

KENNECOTT BINGHAM CANYON MINE AND WATER COLLECTION SYSTEM COMPLIANCE MONITORING PLAN

MONITORING REQUIREMENTS AND PLAN CONTENT

The Groundwater Quality Protection Regulations require a Compliance Monitoring Plan to demonstrate compliance with groundwater protection limits for the Bingham Canyon Mine and Water Collection System (WCS). The plan is required to evaluate groundwater flow directions, and water quality at the site and at compliance points. Many elements of the plan, particularly those dealing with site hydrogeology, hydro geochemistry, and background chemistry have been previously discussed in Sections 3 and 4 of the Water Collection Monitoring Network Groundwater Discharge Permit Application and the Water Collection Monitoring Network Groundwater Discharge Permit Application Addendum submitted to the Division of Water Quality (DWQ) in 2013. Kennecott Utah Copper LLC (KENNECOTT) has an existing general or operational, groundwater monitoring plan that is described in the Groundwater Characterization and Monitoring Plan (GCMP) (Kennecott, 2014)

This Compliance Monitoring Plan for the Bingham Canyon Mine/Water Collection System includes:

- Monitoring strategy including criteria used in the selection of monitoring point locations and methods.
- Description of general monitoring program.
- Description of the compliance monitoring program, including compliance points monitoring parameters and standards.

Implementation of this plan will result in monitoring of the principal aquifer of the southwestern Jordan Valley to identify changes in conditions and to establish compliance criteria that will trigger response or investigative actions, should significant changes in ground water be identified.

MONITORING STRATEGY

Best Available Technology (BAT) Inspection, Maintenance, and Monitoring as well as groundwater monitoring have been selected as the compliance monitoring methods for the Bingham Canyon Mine and Water Collection System.

BAT MAINTENANCE, INSPECTION, AND MONITORING PLAN

The BAT Monitoring Plan is intended to provide appropriate information to ensure that Kennecott meets the monitoring, compliance, and reporting requirements set by the DWQ for the Bingham Canyon Mine/ Water Collection System Ground Water Discharge Permit (GWDP). The purpose of these actions is to maintain the protection of groundwater provided by the WCS, and to reduce the mobility of potentially hazardous substances by preventing discharges to groundwater. The goal of this plan is to ensure that the Bingham Canyon Mine and WCS which include all of the structures contained within it for collecting and monitoring contact and waste rock contact water (WRCW) are maintained in working condition. Actions that will be conducted to ensure that the system is functional, compliant with operational and regulatory criteria, and meet BAT criteria include:

- Inspect and maintain sediment control structures;
- Inspecting and maintaining as necessary the de-silting/sedimentation basins within each drainage to ensure they are functioning as designed;
- Removing de-silting/sedimentation basin sediments as necessary to maintain proper function;
- Monitoring erosion controls and instituting new controls when necessary;
- Maintaining ditches, pipelines, flumes, and flow monitoring equipment;
- Monitoring flows and water quality parameters for each of the drainages; and
- Summarizing data generated from within the collection systems and items relevant to compliance issues.

Preventive maintenance, as governed by this plan, includes employee training, inspection of structures associated with the storm water collection system, good housekeeping practices, and maintenance responsibilities.

Inspections

Frequency - Each cut-off wall, surface water and process water conveyance structures, surface water collection basins, pipelines and collection system component will be inspected quarterly. This may occur during routine maintenance or data collection visits.

Protocol - A standard inspection protocol will be followed for each inspection conducted. The inspection report form will be completed and signed by the inspector. The operational status of each structure will be noted along with any needed corrective actions or maintenance items. The physical

Appendix A

UGW#350010

condition of collection boxes and gratings, the accumulation of silt or sand in the desilting/sedimentation areas, and/or the clogging of collection box gratings with debris will also be noted. Any necessary repairs or cleaning will be completed within 45 days of the date when inspected. Typically clogged drains or pipes are addressed as soon as practical by operational personnel. The completed inspection form will be reviewed by SAWS Operations and any maintenance or repair items will be completed within 45 days of the inspection.

Record keeping - Copies of each inspection performed will be maintained on file to document compliance with this program as specified in Section II H of the permit. Inspection reports will be available for review by DWQ representatives during compliance visits. A log of inspections completed each quarter will be included in the quarterly water quality sampling reports provided to the DWQ.

Spills and Overflows

Kennecott will respond to all overflow spills of mine waters or sediments as soon as they are discovered. DWQ will be notified in accordance with spill reporting requirements in the Permit (Part III.I.1). The cause of the spill or overflow will be corrected/repared and reported to DWQ as required under Part III.I.2 of the Permit. Kennecott personnel will remove any standing water which may have accumulated during the event and place it back into the collection system. Inspections of all storm water collection structures will be conducted quarterly.

Debris that may cause a blockage of flow in the collection system will be removed. If a discharge is detected, field parameters (pH and conductivity) of the sample will be recorded and a sample of the overflow will be collected. Chemical analysis of overflow waters will be conducted as with regular monitoring. Any overflow will be contained immediately and placed back into the collection system.

A field logbook will be used to record all field observations and sampling data as per Kennecott's Water Sampling SOP's. Any damage that occurred due to a breach or an overflow will be repaired to restore specifications of the approved design.

In the event of low pH water pooling in desilting/sedimentation basins, the water will be pumped into the nearest collection pipeline to prevent seepage to ground water. Appropriate equipment will be available at the site to respond to any emergency spill situations.

Appendix A

UGW#350010

Seeps

Seeps occur along the Bingham Canyon Mine waste rock disposal areas. Most occur naturally during times of heavy spring runoff due to super-saturated soils; however, the potential exists that seeps may occur due to leakage from the east side collection system. Kennecott will assess the collection system area for seeps on a quarterly basis. For each seep observed, Kennecott will determine if flows from the seep report to the cutoff wall/collection system. If Kennecott determines that flow from the seep(s) reports to the collection system, no further action is necessary. If Kennecott is unable to determine if seep flow reports to the collection system or determines that flows do not report to the collection system, a sample of seep water will be analyzed for pH and conductivity. Any seep that has a measured pH less than 4.5 and conductivity greater than 5,000 $\mu\text{mhos/cm}$. will cause Kennecott to take the following actions:

1. Obtain a water quality sample from the seep and analyze for the constituents noted in Part II, Section F, Item 1 (f) (Constituents Sampled).
2. Undertake one or more of the following corrective actions that will include the following, as appropriate, to assure flows report to either the leach collection or storm water collection system:
 - a. Excavation and installation of perforated pipe into the seepage area with a collection system and piping to the collection system.
 - b. Diversion of the seepage to toe drains, the wetlands header pipe, or other collection system structures, depending on their location.
 - c. Construction of a temporary earthen dam and installation of a surface pipe to carry the water to the collection system.
 - d. Installation of an additional cut-off wall.
3. Report the location, approximate flow rate, and water quality of each seep in the quarterly monitoring results required in the permit under Part II, Section I, item 1 (b).

Corrective action to contain seep flows with pH less than 4.5 and conductivity greater than 5,000 $\mu\text{mhos/cm}$ will be completed within 45 days of discovery unless weather or permitting requirements prohibit. The DWQ will be notified of any such instance where more than 45 days will be taken to address a seep with poor water quality (pH<4.5 and conductivity > 5000). The notification will include the reason for delay in capturing seep waters and will provide a schedule when such action will be completed.

Appendix A

UGW#350010

The prior actions will be performed to prevent leach water from potentially migrating offsite or to the principal aquifer of the southwestern Jordan Valley. Chemical analysis of seepage waters will be conducted during regular monitoring. A field logbook will be employed to record grab sample parameters, the date the seep was found, recent precipitation events that may have induced the seep, a visual description of the water, and an estimate of the seep discharge rate.

If a seep is found to have poor water quality (i.e. pH <4.5 and conductivity greater than 5,000 µmhos/cm), and after a reasonable amount of time it is determined to be a permanent seep, the seep will be added to the surface water sampling list.

WATER QUALITY MONITORING PROGRAM

Groundwater Sampling

A monitoring well network of 43 wells will be utilized for compliance monitoring of the Bingham Canyon Mine and Water Collection System. The primary objective of the compliance wells is to measure any water quality impact that may influence the principal aquifer system from Kennecott operations. In as many locations as possible, wells have been selected to provide completions in the alluvial aquifer system immediately to the east of the waste rock dumps where at least 50 to 100 feet of saturated thickness exists. Eleven wells are screened in alluvium. The remaining compliance wells are completed in bedrock because no saturated alluvial deposits exist in most areas, particularly in the southern portion of the East Side dumps, areas closer to the cutoff walls and in the Dry Fork area.

Compliance monitoring wells are located down gradient from each of the water collection facilities to monitor potential releases from the collection system into the principal aquifer and underlying bedrock. Compliance monitor wells located in the southern part of the waste rock disposal area monitor groundwater down gradient from the storm water collection system where active leaching did not occur.

The compliance well monitoring network is designed to achieve the following objectives:

1. Identify flow into the principal aquifer, which would cause the aquifer to exceed relevant permit requirements for any compliance parameter.
2. Sampling over a long period of time which allows historical trending of water quality in the area down gradient of the mine and waste rock disposal areas.
3. Provide samples of water for analysis, which accurately reflect the quality of water in the aquifer location in which they are completed.

Appendix A

UGW#350010

4. Utilize wells completed in alluvium (where present) where there is between 50 and 100 feet of saturation. The screened interval will extend throughout the entire saturated interval.
5. Be constructed and completed in accordance with Kennecott's approved Groundwater Characterization and Monitoring Plan.

The compliance monitoring wells are listed in Table 1 of the GWDP for the Water Collection System. These wells are located in each major drainage and are intended to represent the most likely flow paths for meteoric or storm water that could potentially escape the cutoff wall system.

Well Installation Protocol

Current and all future operational and compliance wells are and will be constructed utilizing guidance approved in the EPA Resource Conservation and Recovery Act Ground Water Monitoring Technical Enforcement Guidance Document, EPA, 1986. Lithologic logs and well construction data for the new monitoring wells will be provided in accordance with permit requirements.

MONITORING TECHNIQUES AND DATA VALIDATION

All groundwater monitoring will be performed using the methods for sampling, analyses, and quality control specified in the GCMP and attachments.

If data outliers or quality assurance/quality control problems are identified, the sample will be retested, and the wells will be re-sampled within 30 days. If the results from the retesting or re-sampling show that the data is an outlier, normal monitoring will resume.

MONITORING FREQUENCY

Quarterly sampling and analysis will be performed for all compliance monitoring wells screened in alluvium. Compliance monitor wells screened in volcanic or Paleozoic bedrock will be sampled on a semi-annual basis (Table 1).

REPORTING and PARAMETERS

Groundwater samples from compliance monitoring wells will be analyzed for the parameters listed in the GWDP.

Kennecott will submit compliance groundwater monitoring data to the DWQ on a quarterly basis. The reports will include a summary of all monitoring data collected during the quarter. Field measurements (ground water levels, specific conductance, pH) and certificates of analysis will be provided.