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H: TANK TOM

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TO: Darron Haddock, Permit Supervisor

FROM: Thomas Munson, Senior Reclamation Hydrologist TM

RE: Technical Analysis and Findings for the Tank Seam, Bear Canyon Mine, Co-Op Mining Company, ACT/015/025, working file, Emery County, Utah

Synopsis

The operator submitted on May 23, 1994 a mining and reclamation plan for the Tank Seam. The following technical analysis and findings relates to the construction and reclamation of the Tank Seam. It needs to be noted that four submittals have been received since July of 1993. Three complete copies of the plan were put together on June 23,1994 incorporating all the submittals into one document to be reviewed and referenced. An update to the plan was received on July 11,1994 regarding reclamation and erosion control.

Baseline Data

Regulatory Basis: R645-301-729. Cumulative Hydrologic Impact Assessment

Revised Hydrologic Evaluation of the Bear Canyon Mine

In the review of additional information to put together the 'Revised Hydrologic Evaluation of the Bear Canyon Mine' the following items were considered : 1) the updated PHC (Probable Hydrologic Consequences) data submitted by Co-Op Mining Company and 2) the informal hearing transcripts taken from the September 9,1993 informal hearing.

Ground Water

Within the vicinity of the Bear Canyon Mine, two major springs have been identified: Big Bear Springs and Birch Springs. Big Bear Springs (maintained by the Castle Valley Special Services District) discharges from three prominent joints. Birch Springs (maintained by the North Emery Water Users) discharges from the normal fault which has approximately 20 feet of vertical displacement. Both springs discharge from the lowest sandstone unit of the Star Point Sandstone (Panther Tongue), where the Mancos Shale acts as a barrier to the downward movement of groundwater. As a result of the Order issued by the Division of Oil, Gas, and Mining, Co-Op Mining Company initiated a drilling program to better define the ground water flow path associated with the Blackhawk-Starpoint aquifer in the area of the mine.

Although a regional aquifer (termed the Star Point - Blackhawk Aquifer by Danielson, et al., 1981) has been designated for the area, in-mine drilling and aquifer testing conducted for this study area indicate that three aquifers within the Star-Point Sandstone have individual static water levels. Further, in the southernmost hole (DH-3) shown on Plate 2, PAP, none of the three aquifers are fully saturated. This fact indicates that each of the units have a separate and distinct water levels. The springs issue from the bottom of the Panther Tongue (417 - 433 feet below the Blackhawk formation contact with the Star Point Sandstone), therefore, Birch Springs and Big Bear Springs are hydrologically isolated from the impacts of mining in the Blackhawk Formation by the presence of two Mancos Tongues in the Star Point Sandstone.

Areas of encountered groundwater within the mine are fractures which drain over a period of several months as the Mine advances northward. This indicates a high degree of hydraulic interconnection through fractures in the portion of the Blackhawk Formation which overlies the mine. Inflows in the north end of the North Main and Second East entries are through roof bolt holes and hairline fractures which are presumed to drain overlying perched aquifers in the Blackhawk Formation. The current rate of discharge from the mine is approximately 300 GPM.

Big Bear Springs and Birch Springs in the vicinity of the Bear Canyon Mine issue from joints at the contact between the Panther Tongue and the Mancos Shale. The majority of water inflows in the mine are through bolt holes and fractures draining perched aquifers in the Blackhawk and an indeterminate amount of interception of water from the floor in the area of the Second East entries. The review of water source information, the graphical tracking of precipitation versus flow, the testing of the spring water and mine water quality for Tritium dating, analysis of water quality chemical data using Stiff and Piper

diagrams, and the known presence of three separate piezometric surfaces based on drilling in the Spring Canyon, Storrs, and Panther Tongues of the Star Point Sandstone leads to a conclusion of no significant material damage to the Hydrologic Balance outside the permit area.

Future Mining in the Tank Seam above the Bear Canyon Seam

The Co-Op Mining Company has drilled 8 exploratory drill holes into the Tank Seam (page 2-13, Appendix 7 - J, PAP). All were dry except one which flows at .5 GPM (drilled up from the mine workings in the Blind Canyon Seam). The inflows into the Tank Seam are expected to be much less than those encountered in the Blind Canyon Seam. Stratigraphically, the Tank Seam is 250 feet above the Blind Canyon Seam and therefore, would tend to be drier and not expected to have the ground water inflows found in lower coal seams (i.e the Blind Canyon and the Hiawatha Seams). There has been no continuous water quality problems associated with mine water discharge at the Bear Canyon Mine and therefore it is not expected to change in the future, although it will be closely watched for any long term trends.

Surface Water

The permittee has submitted information in their PHC which documents the quality and quantity of surface water routinely collected in the permit and adjacent areas from stations located on Bear Creek and Trail Creek. Analytical data from these sources are summarized in Chapter 7 of the PAP and the Annual reports. Locations of these monitoring points are presented on Plate 7-4 of the PAP. The following potential impacts are discussed in the PHC on pages 3-10 thru 4-3:

- Contamination from acid- or toxic-forming materials;
- Increased sediment yield from disturbed areas;
- Flooding or stream flow alteration;
- Impacts to the chemical quality of surface water; and
- Impacts to surface water quantity.

The permittee has provided a summary of the potential impacts based on the Potential Magnitude of Impact and the Probability of Occurrence. The two potential impacts to surface water quality with moderate or high probability of occurrence are in order, road salting and mine discharge. Both potential impacts are being monitored, by monitoring treatments inplace (i.e. sediment ponds). Any mitigation of road salting within the permit area will be based on UPDES permit requirements. The monitoring of

discharge and underground occurrence are in place to determine if mitigation measures are needed.

The permittee has provided an adequate erosion and sediment control plan for reclamation of the Tank Seam and therefore a Cumulative Hydrologic Impact Assessment can be completed.

Finding

The permittee has met the requirements of the rules regarding the collection of Baseline ground and surface water data. The permittee has also provided an accurate assessment of the potential impacts from mining the Tank Seam. The permittee has met the requirements of the rules regarding erosion and sediment control for reclamation.

Erosion and Sediment Control

Regulatory Basis - R645-301-741 through 742.126 and 742.240 Sediment Control Measures

Operation Plan

The permittee is proposing to build a road and pad area isolated from the normal sediment control facilities at the main facilities area in steep canyon which is considered a space limited environment. Therefore, the operator has decided to treat all disturbed areas using alternative sediment control (i.e. silt fence and erosion control matting). The permittee meets the regulatory requirements of R645-301-741 through 742.126 and 742.240. The construction procedures for installation of sediment controls are described on pages 3H-2, 3H-3, Figure 3H-2, and 3H-6, 3H-9, and 3H-10. Each BTCA area is described in appendix 7-K. Approximate silt fence locations are shown on Plates 7-1C and 7-1E. As-built drawings will be submitted following construction(page 3H-10). A berm will be constructed on the downhill side of the road cut. A drawing of the berm configuration is shown on figure 3H-1 and 3H-2. When the berm is in place, the road cuts will be started using a front end loader and/or backhoe. The road cuts will be made into the slope towards the cut face rather than parallel to the slope to allow any sloughage to be contained within the berm.
Culverts will be installed on the fill slope as construction progresses upslope. Culvert outlets will be protected as described in Section 7.2.7.3. Table 7.2-11, Culvert Characteristics describes the size of culverts and the outlet conditions.

Reclamation

The permittee commits to erosion control matting on slopes greater than 2:1 in section 3.6.4 of the Bear Canyon plan and page 3-111 of the Tank seam submittal. The permit does have a comprehensive maintenance plan for erosion. The permittee has included a plan found on pages 3-81 and7K-15 of PAP for monitoring sediment contributions and maintaining erosion following reclamation of the site.

Findings

The permittee has met the requirements of the sediment and erosion control rules. The plan minimizes erosion to the extent possible and prevents additional contributions of sediment to streamflow.

Surface Water Diversions

Regulatory Basis - R645-301-742-300. Diversions

Operation Plan

A summary of surface water diversions calculations can be found in Table 7.2-10. A table describing ditch characteristics for disturbed area ditches is found on pages 7G-46 and 47. Table 7.2-11, Culvert Characteristics, summarizes the outlet conditions for each constructed culvert. Page 7G-24A and B gives the culvert size, type, contributing watersheds, Peak Q(cfs), slope(ft/ft), and outlet condition.

The permittee has used the SCS curve number methodology to generate peak flows. These flows are used to assess the adequacy of the culverts. The curve numbers were chosen, peak flows generated based on watershed characteristics, and the Flowmaster computer program used to size or determine the adequacy of the culverts and road side ditches to pass the necessary flows from the 10 year-6 hour design storm.

Reclamation

The reclaimed Tank Seam access road channel designs are discussed on pages 7H-52 through 7H-77. The peak flows for all the six reclaimed channels are found on pages 7H-65 showing maximum velocity and maximum flow depth.

With review of this background information, it appears that stable reclamation is the single most important issue concerning

diversions. Due to the steep maximum slopes (beyond the angle of repose), the drainages can not be reclaimed in a stable manner with riprap. Therefore, the drainages must be reclaimed back to stable natural drainage characteristics using the current drainages as a guide. None of the existing boulders or natural riprap will be removed, only the fill placed in the drainage. The permittee has provided the documentation of the current drainages in the form of photos, average bottom widths, average depths, and average slopes. Characteristic rock sizes are also given for each channel. Profiles of the pre-mining, and subsequently the proposed post-mining channels are shown on Plate 7-8C. This information will allow for accurate reclamation of the disturbed portions of the channels by mimicking the premining conditions.

The permittee will be required to prevent additional contributions of sediment to streamflow outside the permit area. It is recommended that the permittee monitor overland flows from undisturbed and disturbed reclaimed areas to gain some understanding of what the expected sediment concentrations are in terms of settleable solids, suspended solids, and particle size distributions. The Division currently has a program where overland flow samplers can be gotten from the Division and used to collect these type of analysis. In the plan the operator has mentioned the use of erosion control matting and other methods to control erosion.

Finding

The permittee has met the requirements of the rules by providing an adequate plan, discussing the reclamation of the channels which provides for natural restoration of the channels back to premining conditions characteristic of the natural watersheds prior to mining.