

## TECHNICAL ANALYSIS

Tank Seam Road  
Co-Op Mining Company  
Bear Canyon Mine  
ACT/015/025

July 20, 1994

### BIOLOGICAL ANALYSIS

#### **R645-301-321. Vegetation Information.**

Plate 9-1, Vegetation Map, is included in the submittal for the proposed Tank Seam Road and Portal Pad. The new vegetation map has been updated to include the Tank Seam reference area. The existing vegetation in the area of the proposed disturbance is included on the map.

An inspection of the proposed road was made by Forest Botanist Robert Thompson on November 4, 1993, for threatened, endangered and sensitive plant species (page 9B-5). He stated that the area was clear of any species of concern.

#### **R645-301-322. Fish and Wildlife Resource Information.**

No additional fish and wildlife resource information specific to the Tank Seam road and portal pad was provided in this amendment. The resource information included in the permit is general enough to cover this area which is close to the other disturbed areas. The raptor survey included the proposed area of disturbance. The entire area is classified as critical deer and elk winter range.

A letter dated December 23, 1992 from DWR (page 10D-18) recommended the current proposed road route over other alternative routes because of less impact. The letter states that the known golden eagles nest within one-half mile of the road are not located in direct line of site. However, the lower cliff areas are potential Townsend Big-eared bat habitat. A survey of the area for this species must be complete prior to construction of the road and pad as required by R645-301-322.100.

#### **R645-301-410. Land Use.**

No amendment to the plan has been made for this section. The stated premining land use for the area is wildlife and grazing. R645-301-411.110 requires the amendment to state the current land use for the area which in this case would be only wildlife. Due to the steepness of the site, livestock grazing would be prohibitive.

The current productivity of the area to be disturbed has not been described as required by R645-301-411.100. The Division will accept a letter from the SCS which states the estimated current and potential productivity of the reference area to fulfill this requirement.

enhancement methods as described in the approved plan.

### Stipulations

1. Adjacent to the proposed area of disturbance is potential Townsend Big-eared bat habitat. As required by R645-301-322.100, information must be included in the plan which demonstrates that the proposed disturbance will not impact the bats.
2. The plan states that the land use is grazing and wildlife which is incorrect for the road and pad area. The Operator must state the current land use for the proposed Tank Seam road and pad as required by R645-301-411.110.
3. The Operator must describe the current productivity of the area to be disturbed as required by R645-301-411.100.
4. The Operator must commit to interim stabilization of the cut slopes through prompt establishment of vegetation as required by R645-301-331.
5. The plan fails to state the rate and type of mulch to be used in final reclamation as required by R645-301-341.230. The Operator must provide the rate and type of mulch to be used.

### ENGINEERING ANALYSIS

#### CERTIFICATION

Regulatory Reference: R645-301-512

**Analysis:** The maps which have been revised for the Tank Seam proposal are 2-4C--Surface Facilities, 2-4E--Surface Facilities, 3-1--Cross Sections, 3-2C--Post-Mining Topography, 3-2E--Post-Mining Topography, 3-4C--Bear Canyon No. 2 Mine, 3-5C--Road Details, 6-9--Interburden Isopach Map Bear Canyon Tank Seam, 6-10--Overburden Map Tank Seam, 6-11--Isopach Map Tank Seam, 6-12--Structure Contour Map Tank Seam, 7-1C--Hydrology Map, 7-1E--Hydrology Map, 7-4--Water Monitoring, 7-5--Watershed Map, 7-7--Post-Mining Watershed, 7-8C--Post-Mining Drainage Profiles, 8-1--Soils Map, 8-5C--Reclamation Area, 8-5D--Reclamation Area, 8-5E--Reclamation Area, 8-6--Proposed Tank Seam Road Topsoil Stockpile, and 9-1--Vegetation Map.

Of the maps listed above, only 2-4C, 2-4E, 3-1, 3-2C, 3-2E, 3-4C, 3-5C, 6-9, 6-10, 6-11, 6-12, 7-1C, 7-1E, 7-4, 7-5, 7-7, and 7-8C require certification by a professional engineer or land surveyor. All, however, have been certified by a qualified, registered,

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## **REPORTING AND EMERGENCY PROCEDURES**

Regulatory Reference: R645-301-515

**Analysis:** The reporting and emergency procedures in the approved plan apply, without change, to the Tank Seam.

**Findings:** The reporting and emergency procedures in the approved plan continue to apply, unchanged by the addition of the Tank Seam.

## **PREVENTION OF SLIDES IN SURFACE COAL MINING AND RECLAMATION ACTIVITIES**

Regulatory Reference: R645-301-516

**Analysis:** There are no surface coal mining and reclamation activities at this site.

**Findings:** This section is not applicable to the proposal.

## **OPERATION PLAN**

Regulatory Reference: R645-301-520

## **GENERAL**

Regulatory Reference: R645-301-521

**Analysis:** The maps which have been revised for the Tank Seam proposal are 2-4C--Surface Facilities, 2-4E--Surface Facilities, 3-1--Cross Sections, 3-2C--Post-Mining Topography, 3-2E--Post-Mining Topography, 3-4C--Bear Canyon No. 2 Mine, 3-5C--Road Details, 6-9--Interburden Isopach Map Bear Canyon Tank Seam, 6-10--Overburden Map Tank Seam, 6-11--Isopach Map Tank Seam, 6-12--Structure Contour Map Tank Seam, 7-1C--Hydrology Map, 7-1E--Hydrology Map, 7-4--Water Monitoring, 7-5--Watershed Map, 7-7--Post-Mining Watershed, 7-8C--Post-Mining Drainage Profiles, 8-1--Soils Map, 8-5C--Reclamation Area, 8-5D--Reclamation Area, 8-5E--Reclamation Area, 8-6--Proposed Tank Seam Road Topsoil Stockpile, and 9-1--Vegetation Map.

521.110 Previously Mined Areas--The Tank Seam lies entirely within the approved permit area. Therefore, the approved maps which show the location and extent of active, inactive, or abandoned underground mines or mine openings have not been and do not need

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521.240 Mine and Permit Identification Signs--The Tank Seam lies entirely within the approved permit area. The sole access to the area is by way of the approved access road and gate. Therefore, the mine and permit identification signs remain unchanged.

521.250 Perimeter Markers--Perimeter markers will delineate the Tank Seam area in accordance with the approved plan. Perimeter marker specifications remain unchanged.

521.260 Buffer Zone Markers--There are no buffer zones in the Tank Seam area.

521.270 Topsoil Markers--Topsoil from the Tank Seam area will be stored in two (2) stockpiles: one on the present Upper Storage Pad and one at the first switchback of the Tank Seam Access Road. Both stockpiles will be marked by lengths of painted rebar as specified in the approved plan.

**Location in Plan:** Plates 2-4C, 2-4E, 3-1, 3-2C, 3-2E, 3-4C, 3-5C, 6-9, 6-10, 6-11, 6-12, 7-1C, 7-1E, 7-4, 7-5, 7-7, 7-8C, 8-1, 8-5C, 8-5D, 8-5E, 8-6 and 9-1.

**Findings:** The proposal fulfills the requirements of this section.

## COAL RECOVERY

Regulatory Reference: R645-301-522

**Analysis:** The Tank Seam will add approximately 6 million tons to the present estimated in-place coal reserves. Mining will continue to be by room-and-pillar methods with pillar extraction, which methods yield, industry wide, an average recovery rate of 50 percent. The permittee expects to be able to recover approximately 60 percent of the in-place reserves, which has been the approximate recovery rate in the past at this site.

**Location in Plan:** Pages 3-20, 3-27 and 3-28.

**Findings:** The proposal fulfills the requirements of this section.

## MINING METHOD(S)

Regulatory Reference: R645-301-523

**Analysis:** Mining will continue to be by room-and-pillar methods with pillar extraction, and pillar extraction will be done in the Tank Seam before being done in the lower seams. Coal will be taken from the Tank Seam operation by belt, transferred to the Blind Canyon Seam through a vertical drop shaft, and transported thence to the loadout facility by way of

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524.700 Records of Blasting Operations--A record of each blast will be kept at the site and made available, on request, to the Division and the public. The record will include the following:

- 1) The name of the operator conducting the blast.
- 2) The location, date, and time of the blast.
- 3) The name, signature, and certification number of the blaster supervising the blast.
- 4) The identification, direction, and distance of the nearest building outside the permit area.
- 5) Weather conditions.
- 6) A record of the blast specifications.

**Location in Plan:** Pages 3-30 and 3-34. Appendix 3-M.

**Findings:** The proposal fulfills the requirements of this section.

## **SUBSIDENCE**

Regulatory Reference: R645-301-525

**Analysis:** Since the Tank Seam lies entirely within the approved permit area and directly above the existing Bear Canyon No. 1 Mine, the approved plan for monitoring, control and mitigation of subsidence has not been and does not need to be revised.

**Findings:** The approved plan for monitoring, control and mitigation of subsidence continues to apply, unchanged by the addition of the Tank Seam.

## **MINE FACILITIES**

Regulatory Reference: R645-301-526

**Analysis:** Two new facilities have been added to the mine facilities description: the Tank Seam fan and the Tank Seam Borehole Structure.

The Tank Seam Fan will be located on the Tank Seam Portal Pad. This fan is MSHA approved and has the necessary safety guards in place.

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over the Tank Seam Access Road.

A conveyor will take coal from the Tank Seam Belt Portal to a drop shaft, by way of which the coal will be transferred to the Bear Canyon No. 1 Mine. From the Bear Canyon No. 1 Mine, the coal will be transported to the existing coal loadout facility by the existing conveyor system. No coal washing or processing of any kind takes place at this site.

Noncoal mine waste will continue to be handled and disposed of according to the approved plan.

**Location in Plan:** Page 3-4. Appendix 3A. Plates 2-4E, 3-1, and 7-1E.

**Findings:** The proposal fulfills the requirements of this section.

## MANAGEMENT OF MINE OPENINGS

Regulatory Reference: R645-301-529

**Analysis:** Three new portals and a shaft will be added to the existing mine openings to accommodate the Tank Seam: the Tank Seam Fan Portal, the Tank Seam Belt Portal, the Tank Seam Access Portal and the Tank Seam Borehole Structure. The 3 Tank Seam portals will be built, maintained, closed and maintained in accordance with the approved plan.

The Tank Seam Borehole Structure is a vertical shaft which will transfer coal from the Tank Seam conveyor to the Bear Canyon No. 1 Mine, whence the coal will be transported to the coal stockpile by the existing conveyor system. Water for the Tank Seam operation will also be supplied through this shaft. The shaft will be 8 feet in diameter and will be lined with a 4-foot-diameter steel tube. Vibrators will be installed on the outside of the tube to dislodge coal which may jam in it and obstruct it. The shaft opening will be completely enclosed by a protective structure.

Cuttings from the boring of the Tank Seam Borehole Structure will be stored underground in the Bear Canyon No. 1 Mine. During final reclamation, these cuttings will be used to completely backfill the shaft from bottom to collar.

**Location in Plan:** Pages 3-2, 3-4, 3-108 and 3A-7.

**Findings:** The proposal fulfills the requirements of this section.

## OPERATIONAL DESIGN CRITERIA AND PLANS

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The operational road design was analyzed for stability by the consulting firm of Dames & Moore. The results of this analysis are contained in a May 6, 1994 report which has been included in the plan as part of Appendix 3H.

Dames & Moore first determined the material properties of the native material using a sieve analysis and a direct shear/normal stress test. The sieve analysis indicated that the material is, by the Unified Soil Classification System, a fine-grained soil. The direct shear/normal stress test indicated that the material has a cohesion of approximately 180 psf and displays a friction angle of approximately 32°.

Using these material property values, Dames & Moore then performed separate stability analyses of both the cut slope and the fill slope. Both were analyzed using a standard, two-dimensional, circular failure computer program. The cut slope was modelled at 1H:2V (63°), under dry conditions, with a conservative estimate of 6 feet of surface material over bedrock. The fill slope was modelled at 1H:1V (45°), also under dry conditions, and also with an estimated 6 feet of material over bedrock. In addition, the fill slope was modelled using the worst-case assumption of the road being built entirely on fill, which does not occur anywhere in the design. Dry conditions were assumed because of the relatively high proportion of silt- and clay-size material (37%) and the resultant low permeability of the native material.

Dames & Moore found that both the cut slope and the fill slope display a minimum safety factor of 1.4, which is higher than the value of 1.3 required by this section.

Using the data provided by Dames & Moore, the Division performed its own computer analysis of the stability of the operational road slopes. This analysis indicated the presence of a potential circular failure surface, with a safety factor of less than the required 1.3, which extends from the top of the fill into the native material and again emerges near the toe of the fill. Dames & Moore explained, both in telephone conversations with this writer and in a July 12, 1994 letter to the Division, that this failure surface, though indicated as a possibility by the Division's analysis, is very improbable for two reasons. First, even though the model, for simplicity, assumes a depth to a planar bedrock surface of 6 feet, in reality the surface material ranges from 0 to 3 feet in thickness and the bedrock surface is stepped and rough and often even exposed at the surface. This means that any failure through the native material would cut through bedrock—a very unlikely occurrence. Second, Dames & Moore's experience indicates that, in situations like that of the Tank Seam Access Road where fill is placed and compacted atop native material, any failures which occur almost always occur in the fill or along the boundary between the fill and the native material and rarely extend into the native material. This writer's experience also indicates that this is the case.

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**Analysis:** The permittee proposes no alternative specifications and claims no settled and revegetated fills at this site, but intends to use all available material in final reclamation.

**Findings:** This section is not applicable to the proposal.

## RECLAMATION PLAN

Regulatory Reference: R645-301-540

## GENERAL

Regulatory Reference: R645-301-541

## NARRATIVES, MAPS, AND PLANS

Regulatory Reference: R645-301-542

### Analysis:

542.100 Reclamation Timetable--Page 3-83 contains a reclamation timetable for the entire Bear Canyon site. Reclamation of the Tank Seam will add approximately 4 weeks to the overall reclamation schedule, which will take approximately 20 weeks.

542.200 Backfilling, Soil Stabilization, Compacting, and Grading Plan--Pages 3-2, 3-4, 3-108, 3-109, 3-110, 3-111 and 3A-7, Appendix 3H, and Plates 3-1, 3-2C, 3-2E, 7-7 and 7-8C comprise the plan for backfilling, soil stabilization, compacting and grading.

542.300 Final Surface Configuration Maps and Cross Sections--Pages 3H-13 through 3H-43 show cross sections of the original surface configuration to which the area will be reclaimed. Plates 3-1, 3-2C, 3-2E, 7-7 and 7-8C also depict the final configuration.

542.600 Road Reclamation--See R645-301-534 above.

542.700 Final Abandonment of Mine Openings--See R645-301-551 below.

542.720 Disposal of Excess Spoil--There is no excess spoil at this site. All available material will be used in final reclamation.

542.730 Disposal of Coal Mine Waste--No coal mine waste is to be disposed of at

# SB-SLOPE

Simplified Bishop Slope Stability Analysis

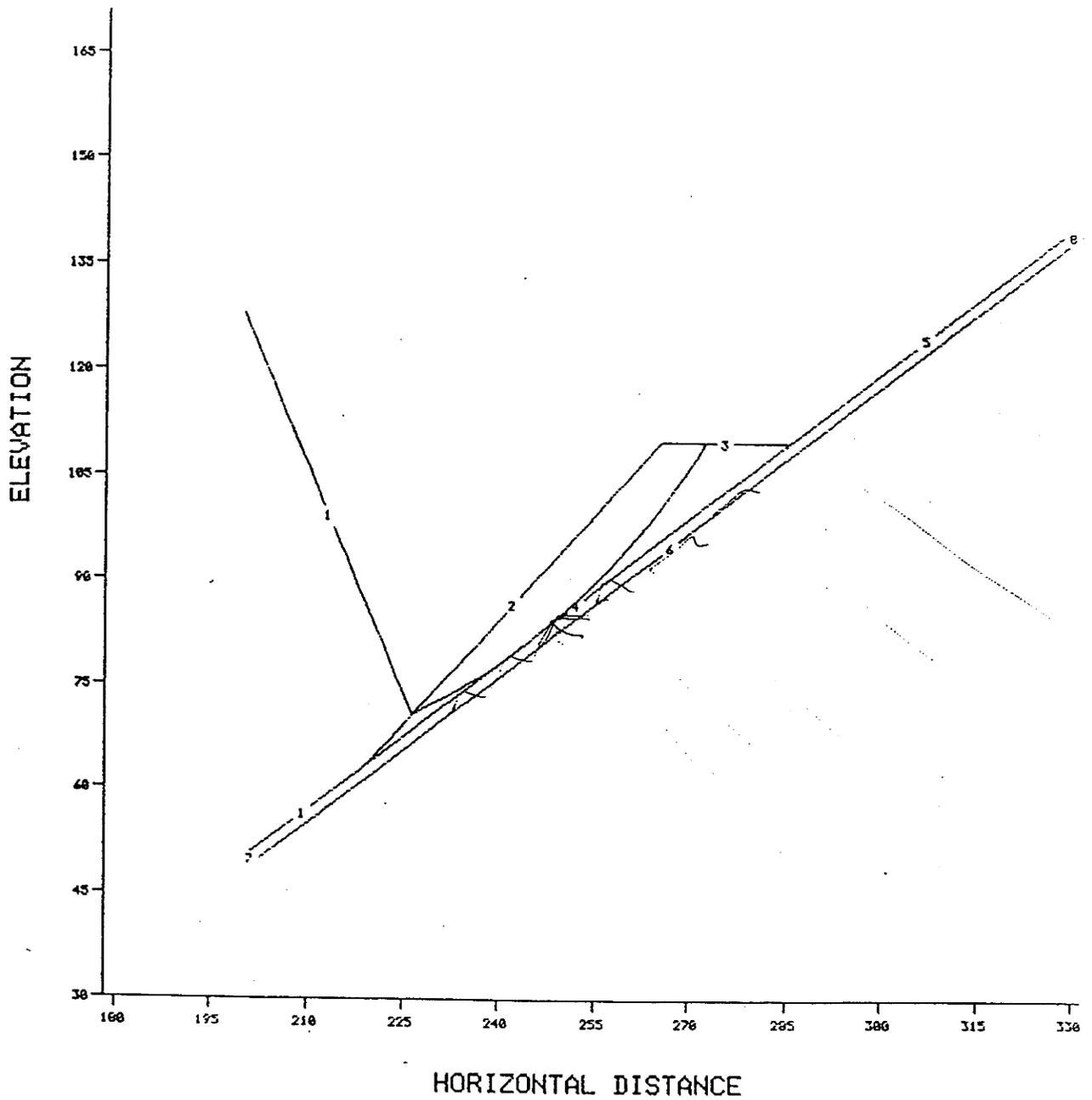
PROJECT: TANK SEAM ROAD

LOCATION: COOP

FILE: TANK5

COMPLETE SLOPE CROSS SECTION

| CIRCLE | X     | Y     | RADIUS | FS   |
|--------|-------|-------|--------|------|
| 1      | 179.0 | 173.5 | 113.2  | 1.31 |



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

**Findings:** The proposal fulfills the requirements of this section.

## **PERMANENT FEATURES**

Regulatory Reference: R645-301-552

**Analysis:** The permittee plans to leave no permanent features at this site.

**Findings:** This section is not applicable to the proposal.

## **BACKFILLING AND GRADING**

Regulatory Reference: R645-301-553

**Analysis:** Reclamation of the Tank Seam area will involve sealing and backfilling of the portals, backfilling of the shaft, and restoration of the access road and pad to the original surface configuration. No highwalls, spoil piles, depressions or refuse piles will be left.

The road and pad will be backfilled starting at the pad. A backhoe will reach over the edge to retrieve displaced material and place that material on the surface. The material will be compacted by the backhoe in 18-inch lifts. Topsoil will be placed on the surface of the fill as it is constructed and then scarified with the bucket of the backhoe.

The reclaimed road design was analyzed for stability by the consulting firm of Dames & Moore. The results of this analysis are contained in a May 10, 1994 report which has been included in the plan as part of Appendix 3F. This analysis made use of the material properties determined for the operational analysis, which is included in Appendix 3H.

Dames & Moore determined the material properties of the native material using a sieve analysis and a direct shear/normal stress test. The sieve analysis indicated that the material is, by the Unified Soil Classification System, a fine-grained soil. The direct shear/normal stress test indicated that the material has a cohesion of approximately 180 psf and displays a friction angle of approximately 32°.

Using these material property values, Dames & Moore performed separate stability analyses of both the cut slope and the fill slope. Both were analyzed using a standard, two-dimensional, circular failure computer program. Both were modelled at 1H:2V (63°), under dry conditions, with a conservative estimate of 6 feet of surface material over bedrock. Dry conditions were assumed because of the relatively high proportion of silt- and clay-size material (37%) and the resultant low permeability of the native material.

Dames & Moore found that the cut slope displays a minimum safety factor of 1.8 and that the fill slope displays a minimum safety factor of 1.4, both of which are higher than the value of 1.3 required by this section.

Using the data provided by Dames & Moore, the Division performed its own computer analysis of the stability of the reclaimed road slopes. This analysis indicated that the reclaimed slope designs indeed display the required safety factor.

There was concern on the part of some at the Division because Dames & Moore, after discussion with the permittee, amended the May 10, 1994 report, by changing some of its original construction recommendations. The May 10 report recommended that the fill be compacted in 8-inch lifts and that material larger than cobble be removed from the base of the fill. The amended report recommended that the fill be compacted in 18-inch lifts and that material larger than 18 inches be removed from the fill and placed at the fill surface. Dames & Moore explained, in a telephone conversation with this writer and in the July 12 letter to the Division, that the recommendation of 8-inch lifts was changed because it is a standard for foundation preparation and would thus be excessive in this case. Dames & Moore further explained that the important thing is that void spaces be properly eliminated from the fill to avoid excessive settling, but that the presence of large rocks can only enhance the stability of the fill since they increase its shear strength. Again, this writer's experience corresponds with that of Dames & Moore. This writer believes that the changes in the recommendations were proper and in line with good engineering judgement.

**Location in Plan:** Pages 3-4, 3-6, 3-108, 3-109, 3-110, 3-111 and 3D-7. Appendices 3A, and 3H. Plates 3-1, 3-2C, 3-2E, 7-7 and 7-8C.

**Findings:** The proposal fulfills the requirements of this section.

### **STABILITY SYNOPSIS**

**Cut Slopes:** The Division evaluated the cut slopes, in the Dames and Moore report, on the Tank Seam access road. The Dames and Moore report examined two cut slopes for reclaimability and one for stability. Dames and Moore reported that all the cut slopes would meet the minimum static safety factor of 1.3.

The Division evaluated the cut slopes using SB-STABLE. In the Division's initial study the soil, rock properties, and slope profiles were the same as those used by Dames and Moore. The Division's analysis also showed that the cut slopes would have a minimum static safety factor exceeding 1.3 during construction and reclamation.

**Fill Slope:** The Dames and Moore report examined fill slope profile for stability.

The fill slope profile is shown in Plate 3. The natural slope in Plate 3 has an angle of 35 degrees while the fill is 45 degrees. The natural slope is shown to consist of soil.

**An assumption used in the Dames and Moore report was that the critical failure surface would be at the contact between the fill and the natural soil. No other failure surfaces, for the fill slope, were examined in the Dames and Moore report. Dames and Moore found the safety factor to be 1.44.**

The Division determined the safety factor, along the contact between the fill and natural slope, to be 1.4. The Division then examined other failure surfaces that were not explored by Dames and Moore. Several failure surfaces were found that did not meet the minimum safety factor. Some of them had a safety factor lower than 1.1. Those slip surfaces would begin at the outer edge of the road, go through the fill into the natural soil, and exit below the fill's toe.

The text describes the slopes as consisting of bedrock covered with soil. The plate used to describe the cut slope showed the bed rock covered with 6 feet of soil. The Division modified the slope stability model, so the natural slope consisted of bedrock covered with 6 feet of soil. The rock properties used in the cut slope analysis were used in the model.

SB-STABLE found some failure surfaces that went from the fill into the natural soil, into the bedrock, and the back into the natural soil and fill. That type of failure seemed unlikely to the Division. To prevent such failure from occurring in the model the Division increased the rock's strength parameters in the model. Failure surfaces with safety factor of 1.1 were found using the modified profile.

The Division informed Co-Op Mining of the results and they passed the analysis on to Dames and Moore. In a draft letter to Co-Op, Dames and Moore stated the slope's profile in the initial study had been overly simplified. Instead of a smooth slope with a uniform soil cover the natural slope consisted of bedrock "steps". The bedrock is exposed in some areas of the slope and covered with 2 to 3 feet of soil in others. Dames and Moore felt that if bedrock steps were added to the model, then the natural slope would not fail.

The Division then modified its model by assigning rock properties to all areas of the natural slope. Safety factors of 1.31 were discovered for some failure surfaces.

Until then all models had been run using dry soil parameters. It was assumed that since the bedrock was close to the surface any pore pressure would be minor. When saturated conditions were used (still no pore pressure) the lowest static safety factor was 1.29.

The Division then ran the model, assuming dry conditions and 2 feet of soil covering the bedrock. The lowest safety factor was 1.2. The contact between the fill and natural slope is

90 feet. The critical failure surface extended 40 feet into the natural soil. **Dames and Moore did not state what the maximum spacing of the steps was. If a 40-foot width between steps does occur near the toe then the slope will have not met the minimum safety requirements.** When saturated conditions were assumed with 2 feet of soil cover, the safety factor dropped to 1.15.

The Division contacted UDOT for their opinion on placing fill, that will have a 45 degree slope, on a 35-degree slope. They said that they would not recommend placing any fill on a 35-degree slope.

### STABILITY

**Cut Slopes and Reclamation:** Using the information supplied by Dames and Moore the Division performed a slope stability analysis. The Division's results agreed with the Dames and Moore study that showed the cut-slopes to be stable and reclaimable.

**Fill Slope:** The Division did not agree with the initial Dames and Moore study regarding the fill-slope. Even after the Division added a strong bedrock layer 6 feet under the natural soil the safety factor continued to be 1.1.

When Dames and Moore learned of the low safety factor they revised their assumptions about the slope's profile. They claimed that if the slope was modeled with bedrock steps then the safety factors would be satisfactory. Dames and Moore did not supply the Division with any information on the steps spacing or demonstrate that the steps would prevent failure.

When the Division analyzed the slope using Dames and Moore revised assumptions the safety factor was 1.31. When saturated soil conditions were assumed the safety factor dropped to 1.29. The regulations require road embankments to have safety factors no less than 1.3.

The bedrock step spacing is important. The Division has demonstrated that if a 40 gap in the bedrock can result in a safety factor of 1.2.????????? While Dames and Moore's assumption about steps may appear reasonable they have supplied the Division with no information that such conditions will occur on all fill surfaces.

In the model the fill did not fail because it has high strength parameters. The strength parameters were based on one soil sample. If the parameters are decreased slightly then the fill failures have the required safety factor.

**The model is very sensitive to small changes in slope profile and material properties.**

**If the Operator is allowed to construct fill slope then he must supply the Division with detailed as-built designs demonstrating the slope's stability.**

**Stipulations**

6. The Operator must expose bedrock when needed to ensure that the slope is stepped.
7. The Operator must test fill material prior to placement.
8. The Operator must submit detailed slope profiles and stability analysis for each fill-slope.

**BASELINE DATA**

**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 September 9, 1993 informal hearing transcripts.

**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 in place (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**

**R645-301-741 thru  
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 slough 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 and 7K-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 stream flow.

## **SURFACE WATER DIVERSIONS**

### **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 stream flow 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.

Page 26  
Tank Seam Road  
ACT/015/025  
July 20, 1994

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**TECHNICAL ANALYSIS  
(Includes Fee Lease Addition)**

**BEAR CANYON MINE  
CO-OP MINING COMPANY  
ACT/015/025**

**Emery County, Utah  
August 11, 1989**

**UMC 785.19 Alluvial Valley Floors-(RVS)**

**Existing Environment and Applicant's Proposal**

Bear Creek Canyon encompasses limited unconsolidated streamlaid deposits (Plate 7-4). Although Bear Creek sustains sufficient water for limited agricultural activities, the applicant states that the "area has no history of agricultural attempts" (page 3-100). The Division determines that the lack of "agricultural attempts" also precludes past utilization of flood irrigation. Moreover, technical staff inspections of the mine site have not identified the presence of flood irrigation. Limited streamflow, poor soil conditions (Plate 8-1) and steep topography (Plate 7-4) indicate a low capability for the area to be flood irrigated.

**Compliance**

Sufficient information about alluvial deposits and irrigation are available to determine as required by UMC 785.19(c)(2) that no alluvial valley floors exist.

The applicant is in compliance with this section.

**Stipulations**

None.

**UMC 817.11 Signs and Markers-(PGL)**

**Existing Environment and Applicant's Proposal**

Signs and markers for the Bear Canyon Mine are described on page 3-30. The maintenance and removal schedule for all signs is outlined in Table 3.4-2, page 3-31.

**Compliance**

The size, description, maintenance and removal of signs for the Bear Canyon Mine meets the requirements of this section.

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.13-.15 Casing and Sealing of Underground Openings-(RVS)

### Existing Environment and Applicant's Proposal

**Boreholes.** The applicant has drilled 14 boreholes for the purpose of evaluating the permit and adjacent area ground-water system (Appendix 7-A). Borehole locations have been identified on Plate 7-4. One additional borehole will be completed to further evaluate the ground-water system (page 7-43 and Plate 7-4).

The applicant states that, upon abandonment, all boreholes will be plugged with five feet of cement as required by Rule M-3(5), Utah Mined Land Reclamation Act of 1975 (page 3-66).

**Entries.** The applicant has committed to sealing all mine entries upon completion of mining (page 3-67). Seals will be constructed of solid concrete blocks in a double wall thickness (16 inches) and located a minimum of 25 feet from the entryway (page 3-67). Installation will include recessing the seals 16 inches and 12 inches into the rib and floor, respectively. Seals will not be recessed into the roof. Structural integrity will be enhanced by incorporating interlaced pilasters in the central portion of the seals.

Figure 3.6-1 (page 3-69) indicates entries will be backfilled to the seal (not less than 25 feet) with noncombustible material. The entryway and adjacent highwall (including the exposed seam) area will be backfilled with noncombustible material, graded, covered with suitable topsoil material and revegetated.

The applicant proposes to install temporary seals for entryways that are temporarily inactive (page 3-101). Temporary seals will be constructed of woven wire and posted. Boreholes utilized for ground-water monitoring will be sealed in a non-permanent fashion by installing PVC surface casing with a threaded cap for access.

### Compliance

The applicant's proposals for permanently sealing boreholes and entries are designed to prevent access and preclude toxic drainage from entering ground or surface waters as required by UMC 817.13 and 817.15.

The applicant has provided adequate plans for posting signs and limiting access to temporarily inactive entries. The applicant's proposal for temporarily sealing boreholes (i.e., ground-water monitoring wells) meets the requirements of this section.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.22 Topsoil: Removal-(HS)

#### Existing Environment and Applicant's Proposal

The Bear Canyon Mine was developed in an area of pre-Law (SMCRA) disturbance and had no topsoil removed from the majority of the ten acres of disturbance (page 8-18). The scale house and adjacent area (Plate 2-4) was disturbed by construction activities in approximately 1986. Topsoil and subsoil was analyzed (Appendix 8-A), and separately removed and stockpiled (Partial State Inspection Report, March 8, 9 and 10, 1983). Approximately 2,600 cubic yards of soil was stockpiled in the original topsoil storage pile (Plate 2-4) for final reclamation.

Topsoil material, approximately 3,400 cubic yards was purchased from R.D. Campbell (page 8-14) and stockpiled in the Ball Park Topsoil Storage Pile (Plate 8-4).

The calculated volume of topsoil required to redistribute six inches over ten acres equals approximately 8,067 cubic yards. Stored topsoil on site amounts to approximately 6,000 cubic yards of material. Consequently, a topsoil deficiency exists, equalling approximately 2,067 cubic yards (page 8-18).

The operator has proposed utilizing downcast material adjacent to the old portal access road as a plant growth medium for final reclamation (Appendix 8-D).

Chemical and physical analyses of all approved stockpiled soil material is located in Appendix 8-A. Soil mapping unit descriptions and a soils map are given in Appendix 8-B and on Plate 8-1, respectively.

### Compliance

Coal mining activities occurred prior to the Surface Mine Control and Reclamation Act (SMCRA), Public Law 95-87 of August 3, 1977. Accordingly, no topsoil was salvaged from the majority of the disturbance. Topsoil was salvaged from the scalehouse area (approximately 3.2 acres). Analyses of the topsoil were conducted prior to removal (Appendix 8-A). Existing vegetation was removed and topsoil was separately removed, utilizing bulldozers, front-end loaders, and dump trucks (pages 8-19 and 8-20). Profile descriptions and chemical and physical data indicate no characteristics that would jeopardize reclamation success within the salvaged material.

Topsoil material purchased from R.D. Campbell has been sufficiently characterized by the applicant. Mass balance calculations indicate a topsoil deficiency for final reclamation (deficiency equals approximately 2,067 cubic yards). The applicant has proposed utilizing existing material on site (downcast material) or purchasing a suitable topsoil off site and hauling it to the mine (Appendix A, page 8A-2).

The Division will determine, based on physical and chemical characteristics of the substitute material, and results derived from the revegetation test plots whether downcast material will be suitable topsoil material.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.23 Topsoil: Storage-(HS)

#### Existing Environment and Applicant's Proposal

Topsoil was removed from the scale house area and placed in the original topsoil stockpile (Plate 8-4). Reseeding has already occurred and a berm has been constructed around the perimeter of the stockpile to contain any minor erosion on site (page 8-12). The as-built survey is shown on Plate 8-2.

Approximately 3,400 cubic yards of topsoil was purchased from R.D. Campbell (page 8-14) and stored within the Bear Canyon Ball Park Topsoil Storage Pile (Plate 2-4). The area was reseeded in the fall of 1988 and a protective berm has been constructed (page 8-15). A sprinkler system has been installed on the storage pile (NOV 89-32-2-1 abatement requirement).

Once a substitute topsoil material is adequately characterized for suitability and approved by the Division (see discussion under UMC 817.22), the operator ensures that the material is placed on a stable surface, protected from wind and water erosion, excluded from the influences of active operations, and left in place (page 3-61, 8-21 and 8-22).

### Compliance

Removed and purchased topsoil has been placed within the permit area. Immediate redistribution of topsoil is not practical because essential facilities will remain operational throughout the life of the facility. The applicant has committed to promptly reclaiming disturbed areas when no longer needed for operations (page 3-61).

The areas where topsoil has been stored (Original Topsoil Pile and Ball Park Topsoil Storage Pile) are relatively flat. The surrounding terrain does not pose an imminent danger for slope failure.

The stockpiles have been adequately protected from wind and water erosion. There are no plans to move the stockpiles from their present location.

The operator has committed to fulfilling the requirements of this section for the proposed substitute topsoil material.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.24 Topsoil: Redistribution-(HS)

#### Existing Environment and Applicant's Proposal

Prior to the redistribution of topsoil, regraded land will be scarified by a ripper-equipped tractor to a depth of 14 inches (page 3-78).

Steep slope areas which must remain after abandonment will receive special ripping to create ledges, crevices, pockets and screes and are referred to as cat track terraces (page 3-80).

Topsoil redistribution procedures will ensure that approximately six inches of topsoil will be placed uniformly upon the approximate ten acres of disturbance (page 8-23). Topsoil will be redistributed in the fall of the year.

To minimize compaction of the redistributed topsoil, travel on reclaimed areas will be limited. After topsoil has been applied, surface compaction will be reduced with disking to a depth of six inches (page 8-23).

The applicant will exercise care to guard against erosion during and after application of topsoil and will employ wood fiber mulch and tackifier to ensure the stability of topsoil on graded slopes (page 8-23).

### Compliance

The redistribution of topsoil to a uniform depth of six inches is adequate to support the postmining land use of recreation, livestock grazing, and wildlife habitat. The depth of redistributed topsoil closely parallels predisturbance conditions.

Scarification of regraded spoils and disking of redistributed topsoil will alleviate compaction caused by machinery traffic and ensure good overburden/soil contact, thereby preventing slippage and create a soil profile conducive to root penetration.

Regraded soils should be left in a roughened condition to provide micro-relief to reduce runoff and maintain available water supply to the vegetation.

All soil redistribution and seedbed preparation activities should be carried out when the soil is dry. Working on wet soil results in excessively compacted soil.

Wood fiber mulch and tackifying agents will ensure adequate protection from wind and water erosion by raising the wind profile above the soil surface and acting as a barrier against raindrop impact.

The applicant is in compliance with this section.

#### Stipulations

None.

#### UMC 817.25 Topsoil: Nutrients and Soil Amendments-(HS)

#### Existing Environment and Applicant's Proposal

Topsoil will be tested before it is seeded to determine the type and amount of fertilizer or neutralizer required (page 3-81). Soil analyses will be conducted for the following constituents: Soil Texture, Available Phosphorus and Nitrogen, pH, Electrical Conductivity and Sodium Adsorption Ratio. All necessary fertilization or neutralization, as determined by soil testing, will be done (page 3-81).

#### Compliance

The applicant has committed to sampling topsoil to determine deficiencies or toxicities which may inhibit or prevent revegetation success. At a minimum, the parameters listed above will be analyzed. Other parameters may be required, based on preliminary test results.

The applicant is in compliance with this section.

#### Stipulations

None.

## UMC 817.41 Hydrologic Balance: General Requirements-(TM/RVS)

### Existing Environment and Applicant's Proposal

#### Surface Water-(TM)

The applicant proposes to conduct all operations in such a way as to minimize potential impacts to surface and ground-water quality.

The following quotes describes the existing surface water environment at the Bear Canyon Mine.

"The channel of Bear Creek is straddled by the mine plan area with the vast majority of the area, disturbed and undisturbed, west of the creek. Bear Creek is a perennial stream with flows often frozen during the winter. An intermittent tributary flows into Bear Creek from the east in the mine plan area, but this tributary does not pass through any disturbed area" (page 7-50). Bear Creek flows into Huntington Creek approximately one mile south of the mine site.

The applicant has included Bear Creek flow data (1978-79) from a U.S. Geological Survey report in Table 7.2-2.

The applicant also included historical water quality and flow data from 1984-87. Data were obtained at three stations:

1. BC-1 Upper Bear Creek,
2. BC-2 Lower Bear Creek,
3. BC-3 Right Fork Bear Creek;

The applicant makes the following commitments regarding reclamation.

"Upon completion of mining activities, all diversion structures (ditches, culverts, ponds) shall be reclaimed as close to original configuration as possible. Sequencing of this reclamation shall be from the highest points in elevation to the lowest ones. In addition, the lower disturbed area collection ditches and sedimentation ponds shall not be removed until the reclaimed areas have been stabilized".

For additional technical information regarding reclamation see Section 7.3, Reclamation Hydrology.

#### Ground-Water-(RVS)

The applicant describes ground water as occurring under confined and unconfined conditions in the permit and adjacent area (page 7-5). Unconfined conditions occur within shallow alluvial deposits as local perched zones, whereas confined conditions are recognized at depth and are associated with fault zones and relatively

permeable lithologies that are overlain by impermeable rocks or juxtaposed by faulting against impermeable rocks (page 7-5). Surface percolation from snowmelt is thought to be the source of most ground-water recharge.

Three springs occur adjacent to the permit area. Bear Spring (140 gpm average flow) and Birch Spring (17 gpm average flow) are perennial and COP Development Spring is intermittent (Table 7.1-4).

The applicant states that spring flow is controlled by a fault zone that drains aquifers adjacent to the permit area (page 7-18). Discharge data indicate springs and seeps respond to seasonal runoff (Section 7.1.3, page 7-7). The applicant currently monitors Huntington Spring (SBC-4), Birch Spring (SBC-5), Co-Op Development Spring (SBC-6) and Mine Water Discharge (SBC-1), see Table 7.1-8.

The applicant initiated a drilling program (12 boreholes) to identify aquifers within the mine plan area. Data from four boreholes adjacent to the permit area were also utilized to characterize the regional ground-water system. One borehole (SBC-2), located adjacent to the main access portal, penetrated the Mancos Shale and did encounter traces of water (page 7-5). The remaining boreholes penetrated units above the Mancos Shale and did not encounter water (Table 7.1-5). These borehole data indicate aquifers within the vicinity of the permit area are laterally and vertically restricted to localized saturated zones (page 7-27).

Mine inflow totals approximately 60 gpm from the east bleeder area and minor roof drips that flow continuously (page 3C-10). Mine inflow is attributed to dewatering of localized aquifers and the intersection of mine workings with flow along fault/fracture conduits (pages 3C-16 and 3C-17).

Water quality data for springs and mine inflows are given in Table 7.1-3. These data indicate water quality is within state and federal standards.

## Compliance

### Surface Water-(TM)

The applicant has provided almost nine years of continuous water quality data on the Bear Creek drainage. The existing water quality in Bear Creek is marginal. The mine has sediment controls in place and routes all undisturbed drainage around the site, minimizing impacts to Bear Creek.

All data collected since the mine has been in operation shows that no changes to water quality and quantity to date have occurred due to mining. Therefore, a determination of minimal change to prevailing hydrologic balance can be made based on the assessment of data collected to date.

The applicant has committed to collect data in the future as outlined in the Division's Guidelines and shows the stations and parameters to be sampled in Tables 7.1-8 and 7.1-9 through 1995.

The applicant is in compliance with this section.

#### Ground-Water-(RVS)

The applicant has provided information about the occurrence, movement and quality of ground water that, in conjunction with the commitment to maintain a hydrologic barrier along the fault, allows a determination of minimal change to the subsurface hydrologic balance. Moreover, the applicant has committed to developing an additional in-mine borehole (page 7-43), acquiring additional baseline ground-water data (pages 7-37, 7-38 and Table 7.1-4), and submitting an Annual Hydrologic Monitoring Report (page 7-43).

The applicant is in compliance with this section.

#### Stipulations

None.

#### UMC 817.42 Water Quality Standards and Effluent Limitations-(TM)

#### Existing Environment and Applicant's Proposal

The applicant proposes the following water treatment measures for the mine plan area.

"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). All the runoff from this west side disturbed area is collected and channeled to Sedimentation Pond A. The small amount of runoff from the disturbed area east of Bear Creek is channeled to Sedimentation Pond B. In order to minimize the amount of water crossing the disturbed area, runoff from the undisturbed area above the mine is diverted around or channeled through the disturbed area and into Bear Creek" (page 7-58).

The Co-Op Mining Company was issued by the Department of Health, Division of Environmental Health, general permit number UT-6040006 for five discharge points on May 4, 1989. This includes two sediment pond points and two underground discharge points. The permit and monitoring requirements for all discharge points is found on pages 7B-11 through 7B-31. A map showing all monitoring points is on page 7B-10.

All disturbed drainage which does not drain to a sediment pond and is small in size and treated by alternative sediment controls is described in Appendix 7-K and shown on Plate 7-1.

### Compliance

All disturbed drainage and discharges are treated by treatment facilities or alternative sediment controls and meets all applicable state and federal effluent limitations and does not degrade receiving waters.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.43 Hydrologic Balance: Diversions and Conveyance of Overland Flow, Shallow Ground Water Flow and Ephemeral Streams - (TM)

#### Existing Environment and Applicant's Proposal

The applicant uses a series of diversion ditches and culverts to divert "disturbed" and "undisturbed" drainage through the Bear Canyon Mine Permit Area. The calculations for these structures are shown on two tables labeled "Summary of Ditch Sizes" and "Summary of Culvert Sizes" (Section 7.2.8).

Standard engineering practices were used in sizing the ditches and culverts. Refer to Plate 7-1 for locations of the various ditches and culverts and Plate 7-5 for watershed areas used to calculate design flows (Appendix 7-F).

### Compliance

The Division has analyzed the design calculations proposed by the applicant for the disturbed and undisturbed surface water drainage plan. All temporary diversions, including ditches and culverts, have been designed to convey a 10-year, 24-hour peak flow (Appendix 7-F). Channel linings, silt fences and energy dissipators have also been designed according to UMC 817.43 and approved by the Division (Section 7.2.8, Figures 7.2-8 and 7.2-9).

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.44 Stream Channel Diversions-(TM)

### Existing Environment and Applicant's Proposal

The applicant has proposed to restore the natural drainage system found in the permit area. This includes two small ephemeral channels and Bear Creek, which is a perennial stream. The two ephemeral channels will be reconstructed in the locations, and to the dimensions shown in cross sections (C-C and D-D) and profiles (E and F) found on Plates 7-7 and 7-8. Table 7.3-1 contains a summary of the 100-year, 24-hour flows, expected velocities, Manning co-efficients, slope, and riprap sizing associated with the two ephemeral channels (Section 7.3.2).

Bear Creek channel restoration involves re-creation of the natural channel based on cross sections taken prior to channel disturbance. The applicant plans on using rock check dams along the course of the channel utilizing native materials to enhance reestablishment of riparian vegetation. The holding ponds created by the check dams will fill with sediment and minimize the downstream migration of silt and convert these silted-in areas into potential riparian vegetation areas (Section 7.3.3).

Measures will be taken to restore a pattern of riffles, pools and drops approximate to natural stream channel characteristics. Riprap and filter blankets under the riprap will be used to control erosion. These materials will be placed in the ephemeral channels as shown on Plate 7-7.

### Compliance

The applicant has met the criteria spelled out in UMC 817.44(d)(1)(2)(3). Since no pre-existing cross sections for the two ephemeral drainages are available, the applicant has chosen to size these two channels based on the 100-year, 24-hour storm event criteria listed in UMC 817.44(b)(2). Bear Creek has been sized so that the capacity of the channel itself is equal to the capacity of the unmodified stream channel immediately upstream and downstream of the current diversion (see Plate 7-8). All three channels will be restored to a natural meandering shape at an environmentally acceptable gradient. Also, a pattern of riffles, pools and drops will be restored to approximate natural stream channel characteristics.

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.45 Sediment Control Measures-(TM)

### Existing Environment and Applicant's Proposal

Bear Canyon Road erosion control is proposed as follows by the applicant.

"Ditches and culverts have been added to the road to control runoff and safely pass the runoff from a 10-year, 24-hour precipitation event (see Plate 3-1 and 3-5). Ditches shall be maintained at a minimum depth of 1.8 feet, and at least 30 inches of headwater depth will be maintained at the inlet of the 18 inch culverts. Culverts are fitted with trash racks to prevent plugging and buried and compacted a minimum of 30 inches to prevent crushing. In areas where velocities of runoff exceed five fps, erosion protection such as straw bales at 100 foot intervals or six-inch median diameter riprap on a bed of gravel/sand six inches thick shall be maintained. Culvert spacing conforms with the requirements of UMC 817.153(c)(2)(i). Rock or concrete headwalls shall be other erosion protection shall be the outlet" (Appendix 3-D).

Several alternative sediment control methodologies (i.e., silt fences and energy dissipators) are currently utilized or will be used as necessary within the permit area (Appendix 7-K, Small Area Exemptions).

### Compliance

The applicant has provided the necessary PAP documentation regarding alternative sediment control areas (ASCA's), including identification (Appendix 7-K) and location of these ASCA's on Plate 7-1. Moreover, field inspections have determined that all these areas qualify as ASCA's and runoff from the ASCA's will meet applicable state and federal effluent limits. The total drainage area combined for the ASCA's is less than 15 percent of the total disturbed area, meeting Division guidelines.

Figures 7.2-8, 7.2-9, and 7.2-10 document acceptable installation designs for the ASCA's currently in place. Maintenance of all sediment control structures is discussed on page 3-8 of the PAP with a commitment to maintain structures to meet all applicable state and federal effluent limits.

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.46 Hydrologic Balance: Sedimentation Ponds-(TM)

### Existing Environment and Applicant's Proposal

The applicant includes the following proposal for sediment ponds in the PAP.

"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). All runoff from this west side disturbed area is collected and channeled to Sedimentation Pond A. The small amount of runoff from the disturbed area east of Bear Creek is channeled to Sedimentation Pond B. In order to minimize the amount of water crossing the disturbed area, runoff from the undisturbed area above is diverted around or channeled through the disturbed area and into Bear Creek" (Section 7.2.6).

The disturbed area west of Bear Creek was split into three sections to facilitate calculations. The design calculations for both Pond A and B are found in Section 7.2.5.1.

The applicant chose to accept calculations derived by Division technical staff for sediment pond A and B. The calculations are as follows:

#### Design Criteria Pond "A"

Drainage Area: 14.35 Acres  
SCS Curve #82  
3-Year Sediment Storage: 41,444 ft<sup>3</sup>  
10-Year, 24-Hour Runoff Storage: 42,714 ft<sup>3</sup>  
Total Storage Volume: 84,158 ft<sup>3</sup>  
Use Existing Spillway: 10 Foot Wide  
Broad Crested Weir  
Rainfall Data Base: Hiawatha Data by  
E. Arlo Richardson

#### Design Criteria Pond "B"

Drainage Area: 1.82 Acres  
SCS Curve #82  
3-Year Sediment Storage: 2,156 ft<sup>3</sup>  
10-Year, 24-Hour Runoff Storage: 8,182 ft<sup>3</sup>  
Total Storage Volume: 10,338 ft<sup>3</sup>  
Use Existing Spillway: 4 Foot Wide  
Broad Crested Weir  
Rainfall Data Base: Hiawatha Data by  
E. Arlo Richardson

Plates 7-2 and 7-3 show a plan view and cross sections of Sedimentation Pond A and B, respectively.

#### Compliance

The applicant has provided adequate plans for the design of Pond A and Pond B. Design were implemented during the 1985 construction season.

The applicant has provided detailed plans for removal of the sedimentation ponds (pages 7-94, 7-95, and Plate 7-7a).

The applicant is in compliance with this section.

#### Stipulations

None.

#### UMC 817.47 Hydrologic Balance: Discharge Structures-(TM)

##### Existing Environment and Applicant's Proposal

The applicant addresses certain specific methods for reducing discharge related erosion from sedimentation ponds and diversions by installing energy dissipators, riprap channels and other devices, where necessary to reduce erosion and control flows (Figures 7.2-8 through 7.2-10 and Figure 7.2-1).

#### Compliance

The applicant has provided adequate plans for the design and implementation of erosion-reducing structures and/or practices. These include energy dissipators, silt fences, or riprap channel linings (Figures 7.2-8 through 7.2-10 and Figure 7.2-1).

The applicant is in compliance with this section.

#### Stipulations

None.

#### UMC 817.48 Hydrologic Balance: Acid-Forming and Toxic Forming Materials-(HS)

The applicant indicates on page 3-32 of the PAP that the mine produces no acid- and/or toxic-forming materials. Samples of the roof, floor and coal were analyzed and data are presented in Appendix 6-B.

Analyses of these materials indicate that they contain high Sodium Adsorption Ratio (SAR) values (floor materials) and an acid-forming potential (coal). Therefore, the applicant has committed to disposal of any acid- and/or toxic-forming material that is brought to the surface against the highwall and covering it with four feet of soil material (Appendix 3-E, page 3E-2).

Additionally, roof rock, coal fines and any material contaminated with coal fines and soil material contaminated with oil and grease will be placed against the highwall and covered with four feet of soil material (Appendix 3-E, page 3E-2).

### Compliance

The applicant commits to covering all acid- and/or toxic-forming materials with four feet of suitable non-acid and non-toxic forming material.

Preliminary roof, coal and floor data indicate elevated SAR levels and an acid-forming potential. Co-Op disposes of underground development waste in abandoned areas underground, in accordance with UMC 817.71-.74 and MSHA regulations (page 3-8). Water quality data of in-mine water and existing ground water indicates minimal change to the subsurface hydrologic balance (see discussion under UMC 817.41).

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.49 Hydrologic Balance: Permanent and Temporary Impoundments-(TM)

### Existing Environment and Applicant's Proposal

The design, construction, and maintenance of the two temporary impoundments, Pond A and B is discussed in Section 7.2.7 of the PAP.

The applicant states that all embankments of temporary impoundments, the surrounding areas and diversion ditches, disturbed or created by construction shall be graded, fertilized, seeded and mulched to comply with the requirements of UMC 817.111-.117 immediately following embankment construction. Areas where vegetation is not successful, or where rills and gullies develop shall be repaired and revegetated (page 3-86).

### Compliance

The applicant has not proposed any permanent impoundments to be left onsite, therefore, does not need to meet the requirements associated with permanent impoundments.

All the design requirements, slope stability, size, and maintenance for temporary impoundments has been adequately discussed in Section 7.2.7 of the PAP.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.50 Hydrologic Balance: Underground Mine Entry and Access Discharges-(RVS)

#### Existing Environment and Applicant's Proposal

The applicant states that "strata in the Wasatch Plateau generally dip southerly (slightly southeast or southwest) at angles of one to three degrees" (page 6-4). Plate 3.4-1 indicates the dip within the mine plan and adjacent area ranges from one to two degrees in an overall southerly direction. Elevations shown on Plate 3-4 show the access portal, conveyor belt portal and fan portal to be lower than all other portions of the mine workings.

Mine inflow totals approximately 60 gpm from the east bleeder area and minor roof drips that flow continuously (page 3C-10).

Details of the permanent entry seals are given on Figure 3.6-1 and pages 3-67 and 3-69.

A monitoring (quarterly) and mitigation plan for unplanned portal discharges following mining is presented on page 7-57.

### Compliance

The applicant has demonstrated that entries and accesses to underground workings are located, designed, constructed, and utilized to prevent gravity discharge from the mine. Moreover, the applicant has committed to monitoring and, if necessary, providing mitigation for unsuitable portal discharges following mining.

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.52 Surface and Ground Water Monitoring-(TM/RVS)

### Existing Environment and Applicant's Proposal

#### Surface Water-(TM)

The surface water operational monitoring plan is discussed on pages 7-53 through 7-57, and the water quality parameters to be tested are shown in Table 7.2-4, page 7-56.

The 1989-1995 Bear Canyon Mine Water Monitoring Matrix is found in Tables 7.1-8 and 7.1-9, page 41.

Surface Water Monitoring Stations are:

1. BC-1 Upper Bear Creek, located above the mining area, approximately 3,000 feet upstream from where the mine road crosses Bear Creek in the mine plan area.
2. BC-2 Lower Bear Creek, located downstream at Wier-4.
3. BC-3 Right Fork Bear Creek, located on the right hand tributary, just above the confluence with the main channel of Bear Creek.

The entire monitoring plan is found in Section 7.2.5.

The applicant has permitted four UPDES discharge points as shown on pages 7B-10 through 7B-31 under Permit Number UT-6040006. Two of these points are sedimentation pond outlets and two are underground seepage water overflows. No problems with water quality have been documented to date.

The applicant has committed to submitting quarterly data 90 days following sample collection, summarizing all data in an annual report, and sending all UPDES discharge report forms to the Division (page 7-57).

#### Ground-Water-(RVS)

The applicant commits to monitoring "mine roof seeps and sumps, dry drill holes within the mine, observation wells and springs" (page 7-37). Ground-water monitoring will include stations SBC-1 through SBC-8 (page 7-38) and will be conducted according to Table 7.1-6 and 7.1-7.

The applicant commits to providing an Annual Hydrologic Monitoring Report that includes a yearly update of the mine inflow survey (page 7-43).

## Compliance

### Surface Water-(TM)

On a quarterly basis as shown in Table 7.1-8 and 7.1-9, the parameter list shown in Table 7.2-5 will be utilized for sampling. This list was taken from the Division Water Quality Guidelines (Section 7.2.5) An annual report summarizing all data will be submitted to the Division.

The applicant is in compliance with this section.

### Ground Water-(RVS)

The applicant has committed to acquiring baseline operational monitoring data for springs, mine inflows and boreholes and providing these data on a quarterly and annual basis.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.53 Hydrologic Balance: Transfer of Wells-(RVS)

#### Existing Environment and Applicant's Proposal

The applicant states on page 3-66 of the PAP that "upon abandonment of drilling operations, all drill holes are to be cemented with an approved slurry."

### Compliance

The applicant has indicated that no boreholes will be transferred for further use as water wells.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.55 Discharge of Water into an Underground Mine-(TM)

#### Existing Environment and Applicant's Proposal

The applicant has obtained all the appropriate discharge permits from the Department of Health discussing discharge of any underground water.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.56 Hydrologic Balance: Postmining Rehabilitation of Sedimentation Ponds, Diversions, Impoundments and Treatment Facilities-(TM)

Existing Environment and Applicant's Proposal

The applicant provides the following information about restoration of the surface water drainage system.

"After the disturbed areas are stabilized and runoff is comparable to the area's premining conditions without detention time, the site drainage system will be removed. The site drainage system areas will be backfilled and revegetated. All ponds will be drained and allowed to dry; thereafter, they will be backfilled and revegetated" (page 3-71).

Compliance

According to the above statement, the applicant does not propose to retain any impoundments or drainage systems onsite.

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.57 Hydrologic Balance: Stream Buffer Zones-(TM)

Existing Environment and Applicant's Proposal

The applicant has provided a map showing stream buffer zones and sign placement on Plate 2-4.

Compliance

The applicant is in compliance with this section.

Stipulations

None.

## UMC 817.59 Coal Recovery-(RVS)

### Existing Environment and Applicant's Proposal

The Bear Canyon coal seam averages ten feet and the Hiawatha coal seam averages five feet in thickness (Table 3.4-1, page 3-27) over the proposed workings and are the extraction targets. Recoverable coal reserves were "conservatively" estimated to be 60 percent of the in-place coal reserves (page 3-28). Under Section 3.4.1.2 entitled "Mining Methods", the applicant states that room and pillar mining methods will be employed (page 3-15).

### Compliance

The applicant proposes to conduct underground activities to maximize the utilization and conservation of the coal resource while utilizing current technology to maintain environmental integrity.

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.61-.68 Use of Explosives-(RVS)

### Existing Environment and Applicant's Proposal

The applicant states that there will be "no surface blasting activities incident to this underground operation" (page 3-10).

### Compliance

Inasmuch as all blasting will be confined to underground, the applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.71 Disposal of Excess Spoil and Underground Development Waste-(PGL)

### Existing Environment and Applicant's Proposal

The applicant does not anticipate the handling of development waste rock in its mining operations. The applicant commits to submit plans for an approved waste disposal site, if needed. Currently, development waste is stored underground (page 3-57).

### Compliance

Underground development waste is disposed underground.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.81-.88 Coal Processing Waste Banks-(PGL)

#### Existing Environment and Applicant's Proposal

The applicant does not process any coal onsite, therefore, this section is not applicable (page 3-7).

### UMC 817.89 Disposal of Noncoal Waste-(PGL)

#### Existing Environment and Applicant's Proposal

Noncoal waste at the mine is placed in metal dumpsters. A local contractor empties these dumpsters when they are 80 percent full and sends the noncoal waste to an approved landfill (page 3-58).

### Compliance

The applicant adequately disposes of noncoal waste at the Bear Canyon Mine.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.91-.93 Coal Processing Waste: Dams and Embankments-(PGL)

The applicant does not process any coal onsite, therefore, this section is not applicable.

### UMC 817.95 Air Resources Protection-(PGL)

#### Existing Environment and Applicant's Proposal

The Bear Canyon Mine is not considered a "major source" under the PSD regulations because total annual controlled emissions of particulate matter are expected to be less than 250 tons/year (page 3-55). Chapter 11, page 3-130, includes a stipulated approval letter from the Division of Environmental Health (DEH) dated December 20, 1983. In June 1985, Co-Op Mining Company submitted a

revised plan to the Department of Health and Bureau of Air Quality, required by Condition Number Two. The revised plan was approved February 20, 1986. The fugitive dust control plan is included in Chapter 11.1.

### Compliance

The applicant adequately addresses fugitive dust control for this mine site. The applicant also has the required approval from the Bureau of Air Quality.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.97 Fish and Wildlife Information-(BAS/WJM)

#### Existing Environment and Applicant's Proposal

Fish and wildlife resource information is discussed in Chapter Ten. A variety of wildlife species use the variable habitats within and adjacent to the permit area (Appendix 10-B).

Economically important mammals, which are most likely impacted by mining operations, include mule deer and elk. Other high interest mammals present include the cougar, black bear, bobcat and snowshoe hare. The major impact to these species is loss of habitat (Section 10.4.2). Seasonal distribution is shown on Plate 10-1.

Two endangered species of birds may occur on or near the permit area. These are the bald eagle and peregrine falcon. Neither species has been observed, nor are there known roosting trees or nesting sites within the permit area (Section 10.3.3.2). No other threatened or endangered species is known to occur in the mine plan area (Sections 10.3.3.1 and 9.4).

Bear Creek, a perennial stream (see discussion under UMC 817.41), drains into Huntington Creek, classified as a Class Three fishery by DWR. Huntington Creek supports natural reproduction of self-sustaining cutthroat and brown trout populations (Appendix 10-B).

Powerpole configurations have been determined by the U.S. Fish and Wildlife Service (USFWS) to not require corrective modification as long as raptor mortality continues not to occur (letter from USFWS to DOGM, dated July 6, 1983).

A minimum of either 100 or 200 foot barrier pillars to the outcrop (see discussion under UMC 817.121-.126) will be maintained to minimize potential adverse impacts to nesting raptors from subsidence and possible escarpment failure (page 3-18).

Hazardous or toxic materials used at the mine will be disposed of in a manner approved by regulatory authorities (page 3-32, Appendix 3-E). Hazards to wildlife will be covered, buffered, or fenced (Section 10.5).

Barriers to migration or other movement will be remedied as directed by DWR (page 3-54).

No pest control measures will be implemented without approval from the Division (Section 10.5).

Water sources necessary to wildlife will be provided (Section 3.5.6.2). In addition, riparian habitat on Bear Creek has been enhanced by installation of velocity dissipators, and planting of species valuable for wildlife (Appendix 10-D).

During the first suitable planting season following mining, the applicant will implement permanent revegetation, designed to restore and enhance wildlife habitat on disturbed areas (Section 3.6.5). The revegetation mix includes herbaceous and woody species, adapted to on-site conditions and of known value to wildlife for cover, forage or both (Section 9.5.5).

### Compliance

The applicant has adequately characterized adverse impacts to fish, wildlife, and related environmental values in Section 10.4 and Appendix 10-B.

A commitment to report any threatened and endangered species or their critical habitat observed on the permit area during operations has been made (Section 10.3.3.1). A commitment to report any golden eagles observed has also been made (page 3-54). The applicant commits to raptor-safe design and construction of electric powerlines and other transmission facilities (Section 10.7).

Impact avoidance, mitigation and wildlife monitoring discussed in Sections 3.5.6.2, 10.5 and 10.7, and Appendices 10-B and 10-D comply with the requirements of paragraph (d) of this section.

Adequate plans for permanent vegetation of the site have been provided (Section 9.5; see discussion under UMC 817.111-.117). Species to be used for revegetation will provide nutritional value and cover for wildlife and will enhance fish and wildlife habitat after bond release. Plants will be grouped in a manner which optimizes edge effect (page 9-23).

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.99 Slides and Other Damage-(PGL)

Existing Environment and Applicant's Proposal

The applicant commits to take all necessary steps to remedy any adverse impacts from slides and notify the Division by the fastest available means to safeguard human and environmental values as stated on page 3-41.

Compliance

The applicant's commitment to notify the Division and remedy any adverse impacts from slides meets the requirements of this section.

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.100 Contemporaneous Reclamation-(BAS/WJM)

Existing Environment and Applicant's Proposal

The interim reclamation plan is described in Appendix 3-G. Reclamation will proceed as contemporaneously as practicable, and during the first normal period for favorable planting conditions (Section 3.6.5).

Compliance

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.101 Backfilling and Grading-(PGL)

Existing Environment and Applicant's Proposal

Backfilling operations will be conducted in the portal and treatment facility areas. Compaction operations will include the use of equipment such as sheepsfoot tampers to stabilize all filled holes and depressions. The portal fill material will be put in place with a LHD (page 3-72).

A backhoe and dozer will work conjunctively to remove the outer edge of the operational benches and compact it against the highwall. The backhoe will reach over the edge of the bank (approximately 20 feet) pulling back material. The dozer will then push and compact material from the highwall outward to reach a bench slope of approximately 3h:1v.

The procedure will continue from the upper benches down the canyon reshaping the mine yard and disturbed area to the configuration shown on Plate 3-2, Postmining Topography.

As backfilling and grading is completed, operational areas will be scarified by ripping to a depth of 14 inches with a dozer.

Topsoil will be spread over the disturbed areas after the grading and ripping is complete.

A stability analysis of this area demonstrates a factor of safety greater than 1.3 (page 3-75) (Stability Analysis - Appendix 3F).

The applicant proposes to reduce or retain highwalls in some areas as follows: "The highwalls will be reduced along the pad and road areas where feasible. This will be accomplished by recovering material from the edge of pad and road fill areas with a backhoe and placing it against the base of the highwall. The material will be compacted with a cat to promote stability of the backfill. Erosion controls, such as straw dikes or water bars, will be placed below the backfilled areas to minimize washing of the fill material." The applicant proposes to retain highwalls in some areas. The rationale for leaving or reducing highwalls offered by the applicant is stated on page 3-78. Plate 3-2 delineates highwalls that will be retained.

### Compliance

The applicant's proposal to backfill and grade the Bear Canyon Mine site meets the requirements of this section. The rationale for retention of highwalls is acceptable.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.106 Regrading or Stabilizing Rills and Gullies-(HS)

#### Existing Environment and Applicant's Proposal

If rills and gullies form, the applicant has committed to a four phase approach to the stabilization of the area: (1) diversion of

water away from the area; (2) distribution of additional soil material in order to fill the rills and gullies; (3) recontouring of the area; and (4) reseeding (page 3-86).

### Compliance

The applicant has provided a specific plan to regrade or stabilize rills and gullies.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.111 Revegetation: General Requirements-(BAS/WJM)

#### Existing Environment and Applicant's Proposal

The applicant's reclamation plan is contained in Sections 3.6 and 9.5. A commitment has been made to recreate a permanent and diverse vegetative cover (Sections 3.5.5.2 and 3.6.5). Following topsoil redistribution and seedbed preparation (see discussion under UMC 817.22 and 817.24), the disturbance area will be drilled or hydroseeded (Sections 9.5.2 and 9.5.4.1).

Two seed mixes (Section 9.5.5) are proposed for restoration of riparian and pinyon/juniper-grass vegetation types. The riparian mix (Table 9.5-2) consists of five grass, six forb and four shrub species. Supplemental stocking of woody plants will follow seeding (Section 9.5.4 and page 9-2). The pinyon/juniper-grass mix consists of five each of grass, forb, and shrub species. Supplemental stocking of three tree species will follow seeding by two years (page 9-23).

Rates of broadcast seeding exceed 80 PLS/ft<sup>2</sup> for both mixes. Rates will be reduced by half for drill-seeding.

With the exception of yellow sweetclover, all plant materials proposed for either mix are native perennials, adapted to local conditions.

### Compliance

Reclamation plans are adequate to ensure a diverse, effective, and permanent vegetative cover.

Plant materials are capable of regeneration and plant succession. A timely recovery of vegetative cover and productivity will be facilitated by the applicant's monitoring commitments (Section 3.6.6.2).

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.112 Revegetation: Use of Introduced Species-(BAS/WJM)

Existing Environment and Applicant's Proposal

Yellow sweetclover (Melilotus officinalis) is proposed for use in the riparian seed mix (page 9-21). The pinyon/juniper-grass mix consists entirely of native species.

Compliance

Yellow sweetclover, an introduced species, is not persistent. Its fast-growing, nitrogen-fixing characteristics are valuable for soil stabilization and enrichment.

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.113 Revegetation: Timing-(BAS)

Existing Environment and Applicant's Proposal

The applicant commits to reclaim immediately after final site preparation (Appendix 3-G). Further details are provided in Sections 3.6.1 and 3.6.2.

Following cessation of operations and final site preparation, seeding of disturbed areas will be conducted (Section 9.5). Seeding will occur in the fall (page 9-12), which is the normal period for favorable planting conditions. Supplemental planting of seedlings is scheduled to follow seeding by two years (page 9-23).

The applicant commits to as rapid a restoration as possible, using the best technology available (page 3-58 and 3-59).

Compliance

The applicant is in compliance with this section.

Stipulations

None.

## UMC 817.114 Revegetation: Mulching-(BAS/WJM)

### Existing Environment and Applicant's Proposal

Soil stabilization and moisture retention will be facilitated by soil redistribution procedures (Section 8.8). The soil surface will be left in a rough condition (page 3-64). Terraces will be created along slope contours (Plate 3-2).

Wood fiber hydromulch will be applied to all seeded areas (Section 9.5.2). The rate of application (from 1200 to 2500 lbs/acre) will be determined by slope steepness (page 9-14). Mulch will be anchored with a chemical tackifier (page 9-13).

### Compliance

Soil stabilization practices, use of mulch, and chemical stabilizers satisfy the requirements of this section.

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.116 Revegetation: Standards for Success-(BAS/WJM)

### Existing Environment and Applicant's Proposal

The applicant commits to restore disturbed areas to a condition equivalent to premining conditions (pages 3-87 and 3-88). If monitoring indicates rill or gully formation or other vegetation inadequacies, damage will be repaired and the area reseeded (page 3-86).

A composite reference area was established in 1983 to represent premining pinyon/juniper and riparian vegetation types (Plate 9-1 and Appendix 9-A). Reference area sampling data (Appendix 9-A) serves as the initial success standard for disturbed areas, although concurrent sampling of all reclaimed areas and reference areas in years 9 and 10 of the bond liability period will ultimately determine revegetation success.

Reclamation will be considered successful when cover, productivity, and woody plant density are 90 percent of their reference area counterparts at 90 percent statistical confidence (page 3-87).

Revegetation monitoring plans are presented in Sections 3.6.5.6 and 3.6.6.2. Under interim reclamation (Section 3.6.5.6), all seeded areas will be inspected annually. Steps will be taken to correct problem areas (page 3-84). For permanent reclamation (Section 3.6.6.2), the applicant commits to annual qualitative monitoring and quantitative sampling during years 2, 3, 5, 9 and 10 of the bond liability period. Sampling will consist of cover, composition, and woody plant density measurements. Productivity will be evaluated during years 9 and 10 (page 3-87).

### Compliance

Success of reclamation will be measured by sampling methods approved by the Division. Vegetative parameters of the approved reference area will be compared with reclaimed areas to document revegetation success.

Monitoring during the 10-year liability period is sufficient to document progress toward reclamation objectives. All monitoring will meet sample adequacy requirements for a statistically adequate sample size (Section 3.6.6.2). The applicant has committed to remedy reclamation inadequacies by reseeding (page 3-86) or by supplemental stocking with woody plants (Sections 9.5.4 and 9.5.5).

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.117 Revegetation: Tree and Shrub Stocking on Forest Land-(BAS/WJM)

### Existing Environment and Applicant's Proposal

All disturbed surface area is under private ownership (Section 4.3.1.1), but because wildlife habitat is an approved postmining land use, this section applies. The applicant proposes to include raw shrub seed at a rate of 13.8 lbs/acre in the pinyon/juniper grass seed mix, and 12.5 lbs/acre in the riparian seed mix (page 9-21 and 9-22).

Within two years of seeding, native tree and shrub seedlings will be planted as necessary to achieve woody plant density standards (Sections 9.5.4 and 9.5.5).

### Compliance

The rate of shrub seed application, augmented by tree and shrub planting is expected to equal or exceed 90 percent of the pre-disturbance stocking level (Appendix 9-A) with 90 percent statistical confidence.

The applicant is in compliance with this section.

Stipulations

None.

UMC 817.121-.126 Subsidence Control-(RVS)

Existing Environment and Applicant's Proposal

The Bear Canyon coal seam is the primary mining target for this permit term (Table 3.4-1, page 3-27). The applicant states (page 15) that room and pillar methods will be used to extract the Bear Canyon coal seam. Overburden, within and adjacent to the permit area, ranges from approximately 100 to 1,800 feet and encompasses the lower portion of the North Horn Formation, Price River Formation, Castlegate Sandstone and upper portion of the Blackhawk Formation (page 6-18 and Plate 3.4-1). Maximum subsidence is projected to be 5.4 feet directly above a pillared panel (Appendix 3-H, page 3H-7).

A survey of renewable resource lands was conducted on June 13, 1984 and the applicant concludes that subsidence will not impact the hydrologic balance, timber, vegetation for grazing, fish and wildlife, paleontological and archeological resources, man-made structures and mineral and hydrocarbon resources (Appendix 3-H). The applicant indicates no surface facilities or structures exist over mine areas (page 3-19) and, therefore, no man-made structures will be impacted by subsidence induced material damage.

The applicant commits, on page 3-18 and page 3H-6, to maintaining a minimum 100 foot outcrop barrier pillar. Plate 3-4 indicates a minimum 200 foot wide outcrop barrier will be established.

Appendix 3-H includes a plan for installing four permanent subsidence monitoring stations. The stations are located in Sections 14 and 23 (Figure 3-3) and will be monitored at "nominal" six month intervals. The applicant commits to conducting a yearly field investigation for the purpose of identifying and recording surface manifestations of subsidence until the completion of reclamation (Appendix 3-H, page 5A-6). Annual results of the field investigation and subsidence monitoring program will be submitted to the Division as part of the annual report (page 3H-10).

The applicant commits to notifying all owners of property within the area that may be impacted by subsidence per UMC 817.122 and mitigating for materially damaged structures and surface lands as described by UMC 817.124 (pages 3H-10 through 3H-12).

The applicant identifies Bear Canyon Spring, Birch Spring and COP Development Spring as occurring adjacent to the permit area (page 7-6). COP Development Spring is characterized as intermittent, whereas Bear Canyon Spring and Birch Spring are identified as perennial with average flows of 140 gpm and 17gpm, respectively (Table 7.1-4). Bear Canyon Spring and Birch Spring are public water sources.

Fault zones are given as the mechanism controlling recharge to Bear Canyon Spring, Birch Spring and COP Development Spring (page 3C-9). Data from boreholes drilled within and adjacent to the permit area indicate aquifers are laterally and vertically restricted to localized saturated zones (page 7-4). Borehole SBC-2 did not encounter water, indicating the Star Point-Blackhawk aquifer does not occur everywhere above the Mancos Shale (page 7-5). The applicant anticipates a certain amount of localized diversion and interception of the present ground-water flow due to subsidence (page 7-34). However, the applicant also expects these impacts to be minimal because most subsidence cracks will naturally seal (page 7-34).

The applicant has committed to maintaining a barrier along the fault inby the main access portal to prevent impacts to spring flow (Plate 3-4A).

#### Compliance

The applicant has provided information about mining methods, overburden thickness and vertical movement that indicate activities have been planned and will be conducted to prevent subsidence from causing material damage (UMC 817.121). Moreover, the applicant has adequately committed to public notification (UMC 817.122) and surface owner protection (UMC 817.124).

The applicant indicates flow to Bear Canyon Spring and Birch Spring, both public water sources, is controlled by faults or fault zones. The applicant has committed to maintaining a barrier along the fault inby the access portal to prevent impacts to spring flow (UMC 817.126).

The applicant is in compliance with this section.

#### Stipulations

None.

## UMC 817.131 Cessation of Operations: Temporary-(PGL)

### Existing Environment and Applicant's Proposal

In the event of a temporary cessation of operations, the applicant commits to notify the Division within 48 hours of pending shutdown and submit all necessary information, i.e., exact number of surface acres and the horizontal and vertical extent of subsurface strata in the permit area prior to cessation or abandonment, extent and kind of surface reclamation, and identification of backfilling, regrading, revegetation, environmental monitoring, underground opening closures and water treatment activities that will continue during temporary cessation (pages 3-100 and 3-101).

### Compliance

The applicant's commitment meets the requirements of this section.

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 817.133 Postmining Land Use-(BAS/WJM)

### Existing Environment and Applicant's Proposal

Mining commenced in Bear Canyon in 1896 and continued until 1906. The mine reopened in 1938 and was worked intermittently until 1957. The site was then abandoned until Co-Op Mining Company resumed mining in 1981 (Section 4.4.2).

Premining uses of the permit area included livestock grazing, wildlife habitat and recreation (Section 4.4). Present management emphasizes wildlife habitat, livestock grazing, and watershed management (Section 4.4.2). The U.S. Forest Service, State of Utah, and Emery County administer the permit and adjacent areas (Section 4.3.1.2).

The applicant proposes to return Bear Canyon Mine to premining land uses, which include wildlife habitat, livestock grazing and recreation. All buildings and support facilities will be removed from the permit area after cessation of operations (page 3A-7 and 3-90).

### Compliance

The reclamation plan is adequate to ensure a timely return to conditions capable of supporting premining uses. Wildlife habitat, livestock grazing, and recreation may be considered the highest and best uses achievable. These uses are compatible with those in the surrounding area.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.150-.156 Roads: Class I-(PGL)

#### Existing Environment and Applicant's Proposal

The Bear Canyon Road is approximately 1,800 feet long from the gate to the scale house (page 3-9). The road is constructed 30 feet wide and surfaced with six inches of 3/4-inch gravel. Drainage is provided along the road by ditches at least 1.8 feet deep. Culverts are installed (shown on Plate 3-5) and will be protected by rock lining or concrete headwalls. Culverts are installed with a trash rack and rock headwall at inlets and riprap at outlets to prevent erosion. The road is maintained and will be maintained throughout the life of the operation. This road will be reclaimed at the end of the operation and all culverts will be removed (Appendix 3-D).

### Compliance

The Class I Haul Road meets the requirements of this section.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.160-.166 Roads: Class II-(PGL)

#### Existing Environment and Applicant's Proposal

The mine area and portal access road is approximately 2,112 feet long. The road is used primarily for access to the mine portals and other facilities. The overall grade does not exceed 10 percent.

The horizontal alignment is consistent with existing topography. The road is surfaced with four inches of three-quarter-inch gravel, and is maintained. The road will be removed upon completion of the mining operation (page 3-9, Appendix 3-D).

There are three other Class Two roads within the permit area: road to Sedimentation Pond A (430 feet long); road to coal preparation facility (600 feet long); and, bathhouse road (160 feet long). All of these roads are surfaced with four inches of three-quarter-inch gravel and will be maintained in such a manner that approved design standards are met. All of these roads will be removed upon completion of the mining operation (page 3-9 and Plate 3-1A).

Ditches are maintained. Rock or concrete headwalls are provided at inlets to all culverts, and riprap or other erosion protection is installed (Plates 3-1 and 3-5).

### Compliance

The Class Two roads at the Bear Canyon mine site meet the requirements of this section.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.170-.176 Roads: Class III-(PGL)

#### Existing Environment and Applicant's Proposal

A small pre-Law jeep trail is shown on Plate 2-4. This road is blocked off and not used. This section is not applicable.

### UMC 817.180 Other Transportation Facilities-(PGL)

#### Existing Environment and Applicant's Proposal

The coal storage yard is equipped with a system of conveyors whereby coal can be segregated according to size. The truck loadout is a conveyor system designed to load tractor-trailer trucks. Coal exits the mine via the conveyor. All conveyors and other facilities will be maintained in such a manner as to prevent damage to fish, wildlife and related environmental values (Appendix 3-A, pages 3-A4 and 3-A6).

The applicant commits to remove facilities and restore those areas to prevent damage to fish, wildlife, and associated environmental issues (page 3-68).

### Compliance

The applicant's commitment to maintain these facilities and remove them in order to prevent damage to fish, wildlife, and associated environmental values meets the requirements of this section.

The applicant is in compliance with this section.

### Stipulations

None.

### UMC 817.181 Support Facilities and Utility Installations-(PGL)

#### Existing Environment and Applicant's Proposal

Support facilities associated with the mine are described in Appendix 3-A:

- temporary scalehouse;
- coal storage facilities;
- crush facility;
- fuel storage tanks;
- shop;
- power transformer;
- principal conveyor structure;
- noncoal storage yard;
- new scalehouse;
- mine office;
- magazines; and
- electrical storage shed.

The applicant states that facilities will be maintained and the area restored in such a manner to prevent damage to fish, wildlife, and related environmental issues (page 3-68).

### Compliance

The applicant's proposal for support facilities and utility installations meets the requirements of this section.

The applicant is in compliance with this section.

### Stipulations

None.

## UMC 828.00 Prime Farmland Investigation-(HS)

### Existing Environment and Applicant's Proposal

A November 25, 1983 letter from the state soil scientist indicates there are no lands identified as prime farmland within or adjacent to the proposed permit area (page 8C-2).

### Compliance

There are no soil map units within the permit area that have been designated prime farmland by the Soil Conservation Service. The area is too steep to be considered for prime farmland. More than 10 percent of the surface layer consists of rock fragments coarser than three inches.

The applicant is in compliance with this section.

### Stipulations

None.

djh  
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