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June 29, 1994

TO: Darron Haddock, Permit Supervisor

FROM: Henry Sauer, Senior Reclamation Soils Specialist

RE: Draft Review, Tank Seam Road and Portal Amendment, Bear Canyon Mine, CO-Op Mining Company, ACT/015/025, Working File, Emery County, Utah

SYNOPSIS

The permittee has responded (received May 23, 1994) to the Division's second denial of the Tank Seam Road and Portal Amendment proposal. The Tank Seam Road and Portal Amendment proposal, as submitted, does not adequately demonstrate compliance with the Utah Coal Mining Rules.

The major deficiencies revolve around the stability analyses conducted by Dames & Moore and the resulting commitments made by the permittee.

Based on the forthcoming analysis this writer recommends that Division staff conduct an independent stability analysis for the construction and reclamation of the Tank Seam Road and Portal (TSR&P). In addition, the permittee's attempt to adhere to the design specifications dictated by the stability analyses conducted by Dames and Moore (D&M) is inadequate, difficult to comprehend, ambiguous and uninspectable.

This writer recommends that the issues enumerated below be adequately resolved prior to approval of the Tank Seam Road and Portal Amendment.

ANALYSIS

Rule Citations: **R645-301-537. Regraded Slopes & R645-301-553 Backfilling and Grading**

Discussion

The following summary is an attempt to illuminate the disparities in the stability analyses conducted by D&M. Except as noted, discussions regarding the constructed and reclaimed

cuts are not included.

The initial report regarding the construction of the TSR&P was dated September 16, 1993 (page 4 was later revised). A related report regarding the reclamation of the TSR&P was dated September 22, 1993 (page 2 was later revised). Both reports have been subsequently revised and are dated May 6, 1994 and May 10, 1994, respectively.

No additional substrate samples were taken or data generated after the initial sight visit was conducted by representative of D&M on September 2, 1993.

CONSTRUCTED FILL

The original D&M stability report (September 16, 1993) regarding the construction of the TSR&P employed a two dimensional limit equilibrium stability program (PCSTABL5). A specified failure was input for the constructed fills. A minimum safety factor of 1.4 was achieved. The model considered dry conditions only. Table 1 reports the factors ascribed and their numerical value.

TABLE 1

Soil	Slope	Bedrock	Cohesion Intercept	Unit Weight	Sat. Unit Weight	Friction Angle
Nat.	35°	6 ft.	180psf	120pcf	125pcf	32°
Fill	45°		180psf	125pcf	130pcf	36°

Please note the difference in unit weight between the natural soils and fill material. The difference indicates compaction of the fill material.

Based on the results from the PCSTABL5 program the following recommendation were fashioned (emphasis added).

i) Particles greater than **three (3) inches** in diameter should be removed from the fill.
ii) Lifts compacted in **eight (8) inch** intervals.
iii) Fill foundation preparation to include: removal of particles greater than three (3) inches in diameter; constructing a series of ten (10) feet wide terraces to key the fill material into the natural soils.
iv) Snow removed from the surface of the road and placed on

the south end of the switch backs.

In conclusion, the D&M report stated that during precipitation and runoff periods localized **minor slides and sloughs should be expected**.

Subsequent to the Divisions second review (Dated February 23, 1994) and phone conversations with the permittee (see correspondence from C. Charles Payton {D&M}, to Mr. Charles Reynolds {Co-Op} dated February 28, 1994), D&M revised page 4 of the September 16, 1993 report. All other factors remained constant. The following changes were incorporated into the original report (emphasis added).

i) Particles greater than **eighteen (18) inches** in diameter should be removed from the fill.
ii) Lifts compacted in **eighteen (18) inch intervals**.
iii) "Rock fragments incorporated in the fill should be placed in a manner to minimize void space".

In conclusion the D&M report again stated that during precipitation and runoff periods localized **minor slides and sloughs should be expected**.

In a report dated May 6, 1994 D&M incorporated the changes made above (revision of page 4). All other factors involved with and conclusions made in the original stability analysis remained constant except as noted below. The following recommendation were added (emphasis added).

i) Fill foundation preparation to include: removal of **loose cobbles and boulders**.
ii) Cobble and boulder sized rock fragments **securely embedded into existing slopes** may be left in-place provided adequate compaction is achieved adjacent to these fragments.

RECLAIMED FILL

The original D&M stability report (September 22, 1993) regarding the reclamation of the TSR&P employed a two dimensional limit equilibrium stability program (PCSTABL5). The cut slope evaluated from the September 16, 1993 report was used as a model for the reclaimed slope. Only circular failure surfaces were evaluated. A minimum safety factor of 1.8 was achieved. The model considered dry conditions only. Table 2 reports the factors ascribed and their numerical value.

TABLE 2

Soil	Slope	Bedrock	Cohesion Intercept	Unit Weight	Sat. Unit Weight	Friction Angle
Nat.	35°	6 ft.	180psf	120pcf	125pcf	32°
Fill	45°		180psf	125pcf	130pcf	36°
Bedrock			500pcf	130pcf	140pcf	38°

Based on the results from the PCSTABL5 program the following recommendation were fashioned (emphasis added).

i) Particles greater than **three (3) inches** in diameter should be removed from the fill.
ii) The fill material placed in the road cuts should be compacted in **eight (8) inch lift** intervals.
iii) **Cobble and boulder size rock fragments could be placed on the reclaimed ground surface.**

Subsequent to the Divisions second review (Dated February 23, 1994) and phone conversations with the permittee (see correspondence from C. Charles Payton {D&M}, to Mr. Charles Reynolds {Co-Op} dated February 28, 1994), D&M revised page 2 of the September 22, 1993 report. All other factors remained constant. The following changes were incorporated into the original report (emphasis added).

i) Particles greater than **eighteen (18) inches** in diameter should be removed from the fill.
ii) The fill material placed in the road cuts should be compacted in **eighteen (18) inch** lift intervals.

In a report dated May 10, 1994 D&M incorporated the changes made above (revision of page 2). All other factors involved with and conclusions made in the original stability analysis remain constant except as noted below. The following recommendation were added (emphasis added).

i) All rock fragments in excess of 18 inches should be **removed from the initial lifts of the fill**.
ii) Boulder size rock fragments in excess of 18 inches could be incorporated into the **upper lifts of the fill** provided the majority of the rock fragments are well embedded in the fill and the material adjacent to these rock fragments is properly compacted.

In and of themselves the reports described above are difficult to logically justify. The permittee's commitments relative to design specification for the construction and reclamation of the TSR&P dilute the design specification incorporated into the D&M reports even further. In this writers opinion they are ambiguous, grant complete latitude and will be impossible to verify by inspection. The following commitments have been taken, verbatim, from the TSR&P proposal (emphasis added).

Page 3H-48 "Rock fragments larger than 18 inches which are disturbed will be embedded into the surface of the fill as described in the slope stability analysis on page 4H-48."

Page 3H-6 "The base of the fill area will be prepared according to the recommendations on Page 3H-48 by removing all vegetation and rock fragments larger than 18 inches which are not embedded into the natural ground and/or stable, and any cobble or boulder size rocks which are positioned so as to interfere with compaction activities."

Page 3H-6 & 3H-7 "The initial cut to reach the base of the fill area will act as a series of terraces with which the fill material can be keyed into the natural soils, as recommended on page 3H-48. As the fill progresses up the slope, removal of rock fragments and vegetation will continue on the slopes above the fill. Rock fragments less than 18 inches will be incorporated into the as the are removed. Rock fragments larger than 18 inches will be incorporated into the surface of the fill **and** will be embedded into the fill material to aid in surface stabilization.

Page 3D-7 "...snow will be stored against the cut slope of the road along the ditches..."

In addition to the above anomalies, on page 3H-3, the permittee states that fill material (along the Tank Seam Road) is restricted to no more than 10 feet down slope from the road. This directly contradicts the cross section found on pages 3H-11 thru 3H-43. The following cross section depict fills greater the 10 feet: 3+00; 11+00; 15+00; 16+00; and 25+00.

In conclusion, the permittee's proposal to construct and reclaim the TSR&P does not comply with the Utah Coal Mining Rules.

Rule Citation: **R645-301-242. Soil Redistribution & R645-301-244. Soil Stabilization**

Discussion

The permittee has not adequately demonstrated that redistribution and protection of the soils resource on the regraded reclamation surface is feasible. On page 3L-14 the permittee states that reclamation will involve restoring road and pad areas to premining cross sections. In the May 10, 1993 D&M report the internal friction angle of redistributed scarified topsoil was estimated at 30 degrees. The origin of this estimate is unknown. It may be reasonably assumed that the internal friction angle equates to the angle of repose for the material in question. The proposed reclaimed slopes greatly exceed 30 degree slopes.

In conclusion, redistributed topsoil will not adhere to the regraded slopes and therefore does not comply with the Utah Coal Mining Rules.

FINDING/RECOMMENDATION

The Tank Seam Road and Portal Amendment proposal, as submitted, does not adequately demonstrate compliance with the Utah Coal Mining Rules.

Based on the aforementioned analysis this writer recommends that Division staff conduct an independent stability analysis for the construction and reclamation of the Tank Seam Road and Portal (TSR&P).

This writer recommends that the issues enumerated above be adequately addressed prior to approval of the Tank Seam Road and Portal Amendment.

CC: Coal Staff