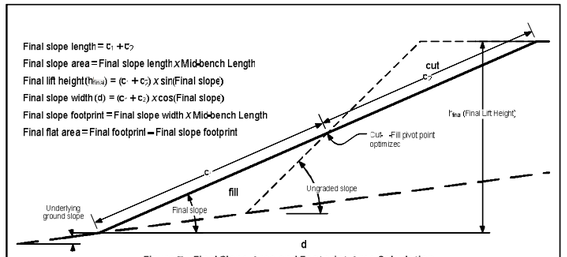

Figure 3 - Final Slope Area and Footprint Area Calculation

Solution Collection Ditch Calculations

Use when existing heap material is not suitable drain rock
Assume to be constructed in existing solution channels
Assume 2H:1V ditch sideslopes
Drain rock assumed to be Gravel - Dry at 2,550 lb/cy (1,510 kg/m3) from CAT Handbook 35th Ed.

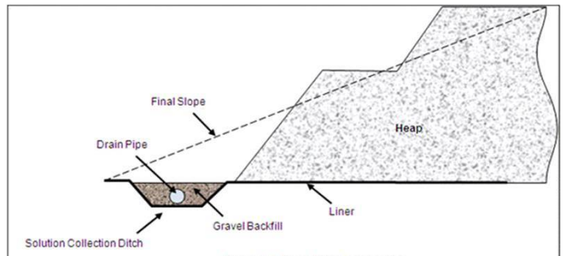

Figure 4 – Drainage Ditch Construction

Heap Leach Pad - Drainage Channel Fill & Drainage Pipe Installation

		Drain Rock Placement								Drainpipe Installation				
	Description (required)	Drain Rock Volume cy	Drain Rock Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours hrs	Drainage Labor Cost $	Drainage Equipment Cost $	Total Drainage Cost $	Piping Crew Hours hrs	Piping Labor Cost $	Piping Equipment Cost $	Piping Material Cost $	Total Pipe Installation Cost $
1	Heap Leach 1750	0					$0	$0	$0		$0	$0	$0	$0
2	Heap Leach 1800	0					$0	$0	$0		$0	$0	$0	$0
3	Heap Leach 1850 A	0					$0	$0	$0		$0	$0	$0	$0
4	Heap Leach 1850 B	0					$0	$0	$0		$0	$0	$0	$0
5	Heap Leach 1900	0					$0	$0	$0		$0	$0	$0	$0
6	Heap Leach 1950	0					$0	$0	$0		$0	$0	$0	$0
7	Heap Leach 2000	0					$0	$0	$0		$0	$0	$0	$0
8	Heap Leach 2050	0					$0	$0	$0		$0	$0	$0	$0
9	Heap Leach 2100	0					$0	$0	$0		$0	$0	$0	$0
10	Heap Leach 2150	0					$0	$0	$0		$0	$0	$0	$0
11	Heap Leach 2200	0					$0	$0	$0		$0	$0	$0	$0
12	Heap Leach 2250	0					$0	$0	$0		$0	$0	$0	$0
13	Heap Leach 2300	0					$0	$0	$0		$0	$0	$0	$0
14	Heap Leach 2350	0					$0	$0	$0		$0	$0	$0	$0
15	Heap Leach 2400	0					$0	$0	$0		$0	$0	$0	$0
16	Heap Leach 2450	0					$0	$0	$0		$0	$0	$0	$0
17	Heap Leach 2500	0					$0	$0	$0		$0	$0	$0	$0
18	Heap Leach 2550	0					$0	$0	$0		$0	$0	$0	$0
19	Heap Leach 2600	0					$0	$0	$0		$0	$0	$0	$0
20	Heap Leach 2650	0					$0	$0	$0		$0	$0	$0	$0
						0	**$0**	**$0**	**$0**		**$0**	**$0**	**$0**	**$0**

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Heap Leach Pad - Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side) x (Altitude Deration)

	Description (required)	Regrading Volume cy	Dozing Distance (see above) ft	Regrading Fleet	Uncorrected Dozer Productivity cy/hr	Grade Correction	Dozing Material	Density Correction	Side-by-Side or Slot Dozing	Total Hourly Productivity cy/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	**Heap Leach 1750**	25,084	63	D10R	2,410	1.6	1.0	0.82	1.0	1,968	13	$1,019	$4,636	$5,655
2	**Heap Leach 1800**	30,751	63	D10R	2,410	1.6	1.0	0.82	1.0	1,968	16	$1,255	$5,706	$6,961
3	**Heap Leach 1850 A**	8,802	63	D10R	2,410	1.6	1.0	0.82	1.0	1,968	4	$314	$1,427	$1,741
4	**Heap Leach 1850 B**	29,832	63	D10R	2,410	1.6	1.0	0.82	1.0	1,968	15	$1,176	$5,350	$6,526
5	**Heap Leach 1900**	31,467	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	19	$1,490	$6,776	$8,266
6	**Heap Leach 1950**	58,685	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	36	$2,823	$12,839	$15,662
7	**Heap Leach 2000**	75,264	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	46	$3,607	$16,406	$20,013
8	**Heap Leach 2050**	77,388	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	48	$3,764	$17,119	$20,883
9	**Heap Leach 2100**	89,169	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	55	$4,313	$19,616	$23,929
10	**Heap Leach 2150**	85,570	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	53	$4,156	$18,902	$23,058
11	**Heap Leach 2200**	121,009	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	75	$5,881	$26,749	$32,630
12	**Heap Leach 2250**	132,927	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	82	$6,430	$29,245	$35,675
13	**Heap Leach 2300**	144,766	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	89	$6,978	$31,742	$38,720
14	**Heap Leach 2350**	156,822	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	97	$7,606	$34,595	$42,201
15	**Heap Leach 2400**	163,174	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	100	$7,841	$35,665	$43,506
16	**Heap Leach 2450**	154,010	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	95	$7,449	$33,882	$41,331
17	**Heap Leach 2500**	64,605	79	D10R	1,989	1.6	1.0	0.82	1.0	1,624	40	$3,136	$14,266	$17,402
18	**Heap Leach 2550**	166,440	82	D10R	1,927	1.6	1.0	0.82	1.0	1,574	106	$8,311	$37,805	$46,116
19	**Heap Leach 2600**	192,887	82	D10R	1,927	1.6	1.0	0.82	1.0	1,574	123	$9,644	$43,868	$53,512
20	**Heap Leach 2650**	154,784	82	D10R	1,927	1.6	1.0	0.82	1.0	1,574	98	$7,684	$34,952	$42,636
		1,963,436									1,210	**$94,877**	**$431,546**	**$526,423**

Heap Leach Pad - Cover and Growth Media Costs

		Cover (lower layer)								Growth Media Placement							
	Description (required)	Cover Volume cy	Cover Replacement Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Cover Labor Cost $	Cover Equipment Cost $	Total Cover Cost $	Growth Media Volume cy	Growth Media Replacement Fleet	Fleet Productivity BCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	**Heap Leach 1750**	0		Cover Material!			$0	$0	$0	20,038	777D/992G	919	3	22	$8,564	$33,386	$41,950
2	**Heap Leach 1800**	0		Cover Material!			$0	$0	$0	16,928	777D/992G	919	3	18	$7,007	$27,316	$34,323
3	**Heap Leach 1850 A**	0		Cover Material!			$0	$0	$0	3,892	777D/992G	919	3	5	$1,946	$7,588	$9,534
4	**Heap Leach 1850 B**	0		Cover Material!			$0	$0	$0	24,169	777D/992G	919	3	26	$10,122	$39,456	$49,578
5	**Heap Leach 1900**	0		Cover Material!			$0	$0	$0	9,363	777D/992G	919	3	10	$3,893	$15,176	$19,069
6	**Heap Leach 1950**	0		Cover Material!			$0	$0	$0	20,406	777D/992G	919	3	22	$8,564	$33,386	$41,950
7	**Heap Leach 2000**	0		Cover Material!			$0	$0	$0	25,818	777D/992G	919	3	28	$10,900	$42,491	$53,391
8	**Heap Leach 2050**	0		Cover Material!			$0	$0	$0	26,818	777D/992G	919	3	29	$11,289	$44,009	$55,298
9	**Heap Leach 2100**	0		Cover Material!			$0	$0	$0	30,383	777D/992G	919	3	33	$12,847	$50,079	$62,926
10	**Heap Leach 2150**	0		Cover Material!			$0	$0	$0	31,942	777D/992G	919	3	35	$13,625	$53,114	$66,739
11	**Heap Leach 2200**	0		Cover Material!			$0	$0	$0	42,156	777D/992G	919	3	46	$17,907	$69,807	$87,714
12	**Heap Leach 2250**	0		Cover Material!			$0	$0	$0	45,563	777D/992G	919	3	50	$19,465	$75,878	$95,343
13	**Heap Leach 2300**	0		Cover Material!			$0	$0	$0	48,161	777D/992G	919	3	53	$20,632	$80,430	$101,062
14	**Heap Leach 2350**	0		Cover Material!			$0	$0	$0	51,086	777D/992G	919	3	56	$21,800	$84,983	$106,783
15	**Heap Leach 2400**	0		Cover Material!			$0	$0	$0	55,215	777D/992G	919	3	60	$23,357	$91,053	$114,410
16	**Heap Leach 2450**	0		Cover Material!			$0	$0	$0	50,398	777D/992G	919	3	55	$21,411	$83,465	$104,876
17	**Heap Leach 2500**	0		Cover Material!			$0	$0	$0	52,277	777D/992G	919	3	57	$22,190	$86,500	$108,690
18	**Heap Leach 2550**	0		Cover Material!			$0	$0	$0	51,920	777D/992G	775	2	67	$20,891	$84,634	$105,525
19	**Heap Leach 2600**	0		Cover Material!			$0	$0	$0	60,366	777D/992G	775	2	78	$24,320	$98,529	$122,849
20	**Heap Leach 2650**	0		Cover Material!			$0	$0	$0	130,645	777D/992G	775	2	169	$52,694	$213,479	$266,173
							$0	**$0**	**$0**	797,544				919	**$333,424**	**$1,314,759**	**$1,648,183**

Heap Leach Pad - Scarifying/Revegetation Costs

	Description (required)	Slope Area acres	Flat Area acres	Total Surface Area acres	Final Slope Length ft	Flat Area Long Dimension ft	Ripping/ Scarifying Fleet	Slope Scarifying/ Ripping Hours hrs	Flat Area Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Heap Leach 1750**	5.76	6.70	12.46	126	1,123	D10R	4	4	$627	$2,853	$3,480	$0	$2,282	$2,678	$4,960
2	**Heap Leach 1800**	7.06	3.40	10.46	126	1,469	D10R	5	2	$549	$2,497	$3,046	$0	$1,916	$2,249	$4,165
3	**Heap Leach 1850 A**	2.02	0.40	2.42	126	411	D10R	1	0	$78	$357	$435	$0	$443	$520	$963
4	**Heap Leach 1850 B**	6.85	8.10	14.95	126	1,342	D10R	5	5	$784	$3,567	$4,351	$0	$2,739	$3,213	$5,952
5	**Heap Leach 1900**	5.80	0.10	5.90	158	884	D10R	4	0	$314	$1,427	$1,741	$0	$1,080	$1,267	$2,347
6	**Heap Leach 1950**	10.82	1.80	12.62	158	1,548	D10R	7	1	$627	$2,853	$3,480	$0	$2,312	$2,712	$5,024
7	**Heap Leach 2000**	13.88	2.10	15.98	158	1,979	D10R	9	2	$863	$3,923	$4,786	$0	$2,928	$3,434	$6,362
8	**Heap Leach 2050**	14.27	2.30	16.57	158	2,098	D10R	9	2	$863	$3,923	$4,786	$0	$3,035	$3,561	$6,596
9	**Heap Leach 2100**	16.45	2.40	18.85	158	2,216	D10R	10	2	$941	$4,280	$5,221	$0	$3,453	$4,051	$7,504
10	**Heap Leach 2150**	15.78	4.00	19.78	158	2,472	D10R	10	2	$941	$4,280	$5,221	$0	$3,624	$4,251	$7,875
11	**Heap Leach 2200**	22.32	3.80	26.12	158	3,198	D10R	14	2	$1,255	$5,706	$6,961	$0	$4,785	$5,614	$10,399
12	**Heap Leach 2250**	24.52	3.70	28.22	158	3,389	D10R	15	3	$1,411	$6,420	$7,831	$0	$5,170	$6,064	$11,234
13	**Heap Leach 2300**	26.70	3.20	29.90	158	3,916	D10R	17	2	$1,490	$6,776	$8,266	$0	$5,477	$6,426	$11,903
14	**Heap Leach 2350**	28.92	2.70	31.62	158	3,798	D10R	18	1	$1,490	$6,776	$8,266	$0	$5,793	$6,796	$12,589
15	**Heap Leach 2400**	30.09	4.10	34.19	158	4,053	D10R	19	2	$1,647	$7,490	$9,137	$0	$6,263	$7,347	$13,610
16	**Heap Leach 2450**	28.40	2.80	31.20	158	3,709	D10R	18	2	$1,568	$7,133	$8,701	$0	$5,715	$6,706	$12,421
17	**Heap Leach 2500**	11.92	20.50	32.42	158	3,810	D10R	8	13	$1,647	$7,490	$9,137	$0	$5,938	$6,967	$12,905
18	**Heap Leach 2550**	30.75	1.40	32.15	166	3,565	D10R	20	1	$1,647	$7,490	$9,137	$0	$5,889	$6,909	$12,798
19	**Heap Leach 2600**	35.63	1.80	37.43	166	3,952	D10R	23	2	$1,960	$8,916	$10,876	$0	$6,857	$8,044	$14,901
20	**Heap Leach 2650**	28.59	52.40	80.99	166	4,071	D10R	19	33	$4,077	$18,546	$22,623	$0	$14,836	$17,405	$32,241
		366.53	127.70	494.23				235	81	**$24,779**	**$112,703**	**$137,482**	**$0**	**$90,535**	**$106,214**	**$196,749**

1) Minimum total ripping hours = 1 (i.e. If total ripping hrs (slope + flat) < 1, then one hour of fleet time is assumed, regardless of acres shown in in scarifying table.)

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Closure Cost Estimate
Pits

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Pits - Cost Summary

	Labor	Equipment	Materials	Totals
Safety Berm Construction Cost	$24,320	$98,529	N/A	$122,849
Safety Berm Revegetation Cost	$0	$0	$0	$0
TOTALS	**$24,320**	**$98,529**	**$0**	**$122,849**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Pits - User Input

	Facility Description			Pit Berms					Berm Construction		Excavate or Doze	Hauling (if selected method)				Revegetation		
	Description (required)	ID Code	Type	Berm (or Highwall) Length	Berm Height	Berm Base Width	Berm Sideslope Angle	Volume (if calculated elsewhere)	Construction Method	Berm Material Type	Berm Construction Equipment Fleet	Berm Hauling Fleet	Distance to Borrow Source	Slope to Borrow Source	Maximum Fleet Size	Seed Mix	Mulch	Fertilizer
				ft	ft	ft	_H:1V	cy	(select)	(select)	(select)	(select)	ft	% grade	(user override)	(select)	(select)	(select)
1	Pit Berm		Pit	19,721.0	8.0	22.0	1.3		Haul & Place	Shale	Large	Large Truck	4,000	0.0		None	None	None

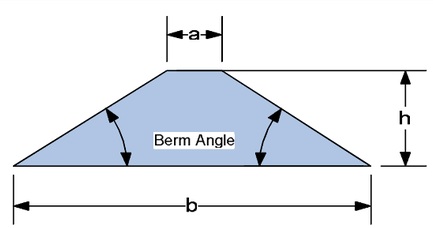
Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
3. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Pits - Calculations

Safety Berm Volume Calculation

$$\text{Cross Sectional Area} = \frac{(a + b)}{2} \times h$$

Berm Volume = Berm Length x Cross Sectional Area



Dozer productivity assumes push distance of:
100 feet

Dozer:
Length x (Berm Base Width + Dozer Push Distance) - accounts for disturbance created in borrow area

Excavator:
Length x (Berm Base Width + (2 x Excavator Track Width) - accounts for disturbance created in borrow area

Haul & Place:
Length x Berm Base Width - if necessary use Yards sheet to account for disturbance created in borrow area

Revegetation Calculations

Minimum 1 acre revegetation crew time per area

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Pits - Safety Berm Construction Costs

		Safety Berm							
	Description (required)	Safety Berm Volume cy	Selected Fleet	Number of Trucks/ Scrapers	Corrected Fleet Productivity cy/hr	Total Hours	Safety Berm Labor Cost $	Safety Berm Equipment Cost $	Total Safety Berm Cost $
1	**Pit Berm**	67,782	777D/992G	2	868	78	$24,320	$98,529	$122,849
		67,782				78	**$24,320**	**$98,529**	**$122,849**

Pits - Safety Berms - Revegetation Costs

	Description (required)	Flat Area acres	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Pit Berm**	9.96	$0	$0	$0	$0
		9.96	**$0**	**$0**	**$0**	**$0**

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Closure Cost Estimate
Haul Material

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Generic Material Hauling - Cost Summary

	Labor	Equipment	Materials	Totals
Hauling/Crush/Screen/Compact	$778,097	$3,041,184	N/A	$3,819,281
Cover Placement Cost	$0	$0	N/A	$0
Topsoil Placement Cost	$435,227	$1,696,621	N/A	$2,131,848
Ripping/Scarifying Cost	$27,600	$125,541	N/A	$153,141
Subtotal Earthworks	**$1,240,924**	**$4,863,346**	**$0**	**$6,104,270**
Revegetation Cost	$0	$124,012	$145,490	$269,502
TOTALS	**$1,240,924**	**$4,987,358**	**$145,490**	**$6,373,772**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Generic Material Hauling - User Input

	Facility Description			Physical		Hauled Material			Crushing & Screening					Cover			Growth Media		
	Description (required)	ID Code	Type	Final Surface Area acres	Average Ripping Distance ft	Material Volume Required cy	Distance from Borrow Source (1) ft	Slope to Borrow Source % grade	Crush Material	Screen Material	Loss to Crushing/ Screening %	Distance to Placement Location (2) ft	Slope to Placement % grade	Cover Thickness in	Distance to Cover Borrow ft	Slope to Borrow % grade	Growth Media Thickness in	Distance to Growth Material Stockpile ft	Slope to Stockpile % grade
1	**Yellow Pup to TSF - Upland Waste Rock Placement**	**6.2.2**	**Tailings Impou**	**623.00**	**10,116**	**2,010,172**	**5,835**	**5.5**									**12**	**7,277**	**4.3**
2	**Yellow Pup to TSF North -Wetland Waste Rock Placemen**	**6.2.2**	**Tailings Impou**	**25.00**	**3,297**	**80,665**	**2,290**	**5.2**									**12**	**4,606**	**-5.2**
3	**Yellow Pup to TSF South -Wetland Waste Rock Placement**	**6.2.2**	**Tailings Impou**	**29.00**	**3,813**	**93,571**	**1,370**	**4.4**									**12**	**5,750**	**-4.2**

Notes:
1. Input distance to crusher if material to be crushed
2. Input distance from crusher to placement if material to be crushed
3. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

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Closure Cost Estimate
Haul Material

Generic Material Hauling - User Input (cont.)

		Hauling Material				Cover			Growth Media			Revegetation				
	Description (required)	Haul Material Type (select)	Material Hauling Fleet (select)	Each Fleet Size (from/to crusher) (user override)	Compact After Placement?	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch Type (select)	Fertilizer Type (select)	Scarify/ Rip? (select)	Scarifying/ Ripping Fleet (select)
1	Yellow Pup to TSF - Upland Waste Rock Placement	Shale	Large Truck		No				Topsoil	Large Truck		User Mix 5 (fr	None	Chemical	Yes	Large Dozer
2	Yellow Pup to TSF North -Wetland Waste Rock Placemen	Shale	Large Truck		No				Topsoil	Large Truck		User Mix 5 (fr	None	Chemical	Yes	Large Dozer
3	Yellow Pup to TSF South -Wetland Waste Rock Placemen	Shale	Large Truck		No				Topsoil	Large Truck		User Mix 5 (fr	None	Chemical	Yes	Large Dozer

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Generic Material Hauling - Load, Haul, Place and Grade

		Material Haulage								Crush and/or Compact			
	Description (required)	Material Volume to Crusher cy	Final Material Volume cy	Material Haulage Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Hauling Labor Cost $	Hauling Equipment Cost $	Total Crush/ Screen Cost $	Compact Labor Cost $	Compact Equipment Cost $	Total Load/Haul/ Place Cost $
1	Yellow Pup to TSF - Upland Waste Rock Placement	2,010,172	2,010,172	777D/992G	1,078	3	1,865	$726,026	$2,830,231	$0	$0	$0	$3,556,257
2	Yellow Pup to TSF North -Wetland Waste Rock Placemen	80,665	80,665	777D/992G	988	2	82	$25,568	$103,582	$0	$0	$0	$129,150
3	Yellow Pup to TSF South -Wetland Waste Rock Placemen	93,571	93,571	777D/992G	1,102	2	85	$26,503	$107,371	$0	$0	$0	$133,874
		2,184,408	2,184,408				2,032	**$778,097**	**$3,041,184**	**$0**	**$0**	**$0**	**$3,819,281**

Notes: Final Material Volume includes allowance for additional material hauled to crushing/screening plant based on Loss to Crushing/Screening input above.

Generic Material Hauling - Cover and Growth Media Costs

		Cover Placement								Growth Media Placement							
	Description (required)	Cover Volume cy	Cover Placement Fleet	Cover Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Placement Cost $	Growth Media Volume cy	Growth Media Placement Fleet	Growth Media Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoil Placement Cost $
1	Yellow Pup to TSF - Upland Waste Rock Placement						$0	$0	$0	1,005,107	777D/992G	979	3	1,027	$399,801	$1,558,524	$1,958,325
2	Yellow Pup to TSF North -Wetland Waste Rock Placemen						$0	$0	$0	40,333	777D/992G	1,018	3	40	$15,572	$60,702	$76,274
3	Yellow Pup to TSF South -Wetland Waste Rock Placemen						$0	$0	$0	46,787	777D/992G	909	3	51	$19,854	$77,395	$97,249
							$0	**$0**	**$0**	1,092,227				1,118	**$435,227**	**$1,696,621**	**$2,131,848**

Generic Material Hauling - Scarifying/Revegetation Costs

	Description (required)	Total Surface Area acres	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Cost $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Cost $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	Yellow Pup to TSF - Upland Waste Rock Placement	623.00	324	$25,405	$115,555	$140,960	$0	$114,121	$133,885	$248,006
2	Yellow Pup to TSF North -Wetland Waste Rock Placemen	25.00	13	$1,019	$4,636	$5,655	$0	$4,579	$5,373	$9,952
3	Yellow Pup to TSF South -Wetland Waste Rock Placemen	29.00	15	$1,176	$5,350	$6,526	$0	$5,312	$6,232	$11,544
		677.00	352	**$27,600**	**$125,541**	**$153,141**	**$0**	**$124,012**	**$145,490**	**$269,502**

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Closure Cost Estimate
Foundations & Buildings

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Buildings & Foundation Demolition Cost Summary	Labor	Equipment	Materials	Totals
Building Demolition Cost	$34,479	$11,992	N/A	$46,471
Wall Demolition Cost	$37,370	$4,370	N/A	$41,740
Slab Demolition	$775	$2,640	N/A	$3,415
Subtotal Demolition	**$72,624**	**$19,002**	**$0**	**$91,626**
Cover Placement Cost	$612	$1,440	N/A	$2,052
Growth Media Placement Cost	$0	$0	N/A	$0
Ripping/Scarifying Cost	$0	$0	N/A	$0
Subtotal Earthworks	**$612**	**$1,440**	**$0**	**$2,052**
Revegetation Cost	$0	$0	$0	$0
TOTALS	**$73,236**	**$20,442**	**$0**	**$93,678**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Minimum thickness of cover over unbroken slab: **0** ft

Buildings & Foundation - User Input

You must fill in ALL green cells and relevant blue cells in this section for each building or facility

	Facility Description			Physical - MANDATORY								Foundation Cover (1)			Growth Media (1) (entire footprint)		
	Description (required)	ID Code	Type	Length ft	Width ft	Eve Height ft	Slab Thickness in	Foundation Wall Thickness in	Foundation Wall Height ft	Average Flat Area Long Dimension (ripping distance) ft	Building Area Footprint (including surrounding facilities) acres	Foundation Cover Thickness in	Distance from Foundation Cover Borrow Area ft	Slope from Facility to Borrow Area % grade	Growth Media Thickness in	Distance from Growth Media Stockpile ft	Slope from Facility to Stockpile % grade
1	**Conveyor Drive Tower**	**6.10.**	**Process - Plant & Buildings**	**50**	**50**	**30**	**6**	**8**	**1**	**0**	**0.00**	**12**	**1,000**	**8.0**	**0**	**0**	**0.0**
2	**Crusher Access Tunnel**	**6.10.**	**Process - Crushing & Screening**	**176**	**8**	**8**	**8**	**8**	**1**	**0**	**0.00**	**12**	**1,000**	**8.0**	**0**	**0**	**0.0**
3	**TSF Seepage Reclaim Building**	**6.10.**	**Site Facilities - Buildings**	**88**	**14**	**20**	**6**	**8**	**2**	**0**	**0.00**	**0**	**0**	**0.0**	**0**	**0**	**0.0**
4	**TSF Barge**	**6.10.**	**Site Facilities - Structures**	**34**	**30**	**20**	**6**	**8**	**2**	**0**	**0.00**	**0**	**0**	**0.0**	**0**	**0**	**0.0**
5	**Fresh Water Pump House**	**6.10.**	**Site Facilities - Structures**	**30.5**	**31**	**20**	**6**	**8**	**2**	**0**	**0.00**	**0**	**0**	**0.0**	**0**	**0**	**0.0**

Notes:
1. Foundation cover only calculated to cover slab. Growth media estimated over entire footprint area
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

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Closure Cost Estimate
Foundations & Buildings

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Buildings & Foundation Demolition Cost Summary	Labor	Equipment	Materials	Totals
Building Demolition Cost	$34,479	$11,992	N/A	$46,471
Wall Demolition Cost	$37,370	$4,370	N/A	$41,740
Slab Demolition	$775	$2,640	N/A	$3,415
Subtotal Demolition	**$72,624**	**$19,002**	**$0**	**$91,626**
Cover Placement Cost	$612	$1,440	N/A	$2,052
Growth Media Placement Cost	$0	$0	N/A	$0
Ripping/Scarifying Cost	$0	$0	N/A	$0
Subtotal Earthworks	**$612**	**$1,440**	**$0**	**$2,052**
Revegetation Cost	$0	$0	$0	$0
TOTALS	**$73,236**	**$20,442**	**$0**	**$93,678**

Buildings & Foundation - User Input (cont.)

You must fill in ALL green cells and relevant blue cells in this section for each building or facility

		Construction Materials		Slab Demolition		Foundation Cover			Growth Media			Revegetation				
	Description (required)	Building Type (select)	Foundation Wall Type (select)	Slab Demo Method (select)	Slab Breaking Equipment Fleet (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Growth Media Material Type (select)	Growth Media Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Scarify/ Rip? (select)	Ripping Fleet (select)
1	**Conveyor Drive Tower**	**Sm. steel**	**Conc 8 in (200 mm) thick**	**Break & bury**	**Med Excavator**	**Granite - broke**	**Med Truck**									
2	**Crusher Access Tunnel**	**Sm. steel**	**Conc 8 in (200 mm) thick**	**Break & bury**	**Med Excavator**	**Granite - broke**	**Med Truck**									
3	**TSF Seepage Reclaim Building**	**Sm. steel**	**Conc 8 in (200 mm) thick**	**Break & bury**	**Med Excavator**	**Granite - broke**	**Med Truck**									
4	**TSF Barge**	**Sm. steel**	**Conc 8 in (200 mm) thick**	**Break & bury**	**Med Excavator**											
5	**Fresh Water Pump House**	**Sm. steel**	**Conc 8 in (200 mm) thick**	**Break & bury**	**Med Excavator**											

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Buildings & Foundation - Calculations

Building Volume Calculations

Using Means Heavy Construction Cost Data (2004) calculates cubic feet from building dimensions
- Estimage slab thickness and wall thickness if not known
- Assumes that all concrete slabs are reinforced
- Productivity for crew from Means Heavy Construction Cost Data (2004) adjusted for supervision
  - (addressed in Misc. Costs) and Davis-Bacon Wage Rates
- Demolition costs do not include hauling or disposing if debris - Use Waste Disposal module

Slab Demolition Calculations

Minimum 1 hr excavator time for slab demolition

Cover Volume Calculation

Foundation area x cover thickness
- If "Bury in Place" is selected as slab demolition method, cover thickness is adjusted such that
  - total cover (cover + growth media) equals value entered in "Minimum thickness of cover over unbroken slab" cell above

Ripping/Scarifying Calculations

Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)

Revegetation

Minimum 1 acre revegetation crew time per area

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Closure Cost Estimate
Foundations & Buildings

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Buildings & Foundation Demolition Cost Summary

	Labor	Equipment	Materials	Totals
Building Demolition Cost	$34,479	$11,992	N/A	$46,471
Wall Demolition Cost	$37,370	$4,370	N/A	$41,740
Slab Demolition	$775	$2,640	N/A	$3,415
Subtotal Demolition	**$72,624**	**$19,002**	**$0**	**$91,626**
Cover Placement Cost	$612	$1,440	N/A	$2,052
Growth Media Placement Cost	$0	$0	N/A	$0
Ripping/Scarifying Cost	$0	$0	N/A	$0
Subtotal Earthworks	**$612**	**$1,440**	**$0**	**$2,052**
Revegetation Cost	$0	$0	$0	$0
TOTALS	**$73,236**	**$20,442**	**$0**	**$93,678**

Building & Foundation Demolition Costs

Uses RS Means Heavy Construction Cost Data for building and wall demolition cost calculations. Uses CAT Handbook for slab breaking production.

								Building Demolition			Wall Demolition			Slab Demolition			Total Costs		
	Description (required)	Building Footprint (slab area) sqft	Building Volume cu ft	Wall Length ft	Wall Area sq ft	Slab Demolition Fleet	Slab Volume cy	Total Labor Cost $	Total Equipment Cost $	Total Building Demolition Cost $	Total Labor Cost $	Total Equipment Cost $	Total Wall Demolition Cost $	Total Labor Cost $	Total Equipment Cost $	Total Slab Breaking Cost $	Total Labor Cost $	Total Equipment Cost $	Total Demolition Costs $
1	**Conveyor Drive Tower**	2,500	75,000	200	200	345B	46	$17,250	$6,000	$23,250	$5,524	$646	$6,170	$155	$528	$683	$22,929	$7,174	$30,103
2	**Crusher Access Tunnel**	1,408	11,264	368	245	345B	35	$2,591	$901	$3,492	$6,767	$791	$7,558	$155	$528	$683	$9,513	$2,220	$11,733
3	**TSF Seepage Reclaim Building**	1,232	24,640	204	408	345B	23	$5,667	$1,971	$7,638	$11,269	$1,318	$12,587	$155	$528	$683	$17,091	$3,817	$20,908
4	**TSF Barge**	1,020	20,400	128	256	345B	19	$4,692	$1,632	$6,324	$7,071	$827	$7,898	$155	$528	$683	$11,918	$2,987	$14,905
5	**Fresh Water Pump House**	930	18,605	122	244	345B	17	$4,279	$1,488	$5,767	$6,739	$788	$7,527	$155	$528	$683	$11,173	$2,804	$13,977
			149,909				140	**$34,479**	**$11,992**	**$46,471**	**$37,370**	**$4,370**	**$41,740**	**$775**	**$2,640**	**$3,415**	**$72,624**	**$19,002**	**$91,626**

Building & Foundation - Foundation Cover and Growth Media Costs

		Foundation Cover								Growth Media								Total Cover & Growth Media Costs		
	Description (required)	Cover Volume cy	Cover Repacement Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Cost $	Growth Media Volume cy	Growth Media Repacement Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Growth Media Cost $	Total Labor Cost $	Total Equipment Cost $	Total Costs $
1	**Conveyor Drive Tower**	93	740/988G	488	2	1	$306	$720	$1,026						$0	$0	$0	$306	$720	$1,026
2	**Crusher Access Tunnel**	52	740/988G	488	2	1	$306	$720	$1,026						$0	$0	$0	$306	$720	$1,026
3	**TSF Seepage Reclaim Building**						$0	$0	$0						$0	$0	$0	$0	$0	$0
4	**TSF Barge**						$0	$0	$0						$0	$0	$0	$0	$0	$0
5	**Fresh Water Pump House**						$0	$0	$0						$0	$0	$0	$0	$0	$0
		145				2	**$612**	**$1,440**	**$2,052**						**$0**	**$0**	**$0**	**$612**	**$1,440**	**$2,052**

Building & Foundation - Scarifying/Revegetation Costs

					Scarifying/Ripping			Revegetation				Total Scarify & Revegation Costs			
	Description (required)	Flat Area acres	Area Long Dimension ft	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $	Total Labor Cost $	Total Equipment Cost $	Total Material Cost $	Total Costs $
1	**Conveyor Drive Tower**	0.10	0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	**Crusher Access Tunnel**	0.10	0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	**TSF Seepage Reclaim Building**	0.10	0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	**TSF Barge**	0.10	0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	**Fresh Water Pump House**	0.10	0		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
		0.50			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

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Closure Cost Estimate
Other Demo & Equip Removal

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Other Demoltion and Equipment Removal - Cost Summary	Labor	Equipment	Materials	Totals
Other Demolition	$0	$0	$0	$0
Equipment Removal	$502,741	$257,845	$0	$760,585
TOTALS	**$502,741**	**$257,845**	**$0**	**$760,585**

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Other Demolition

	Facility Description								
	Description (required)	ID Code	Type	Quantity	Units	Labor Unit Cost $	Equipment Unit Cost $	Material Unit Cost $	Total Cost $
1									
2									
						$0	$0	$0	

Notes:

Equipment & Material Removal

	Facility Description								
	Description (required)	ID Code	Type	Quantity	Units	Labor Unit Cost ($)	Equipment Unit Cost ($)	Material Unit Cost ($)	Total Cost ($)
1	**Belt Coveyor - Equipment removal**	**6.10.**	**Site Facilities - Structures**	**20**	**8**	**$3,998.48**	**$2,092.80**		$121,826
2	**Belt Coveyor - Structure removal**	**6.10.**	**Process - Crushing & Screening**	**64**	**8**	**$3,998.48**	**$2,092.80**		$389,842
3	**Conveyor Tower - Removal of Major Equipment**	**6.10.**	**Process - Crushing & Screening**	**4**	**8**	**$3,998.48**	**$2,092.80**		$24,365
4	**Crusher Conveyor Access Tunnel - Removal of Major Equipment**	**6.10.**	**Process - Crushing & Screening**	**4**	**8**	**$3,998.48**	**$2,092.80**		$24,365
5	**Fuel Tank distribution pipe removal**	**6.10.**	**Site Facilities**	**16**	**4**	**$1,999.24**	**$1,046.40**		$48,730
6	**TSF Barge - Removal of Major Equipment**	**6.10.**	**Site Facilities - Structures**	**6**	**4**	**$1,999.24**	**$1,046.40**		$18,274
7	**TSF Seepage Reclaim Building - Removal of Major Equipment**	**6.10.**	**Site Facilities - Buildings**	**8**	**2**	**$847.12**	**$298.48**		$9,165
8	**Fresh Water Pump House - Removal of Major Equipment**	**6.10.**	**Site Facilities - Buildings**	**6**	**2**	**$847.12**	**$298.48**		$6,874
9	**Heap Leach Well Head Houses**	**6.10.**	**Site Facilities - Buildings**	**3**	**5**	**$2,117.80**	**$746.20**		$8,592
10	**Heap Leach PSPS and valve Enclosure**	**6.10.**	**Site Facilities - Buildings**	**6**	**5**	**$2,117.80**	**$746.20**		$17,184
						$502,741	**$257,845**	**$0**	**$669,217**

Notes:

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Closure Cost Estimate
Sediment & Drainage Control

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Drainage Control - Cost Summary

	Labor	Equipment	Materials	Totals
Diversion Ditch Construction	$37,531	$65,359	N/A	$102,890
Diversion Ditch Liner	$0	$0	$0	$0
Diversion Ditch Rip-Rap	$561,403	$129,565	$0	$690,968
Sed Pond Construct/Regrade	$16,701	$75,966	N/A	$92,667
Liner Installation	$0	$0	$0	$0
Sed Pond Cover	$0	$0	N/A	$0
Ripping/Scarifying Cost	$0	$0	N/A	$0
Subtotal Earthworks	**$615,635**	**$270,890**	**$0**	**$886,525**
Diversion Ditch Revegetation	$0	$3,132	$3,675	$6,807
Sediment Pond Revegetation	$0	$0	$0	$0
Subtotal Revegetation	**$0**	**$3,132**	**$3,675**	**$6,807**
TOTALS	**$615,635**	**$274,022**	**$3,675**	**$893,332**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Diversion Ditches - User Input

			Diversions Ditches							Revegetation			Liner and Rip-Rap Installation			
	Description (required)	ID Code	Diversion Length ft	Diversion Depth ft	Ditch Bottom Width ft	Ditch Sideslope Angle _H:1V	Excavate Volume (if calculated elsewhere) cy	Excavating Material Condition (select)	Excavating Equipment Fleet (select)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Liner Area S.Y.	Liner Type (select)	Rip-Rap Area S.Y.	Rip-Rap Type (select type)
1	Spill Way (Rock Cut)	6.3.2	571	8.0	35.0	2.5		1	Small	None	None	None			1,651	Rip-Rap 18 in (45
2	Spillway Exit	6.3.2	1153.3	6.0	25.0	2.5		1	Small	None	None	None			2,448	Rip-Rap 18 in (45
3	Downchute Approach	6.3.2	62.5	6.0	25.0	2.5		1	Small	None	None	None			133	Rip-Rap 18 in (45
4	Downchute (Concrete Baffles see User 4)	6.3.2	0	0.0	0.0	0.0									0	
5	Downchute Exit Reach 1	6.3.2	522.1	6.0	25.0	2.5		1	Small	None	None	None			1,108	Rip-Rap 18 in (45
6	Downchute Exit Reach 2	6.3.2	509	6.0	25.0	2.5		1	Small	None	None	None			1,080	Rip-Rap 18 in (45
7	Outlet Downchute	6.3.2	250	6.0	30.0	4.0		1	Small	None	None	None			736	Rip-Rap 18 in (45
8	Energy Dissapation Basin	6.3.2	100	6.0	30.0	4.0		1	Small	None	None	None			294	Rip-Rap 18 in (45
9	Conveyance Channels for North Wetland System	3	11500	8.0	14.0	3.0		1	Small	User Mix 5 (fror	None	Chemical			0	

Notes:
Since channels will be constructed on historical placer mining tailings, erosion control is not expected to be a requirement.

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Sediment/Evaporation Pond Construction/Removal - User Input

			Sediment Ponds								Growth Media		
	Description (required)	ID Code	Pond Width ft	Pond/Berm Length ft	Berm Height ft	Crest Width ft	Sideslope Angle _H:1V	Final Area (if calculated elsewhere) acres	Regrade Volume (if calculated elsewhere) cy	Cover Volume (if calculated elsewhere) cy	Growth Media Thickness in	Distance from Growth Media Stockpile ft	Slope from Pond to Borrow % grade
1	**North Wetland Basins Ponds (six total)**		**500**	**2,000**	**6.0**	**3.0**	**3.0**	**7.00**	**67,759**	**0**	**0**	**0**	**0.0**

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)
3. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Sediment/Evaporation pond construction is used to estimate GIL causeway Removal. Culvert removal is included on misc costs spreadsheet.

Sediment/Evaporation Pond Construction/Removal - User Input (cont.)

		Sediment Ponds				Growth Media			Revegetation			Ripping/Scarifying	
	Description (required)	Excavating Material Condition (select)	Material Type (select)	Excavating Equipment Fleet (select)	Liner Type (select)	Growth Media Material Type (select)	Growth Media Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Scarify/ Rip? (select)	Scarify/ Ripping Fleet (select)
1	**North Wetland Basins Ponds (six total)**	**1.2**	**Stone - crushed**	**Large**									

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

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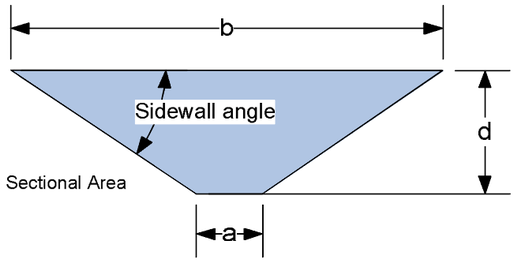
Drainage Control - Calculations

Diversion Ditch Volume Calculation



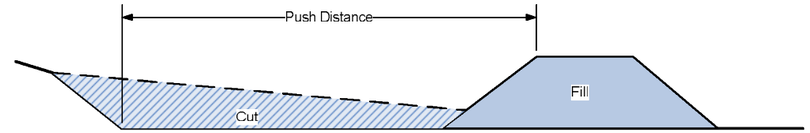
Cross Sectional Area = $\frac{(a + b)}{2} \times d$

Ditch Volume = Ditch Length x Cross Sectional Area

Figure 1 - Ditch Volume Calculation

1) Assume 20% swell for excavations
2) Assumes heavy duty trenching bucket is used

Sediment/Evaporation Pond Construction Calculation



Cut = Fill
Push distance = pond width up to 2/3 max push distance (400 ft)

Figure 2 - Sediment Ponds

1) Assume balanced cut-to-fill for berm construction
2) Include cost for liner, if required.
3) Include line items for removal, if necessary.
4) Assume 20% swell for excavations
5) Minimum 1 hr ripping/scarifying per area
6) Minimum 1 acre revegetation crew time per area

Diversion Ditches - Excavation Costs

									Liner Installation				Rip-Rap Installation			
	Description (required)	Diversion Ditch Volume LCY	Diversion Ditch Equipment	Corrected Excavator Productivity LCY/hr	Total Hours	Diversion Ditch Labor Cost $	Diversion Ditch Equipment Cost $	Total Diversion Ditch Cost $	Total Labor Cost $	Total Equipment Cost $	Total Material Cost $	Total Liner Cost $	Labor Cost $	Equipment Cost $	Material Cost $	Total Cost $
1	Spill Way (Rock Cut)	11,166	325C	398	28	$2,136	$3,720	$5,856	$0	$0	$0	$0	$124,403	$28,711	$0	$153,114
2	Spillway Exit	12,302	325C	398	31	$2,365	$4,118	$6,483	$0	$0	$0	$0	$184,459	$42,571	$0	$227,030
3	Downchute Approach	667	325C	398	2	$153	$266	$419	$0	$0	$0	$0	$9,996	$2,307	$0	$12,303
4	Downchute (Concrete Baffles see User 4)					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	Downchute Exit Reach 1	5,569	325C	398	14	$1,068	$1,860	$2,928	$0	$0	$0	$0	$83,505	$19,272	$0	$102,777
6	Downchute Exit Reach 2	5,429	325C	398	14	$1,068	$1,860	$2,928	$0	$0	$0	$0	$81,410	$18,788	$0	$100,198
7	Outlet Downchute	3,600	325C	398	9	$687	$1,196	$1,883	$0	$0	$0	$0	$55,450	$12,797	$0	$68,247
8	Energy Dissapation Basin	1,440	325C	398	4	$305	$531	$836	$0	$0	$0	$0	$22,180	$5,119	$0	$27,299
9	Conveyance Channels for North Wetland System	155,378	325C	398	390	$29,749	$51,808	$81,557	$0	$0	$0	$0	$0	$0	$0	$0
		195,551			492	**$37,531**	**$65,359**	**$102,890**	**$0**	**$0**	**$0**	**$0**	**$561,403**	**$129,565**	**$0**	**$690,968**

Notes: LCM assumes 20% swell from ditch volume

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Closure Cost Estimate
Sediment & Drainage Control

Diversion Ditches - Revegetation Costs

	Description (required)	Surface Area acres	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**Spill Way (Rock Cut)**	1.00	$0	$0	$0	$0
2	**Spillway Exit**	1.50	$0	$0	$0	$0
3	**Downchute Approach**	0.10	$0	$0	$0	$0
4	**Downchute (Concrete Baffles see User 4)**		$0	$0	$0	$0
5	**Downchute Exit Reach 1**	0.70	$0	$0	$0	$0
6	**Downchute Exit Reach 2**	0.70	$0	$0	$0	$0
7	**Outlet Downchute**	0.50	$0	$0	$0	$0
8	**Energy Dissapation Basin**	0.20	$0	$0	$0	$0
9	**Conveyance Channels for North Wetland System**	17.10	$0	$3,132	$3,675	$6,807
		21.80	**$0**	**$3,132**	**$3,675**	**$6,807**

Sediment/Evaporation Ponds - Construction/Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83)

	Description (required)	Regrading Volume cy	Sed/Evap Pond Equipment	Dozing Distance (see above) ft	Uncorrected Dozer Productivity LCY/hr	Grade Correction	Density Correction	Excavating Material	Corrected Productivity LCY/hr	Total Dozer Hours hr	Earthwork: Total Labor Cost $	Earthwork: Total Equipment Cost $	Earthwork: Total Constr/ Regrading Cost $	Liner: Total Labor Cost $	Liner: Total Equipment Cost $	Liner: Total Material Cost $
1	**North Wetland Basins Ponds (six total)**	67,759	D10R	400	501	1.00	0.85	1.20	318	213	$16,701	$75,966	$92,667	$0	$0	$0
		67,759								213	**$16,701**	**$75,966**	**$92,667**	**$0**	**$0**	**$0**

Sediment/Evaporation Ponds - Growth Media Costs

	Description (required)	Growth Media: Growth Media Volume cy	Growth Media Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Placement Cost $
1	**North Wetland Basins Ponds (six total)**						$0	$0	$0
							$0	**$0**	**$0**

Sediment/Evaporation Ponds - Revegetation Costs

	Description (required)	Surface Area acres	Long Ripping Distance ft	Area Width ft	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	**North Wetland Basins Ponds (six total)**	7.00	610	500		$0	$0	$0	$0	$0	$0	$0
		7.00	609.84		0	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

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Closure Cost Estimate
Yards, Etc.

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Yards, Etc. - Cost Summary

	Labor	Equipment	Materials	Totals
Regrading Cost	$0	$0	N/A	$0
Cover Placement Cost	$0	$0	N/A	$0
Growth Media Placement Cost	$70,430	$280,566	N/A	$350,996
Ripping/Scarifying Cost	$25,325	$115,198	N/A	$140,523
Subtotal Earthworks	**$95,755**	**$395,764**		**$491,519**
Revegetation Cost	$0	$92,641	$97,365	$190,006
TOTALS	**$95,755**	**$488,405**	**$97,365**	**$681,525**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Yards, Etc. - User Input — You must fill in ALL green cells and relevant blue cells in this section for each building or facility

	Facility Description			Physical			Cover			Growth Media		
	Description (required)	ID Code	Type	Area acres	Average Flat Area Long Dimension (ripping distance) ft	Regrade Volume (calculated elsewhere) cy	Cover Thickness in	Distance from Cover Borrow Area ft	Slope from Facility to Borrow Area % grade	Growth Media Thickness in	Distance from Growth Media Stockpile ft	Slope from Facility to Stockpile % grade
1	Laydown Yard		Yard	39.24	925	0				6	4,180	-1.9
2	Barnes Creek Borrow		Other Facilities	105.00	2,649	0				0	0	0.0
3	Fort Knox Access Road		Other Facilities	96.00	16,673	0				6	6,510	-2.1
4	Phase 7 Haul Road and Dewatering Access Roads		Other Facilities	72.00	3,835	0				6	1,835	-3.3
5	Pipeline Road		Other Facilities	16.40	7,442	0				0	0	0.0
6	Heap Leach Haul Road		Other Facilities	30.00	1,725	0				6	3,948	0.3
7	Dewatering Access Road		Other Facilities	3.00	753	0				0	0	0.0
8	Borrow Access Roads		Other Facilities	16.80	955	0				0	0	0.0
9	Heap Leach Growth Media 1		Other Facilities	92.80	2,696	0				0	0	0.0
10	Heap Leach Growth Media 2		Other Facilities	5.31	532	0				0	0	0.0
11	Barnes Creek Growth Media		Other Facilities	4.40	552	0				0	0	0.0
12	Yellow Pup Growth Media 1		Other Facilities	4.10	706	0				0	0	0.0
13	Yellow Pup Growth Media 2		Other Facilities	3.95	546	0				0	0	0.0
14	Yellow Pup Growth Media 3		Other Facilities	3.90	643	0				0	0	0.0
15	Yellow Pup Growth Media 4		Other Facilities	8.60	1,006	0				0	0	0.0
16	TSF South Growth Media		Other Facilities	4.24	674	0				0	0	0.0

Notes:
1. All Physical parameters must be input even if manual overrides for volume or area are used.
2. If Slope from facility to borrow source is >20, downhill travel time may be underestimated due to limitation of uphill travel time curves and downhill speed tables from CAT Handbook (see Productivty Sheet)

Laydown Yard and Road reclamation will entail ripping prior to GM placement then ripping the growth media (second ripping) followed by seeding and fertilizing.
The area was doubled to account for ripping twice therefor the the GM reduced to 6 inches and Seed mix is User 1 which is 1/2 the cost of User Mix 5
Pipeline Road, Borrow Access Roads, and Dewatering Access Road only needs to be ripped.

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Yards, Etc. - User Input (cont.)

You must fill in ALL green cells and relevant blue cells in this section for each building or facility

		Grading			Cover			Growth Media			Revegetation				
	Description (required)	Dozing Material Condition (select)	Dozing Material Type (select)	Grading Equipment Fleet (select)	Cover Material Type (select)	Cover Placement Equipment Fleet (select)	Maximum Fleet Size (user override)	Growth Media Material Type (select)	Growth Media Equipment Fleet (select)	Maximum Fleet Size (user override)	Seed Mix (select)	Mulch (select)	Fertilizer (select)	Scarify/ Rip? (select)	Ripping Fleet (select)
1	Laydown Yard	1	Shale	Large				Topsoil	Large Truck		User Mix 1	None	Chemical	Yes	Large Dozer
2	Barnes Creek Borrow	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer
3	Fort Knox Access Road	1	Shale	Large				Topsoil	Large Truck		User Mix 1	None	Chemical	Yes	Large Dozer
4	Phase 7 Haul Road and Dewatering Access Roads	1	Shale	Large				Topsoil	Large Truck		User Mix 1	None	Chemical	Yes	Large Dozer
5	Pipeline Road	1	Shale	Large				Shale	Large Truck		User Mix 1	None	Chemical	Yes	Large Dozer
6	Heap Leach Haul Road	1	Shale	Large				Topsoil	Large Truck		User Mix 1	None	Chemical	Yes	Large Dozer
7	Dewatering Access Road	1	Shale	Large				Shale	Large Truck		User Mix 1	None	Chemical	Yes	Large Dozer
8	Borrow Access Roads	1	Shale	Large				Shale	Large Truck		User Mix 1	None	Chemical	Yes	Large Dozer
9	Heap Leach Growth Media 1	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer
10	Heap Leach Growth Media 2	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer
11	Barnes Creek Growth Media	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer
12	Yellow Pup Growth Media 1	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer
13	Yellow Pup Growth Media 2	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer
14	Yellow Pup Growth Media 3	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer
15	Yellow Pup Growth Media 4	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer
16	TSF South Growth Media	1	Topsoil	Large							User Mix 5 (fro	None	Chemical	Yes	Large Dozer

Notes:
1. Material Types are used for density correction based on material densities in Caterpillar Performance Handbook material density table

Yards, Etc. - Calculations

Grading Calculations

Average push distance assumed to be 2/3 of the 600 feet maximum from Catepillar Handbook or 400 feet
Material assumed to be loose stockile (1.2 productivity factor)
Slope assumed to be 0 to 5% (1.0 productivity factor)

Cover Volume Calculation

Yard area x cover thickness

Ripping/Scarifying Calculations

Flat area width = Final flat area ÷ Average long dimensions
Number of passes = Flat area width ÷ Grader width
Travel distance = Number of passes x Average long dimensions
Total hours = (Travel distance ÷ Grader productivity) + (Number of passes x Grader maneuver time)
Minimum 1 hr ripping/scarifying per area

Revegetation

Minimum 1 acre revegetation crew time per area

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Yards, Etc. - Regrading Costs

Productivity = Dozer Productivity x Grade Correction x Density Correction x Operator (0.75) x Material x Visibility x Job Efficiency (0.83) x (Slot/Side-by-Side)

	Description (required)	Regrading Volume cy	Dozing Distance (see above) ft	Uncorrected Dozer Productivity cy/hr	Grade Correction	Dozing Material	Density Correction	Total Hourly Productivity cy/hr	Total Dozer Hours hr	Total Labor Cost $	Total Equipment Cost $	Total Regrading Cost $
1	Laydown Yard									$0	$0	$0
2	Barnes Creek Borrow									$0	$0	$0
3	Fort Knox Access Road									$0	$0	$0
4	Phase 7 Haul Road and Dewatering Access Roads									$0	$0	$0
5	Pipeline Road									$0	$0	$0
6	Heap Leach Haul Road									$0	$0	$0
7	Dewatering Access Road									$0	$0	$0
8	Borrow Access Roads									$0	$0	$0
9	Heap Leach Growth Media 1									$0	$0	$0
10	Heap Leach Growth Media 2									$0	$0	$0
11	Barnes Creek Growth Media									$0	$0	$0
12	Yellow Pup Growth Media 1									$0	$0	$0
13	Yellow Pup Growth Media 2									$0	$0	$0
14	Yellow Pup Growth Media 3									$0	$0	$0
15	Yellow Pup Growth Media 4									$0	$0	$0
16	TSF South Growth Media									$0	$0	$0
										$0	**$0**	**$0**

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Closure Cost Estimate
Yards, Etc.

Yards, Etc. - Cover and Growth Media Costs

		Cover								Growth Media							
	Description (required)	Cover Volume cy	Topsoil Repacement Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Cover Cost $	Growth Media Volume cy	Growth Media Fleet	Fleet Productivity LCY/hr	Number of Trucks/ Scrapers	Total Fleet Hours	Total Labor Cost $	Total Equipment Cost $	Total Topsoiling Cost $
1	Laydown Yard						$0	$0	$0	31,621	777D/992G	780	2	41	$12,784	$51,791	$64,575
2	Barnes Creek Borrow						$0	$0	$0						$0	$0	$0
3	Fort Knox Access Road						$0	$0	$0	77,440	777D/992G	966	3	80	$31,143	$121,404	$152,547
4	Phase 7 Haul Road and Dewatering Access Roads						$0	$0	$0	58,080	777D/992G	1,011	2	57	$17,773	$72,002	$89,775
5	Pipeline Road						$0	$0	$0						$0	$0	$0
6	Heap Leach Haul Road						$0	$0	$0	24,200	777D/992G	872	2	28	$8,730	$35,369	$44,099
7	Dewatering Access Road						$0	$0	$0						$0	$0	$0
8	Borrow Access Roads						$0	$0	$0						$0	$0	$0
9	Heap Leach Growth Media 1						$0	$0	$0						$0	$0	$0
10	Heap Leach Growth Media 2						$0	$0	$0						$0	$0	$0
11	Barnes Creek Growth Media						$0	$0	$0						$0	$0	$0
12	Yellow Pup Growth Media 1						$0	$0	$0						$0	$0	$0
13	Yellow Pup Growth Media 2						$0	$0	$0						$0	$0	$0
14	Yellow Pup Growth Media 3						$0	$0	$0						$0	$0	$0
15	Yellow Pup Growth Media 4						$0	$0	$0						$0	$0	$0
16	TSF South Growth Media						$0	$0	$0						$0	$0	$0
							$0	**$0**	**$0**	191,341				206	**$70,430**	**$280,566**	**$350,996**

Yards, Etc. - Scarifying/Revegetation Costs

	Description (required)	Surface Area acres	Area Long Dimension ft	Scarifying/ Ripping Hours hrs	Scarifying/ Ripping Labor Costs $	Scarifying/ Ripping Equipment Cost $	Total Scarifying/ Ripping Costs $	Revegetation Labor Cost $	Revegetation Equipment Cost $	Revgetation Material Cost $	Total Revegetation Cost $
1	Laydown Yard	39.24	925	25	$1,960	$8,916	$10,876	$0	$7,188	$6,809	$13,997
2	Barnes Creek Borrow	105.00	2,649	67	$5,253	$23,896	$29,149	$0	$19,234	$22,565	$41,799
3	Fort Knox Access Road	96.00	16,673	60	$4,705	$21,399	$26,104	$0	$17,585	$16,656	$34,241
4	Phase 7 Haul Road and Dewatering Access Roads	72.00	3,835	46	$3,607	$16,406	$20,013	$0	$13,189	$12,493	$25,682
5	Pipeline Road	16.40	7,442	10	$784	$3,567	$4,351	$0	$3,004	$2,846	$5,850
6	Heap Leach Haul Road	30.00	1,725	19	$1,490	$6,776	$8,266	$0	$5,495	$5,205	$10,700
7	Dewatering Access Road	3.00	753	2	$157	$713	$870	$0	$550	$520	$1,070
8	Borrow Access Roads	16.80	955	11	$863	$3,923	$4,786	$0	$3,077	$2,915	$5,992
9	Heap Leach Growth Media 1	92.80	2,696	59	$4,626	$21,042	$25,668	$0	$16,999	$19,943	$36,942
10	Heap Leach Growth Media 2	5.31	532	3	$235	$1,070	$1,305	$0	$973	$1,141	$2,114
11	Barnes Creek Growth Media	4.40	552	3	$235	$1,070	$1,305	$0	$806	$945	$1,751
12	Yellow Pup Growth Media 1	4.10	706	3	$235	$1,070	$1,305	$0	$751	$881	$1,632
13	Yellow Pup Growth Media 2	3.95	546	3	$235	$1,070	$1,305	$0	$724	$849	$1,573
14	Yellow Pup Growth Media 3	3.90	643	3	$235	$1,070	$1,305	$0	$714	$838	$1,552
15	Yellow Pup Growth Media 4	8.60	1,006	6	$470	$2,140	$2,610	$0	$1,575	$1,848	$3,423
16	TSF South Growth Media	4.24	674	3	$235	$1,070	$1,305	$0	$777	$911	$1,688
		505.74		323	**$25,325**	**$115,198**	**$140,523**	**$0**	**$92,641**	**$97,365**	**$190,006**

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Closure Cost Estimate
Misc. Costs

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Miscellaneous Cost Summary

	Labor	Equipment	Materials	Totals
Fence Removal	$9,850	$2,200	N/A	$12,050
Fence Installation	$0	$0	$0	$0
Culvert & Buried Pipe Removal	$5,335	$1,197	N/A	$6,532
Surface Pipe Removal	$1,167,190	$58,353	N/A	$1,225,543
Power Lines	$172,335	N/A	N/A	$172,335
Substations/Transformers	$26,040	N/A	N/A	$26,040
Rip-rap, rock lining, gabions	$0	$0	$0	$0
Other Costs	$0	$0	$0	$0
TOTALS	**$1,380,750**	**$61,750**	**$0**	**$1,442,500**

Color Code Key

User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Fence Removal — **You must fill in ALL green and blue cells**

	Description (required)	ID Code	Length ft	Type (select type)	Costs: Labor Cost $	Equipment Cost $	Total Cost $
1	**Heap Leach Fencing**	**6.12**	**2500**	**Chain link 8-10 ft**	$9,850	$2,200	$12,050
					$9,850	**$2,200**	**$12,050**

Notes:

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Closure Cost Estimate
Misc. Costs

Fence Installation

You must fill in ALL green and blue cells

	Description (required)	ID Code	Input: Length ft	Input: Type (select type)	Costs: Labor Cost $	Costs: Equipment Cost $	Costs: Material Cost ($)	Costs: Total Cost $
					$0	$0	$0	$0

Notes:

Culvert & Buried Pipe Removal

You must fill in ALL green and blue cells

	Description (required)	ID Code	Input: Length ft	Input: Type (select type)	Input: Location (select)	Costs: Labor Cost $	Costs: Equipment Cost $	Costs: Total Cost $
1	GIL Culvert 6.5 ft		100	36 in (1m) Diamet	On site	$1,947	$437	$2,384
2	GIL Culvert 10 ft		82	36 in (1m) Diamet	On site	$1,597	$358	$1,955
3	GIL Culvert 4 ft		92	36 in (1m) Diamet	On site	$1,791	$402	$2,193
						$5,335	$1,197	$6,532

Notes: **Note SRCE culvet removal goes up to 36".**

Surface Pipe Removal

You must fill in ALL green and blue cells

	Description (required)	ID Code	Input: Length ft	Input: Type (select type)	Input: Location (select)	Costs: Labor Cost $	Costs: Equipment Cost $	Costs: Total Cost $
1	18" Fresh water pipline to barge Pond		18280	10 in (250 mm) - 1	On site	$171,101	$8,592	$179,693
2	12" Fresh water pipeline to Mill (length above ground)		32730	10 in (250 mm) - 1	On site	$306,353	$15,383	$321,736
3	18" Seepage to Barge Pond pipeline		3775	10 in (250 mm) - 1	On site	$35,334	$1,774	$37,108
4	20" Barge to Mill pipeline		14450	20 in (500 mm) - 3	On site	$203,023	$10,115	$213,138
5	Mill to tailings discharge lines		20000	20 in (500 mm) - 3	On site	$281,000	$14,000	$295,000
6	South pond to North Pond		10475	20 in (500 mm) - 3	On site	$147,174	$7,333	$154,507
7	Misc interceptor well pipelines		4129	6 in (150 mm) - 8 i	On site	$23,205	$1,156	$24,361
						$1,167,190	$58,353	$1,225,543

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Closure Cost Estimate
Misc. Costs

Notes:

Power Line and Substation Removal			You must fill in ALL green and blue cells								
			Input				Costs			Cost Breakdown	
	Description (required)	ID Code	Power Line Length miles	Power Line Type (select)	Number of Substations #	Location (select)	Power Line Removal $	Substation Removal $	Total Cost $	Labor Cost $	Equipment Cost $
1	Mine Powerlines		8.033522727	Single Pole	4	On-site	$172,335	$26,040	$198,375	$39,675	$158,700
							$172,335	$26,040	$198,375	$39,675	$158,700

Notes: If substation owned by operator, use Other Demo & Equipment Removal sheet
User may need to add line items in Foundations & Buildings for substation slab demolition and fence removal
Labor/Equipment costs assume approximately 80% of cost are equipment and 20% are labor related costs
Mine power lines includes the following substations (sectionalizer) 1 at the Heap Leach, 1 at the freshwater reservoir, 1 at the seepage reclaim building and one at the Barge Pond.

Rip-Rap & Rock Lining			You must fill in ALL green and blue cells					
			Input		Costs			
	Description (required)	ID Code	Area S.Y.	Type (select type)	Labor Cost $	Equipment Cost $	Material Cost $	Total Cost $
					$0	$0	$0	$0

Notes:

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Closure Cost Estimate
Constr. Mgmt

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Construction Management & Road Maintenance - Cost Summary	Labor	Equipment	Materials	Totals
Construction Management	$0	$0	N/A	$0
Construction Support		$0		$0
Road Maintenance	$145,104	$393,504	$0	$538,608
TOTAL CONSTRUCTION MANAGEMENT	**$145,104**	**$393,504**	**$0**	**$538,608**

Clear Sheet

Construction Management

Construction Management Staff

Description	Duration mo.	Hours/ Month hr.	Number of Supervisors	Supervisor Rate $/hr	Labor Cost $	Equipment Cost(1) $	Totals $
Active Reclamation					$0	$0	$0
Monitoring & Maintenance					$0	$0	$0
				Total Staff	**$0**	**$0**	**$0**

Construction Management Support

Description	Duration mo.	Number of Units		Rental Rate $/mo	Generator Cost $/mo	Equipment Cost(1) $	Totals $
Temporary Office Rental						$0	$0
Temporary Toilets						$0	$0
					Total Support	**$0**	**$0**

Notes: Office rental assumes only 1 generator required for every 4 trailers

Total Construction Management **$0**

Road Maintenance

Description	Fleet Size (select)	Number	Duration mo.	Hours/ Month hr.	Labor Cost $	Equipment Cost $	Totals $
Active Reclamation							
Water Truck	**Large**	**1**	**24**	**40**	$69,830	$244,186	$314,016
Grader	**Large**	**1**	**24**	**40**	$75,274	$149,318	$224,592
Monitoring & Maintenance							
Water Truck	**Large**				$0	$0	$0
Grader	**Large**				$0	$0	$0
Description	**Gallons/ Day**	**Days/ Month**	**Duration mo.**	**Cost/ Gallon $**			**Totals $**
Water Fees							
Water Fees							$0
				Total Project Maintenance	**$145,104**	**$393,504**	**$538,608**

Notes: 1) Supervisor equipment = pickup truck
Assumptions for Road Maintenance: Active Reclamation 2017 - 2029 grade and dust control twice per year.

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Closure Cost Estimate
Labor Rates

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Color Code Key	
User Input - Direct Input	Direct Input
User Input - Pull Down List	Pull Down Selection
Program Constant (can override)	Alternate Input
Program Calculated Value	Locked Cell - Formula or Reference

ZONE ADJUSTMENTS		
Cost Basis/Project Region	Alaska	Interior Alaska
Power Equipment Operators	Overtime Factor	$9.91
Truck Drivers	Overtime Factor	$9.91
Laborers	Overtime Factor	$9.91

INDIRECT COSTS	
Unemployment (%)	
Retirement/SS/Medicare (%)	
Workman's Compensation (%)	
Other Indirects	
State Payroll Tax (13),(15),(17),(1	
Additional markup to base rate	21.00%
Total Other Indirects	**21.00%**

HOURLY LABOR RATE TABLE

EQUIPMENT TYPE (1) OR JOB DESCRIPTION	Labor Group	Base Rate ($/hr)	Zone Adjustment ($/hr)	Hourly Wage ($/hr)	Fringe ($/hr)	Retirement/ Medicare ($/hr)	Unemployment Insurance ($/hr)	Workman's Compensation ($/hr)	Other Indirect Costs ($/hr)	Additional User Markups to Base Rate† ($/hr)	%	($/hr)	Total ($/hr)
Equipment Operators ($/hr) (2)													
Bulldozers													
D6R	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
D6R w/ Winch	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
D7R	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
D8R	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
D9R	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
D10R	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
D11R	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
Wheeled Dozers													
824G	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
834G	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
844	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
854G	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
Motor Graders													
120H	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
14G/H	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
16G/H	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
24M	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
Track Excavators													
312C	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
320C	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
325C	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
330C	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
345B	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
365BL	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
385BL	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
Scrapers													
631G	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
637G	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
Wheeled Loaders													
924G	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
928G	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
950G	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
966G	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
972G	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
980G	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
988G	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
990	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
992G	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
994D	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
L2350	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
Shovels													
PC2000	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
PC3000	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
PC4000	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
PC5500	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
PC8000	A1602 Goup 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
Hydraulic Hammers													
H-120 (fits 325)													
H-160 (fits 345)													
H-180 (fits 365/385)													
Demolition Shears													
S340 (fits 322/325/330)													
S365 (fits 330/345)													
S390 (fits 365/385)													
Demolition Grapples													
G315 (fits 322/325)													
G320 (fits 325/330)													
G330 (fits 345/365)													

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Other Equipment													
420D 4WD Backhoe	A1602 Group 1 A	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
428D 4WD Backhoe	A1601 Group 1	$37.43	$9.91	$47.34	$19.00	$0.00	$0.00	$0.00	$9.94			$0	$76.28
CS533E Vibratory Roller	A1604 Group 3	$35.94	$9.91	$45.85	$19.00	$0.00	$0.00	$0.00	$9.63			$0	$74.48
CS633E Vibratory Roller	A1604 Group 4	$36.94	$9.91	$46.85	$19.00	$0.00	$0.00	$0.00	$9.84			$0	$75.69
CP533E Sheepsfoot Compactor	A1604 Group 5	$37.94	$9.91	$47.85	$19.00	$0.00	$0.00	$0.00	$10.05			$0	$76.90
CP633E Sheepsfoot Compactor	A1604 Group 6	$38.94	$9.91	$48.85	$19.00	$0.00	$0.00	$0.00	$10.26			$0	$67.85
Light Truck - 1.5 Ton	A2106 Group V	$34.85	$9.91	$44.76	$19.00	$0.00	$0.00	$0.00	$9.40			$0	$73.16
Supervisor's Truck	A2106 Group V	$34.85	$9.91	$44.76	$19.00	$0.00	$0.00	$0.00	$9.40			$0	$73.16
Flatbed Truck	A2105 Group IV	$35.61	$9.91	$45.52	$19.00	$0.00	$0.00	$0.00	$9.56			$0	$64.52
Air Compressor + tools	N0403 Goup 3	$33.68	$9.91	$43.59	$19.00	$0.00	$0.00	$0.00	$9.15			$0	$62.59
Welding Equipment	N1203 Group 3	$30.90	$9.91	$40.81	$19.00	$0.00	$0.00	$0.00	$8.57			$0	$59.81
Heavy Duty Drill Rig	N2204 Group 3A	$36.60	$9.91	$46.51	$19.00	$0.00	$0.00	$0.00	$9.77			$0	$65.51
Pump (plugging) Drill Rig	N2204 Group 3A	$37.60	$9.91	$47.51	$19.00	$0.00	$0.00	$0.00	$9.98			$0	$66.51
Concrete Pump					$19.00							$0	
Gas Engine Vibrator	A1601 Group 1	$36.83	$9.91	$46.74	$19.00	$0.00	$0.00	$0.00	$9.82			$0	$75.56
Generator 5KW					$19.00							$0	
HDEP Welder (pipe or liner)					$19.00							$0	
5 Ton Crane	A1601 Group 1	$37.13	$9.91	$47.04	$19.00	$0.00	$0.00	$0.00	$9.88			$0	$75.92
20 Ton Crane	A1601 Group 1	$37.13	$9.91	$47.04	$19.00	$0.00	$0.00	$0.00	$9.88			$0	$75.92
50 Ton Crane	A1602 Group 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41
120 Ton Crane	A1602 Group 1A	$39.19	$9.91	$49.10	$19.00	$0.00	$0.00	$0.00	$10.31			$0	$78.41

NOTES:

(1) Equipment Type:	Catepillar model or equivalent, LeTourneau
(2) Equipment Operator Source:	
(3) Zone Basis:	

Truck Drivers ($/hr) (4)													
725	A2104 Group III	$36.19	$9.91	$46.10	$17.66	$0.00	$0.00	$0.00	$9.68			$0	$73.44
730	A2103 Group II	$37.01	$9.91	$46.92	$17.66	$0.00	$0.00	$0.00	$9.85			$0	$74.43
735	A1601 Group 1	$37.01	$9.91	$46.92	$17.66	$0.00	$0.00	$0.00	$9.85			$0	$74.43
740	A1601 Group 1	$37.01	$9.91	$46.92	$17.66	$0.00	$0.00	$0.00	$9.85			$0	$74.43
769D	A2102 Group 1A	$39.54	$9.91	$49.45	$17.66	$0.00	$0.00	$0.00	$10.38			$0	$77.49
773E	A2102 Group 1A	$39.54	$9.91	$49.45	$17.66	$0.00	$0.00	$0.00	$10.38			$0	$77.49
777D	A2102 Group 1A	$39.54	$9.91	$49.45	$17.66	$0.00	$0.00	$0.00	$10.38			$0	$77.49
785C	A2102 Group 1A	$39.54	$9.91	$49.45	$17.66	$0.00	$0.00	$0.00	$10.38			$0	$77.49
793C	A2102 Group 1A	$39.54	$9.91	$49.45	$17.66	$0.00	$0.00	$0.00	$10.38			$0	$77.49
797B	A2102 Group 1A	$39.54	$9.91	$49.45	$17.66	$0.00	$0.00	$0.00	$10.38			$0	$77.49
613E (5,000 gal) Water Wagon	A2105 Group 1	$35.61	$9.91	$45.52	$17.66	$0.00	$0.00	$0.00	$9.56			$0	$72.74
621E (8,000 gal) Water Wagon	A2105 Group 1	$35.61	$9.91	$45.52	$17.66	$0.00	$0.00	$0.00	$9.56			$0	$72.74
777D Water Truck	A2105 Group 1	$35.61	$9.91	$45.52	$17.66	$0.00	$0.00	$0.00	$9.56			$0	$72.74
785C Water Truck	A2105 Group 1	$35.61	$9.91	$45.52	$17.66	$0.00	$0.00	$0.00	$9.56			$0	$72.74
Dump Truck (10-12 yd3)	A2104 Group III	$36.19	$9.91	$46.10	$17.66	$0.00	$0.00	$0.00	$9.68			$0	$73.44

NOTES:

(4) Truck Driver Source:	Alaska Laborers & Mechanics Minimum Rates of Pay
(5) Zone Basis:	

Laborers ($/hr) (6,7)													
General Laborer	N1201 Group 1	$29.00	$9.91	$38.91	$24.32	$0.00	$0.00	$0.00	$8.17			$0	$71.40
Skilled Laborer	A1601 Group 1	$29.00	$9.91	$38.91	$24.32	$0.00	$0.00	$0.00	$8.17			$0	$71.40
Driller's Helper	A1605 Group 5	$29.73	$9.91	$39.64	$24.32	$0.00	$0.00	$0.00	$8.32			$0	$72.28
Rodmen (reinforcing concrete)	A1101	$33.55	$9.91	$43.46	$24.32	$0.00	$0.00	$0.00	$9.13			$0	$76.91
Cement finisher	N1202 Group 2	$30.00	$9.91	$39.91	$24.32	$0.00	$0.00	$0.00	$8.38			$0	$72.61
Carpenter	N1201 Group 1	$29.00	$9.91	$38.91	$21.62	$0.00	$0.00	$0.00	$8.17			$0	$68.70

NOTES:

(6) Laborer Source:	Pamp 600 09-11-2012
(7) Carpenter Source:	Pamp 600 09-11-2012
(8) Zone Basis:	

Project Management and Technical Labor ($/hr) (9)													
Project Manager		$200.00	$9.91	$209.91	$24.32	$0.00	$0.00	$0.00	$44.08		-21.00%	-$44	$234.23
Foreman		$81.72	$9.91	$91.63	$24.32	$0.00	$0.00	$0.00	$19.24			$0	$135.19
Field Geologist/Engineer		$101.00	$9.91	$110.91	$24.32	$0.00	$0.00	$0.00	$23.29			$0	$158.52
Field Tech/Sampler		$320.00	$9.91	$329.91	$24.32	$0.00	$0.00	$0.00	$69.28		-21.00%	-$69	$354.23
Range Scientist					$24.32								
Senior Planning Engineer		$120.00	$9.91	$129.91	$24.32	$0.00	$0.00	$0.00	$27.28			$0	$181.51
Project Engineer		$120.00	$9.91	$129.91	$24.32	$0.00	$0.00	$0.00	$27.28			$0	$181.51
Mechanic/Fitter					$24.32								
Contract Sampling (non bulk rate)		$320.00	$9.91	$329.91	$24.32	$0.00	$0.00	$0.00	$69.28		-21.00%	-$67	$356.31
					$24.32								
					$24.32								
					$24.32								

NOTES:

(9) Project Manager:	
(9) Foreman Source:	
(9) Techical Labor Source:	
Other Labor Source:	
Other Labor Source:	
†Additional User Markups	
(These are added by the user to the	
base rate to account for site-specific	
conditions or corporate requirements)	

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Closure Cost Estimate
Equipment Costs

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Monthly Rental Basis: 200 hrs month

EQUIPMENT RENTAL RATE TABLE

EQUIPMENT TYPE (1)	Monthly Owner/Rental Rate	Equipment Hourly Rate	Fuel/Lube/ Wear	Total Rate
Bulldozers				
D6R	$11,509.81	$57.55	$55.46	$113.01
D6R w/ Winch	$13,006.21	$65.03	$58.05	$123.08
D7R	$15,930.42	$79.65	$69.80	$149.45
D8R	$22,564.47	$112.82	$93.06	$205.88
D9R	$29,952.94	$149.76	$134.97	$284.74
D10R	$38,339.01	$191.70	$164.95	$356.65
D11R	$53,315.48	$266.58	$246.87	$513.44
Wheeled Dozers				
824G			$50.05	$50.05
834G			$76.43	$76.43
844			$93.59	$93.59
854G			$108.87	$108.87
Motor Graders				
120H	$5,436.92	$27.18	$30.49	$57.67
14G/H	$12,507.41	$62.54	$56.13	$118.67
16G/H	$17,027.78	$85.14	$70.41	$155.54
24M			$63.40	$63.40
Track Excavators				
312C	$5,966.47	$29.83	$26.11	$55.94
320C	$10,084.35	$50.42	$48.25	$98.67
325C	$13,840.80	$69.20	$63.63	$132.84
330C	$16,803.30	$84.02	$77.15	$161.16
345B	$20,630.85	$103.15	$98.11	$201.27
365BL	$26,046.30	$130.23	$128.53	$258.76
385BL	$36,598.72	$182.99	$165.21	$348.20
Scrapers				
631G	$28,905.46	$144.53	$144.13	$288.66
637G	$39,137.09	$195.69	$208.86	$404.54

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Closure Cost Estimate
Equipment Costs

Wheeled Loaders				
924G	$4,221.09	$21.11	$23.44	$44.54
928G	$4,445.55	$22.23	$26.95	$49.17
950G	$7,369.77	$36.85	$33.01	$69.86
966G	$10,886.31	$54.43	$52.29	$106.72
972G	$11,297.82	$56.49	$55.43	$111.92
980G	$13,367.84	$66.84	$64.20	$131.03
988G	$23,580.77	$117.90	$102.96	$220.86
990	$32,453.17	$162.27	$143.21	$305.48
992G	$41,188.41	$205.94	$191.88	$397.82
994D			$147.24	$147.24
L2350			$269.94	$269.94
Shovels				
PC2000			$151.33	$151.33
PC3000			$204.50	$204.50
PC4000			$286.30	$286.30
PC5500			$486.71	$486.71
PC8000			$609.41	$609.41
Hydraulic Hammers				
H-120 (fits 325)	$3,250.00	$16.25	$0.00	$16.25
H-160 (fits 345)	$6,640.00	$33.20	$9.21	$42.41
H-180 (fits 365/385)	$7,775.00	$38.88	$0.00	$38.88
Demolition Shears				
S340 (fits 322/325/330)				$0.00
S365 (fits 330/345)				$0.00
S390 (fits 365/385)				$0.00
Demolition Grapples				
G315 (fits 322/325)				$0.00
G320 (fits 325/330)				$0.00
G330 (fits 345/365)				$0.00
Other Equipment				
420D 4WD Backhoe	$3,846.99	$19.23	$22.73	$41.96
428D 4WD Backhoe	$4,707.42	$23.54	$24.63	$48.17
CS533E Vibratory Roller			$15.34	$15.34
CS633E Vibratory Roller			$19.43	$19.43
CP533E Sheepsfoot Compactor			$15.34	$15.34
CP633E Sheepsfoot Compactor			$19.43	$19.43
Light Truck - 1.5 Ton	$1,401.49	$7.01	$10.53	$17.53
Supervisor's Truck	$1,473.67	$7.37	$8.85	$16.22
Flatbed Truck	$1,383.45	$6.92	$24.93	$31.85
Air Compressor + tools	$5,918.12	$29.59	$26.91	$56.50
Welding Equipment	$8,500.00	$42.50	$8.18	$50.68
Heavy Duty Drill Rig	$28,000.00	$140.00	$49.08	$189.08
Pump (plugging) Drill Rig	$28,000.00	$140.00	$40.90	$180.90
Concrete Pump	$16,000.00	$80.00	$40.90	$120.90
Gas Engine Vibrator	$2,769.00	$13.85	$4.09	$17.94
Generator 5KW	$268.62	$1.34	$7.56	$8.90
HDEP Welder (pipe or liner)	$1,200.00	$6.00	$8.18	$14.18
5 Ton Crane	$9,000.00	$45.00	$12.27	$57.27
20 Ton Crane	$19,200.00	$96.00	$16.36	$112.36
50 Ton Crane	$19,200.00	$96.00	$19.22	$115.22
120 Ton Crane			$21.27	$21.27
Trucks				
725	$11,993.91	$59.97	$45.26	$105.23
730	$12,583.38	$62.92	$51.09	$114.00
735	$14,393.89	$71.97	$63.80	$135.77
740	$16,054.03	$80.27	$66.34	$146.61

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Closure Cost Estimate
Equipment Costs

769D	$15,500.65	$77.50	$78.20	$155.71
773E	$18,826.95	$94.13	$95.39	$189.52
777D	$25,166.76	$125.83	$128.53	$254.36
785C			$99.18	$99.18
793C			$170.76	$170.76
797B			$240.29	$240.29
613E (5,000 gal) Water Wagon			$24.54	$24.54
621E (8,000 gal) Water Wagon			$43.97	$43.97
777D Water Truck	$25,166.76	$125.83	$128.53	$254.36
785C Water Truck	$10,584.00	$52.92	$134.55	$187.47
Dump Truck (10-12 yd^3)	$15,760.00	$78.80	$21.27	$100.07

NOTES:

(1) Power Equipment Source:	
(2) Power Equipment Type:	Catepillar model or equivalent, LeTourneau loader, Komatsu shovels
(3) Drilliing Equipment Source:	Drilling Contractor
(4) Other Equipment Source:	* Starred numbers came from a similar piece of equipment (usually slightly larger).
(5) Drill rig includes support (pipe) truck	

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Closure Cost Estimate
Equipment Costs

FUEL, LUBE AND WEAR CALCULATIONS						
EQUIPMENT TYPE	PM Cost Per Hour(1)	Under carriage or Tires (2)	G.E.T Consumption (3)	Fuel Use Rate gal/hr (4)	Cost@ 4.09/gal	Total Hourly Equipment Cost
Bulldozers						
D6R	$29.90			6.25	$25.56	$55.46
D6R w/ Winch	$32.49			6.25	$25.56	$58.05
D7R	$39.12			7.50	$30.68	$69.80
D8R	$53.18			9.75	$39.88	$93.06
D9R	$76.69			14.25	$58.28	$134.97
D10R	$91.33			18.00	$73.62	$164.95
D11R	$138.48			26.50	$108.39	$246.87
Wheeled Dozers						
824G	$6.08	$0.00		10.75	$43.97	$50.05
834G	$6.08	$18.82		12.60	$51.53	$76.43
844	$4.94	$27.30		15.00	$61.35	$93.59
854G		$31.16		19.00	$77.71	$108.87
Motor Graders						
120H	$14.13			4.00	$16.36	$30.49
14G/H	$30.57			6.25	$25.56	$56.13
16G/H	$39.73			7.50	$30.68	$70.41
24M				15.50	$63.40	$63.40
Track Excavators						
312C	$18.42			1.88	$7.69	$26.11
320C	$28.21			4.90	$20.04	$48.25
325C	$36.64			6.60	$26.99	$63.63
330C	$43.61			8.20	$33.54	$77.15
345B	$54.76			10.60	$43.35	$98.11
365BL	$74.54			13.20	$53.99	$128.53
385BL	$93.63			17.50	$71.58	$165.21
Scrapers						
631G	$82.78			15.00	$61.35	$144.13
637G	$111.72			23.75	$97.14	$208.86
Wheeled Loaders						
924G	$12.19			2.75	$11.25	$23.44
928G	$12.63			3.50	$14.32	$26.95
950G	$16.65			4.00	$16.36	$33.01
966G	$28.77			5.75	$23.52	$52.29
972G	$29.87			6.25	$25.56	$55.43
980G	$33.52			7.50	$30.68	$64.20
988G	$53.47			12.10	$49.49	$102.96
990	$73.68			17.00	$69.53	$143.21
992G	$97.81			23.00	$94.07	$191.88
994D				36.00	$147.24	$147.24
L2350				66.00	$269.94	$269.94
Shovels						
PC2000				37.00	$151.33	$151.33
PC3000				50.00	$204.50	$204.50
PC4000				70.00	$286.30	$286.30
PC5500				119.00	$486.71	$486.71
PC8000				149.00	$609.41	$609.41
Hydraulic Hammers						
H-120 (fits 325)	N/A					$0.00
H-160 (fits 345)	N/A		$9.21			$9.21
H-180 (fits 365/385)	N/A					$0.00
Demolition Shears						

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Closure Cost Estimate
Equipment Costs

S340 (fits 322/325/330)	N/A					$0.00
S365 (fits 330/345)	N/A					$0.00
S390 (fits 365/385)	N/A					$0.00
Demolition Grapples						
G315 (fits 322/325)	N/A					$0.00
G320 (fits 325/330)	N/A					$0.00
G330 (fits 345/365)	N/A					$0.00
Other Equipment						
420D 4WD Backhoe	$10.46			3.00	$12.27	$22.73
428D 4WD Backhoe	$12.36			3.00	$12.27	$24.63
CS533E Vibratory Roller				3.75	$15.34	$15.34
CS633E Vibratory Roller				4.75	$19.43	$19.43
CP533E Sheepsfoot Compactor				3.75	$15.34	$15.34
CP633E Sheepsfoot Compactor				4.75	$19.43	$19.43
Light Truck - 1.5 Ton	$4.39			1.50	$6.14	$10.53
Supervisor's Truck	$4.76			1.00	$4.09	$8.85
Flatbed Truck	$5.71			4.70	$19.22	$24.93
Air Compressor + tools	$22.82		N/A	1.00	$4.09	$26.91
Welding Equipment			N/A	2.00	$8.18	$8.18
Heavy Duty Drill Rig				12.00	$49.08	$49.08
Pump (plugging) Drill Rig				10.00	$40.90	$40.90
Concrete Pump			N/A	10.00	$40.90	$40.90
Gas Engine Vibrator			N/A	1.00	$4.09	$4.09
Generator 5KW	$1.42		N/A	1.50	$6.14	$7.56
HDEP Welder (pipe or liner)			N/A	2.00	$8.18	$8.18
5 Ton Crane				3.00	$12.27	$12.27
20 Ton Crane				4.00	$16.36	$16.36
50 Ton Crane				4.70	$19.22	$19.22
120 Ton Crane				5.20	$21.27	$21.27
Trucks						
725	$26.04			4.70	$19.22	$45.26
730	$29.82			5.20	$21.27	$51.09
735	$33.74			7.35	$30.06	$63.80
740	$36.28			7.35	$30.06	$66.34
769D	$40.37			9.25	$37.83	$78.20
773E	$47.33			11.75	$48.06	$95.39
777D	$60.02			16.75	$68.51	$128.53
785C				24.25	$99.18	$99.18
793C				41.75	$170.76	$170.76
797B				58.75	$240.29	$240.29
613E (5,000 gal) Water Wagon				6.00	$24.54	$24.54
621E (8,000 gal) Water Wagon				10.75	$43.97	$43.97
777D Water Truck	$60.02			16.75	$68.51	$128.53
785C Water Truck		$35.37		24.25	$99.18	$134.55
Dump Truck (10-12 yd3) (5)	N/A		N/A	5.20	$21.27	$21.27

Notes:

(1) PM Source:	
(2) Undercarriage Source:	
(3) G.E.T. Source:	CAT Historical Data
(4) Fuel Use Source:	Caterpillar Handbook, Edition 35, Ch. 20; or estimated average for smaller vehicles
(5) Dump Truck Oper. Cost Source:	Means Heavy Construction (2008)

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Closure Cost Estimate
Equipment Costs

TIRE COST TABLES						
Equipment	Tire Size	# of Tires Per Piece of Equipment	Cost Per Tire	Tire Cost (1)(2)	Life Expectency Hours (Low/Zone A) (3)	Tire Cost per Hour
Bulldozers						
D6R			N/A			
D6R w/ Winch			N/A			
D7R			N/A			
D8R			N/A			
D9R			N/A			
D10R			N/A			
D11R			N/A			
Wheeled Dozers						
824G	29.5R25	4		$0.00	3,500	$0.00
834G	35/65-R33	4	$16,465.00	$65,860.00	3,500	$18.82
844	45/65-R39	4	$23,888.00	$95,552.00	3,500	$27.30
854G	45/65-R45	4	$27,263.00	$109,052.00	3,500	$31.16
Motor Graders						
120H	13PR24	6		$0.00	3,500	
14G/H	20.5R25	6		$0.00	3,500	
16G/H	23.5R25	6		$0.00	3,500	
24M	23.5R25	6		$0.00	3,500	
Track Excavators						
312C			N/A			
320C			N/A			
325C			N/A			
330C			N/A			
345B			N/A			
365BL			N/A			
385BL			N/A			
Scrapers						
631G	37.25R35	4		$0.00	4,000	
637G	37.25R35	4		$0.00	4,000	
Wheeled Loaders						
924G	17.5R25	4		$0.00	4,500	
928G	17.5R25	4		$0.00	4,500	
950G	26.5R25	4		$0.00	4,500	
966G	26.5R25	4		$0.00	4,500	
972G	26.5R25	4		$0.00	4,500	
980G	29.5R25	4		$0.00	4,500	
988G	35/65-33	4		$0.00	4,500	
990	41.25/70-39	4		$0.00	4,500	
992G	45/65R45	4		$0.00	4,500	
994D	55/85R57	4		$0.00	4,500	
L2350	55/85R57	4		$0.00	4,500	
Shovels						
PC2000			N/A			
PC3000			N/A			
PC4000			N/A			
PC5500			N/A			
PC8000			N/A			
Hydraulic Hammers						
H-120 (fits 325)			N/A			
H-160 (fits 345)			N/A			
H-180 (fits 365/385)			N/A			

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Closure Cost Estimate
Equipment Costs

Demolition Shears						
S340 (fits 322/325/330)			N/A			
S365 (fits 330/345)			N/A			
S390 (fits 365/385)			N/A			
Demolition Grapples						
G315 (fits 322/325)			N/A			
G320 (fits 325/330)			N/A			
G330 (fits 345/365)			N/A			
Other Equipment						
420D 4WD Backhoe	340/80R18-19.5LR24	2		$0.00	3,000	
428D 4WD Backhoe	340/80R18-16.9R28	2		$0.00	3,000	
CS533E Vibratory Roller			N/A			
CS633E Vibratory Roller			N/A			
CP533E Sheepsfoot Compactor			N/A			
CP633E Sheepsfoot Compactor			N/A			
Light Truck - 1.5 Ton		4		$0.00	3,000	
Supervisor's Truck		4		$0.00	3,000	
Flatbed Truck		22		$0.00	3,000	
Air Compressor + tools			N/A			
Welding Equipment			N/A			
Heavy Duty Drill Rig		4		$0.00	3,000	
Pump (plugging) Drill Rig		4		$0.00	3,000	
Concrete Pump			N/A			
Gas Engine Vibrator			N/A			
Generator 5KW			N/A			
HDEP Welder (pipe or liner)			N/A			
5 Ton Crane		4		$0.00	3,000	
20 Ton Crane		4		$0.00	3,000	
50 Ton Crane		6		$0.00	3,000	
120 Ton Crane		6		$0.00	3,000	
Trucks						
725	23.5R25	6		$0.00	2,000	
730	23.5R25	6		$0.00	2,000	
735	26.5R25	6		$0.00	2,000	
740	29.5R25	6		$0.00	2,000	
769D	18.00R33	6		$0.00	6,000	
773E	24.00R35	6		$0.00	5,000	
777D	27.00R49	6		$0.00	5,000	
785C	33.00R51	6		$0.00	4,000	
793C	40.00R57	6		$0.00	4,000	
797B	40.00R57	6		$0.00	4,000	
613E (5,000 gal) Water Wagon	23.5R25	6		$0.00	6,000	
621E (8,000 gal) Water Wagon	33.25R29	6		$0.00	8,000	
777D Water Truck	27.00R49	6		$0.00	5,000	
785C Water Truck	33.00R51	6	$23,577.00	$141,462.00	4,000	$35.37
Dump Truck (10-12 yd3)		10		$0.00	6,000	

Notes:

(1) Unit Cost Basis:	Cost per tyre each
(2) Cost Basis:	
(3) Tire Cost Source:	
(4) Tire Wear Source:	Caterpillar Handbook, Edition 37

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Closure Cost Estimate
Material Costs

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Revegetation Materials

Seed Mixes

Seed Mix	Description		Cost/Acre
None			
Mix 1	Basins		
Mix 2	Low Hills		
Mix 3	Uplands		
Mix 4	Riparian or Custom		
User Mix 1	**Ladown Yards (1/2 the costs since area**		**$41.40**
User Mix 2			
User Mix 3			
User Mix 4			
	Cost/lb	**lbs/Acre**	**Cost/Acre**
User Mix 5 (from Seed Mix sheet)	$9.20	$9.00	$82.80
Notes:			

Mulch

Item	Cost/lb	lbs/Acre	Cost/Acre
None			
Straw Mulch		**10**	
Hydro Mulch		**10**	
Timber Mulch		**10**	
		10	
Notes:			

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Closure Cost Estimate
Material Costs

Amendments			
Item	**Cost/lb**	**lbs/Acre**	**Cost/Acre**
None			
Organic Matter		**10**	
Treated Sludge		**10**	
Chemical	$0.44	**300**	$132.11
		10	
Notes:			

Well Abandonment Materials			
Description	**Cost/50lb bag**	**Units**	**Cost/unit***
Cement	$30.39	cy	$144.71
Grout (Low Grade Bentonite)	$23.31	cy	$111.00
Inert Material/Cuttings	$0.00	cy	$0.00
		cy	
		cy	
Cement and grout quotes from 2012 Baroid pricing			
Wells will be closed with grout. Inert Material is assumed to be grout			
* Assumes 1 bag mixes with water to make 0.21 y3 or 0.16 m3 of grout/cement slurry.			

Monitoring Costs		
Description	**Units**	**Cost/unit**
Monitor Well Pump	ea.	
Sampling Supplies	ea.	$0.00
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
	ea.	
Sampling costs are non-diccounted/bulk rate from ACZ		

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Closure Cost Estimate
Material Costs

Fuel, Etc.			
Description	**Units**	**Cost/unit**	**User Overrides**
Off-road Diesel - delivered (1)	$/gal	$4.090	
Pickup Truck Mileage	$/mi		
Electical Power	$/kWh	$0.165	
Concrete Delivered to Site	CY	$180.000	
Rebar Delivered	lb	$0.750	
Signage Install	Per Sign Post	$500.000	

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Closure Cost Estimate
Material Costs

Revegetation Method				
Slopes				
Disturbance Type	**Seed Application Method**	**Labor** Cost/Acre	**Equipment** Cost/Acre	**Total** Cost/Acre
Waste Rock Dumps	**Mechanical Broadcast**		$183.18	$183.18
Heap Leach	**Mechanical Broadcast**		$183.18	$183.18
Tailings	**Mechanical Broadcast**		$183.18	$183.18
Quarries & Borrow Pits	**Mechanical Broadcast**		$183.18	$183.18
Flat Areas and Undifferentiated				
Disturbance Type	**Seed Application Method**	**Labor** Cost/Acre	**Equipment** Cost/Acre	**Total** Cost/Acre
Exploration Trenches	**Mechanical Broadcast**		$183.18	$183.18
Exploration Roads	**Mechanical Broadcast**		$183.18	$183.18
Waste Rock Dumps	**Mechanical Broadcast**		$183.18	$183.18
Heap Leach	**Mechanical Broadcast**		$183.18	$183.18
Tailings	**Mechanical Broadcast**		$183.18	$183.18
Quarries & Borrow Pits	**Mechanical Broadcast**		$183.18	$183.18
Roads	**Mechanical Broadcast**		$183.18	$183.18
Pits	**Mechanical Broadcast**		$183.18	$183.18
Haul Material	**Mechanical Broadcast**		$183.18	$183.18
Foundations & Buildings	**Mechanical Broadcast**		$183.18	$183.18
Sediment & Drainge Control	**Mechanical Broadcast**		$183.18	$183.18
Process Ponds	**Mechanical Broadcast**		$183.18	$183.18
Landfills	**Mechanical Broadcast**		$183.18	$183.18
Yards, Etc.	**Mechanical Broadcast**		$183.18	$183.18
Revegetation Maintenance	**Mechanical Broadcast**		$183.18	$183.18

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Closure Cost Estimate
Misc. Unit Costs

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Color Code Key	
User Input - Direct Input	**Direct Input**
User Input - Pull Down List	**Pull Down Selection**
Program Constant (can override)	**Alternate Input**
Program Calculated Value	**Locked Cell - Formula or Reference**

Revegetation

	Means Number	Unit	Crew	Daily Output	Daily Output User	Materials	Labor	Equipment	Total	Notes
Seeding - Broadcast Hand (1)		acres							$0.00	
Seeding - Broadcast Mechanical (1)		acres						$183.18	$183.18	
Seeding - Drill (1)		acres		365					$0.00	
Seeding - Hydroseeding (1)				365					$0.00	
Shrub Planting - bare root 6-10 in (150- 250mm) (2)	02910-400-0561	ea.	1 Clab	365			$1.56	$0.00	$1.56	
Tree Planting - bare root 11-16 in (270- 400mm) (3)	02910-400-0562	ea.	1 Clab	260			$2.20	$0.00	$2.20	
Cactus Planting (4)		ea.	1 Clab						$0.00	
NOTES:										
(1) Seeding Source:										
(2) Shrub Source:										
(3) Tree Source:										
(4) Cactus Source:										

Building and Wall Demolition

Hourly productivity rates and crew composition from Means Heavy Construction 2005 Edition by permission of R.S.Means/Reed Construction Data .
All equipment, labor and material unit costs are from Labor Costs, Equipment Costs and Material Costs spreadsheets

	Means Number	Unit	Crew	Daily Output	Daily Output User	Labor	Equipment	Premium	Total	Notes
Building Demolition										
Lg. steel	02220-110-0012	C.F.	B-8	21500		$0.21	$0.13		$0.34	
Lg. concrete	02220-110-0050	C.F.	B-8	15300		$0.30	$0.19		$0.49	
Lg. masonry	02220-110-0080	C.F.	B-8	20100		$0.23	$0.14		$0.37	
Lg. mixed	02220-110-0100	C.F.	B-8	20100		$0.23	$0.14		$0.37	
Sm. steel	02220-110-0500	C.F.	B-3	14800		$0.23	$0.08		$0.31	
Sm. concrete	02220-110-0600	C.F.	B-3	11300		$0.30	$0.11		$0.41	
Sm. masonry	02220-110-0650	C.F.	B-3	14800		$0.23	$0.08		$0.31	
Sm. wood	02220-110-0700	C.F.	B-3	14800		$0.23	$0.08		$0.31	
Wall Demolition										
Block 4 in (100 mm) thick	02220-130-2000	S.F.	1 Clab	180		$3.17	$0.00	0%	$3.17	
Block 6 in (150 mm) thick	02220-130-2040	S.F.	1 Clab	170		$3.36	$0.00	0%	$3.36	
Block 8 in (200 mm) thick	02220-130-2080	S.F.	1 Clab	150		$3.81	$0.00	0%	$3.81	
Block 12 in (300 mm) thick	02220-130-2100	S.F.	1 Clab	150		$3.81	$0.00	0%	$3.81	
Conc 6 in (150 mm) thick	02220-130-2400	S.F.	B-9	160		$24.17	$2.83	0%	$27.00	
Conc 8 in (200 mm) thick	02220-130-2420	S.F.	B-9	140		$27.62	$3.23	0%	$30.85	
Conc 10 in (250 mm) thick	02220-130-2440	S.F.	B-9	120		$32.23	$3.77	0%	$36.00	
Conc 12 in (300 mm) thick	02220-130-2500	S.F.	B-9	100		$38.67	$4.52	0%	$43.19	

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Closure Cost Estimate
Misc. Unit Costs

Waste Disposal

Unit rates from Means Heavy Construction 2006 Edition by permission of R.S.Means/Reed Construction Data .

	Means Number	Unit	Crew	Daily Output	Materials	Labor	Equipment		Total	Notes
Rubbish Handling										
Dumpster delivery (average for all sizes)	02220-350-0910	ea.							$0.00	
Haul (average for all sizes)	02220-350-0920	ea.							$0.00	
Rent per month (average for all sizes)	02220-350-0940	ea.							$0.00	
Disposal fee per ton (tonne) (average for all sizes)	02220-350-0950	ton							$0.00	
NOTES:										
Dumpster Cost Source										
Dumpster Disposal Fee Source:										
Hazardous Material Handling - Solids (+ Liquids in drums)										
Pickup fees 55 gal (200 L). drums	02110-300-1100	ea.							$0.00	
Bulk material (average)	02110-300-1220/1230	ton							$0.00	
Transport - truck load (80 drums, 25 cy (m3), 18 tons)	02110-300-1260/1270	mile							$0.00	
Dump site solid disposal fee	02110-300-6000/6020	ton							$0.00	
NOTES:										
Solid Handling Cost Source										
Solid Disposal Fee Source:										
Hazardous Material Handling - Liquids										
Vacuum Truck Pickup (2200 gal/8300 L)	02110-300-3110	hr.							$0.00	
Vacuum Truck Pickup (5000 gal/19000 L)	02110-300-3120	hr.							$0.00	
Dump site liquid disposal fee	02110-300-6000/6020	ton							$0.00	
NOTES:										
Liquid Handling Cost Source										
Liquid Disposal Fee Source:										
Hydrocarbon Contaminated Soils (HCS)										
Insitu Biotreatment	02115-200-2020/2021	C.Y.							$0.00	
HCS disposal fee	02115-200-2050/2055	C.Y.							$0.00	
NOTES:										
Insitu Treatment Cost Source										
HCS Disposal Fee Source:										

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Closure Cost Estimate
Misc. Unit Costs

Concrete Structure Installation

Weekly dumpster rental rates from Means Heavy Construction 2005 Edition with permission by R.S.Means/Reed Construction Data .
Weekly dumpster rental rates include haul to off-site disposal site and disposal fees

	Means Number	Unit	Crew	Daily Output	Materials	Labor	Equipment	Premium	Total	Notes
Reinforced Concrete Bulkheads and Shaft Covers										
Grade walls - 15 in (400mm) thick, 8 ft (2.5m) high	03310-240-4300	C.Y.	C-14D	80.02		$79.57	$15.50		$95.07	includes reinforcing
Grade walls - 15 in (400mm) thick, 12 ft (3.7m) high	03310-240-4350	C.Y.	C-14D	26.2		$243.04	$47.35		$290.39	includes reinforcing
Elevated conc, 1-way beam & slab - 15ft (4.6m) span	03310-240-2700	C.Y.	C-14B	20.59		$768.83	$60.25		$829.08	includes reinforcing
Elevated conc, 1-way beam & slab - 25ft (7.5m) span	03310-240-2750	C.Y.	C-14B	28.36		$558.19	$43.74		$601.93	includes reinforcing
Bat Gate/Foam Plug Installation										
Bat Gate (5)		ea.								materials $/ea. Installed
Culvert Gate (5)		ea.								materials $/ea. Installed
Adit Foam Plug (6)		ea./C.Y.								materials $/cy placed
Production Opening Foam Plug (6)		ea./C.Y.								materials $/cy placed

NOTES:

(5) Bat Gate Source:

(6) Foam Plug Source:

Misc. Linear Projects

Hourly productivity rates and crew composition from Means Heavy Construction 2005 Edition by permission of R.S.Means/Reed Construction Data .
All equipment, labor and material unit costs are from Labor Costs, Equipment Costs and Material Costs spreadsheets

	Means Number	Unit	Crew	Daily Output	Materials	Labor	Equipment	Premium	Total	Notes
Fencing Installation										
Barbed 3-strand	02820-170-1650	L.F.	B-80A	760		$3.02	$0.18		$3.20	
Barbed 4-strand	extrapolated	L.F.	B-80A	570		$4.03	$0.25		$4.28	
Barbed 5-strand	02820-130-0920	L.F.	B-80A	456		$5.04	$0.31		$5.35	
Chain link 8-10ft (2.5-3m) Install	02820-130-0920	L.F.	B-80C	180		$12.77	$0.78		$13.55	
Wood stockade fence 6 ft (2 m) high - Install	02820-510-1240	L.F.	B-80C	150		$15.33	$0.93		$16.26	
	user	L.F.							$0.00	
	user	L.F.							$0.00	
	user	L.F.							$0.00	
	user	L.F.							$0.00	
Fencing Removal										
Barbed 3-strand Removal	02220-220-1600	L.F.	2 Clab	430		$4.02	$0.33		$4.35	
Barbed 4-strand Removal	extrapolated	L.F.	2 Clab	355		$4.87	$0.40		$5.27	
Barbed 5-strand Removal	02220-220-1650	L.F.	2 Clab	280		$6.17	$0.50		$6.67	
Chain link 8-10 ft (2.5-3 m) Removal	02220-220-1700	L.F.	B-6	445		$3.94	$0.88		$4.82	
Wood, all types 4-6 ft ("1.5-2 m) high - Removal	02220-220-1775	L.F.	2 Clab	430		$4.02	$0.33		$4.35	
	user	L.F.								
	user	L.F.							$0.00	
	user	L.F.							$0.00	
	user	L.F.							$0.00	

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Closure Cost Estimate
Misc. Unit Costs

Culvert Removal										
12 in (300 mm) Diameter	02220-220-2900	L.F.	B-6	175		$10.02	$2.25		$12.27	
18 in (450 mm) Diameter	02220-220-2930	L.F.	B-6	150		$11.68	$2.62		$14.30	
24 in (600 mm) Diameter	02220-220-2960	L.F.	B-6	120		$14.61	$3.28		$17.89	
36 in (1m) Diameter	02220-220-3000	L.F.	B-6	90		$19.47	$4.37		$23.84	
Pipeline Removal										
0.75 in (20mm) - 4 in (100 mm) diameter	02220-381-1600	L.F.	B-20	700		$4.01	$0.20		$4.21	
6 in (150 mm) - 8 in (200 mm)	02220-381-1700	L.F.	B-20	500		$5.62	$0.28		$5.90	
10 in (250 mm) - 18 in (450 mm)	02220-381-1800	L.F.	B-20	300		$9.36	$0.47		$9.83	
20 in (500 mm) - 36 in (1 m)	02220-381-1900	L.F.	B-20	200		$14.05	$0.70		$14.75	
Pipe and Drainpipe Installation										
Water 4in (100mm) 40ft (12m) length, welded HDPE	02510-760-0100	L.F.	B-22A	400		$8.80	$4.64		$13.44	
Water 6in (150mm) 40ft (12m) length, welded HDPE	02510-760-0200	L.F.	B-22A	380		$9.26	$4.88		$14.14	
Water 12in (300mm) 40ft (12m) length, welded HDPE	02510-760-0500	L.F.	B-22A	260		$13.54	$7.14		$20.68	
Drain 4in (100mm) perforated PVC	02620-630-2100	L.F.	B-14	315		$14.48	$1.51		$15.99	
Drain 6in (150mm) perforated PVC	02620-630-2110	L.F.	B-14	300		$15.21	$1.59		$16.80	
Drain 4in (100mm) corrugated, perf or plain	02620-660-0040	L.F.	2 Clab	1200		$1.44	$0.12		$1.56	
Drain 6in (150mm) corrugated., perf or plain	02620-660-0060	L.F.	2 Clab	900		$1.92	$0.16		$2.08	
Drain Rock Preparation										
Crushing		C.Y.								
Screening		C.Y.								
TOTAL									$0.00	
Misc.										
Backhoe work	02210-700-0120	C.Y.	B-11M	28		$21.79	$11.99		$33.78	
Powerline and Transformer Removal										
Single Pole		mile							$21,452.00	
Double Pole		mile								
Transformer (9)		ea.							$6,510.00	
NOTES:										
(7) Single Pole Source:	RS Means 2010									
(8) Double Pole Source:										
(9) Transformer Source:	Norcon Quote									

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Closure Cost Estimate
Misc. Unit Costs

Erosion and Sedimentation Control

Hourly productivity rates and crew composition from Means Heavy Construction 2005 Edition by permission of R.S.Means/Reed Construction Data .
All equipment, labor and material unit costs are from Labor Costs, Equipment Costs and Material Costs spreadsheets

	Means Number	Unit	Crew	Daily Output	Materials	Labor	Equipment	Premium	Total	Notes
Rip-Rap & Rock Lining										
Rip-Rap 3/8 to 1/4 CY (m3) pieces, grouted	02370-450-0110	S.Y.	B-13	80		$49.92	$11.52		$61.44	assumes on-site source of rip-rap
Rip-Rap 18 in (450 mm) min thick, no grout	02370-450-0200	S.Y.	B-13	53		$75.35	$17.39		$92.74	assumes on-site source of rip-rap
Gabions, 6 in (150 mm) deep	02370-450-0400	S.Y.	B-13	200		$19.97	$4.61		$24.58	assumes on-site source rock fill for gabions
Gabions, 9 in (250 mm) deep	02370-450-0500	S.Y.	B-13	163		$24.50	$5.65		$30.15	assumes on-site source rock fill for gabions
Gabions, 12 in (300 mm) deep	02370-450-0200	S.Y.	B-13	153		$26.10	$6.02		$32.12	assumes on-site source rock fill for gabions
Gabions, 18 in (450 mm) deep	02370-450-0200	S.Y.	B-13	102		$39.15	$9.04		$48.19	assumes on-site source rock fill for gabions
Gabions, 36 in (1m) deep	02370-450-0200	S.Y.	B-13	60		$66.56	$15.36		$81.92	assumes on-site source rock fill for gabions
HDEP Liner Installation										
Finish grading large area	2310-100-0100	S.F.	B-11L	54000		$0.02	$0.02		$0.04	
Compaction-riding, vibrating roller - 12in (300mm) lifts	2315-310-5100	C.Y.	B-10Y	2600		$0.45	$0.05		$0.50	
60 mil HDPE	2660-610-0010	S.F.	3 Skwk	1600		$1.45	$0.28	10%	$1.90	
80 mil HDPE	user	S.F.	3 Skwk	149	$9.00	$15.60	$3.01		$27.61	
40 mil VLDPE	user	S.F.	3 Skwk	150	$7.00	$15.49	$2.99		$25.48	
	user	S.F.	3 Skwk	149		$15.60	$3.01		$18.61	
	user	S.F.	3 Skwk	149		$15.60	$3.01		$18.61	

Construction Management Support

Office Trailer, Furnished, no hook-ups	0150-500-0250	mo.						$0.00	
Toilet Portable, chemical	1590-400-6410	mo.						$0.00	
TOTAL					$0.00			$0.00	

Pump and Casing Removal

	Pump Type	Measurement	Unit				Labor	Equipment		Total	Notes
Pump Removal											
Submersible		ft to pump	L.F.							$0.00	
Line Shaft		ft to pump	L.F.							$0.00	

NOTES:

(10) Pump Removal Source:

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Closure Cost Estimate
Fleets (Crews)

ACTIVITY AND FLEET		Standard Labor Crew	User Defined Labor Crew	EQUIPMENT UNIT COST (Hourly)	TOTAL LABOR UNIT COST (Hourly)	TOTAL COST (Hourly)
Truck Tractor			**1**	**$89.48**		$89.48
Totals				$312.21	$212.46	$524.67
User Crew #10						
Description:						
LABOR						
General Laborer			**1**	$0.00	$73.44	$73.44
Foreman				$0.00	$0.00	$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
EQUIPMENT						
928G			**1**	$49.17	$76.55	$125.72
20 Ton Crane			**1**	$112.36	$76.25	$188.61
Dump Truck (10-12 yd3)			**2**	$200.14	$147.94	$348.08
Supervisor's Truck			**1**	$16.22	$73.97	$90.19
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
Totals				$377.89	$448.15	$826.04

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Date of Submittal: 7/10/2013
File Name: SRCE Fort Knox 2013 R1.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Dozer Operator Skill:	Average
Grader Operator Skill:	Average
Truck/Scraper Operator:	Average
Loader Operator Skill:	Average
Excavator Operator Skill:	Average
Dozer Job Efficiency:	50 min/hr
Truck Job Efficiency:	50 min/hr
Scraper Job Efficiency:	50 min/hr
Loader Job Efficiency:	50 min/hr
Excavator Job Efficiency:	50 min/hr
Grader Job Efficiency:	50 min/hr

Productivity - Bulldozers

Dozer Specifications

Description	D11R	D10R	D9R	D8R	D7R	D6R
Blade Width (SU) (ft)	18.33	15.92	14.17	12.92	12.08	10.67
Shank Guage (3 shanks) (ft)	9.83	8.67	7.67	7.08	6.5	6.5
Pocket Spacing (ft)	4.75	4.33	3.87	3.58	3.25	3.25
Ripping Width (Ripper + 1 Pocket) (ft)	14.58	13	11.54	10.66	9.75	9.75
Ripping Speed (mph)	1	1	1	1	1	1
Ripping Maneuver (turn) Time (min)	0.25	0.25	0.25	0.25	0.25	0.25
Altitude Deration Factor	1	1	1	1	1	1
Ripping Hourly Production (excluding maneuvering time) (ft)	5,280	5,280	5,280	5,280	5,280	5,280

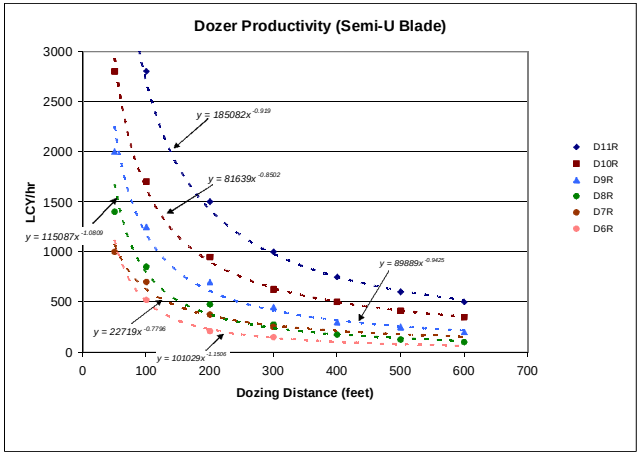
Source: Caterpillar Performance Handbook Edition 35

Dozer Productivity vs. Grading Distance

Average Dozing Distance (feet)	Production (LCY/hr) D11R	D10R	D9R	D8R	D7R	D6R
50	4,800	2,800	2,000	1,400	1,000	
100	2,800	1,700	1,250	850	700	520
200	1,500	950	700	475	375	210
300	1,000	625	450	275	250	150
400	750	500	300	175		
500	600	410	250	125		
600	500	350	200	100		

Source: Caterpillar Performance Handbook Edition 35

dozer productivity = k x Dozing Distance^p (see graph)						
k =	185082	81639	89889	115087	22719	101029
p =	-0.919	-0.8502	-0.9425	-1.0809	-0.7796	-1.1506



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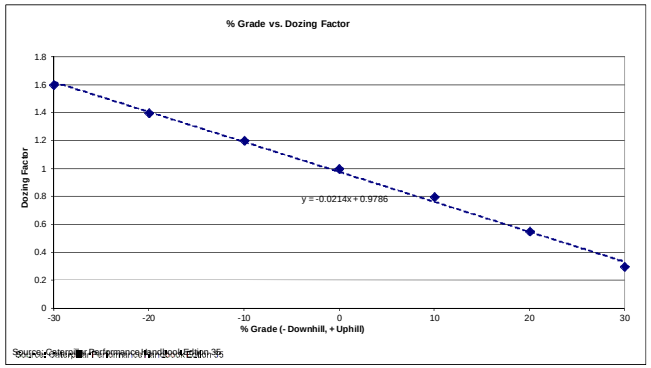
Productivity - Bulldozers (cont.)

% Grade vs. Dozing Factor	
% Grade	**Dozing Factor**
-30	1.6
-20	1.4
-10	1.2
0	1
10	0.8
20	0.55
30	0.3
Source: Caterpillar Performance Handbook Edition 35	
% Grade Dozing Factor = -0.0214x + 0.9786 (see graph)	



Job Condition Correction Factors - Bulldozers	
OPERATOR	
Average	0.75
MATERIAL (1)	
Loose stockpile	1.2
Normal	1
Hard to cut; frozen — with tilt cylinder	0.8
Hard to drift; "dead" (dry,non-cohesive material) or very sticky material	0.8
Rock, ripped or blasted	0.6
SLOT DOZING OR SIDE BY SIDE (1)	1.2
VISIBILITY	
Good conditions	1
JOB EFFICIENCY	
50 min/hr	0.83
(1) Selected in facility worksheets. Other factors included as standard factors.	
Source: Caterpillar Performance Handbook Edition 35	

Material Densities(1)		
Material	**lb/cy**	**kg/m^3**
Alluvium	2,900	1,720
Basalt	3,300	1,960
Clay - Dry	2,500	1,480
Granite - broken	2,800	1,660
Gravel	2,550	1,510
LS - broken	2,600	1,540
LS - crushed	2,600	1,540
Sandstone	2,550	1,510
Shale	2,100	1,250
Stone - crushed	2,700	1,600
Tailings - Coarse (dry, loose sand)	2,400	1,420
Tailings - Slimes (loose sand & clay)	2,700	1,600
Topsoil	1,600	950
(1) Source: Caterpillar Performance Handbook Edition 35		

Note: uses Sand & Gravel - Dry from Caterpillar Handbook

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Productivity - Scrapers

Scraper Specifications		
Description	**631G**	**637G**
Empty Weight	100,600	112,760
Payload Capacity (cy)		
Struck	24	24
Heaped	34	34
Average	29	29
Loaded by	One D10R	Self*
Load Time (min)	1	1
Maneuver and Spread (min)	1	1
Job Efficiency	1	1
Rolling Resistance**	3	3
Altitude Deration Factor	1	1

* Requires pair

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials			Downhill Scraper Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)											
			631G						637G PP					
Material	**lb/cy**	**Scraper Load lb**	**Loaded Weight (lbs)**	**22**	**16**	**10**	**5**	**1**	**Loaded Weight (lbs)**	**25**	**15**	**10**	**5**	**1**
Alluvium	2,900	84,100	184,700	7.5	10	13	33	33	196,860	7	10	18.5	34	34
Basalt	3,300	95,700	196,300	7.5	10	13	24.5	33	208,460	7	10	18.5	25	34
Clay - Dry	2,500	72,500	173,100	7.5	10	13	33	33	185,260	7	10	18.5	34	34
Granite - broken	2,800	81,200	181,800	7.5	10	13	33	33	193,960	7	10	18.5	34	34
Gravel	2,550	73,950	174,550	7.5	10	13	33	33	186,710	7	10	18.5	34	34
LS - broken	2,600	75,400	176,000	7.5	10	13	33	33	188,160	7	10	18.5	34	34
LS - crushed	2,600	75,400	176,000	7.5	10	13	33	33	188,160	7	10	18.5	34	34
Sandstone	2,550	73,950	174,550	7.5	10	13	33	33	186,710	7	10	18.5	34	34
Shale	2,100	60,900	161,500	7.5	10	18	33	33	173,660	10	13.5	18.5	34	34
Stone - crushed	2,700	78,300	178,900	7.5	10	13	33	33	191,060	7	10	18.5	34	34
Tailings - Coarse (dry, loose sand)	2,400	69,600	170,200	7.5	10	13	33	33	182,360	7	10	18.5	34	34
Tailings - Slimes (loose sand & clay)	2,700	78,300	178,900	7.5	10	13	33	33	191,060	7	10	18.5	34	34
Topsoil	1,600	46,400	147,000	7.5	10	18	33	33	159,160	10	13.5	18.5	34	34
			Empty	10	18	24.5	33	33	Empty	10	13.5	18.5	34	34

Source: Caterpillar Performance Handbook Edition 34

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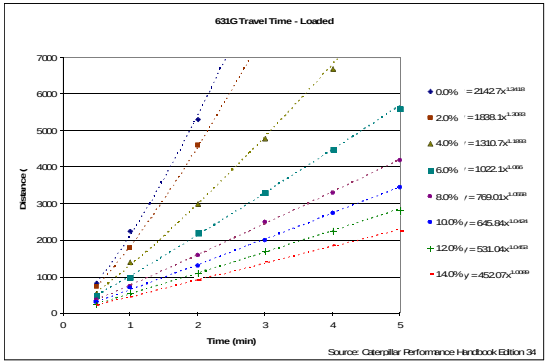
Productivity - Scrapers (cont.)

631G Scraper Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	825	2,250	5,300				2142.7	1.3418
2	750	1,800	4,600				1838.1	1.3083
4	550	1,400	3,000	4,800	6,700		1310.7	1.1893
6	490	1,000	2,200	3,300	4,500	5,600	1022.1	1.066
8	375	750	1,600	2,500	3,300	4,200	769.01	1.0558
10	300	700	1,300	2,000	2,750	3,450	645.84	1.0424
12	250	550	1,100	1,700	2,250	2,800	531.04	1.0453
14	225	450	900	1,400	1,850	2,250	452.07	1.0089

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



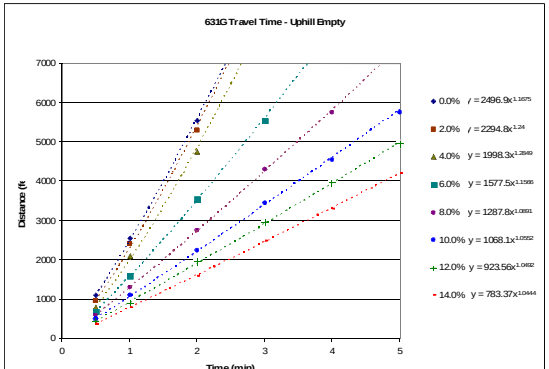
Source: Caterpillar Performance Handbook Edition 34

631G Scraper Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,100	2,550	5,550				2496.9	1.1675
2	950	2,400	5,300				2294.8	1.24
4	800	2,100	4,750				1998.3	1.2849
6	700	1,600	3,550	5,550			1557.5	1.1566
8	600	1,300	2,750	4,300	5,750		1287.8	1.0891
10	500	1,100	2,250	3,450	4,550	5,750	1068.1	1.0552
12	450	900	1,950	2,950	3,950	4,950	923.56	1.0492
14	375	800	1,600	2,500	3,300	4,200	783.37	1.0444

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

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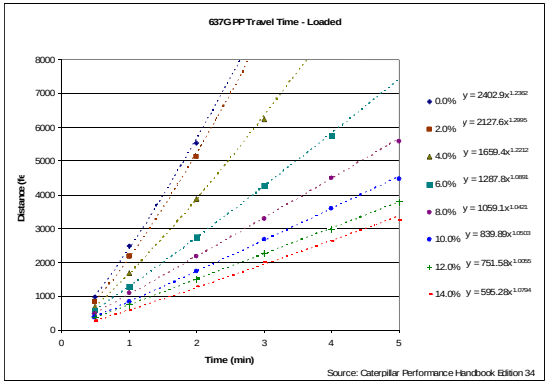
Productivity - Scrapers (cont.)

637G Push-Pull Scraper Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,000	2,500	5,550				2402.9	1.2362
2	850	2,200	5,150				2127.6	1.2995
4	700	1,700	3,900	6,250			1659.4	1.2212
6	600	1,300	2,750	4,300	5,750		1287.8	1.0891
8	500	1,100	2,200	3,300	4,500	5,600	1059.1	1.0421
10	400	850	1,750	2,700	3,600	4,475	839.89	1.0503
12	375	750	1,500	2,300	3,000	3,800	751.58	1.0055
14	275	600	1,300	2,000	2,650	3,250	595.28	1.0794

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



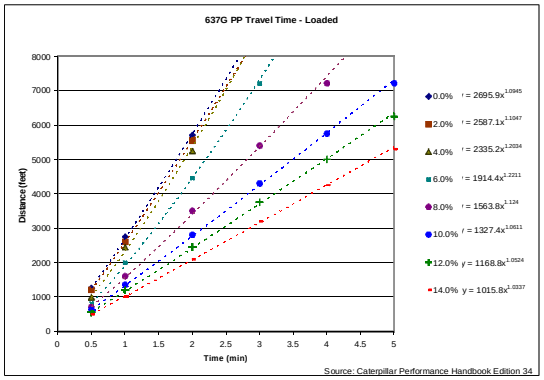
Source: Caterpillar Performance Handbook Edition 34

637G Push-Pull Scraper Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,250	2,750	5,700				2695.9	1.0945
2	1,200	2,600	5,550				2587.1	1.1047
4	990	2,450	5,250				2335.2	1.0234
6	800	2,000	4,450	7,216			1914.4	1.2211
8	700	1,600	3,500	5,400	7,216		1563.8	1.124
10	625	1,350	2,800	4,300	5,750	7,216	1327.4	1.0611
12	550	1,200	2,450	3,750	5,000	6,250	1168.8	1.0524
14	495	1,010	2,100	3,200	4,250	5,300	1015.8	1.0337

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

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Productivity - Haul Trucks

Haul Truck Specifications

Description	769D	773E	777D	785C	793C	797B
Chassis Weight (lb)	53,506	70,330	113,160	170,000	259,500	473,600
Body Weight (lb)	17,350	20,300	34,785	36,788	70,785	104,200
Standard Liner Weight (lb)	7,000	8,600	12,040	16,846	24,418	8,800
Total Truck Weight (lb)	77,856	99,230	159,985	223,634	354,703	586,600
Payload Capacity (cy)						
Struck	21.6	34.8	55	78.5	126	228
Heaped	31.7	46	78.6	102	169	290
Average	26.65	40.4	66.8	90.25	147.5	259
Maneuver to Load Time (min)	0.7	0.7	0.7	0.7	0.7	0.7
Maneuver and Dump Time (min)	1.1	1.1	1.1	1.1	1.1	1.1
Job Efficiency	0.83	0.83	0.83	0.83	0.83	0.83
Rolling Resistance**	2.5	2.5	2.5	2.5	2.5	2.5
Altitude Deration Factor	1	1	1	1	1	1

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials / Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)

Material	lb/cy	Truck (769D) Load lb	Truck (773E) Load lb	Truck (777D) Load lb	769D Loaded Weight (lbs)	20	15	10	5	773E Loaded Weight (lbs)	20	15	10	5	777D Loaded Weight (lbs)	20	15	10	5
Alluvium	2,900	77,285	117,160	193,720	155,141	11	11	15	26	216,390	7	7	13	23	353,705	7	9	12	29
Basalt	3,300	87,945	133,320	220,440	165,801	11	11	11	20	232,550	7	7	13	23	380,425	7	7	12	21
Clay - Dry	2,500	66,625	101,000	167,000	144,481	11	11	15	26	200,230	7	9	13	23	326,985	7	9	16	29
Granite - broken	2,800	74,620	113,120	187,040	152,476	11	11	15	26	212,350	7	7	13	23	347,025	7	9	12	29
Gravel	2,550	67,958	103,020	170,340	145,814	11	11	15	26	202,250	7	9	13	23	330,325	7	9	16	29
LS - broken	2,600	69,290	105,040	173,680	147,146	11	11	15	26	204,270	7	9	13	23	333,665	7	9	12	29
LS - crushed	2,600	69,290	105,040	173,680	147,146	11	11	15	26	204,270	7	9	13	23	333,665	7	9	12	29
Sandstone	2,550	67,958	103,020	170,340	145,814	11	11	15	26	202,250	7	9	13	23	330,325	7	9	16	29
Shale	2,100	55,965	84,840	140,280	133,821	11	11	15	26	184,070	7	9	13	31	300,265	7	9	16	29
Stone - crushed	2,700	71,955	109,080	180,360	149,811	11	11	15	26	208,310	7	7	13	23	340,345	7	9	12	29
Tailings - Coarse (dry, loose sand)	2,400	63,960	96,960	160,320	141,816	11	11	15	26	196,190	7	9	13	23	320,305	7	9	16	29
Tailings - Slimes (loose sand & clay)	2,700	71,955	109,080	180,360	149,811	11	11	15	26	208,310	7	7	13	23	340,345	7	9	12	29
Topsoil	1,600	42,640	64,640	106,880	120,496	11	11	15	26	163,870	7	9	17	31	266,865	9	12	16	29
					Empty	15	15	26	36	Empty	13	17	23	42	Empty	16	16	29	39

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials / Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)

Material	lb/cy	Truck (785C) Load lb	Truck (793C) Load lb	Truck (797B) Load lb	785C Loaded Weight (lbs)	20	15	10	5	793C Loaded Weight (lbs)	20	15	10	5	797B Loaded Weight (lbs)	20	15	10	5
Alluvium	2,900	261,725	427,750	751,100	485,359	8	8	14	27	782,453	7	7	10	17	1,337,700	7	7	9	17
Basalt	3,300	297,825	486,750	854,700	521,459	8	8	14	27	841,453	7	7	10	17	1,441,300	7	7	9	17
Clay - Dry	2,500	225,625	368,750	647,500	449,259	8	11	14	36	723,453	7	7	10	25	1,234,100	7	7	9	23
Granite - broken	2,800	252,700	413,000	725,200	476,334	8	8	14	27	767,703	7	7	10	17	1,311,800	7	7	9	17
Gravel	2,550	230,138	376,125	660,450	453,772	8	8	14	36	730,828	7	7	10	25	1,247,050	7	7	9	23
LS - broken	2,600	234,650	383,500	673,400	458,284	8	8	14	27	738,203	7	7	10	25	1,260,000	7	7	9	23
LS - crushed	2,600	234,650	383,500	673,400	458,284	8	8	14	27	738,203	7	7	10	25	1,260,000	7	7	9	23
Sandstone	2,550	230,138	376,125	660,450	453,772	8	8	14	36	730,828	7	7	10	25	1,247,050	7	7	9	23
Shale	2,100	189,525	309,750	543,900	413,159	8	11	14	36	664,453	7	7	10	25	1,130,500	7	7	13	23
Stone - crushed	2,700	243,675	398,250	699,300	467,309	8	8	14	27	752,953	7	7	10	17	1,285,900	7	7	9	23
Tailings - Coarse (dry, loose sand)	2,400	216,600	354,000	621,600	440,234	8	11	14	36	708,703	7	7	10	25	1,208,200	7	7	9	23
Tailings - Slimes (loose sand & clay)	2,700	243,675	398,250	699,300	467,309	8	8	14	27	752,953	7	7	10	17	1,285,900	7	7	9	23
Topsoil	1,600	144,400	236,000	414,400	368,034	8	11	19	36	590,703	7	10	13	25	1,001,000	7	9	13	23
					Empty	14	19	36	36	Empty	10	13	17	33	Empty	13	17	23	42

Source: Caterpillar Performance Handbook Edition 35

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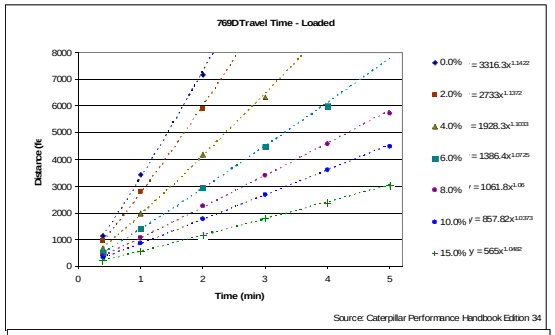
Productivity - Haul Trucks (cont.)

769D Haul Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	1,148	3,428	7,183				3316.3	1.1422
4	689	1,984	4,198	6,330			1928.3	1.1033
6	508	1,427	2,952	4,510	6,002		1386.4	1.0725
8	394	1,082	2,263	3,411	4,592	5,740	1061.8	1.06
10	328	869	1,771	2,690	3,608	4,510	857.82	1.0373
15	213	574	1,181	1,804	2,394	3,018	565	1.0482

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



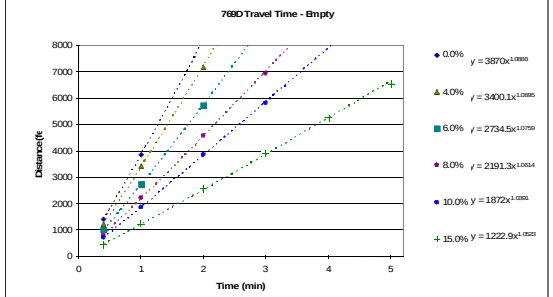
Source: Caterpillar Performance Handbook Edition 34

769D Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	1,427	3,870					3870	1.0888
4	1,246	3,444	7,183				3400.1	1.0895
6	1,017	2,755	5,740				2734.5	1.0759
8	820	2,230	4,592	6,954			2191.3	1.0614
10	722	1,870	3,870	5,838			1872	1.0391
15	459	1,246	2,558	3,903	5,248	6,560	1222.9	1.0523

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



Source: Caterpillar Performance Handbook Edition 34

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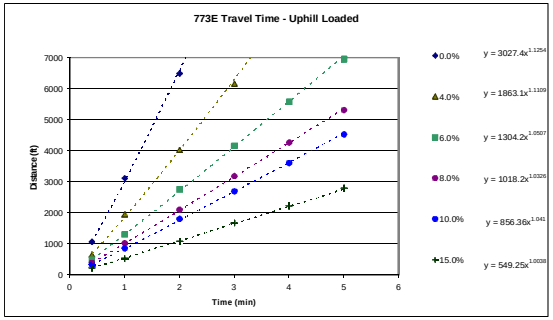
Productivity - Haul Trucks (cont.)

773E Haul Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	1,066	3,117	6,496				3027.4	1.1254
4	656	1,952	4,035	6,168			1863.1	1.1109
6	492	1,312	2,756	4,167	5,577	6,955	1304.2	1.0507
8	394	1,017	2,100	3,182	4,265	5,315	1018.2	1.0326
10	328	853	1,804	2,690	3,609	4,528	856.36	1.041
15	226	525	1,083	1,673	2,231	2,789	549.25	1.0038

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

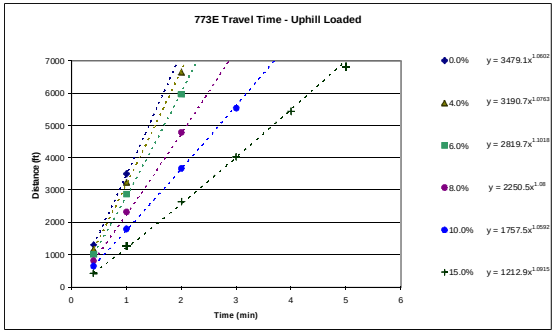


773E Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	1,312	3,510	7,218				3479.1	1.0602
4	1,181	3,248	6,660				3190.7	1.0763
6	1,017	2,887	5,971				2819.7	1.1018
8	820	2,329	4,790	7,218			2250.5	1.08
10	656	1,804	3,675	5,545			1757.5	1.0592
15	427	1,280	2,657	4,035	5,446	6,824	1212.9	1.0915

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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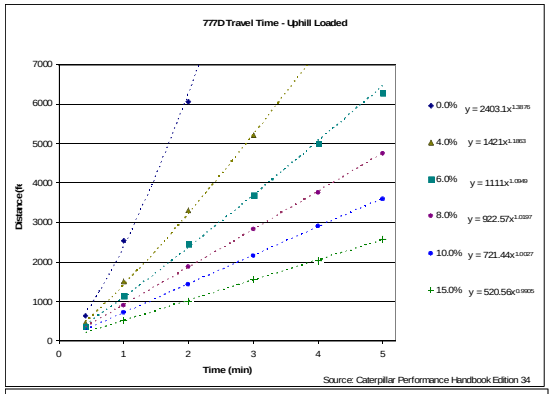
Productivity - Haul Trucks (cont.)

777D Haul Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	656	2,558	6,068				2403.1	1.3876
4	459	1,509	3,313	5,215	7,085		1412	1.1863
6	394	1,148	2,460	3,706	5,018	6,298	1111	1.0949
8		918	1,886	2,837	3,772	4,756	922.57	1.0197
10		722	1,443	2,165	2,919	3,608	721.44	1.0027
15		525	1,017	1,558	2,034	2,591	520.56	0.9905

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



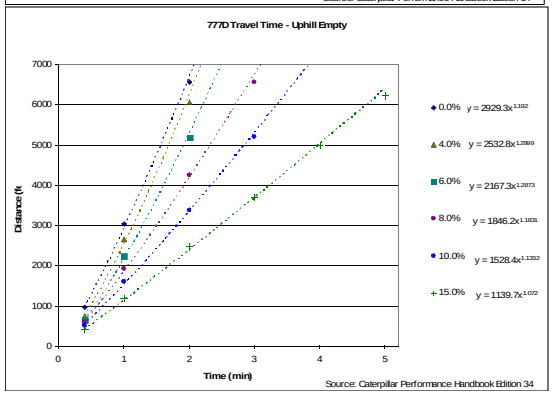
Source: Caterpillar Performance Handbook Edition 34

777D Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	968	3,034	6,560				2929.3	1.192
4	754	2,657	6,068				2532.8	1.2999
6	656	2,247	5,182				2167.3	1.2873
8	607	1,935	4,248	6,560			1846.2	1.1831
10	525	1,607	3,378	5,215	7,282		1528.4	1.1332
15	410	1,197	2,460	3,706	4,986	6,232	1139.7	1.072

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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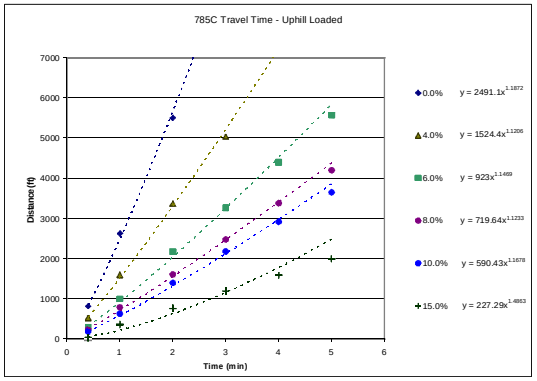
Productivity - Haul Trucks (cont.)

785C Haul Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	820	2,630	5,500				2491.1	1.1872
4	530	1,600	3,370	5,040			1524.4	1.1206
6	300	1,000	2,180	3,270	4,400	5,570	923	1.1469
8	240	790	1,610	2,480	3,380	4,200	719.64	1.1233
10	190	630	1,400	2,180	2,920	3,650	590.43	1.1678
15	40	370	770	1,200	1,590	2,000	227.29	1.4863

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

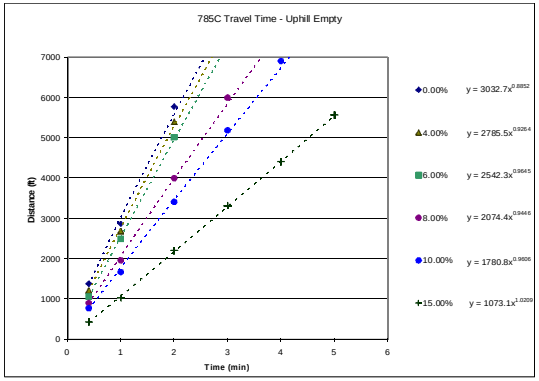


785C Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.4	1	2	3	4	5	k	p
0	1,380	2,870	5,780				3032.7	0.8852
4	1,210	2,690	5,400				2785.5	0.9264
6	1,060	2,490	5,020				2542.3	0.9645
8	900	1,960	4,000	6,000			2074.4	0.9446
10	770	1,670	3,410	5,190	6,910		1780.8	0.9606
15	430	1,030	2,200	3,320	4,410	5,570	1073.1	1.0209

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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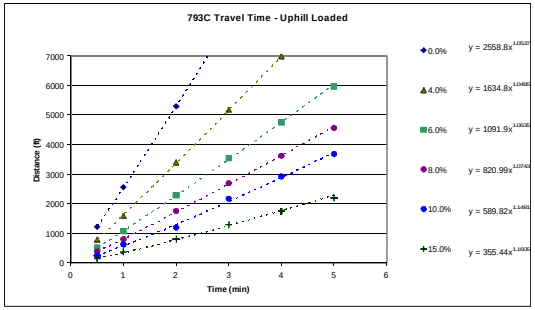
Productivity - Haul Trucks (cont.)

793C Haul Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,230	2,570	5,300				2558.8	1.0537
4	800	1,600	3,400	5,190	7,000		1634.8	1.0485
6	520	1,090	2,300	3,560	4,760	5,970	1091.9	1.0635
8	390	810	1,760	2,700	3,630	4,570	820.99	1.0743
10	260	630	1,200	2,180	2,930	3,690	589.82	1.1481
15	150	380	810	1,300	1,760	2,210	355.44	1.1605

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

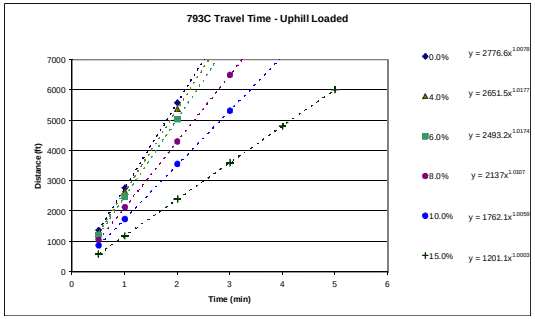


793C Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,380	2,780	5,580				2776.6	1.0078
4	1,310	2,650	5,370				2651.5	1.0177
6	1,230	2,500	5,040				2493.2	1.0174
8	1,060	2,140	4,300	6,490			2137	1.0107
10	880	1,750	3,560	5,310			1762.1	1.0059
15	600	1,200	2,410	3,610	4,800	6,000	1201.1	1.0003

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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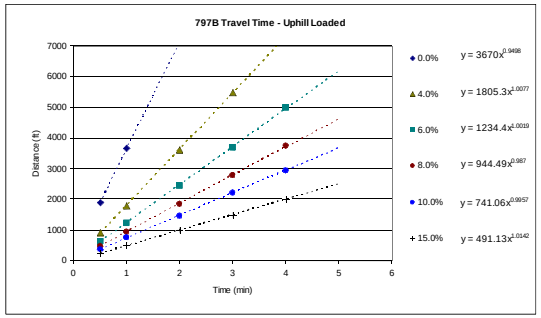
Productivity - Haul Trucks (cont.)

797B Haul Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,900	3,670					3670	0.9498
4	900	1,800	3,620	5,480			1805.3	1.0077
6	620	1,230	2,450	3,700	5,000		1234.4	1.0019
8	480	940	1,850	2,790	3,750		944.49	0.987
10	370	750	1,460	2,220	2,950		741.06	0.9957
15	240	500	1,000	1,480	2,000		491.13	1.0142

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

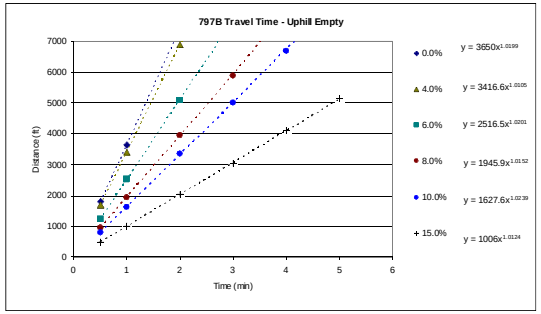


797B Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	1,800	3,650					3650	1.0199
4	1,700	3,400	6,900				3416.6	1.0105
6	1,240	2,520	5,100				2516.5	1.0201
8	960	1,950	3,960	5,900			1945.9	1.0152
10	800	1,620	3,350	5,000	6,700		1627.6	1.0239
15	500	1,000	2,040	3,050	4,100	5,130	1006	1.0124

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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Productivity - Articulated Trucks

Articulated Truck Specifications				
Description	**725**	**730**	**735**	**740**
Chassis Weight (lb)				
Body Weight (lb)				
Standard Liner Weight (lb)				
Operating Weight (Empty) (lb)	50,120	51,220	65,830	72,070
Payload Capacity (cy)				
Struck	14.5	17.1	19.3	23.3
Heaped	18.8	22.1	31.8	30.2
Average	16.65	19.6	25.55	26.75
Maneuver to Load Time (min)	0.7	0.7	0.7	0.7
Maneuver and Dump Time (min)	1.1	1.1	1.1	1.1
Job Efficiency	0.83	0.83	0.83	0.83
Rolling Resistance**	2.5	2.5	2.5	2.5
Altitude Deration Factor	1	1	1	1

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials				Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)									
				725					730				
Material	**lb/cy**	**Truck (725) Load lb**	**Truck (730) Load lb**	**Loaded Weight (lbs)**	**20**	**15**	**10**	**5**	**Loaded Weight (lbs)**	**20**	**15**	**10**	**5**
Alluvium	2,900	48,285	56,840	98,405	9	9	13	30	108,060	5	8	13	29
Basalt	3,300	54,945	64,680	105,065	5	9	13	22	115,900	5	8	13	29
Clay - Dry	2,500	41,625	49,000	91,745	9	13	13	30	100,220	8	8	13	29
Granite - broken	2,800	46,620	54,880	96,740	9	13	13	30	106,100	5	8	13	29
Gravel	2,550	42,458	49,980	92,578	9	13	13	30	101,200	8	8	13	29
LS - broken	2,600	43,290	50,960	93,410	9	13	13	30	102,180	8	8	13	29
LS - crushed	2,600	43,290	50,960	93,410	9	13	13	30	102,180	8	8	13	29
Sandstone	2,550	42,458	49,980	92,578	9	13	13	30	101,200	8	8	13	29
Shale	2,100	34,965	41,160	85,085	9	13	22	30	92,380	8	13	13	29
Stone - crushed	2,700	44,955	52,920	95,075	9	13	13	30	104,140	8	8	13	29
Tailings - Coarse (dry, loose sand)	2,400	39,960	47,040	90,080	9	13	13	30	98,260	8	8	13	29
Tailings - Slimes (loose sand & clay)	2,700	44,955	52,920	95,075	9	13	13	30	104,140	8	8	13	29
Topsoil	1,600	26,640	31,360	76,760	9	13	22	30	82,580	8	13	22	35
				Empty	13	13	22	30	Empty	13	13	22	35

Source: Caterpillar Performance Handbook Edition 35

Weight of Materials				Downhill Haul Truck Speed - Grade Retarding vs. Effective Grade (Grade - Rolling Resistance)									
				735					740				
Material	**lb/cy**	**Truck (735) Load lb**	**Truck (740) Load lb**	**Loaded Weight (lbs)**	**20**	**15**	**10**	**5**	**Loaded Weight (lbs)**	**20**	**15**	**10**	**5**
Alluvium	2,900	74,095	77,575	139,925	7	9	13	27	149,645	7	9	17	23
Basalt	3,300	84,315	88,275	150,145	7	9	13	27	160,345	7	9	13	23
Clay - Dry	2,500	63,875	66,875	129,705	7	9	13	27	138,945	9	13	17	31
Granite - broken	2,800	71,540	74,900	137,370	7	9	13	27	146,970	7	9	17	23
Gravel	2,550	65,153	68,213	130,983	7	9	13	27	140,283	7	9	17	31
LS - broken	2,600	66,430	69,550	132,260	7	9	13	27	141,620	7	9	17	31
LS - crushed	2,600	66,430	69,550	132,260	7	9	13	27	141,620	7	9	17	31
Sandstone	2,550	65,153	68,213	130,983	7	9	13	27	140,283	7	9	17	31
Shale	2,100	53,655	56,175	119,485	9	9	18	27	128,245	7	13	17	31
Stone - crushed	2,700	68,985	72,225	134,815	7	9	13	27	144,295	7	9	17	23
Tailings - Coarse (dry, loose sand)	2,400	61,320	64,200	127,150	7	9	13	27	136,270	9	13	17	31
Tailings - Slimes (loose sand & clay)	2,700	68,985	72,225	134,815	7	9	13	27	144,295	7	9	17	23
Topsoil	1,600	40,880	42,800	106,710	9	13	18	36	114,670	9	13	17	31
				Empty	13	18	27	42	Empty	17	17	23	31

Source: Caterpillar Performance Handbook Edition 35

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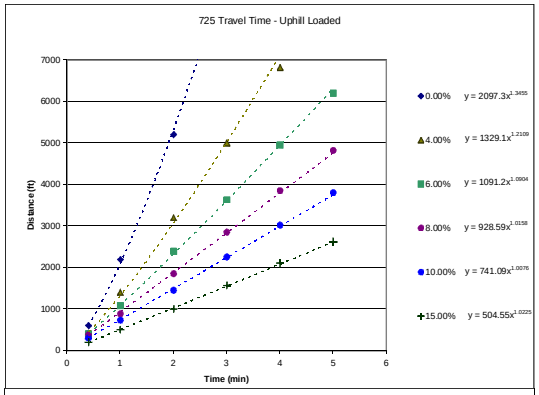
Productivity - Articulated Trucks (cont.)

725 Articulated Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	600	2,190	5,200				2097.3	1.3455
4	420	1,400	3,200	5,000	6,820		1329.1	1.2109
6	400	1,080	2,390	3,630	4,950	6,200	1091.2	1.0904
8	380	880	1,850	2,850	3,850	4,820	928.59	1.0158
10	300	729	1,450	2,250	3,020	3,800	741.09	1.0076
15	200	500	1,000	1,570	2,100	2,620	504.55	1.0225

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

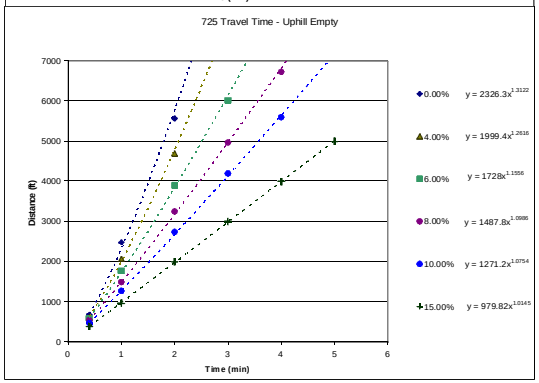


725 Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	680	2,480	5,570				2326.3	1.3122
4	620	2,070	4,700				1999.4	1.2616
6	590	1,770	3,900	6,020			1728	1.1556
8	540	1,490	3,250	4,970	6,730		1487.8	1.0986
10	470	1,270	2,740	4,200	5,600	7,050	1271.2	1.0754
15	390	960	2,000	3,000	4,000	5,000	979.82	1.0145

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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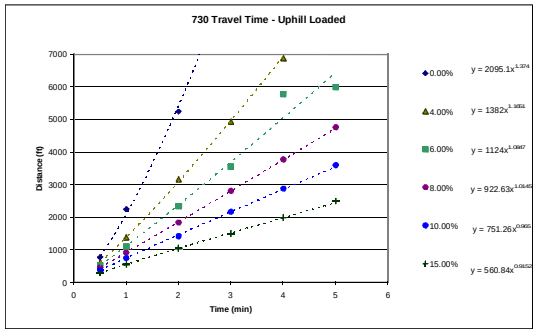
Productivity - Articulated Trucks (cont.)

730 Articulated Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	780	2,250	5,240				2095	1.374
4	610	1,390	3,170	4,930	6,880		1382	1.1651
6	540	1,100	2,340	3,550	5,780	6,000	112	1.0847
8	460	920	1,840	2,810	3,770	4,760	922.63	1.0145
10	390	750	1,420	2,170	2,880	3,600	751.26	0.965
15	300	560	1,050	1,500	1,995	2,500	560.84	0.9152

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

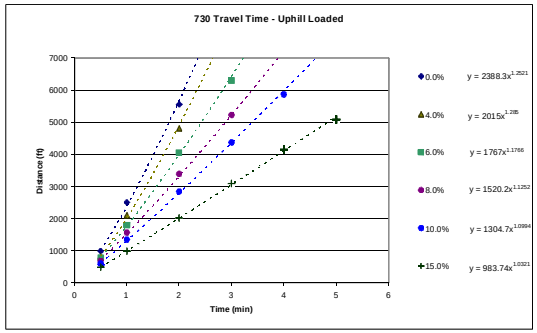


730 Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	980	2,500	5,560				2388	1.25621
4	810	2,100	4,810				2015	1.285
6	770	1,800	4,060	6,310			1767	1.1766
8	680	1,560	3,390	5,230	7,070		1520.2	1.1252
10	595	1,340	2,840	4,370	5,870		1304.7	1.0994
15	480	980	2,020	3,090	4,150	5,090	983.74	1.0321

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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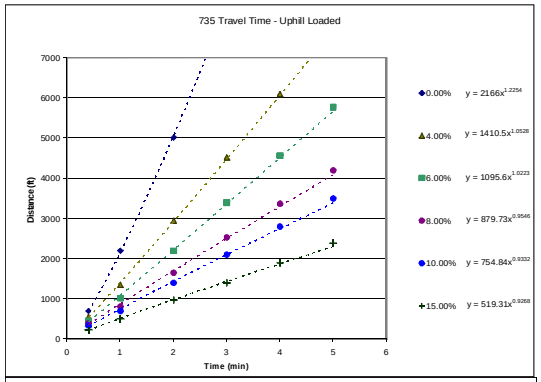
Productivity - Articulated Trucks (cont.)

735 Articulated Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	700	2,200	5,020				2166	1.2254
4	550	1,350	2,950	4,520	6,100		1410.5	1.0528
6	450	1,020	2,200	3,400	4,570	5,770	1095.6	1.0223
8	390	810	1,650	2,530	3,370	4,200	879.73	0.9546
10	340	700	1,400	2,100	2,800	3,500	754.84	0.9332
15	230	500	970	1,400	1,900	2,390	519.31	0.9268

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

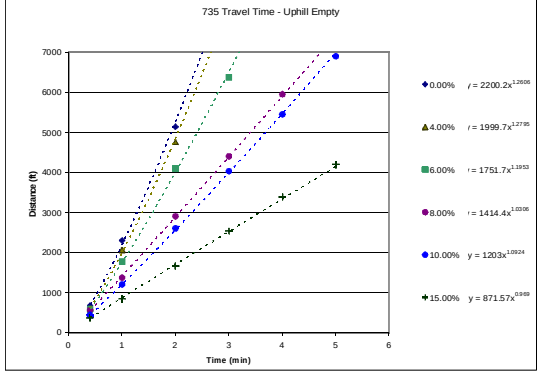


735 Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	680	2,300	5,140				2200.2	1.2606
4	610	2,070	4,760				1999.7	1.2795
6	580	1,770	4,100	6,370			1751.7	1.1953
8	560	1,370	2,900	4,400	5,950		1414.4	1.0306
10	440	1,200	2,600	4,030	5,450	6,900	1203	1.0924
15	370	840	1,660	2,540	3,390	4,200	871.57	0.969

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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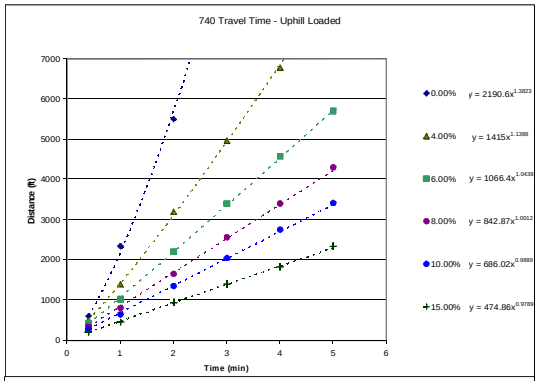
Productivity - Articulated Trucks (cont.)

740 Articulated Truck Travel Time - Uphill Loaded

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	600	2,340	5,500				2190.6	1.3823
4	500	1,390	3,190	4,960	6,780		1415	1.1389
6	420	1,020	2,200	3,400	4,580	5,700	1066.4	1.0438
8	350	800	1,650	2,560	3,400	4,300	842.87	1.0012
10	290	640	1,350	2,040	2,750	3,410	686.02	0.9889
15	200	450	940	1,400	1,830	2,340	474.86	0.9789

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35

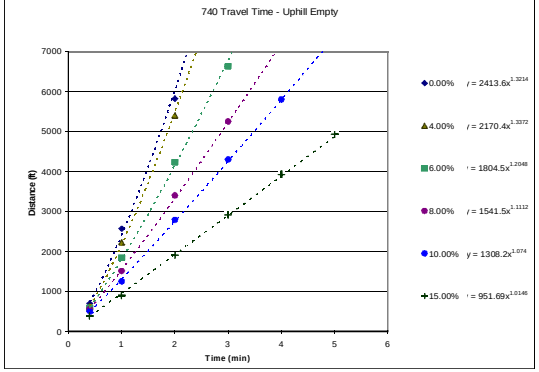


740 Haul Truck Travel Time - Uphill Empty

Total Resistance (%) (rolling + grade)	Time (min) 0.5	1	2	3	4	5	k	p
0	700	2,570	5,820				2413.6	1.3214
4	630	2,230	5,400				2170.4	1.3372
6	590	1,840	4,230	6,630			1804.5	1.2048
8	560	1,510	3,400	5,250	7,120		1541.5	1.1112
10	500	1,250	2,790	4,300	5,800		1308.2	1.074
15	390	900	1,900	2,920	3,930	4,930	951.69	1.0146

$$\text{Travel Time (min)} = \sqrt[p]{\frac{\text{distance}}{k}}$$

Source: Caterpillar Performance Handbook Edition 35



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Productivity - Wheel Loaders

Wheel Loader Specifications

Description	924G	928G	950G	966G	972G	972G (2)	980G	988G	988G(2)	990	992G	992G(2)	994D	L2350
Payload Capacity (cy)														
Struck	2.2	2.5	3.46	4.46	4.71	4.71	6.34	6.9	6.9	9.5	13.2	13.2	18	
Heaped	2.7	3.25	4	5.25	5.5	5.5	7.25	8.33	8.33	11.25	16	16	22.5	
Average	2.45	2.875	3.73	4.855	5.105	5.105	6.795	7.615	7.615	10.375	14.6	14.6	20.25	53
Matched Truck	N/A	N/A	N/A	725	730	735	N/A	740	769D	773D	777D	785C	793C	797B
Average Cycle Time (min)	0.45	0.45	0.5	0.5	0.5	0.5	0.55	0.55	0.55	0.55	0.6	0.6	0.6	0.75
Passes to Fill Truck	N/A	N/A	N/A	3	4	5	N/A	4	3	4	5	6	7	5
Altitude Deration Factor	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Operator Efficiency	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Job Efficiency	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Time to Fill Truck	N/A	N/A	N/A	1.5	2	2.5	N/A	2.2	1.65	2.2	3	3.6	4.2	3.75
Rolling Resistance**	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Loader matched to small truck fleet
Loader matched to medium truck fleet
Loader matched to large truck fleet
Loader matched to extra large truck fleet

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered
992G (2) - can be used to load 785 with 6 passes

Source: Caterpillar Performance Handbook Edition 35; LeTourneau/actual Chilean mine operating data for L2350.

Wheeled Loaders	General Purpose	Spade Nose-Rock
928G	3.25 cubic yard	not available
966G	5.0 cubic yard	not available
972G	5.5 cubic yard	not available
988G	not available	8.3 cubic yard
992G	not available	16.0 cubic yard

note: capacities are 2:1 heaped, SAE standards
NOTES: Buckets for both Track Excavators and Wheel Loaders are offered by CECo & available for the rental rates quoted. Bucket sizes and capacities obtained from CATERPILLAR PERFORMANCE HANDBOOK, ED 34; Section 12, Wheel Loader and Section 4, Excavators

Bucket capacity and width dictated by material weight and configuration, ie., shot, loose, tight bank, stockpile, rock, etc. Typical Nevada applications were used to determine above bucket capacities as related to materials & densities. Job site specifics may alter specific bucket requirements. (Cashman Equipment, Elko, Nevada - February 21, 2005)

Productivity - Shovels

Shovel Specifications (Komatsu equivalent)

Description	PC2000	PC3000	PC4000	PC5500	PC8000
Payload Capacity (cy)					
Struck	10.46	18.84	26.16	33.48	47.09
Heaped	14.39	25.9	35.97	46.04	64.75
Average	12.43	22.37	31.07	39.76	55.92
Matched Truck	740	777D	785C	793C	797B
Average Cycle Time (min)	0.49	0.49	0.59	0.59	0.69
Passes to Fill Truck	2.05	2.84	3.38	4.69	5.11
Altitude Deration Factor	1	1	0.9	1	1
Operator Efficiency	1	1	1	1	1
Job Efficiency	0.83	0.83	0.83	0.83	0.83
Time to Fill Truck	1.68	2.33	3.32	4.61	5.86
Rolling Resistance**	2.5	2.5	2.5	2.5	2.5

Shovel matched to small truck fleet
Shovel matched to medium truck fleet
Shovel matched to large truck fleet
Shovel matched to extra large truck fleet

**A firm, smooth, rolling roadway with dirt or light surfacing, flexing slightly under load or undulating, maintained fairly regularly, watered
992G (2) - can be used to load 785 with 6 passes

Source: Caterpillar Performance Handbook Edition 35; Komatsu actual Peruvian mine (Lagunas Norte) operating data for PC4000.

Productivity - Motor Graders

Motor Grader Specifications

Description	120H	14G/H	16G/H	24M
Grader Width (ft)	8	9.25	10.08	14.04
Blade Width (ft)	12	14	16	16
Ripper Width (7 shanks) (ft)	7.6	8.5	9.75	12.83
Road Maintence Speed (mph)				
Minimum	3	3	3	3
Maximum	9.5	9.5	9.5	9.5
Average	6.25	6.25	6.25	6.25
Hourly Production	33,000	33,000	33,000	33,000
Ripping Speed (mph)	1	1	1	1
Minimum	0	0	0	0
Maximum	3	3	3	3
Average	1.5	1.5	1.5	1.5
Altitude Deration Factor	1	1	1	1
Hourly Production (with job efficiency correction & altitude deration factors) (excluding manuever time)	6,574	6,574	6,574	6,574
Maneuver time per pass (min)	0.5	0.5	0.5	0.5
Operator Efficiency	1	1	1	1

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Job Efficiency	0.83	0.83	0.83	0.83

Source: Caterpillar Performance Handbook Edition 35

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Productivity - Excavators

Track Excavator Specifications

Description	312C	320C	325C	330C	345B	365BL	385BL
Bucket Capacity (cy)	0.68	1.57	2.22	2.22	3	4.6	7.3
Fill Factor	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Average Bucket Load (cy)	0.612	1.413	1.998	1.998	2.7	4.14	6.57
Soil Type	packed earth	hard clay	hard clay	hard clay	hard clay	hard clay	hard clay
Job Condition	med-hard	med-hard	med-hard	med-hard	med-hard	med-hard	med-hard
Cycle Times (minutes) - based on hard clay							
Load Bucket	0.07	0.09	0.09	0.09	0.13	0.1	0.19
Swing Loaded	0.06	0.06	0.06	0.07	0.07	0.09	0.06
Dump Bucket	0.03	0.03	0.04	0.04	0.02	0.04	0.03
Swing Empty	0.05	0.05	0.06	0.07	0.06	0.07	0.07
Total Cycle Time	0.21	0.23	0.25	0.27	0.28	0.3	0.35
Job Efficiency	0.83	0.83	0.83	0.83	0.83	0.83	0.83
Operator Efficiency	1	1	1	1	1	1	1
Altitude Deration Factor	1	1	1	1	1	1	1
Corrected Productivity (LCY/hr)	145	306	398	369	480	687	935
Exploration Road Cycle Time (1) (min)	N/A	0.38	0.4	N/A	0.42	N/A	N/A
Exploration Road Corr Prod (LCY/hr)	N/A	185	249	N/A	320	N/A	N/A
Track Width (ft)	8.17	9.17	9.83	10.5	11.42	11.5	11.5
Ditch/Trench Excavation							
Bucket Capacity (cy)	0.42	0.58	0.88	0.89	2.09	3.27	2.75
Fill Factor	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Corrected Productivity (LCY/hr)	50	63	88	82	186	271	196

Source: Caterpillar Performance Handbook Edition 35

Track Excavators	Hvy Duty Rock	Extreme Service Exc (e.g. haulroad recontour)	Hvy Duty Trench
312C	30", 0.68 cubic yd	47", 0.94 cubic yd	22", .42 cubic yd
320C	30", 0.90 cubic yd	55.1", 1.57 cubic yd	23.6", .58 cubic yd
325C	36", 1.25 cubic yd	60", 2.22 cubic yd	30", .88 cubic yd
330C	36", 1.25 cubic yd	60", 2.22 cubic yd	30", .89 cubic yd
345B	43.2", 1.69 cubic yd	65", 3.0 cubic yd	48", 2.09 cubic yd
365BL	60", 3.25 cubic yd	82", 4.6 cubic yd	59", 3.27 cubic yd
385BL	85", 6.30 cubic yd.	96.0, 7.30 cubic yd	57", 2.75 cubic yd

Note: capacities are 2:1 heaped, SAE standards
NOTES: Buckets for both Track Excavators and Wheel Loaders are offered by CECo &

available for the rental rates quoted. Bucket sizes and capacities obtained from CATERPILLAR PERFORMANCE HANDBOOK, ED 34; Section 12, Wheel Loader and Section 4, Excavators
Bucket capacity and width dictated by material weight and configuration, ie., shot, loose, tight bank, stockpile, rock, etc. Typical Nevada applications were used to determine above bucket capacities as related to materials & densities. Job site specifics may alter specific bucket requirements (Cashman Equipment, Elko, Nevada - February 21, 2005)

(1) Exploration cycle time assumes feathering/smoothing performed by excavator

Concrete Breaking Production

Track Excavator w/Hammer Specifications

Description	325C	345B	385BL
Hydraulic Hammer	H120D s	H160D s	H180D s
Material	reinforced concrete		
Min Shift Production (yd3/8hr)	160	300	350
Max Shift Production (yd3/8hr)	300	850	1,550
Avg Shift Production (8hr)	230	575	950
Job Efficiency	0.83	0.83	0.83
Altitude Deration Factor	1	1	1

Source: Caterpillar Performance Handbook Edition 35

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Drill Hole Plugging Productivity

Drill Hole Plugging Productivity		
Description	**Drill Rig**	**Pump Rig**
Move-to-hole, set-up, tear-down [1]	2	2
Trip in tremmie pipe [1]	500	
Pulling casing (threaded, not cemented)	200	
Single-pass perforating (water wells)	Productivity(all p	Passes
4	60	4
6	60	4
8	50	4
12	45	6
18	40	9
24	28	12
Perforation setup,trip in/out,tear-down	2	
Perforation tool cost (wear cost)[3]	2.5	
Inert Material Placement (backfill)		
Grouting/Cement [4] (cy/hr)		5.33
Cuttings (see below) (cy/hr)		3.5

Sources:
1. Drillers daily logs from Newmont, Barrick, New West Gold, Agnico Eagle, Idaho General Mines Inc.
2. Drillers daily logs from Newmont, Barrick, Target Minerals
3. Drillers daily logs from Newmont
4. WDC Exploration, Dec 2005

Sournce: WDC Exploration, Dec 2005

Cuttings Placement Productivity		
Shift productivity (Means 02210-700-0120; Crew B11M)	28	cy / shift
Shift length	8	hours
Estimated Hourly Productivity	3.5	cy / hour

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Altitude Deration Table

	Elevation											
	0-760 m (0-2500')		760-1500 m (2500-5000')		1500-2300 m (5000-7000')		2300-3000 m (7500-10,000')		3000-3800 m (10,000-12,000')		3800-4600 m (12,500-15,000')	
MODEL	**CAT**	**User**	**CAT**	**User**	**CAT**	**User**	**CAT**	**User**	**CAT**	**User**	**CAT**	**User**
Bulldozers												
D6R	100		100		100		100		92		84	
D6R w/ Winch	100		100		100		100		92		84	
D7R	100		100		100		100		100		96	
D8R	100		100		100		93		85		77	
D9R	100		100		100		93		85		77	
D10R	100		100		100		100		97		89	
D11R	100		100		100		93		85		77	
Wheeled Dozers												
824G	100		100		100		100		92		84	
834G	100		100		100		100		92		84	
844	100		100		100		100		100		96	
854G	100		100		100		93		85		77	
Graders												
120H	100		100		100		100		96		93	
14G/H	100		100		100		100		98		96	
16G/H	100		100		100		100		98		96	
24M	100		100		100		100		98		96	
Excavators												
312C	100		100		100		83		78		73	
320C	100		100		90		87		83		76	
325C	100		100		100		100		100		100	
330C	100		100		100		100		100		100	
345B	100		100		100		100		93		93	
365BL	100		100		100		86		86		86	
385BL	100		100		100		93		85		78	
Scrapers												
631G	100		100		100		100		97		90	
637G	100		100		100		95		87		80	
Loaders												
924G	100		100		100		100		97		89	
928G	100		100		100		100		92		85	
950G	100		100		100		100		100		100	
966G	100		100		100		100		96		88	
972G	100		100		92		84		77		70	
980G	100		100		100		100		96		88	
988G	100		100		100		95		85		75	
990	100		100		100		100		92		85	
992G	100		100		100		100		93		87	
994D	100		100		100		100		96		88	
L2350	100		100		100		100		96		90	
Shovels												
PC2000	100		100		100		100		96		90	
PC3000	100		100		100		100		96		90	
PC4000	100		100		100		100		96		90	
PC5500	100		100		100		100		96		90	
PC8000	100		100		100		100		96		90	
Other Equipment												
420D 4WD Backhoe	99		97		95		91		91		91	
428D 4WD Backhoe	99		97		95		91		91		91	
CS533E Vibratory Roller	100		100		98		95		91		86	
CS633E Vibratory Roller	100		100		100		100		91		86	
CP533E Sheepsfoot Compactor	100		100		98		95		91		100	
CP633E Sheepsfoot Compactor	100		100		100		100		91		86	
Light Truck - 1.5 Ton												
Supervisor's Truck												
Flatbed Truck												
Air Compressor + tools												
Welding Equipment												
Heavy Duty Drill Rig												
Pump (plugging) Drill Rig												
Concrete Pump												
Gas Engine Vibrator												
Generator 5KW												
HDEP Welder (pipe or liner)												
5 Ton Crane												
20 Ton Crane												
50 Ton Crane												
120 Ton Crane												
Trucks												
725	100		100		100		100		100		95	
730	100		100		100		100		100		95	
735	100		100		100		100		99		91	
740	100		100		100		100		99		91	
769D	100		100		100		93		88		82	
773E	100		100		100		100		93		85	
777D	100		100		100		100		93		87	
785C	100		100		100		93		86		80	
793C	100		100		100		100		100		93	
797B	100		100		100		100		100		93	
613E (5,000 gal) Water Wagon	100		100		100		100		95		87	
621E (8,000 gal) Water Wagon	100		100		100		100		97		90	
777D Water Truck	100		100		100		100		93		87	
785C Water Truck	100		100		100		93		86		80	
Dump Truck (10-12 yd^3) (5)												

Notes:
User entered deration value will override values from CAT Performance Handbook, except L2350 Loader: data from actual mine performance in Chile.
Komatsu altitude deration assumed from LeTourneau L2350

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Closure Cost Estimate
Seed Mixture

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Seed Mixture						
Common Name	Scientific Name	Species Number of Seeds / lb	Species % in Mix	PLS/acre	Cost/Lb	Cost/Acre
Grasses						
Seed Mix:			100.00	9.00	9.20	$82.80
Arctared Fescue						
Gruenin Alpine Bluegrass						
Tundra Glaucous Bluegrass						
Nortran Tufted Hairgrass						
Forbs						
Shrubs						
Total				$9.00		$82.80

Source:

Notes:

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Closure Cost Estimate
User 1

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

2012 MOB/DEMOB using R.S. MEANS and SRCE equipment and Alaska Labor Rates

Miles to project, one way	350
Speed (MPH)	55
Hours travel time	6.363636364

Equipment	Mobilization $/hour Equipment	Dead head Equipment	Mobilization $/hour Labor	Dead Head Labor	# of units	One Way Mob Cost Equipment	One Way Mob Cost Labor	Total Mob and Demob Cost	
Bulldozers									
D6R	$ 232	$ 115	$ 211	$ 65	0	$ -	$ -	$ -	
D8R	$ 242	$ 115	$ 211	$ 65	0	$ -	$ -	$ -	
D10R	$ 321	$ 115	$ 211	$ 65	7	$ 19,427	$ 12,266	$ 63,386	Multiple Mob/Demob, years 2017 (building demo), 2021 (WRD), 2029 (HL)
Loaders									
988	$ 242	$ 115	$ 211	$ 65	1	$ 2,273	$ 1,752	$ 8,051	
992G	$ 335	$ 115	$ 211	$ 65	3	$ 8,598	$ 5,257	$ 27,709	
Haul Truck									
733	$ 209	$ 115	$ 211	$ 65	0	$ -	$ -	$ -	
740	$ 209	$ 115	$ 211	$ 65	2	$ 4,132	$ 3,505	$ 15,274	
777	$ 276	$ 115	$ 211	$ 65	9	$ 22,410	$ 15,771	$ 76,362	Multiple Mob/Demob, years 2017 (building demo, TSF Wetland and Upland), 2021 (WRD), 2029 (HL)
Track Excavators									
345B	$ 232	$ 115	$ 211	$ 65	1	$ 2,212	$ 1,752	$ 7,928	Mob/Demob year 2017 North Wetland Complex
365B	$ 259	$ 115	$ 211	$ 65	0	$ -	$ -	$ -	
385B	$ 255	$ 115	$ 211	$ 65	0	$ -	$ -	$ -	
Motor Graders									
14	$ 232	$ 115	$ 211	$ 65	4	$ 8,847	$ 7,009	$ 31,713	
16 G/H	$ 214	$ 115	$ 211	$ 65	4	$ 8,389	$ 7,009	$ 30,796	
Trucks									
777D Water Truck	$ 255	$ 115	$ 211	$ 65	2	$ 4,712	$ 3,505	$ 16,434	Mob/demob year 2017 Duration of Reclamation
25 Ton Crane	$ 239	$ 115	$ 211	$ 65	1	$ 2,255	$ 1,752	$ 8,016	Mob/demob year 2017 Building Demo
Dump Truck (10-12 yd3)	$ 255	$ 115	$ 211	$ 65	2	$ 4,712	$ 3,505	$ 16,434	Mob/demob year 2017 Building Demo
Seed and Fertilize									
Aircraft					3	$ 8,950	$ 8,950	$ 53,700	Multiple Mob/Demob, years 2017 (building Demo), 2021 (WRD), 2029 (HL)
TOTAL						$ 96,918	$ 72,032	$ 355,801	

Assumptions:

Grading

Barnes Creek will use three D10's, in 2021
Yellow Pup will use three D10's. The three D10's will be the same ones used on Barnes Creek.
Heap Leach will use three D10's beginning in 2029

Hauling

The number of haul trucks used for WRD and HL GM placement is the average number of trucks rounded up. The average is taken from the Waste Rock Dump and Heap Leach worksheets. There is one loader per three haul trucks.
Tailings Cover will start in 2017. From the Haul Material tab there is an average of 3 haul trucks per loader. Scarifying and ripping is accomplished by one D10.
Laydown Yard will use 2 Haul Trucks for GM placement. This occurs in 2017

Demolition

Structures to be demolished are identified on the Other Demo & Equip. Removal and Foundations and Building tab.

Closure Cost Estimate
User 2

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

PIT WATER TREATMENT

	2007 Estimate	CPI Inflation Calculator From 2007 to 2013
System Capital Cost ($)	$ 300,000	$ 335,917
Annual Operating Cost ($)	$ 100,000	$ 111,972
Years of Operation ($)	$ 15	
FeSo4 40 tons @ $1,100/ton delivered to site		$ 44,000
Total System Cost ($)	$ 1,800,000	$ 2,059,504

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
$ 400,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000

Pit water treatment costs based on estimate supplied by Water Management Consultants (see below).

This estimate was received in a technical memorandum from Water Management Consultants on January 10, 2007 titled Revised Fort Knox Pit Lake Evaluation.
Fort Knox pit lake evaluation 2012 update treatment provisions document by Schlumgerger Water Service revised the about of FeSo4 required for treatment to 40 tons.

Closure Cost Estimate
User 2

Details on the process are as follows:

1. $NaMnO_4$ solution injection to oxidize the seepage water, if necessary. Ideally, the redox potential of the water after oxidation should be around 350 mV. The chemical reaction is instantaneous, so very little reaction time is needed. Therefore, the reaction can take place in-line. The dosage rate would be controlled by feed-back from an in-line red-ox probe in the raw water stream.

2. Depending on pH of tailings decant/seepage water after oxidation, it will need to be adjusted to 7.5 to 8.0 s.u. This can be done using in-line CO_2 gas injection. It is possible that no pH adjustment will be required but it will be needed as a contingency to handle fluctuations in chemistry.

3. Mixing in 100-foot length pipe, downstream of the pH adjustment point. This will ensure that water conditions are uniform and stable prior to addition of coagulant. This would be accomplished by creating turbulent flow conditions through a pipe header that directs flow through many repetitive elbows.

4. Hydrated ferrous sulfate injection. The dosage rate should be equivalent to a ratio of 960:1 by mass, hydrated ferrous sulfate to arsenic. The dosage rate would be controlled by raw water feed rate. The dosage pump output rate would be tied to the influent flow meter. The addition of hydrated ferrous sulfate will cause the pH to decrease to 7.0 to 7.5, which is optimal for coagulation using iron-based coagulants.

5. Discharge directly to the pit lake. Physical mixing, precipitation/adsorption reactions, and settling will occur within the pit lake.

Figure 5.1 illustrates the conceptual process flow sheet. The system will consist of a sodium permanganate metering pump to inject directly into the raw water feed. The design flow rate of the system is expected to be on the order of 2,500 gpm. Lime addition will be accomplished using a slaked lime system and metering pump (Figure 5.1). Precipitates will be allowed to settle at the bottom of the pit. The sludge will become covered with sediments transported from the pit walls and remain physically and chemically stable.

The information provided above is conceptual in nature and in order to finalize the engineering design the following activities would be performed.

- Bench scale testing on actual decant and seepage water (both in appropriate proportions) to determine optimal reagents, dosing amounts and treatment efficiency.
- Sludge stability testing to confirm behavior of precipitates under expected conditions.
- Definition of a detailed pumping schedule and estimation of total volumes to be treated on a yearly basis.
- Pipe and pump sizing.
- Specification of metering rates for reagent addition.
- Detailed drawings showing final design and flow sheet specifications.

Closure Cost Estimate
User 2

The information above would be used to meet the requirements of 18 AAC 72.600 which provide the specifications for non-domestic water treatment systems. It is anticipated that a design package would be submitted under separate cover to address the requirements of 18 AAC 72.600. This submittal will include the following to the extent possible:

1) The location of proposed or existing improvements, wastewater treatment works and disposal systems, sewers, drinking water supply lines, drinking water sources, and waters in the vicinity of the proposed system.

2) Detailed flow diagrams showing the physical and chemical composition and amount of the non-domestic wastewater disposal.

3) A statement identifying persons who will own, operate, and maintain the proposed system.

4) A description and timetable of the proposed construction or other activity.

5) Information on sludge handling and disposal from the proposed treatment works.

As discussed above, this treatment alternative will contribute additional sulfate to the water. Based on the current modeling, the additional sulfate flux from hydrated ferrous sulfate addition does not raise the pit lake sulfate concentrations to above standards. However, if this does become of concern, ferric chloride ($FeCl_3$) may be used as a substitute treatment alternative with similar results in terms of reducing metals concentrations in the pit lake.

Capital costs for this system should be less than $300,000. Annual operating and maintenance costs will be on the order of $100,000 per year. Appendix D provides a summary of the preliminary estimate of capital and operating costs. Firm estimates of these costs would be developed once the design is finalized.

6 CONCLUSIONS

The Reclamation and Closure Plan for the Fort Knox Mine includes managing process water prior to closure by pumping decant and seepage water to the pit. As part of the initial evaluation FGMI assessed the potential for impacts to water quality over the long term through a preliminary screening evaluation. The scope of the screening evaluation reflected initial guidance from the ADEC indicating that the pit would be considered part of the "treatment works" that includes the TSF. As a result the need to assess water quality of the pit lake through the recovery period was deemed unnecessary. The results of the screening analysis indicated that by the time the pit began to discharge, the water quality would meet requisite standards.

In response to recent comments provided by ADEC, FGMI has completed a more detailed analysis of pit lake water quality over time. This evaluation includes predictions of water quality during the recovery period and over the long-term. The results of the pit lake modeling indicate the following:

- Based on the revised pit lake water balance, the pit is predicted to fill to the subsurface spill-point elevation of 1,470 ft amsl in approximately 88 years.

- With the exception of manganese, water quality standards can be met with no active management or treatment after 15 years following cessation of dewatering.

Closure Cost Estimate
User 3

Dewatering Wells & Piezometers

Well ID	Well Dia. (in)	Well Depth (ft)	Well Volume (ft3)	Stemming (cy)	Bentonite (50lb Bags)	Time to Close Well (hrs)	Move Between Wells (hrs)	Stemming Cost ($)	cement Cost ($)	Labor ($)	Equipment ($)	Total Cost ($)
DW05-153	8	1230	429.350996	15.90188874	25.4	24.6	2	$ 477	$ 772	$7,302	$2,206	$ 9,508
DW08-189	8	1210	422.369679	15.64332144	25	24.2	2	$ 469	$ 760	$7,192	$2,173	$ 9,365
DW08-196	8	1210	422.369679	15.64332144	25	24.2	2	$ 469	$ 760	$7,192	$2,173	$ 9,365
DW08-200	8	1212	423.0678107	15.66917817	25.04	24.24	2	$ 470	$ 761	$7,203	$2,176	$ 9,379
DW09-206	8	600	209.4395102	7.757018898	12.8	12	2	$ 233	$ 389	$3,843	$1,161	$ 5,004
DW09-207	8	1008	351.8583772	13.03179175	20.96	20.16	2	$ 391	$ 637	$6,083	$1,838	$ 7,921
DW09-209	8	1147	400.3785304	14.82883446	23.74	22.94	2	$ 445	$ 721	$6,846	$2,068	$ 8,914
DW09-210	8	1200	418.8790205	15.5140378	24.8	24	2	$ 465	$ 754	$7,137	$2,156	$ 9,293
DW09-211	8	820	286.2339973	10.60125916	17.2	16.4	2	$ 318	$ 523	$5,051	$1,526	$ 6,577
DW09-214	8	1222	426.5584692	15.79846182	25.24	24.44	2	$ 474	$ 767	$7,258	$2,193	$ 9,450
DW09-219	8	1208	421.6715473	15.61746471	24.96	24.16	2	$ 469	$ 759	$7,181	$2,169	$ 9,350
DW09-222	12	280	219.9114858	8.144869843	9.6	5.6	2	$ 244	$ 292	$2,086	$630	$ 2,716
DW09-223	8	862	300.894763	11.14425048	18.04	17.24	2	$ 334	$ 548	$5,281	$1,596	$ 6,877
DW09-226	8	1022	356.7452991	13.21278886	21.24	20.44	2	$ 396	$ 645	$6,160	$1,861	$ 8,021
DW09-228	12	260	204.2035225	7.563093425	9	5.2	2	$ 227	$ 274	$1,976	$597	$ 2,573
DW09-230	8	1190	415.388362	15.38475415	24.6	23.8	2	$ 462	$ 748	$7,082	$2,140	$ 9,222
DW09-233	8	797	278.2054828	10.30390677	16.74	15.94	2	$ 309	$ 509	$4,925	$1,488	$ 6,412
DW09-234	8	802	279.950812	10.36854859	16.84	16.04	2	$ 311	$ 512	$4,952	$1,496	$ 6,448
DW10-237	8	1005	350.8111797	12.99300665	20.9	20.1	2	$ 390	$ 635	$6,066	$1,833	$ 7,899
DW10-242	8	992	346.2733236	12.82493791	20.64	19.84	2	$ 385	$ 627	$5,995	$1,811	$ 7,806
DW10-243	8	1015	354.3018382	13.1222903	21.1	20.3	2	$ 394	$ 641	$6,121	$1,849	$ 7,971
DW10-253	8	1210	422.369679	15.64332144	25	24.2	2	$ 469	$ 760	$7,192	$2,173	$ 9,365
DW10-264	8	680	237.3647783	8.791288084	14.4	13.6	2	$ 264	$ 438	$4,282	$1,294	$ 5,576
DW11-276	8	1210	422.369679	15.64332144	25	24.2	2	$ 469	$ 760	$7,192	$2,173	$ 9,365
DW11-268	5.5	1200	197.985787	7.332806927	17.05	24	2	$ 220	$ 518	$7,137	$2,156	$ 9,293
DW12-298	5.5	1200	197.985787	7.332806927	17.05	24	3	$ 220	$ 518	$7,412	$2,239	$ 9,651
PL-00-94	1.5	899	11.03238983	0.408607031	3.52125	17.98	2	$ 12	$ 107	$5,485	$1,657	$ 7,141
PL-04-141	2	703	15.3370808	0.56804003	3.715	14.06	2	$ 17	$ 113	$4,408	$1,332	$ 5,740
PL05-154	2	800	17.45329252	0.646418241	4.2	16	2	$ 19	$ 128	$4,941	$1,493	$ 6,434
PL07-171	2	200	4.36332313	0.16160456	1.2	4	2	$ 5	$ 36	$1,647	$498	$ 2,145
PL07-173	2	290	6.326818538	0.234326613	1.65	5.8	2	$ 7	$ 50	$2,141	$647	$ 2,788
PL08-197	2	1200	26.17993878	0.969627362	6.2	24	2	$ 29	$ 188	$7,137	$2,156	$ 9,293
PL09-208	2	1200	26.17993878	0.969627362	6.2	24	2	$ 29	$ 188	$7,137	$2,156	$ 9,293
PL09-229	2	990	21.59844949	0.799942574	5.15	19.8	2	$ 24	$ 157	$5,984	$1,808	$ 7,792
PL10-245	2	1200	26.17993878	0.969627362	6.2	24	2	$ 29	$ 188	$7,137	$2,156	$ 9,293
PL10-246	2	1250	27.27076956	1.010028502	6.45	25	2	$ 30	$ 196	$7,412	$2,239	$ 9,651
PL10-254	2	1200	26.17993878	0.969627362	6.2	24	2	$ 29	$ 188	$7,137	$2,156	$ 9,293
PL10-256	2	825	17.99870791	0.666618812	4.325	16.5	2	$ 20	$ 131	$5,078	$1,534	$ 6,612
PL10-257	2	1210	26.39810494	0.97770759	6.25	24.2	2	$ 29	$ 190	$7,192	$2,173	$ 9,365
PL10-259	2	1205	26.28902186	0.973667476	6.225	24.1	2	$ 29	$ 189	$7,164	$2,164	$ 9,329
PL10-260	2	267	5.825036379	0.215742088	1.535	5.34	2	$ 6	$ 47	$2,015	$609	$ 2,624
PL10-263	2	1200	26.17993878	0.969627362	6.2	24	2	$ 29	$ 188	$7,137	$2,156	$ 9,293
PL11-268	2	1200	26.17993878	0.969627362	6.2	24	2	$ 29	$ 188	$7,137	$2,156	$ 9,293
PL11-274	2	620	13.5263017	0.500974137	3.3	12.4	2	$ 15	$ 100	$3,953	$1,194	$ 5,147
PL11-279	2	400	8.72664626	0.323209121	2.2	8	2	$ 10	$ 67	$2,745	$829	$ 3,574
PL11-280	2	400	8.72664626	0.323209121	2.2	8	2	$ 10	$ 67	$2,745	$829	$ 3,574
PL11-281	2	400	8.72664626	0.323209121	2.2	8	2	$ 10	$ 67	$2,745	$829	$ 3,574
PL11-282	2	700	15.27163095	0.565615961	3.7	14	2	$ 17	$ 112	$4,392	$1,327	$ 5,719
PL11-283	2	400	8.72664626	0.323209121	2.2	8	2	$ 10	$ 67	$2,745	$829	$ 3,574
PL11-284	2	1205	26.28902186	0.973667476	6.225	24.1	2	$ 29	$ 189	$7,164	$2,164	$ 9,329
PL 11-287	1	305	1.663516943	0.061611739	0.8625	6.1	2	$ 2	$ 26	$2,223	$672	$ 2,895
PL11-285	1	750	4.090615434	0.151504275	1.975	15	2	$ 5	$ 60	$4,667	$1,410	$ 6,076
Dewatering Well Closure Total						936.22	105	$ 10,255	$ 19,256	$ 285,815	$ 86,348	$ 372,163

Closure Cost Estimate
User 3

Interceptor Wells

Well ID	Well Dia. (in)	Well Depth (ft)	Well Volume (ft3)	Stemming (cy)	Bentonite (50lb Bags)	Time to Close Well (hrs)	Move Between Wells (hrs)	Stemming Cost ($)	Bentonite Cost ($)	Labor ($)	Equipment ($)	Total Cost ($)
IW-1	6	320	62.83185307	2.327105669	5.4	6.4	2	$ 70	$ 164	$ 2,306	$ 697	$ 3,002
IW-2	6	329	64.59899894	2.392555516	5.535	6.58	2	$ 72	$ 168	$ 2,355	$ 712	$ 3,067
IW-3	6	310	60.86835766	2.254383617	5.25	6.2	2	$ 68	$ 160	$ 2,251	$ 680	$ 2,931
IW-4	6	330	64.79534848	2.399827721	5.55	6.6	2	$ 72	$ 169	$ 2,361	$ 713	$ 3,074
IW-5	6	380	74.61282552	2.763437982	6.3	7.6	2	$ 83	$ 191	$ 2,635	$ 796	$ 3,431
IW-6	6	380	74.61282552	2.763437982	6.3	7.6	2	$ 83	$ 191	$ 2,635	$ 796	$ 3,431
IW-7	8	204	71.20943348	2.637386425	4.88	4.08	2	$ 79	$ 148	$ 1,669	$ 504	$ 2,173
IW-8	8	184	64.22811647	2.378819129	4.48	3.68	2	$ 71	$ 136	$ 1,559	$ 471	$ 2,030
IW-9	8	197	68.76597253	2.546887871	4.74	3.94	2	$ 76	$ 144	$ 1,631	$ 493	$ 2,123
IW-10	8	260	90.7571211	3.361374856	6	5.2	2	$ 101	$ 182	$ 1,976	$ 597	$ 2,573
IW-11	8	296	103.3234917	3.82679599	6.72	5.92	2	$ 115	$ 204	$ 2,174	$ 657	$ 2,831
Well 401	8	76	26.52900463	0.982555727	2.32	1.52	2	$ 29	$ 71	$ 966	$ 292	$ 1,258
MW-1	6	305	59.88660996	2.218022591	5.175	6.1	2	$ 67	$ 157	$ 2,223	$ 672	$ 2,895
MW-3	6	296	58.11946409	2.152572744	5.04	5.92	2	$ 65	$ 153	$ 2,174	$ 657	$ 2,831
Interceptor Well Closure Total						77.34	28	$ 1,050	$ 2,239	$ 28,916	$ 8,736	$ 37,652

Monitor Wells

Well ID	Well Dia. (in)	Well Depth (ft)	Well Volume (ft3)	Stemming (cy)	Bentonite (50lb Bags)	Time to Close Well (hrs)	Move Between Wells (hrs)	Stemming Cost ($)	Bentonite Cost ($)	Labor ($)	Equipment ($)	Total Cost ($)
MW-2	6	279	54.7815219	2.028945255	4.785	5.58	2	$ 61	$ 145	$ 2,081	$ 629	$ 2,709
MW-4	6	288	56.54866776	2.094395102	4.92	5.76	2	$ 63	$ 150	$ 2,130	$ 644	$ 2,774
MW-5	6	120	23.5619449	0.872664626	2.4	2.4	2	$ 26	$ 73	$ 1,208	$ 365	$ 1,573
MW-6	6	150	29.45243113	1.090830782	2.85	3	2	$ 33	$ 87	$ 1,373	$ 415	$ 1,787
MW-7	6	135	26.50718801	0.981747704	2.625	2.7	2	$ 29	$ 80	$ 1,290	$ 390	$ 1,680
Monitor Well Closure Total						19.44	10	$ 212	$ 534	$ 8,081	$ 2,441	$ 10,523

Piezometers

Well ID	Well Dia. (in)	Well Depth (ft)	Well Volume (ft3)	Stemming (cy)	Bentonite (50lb Bags)	Time to Close Well (hrs)	Move Between Wells (hrs)	Stemming Cost ($)	Bentonite Cost ($)	Labor ($)	Equipment ($)	Total Cost ($)
PZ-1	6	420	82.46680716	3.054326191	6.9	8.4	2	$ 92	$ 210	$ 2,855	$ 862	$ 3,717
PZ-2	6	450	88.35729338	3.272492347	7.35	9	2	$ 98	$ 223	$ 3,020	$ 912	$ 3,932
PZ-3	6	445	87.37554568	3.236131321	7.275	8.9	2	$ 97	$ 221	$ 2,992	$ 904	$ 3,896
PZ-4	6	550	107.9922475	3.999712869	8.85	11	2	$ 120	$ 269	$ 3,569	$ 1,078	$ 4,647
PZ-5	6	450	88.35729338	3.272492347	7.35	9	2	$ 98	$ 223	$ 3,020	$ 912	$ 3,932
PZ-6	6	150	29.45243113	1.090830782	2.85	3	2	$ 33	$ 87	$ 1,373	$ 415	$ 1,787
PZ-7	8	200	69.81317008	2.585672966	4.8	4	2	$ 78	$ 146	$ 1,647	$ 498	$ 2,145
PZ08-1	1.5	100	1.22718463	0.045451283	0.525	2	2	$ 1	$ 16	$ 1,098	$ 332	$ 1,430
PZ08-2	1.5	102	1.251728323	0.046360308	0.5325	2.04	2	$ 1	$ 16	$ 1,109	$ 335	$ 1,444
PZ08-3	1.5	107	1.313087554	0.048632872	0.55125	2.14	2	$ 1	$ 17	$ 1,136	$ 343	$ 1,480
PZ08-4	1.5	96	1.178097245	0.043633231	0.51	1.92	2	$ 1	$ 15	$ 1,076	$ 325	$ 1,401
PZ08-5	1.5	155	1.902136177	0.070449488	0.73125	3.1	2	$ 2	$ 22	$ 1,400	$ 423	$ 1,823
PZ08-6	1.5	90	1.104466167	0.040906154	0.4875	1.8	2	$ 1	$ 15	$ 1,043	$ 315	$ 1,358
PZ08-7	1.5	185	2.270291566	0.084084873	0.84375	3.7	2	$ 3	$ 26	$ 1,565	$ 473	$ 2,037
PZ08-8	1.5	160	1.963495408	0.072722052	0.75	3.2	2	$ 2	$ 23	$ 1,427	$ 431	$ 1,859
PZ08-9	1.5	135	1.656699251	0.061359232	0.65625	2.7	2	$ 2	$ 20	$ 1,290	$ 390	$ 1,680
PZ08-10	1.5	100	1.22718463	0.045451283	0.525	2	2	$ 1	$ 16	$ 1,098	$ 332	$ 1,430
PZ08-11	1.5	100	1.22718463	0.045451283	0.525	2	2	$ 1	$ 16	$ 1,098	$ 332	$ 1,430
PZ08-12	1.5	80	0.981747704	0.036361026	0.45	1.6	2	$ 1	$ 14	$ 988	$ 299	$ 1,287
PZ08-13	1.5	62	0.760854471	0.028179795	0.3825	1.24	2	$ 1	$ 12	$ 889	$ 269	$ 1,158
PZ08-14	1.5	37	0.454058313	0.016816975	0.28875	0.74	2	$ 1	$ 9	$ 752	$ 227	$ 979
PZ08-15	1.5	82	1.006291397	0.037270052	0.4575	1.64	2	$ 1	$ 14	$ 999	$ 302	$ 1,301
TOTAL						85.12	44	$ 637	$ 1,629	$ 35,443	$ 10,708	$ 46,151

Heap Leach Wells

Well ID	Well Dia. (in)	Well Depth (ft)	Well Volume (ft3)	Stemming (cy)	Bentonite (50lb Bags)	Time to Close Well (hrs)	Move Between Wells (hrs)	Stemming Cost ($)	Bentonite Cost ($)	Labor ($)	Equipment ($)	Total Cost ($)
HL-1	15	94	115.3553552	4.272420565	5.025	1.88	0.5	$ 128	$ 153	$ 653	$ 197	$ 851
HL-2	6	141	27.68528526	1.025380936	2.715	2.82	0.5	$ 31	$ 83	$ 911	$ 275	$ 1,187
HL-3	6	183	35.93196598	1.330813555	3.345	3.66	0.5	$ 40	$ 102	$ 1,142	$ 345	$ 1,487
HL-4	6	200	39.26990817	1.454441043	3.6	4	0.5	$ 44	$ 109	$ 1,235	$ 373	$ 1,608
HL-5	6	200	39.26990817	1.454441043	3.6	4	1	$ 44	$ 109	$ 1,373	$ 415	$ 1,787
HL-6	6	200	39.26990817	1.454441043	3.6	4	1	$ 44	$ 109	$ 1,373	$ 415	$ 1,787
OL-296	8	596	208.0432468	7.705305438	12.72	11.92	2	$ 231	$ 387	$ 3,821	$ 1,154	$ 4,975
HL 201	30	160	785.3981634	29.08882087	15	3.2	0.5	$ 873	$ 456	$ 1,016	$ 307	$ 1,322
HL 202	30	160	785.3981634	29.08882087	15	3.2	0.5	$ 873	$ 456	$ 1,016	$ 307	$ 1,322
HL 310	30	160	785.3981634	29.08882087	15	3.2	0.5	$ 873	$ 456	$ 1,016	$ 307	$ 1,322
HL 311	30	160	785.3981634	29.08882087	15	3.2	0.5	$ 873	$ 456	$ 1,016	$ 307	$ 1,322
HL 312	30	160	785.3981634	29.08882087	15	3.2	0.5	$ 873	$ 456	$ 1,016	$ 307	$ 1,322
Heap Leach Wells Closure Total								$ 4,924	$ 3,331	$ 15,586	$ 4,709	$ 20,295

Heap Leach Well Puncture

Drill Depth is approximately 50 feet
One hole will take approximately 12 hours to complete for a total of 36 hrs

Labor	Equipment	Total
$ 12,420	$ 1,680	$ 14,100

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Fort Knox Closure Monitoring (Active and Post)
Comments:
Duration 1-2 years is the start of heap leach rinsing or year 2027. Year 2027 is assumed to be the start of active closure monitoring.
Water quality standards will be met end of year 4
Post-closure monitoring will be years 5-14
Some surface sample sites are historically frozen during Q4, and is accounted for in calculations

Analytical cost per sample	$	529
Labor	$	320

	Analytical	Labor	
Total	$ 383,873	$ 232,320	$ 616,193

		Analysis Type	Years 1-2 (2025-2026) Samples/Year	Years 3-4 (2027-2028) Samples/Year	Years 5-14 (2029 - 2038) Samples/Year	Analytical	Labor	Cost
Pit Lake (Table 7-1)	Pit surface water	profile.1.cost	4	4	1	$ 13,748	$ 8,320	$ 22,068
Decant Pond/TSF Monitoring Location (Table 7-1)	Tailings Decant	profile.1.cost	4	4	4	$ 29,610	$ 17,920	$ 47,530
	Upper Wetlands	profile.1.cost	3	3	3	$ 22,208	$ 13,440	$ 35,648
	Lower Wetlands	profile.1.cost	3	3	3	$ 22,208	$ 13,440	$ 35,648
	FW reservoir	profile.1.cost	4	4	4	$ 29,610	$ 17,920	$ 47,530
	FW dam Seepage	profile.1.cost	4	4	4	$ 29,610	$ 17,920	$ 47,530
Groundwater Monitoring Wells (Table 7-1)	MW-5	profile.2.cost	4	4	1	$ 9,518	$ 5,760	$ 15,278
	MW-6	profile.2.cost	4	4	1	$ 9,518	$ 5,760	$ 15,278
	MW-7	profile.2.cost	4	4	1	$ 9,518	$ 5,760	$ 15,278
Pearl Creek Valley GW wells are not listed in Reclamation Plan (Dec 2012) but are anticipated to be monitored	PC-1GW	profile.2.cost	4	4	1	$ 9,518	$ 5,760	$ 15,278
	PC-2GW	profile.2.cost	4	4	1	$ 9,518	$ 5,760	$ 15,278
	PC-3GW	profile.2.cost	4	4	1	$ 9,518	$ 5,760	$ 15,278
	PB-2D	profile.2.cost	4	4	1	$ 9,518	$ 5,760	$ 15,278
	VC-2GW	profile.2.cost	4	4	1	$ 9,518	$ 5,760	$ 15,278
Seepage Collection System (Table 7-1)	IW-1	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	IW-2	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	IW-3	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	IW-4	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	IW-5	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	IW-6	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	IW-7	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	IW-8	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	IW-11	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	MW-1	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	MW-2	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	MW-3	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	MW-4	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	Site 401	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
Heap Leach (Section 7.1.3)	HL-1	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
Operational monitoring of solution chemistry and le	HL-2	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	HL-3	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	Solution Rinsing	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	LCRS	profile.2.cost	4	4	0	$ 8,460	$ 5,120	$ 13,580
	PCMS *Historically flow = 0	profile.2.cost	0	0	0	$ -	$ -	$ -

Closure Cost Estimate
User 5

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Spillway Concept Costs

		Labor	Equipment	Materials	Totals
Spill Way Construction		$ 1,097,434	$ 213,795		$1,311,229
Concrete Delivered				$ 371,032	$371,032
Rebar Delivered				$ 197,157	$197,157
	TOTALS	$ 1,097,434	$ 213,795	$ 568,190	$1,879,419

Notes: RS Means was used to determine crew and Productivity Rate
03 30 53.40 Concrete Cast-In Place
includes forms (4 uses), reinforcing steel, concrete placement and finishing unless otherwise indicated
Productivity Rate RS Means 03 30 53.40 0700
Daily Productivity Rate 11.96 CY
Hourly Productivity Rate 1.495 CY

Comments:
Earthwork for spillway construction can found on Sediment & Drainage Control tab.

Spillway Length	708	ft
Spillway width	25	ft
Spillway Depth	12	ft
Spillway Perimeter	49	ft
Assume 50 ft expansion joints	14.16	ft
Surface Area of Concrete Slabs	34692	sq ft
length of spillway	710	ft
Width of spillway	25	ft
bottom thickness	1.5	ft
unit volume of spillway floor	37.5	cf/lf
Volume of spillway floor	983.3333333	CY
Height of spillway walls	12	ft
spillway wall thickness	1.5	ft
unit volume of spillway walls	36	ft
Volume of spillway walls	946.6666667	CY
Baffle Height	3.8	ft
Baffle Width	5.7	ft
Baffle Top length	0.2	ft
Baffle Back length	4.248529157	ft
Baffle bottom Length	2.1	ft
Baffle Side area (x2)	4.37	sq ft
Baffle Front Area	21.66	sq ft
Baffle Top Area	1.14	sq ft
Baffle Back Area	24.2166162	sq ft
Baffle Bottom Area	11.97	sq ft
Addn Area per Baffles	43.7866162	sq ft
Number of Baffles per 2 Rows (altern	4.385964912	ea
Baffle Spacing (2 rows)	21.82	ft
Number of pairs of rows	32.44729606	ea
Addn Area from Baffles (spalling only	1420.757299	sq ft
Volume of individual Baffle	24.91	cu ft
Baffles per row pair	4.39	ea
Baffle Spacing (2 rows)	21.82	ft
Number of pairs of rows	32.45	ea
Number of baffles	142.31	
Concrete volume in baffles	131.29	CY
Total Concrete	2,061	CY

longitudinal reinforcing steel	710	ft
Bar size	#4	
# bars based on 318 for 100 ft slab vs 25	80	
# bars based on 60 for 10 ft wall vs 12	72	
Weight per LF	0.668	lbs/ft
Weight in slab	37942.4	lbs
Weight in walls	34148.16	lbs
Transverse reinforcing steel		
Bar size slab	#5 & #6	
# bars (assume same for 710 ft long spillway)	1050	ft
length ft (width + walls+footer)	30	ft
weight per LF 1@#5 + 1@#6	2.545	lbs/ft
Bar size walls	#5 & #6	
# bars (assume same for 710 ft long spillway)	2100	ft
length ft (width + walls+footer)	12	ft
weight per LF 1@#5 + 1@#6	2.545	lbs/ft
Weight in Slab	80167.5	lbs
Weight in Walls	64134	lbs
Baffles		
Assume loops 12" oc		
vertical plane Perimeter (H + top+back+4)	12.2485292	ft
#loops per baffle (W/12")	6	bars/baffle
horizontal plane perimeter (2 x W + 2x (Top+bot)/2	13.7	ft
#loops per baffle (H/12")	4	bars/baffle
Bar size	#4	
Weight per LF	0.668	lbs/ft
Weight per baffle	85.70	lbs/baffle
Weight in baffles	12195.9858	lbs
Est.\ Weight reinforcing steel	228,588	lbs
15% weight Contingency	34,288	
Weight reinforcing steel	262,876	lbs

	# of Crew members	Equipment Unit Cost (Hourly)	Labor Unit Cost (Hourly)	Total Cost (hourly
Foreman	1	$ -	$ 135	$ 135
Supervisor's Truck	1	$ 16	$ 73	$ 89
General Laborer	4	$ -	$ 286	$ 286
Rodmen (reinforcing concrete)	2	$ -	$ 154	$ 154
Cement finisher	1	$ -	$ 73	$ 73
Gas Engine Vibrator	1	$ 18	$ 76	$ 94
Concrete Pump	1	$ 121	$ -	$ 121
Totals		$ 155	$ 796	$ 951

Closure Cost Estimate
User 6

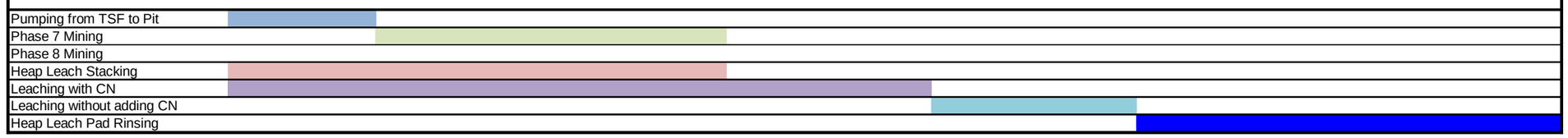
Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Solution/Water Management - Cost Summary

	Labor	Equipment	Power	Capital	Totals
Pumping	$ 5,003,712	$ 614,924	$ 36,225,257	$ 406,872	$ 42,250,765
Freight				$ 18,200	$ 18,200
TOTALS	**$ 5,003,712**	**$ 614,924**	**$ 36,225,257**	**$ 425,072**	**$ 42,268,965**

Comments
Default crew assumes crew of two laborers required during pumping hours and one vehicle
Pore Volume & Pump Calculations Based on McClelland Column Test Work
Residual leaching is complete end of 2024
Rinsing starts beginning 2025
Water Quality Standards met end of year 2028

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Barge Pond to Detox to Pit Rim	$ 497,874					$ 86,494	$ 51,783	$ 69,423	$ 69,423	$ 51,783	$ 33,573	$ 102,996	$ 32,401
Interceptor wells to seepage sump	$ 669,121					$ 83,640	$ 83,640	$ 83,640	$ 83,640	$ 83,640	$ 83,640	$ 83,640	$ 83,640
Seepage Sump to Barge Pond	$ 2,327,648					$ 290,956	$ 290,956	$ 290,956	$ 290,956	$ 290,956	$ 290,956	$ 290,956	$ 290,956
CIC1 and CIC 2 to Heap Leach	$ 11,948,594									$ 2,987,149	$ 2,987,149	$ 2,987,149	$ 2,987,149
Heap Leach to Pit Rim via CIC1 and CIC2	$ 3,200,516									$ 800,129	$ 800,129	$ 800,129	$ 800,129
Pit to CIC1 and CIC 2	$ 17,581,503									$ 4,395,376	$ 4,395,376	$ 4,395,376	$ 4,395,376
Total Power Required	$ 36,225,257	$ -	$ -	$ -	$ -	$ 461,090	$ 426,379	$ 444,019	$ 444,019	$ 8,609,032	$ 8,590,823	$ 8,660,245	$ 8,589,650



	Year	Start Time	End Time	Run Time (hours)	Flow Rate (gpm)	Flow Rate (m3/hr)	Pump Intake Elevation (ft)	Discharge Elevation (ft)	Total Head(m)	Hydraulic Power (kW)	Shaft Power (kW)	Power Costs ($/pump duration)
Barge Pond to Detox to Pit Rim	2021	44378	44530	3648	5000	1150	1525	1655	39	122	144	$ 86,494
	2022	44743	44804	1464	5000	1150	1525	1655	39	122	144	$ 34,711
		44835	44865	720	5000	1150	1525	1655	39	122	144	$ 17,071
	2023	45108	45230	2928	5000	1150	1525	1655	39	122	144	$ 69,423
	2024	45474	45596	2928	5000	1150	1525	1655	39	122	144	$ 69,423
	2025	45839	45900	1464	5000	1150	1525	1655	39	122	144	$ 34,711
		45931	45961	720	5000	1150	1525	1655	39	122	144	$ 17,071
	2026	46204	46233	696	5000	1150	1525	1655	39	122	144	$ 16,502
		46296	46326	720	5000	1150	1525	1655	39	122	144	$ 17,071
	2027	46478	46599	2904	5000	1150	1525	1655	39	122	144	$ 68,854
		46631	46691	1440	5000	1150	1525	1655	39	122	144	$ 34,142
	2028	46917	47069	3648	1873	430.79	1525	1655	39	46	54	$ 32,401

Closure Cost Estimate
User 6

Pumping Duration 4 years

Power Factor	Hrs Per Year	Hrs Per Month	Run Time	$ Per KWHr
0.8	8760	720	0.99	0.1649
	6570			

TSF Pumping Costs

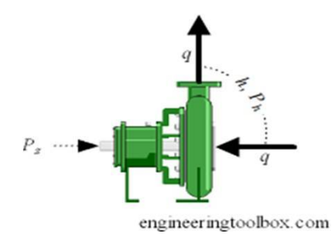
Pumping Route	Well Description	Number of Pumps	HP	Amps	Volts	KW	Total KW	KWHR Per Year	$ Per Year	Rinse Duration (years)	Rinse Duration Pumping Costs
Interceptor wells to Seepage Sump	Interceptor Well 1	1	10	8.973248653	480	5.968	5.968	51,757	$ 8,535	4	$ 34,139
	Interceptor Well 2	1	5	4.486624326	480	2.984	2.984	25,878	$ 4,267	4	$ 17,069
	Interceptor Well 3	1	10	8.973248653	480	5.968	5.968	51,757	$ 8,535	4	$ 34,139
	Interceptor Well 4	1	2	1.794649731	480	1.1936	1.1936	10,351	$ 1,707	4	$ 6,828
	Interceptor Well 5	1	30	26.91974596	480	17.904	17.904	155,271	$ 25,604	4	$ 102,417
	Interceptor Well 6	1	1.5	1.345987298	480	0.8952	0.8952	7,764	$ 1,280	4	$ 5,121
	Interceptor Well 7	1	3	2.691974596	480	1.7904	1.7904	15,527	$ 2,560	4	$ 10,242
	Interceptor Well 8	1	30	26.91974596	480	17.904	17.904	155,271	$ 25,604	4	$ 102,417
	Interceptor Well 11	1	2	1.794649731	480	1.1936	1.1936	10,351	$ 1,707	4	$ 6,828
	Monitoring Well 1	1	1.5	1.345987298	480	0.8952	0.8952	7,764	$ 1,280	4	$ 5,121
	Monitoring Well 3	1	1.5	1.345987298	480	0.8952	0.8952	7,764	$ 1,280	4	$ 5,121
	Site 401	1	1.5	1.345987298	480	0.8952	0.8952	7,764	$ 1,280	4	$ 5,121
Seepage Sump to Barge Pond	Sump Pump 30PP062/(	1	450	46.591868	4160	268.56	268.56	1,764,439	$ 290,956	4	$ 1,163,824

Pumping Route	Well Description		HP Required	Amps	Volts	KW	Total KW	KWHR Per Year	$ Per Year	Rinse Duration (years)	Rinse Duration Pumping Costs
CIC1 and CIC 2 to Heap Leach	CIC pumps		2800	3140.637028	480	2088.8	2088.8	18,114,909	$ 2,987,149	4	$ 11,948,594
Heap Leach to Pit Rim via CIC1 and CIC2	HLP Pumps 201		150	19.41327834	4160	111.9	111.9	970,442	$ 160,026	4	$ 640,103
	HLP Pumps 202		150	19.41327834	4160	111.9	111.9	970,442	$ 160,026	4	$ 640,103
	HLP Pump 310		150	19.41327834	4160	111.9	111.9	970,442	$ 160,026	4	$ 640,103
	HLP Pump 311		150	19.41327834	4160	111.9	111.9	970,442	$ 160,026	4	$ 640,103
	HLP Pump 312		150	19.41327834	4160	111.9	111.9	970,442	$ 160,026	4	$ 640,103
Pit to CIC1 and CIC 1	Future Pit Pumps	4	350	36.23811956	4160	208.88	835.52	7,245,964	$ 1,194,859	4	$ 4,779,438
	Lift Station1		3000	388.2655667	4160	2238	2238	19,408,831	$ 3,200,516	4	$ 12,802,065

Ph (kW)		
1 gpm=	0.23	m^3/hr
1ft=	0.3	m
Density of fluid	1000	kg/m^3
g=	9.81	m/s^2
pump efficiency	0.85	
Initial TSF volume to pit	4,321,761,813	Gallons

Method used to calculate pumping from Barge Pond to pit:
Pump durations are taken from closure pit water balance.
Hydraulic Pump Power

The ideal hydraulic power to drive a pump depends on the mass flow rate, the liquid density and the differential height
- either it is the static lift from one height to an other, or the friction head loss component of the system - can be calculated as



Ph = q ρ g h / (3.6 106) (1)
Ph = power (kW)
q = flow capacity (m3/h)
ρ = density of fluid (kg/m3)
g = gravity (9.81 m/s2)
h = differential head (m)

Shaft Pump Power
The shaft power - the power required transferred from the motor to the shaft of the pump - depends on the efficiency of the pump and can be calculated as
Ps = Ph / η (2)
Ps = shaft power (kW)

η = pump efficiency

Closure Cost Estimate
User 7

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Long Term TSF Dam Maintenance and Repair Costs

Year	Erosion Repair	Clearing Woody Growth	Rill Erosion Repair	Replace Armor Stone	Dam Crest Repair	Seal Cracks	Refurbish Spalling	Spillway Replace	Accelerated Spillway Erosion	Spillway/Earth Repair	Joints Repair	Channel Rip Rap	Spur Road Annual Maintenance	Annual Inspection	Principal	2009 Total	ACPI 2009-2012 (2009-2012)	Real Rate of Return	100 Yr NPV
1	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980	**4.3%**	**$ 1,052,925**
2	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
3	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
4	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
5	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
6	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
7	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
8	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
9	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
10	$ 11,411	$ 11,514								$ 14,160			$ 1,102	$ 6,168		$ 43,253	$ 47,552		
11	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
12	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
13	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
14	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
15	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
16	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
17	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
18	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
19	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
20	$ 11,411	$ 11,514				$ 34,790	$ 36,113			$ 14,160	$ 7,350		$ 1,102	$ 6,168		$ 121,506	$ 131,589		
21	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
22	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
23	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
24	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
25	$ 11,411		$ 16,078		$ 5,140				$ 9,666				$ 1,102	$ 6,168		$ 48,463	$ 53,147		
26	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
27	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
28	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
29	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
30	$ 11,411	$ 11,514								$ 14,160			$ 1,102	$ 32,896		$ 69,981	$ 76,255		
31	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
32	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
33	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
34	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
35	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
36	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
37	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
38	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
39	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
40	$ 11,411	$ 11,514				$ 34,790	$ 36,113			$ 14,160	$ 7,350		$ 1,102	$ 6,168		$ 121,506	$ 131,589		
41	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
42	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
43	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
44	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
45	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
46	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
47	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
48	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
49	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
50	$ 11,411	$ 11,514	$ 16,078	$ 1,034,682	$ 5,140				$ 9,666	$ 14,160		$ 218,589	$ 1,102	$ 6,168		$ 1,327,409	$ 1,426,621		
51	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
52	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		

Closure Cost Estimate
User 7

Year	Erosion Repair	Clearing Woody Growth	Rill Erosion Repair	Replace Armor Stone	Dam Crest Repair	Seal Cracks	Refurbish Spalling	Spillway Replace	Accelerated Spillway Erosion	Spillway/Earth Repair	Joints Repair	Channel Rip Rap	Spur Road Annual Maintenance	Annual Inspection	Principal	2009 Total	ACPI 2009-2012	Real Rate of Return	100 Yr NPV
53	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
54	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
55	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
56	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
57	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
58	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
59	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
60	$ 11,411	$ 11,514				$ 34,790	$ 36,113			$ 14,160	$ 7,350		$ 1,102	$ 32,896		$ 148,234	$ 160,292		
61	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
62	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
63	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
64	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
65	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
66	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
67	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
68	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
69	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
70	$ 11,411	$ 11,514								$ 14,160			$ 1,102	$ 6,168		$ 43,253	$ 47,552		
71	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
72	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
73	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
74	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
75	$ 11,411		$ 16,078		$ 5,140				$ 9,666				$ 1,102	$ 32,896		$ 75,191	$ 81,850		
76	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
77	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
78	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
79	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
80	$ 11,411	$ 11,514				$ 34,790	$ 36,113			$ 14,160	$ 7,350		$ 1,102	$ 6,168		$ 121,506	$ 131,589		
81	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
82	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
83	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
84	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
85	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
86	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
87	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
88	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
89	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
90	$ 11,411	$ 11,514								$ 14,160			$ 1,102	$ 32,896		$ 69,981	$ 76,255		
91	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
92	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
93	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
94	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
95	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
96	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
97	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
98	$ 11,411												$ 1,102	$ 6,168		$ 17,579	$ 19,980		
99	$ 11,411												$ 1,102	$ 32,896		$ 44,307	$ 48,684		
100	$ 11,411	$ 11,514	$ 16,078	$ 1,034,682	$ 5,140	$ 34,790	$ 36,113	$ 3,661,617	$ 9,666	$ 14,160	$ 7,350	$ 218,589	$ 1,102	$ 6,168	$ 1,037,507	$ 5,067,279	$ 6,173,792		

Annual Spur Road Maintenace for TSF and WSR

The estimate is split between the two dams. It is assumed spur road maintenance for both dams is performed on the same day.

Equipment	D6		113.01	Per hr
Labor	1 operator		76.28	Per hr
Mobe/demob	1 per year	$	689	
Time (hr.)		8	1514	
Total for TSF		$	1,102	

MOB/DEMOB using R.S. MEANS and SRCE equipment and Alaska Labor Rates

Miles to project, one way	35
Speed (MPH)	45
Hours travel time	0.777777778

Equipment	Mobilization $/hour Equipment	Mobilization $/hour Labor	# of units	Mob Cost	Demob Cost	Total Mob and Demob Cost
Bulldozers						
D6R	$ 232	$ 211	1	$ 345	$ 345	$ 689

Closure Cost Estimate
User 8

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Long Term WSR Dam Maintenance and Repair Costs

Year	Clean Spillway	Clearing Woody Growth	Erosion Repair	Accelerated Erosion	Seal Cracks	Refurbish Surface Spalling	Ice Damage Repair	Replace Armor Rock	Dam Crest Repair	Spillway Replace	Spillway/earth Repair	Joints Repair	Tailwater Riprap	Spur Road Annual Maintenance 2013 costs	Annual Inspection	Principal	2009 Total	ACPI 2009-2012	Real Rate of Return	100 Yr NPV
1														$ 1,102	$ 4,112		$ 4,112	$ 5,518	**4.3%**	**$ 518,830**
2														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
3														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
4														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
5														$ 1,102	$ 16,448		$ 16,448	$ 18,766		
6														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
7														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
8														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
9														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
10		$ 3,960									$ 14,392			$ 1,102	$ 16,448		$ 34,800	$ 38,474		
11														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
12														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
13														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
14														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
15														$ 1,102	$ 16,448		$ 16,448	$ 18,766		
16														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
17														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
18														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
19														$ 1,102	$ 4,112		$ 4,112	$ 5,518		
20	$ 5,400	$ 3,960	$ 2,383		$ 90,670	$ 90,670					$ 14,392	$ 12,953		$ 1,102	$ 16,448		$ 236,876	$ 255,486		
21														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
22														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
23														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
24														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
25				$ 6,476			$ 3,392		$ 1,542					$ 1,102	$ 16,448		$ 27,858	$ 31,019		
26														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
27														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
28														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
29														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
30		$ 3,960									$ 14,392			$ 1,102	$ 16,448		$ 34,800	$ 38,474		
31														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
32														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
33														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
34														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
35														$ 1,102	$ 16,448		$ 16,448	$ 18,766		
36														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
37														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
38														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
39														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
40	$ 5,400	$ 3,960	$ 2,383		$ 90,670	$ 90,670					$ 14,392	$ 12,953		$ 1,102	$ 16,448		$ 236,876	$ 255,486		
41														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
42														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
43														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
44														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
45														$ 1,102	$ 16,448		$ 16,448	$ 18,766		
46														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
47														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
48														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
49														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
50				$ 6,476			$ 3,392	$ 18,807	$ 1,542		$ 14,392		$ 119,942	$ 1,102	$ 16,448		$ 180,999	$ 195,479		
51														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
52														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
53														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
54														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
55														$ 1,102	$ 16,448		$ 16,448	$ 18,766		
56														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
57														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
58														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
59														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
60	$ 5,400	$ 3,960	$ 2,383		$ 90,670	$ 90,670					$ 14,392	$ 12,953		$ 1,102	$ 16,448		$ 236,876	$ 255,486		
61														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
62														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
63														$ 1,102	$ 4,112		$ 4,112	$ 4,416		

Closure Cost Estimate
User 8

Year	Clean Spillway	Clearing Woody Growth	Erosion Repair	Accelerated Erosion	Seal Cracks	Refurbish Surface Spalling	Ice Damage Repair	Replace Armor Rock	Dam Crest Repair	Spillway Replace	Spillway/earth Repair	Joints Repair	Tailwater Riprap	Spur Road Annual Maintenance 2013 costs	Annual Inspection	Principal	2009 Total	ACPI 2009-2012	Real Rate of Return	100 Yr NPV
64														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
65														$ 1,102	$ 16,448		$ 16,448	$ 18,766		
66														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
67														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
68														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
69														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
70		$ 3,960									$ 14,392			$ 1,102	$ 16,448		$ 34,800	$ 38,474		
71														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
72														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
73														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
74														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
75				$ 6,476			$ 3,392		$ 1,542					$ 1,102	$ 16,448		$ 27,858	$ 31,019		
76														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
77														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
78														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
79														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
80	$ 5,400	$ 3,960	$ 2,383		$ 90,670	$ 90,670					$ 14,392	$ 12,953		$ 1,102	$ 16,448		$ 236,876	$ 255,486		
81														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
82														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
83														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
84														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
85														$ 1,102	$ 16,448		$ 16,448	$ 18,766		
86														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
87														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
88														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
89														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
90		$ 3,960									$ 14,392			$ 1,102	$ 16,448		$ 34,800	$ 38,474		
91														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
92														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
93														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
94														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
95														$ 1,102	$ 16,448		$ 16,448	$ 18,766		
96														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
97														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
98														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
99														$ 1,102	$ 4,112		$ 4,112	$ 4,416		
100	$ 5,400	$ 3,960	$ 2,383	$ 6,476	$ 90,670	$ 90,670	$ 3,392	$ 18,807	$ 1,542	$ 6,576,116	$ 14,000	$ 12,953	$ 119,942	$ 1,102	$ 16,448	$ 518,825	$ 7,481,584	$ 8,512,042		

Annual Spur Road Maintenace for WSR

Equipment	D6	$	113	
Labor	1 operator	$	76	
Mobe/demob	1 per year	$	689	
Time hrs to complete spur maintenance for both dams	8	$	1,514	
Total for TSF		**$**	**1,102**	per year

MOB/DEMOB using R.S. MEANS and SRCE equipment and Alaska Labor Rates

Miles to project, one way	35
Speed (MPH)	45
Hours travel time	0.77777778

Equipment	Mobilization $/hour Equipment	Mobilization $/hour Labor	# of units	Mob Cost	Demob Cost	Total Mob and Demob Cost
Grader						
D6R	$ 232	$ 211	1	$ 345	$ 345	$ 689

Closure Cost Estimate
User 9

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 percent indirects.xlsm
Cost Estimate Type: Surety Cost Basis: Alaska

Pit Rim Warning Signs

Initial Funding

Signs will be installed at 100 ft intervals

Pit rim length =		22,100	ft
# of signs		221	
Install Labor	$	110,500	Install crew and equipment incudes RTD, 1 laborer and 1 operator
Signage	$	14,843	
Signage Posts and Hardware	$	8,170	
Total	$	133,513	

In Perpetuity Funding (used same method as long term dam maintenance)

Long Term Maintenance

Assume 10% of signs will need replacing per year.		22.1	
Assume 2 CLAB (RS Means Crew) for inspections and a 10 hr day to complete inspection		10	hrs
2 Labors	$	2,160	
Materials	$	2,301.28	
Equipment (1 lt duty truck)	$	175.30	
Rate of return		4.30%	
Yearly Estimate	$	4,636.18	

Year	Yearly Estimate	Principle	Total	100 Year NPV	$107,794
1	$ 4,636.18		$ 4,636.18		
2	$ 4,636.18		$ 4,636.18		
3	$ 4,636.18		$ 4,636.18		
4	$ 4,636.18		$ 4,636.18		
5	$ 4,636.18		$ 4,636.18		
6	$ 4,636.18		$ 4,636.18		
7	$ 4,636.18		$ 4,636.18		
8	$ 4,636.18		$ 4,636.18		
9	$ 4,636.18		$ 4,636.18		
10	$ 4,636.18		$ 4,636.18		
11	$ 4,636.18		$ 4,636.18		
12	$ 4,636.18		$ 4,636.18		
13	$ 4,636.18		$ 4,636.18		
14	$ 4,636.18		$ 4,636.18		
15	$ 4,636.18		$ 4,636.18		
16	$ 4,636.18		$ 4,636.18		

Closure Cost Estimate
User 9

Year	Yearly Estimate	Principle	Total	100 Year NPV	$107,794
17	$ 4,636.18		$ 4,636.18		
18	$ 4,636.18		$ 4,636.18		
19	$ 4,636.18		$ 4,636.18		
20	$ 4,636.18		$ 4,636.18		
21	$ 4,636.18		$ 4,636.18		
22	$ 4,636.18		$ 4,636.18		
23	$ 4,636.18		$ 4,636.18		
24	$ 4,636.18		$ 4,636.18		
25	$ 4,636.18		$ 4,636.18		
26	$ 4,636.18		$ 4,636.18		
27	$ 4,636.18		$ 4,636.18		
28	$ 4,636.18		$ 4,636.18		
29	$ 4,636.18		$ 4,636.18		
30	$ 4,636.18		$ 4,636.18		
31	$ 4,636.18		$ 4,636.18		
32	$ 4,636.18		$ 4,636.18		
33	$ 4,636.18		$ 4,636.18		
34	$ 4,636.18		$ 4,636.18		
35	$ 4,636.18		$ 4,636.18		
36	$ 4,636.18		$ 4,636.18		
37	$ 4,636.18		$ 4,636.18		
38	$ 4,636.18		$ 4,636.18		
39	$ 4,636.18		$ 4,636.18		
40	$ 4,636.18		$ 4,636.18		
41	$ 4,636.18		$ 4,636.18		
42	$ 4,636.18		$ 4,636.18		
43	$ 4,636.18		$ 4,636.18		
44	$ 4,636.18		$ 4,636.18		
45	$ 4,636.18		$ 4,636.18		
46	$ 4,636.18		$ 4,636.18		
47	$ 4,636.18		$ 4,636.18		
48	$ 4,636.18		$ 4,636.18		
49	$ 4,636.18		$ 4,636.18		
50	$ 4,636.18		$ 4,636.18		
51	$ 4,636.18		$ 4,636.18		
52	$ 4,636.18		$ 4,636.18		
53	$ 4,636.18		$ 4,636.18		
54	$ 4,636.18		$ 4,636.18		
55	$ 4,636.18		$ 4,636.18		
56	$ 4,636.18		$ 4,636.18		
57	$ 4,636.18		$ 4,636.18		
58	$ 4,636.18		$ 4,636.18		
59	$ 4,636.18		$ 4,636.18		
60	$ 4,636.18		$ 4,636.18		
61	$ 4,636.18		$ 4,636.18		
62	$ 4,636.18		$ 4,636.18		
63	$ 4,636.18		$ 4,636.18		
64	$ 4,636.18		$ 4,636.18		
65	$ 4,636.18		$ 4,636.18		
66	$ 4,636.18		$ 4,636.18		
67	$ 4,636.18		$ 4,636.18		
68	$ 4,636.18		$ 4,636.18		
69	$ 4,636.18		$ 4,636.18		

Closure Cost Estimate
User 9

Year	Yearly Estimate	Principle	Total	100 Year NPV	$107,794
70	$ 4,636.18		$ 4,636.18		
71	$ 4,636.18		$ 4,636.18		
72	$ 4,636.18		$ 4,636.18		
73	$ 4,636.18		$ 4,636.18		
74	$ 4,636.18		$ 4,636.18		
75	$ 4,636.18		$ 4,636.18		
76	$ 4,636.18		$ 4,636.18		
77	$ 4,636.18		$ 4,636.18		
78	$ 4,636.18		$ 4,636.18		
79	$ 4,636.18		$ 4,636.18		
80	$ 4,636.18		$ 4,636.18		
81	$ 4,636.18		$ 4,636.18		
82	$ 4,636.18		$ 4,636.18		
83	$ 4,636.18		$ 4,636.18		
84	$ 4,636.18		$ 4,636.18		
85	$ 4,636.18		$ 4,636.18		
86	$ 4,636.18		$ 4,636.18		
87	$ 4,636.18		$ 4,636.18		
88	$ 4,636.18		$ 4,636.18		
89	$ 4,636.18		$ 4,636.18		
90	$ 4,636.18		$ 4,636.18		
91	$ 4,636.18		$ 4,636.18		
92	$ 4,636.18		$ 4,636.18		
93	$ 4,636.18		$ 4,636.18		
94	$ 4,636.18		$ 4,636.18		
95	$ 4,636.18		$ 4,636.18		
96	$ 4,636.18		$ 4,636.18		
97	$ 4,636.18		$ 4,636.18		
98	$ 4,636.18		$ 4,636.18		
99	$ 4,636.18		$ 4,636.18		
100	$ 4,636.18	$ 106,218	$ 110,854.18		

Closure Cost Estimate
User 10

Project Name: Fort Knox - Reclamation Plan
Date of Submittal: 7/10/2013
File Name: Copy of SRCE_Version_1_4_1_016a.xlsm
Model Version: Version 1.4.1
Cost Data: User Data
Cost Data File: Copy of Cost data for SRCE model - RCP July 2013 with 40 p
Cost Estimate Type: Surety Cost Basis: Alaska

Dam Security Gate
RS Means Crew B80
Cantilever type Gate
Assume reuse and relocate existing gates
Assume 1 gate will take 1 10 hr day to install

Crew			
1 labor foreman		135.19	
1 laborer		71.4	
1 truck driver		71.4	
1 equipment operator		65.51	
Equipment			
1 lt duty truck		17.53	
1 auger (drill rig)		189.08	
Time		20	hrs
Labor	$	6,870	
Equipment	$	4,132	
Total for 2 gates	$	11,002	

Appendix G – Long Term Maintenance and Repair Costs

10-26-09

PSA No. 09-025

FORT KNOX MINE

FINANCIAL ASSURANCE DATA

TSF AND WSF DAMS

Compiled by WHPacific, Fairbanks, Alaska

Jeffrey C. Organek, P.E.

INTRODUCTION

The purpose of this report is to provide estimates of future maintenance and repair costs for the Tailing Storage Facility (TSF) Dam (excludes spillway) and the Water Storage Facility (WSF) Dam (including spillway) located at Fort Knox Gold Mine near Fairbanks Alaska. This data will satisfy a regulatory requirement of the State of Alaska Department of Natural Resources, Dam Safety Division (DNR). It is understood that Fort Knox Gold Mine will supplement this information with additional cost information obtained from other sources to assemble financial assurance submittal to DNR.

It is a requirement of DNR that maintenance and repair costs be estimated "in perpetuity". The costs that have been estimated in this report are presented as current costs. It is understood that Fort Knox Gold Mine will perform economic analysis required to project the estimates to a net present worth.

The cost data in this report pertains exclusively to the earthen embankment dams and the WSF concrete spillway. Excluded are the TSF concrete spillway (to be built in the future), inspections, monitoring equipment, and dynamic components such as pumps and seepage collection equipment. It is understood the Fort Knox Gold Mine will provide cost estimates for these excluded items from other sources when compiling the financial assurance to DNR.

METHODOLOGY

This report was compiled using the following sequence:

1. Conduct research and determine maintenance and repair tasks that could be reasonably expected to occur. The first stage of this research entailed a review of available publications on dam maintenance and repair. Following the review, real time interviews were conducted with engineers, dam owners, regulatory agencies, and professional societies with unique knowledge of dams.

2. Compile a list of maintenance and repair tasks.

3. Conduct research to estimate the costs associated with item 2, above. This research entailed communications with specialty construction contractors and also relied on recent construction bid results from the Fairbanks vicinity.

4. Conduct research to estimate the frequency at which the tasks from item 2, above, will be necessary.

5. Compile the maintenance and repair tasks, associated estimated costs, and estimated frequencies.

DISCUSSION ON REPAIR AND MAINTENANNCE

In general, an earthen dam will degrade either by weathering or erosion.

The weathering process occurs as the forces of nature cause breakdown of dam components. For example, freeze-thaw cycles will cause the degradation of concrete, schist, or granite (all components of these dams).

Erosion occurs as either wind or water carries away soil from the dam. Erosion is typically a much faster process than weathering. In this case, erosion will be caused primarily by water runoff from rain events, which will run down the relatively steep and long dam sideslopes and result in rutting of the surface.

Research indicates that the primary focus of maintenance and repair tasks will be to replace soil lost from the dam by a variety of weathering and erosion processes.

Another primary maintenance task will be removal of vegetation that accumulates on the dam surface. Vegetation removal can be viewed as a paradoxical dam issue. On one hand, vegetation is beneficial, as it allows the dam surface to resist erosive forces. However, as the vegetation progresses, deciduous trees (primarily willow) will establish themselves. The roots of these trees are known to encourage piping, a mechanism by which water flow through the dam embankment erodes internal conduits that will eventually lead to failure. Based on the large mass and thickness of these dams, it is unlikely that the roots of deciduous trees will cause piping. Nevertheless, the removal of vegetation is a standard earthen dam maintenance task that will be expected to occur.

This report will not specifically consider repair of earthquake damage. This is based on the fact that both dams withstood the November 3, 2002 magnitude 7.9 Denali Fault earthquake with no observed damage. It is understood the Fort Knox Gold Mine will likely include costs for post earthquake inspections in their final financial assurance submitted to DNR. For the purposes of this report, it is believed, based on past dam performance, that earthquakes pose a minimal threat to the integrity of the dams.

PRICING

All costs presented are estimates, and thus prudent approximations of what the tasks might cost. All costs are based on informal quotes from contractors, vendors, and recent bid results from Alaska Department of Transportation and Public Facilities or Fairbanks North Star Borough Department of Public Works. The costs incorporate contractor profit and overhead. The costs have been further modified by engineering judgment, and are intended to be conservative.

Material quantities used for cost take offs are also conservative approximations based on the construction drawings. Much of the repair and maintenance tasks are based on response to erosion that will occur in the future. As such, there is great uncertainty. Reasonable assumptions were made regarding the amount of erosion that might occur. Consistent with the accuracy level of the estimates, the material quantities are not intended to be exact calculations, such as might be used to assemble a construction bid, but are conservative approximations.

Make note that these costs will in turn be projected to a net present worth by Fort Knox Gold Mine, a process also subject to uncertainty.

In conclusion, the costs, although subject to some uncertainty and argument, are presented as reasonable estimates which are suitable for use within the scope of a financial assurance study.

REPAIR FREQUENCY

Repair frequencies were estimated based on communications with engineers and dam owners, and were also modified based on engineering judgment and knowledge of local forces acting on engineered structures in the Fairbanks vicinity.

ITEM DESCRIPTIONS

Following is a description of each maintenance and repair task. Reference appendix A for cost breakdowns.

TAILING STORAGE FACILITY DAM, Reference #'s 1 through 8.

Ref. # 1, Clearing of conifers- Work will be conducted by hand labor, and will include removal of stumps and roots. It is assumed that the conifers will have relatively small diameters (<2"), the trees will be distributed at a low density as a result of the rocky nature of the armor stone, and the slash will be discarded on the dam face. This work will occur on both dams.

Ref. # 2, Minor surface erosion-Practically speaking, the dam is constructed of run of mine rock. This material is highly resistant to the erosive forces of water runoff, and no surface erosion on the dam faces have been observed in the 15 years since its construction. It is anticipated, however, that water runoff will gain velocity as it runs down the dam face and cause some erosion at the toe of the dam (where contact is made with the existing natural ground). The work will consist of filling erosion rills with borrow material, and compacting.

Ref # 3, Accelerated rill erosion repair-Because the dam is constructed of run of mine rock, surface erosion will likely be minimal. Over extended periods of time however, some erosion may occur. The assumption is that discrete portions of the dam surface will develop some rill erosion that will need to be filled with replacement fill and compacted. For these calculations, the prudent assumption was made that 30% of the surface will be subject to such erosion at 25 year intervals.

Ref. # 4, Replace armor stone-Existing armor stone is composed of "run of mine" materials-primarily 3' minus schist and granite. Both of these types of stone will decompose rather readily in this environment. The armor stone will have to be replaced on 50 year cycles. This work is intended to replenish or "freshen" the surface. In practice, there are a number of approaches to constructing this repair, with the actual method being determined by the ingenuity of the engineers and contractor who perform the work in the future. This estimate assumed that the armor stone will be dumped over the crest of the dam.

Several factors serve to mitigate the deleterious effects of armor stone weathering. One factor is that the dam is essentially constructed of stone rubble. So, when the surface does break down by a weathering process, there will be more stone beneath that will protect the dam surface. Furthermore, observation of granite exposures (15 years since exposure) at the mine do not indicate that weathering has yet occurred. Because of these factors, the assumption has been made that 20% (rather than 100%) of the dam surface will have to be repaired at the designated frequency.

Ref. # 5, Dam crest damage repair-It is expected that when closed, the crest of the dam will be fenced off so as to block access. This will prevent damage associated with vehicle traffic. It is likely however that some erosion will occur due to snow melt and rain water runoff. The work will entail re-grading the surface to create a slight crown and maintain positive drainage.

The existing dam crest surface is a durable, driving surface that is relatively resistant to erosion.

WATER STORAGE FACILITY DAM, Reference #'s 1 through 8.

Ref. # 6, clean spillway-Work will entail clearing debris (vegetation, soil, rubbish) from the dam spillway. The debris will be disposed of on the mine site. The spillway, in 15 years of operation, has not yet required cleaning. An assumed frequency of 20 years was therefore used.

Ref. # 7, Clearing of conifers- Removal of conifers, primarily willows. Work will be conducted by hand labor, and will include removal of stumps and roots. It is assumed that the conifers will have relatively small diameters (<2"), the trees will be distributed at a low density as a result of the rocky nature of the armor stone, and the slash will be discarded on the dam face. This work will occur on both dams.

Ref. # 8, Minor surface erosion- Erosion of soil material from the dams will be an ongoing process. On an annual basis, small amounts of erosion will occur. The downstream face of the WSF dam is not covered with armor stone, and thus erosion of this face is considered. The work will entail placing and compaction fill within eroded areas of the dam surfaces.

In 15 years of operation, this type of damage has not yet been observed, and so a repair frequency of 20 years will be used.

Ref. # 9, Seal cracks in concrete- Cracks that develop in concrete surface will be cleaned and sealed with mortar or other impervious material.

Ref. # 10, Refurbish surface spalling of concrete- This is intended as an annual process. Erosion of soil material from the dams will be an ongoing process. On an annual basis, small amounts of erosion will occur. The work will entail placing and compaction fill within eroded areas of the dam surfaces.

Ref # 11, Accelerated rill erosion repair- Accelerated rill erosion is similar to "minor surface erosion", yet is more pronounced in that it removes greater amounts of material and creates distinct "rills". Rill erosion is expected to occur at greater intervals than "minor surface erosion". The rills are positioned as longitudinal eroded areas running from the crest, down the sideslope, to the toe of the dam. The work will entail importing, placing, and compacting soil to fill the rills. The work will occur on both dams.

Ref. # 12, Ice Pocket Sloughing repair- This results from buildup of ice within soil directly beneath surface as a result of infiltration of surface water from snow melt off. Spring breakup conditions cause sloughing of soil. Repair entails placing and compacting soil to fill void caused by sloughing.

It should be noted that this type of erosion has never been observed on the Fort Knox WSF Dam since its construction in 1996. However, ice pocket sloughing has been observed in the Chena Lake dikes and dam, operated by the Corps of Engineers, in small amounts, on an annual basis (although these dams are of different construction). Consequently, we will consider this type of repair, but at a much greater frequency than that occurring at the Chena Lake dam.

Also make note that costs of ice pocket sloughing repair were not calculated for the TSF Dam, as this dam will have a 300'-400' "beach" on the upstream side that will limit contact with water, thus making ice pocket buildup unlikely.

Ref. #13, Replace armor stone- Existing armor stone is composed of "run of mine" materials-primarily 3' minus schist and granite. Both of these types of stone will decompose rather readily in this environment. The armor stone will have to be replaced on 50 year cycles. This work is intended to replenish or "freshen" the surface. In practice, there are a number of approaches to constructing this repair, with the actual method being determined by the ingenuity of the engineers and contractor who perform the work in the future. This estimate assumed that the armor stone will be dumped over the crest of the dam.

One factor serves to mitigate the deleterious effects of armor stone weathering. Observation of granite exposures (15 years since exposure) at the mine do not indicate that weathering has yet occurred. Because of this, the assumption has been made that 20% (rather than 100%) of the dam surface will have to be repaired at the designated frequency.

Ref. # 14, Dam crest damage repair- It is expected that when closed, the crest of the dam will be fenced off so as to block access. This will prevent damage associated with vehicle traffic. It is likely however that some erosion will occur due to snow melt and rain water runoff. The work will entail re-grading the surface to create a slight crown and maintain positive drainage.

The existing dam crest surface is a durable, driving surface that is relatively resistant to erosion.

Ref. # 15, replace spillway-Despite maintenance, the spillway has a finite life. Assumption is that the entire spillway will be replaced at 100 year intervals.

Ref. # 16, Spillway/earth interface erosion repair-The junction of the exterior of the concrete spillway and the adjacent earth surface will be a point vulnerable to erosion. Excessive erosion, if left unabated, could undermine the spillway. The repair will entail placing and compacting soil to restore the original, pre-erosion surface.

Ref. #17, Repair spillway contraction joints-The contraction joints are a week point of the structure. Frost action and freeze thaw cycles, coupled with ice buildup within the joints will cause deterioration of the joints. Repair will entail total refurbishing of the joints and adjacent concrete.

Ref. # 18, Replace spillway tailwater riprap-The tailwater riprap will deteriorate in a similar manner as the armor stone. The material will be replaced entirely.

APPENDIX A

MAINTENANCE AND REPAIR COSTS

TAILINGS STORAGE FACILITY DAM

MAINTENANCE

REF. #	ITEM	UNIT	QUANTITY	UNIT COST	COST	FREQUENCY, YEARS
1	clearing of conifers	acres	56	$200	$11,200	10
2	minor surface erosion	LS	1	$11,100	$11,100	1

REPAIR

REF. #	ITEM	UNIT	QUANTITY	UNIT COST	COST	FREQUENCY, YEARS
3	accelerated rill erosion repair	acres	17	$920	$15,640	25
4	replace armor stone	acre	11	$91,500	$1,006,500	50
5	dam crest damage repair	station	50	$100	$5,000	25

TAILINGS STORAGE FACILITY DAM

APPROXIMATE DIMENSIONS ULTIMATE DAM CONFIGURATION			
length of crest	5000	feet	
elevation of crest	1540	feet	
length of toe	1000	feet	
width of crest	57.5	feet	
elevation of toe	1180	feet	
area of crest	31944	SY	
slope	1.8:1	H:V	
length along slope, crest to toe, downstream	800	feet	tailings will be stacked against the majority of the face.
area of downstream face	266666	SY	assume downstram face has same toe dimensions as upstream
area of downstream face	55	acres	
area of upstream face	2777	SY	tailings to within 5' of crest, Shaun baker, e mail, 7-13-09
area of upstream face	0.6	acres	
total area of dam faces	55.6	acres	

based on Knight Piesold drawings
all figures and dimensions are approximate

WATER STORAGE FACILITY DAM

MAINTENANCE

REF. #	ITEM	UNIT	QUANTITY	UNIT COST	COST	FREQUENCY YEARS
6	clean spillway	LS	all required	$5,400	$5,400	20
7	clearing of conifers	acre	6.6	$600	$3,960	10
8	minor surface erosion	acre	3.6	$662	$2,383	20
9	seal cracks in concrete	LF	8820	$10	$88,200	20
10	refurbish surface spalling of concrete	SF	8820	$10	$88,200	20

REPAIR

REF. #	ITEM	UNIT	QUANTITY	UNIT COST	COST	FREQUENCY YEARS
11	accelerated rill erosion repair	acre	3.6	$1,750	$6,300	25
12	ice pocket sloughing repair	lump sum	1	$3,300	$3,300	25
13	replace armor stone	acre	0.2	$91,476	$18,295	50
14	dam crest damage repair	station	15	$100	$1,500	25
15	replace spillway	LS	1	$6,397,000	$6,397,000	100
16	spillway/earth interface erosion repair	LF	1400	$10	$14,000	10
17	repair spillway contraction joints	each	10	$1,260	$12,600	20
18	replace spillway tailwater riprap	CY	4667	$25	$116,675	50

WATER STORAGE FACILITY DAM

APPROXIMATE DIMENSIONS ULTIMATE DAM CONFIGURATION LOOKING DOWNSTREAM		
length of crest	1500 feet	
elevation of crest	1039 feet	
elevation of water surface	1000 feet	assumed-elevation is variable
length of toe	750 feet	
width of crest	30 feet	
elevation of toe	950 feet	
length along slope, crest to toe, downstream	140 feet	average to aluvial backfill
area of upstream face	1.4 acres	assume 40' between crest and water surface
area of downstream face	3.6 acres	trapezoid, 1500, 750, 140H
SPILLWAY		
crest elevation	1025 feet	
maximum water level	1033 feet	
tailwater elevation	965 feet	
entrance channel width	100 feet	
length, along slope, crest-->tailwater	500 feet	
length, along slope, entrance apron/channel	200 feet	
width of structure	106 feet	
perimeter length of concrete channel	126 feet	"U" shaped channel, 106' bottom of channel, average 10 high walls
approximate concrete area of channel	88200 SF	
approximate concrete area of channel	9800 SY	

based on Knight Piesold drawings
spillway is constructed on bedrock, minimal settlement expected

TAILINGS STORAGE FACILITY DAM

clearing of conifers

reference #	1	
area of downstraem face	55	acres
area of upstream face	0.6	acres
total	55.6	SY

price quote
3 laborers work with chain saws, 7, 8 hour days, at 60 $/hour
3*7*8*60=$ 10,080
mark up to $ 11,000 to account for fuel and equipment costs

frequency source 7 years, this is the frequency used by GVEA to clear vegetation from their ROW's

TAILINGS STORAGE FACILITY DAM

minor surface erosion

reference #	2	
length of downstream toe of slope	50000	LF
length of rills	50	LF
rill frequency, on center dimension	50	LF
total length of eroded rills	50000	LF
total volume of eroded material	1852	CY
cost	$11,111	
cost quote:	Borrow 6 $/CY	

notes:
localy available material
minor surface erosion is evenly distributed in rills 50' on center
1 rill has cross sectional area of 1 SF
price estimate source: recent construction bid results from contractor performing work at Fort Knox.
the rills occur on the natural ground at the base of the dam

TAILINGS STORAGE FACILITY DAM

accelerated rill erosion repair
reference # 3

area of downstream face	266666	SY
area of upstream face	2777	SY
total	269443	SY

cost quote: 6 $/cy to place fill material at dam crest, 500 $/acre to place and compact of dam sideslopes
70 CY/acre *6 $/cy=420+500=920 $/acre

notes:
assume that 30% of surface will require repair. 30% * 56 acres=17 acres
localy available material
labor intensive work because of steep and long sideslopes
rills spaced at 50', 1 rill has cross sectional area of 3 SF
so, 3 each 208' long rills=624 LF/acre=1872 CF/acre
so, 1872 CF/acre=70 CY/acre of surface area
price estimate source: recent construction bid results from Fairbanks vicinity.

TAILINGS STORAGE FACILITY DAM

replace armor stone			
reference #	4		
area of downstream face	55	acres	
area of upstream face	0.6	acres	
total area	55.6	acres	
20 % of total area	11.12		
total	269104	CY	
total	508607	tons	assume 140PCF bulk density
cost	$5,086,066		
cost $/acre	$91,476		

price quote	7-23-09 conversation with Dave Fulton of Exclusive Landscaping 10 $/ton process, transport, and install on site material
frequency source	50 year intervals, various sources

notes:
20% of surface will require repair. 20% * 56 acres=11.2 acres
use "run of mine" rock, minus 3' diameter
steep existing slope will increase costs
average armor stone thickness 3'
assume length along slope is 800'
for estimating purposes, assume a 56 acre square surface area

TAILINGS STORAGE FACILITY DAM

dam crest damage repair

reference #	5	
length of crest	5000	feet
width of crest	60	feet

notes:
will require 1 grader and operator working 3, 8 hour days
200 $/hour for grader and operator
so, 200 * 24= $ 4800
so, 4800$ / 50 stations = 96 $/station

WATER STORAGE FACILITY DAM

clean spillway
reference # 6

notes:
clean soil and debris from spillway
use rubber tired bobcats, dumptrucks
local disposal site
approximately 70,000 SF of area to be cleaned.

1 day to complete work, 10 hours
1 bobcat, 1 dumptruck-300 $/hour * 10 hours =$3,000
4 laborers/operators-240 $/hour * 10 hours= $ 2,400
total=$ 5,400

WATER STORAGE FACILITY DAM

clearing of conifers
reference # 7

area of upstream face	1.4	acres
area of upstream face	5.2	acres
total	6.6	acres

price quote
4 laborers work with chain saws, 2, 8 hour days, at 60 $/hour
4*2*8*60=$ 3840
mark up to $ 4,000 to account for fuel and equipment costs

frequency source 7 years is the frequency used by GVEA to clear vegetation from their ROW's

WATER STORAGE FACILITY DAM

minor surface erosion

reference #	8
area of downstraem face	3.6 acre
total	3.6 acre

cost quote: 6 $/cy to place fill material at dam crest, 500 $/acre to place and compact of dam sideslopes
27 CY/acre *6 $/cy=162+500=662 $/acre

notes:
the upstream face is armored, so is not included in these calculations
downstream face is earthen surface, so subject to erosion
dam crest erosion addressed in item 14
localy available material
minor surface erosion is evenly distributed over entire dam sideslope surface
labor intensive work because of steep and long sideslopes
assume 1 acre contains rills at 50', so 3 rills, 208 feet long per acre=725 LF per acre
1 rill has cross sectional area of 1 SF
so, 725 CF/acre=27 CY/acre of surface area

WATER STORAGE FACILITY DAM

seal cracks in concrete

reference #	9		
length, along slope, crest-->tailwater	500	feet	
length, along slope, entrance apron/channel	200	feet	
width of structure	106	feet	
perimeter length of concrete channel	126	feet	average channel height 10'
approximate concrete area of channel	88200	SF	
approximate concrete area of channel	9800	SY	

price quote: Finishing Edge Concrete, 7-21-09, 10 $/LF clean and seal cracks

notes:
contraction joints every 50'
saw cut control joints every 20'
say 1 crack running the full length of "U" section located every 10'
700 feet / 10 feet=70 each 126' long cracks=8820 LF of cracks

WATER STORAGE FACILITY DAM

refurbish surface spalling of concrete			
reference #	10		
width of structure	106	feet	
perimeter length of concrete channel	126	feet	"U" shaped channel, 106' bottom of channel, average 10 high walls
approximate concrete area of channel	88200	SF	
assume 10% of surface is spalled	8820		
price quote:	10 $/SF to chip, clean and apply grout to spalled surface. finishing Edge Concrete 7-21-09		

WATER STORAGE FACILITY DAM

accelerated rill erosion repair

reference #	11
area of downstream face	3.6 acres
total	3.6 SY
cost quote:	6 $/cy to place fill material at dam crest, 500 $/acre to place and compact of dam sideslopes 208 CY/acre *6 $/cy=1248+500=1748 $/acre

notes:
the upstream face is armored, so is not included in these calculations
downstream face is earthen surface, so subject to erosion
dam crest erosion addressed in item 14
localy available material
minor surface erosion is evenly distributed over entire dam sideslope surface
labor intensive work because of steep and long sideslopes
rills spaced at 20', 1 rill has cross sectional area of 3 SF
so, 9 each 208' long rills=1872 LF/acre=5616 CF/acre
so, 5616 CF/acre=208 CY/acre of surface area

WATER STORAGE FACILITY DAM

ice pocket sloughing repair
reference # 12

Chena Lake Dike experiences 2 events per year
Their structure is 2 miles long by 50 ' high
2 miles * 5280 * 50' high* 2 sides=24 acres
average slough is 10' by 10' by 3'=200 SF= 12 CY

So 25 SY of erosion per 24 acres

WSF Dam has approximately 6 acres of surface area
So, figure 12 CY of material per event, located in 1 discrete erosion feature

25 $/CY to place and compact material
25$ * 12 CY=$300
It will be labor intensive to access various parts of the dam surface.
Assume 5 workers, 1 dumptruck, 1 loader, and a bobcat connected to a cable working from the crest.
5 men * 8 hours * 60 $/hour= $2400
dumptruck/loader work 3 hours, so @ $600
comes to 3000 $/erosion feature

3000 + 300=3300

WATER STORAGE FACILITY DAM

replace armor stone			
reference #	13		
length of crest	1500	feet	
length of toe	750	feet	
area of upstream face	1	acres	assume 40' between crest and water surface
total	1	acres	
total	4840	CY	
total	9147.6	tons	assume 140 PCF bulk density
cost	$91,476		
cost $/acre	$91,476		
price quote	7-23-09 conversation with Dave Fulton of Exclusive Landscaping		
	10 $/ton	process, transport, and install on site material	
frequency source	50 year intervals, various sources		

notes:
assume 20% of surface requires repair
use "run of mine" rock, minus 3' diameter
steep existing slope will increase costs
average armor stone thickness 3'
assume length along slope is 140'
for estimating purposes, assume a 3.6 acre square surface area

WATER STORAGE FACILITY DAM

dam crest damage repair

reference #	14	
length of crest	1500	feet
width of crest	17	feet

notes:
will require 1 grader and operator working1, 8 hour days
200 $/hour for grader and operator
so, 200 * 8= $ 1600
so, 1600$ / 15 stations =106 $/station

WATER STORAGE FACILITY DAM

replace spillway
reference # 15

approximate reinforced concrete quantity

width of spillway	106	feet	
depth	2	feet	
unit volume of spillway floor	212	CF/LF	
total volume of spillway floor	5496	CY	
average height of spillway walls	10	feet	
width of spillway walls	2	feet	
unit volume of spillway walls	40	CF/LF	there are 2 walls, includes both
total volume of spillway walls	1037	CY	
total unit volume of spillway	252	CF/LF	
length of spillway	700	feet	
approximate voume of concrete in spillway	176400	CF	
approximate voume of concrete in spillway	6533	CY	

Item	Unit	Amount	Unit price	Total
Concrete	CY	6533	$2,000	$13,066,000
reinforcing steel	pound	587402	$2	$1,174,804
demolition	LS	all required	$1,500,000	$1,500,000
Bridge, 110' long	LS	all required	$260,000	$260,000
			TOTAL	$16,000,804

ITEM	QUANTITY	UNIT COST	COST	NOTES
concrete	6533	$150.00	$980,000.00	delivered to site by local ready mix company
spillway floor, CY	5496	$278.00	$1,527,970.37	2009 MEANS, page 63, line 4650, x1.21 location factor, pg 737
spillway walls, CY	1037	$920.00	$954,074.07	2009 MEANS, page 63, line 4250, x 1.21 location factor, pg737
reinforcing steel, LBS	587402	$2.00	$1,174,804.00	2009 ADOT&PF bid data
demolition, LS	1	$1,500,000.00	$1,500,000.00	
Bridge, 110' long, LS	1	$260,000.00	$260,000.00	Baily Bridges 7-22-09

total **$6,396,848.44**

WATER STORAGE FACILITY DAM

Pricice backup information

replace spillway
reference # 15

longitudinal reinforcing steel, 700 feet

bar size	# of bars	weight per LF	total weight	
4	318	0.668	148697	slab
4	60	0.668	28056	walls
		SUM	176753	

transverse reinforcing steel

bar size	# of bars	length, feet	weight per LF	total weight	
5	1050	105	1.043	114991	slab
6	1050	105	1.502	165596	slab
5	2100	10	1.043	21903	wall
6	2100	10	1.502	31542	wall
			SUM	334031	

Total weigh reinforcing steel	510784	pounds	
15% weight contingency	76618	pounds	splices, miscelaneous bars
approximate weigh reinforcing steel	587402	pounds	

ADOT&PF reinforcing steel bid results

year	location	price per pound
2009	Tok Cuttoff	$1.65
2009	Fairbanks	$2.13
2008		$2.69
2008		$3.63

WATER STORAGE FACILITY DAM

spillway/earth interface erosion repair

reference #	16	
length of spillway	700	feet
total length of concrete/soil interface	1400	feet
price quote	10 $/LF to transport, place, and compact soil quote based on 2009 bid prices for Fairbanks North Star Borough and Fort Knox Gold Mine construction quotes (by independent contractor)	

notes:
assume 1 CF erosion X section
assume 6 $/CF cost of borrow
placement arrangement will make for labor intensive work
so, assume 10 $/LF labor and material

WATER STORAGE FACILITY DAM

repair spillway contraction joints

reference #	17		
perimeter length of concrete channel	126	feet	
unit price	$10	per LF	Finishing Edge Concrete
cost per contraction joint	$1,260		

WATER STORAGE FACILITY DAM

replace spillway tailwater riprap

reference #	18	
average width of channel bottom	150	feet
average width of channel slopes	30	feet
total perimeter	210	feet
depth of riprap	2	feet
Riprap quantity	420	CF/LF
length of riprap	300	feet
volume riprap	126000	CF
volume riprap	4667	CY

notes
granite riprap will be localy available

ADOT&PF riprap bid results

year	Class	location	price per cubic yard
2009	III	Juneau	$26
2009	I	Palmer	$50
2009	III	Chignik	$210
2009	II	Tok	$52
2009	I	Gakona	$60
2009	III		$51