

# Appendix F

## **BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM BEST MANAGEMENT PRACTICES PLAN**

### **BINGHAM CANYON MINE SUPPORT FACILITIES, SOLVENT EXTRACTION ELECTROWINNING PLANT, PRECIPITATION PLANT, AND BINGHAM CANYON WATER TREATMENT PLANT Groundwater Discharge Permit #UGW350010**

#### **1.0 INTRODUCTION**

Groundwater Discharge Permit #UGW350010 was granted for the Kennecott Utah Copper Bingham Canyon Mine and Water Collection System on May 3, 1999. The permit area includes the open pit, waste rock dumps, support shops and various water management facilities. The permit requires that Best Available Technology (BAT) be used in the construction of all facilities and that they are operated according to Best Management Practices (BMP).

The permit also requires a BMP plan for any facilities within the permit boundaries that have the potential to affect groundwater quality. These facilities include various mine support shops, the Solvent Extraction/Electrowinning Plant, South Area Water Services (SAWS) and the Bingham Canyon Water Treatment Plant. Most of these facilities are upgradient from Kennecott Utah Copper, LLC (KUC) groundwater and surface water collection systems. In compliance with the permit, this BMP plan describes the physical and operational controls that are employed to minimize groundwater contamination at these sites.

#### **2.0 BEST AVAILABLE TECHNOLOGY**

##### **2.1 Mine Support Facilities**

Mine support facilities are used for vehicle operations and maintenance and include the Maintenance Shops at the 6190-ft level, the Code 80 Fuel and Lube Area, the Code 85 field maintenance lay down yard and the 6880 Lube Station. Petroleum products are used and stored in bulk at all of these sites. The Explosives Processing Plant also stores diesel and ammonium nitrate in bulk. Diesel fuel, gasoline, lubrication oils, petroleum distillate solvents and ethylene glycol are used on a regular basis around the mine for vehicle maintenance. Each of these facilities is designed to minimize the risk of release, and to contain and collect any materials that are released.

All storage tanks are provided with secondary containment systems. Tanks are either double-walled or located in concrete basins that are capable of holding 110 percent of the largest tank volume.

Oil/water separators are used to treat water which is contaminated with petroleum products before it is reused or piped to the process water circuit. The oil/water separators handle waters from wash pads, secondary containments, refueling pads and sumps. The recovered petroleum product is removed from the oil/water separator and shipped offsite for recycling or treatment.

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Concrete pads that slope to concrete collection sumps underlie all vehicle-refueling areas. Spills which occur during refueling are immediately recaptured.

Concrete pads underlie all shop floors. There are no drains on the shop floors and all sumps are concrete lined, so spilled materials are contained within the shop until they can be recovered.

Concrete pads that are sloped to concrete-lined settling basins underlie all vehicle wash areas. Wash water either flows through an oil/water separator and is reused at the pad or flows through an oil/water separator and is piped into KUC's process water circuit.

## 2.2 Solvent Extraction/Electrowinning Plant

The Solvent Extraction/Electrowinning (SXEW) pilot plant facility, located within the western edge of the Dry Fork dumps, was decommissioned in 2007 and 2008. The associated tank house and mixer/settlers were disassembled. Remaining is the lined leach pad containing low grade copper ore as well as the associated pregnant leach solution pond, raffinate pond and sulfuric acid tank with secondary containment. The leach pad covers approximately 420,000 square feet. From bottom to top, it is constructed of six inches of compacted clay, six inches of compacted silty sand and LDPE and PVC lines.

In 2011 the heap leach underwent modification. A portion of the original heap (300' x 70') was removed in order to accommodate the placement of fresh ore for a new test. Before the fresh ore was placed, the opened area was isolated from the existing heap by means of two 60 mil HDPE plastic liners; a leak detection system was also installed. All process solutions will be handled from the leach pad through an independent collector system to a new set of PLS and raffinate ponds with capacities of 300,000 and 75,000 gallons, respectively, which are constructed with one foot of compacted clay beneath two layers of 60 millimeter HDPE liners and will also include a leak detection system.

The process solutions will be treated in a portable SX/EW pilot plant (capacity of 40 gallons per minute) to more accurately simulate a commercial operation in terms of acid balance and metal recovery.

Performance criteria for the Heap, PLS pond and Raffinate pond are listed in Table F-1. Performance of BAT is tracked through weekly inspections and documentation of leak detection systems. If the head below the upper liner and in any of the three individual sumps exceeds maximum allowable head (MAH) outlined in table F-1 the sump in question will be evacuated of leachate at which time the leakage rate will begin to be measured. If the leakage rate is determined to be above the action leakage rate for a 24 hour period KUC will initiate reporting requirements as outlined in the permit under Part I Section H.

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**Table F-1: Chalcopyrite Heap Leach Ponds BAT Compliance GPD and GPM**

Pond	Surface Area (acres)	Allowable Leakage Rate <sup>1</sup> (gpad)	Action Leakage Rate (gpd)	Action Leakage Rate (GPM)	Maximum Allowable Head in Leak Detection Sump (ft)
Raffinate Pond	0.15	1700	255	0.18	2
PLS Pond	0.37	1700	629	0.44	2
Heap	1.78	1700	3026	2.10	2

Notes:

gpad - Gallons per Acre per Day

ft - Feet

PLS - Pregnant Leach Solution

gpd – Gallons per Day

gpm – Gallons per Minute

<sup>1</sup> - Koerner, R. and Koerner, J 2009. Survey of U.S. State Regulations on Allowable Leakage Rates in Liquid Impoundments and Wastewater Ponds. Geosynthetic Institute GRI White Paper #15, p 7. ALR for in-situ leach mines.

The remaining facility is constructed on top of the Dry Fork waste rock disposal area. It is upgradient from several extraction and monitor wells the Bingham Canyon/Dry Fork area and the Bingham Canyon cutoff wall.

Current plans for the heap leach pad include pilot scale leaching of sulfide ore to better understand the geochemistry of copper heap leaching.

## 2.3 South Area Water Services (SAWS)

The SAWS facilities, including the administration buildings and water treatment structures constructed on alluvial sands and gravels in Bingham Canyon. The underlying contact between permeable alluvial deposits and relatively impermeable volcanoclastic bedrock causes groundwater flow below the plant to move through the alluvium to the Bingham Cutoff wall where it is captured. There is an upward vertical groundwater gradient in the bedrock beneath the facility which inhibits any contaminant movement out of the alluvium.

The entire SAWS facility area is paved with either concrete or asphalt, any waters spilled or released due to an upset condition report to a sump or a lined reservoir. Excess water may be routed to either the Bingham Creek Small or Large Reservoirs (GWDP#UGW350006)). About 80 percent of the High Density Polyethylene (HDPE) and stainless steel piping included in the SAWS facilities is above ground and over paved surfaces. Buried pipe is stainless steel or HDPE.

SAWS personnel over see the operation and maintenance of the Bingham Canyon Mine Water Collection System, Large and Small Reservoirs and all associated piping and water collection and conveyance structures. There are flow meters and sump level indicators located at of these

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sites. In the most critical areas, level indicators alarm to a central control room if sumps become too full or pipe flow decreases significantly. This allows rapid shut-down or redirection of water flows in the event of an upset condition.

## 2.4 Bingham Canyon Water Treatment Plant

The Bingham Canyon Water Treatment Plant is located southwest of the Large Bingham Reservoir. The process area is contained within a building with a sloped concrete floor, which drains to an HDPE lined trench system and then to a sump. The sump is serviced by a pump, which returns all the effluent collected in the trench to the Eastside Collection System. Flow into the trench occurs either from the membrane washing cycle or from flushing and draining of lines within the system; effluents are pumped from the sump as required. Overflow from the sump is routed to the Large Bingham Reservoir de-silting basin. Effluents are not allowed to stand in the trench for any length of time beyond the inflow/pump-out period.

The collection system feed line, plume water feed line and concentrate return line are all dual-wall piping systems consisting of a carrier pipe and a containment pipe. The containment pipes drain into the trench system or into vaults. The vaults are monitored and pumped on an as needed basis.

The trench system has an emergency overflow to Chamber 1 of the Desilting Basin of the Large Bingham Creek Reservoir in the event of a long-duration power outage that coincides with uncontrolled inflows.

## 3.0 INSPECTION AND MAINTENANCE PROCEDURES

Facilities which are in operation are monitored on a continuous basis. All operating mine facilities described in this Plan are operated 24 hours per day, 365 days per year and all areas are inspected at least once per day and generally once per shift by assigned employees. The assigned operators or inspectors are responsible for correcting any problems discovered in a timely manner. Maintenance and repairs are initiated in response to inspection results or according to preventive maintenance (PM) schedules.

PM schedules at the mine are tracked with a computerized maintenance program. Based upon operator inspections and preset maintenance intervals, this program assists in scheduling and planning PMs. Standard Operating Procedures (SOP) are used by the employee or group of employees assigned the responsibility for completing the PM. After the PM is completed, a signed PM checklist is returned to the maintenance scheduler. The maintenance planner notes any items identified during the inspection that require additional repair. A work order is then written and the additional work scheduled. The work-order tracking system is intended to ensure that proper and complete implementation of required repairs occurs in a timely fashion. The system continues to remind maintenance planners periodically until the work-order job is completed and closed out.

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The Bingham Canyon Water Treatment Plant is manned on a continuous basis, twenty-four hours a day, 365 days per year. The operators are also responsible for routine inspection and maintenance of the facility.

## 3.1 Mine Support Facilities

All secondary containments around tanks are inspected weekly during the rainy season and after precipitation events. If there is no oil sheen and the water has a pH between 6.5 and 9, it may be discharged to the ground. Water with oil sheen is conveyed to an oil/water separator.

The integrity of tanks, secondary containments, concrete wash pads, refueling pads and waste storage pads are inspected monthly. Pumps, valves and pipes associated with bulk storage tanks are inspected annually.

Oil/water separators situated below grade and away from secondary containment are inspected at least quarterly and used oil is removed as required. Sludge levels are inspected at a minimum annually and sludge removed as required.

The waste storage pad is inspected weekly to insure the facility meets Environmental Protection Agency (EPA) guidelines which includes the containment of stored waste products.

## 3.2 Solvent Extraction/Electrowinning Facilities

During operation, all facilities associated with the SXEW plant are inspected on a daily basis. All observations are noted on a detailed log sheet. When not in operation, all facilities associated with the plant are inspected at least twice per month.

## 3.3 South Area Water Services (SAWS)

All water collection and conveyance facilities that comprise the Bingham Canyon Mine Water Collection System, including drop boxes, junction boxes, diversion boxes, cutoff walls, valves, desilting basins, pipelines, sediment traps, canals, screens, weirs, and flumes are inspected on a quarterly basis as per the requirements of ground water discharge permit #UGW350010. Pumps and motors are maintained in accordance with the preventive maintenance schedules. If any deficiencies are found, they are corrected immediately or a work order is written for the required repairs. All structures associated with the Large and Small Reservoirs are inspected as per the requirements of ground water discharge permit #UGW350006.

## 3.4 Bingham Canyon Water Treatment Plant

During operation, the operators are responsible for the PM program, which is implemented at the beginning of each shift. PM consists of visual inspection of the equipment, its foundations and mounting assemblies, checks for excessive heat, noise or vibration, and inspection of associated piping for leaks and proper sealing. Pumps have lubricating fluids changed as directed by the manufacturer's instructions. Level control in the sump is checked annually to ensure that the controls activate at the appropriate levels.

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A visual inspection of the outlets of the secondary piping containment is conducted once every month to ascertain whether ruptures have occurred in the carrier pipes.

After the PM is completed, the operator reports any deficiency. A work order is then written for implementation of the required repairs, which generally take place within seven days.

## **4.0 PERFORMANCE CRITERIA**

### **4.1 Housekeeping**

All facilities adhere to strict housekeeping standards. Housekeeping standards have been established for the principal purpose of ensuring consistent application of housekeeping throughout KUC. KUC's facility standards require floors to be washed at an interval necessary to keep them in a clean state. Floors are kept as dry as possible to minimize potential for slips and falls. Hoses, brooms and similar types of equipment are located in strategic areas to facilitate housekeeping. All containers must be in good condition, properly labeled and compatible with the stored material. Spilled materials must be promptly cleaned up and work areas kept reasonably free of grease, oil and other process materials. Area supervisors, through employee training and regular site inspections, enforce these standards. KUC supervisors are trained annually on the environmental aspects of proper housekeeping.

### **4.2 Spill Prevention, Response and Reporting**

All mine facilities are included in the Spill Prevention, Control and Countermeasures (SPCC) Plan which is covered by the Clean Water Act and only regulates petroleum based material. This plan specifies physical and institutional controls to minimize the likelihood of spills, and identifies procedures to be followed in the event of a petroleum based spill. In general, spill response involves: 1) identifying the spilled material; 2) isolation of the spill immediately if it is safe to do so; 3) containing the spilled material as soon as safely possible; and 4) cleaning up and properly disposing of the spilled material and any contaminated soils or debris. Spill response kits are located at strategic locations at each facility. All employees are trained annually on the SPCC Plan.

A verbal report of noncompliance, or spills subject to the provisions of UCA 19-5-114 which may endanger public health or the environment, are made as soon as possible, but no later than twenty-four hours from the time KUC first becomes aware of the reportable incident. The report is made to the Utah Division of Environmental Quality 24-hour number, (801) 536-4123 or to the Division of Water Quality, Groundwater Protection Section at (801) 538-6146, during normal business hours. Other notifications required under RCRA or SARA are made if reportable quantities are exceeded. A written report containing specific details of the incident and KUC's response is required to be submitted within five days.

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## 4.3 Materials Handling

Before new products are allowed on site, their material safety data sheets (MSDSs) are reviewed by procurement personnel as well as health, safety and environmental Personnel as outlined in Kennecott's standard 14.2. An attempt is made to exclude chemicals that may pose health or environmental risks and which would be persistent in the environment if released. Existing product usage is also periodically reviewed to determine if less hazardous materials can be substituted.

Although the mine is regulated under the Mining Safety and Health Administration (MSHA), KUC enforces the Occupational Safety and Health Administration (OSHA) requirements for hazard communications at all facilities. The OSHA standards that are enforced for materials handling include:

- labels and (or) appropriate warnings are placed on all tanks and other containers
- MSDSs are maintained and readily available for all chemicals on site
- employees are informed and trained regarding chemical hazards and hazard communications
- contractor employers are informed concerning hazardous chemicals to which their employees may be exposed while working at the Bingham Canyon Water Treatment Plant
- material transfer operations are conducted in such a manner as to minimize the potential for spillage; chemicals are stored in compatible containers and tanks; containers are properly labeled with NFPA stickers.

## 4.4 Training

All new employees receive an overview of KUC's environmental policy and procedures, including training on housekeeping, hazard communication and SPCC requirements. Throughout the year all KUC employees receive site specific training on a variety of environmental topics including materials handling, waste handling, hazard communication and spill prevention and response.

## 4.5 Recordkeeping

Records that document compliance with the elements mentioned in the BMP are maintained for a minimum of three years. Copies of the required records for mine facilities are kept at the mine. Records for the water treatment plants are kept at KUC's Environmental Engineering Projects Group. Selected records are also maintained by the Environmental Department.