GROUND WATER DISCHARGE PERMIT UGW350008
STATEMENT OF BASIS

Kennecott Utah LLC; Smelter
Magna, Utah

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Introduction

The Division of Water Quality (DWQ) under the authority of the Utah Ground Water Quality Protection Rules[1] (Ground Water Rules) issues ground water discharge permits to facilities which have a potential to discharge contaminants to ground water[2]. As defined by the Ground Water Rules, such facilities include mining operations[3]. The Ground Water Rules are based on an anti-degradation strategy for ground water protection as opposed to non-degradation; therefore, discharge of contaminants to ground water may be allowed provided that current and future beneficial uses of the ground water are not impaired and the other requirements of Rule 317-6-6.4.A are met[4]. Following this strategy, ground water is divided into classes based on its quality[5]; and higher-quality ground water is given greater protection[6] due to the greater potential for beneficial uses.

The Director has developed permit conditions consistent with R317-6 and appropriate to the nature of the mined materials, facility operations, maintenance, best available technology[7] (BAT) and the hydrogeologic and climatic conditions of the site, to ensure that the operation would not contaminate ground water.

Basis for Permit Renewal

This Permit is being renewed in accordance with R317-6-6.7. However, a permit may be terminated or a renewal denied if any one of the four items in R317-6-6.8 applies:

A. Noncompliance by the permittee with any condition of the Permit where the permittee has failed to take appropriate action in a timely manner to remedy the Permit violation;

B. The permittee's failure in the application or during the Permit approval process to disclose fully all significant relevant facts at any time;

[1] Utah Admin. Code Rule 317-6
[2] https://deq.utah.gov/ProgramsServices/programs/water/groundwater/docs/2008/08Aug/GWQP_PermitInfo.pdf
[3] Utah Admin Code Rule 317-6-6.1A
[4] Preamble to the Ground Water Quality Protection Regulations of the State of Utah, sec. 2.1, August, 1989
[5] Utah Admin. Code Rule 317-6-3
[6] Utah Admin. Code Rule 317-6-4
[7] Utah Admin. Code Rule 317-6-1(1.3)

C. A determination that the permitted facility endangers human health or the environment and can only be regulated to acceptable levels by plan modification or termination; or

D. The permittee requests termination of the Permit.

Permit Changes and Modifications

PERMIT MODIFICATIONS

No new facilities will be regulated under this Permit. There are no modifications to this Permit issuance.

Background

PERMIT HISTORY

The Ground Water Discharge Permit Application for the facility was initially submitted to DWQ in 1991 (Kennecott Utah Copper (KUC), 1991). The ground water discharge Permit UGW350008 was subsequently issued to Kennecott Utah Copper in 1992 in accordance UAC R317-6-6.4. The Permit was renewed on October 27, 1998, March 9, 2000, October 26, 2003, September 15, 2008, and November 20, 2013. Excluding minor permit modifications, this is the fifth renewal of the UGW350008 Permit. To assure adequate ground water quality protection, the facility was designed to employ discharge minimization and control technology with ground water monitoring to prevent any impairment of present and future beneficial uses of the ground water.

Compliance monitoring for this facility is a combination of ground water monitoring and periodic inspections. Ground water monitoring is performed at wells throughout the smelter footprint and downgradient of the smelter facilities along the northern perimeter boundary. Compliance monitoring parameters, ground water quality standards, and protection limits are listed in Table 3 of the Permit. Inspections are conducted at waste process water ponds, cooling tower and repair shop basins, wash stations, sumps, drains, storage pads, cooling pads, and processing pads to verify the condition and operation of the equipment, and identify and correct maintenance issues that could lead to a release of process fluids to the environment. Appendix A of the Permit is the Best Management Practices Plan and describes operations, maintenance, and inspection procedures for the nineteen individual facilities that have BAT criteria associated with them. The document will be utilized for spill prevention, spill cleanup, materials handling, general housekeeping practices, and reporting of spill events. Appendix B is the BAT Monitoring Plan and Appendix C is the Smelter Leak Detection and Repair Plan.

DESCRIPTION OF FACILITY

Kennecott Utah Copper LLC operates a modernized smelter facility located on State Highway 201 between the towns of Lakepoint and Magna. The Smelter is located on a tract of land encompassed in Sections 16, 17, 20 and 21 Township 1 South, Range 3 West, Salt Lake Base

and Meridian. (112° 11' 47" W. Long. and 40° 43' 27" N. Lat., USGS 7.5 minute quadrangle Farnsworth Peak, Utah 1972).

The Smelter facilities are comprised of nineteen individual facilities as listed below and described in Table 1A of the Permit:

1) West Process Water Pond;
2) East Process Water Pond;
3) Granulation Cooling Tower Basin;
4) Granulation Pumphouse Sump;
5) Acid Plant Pumphouse Sump;
6) Vehicle Repair Shop Basin;
7) Vehicle Wash Station;
8) Materials Storage Pads;
9) Slag Cooling Area;
10) Acid Plant;
11) Matte Storage Area and Sump;
12) Equipment Decontamination and Materials Processing Pad;
13) Anode Casting Process;
14) Intermediate By-Products Building;
15) Jacket Water Pumphouse Sump;
16) Acid Plant Cooling Water Basin;
17) Power House/Furnace Cooling Water Basin;
18) Power House/Furnace Pumphouse Sump; and
19) Other Sumps and Drains described in Table 2A of the Permit.

Figure 1 in the Permit provides an-overview of the facility and operational sumps listed in Table 2 of the permit. All monitoring locations and facilities described in Tables 1A and 1B are provided in Figure 2.

BACKGROUND INFORMATION

Three different smelters designed to process copper ore concentrates have operated consecutively and continuously at this general location since 1906. The latest smelter was brought on-line in June 1995 and utilizes Outokumpu flash smelting technology. The ore concentrates are melted in a high-temperature process to burn off sulfur and further separate metals from non-economic minerals. The products produced are copper anodes, precious metals, and sulfuric acid (from the off-gases in the furnaces). By-products produced by the Smelter include slag, flue dusts, As/Cd cake, stack gases, sodium perrhenate and process water.

Kennecott has incorporated environmental monitoring programs to reflect system changes made

to the Smelter and continued remedial operations covered under CERCLA actions, described in detail below. For compliance purposes, this permit utilizes operational monitoring and leak detection systems for process water ponds and sumps, and ground water monitoring wells. The Quarterly Inspection Form is used to document routine inspections and copies of the records are kept at the Smelter Record Keeping Center. Compliance documents required by this ground water discharge permit are submitted semi-annually to the Utah Division of Water Quality.

HYDROGEOLOGY AND SITE CONDITIONS

The Smelter site is located at the north end of the Oquirrh Mountains. Subsurface soils consist primarily of unconsolidated sediments of Tertiary and Quaternary age. As a result of the historic changes in water levels of Lake Bonneville a complex sequence of deltaic sand and clay, beach sands and gravels, and lake clay have been deposited at this site and comprise the Salt Lake Group. In addition the soils in the central part of the smelter site, adjacent to Kessler Canyon, are characterized by heterogeneous colluvial sequences apparently in response to major precipitation/runoff events from the Oquirrh Mountains. These soils include mixtures of fine and coarse gravels and cobbles in fine-grained silt and clay matrices. Gravel fractions are typified by limestone and dolomite. Three aquifer systems exist in the vicinity of the Smelter: the bedrock aquifer system associated with the Oquirrh Mountains, the confined deltaic alluvial fan principal aquifer, and the unconfined shallow aquifer.

The limestone and dolomite bedrock aquifer system associated with the Oquirrh Mountains is comprised of highly fractured Paleozoic carbonate rocks. Recharge to this system is primarily from precipitation on the mountains located adjacent to and south of the Smelter. The flow path through this aquifer generally moves from the bedrock system into the principal and shallow aquifers or is discharged as spring water along bedrock contact at the base of the mountains.

The principal aquifer is a confined system that includes a gravel zone and lacustrine deposits. The gravel zone was most likely derived from the local mountains during an extensive low lake cycle. The lacustrine zone consists of clay, silt and interbedded fine sand. The ground water flow direction for this aquifer is northerly toward the Great Salt Lake. Sediments overlying the Principal aquifer are relatively low in vertical hydraulic conductivities and created confined conditions in the underlying principal aquifer. Wells completed in the upper portion of the principal aquifer show an upward vertical hydraulic gradient.

The shallow aquifer system consists of interbedded lacustrine Bonneville clay, silt, and fine sand. The exact depth of this system varies but is approximately the upper 35 to 50 feet of saturated sediments. The potentiometric surface for the shallow aquifer system depicts lateral flow in a northerly direction toward the Great Salt Lake.

BACKGROUND GROUND WATER QUALITY

Based on historical operations, limited data are available that can be used to describe background water quality in the vicinity of the Smelter. Water quality of the Oquirrh Mountains fractured carbonate bedrock aquifer system is generally good with total dissolved solids (TDS) values

typically less than 2000 mg/L. Water quality in the shallow aquifer is quite variable with concentrations of TDS ranging from 1,280 mg/L to 15,100 mg/L. The chemical makeup of the ground water in the shallow aquifer also varies significantly, with marked differences in concentrations of major ions such as magnesium, calcium, sodium, sulfate, and chloride. There is some evidence of impact to ground water quality from historic smelting operations. Arsenic, cadmium, and selenium values that exceed Utah Ground Water Quality Standards have been observed in the Shallow Aquifer. Water quality in the principal aquifer is similar in some respects to the shallow aquifer in that it is quite variable across the permit area. TDS concentrations vary from 944 to 8,990 mg/L. Concentrations of arsenic, selenium, and cadmium that exceed Utah Ground Water Quality Standards have been observed in the Principal aquifer.

Corrective Action Cleanup

The Ground Water Quality Protection Regulations require applicants to submit a corrective action plan or other response measures to be taken to remedy any violation of ground water quality standards resulting from discharges occurring prior to issuance of a ground water discharge permit. Throughout the term of the previous permit and at the time of this permit renewal; Kennecott has been pursuing a cleanup of the North Area facilities under a Memorandum of Understanding between the U.S. Environmental Protection Agency Region VIII, The State of Utah Department of Environmental Quality, and Kennecott. In June 2000, Kennecott completed a revised remedial investigation of copper smelting and refining related contamination in ground water, surface water, and soils at the northern end of the Oquirrh Mountains. Ground water contaminated with arsenic, selenium, and sulfate has been identified and plume boundaries delineated. The cleanup is proceeding under the auspices of a CERCLA program. Ground Water Quality Discharge Permit UGW350008 does not require corrective action measures in addition to the CERCLA process. This permit has a compliance condition that allows the Director to call for a Contamination Investigation and Corrective Action Plan to be submitted and made a part of this permit should the existing process fail to accomplish appropriate cleanup of existing contamination at the Smelter site.

In November 2010, Kennecott submitted a Corrective Action Plan (CAP) to the Division in response to the unintended release of sulfuric acid from a breach in a containment system of the Kennecott Smelter Acid Loading Facility. In January 2011, the Division acknowledged and approved this plan. Groundwater cleanup standards applicable for parameter are shown in Table 1 in Appendix D of the permit. The CAP incorporated the reactivation of a groundwater extraction trench used to contain the sulfuric acid release in 1995. Kennecott confirmed the functionality and efficiency of the trench through inspection and temporary pump testing to sufficiently induce water table drawdown of the shallow ground water. Full functional restoration of the trench was completed by the end of 2010. Daily monitoring via remote telemetry system, quarterly monitoring inspections and equipment maintenance recommendations for preventive maintenance are conducted by Smelter personnel. Monitoring parameters and target analyte concentrations for the trench will require on-going pumping. Reporting of the CAP is incorporated into the Smelter Semi-Annual reports.

Basis for Specific Permit Conditions

1. *Corrective Action* - Please see the discussion under Corrective Action Cleanup for an explanation of the rationale for this condition.

2. *Materials Storage Pad Characterization* - Most of the material to be stored on the storage pads has been characterized using the TCLP procedure. Kennecott is required to perform SPLP analysis on qualifying materials not listed in the Permit under section I.H.2 to provide a more realistic assessment of leachate that may occur from these materials. The SPLP procedure uses a leaching procedure that is more akin to natural precipitation.

BEST AVAILABLE TECHNOLOGY AND PERFORMANCE MONITORING

Best Available Technology (BAT) is defined in R317-6-1.3 as "... the application of design, equipment, work practice, operation standard or combination thereof at a facility to effect the maximum reduction of a pollutant achievable by available processes and methods taking into account energy, public health, environmental and economic impacts and other costs." For this Permit BAT is implemented through a discharge minimization approach with a monitoring component to assess impacts to ground water quality from the operation of the Smelter facilities. This approach is coupled with the use of appropriate containment technology for process waters.

A combination of regular ground water quality monitoring from informational monitoring wells positioned throughout the Smelter site current and operational footprint, compliance monitoring wells, and continuously monitored double-lined leak detection systems provide a spatial distribution of changing ground water quality over time. The ground water quality in several portions of the Smelter facility has been impacted by previous decades of Smelter operations. Thus, determination of impacts from present day releases to ground water becomes quite tenuous without the presence of unaffected background ground water quality. However, using long-term analyte concentrations and variations as a statistical indicator of recent background water quality, will enable KUC and DWQ to better assess potential impacts to ground water quality.

Leak Collection and Removal Systems

Leak Collection and Removal Systems used as a Best Available Technology (BAT) control incorporates leak collection and removal for most major facility components and the proper maintenance of these facilities will be the compliance mechanism for this permit. The BAT design used in the cooling tower basins and vehicle wash and maintenance buildings involves use of a geomembrane under-liner beneath concrete basins or sumps with a leak collection and removal system. The leak collection and removal system is continuously monitored for water level. The performance criteria required for these facilities includes maintaining less than one foot of head on the geomembrane liner. If water levels increase to above one foot, an alarm is automatically transmitted to the Smelter Control Room and corrective measures spelled out in the permit must be followed. Appendix B of the permit is the BAT monitoring Plan for these structures. This plan requires a quarterly inspection for each leak collection system to verify that

the water level alarm is functioning properly.

The BAT design for the two process water ponds includes two 60 mil HDPE liners with a leak collection layer between the liners. A 12-inch thick engineered subgrade with a hydraulic conductivity not to exceed 1 x 10^{-5} cm/sec underlies the double HDPE liner system. Each cell of the process ponds has a continuous water level monitor device as described in the previous paragraph. Appendix C of the permit is the Leak Detection and Repair Plan. This appendix describes what actions must be undertaken within specified time frames if a liner repair is needed to achieve performance criteria for the ponds. In addition to the performance criteria of maintaining less than one foot of head on the lower HDPE liner, the process ponds also have performance criteria of no more than four gallons per minute allowable leakage rate entering the leak collection layer.

Unit Process Well Monitoring

There is one site where BAT design cannot feasibly include leak collection and removal. The Slag Cooling and Crushing Area is a large sloped pad with drains to collect water used in cooling slag pots. The pad BAT design includes routing of all water off the pad with no standing water allowed for this area. This site is monitored with monitoring wells NES729 and NES2556 to determine if any localized degradation is occurring. Table 3 includes the background water quality and permit limits for the two monitoring wells that will be used for compliance monitoring in this area.

Best Management Practices Sites

The Acid Plant and the Hydrometallurgical Plant are facilities with concrete floors sloped to contain spillage and drainage into sump areas. Acid proof concrete basins and sumps are used where exposure to acid is a potential. Plant equipment and machinery are constructed above grade on the contained concrete surfaces.

The Anode Casting Wheel process involves a large circular concrete facility where molten copper is poured into molds and then cooled with water. The cooling water is contained in a circular concrete trench beneath the casting wheel. Water collected in the trench is pumped to a cooling tower.

These three sites do not represent much likelihood for discharge of fluids to ground water. Any spillage in the Acid Plant and Hydrometallurgical Plant will be contained in floor sumps and drains that will not be allowed to accumulate and hold fluids for more than a few hours while clean up occurs. Similarly, the Anode Casting Process involves use of water for cooling the copper anodes in the molds. This water is circulated to a cooling tower and then returned for use again. Accordingly, the performance criteria for these sites include use of best management practices (BMP) such as prompt cleanup of any spills and adherence to good housekeeping practices. Appendix A of the permit spells out the best management practices that Kennecott will undertake for these three sites. These sites will be inspected to determine if potential discharges to ground water may be occurring. If these sites prove to be problematic, they may be subject to well monitoring requirements similar to the Slag Cooling Area.

Several other sites are included in the BMP group of sites. These include: materials storage pads, matte storage area & sump, and the vehicle decontamination pad & sump. The storage pads are used for outdoor storage of copper concentrate, matte copper, blister copper, copper reverts & fines and converter slag. Appendix A has been modified to include the BMP specifics for each of these sites. The pads are designed for total containment for any run off that does not exceed the 24 hour 25 year storm. The sumps from the matte storage area and the vehicle decontamination pad will be emptied into the process water system to avoid any leakage from these structures.

Operational Monitoring

Characterization of the water quality of process fluids that will result from the operation of the Smelter has been performed on two occasions during each of the previous permit terms. Kennecott has been required to sample fluids utilized in the Smelter two times during each of these permit terms. However, because of the provenance of the water sampled, this data provides minimal information for regulatory oversight. Therefore, the operational monitoring of the sumps will continue for KUC on an as-needed basis but will not be further required by DWQ. This should offer adequate ongoing characterization of process fluids in case any adjustments in BMPs are needed.

Perimeter Monitoring Wells

The ground water monitoring well network at the northern perimeter of the Smelter provides information on ground water quality, but is not used as the formal compliance mechanism in this permit. The monitoring well data will assess use of overall best management practices at the Smelter to determine if water quality parameters are improving over time with the implementation of BMP for facilities.

PERMIT-BY-RULE

It should be noted that there are several facilities within the Smelter Complex that are "permit by rule" facilities. These are listed in Table 1B of the permit to identify the BAT utilized for these structures. Kennecott is required by the Ground Water Quality Protection Regulations and the Utah Water Quality Act to assure that no discharge of pollutants occurs from any of the permit by rule facilities. An example would be that Kennecott is responsible for conducting proper housekeeping and maintenance of the Smelter such that storm water runoff from the Smelter to the storm water ponds is not significantly contaminated by Smelter operations.

Compliance Schedule Items

1) Within one year of permit issuance KUC will propose for Director review and approval additional informational wells for compliance that specifically monitor ground water quality near potential source contributions distributed throughout the Smelter footprint.

2) Within 180 days of permit issuance KUC shall submit to the Director for review and

approval a map or maps of the facility area including the location of specific facilities, monitoring wells and locations contained in Tables 1A, 1B, 2 and 2A.

3) Within 180 days of permit issuance KUC shall submit to the Director for review and approval a series of contour maps of the site-wide facility area that display selenium, arsenic, and chloride concentrations and groundwater elevations. The contour maps provided will include 2009, 2013, 2018, which coincide with previous permit renewal years so that changes over time can be depicted and as a basis for future groundwater permit renewal packages.