



0015

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

ACT/015/025
File #2

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April 27, 1988

TO: Memo To File
FROM: Tom Munson, Reclamation Hydrologist *TM*
RE: Chronology of Water Sampling Commitments at the Bear Canyon Mine, Co-op Mining Company, ACT/015/025, Folder #2, Emery County, Utah

Chronology of Water Sampling Stipulations and Commitments

Division of Oil, Gas and Mining

<u>DATE</u>	<u>DOCUMENT</u>	<u>STIPULATION</u>
4/15/85	Draft Technical Analysis	Stipulations Under UMC 817.41 and UMC 817.52

Surface Water Stipulations 817.41-(1, 2,) - TM

Prior to permit approval, the applicant must:

- The applicant must commit to sample the complete list of baseline parameters spelled out in the attached Table 2, once in each of the last two quarters in 1985 and each quarter (four times) in 1986 to adequately characterize baseline conditions for Bear Creek. The ongoing monitoring program which Co-op has undertaken (i.e., monthly sampling) should continue concurrently with baseline data acquisition.

Ground Water Stipulations 817.52-(1,2,3,4) - RVS

Prior to permit approval, the applicant must:

- Submit baseline water quality and quantity data for mine inflows and discharges greater than one gpm, all three springs and boreholes that encountered water (see attached Ground water Baseline and Operational Water Quality Parameter List). Moreover, the applicant must commit to acquiring and submitting a total of two years of baseline water quality and quantity data for the above-noted monitoring sites.

Mine inflows and discharges must be monitored quarterly, whereas springs and boreholes must be monitored four times per annum at not less than monthly increments.

2. Provide a mine inflow survey that identifies wet areas on a mine workings map; including roof drips, wall weeps, seeps, sumps and flowing fractures and/or faults.
3. Commit to initiating an operational monitoring program that acquires water quality and quantity data as described in the attached guidelines. The operational monitoring schedule shall include quarterly sampling of mine inflows and discharges and four spring and borehole samples per annum at not less than monthly increments.
4. Commit to providing DOGM with an Annual Hydrologic Monitoring Report that incorporates yearly water quality and quantity data and includes a yearly update of the mine inflow survey.

<u>DATE</u>	<u>DOCUMENT</u>	<u>COMMITMENT</u>
6/20/85	Response to Technical Analysis	Co-op's Commitments to UMC 817.41 and UMC 817.52

UMC 817.41

Co-op's Response:

2. There will be quarterly baseline sampling in addition to current monthly sampling (see Section 7.2.4, page 41, and Table 7.2-6, page 75).

[See attached Appendix for pages 41, 75 and 76 from the PAP]

UMC 817.52

Co-op's Response

Groundwater - Co-op commits to the above stipulations as outlined in Section 7.1.7, pages 20-21.

[See attached Appendix for pages 20 and 21 from the PAP]

Page Three
ACT/015/025
April 27, 1988

General Notes

Based on Co-op's commitments to these stipulations, Co-op was given final permit approval on October 31, 1985. The following items have been noted in regard to Co-op's follow-up of these permit commitments:

Surface Water

1. Co-op has only completed one baseline sample on Bear Creek at either their upper or lower sampling site on July 24, 1986, leaving five baseline samples using the full parameter list in Table 7.2-6, still not done.

Ground Water

1. Co-op has completed two baseline samples on the mine water discharge point, on July 23, 1986 and October 1, 1986, leaving six baseline samples to be completed on this site.
2. In 1984, Co-op submitted limited water data with no map, but Co-op has never submitted an annual hydrologic monitoring report which includes a mine inflow survey showing all wet areas of the mine and the type of inflow (seeps, fractures, etc.). It is worthwhile to note that the PAP shows quality and quantity data from sampling carried out in 1984, prior to permit approval, but was never sampled again. The Division is currently aware of other water producing areas greater than 1 gpm in the mine, that have never been sampled.

jr
Attachment
cc: J. Helfrich
P. Grubaugh-Littig
J. Whitehead
9486R/43:45

7.1.7 GROUND WATER MONITORING PLAN

Monitoring activities will focus on determining water levels, discharge and water quality fluctuations in relevant aquifers or ground water occurrences in the mine area. Data will be collected from mine roof seeps and sumps, future encounters, if any, by drill holes within the mine, observation wells and springs. Procedures to correlate ground water discharge and contamination of Bear Creek will also be used, following procedures by Waddell, et. al., (1983). The objectives of the monitoring plan are to (1) identify potential impacts during and after mining, and (2) provide on-going base line data on aquifer characteristics and ground water occurrences.

The monitoring activities will be timed to determine the approximate seasonal variations with time for the piezometric heads and water volumes encountered and water quality parameters, for the declining and rising limbs of the annual weather cycle. It is proposed that samples will be collected at about February 1, May 1, August 1, and November 1, at all sites. In addition to these monitoring activities, data shall be routinely collected at all new drill holes and other encounters in the mine, where significant in-flows are encountered.

Springs below the mines will be sampled to determine discharge and water quality parameters and their possible variation with time. These springs include Bear Springs, COP Development Springs, and Birch Springs (Plate 3.4-1). Water quality parameters to be measured are listed in Table 7.1-4. However, periodic checks will be made of the mine area to determine any possible impacts not currently expressed at the surface. This information will be used to estimate seasonal fluctuations, aquifer recharge, and consistent long-term changes and to confirm the formations contributing to spring flow.

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The water levels in the mine sumps (Plate 3.4-1) will be recorded quarterly by level measurements and water samples submitted for quality analysis to a qualified laboratory. This information will be used to assess leakage rates and possible contamination. As mining progresses, three observation wells (WM-F, G, and H) will be drilled through the underlying Hiawatha coal seam, at the base of the Blackhawk formation and a minimum of 25 feet into the underlying Star Point sandstone formation. These well locations are identified in Plate 3.4-1. Locations of these wells are approximate and site conditions and mine personnel will determine their exact locations. The purpose of these wells will be for the collection of piezometric surface and water quality data, as encountered. These three wells are located in areas of projected mining activity and will be drilled upon approval of these monitoring sites. These wells are located such as to determine the extent or occurrence of ground water within the depths of impact of the mining activities on the ground water regime. Any ground waters encountered by these wells will be sampled and will be used to correlate with the water quality data from Bear Springs, Birch Springs, and COP Development Spring to provide a check on estimates of ground water contamination. These springs are focused on since their flow is the sole use of ground water to be possibly affected by the mining activities.

The existing and proposed data collection sites selected are expected to provide a representative cross section for hydrologic data across the mine area based on the flow directions projected.

An Annual Hydrologic Monitoring Report will be submitted yearly to DOGM summarizing water quality and quantity data gathered during the monitoring activities outlined above. In addition, the report shall include a yearly update of the mine inflow survey which incorporates a mine workings map identifying all wet areas of the mine and the type of inflow (seep, fractures, etc.).

upstream from where the mine road crosses Bear Creek in the mine plan area. The monitoring location downstream is a Weir W-4. In addition to these a third monitoring location is being added. In the future the right-hand tributary of Bear Creek will be monitored just above its confluence with Bear Creek. (see plate 7-4)

Monitoring of the following parameters will be performed monthly: flow (gpm), ph, temperature (°C), total dissolved solids (mg/l), iron, magnesium potassium, chloride, nitrate sulphate, carbonates, bicarbonates, calcium, magnesium, sodium and total suspended solids (all in mg/l). On a quarterly basis the parameters list in Table 7.2-6 will be measured.

Flows will be determined by direct measurement (depth times width times 2/3 velocity) or, whenever feasible, by timed filling of a unit volume container. Chemical analyses will be performed by a certified laboratory. Reporting format will be as shown in Figure 7.2-3.

7.2.5 SURFACE WATER CONTROL AND DIVERSIONS

The vast majority of the disturbed area of the Bear Canyon Mine is on the west side of Bear Canyon (same side as the mine portal and to the south). The all run-off from this west side disturbed area is collected and channelled to Sedimentation Pond "A". The small amount of run-off from the disturbed area east of Bear Creek is channelled to Sedimentation Pond "B". In order to minimize the amount of water crossing the disturbed area, run-off from the undisturbed area above is diverted around or channelled through the disturbed area and into Bear Creek.

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TABLE 7.2-

SURFACE WATER BASELINE AND OPERATIONAL
WATER QUALITY PARAMETER LIST

Field Measurements:

- * - Water Levels or Flow
- * - pH
- * - Specific Conductivity (umhos/cm)
- * - Temperature (C°)
- * - Dissolved Oxygen (ppm)

Laboratory Measurements: (mg/l)

- * - Total Settleable Solids
- * - Total Suspended Solids
- * - Total Dissolved Solids
- * - Total Hardness (as CaCO₃)
- Aluminum (Al)
- Arsenic (As)
- Barium (Ba)
- Boron (B)
- * - Carbonate (CO₃⁻²)
- * - Bicarbonate (HCO₃⁻)
- Cadmium (Cd)
- * - Calcium (Ca)
- * - Chloride (Cl⁻)
- Chromium (Cr)
- Copper (Cu)
- Fluoride (F⁻)
- * - Dissolved Iron (Fe)
- Lead (Pb)
- * - Magnesium (Mg)
- * - Manganese (Mn)
- Mercury (Hg)
- Molybdenum (Mo)
- Nickel (Ni)
- Nitrogen: Ammonia (NH₃)
- Nitrate (NO₃⁻)
- Nitrate (NO₂)
- * - Potassium (K)
- Phosphate (PO₄⁻³)
- Selenium (Se)
- * - Sodium (Na)
- * - Sulfate (SO₄⁻²)
- Sulfide (S⁻)
- Zinc (Zn)
- * - Oil and Grease
- * - Cation-Anion Balance

-Baseline
*Operational

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Surface Water Sampling

TABLE 7.2-
(cont'd)

	Baseline	Operational	Postmining
Type of Sampling Site	Surface Water Bodies	Surface Water Bodies	Surface Water Bodies
Field Measurements (See Table 1)	Performed during water level/flow measurements	Performed during water level/flow measurements	Performed during water level/flow measurements
Sample Frequency	Quarterly for lakes, reservoirs and impoundments (water level and quality); monthly flow measurements and quarterly water quality measurements (one sample at low flow and high flow each) for perennial streams. Monthly flow and water quality measurements during period of flow for intermittent streams. Sampling for ephemeral streams determined at pre-design conference.	Quarterly for lakes, reservoirs and impoundments (water level and quality); monthly flow measurements and quarterly water quality measurements (one sample at low flow and high flow each) for perennial streams. Monthly flow and water quality measurements during period of flow for intermittent streams. Sampling for ephemeral streams determined at pre-design conference.	Two per annum for perennial streams (high & low flow); two per annum during snowmelt and rainfall for intermittent streams.
Sampling Duration	<u>Two</u> years (one complete year of data before submission of PAP.	<u>Yearly</u> until two years after surface reclamation activities have ceased.	Until termination of bonding.
Type of Data Collected and Reported	Flow and/or water levels and water quality.	Flow and/or water levels and water quality.	Flow and/or water levels and water quality per operational parameters.
Comments	All field measurements should be performed concurrently with water level/flow measurements.	All field measurements should be performed concurrently with water level/flow measurements.	All field measurements should be performed concurrently with water level/flow measurements

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TABLE 7.2-
(cont'd)

Baseline	Operational	Postmining
Comments	For every fifth year preceding repermitting, one sample at low flow and high flow each should be taken for baseline water quality parameters.	