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State of Utah
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DIVISION OF OIL, GAS AND MINING

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May 16, 2001

TO: Internal File

THRU: Dave W. Darby, Team Lead

FROM: Priscilla W. Burton, Soils Reclamation Specialist

RE: Soils Technical Analysis for Lila Canyon, UtahAmerican Energy, Inc., Horse Canyon Mine, C/007/013-SR98(1)-6

SUMMARY:

The application reviewed was received on April 30, 2001. The mine facilities encompass 48.23 acres. There will be 52,129 cubic yards of topsoil salvaged from 25.06 acres (an average salvage depth of 15.6 inches). There will be approximately 20 acres within the mine facilities area that will be off-limits and undisturbed.

In accordance with R645-301-232.200, since the A horizon is less than six inches deep, the topsoil will be both the A and B horizon soils. Depths of salvage range from 6 to18 inches over the site (see Available Soil Resources table in Section 232.100). Large stones, 36" or less, are considered part of the soil layer and are included in the topsoil volume estimates.

In accordance with R645-301-232.500, the Division finds that the B horizon and C horizons must be removed to a depth of 48 inches from the SBG and DSH soil map units and a depth of 30 inches from VBJ soils. The Division will allow this subsoil material to be stored within the operations pad where it will be surfaced with asphalt, concrete or gravel underlain by an impervious membrane.

Also, in accordance with R645-301-232.500, the Division requires that a certified soil specialist will be on site during any soil salvage, construction and reclamation activity and that pedestals or other survey methods will be utilized to ensure subsoil recovery from Soil Map Units SBJ, DSH, and VBJ during pad development and that volumes and locations of the subsoils as they are stored in the pad will be provided with As-Built information.

TECHNICAL ANALYSIS:

ENVIRONMENTAL RESOURCE INFORMATION

CLIMATOLOGICAL RESOURCE INFORMATION

Regulatory Reference: 30 CFR 783.18; R645-301-724.

Analysis:

Table 7-1A in Section 724.413 shows the average maximum and minimum temperatures by month over thirty years (1958 – 88) for the Sunnyside area. Table 7-1A also includes average annual precipitation by month and annually (13.69 inches annually) and average total snowfall by month and annually (36.5 inches annually).

Prevailing winds as reported in Section 742.412 are from west to east at a speed of 2.7 knots or 3.1 mph (knots x 1.1 = mph). Tom Ordh, meteorologist with the Division of Air Quality, Department of Environmental Quality indicated that the open areas such as Castle Valley would have a wind speed of six miles per hour and canyon winds would be faster, perhaps ten miles per hour.[1] Mr. Ordh indicated that the prevailing winds along the canyon would flow off the plateau. Down in the canyon the wind would be terrain driven. Ordinarily, the winds are upslope in the morning and downslope in the afternoon.

Findings:

Information provided in the proposed amendment is considered adequate to meet the requirement of this section, however a weather station with a wind gauge is recommended.

SOILS RESOURCE INFORMATION

Regulatory Reference: 30 CFR Sec. 783.21, 817.200(c); R645-301-220, -301-411.

Analysis:

Chapter 2, Soils, Sections 210 through 224, discusses the soil resources within the proposed Lila Canyon Mine. Elevation of the proposed mine facilities is from 5,800 to 6,500 feet. The average annual precipitation is 12 - 14 inches with the majority of the precipitation coming in Fall, Winter and early Spring. The vegetation is primarily pinyon-juniper and sage/grass. Soil productivity of existing soils was determined by Mr. George Cook from the Natural Resources Conservation Services, and results are shown in Appendix 3-7.

1 Telephone conversation on 5/17/01 with Tom Ordh, meteorologist, Division of Air Quality, Department of Environmental Quality.

The U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS) is currently compiling information for the Emery County Order III soil survey. Relevant portions of this unpublished Order III soil survey are included in Appendix 2-2, such as typical soil pedon descriptions for the four soil map units identified within the mine surface facilities area. The regional Soil Map (Plate 2-1) accompanies this appendix.

An Order 1 soil survey was performed in August 1998 by Mr. Daniel Larsen, Soil Scientist, Environmental Industrial Services. His report is located in Appendix 2-3. (An addendum attached to Appendix 2-3 is for the proposed fan portal site soils.) The survey contains soil descriptions, soil pedon descriptions, soil salvage suitability analysis, laboratory soil testing data, field soil profile descriptions, soil and landscape photographs, a soils map, and a salvageable soils map. All mapping and soil survey work were performed according to the standards of the National Cooperative Soil Survey. Each soil was classified according to current, unpublished NRCS soil taxonomy, and correlated to a specific soil series. The RBT soil unit references the Travessilla family complex; however, the Travessilla family has been revised by NRCS to the Atchee Series. Six soil map units were identified:

- DSH Strych fine sandy loam variant, 3 to 8 % slopes
- SBG Strych **bouldery** fine sandy loam, 5 to 15 % slopes
- VBJ Strych **very bouldery** fine sandy loam, 5 to 15 % slopes
- XBS Strych **extremely bouldery** sandy loam, 10 to 45 % slopes
- RBL Rubbleland-Strych-Gerst complex, 20 to 70 % slopes
- RBT Rock outcrop - Travessilla family complex (Atchee Series)

From the soil description sheet and Plate 2-2, the Division notes that the canyon bench holds deep soils, stabilized from wind erosion by a surface layer of cryptograms, dried plant litter, boulders and live plant cover. The A horizon layer varies due to position on the slope from 3 inches (at LC 1 through 3) to 26 inches deep (at LC 4). The B horizon stretches from 31 - 60 inches in the profile and is the zone of accumulation of carbonates. The deepest soils are pockets of colluvium from the cliffs above. The soils are underlain by sandstone bedrock, except at the location of the fan portal where shale and burned coal covers the sandstone rock layer. Shale was also encountered at LC 3 and LC 5 (see discussion of SAR and EC below).

Soils are subject to extremes of temperature. On August 6, 1998 at 11:30 a.m., the temperature of the bare soil at location LC4 was 130 °F. At a depth of 20 inches, the temperature was 65 °F. These soils are in a mesic temperature regime (mean annual soil temperature at 50 cm is < 59 °F) as estimated from the mean annual air temperature reported in Section 220 of 46 °F. Mr. Larsen has judged the moisture regime to be on the aridic side of ustic, which is to say that at a depth of 20 inches (50 cm), there is a difference in soil temperature greater than 9 °F between summer and winter and the soil moisture control section (from 12 to 35 inches deep for sandy soil) is dry for 90 or more cumulative days in most years, but it is not dry in all parts for more than half the time that the soil temperature is above 9 °F at a depth of 50 cm.[2]

[2]Soil Survey Staff. 1990. Keys to Soil Taxonomy, fourth edition. SMSS technical monograph no.6. Blacksburg, Virginia. p 33 - 35.

Soil Characterization

Soil pedons descriptions were recorded on standard NRCS forms and are provided in Appendix D within Appendix 2-3. The soil horizons were sampled and analyzed according to the State of Utah Division of Oil, Gas and Mining (DOGM) guidelines for topsoil and overburden[3]. Total nitrogen and available phosphorus were not analyzed at this time; these parameters can be tested at reclamation. Soil texture, rock fragment content (% by volume), and Munsell color were determined in the field. Generalized soil properties, including percent surface stones and boulders, are summarized in Table 3.21, Properties of Soil Map Units on page 9 of Appendix 2-3. Soil sampling locations are shown on Plate 2-2, Detailed Soils Map of the Mine Facilities Site.

Soil samples were sent to Inter-Mountain Laboratories, Inc. for analysis. Appendix C of Appendix 2-3 contains the laboratory data sheets for all analysis on the 22 samples and duplicate analysis. Overall, soil laboratory test results show a good rating for soil materials (Appendix B of Appendix 2-3), except as noted below:

- **pH** is near neutral in the upper horizons, increasing and approaching pH 8.0 down the profile. At one sample location, LC3, pH 8.0 was exceeded at a depth of 24 - 48 inches. At this depth, LC3 soil was rated poor for a pH of 8.6.

- **Electrical Conductivity** and **SAR** were below 1.0, except in samples LC3 from 48-55"deep and LC5 from 40-58"deep. For sample LC3 48-55", the SAR was 18, Exchangeable Sodium Percentage = 22%, and EC of 2.48 mmhos/cm (and pH = 7.3). Since the SAR is greater than 15, soil materials below 48 inches are considered unacceptable. For sample LC5 40-58", the SAR measured 15 with an EC value of 8.89 mmhos/cm (and pH 8.2). The SAR is rated unacceptable for coarse textured soils and the EC is rated poor; therefore, soil materials below 40 inches are considered marginal at best. Sample LC10 0-4" had an EC of 2.58 mmhos/cm which has a rating of fair.

- **Available water holding capacity** values fell predominantly into the "fair" range after correction for coarse fragments. Notable exceptions to the fair category were LC1 below 10 inches, LC11 and LC12 entire profiles, LC5 below three inches that were all poor.

The **percent rock content** within the proposed facilities area is the main deterrent for soil suitability based on the current Division Guidelines (citation previously noted). Appendix 2-3 states that native soils with a higher rock content than the current Guidelines allow, can be salvaged.

The Division encourages salvaging native soils with intrinsic rock content. Using these inherently rocky soils should enhance reclamation success by providing an environment similar to native conditions. Rock content provides for a more stable reclaimed surface, aids in water

[3]Leatherwood, J., and Duce, D., 1988. Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining. State of Utah Department of Natural Resources, Division of Oil, Gas and Mining.

harvesting and water holding capacity of interstitial soils, and creates wildlife habitat and niches on the surface were surface boulders and larger cobble sized rocks are placed. However, care must be taken to avoid higher rock content in surface soils than is present in the undisturbed surface. **Every effort should be made to minimize mixing the deeper subsoils containing extremely high rock content with the surface soils and shallow subsoils containing lower amounts of rock.**

Organic matter content is relatively low in these soils. Generally, the surface soils ranged between 1.0 to 1.5 percent organic matter and the subsoils were about 0.5 percent. A calcic horizon was verified in soil pedons LC1, LC5 and LC6 with $CaCO_3$ ranging between 20 to 21 percent. Pedons LC3 and LC4 have some $CaCO_3$ accumulation in the subsoil but is less than the 15 percent needed to be classified as a calcic horizon. Below the calcic horizon, at depths of 30 inches, the analytical results for these samples show the soluble calcium decreasing and magnesium increasing with depth. (Usually, the reverse is the case where calcium exceeds magnesium in the soil solution, because calcium is retained much more readily than magnesium on soil colloid exchange sites.) But in this case, calcium is being removed from the soil solution by calcium carbonate precipitation in the calcic layer. As a result, soluble magnesium exceeds soluble calcium in the lower soil horizons.

In accordance with R645-301-232.200, since the A horizon is less than six inches deep, the topsoil recovered will be a mix of both the A and B horizon soils. Depths of salvage range from 6 to18 inches over the site (see Available Soil Resources table in Section 232.100). Large stones, 36" or less, are considered part of the soil layer and are included in the topsoil volume estimates.

Substitute Topsoil

The PAP does not propose any borrow material as a source for substitute topsoil.

Findings:

Information provided in the application considered adequate to meet the requirements of this section of the regulations.

ALLUVIAL VALLEY FLOORS

Regulatory Reference: 30 CFR 785.19; 30 CFR 822; R645-302-320.

Analysis:

Alluvial valley floor determination

The Lila Canyon Mine is situated in the western Book Cliffs escarpment. Steeply dipping joints transmit groundwater from the surface (Section 6.5.3.5) as illustrated in Figure VI-5. Water inflow associated with fault or fracture systems are possible, but not expected to be

significant (Section 6.6.1). The surface expressions of the faulting are grabens and draws. Numerous small springs and seeps exist within and adjacent to the permit area (Section 731.220). Appendix 7-3 Probable Hydrologic Consequences of mining concludes that the proposed mine is not expected to cause "contamination, diminution or interruption" of underground or surface sources of water.

The Sunnyside Sandstone contains the two seams of interest: Upper Sunnyside and Lower Sunnyside seams. "The Sunnyside Sandstone is known to transmit groundwater in the Sunnyside area and that portion of the sandstone which underlies the Lower Sunnyside seam is occasionally considered to be a potential aquifer" (Section 6.4.1). Geneva Mine records indicate that the mine was dry until the Sunnyside Fault was intercepted. This suggests that as mining progresses down dip, "substantial" water may be encountered. It is thought that the water encountered is isolated from recharge (Section 6.6.3.1).

The Mancos shale forms the slopes below the base of the Book Cliffs, overlain in places by pediment deposits (Section 6.4.1 and Plate 6-1). In the permit area, ephemeral drainages flow in response to snow melt and precipitation events (Section 731.220 and Plate 7-1). Coleman Wash receives the Lila Canyon drainage. Grassy Wash and Marsh Flat Wash collect the flow from the Mancos slopes further south. Little Park Wash channels the flow on the plateau above. There is no valley holding a stream in the permit area (Section 724.700).

The Order III Survey (Plate 2-1) of the mine permit area soils indicates that the soils on the plateau in Little Park Wash are GNA or Neto Fine Sandy Loam (Section 222.200). No further information on this soil is available in the application. Plate 3-2 Vegetation indicates that the dominant species growing on the plateau in the vicinity of Little Park Wash are Atriplex, Artemesia and Elymus.[4] None of which are wetland species. Little Park Wash falls within the Little Park grazing allotment (Plate 4-2). The land use is unimproved rangeland and wildlife habitat.

Based on the information provided in the application, in accordance with R645-302-321.100, the Division finds that there is no probable existence of an alluvial valley floor.

Findings:

Information provided in the application considered adequate to meet the requirements of this section of the regulations.

[4] Cooper, David J. 1989. A Handbook of Wetland Plants of the Rocky Mountain Region. EPA Region VIII.

PRIME FARMLAND

Regulatory Reference: 30 CFR 785.16, 823; R645-301-221, -302-270.

Analysis:

A reconnaissance investigation was performed by the Natural Resources Conservation Service (NRCS) on June 8, 1998. As there is no developed irrigation system and the soils are arid, it was determined that no Prime Farmland nor farmland of statewide importance existed within the proposed Lila Canyon facilities and coal lease areas. The prime farmland determination letter is included in Appendix 2-1.

Findings:

Information provided in the application considered adequate to meet the requirements of this section of the regulations.

OPERATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

Analysis:

Chapter 2, Soils, Sections 230 through 234, discusses the soils operation plan for the proposed Lila Canyon Mine. Topsoil salvage and stockpiling and subsoil salvage and protection are reviewed under the following headings in this Analysis:

- Topsoil and Subsoil Removal
- Topsoil Substitutes and Supplements
- Topsoil Storage

Topsoil and Subsoil Removal

Available Soil Resources

The 1998 Order 1 soil survey, Appendix 2-3, identifies 157,600 cubic yards of available soil for salvage from the 48 acre disturbance (average salvage depth is 24 inches). This estimate is based on the entire disturbance area. However approximately 20 acres of ground within the perimeter of the mine facilities area will not be disturbed (48.23 acres of potential disturbance minus the 28.11 acres of ground in bonding calculation = 20 acres.) Plate 2-3, Soil Salvage and Replacement, shows these undisturbed islands within the disturbed area boundary.

The Available Soil Resources Table, Section 232.100 page 11, also identifies a **potential soil salvage** volume of 156,141 cubic yards from a 48.23 acre disturbance area (average salvage depth of 24 inches). The same table shows **actual topsoil salvage** as 52, 129 cubic yards from 25.06 acres for an average salvage depth of 15.6 inches.

Soil salvage areas are broken down by soil survey map units and are identified on the Salvageable Soils Map, Appendix A2 of Appendix 2-3, Order 1 Soil Survey. The Salvageable Soils Map shows each soil survey map unit, soil description sites, and potential salvage depths.

Topsoil Salvage Practices

In accordance with R645-301-232.300, since the A horizon is less than six inches deep, the upper 6 to 12 inches that consist of both the A and B horizon materials will be salvaged and stored as topsoil. Therefore, the MRP states that **actual topsoil salvage** will be between 6 and 18 inches (see Available Soil Resources table in Section 232.100). Large stones, 36" or less, are considered part of the soil layer and are included in the topsoil volume estimates.

Plate 2-3, Soil Salvage and Replacement, shows salvage depth in each map unit. A maximum of 18 inches will be salvaged or down to shale, whichever is less. The Available Soil Resources table in Section 232.100 shows **actual topsoil salvage** as 52,129 cubic yards from 25.06 acres for an average salvage depth of 15.6 inches. The specifics of that table have been excerpted and printed below.

Actual Soil Salvage Volumes

Actual Soil Salvage Areas	Soil Depth (inches)	Acres	Soil Volume (yd^3)
Topsoil* SBG	18	11.12	26,910
Topsoil* VBJ	18	4.46	10,793
Topsoil* XBS	12	4.77	7,698
Topsoil* DSH	18	1.39	3,364
Topsoil* RBL	8	2.56	2,753
Topsoil* RBT	6	0.76	613
Total		25.06	52,129

* A horizons < 6 inches; topsoil defined as top 18 inches.

Topsoil salvage at the proposed exhaust fan site located near the coal outcrop will be stored in a berm in the immediate vicinity of the fan installation (Plate 5-2). The proposed fan site is at an elevation of about 6400 feet and is located on a narrow bench, with a slope of about 40 to 45%. The soil survey identifies an approximate salvage depth of 6 inches for the RBT

soils. The approximately 800 cubic yards of topsoil salvaged and stored in the berm will be protected by seeding and a silt fence (Section 233.100).

Topsoil salvage will occur under the supervision of a soil scientist. Topsoil will be removed from excavation areas and stockpiled prior to construction activity. Any vegetation and boulders that might interfere with topsoil salvage will be removed prior to topsoil removal. According to Section 232.100, boulders of approximately three feet in diameter and larger will be separated from the topsoil. The applicant estimates there are about 10,000 cubic yards of these boulders above ground, and this volume is in addition to the topsoil volumes. These will be piled or placed at appropriate locations, such as adjacent to roads and pads, but no attempt will be made to collect them into common piles. Rocks less than three feet in diameter will be stored with the topsoil.

Topsoil removal sequence will start from the lower elevations of the site and proceed up slope. Surface disturbance will not occur on the acreage identified as "Undisturbed Area." i.e. Plate 2-3, Soil Salvage and Replacement, shows three undisturbed islands within the disturbed area boundary. Plate 2-3 shows an access road to and around the topsoil. Soil on this road will be salvaged and stockpiled in a berm around the topsoil pile as stated in Section 232.100 and referred to as a footnote in the Table of Available Soil Resources Section 232.100. As per conversations with Tom Paluso in March, the Division understands that the top 18 inches of soil from the VBJ soils will be salvaged and used to form berms around the perimeter of the topsoil storage yard. A sign will be posted on this berm to indicate that it is composed of topsoil.

Subsoil Segregation and Salvage Practices

The MRP states that subsoil deeper than18 inches from Soil Map Units SBG, DSH, and VBJ will not be salvaged and will remain for use as construction fill during grading activities. Although these subsoils will be used as fill, they will be needed during reclamation to re-establish rooting depth potential. The ability of the soil to store moisture from one year to the next in the upper eight feet has been understood for a long time.[5] Studies of plant phenology have clearly shown that plants in arid areas use soil water from increasing depths as the growing season continues, and if there is inadequate rooting depth, production and vegetative cover will decrease.[6] A good indication of the depth of soil needed is the rooting depth of the plants currently growing on the site, as reported in the Order I Survey and excerpted into the table below.

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[5] Merrill, Lewis A. 1910. A Report of Seven Years' Investigation of Dry Farming Methods. Utah Agricultural College Experiment Station. Bulletin No. 112.

[6] Baker, Paul B. 1988. Nutrient and Water Relationships between Crested Wheatgrass and Two Shrub Species. M.S. Thesis. Utah State University. Logan.

Comparison of Potential Soil Salvage Depth, Rooting Depth and Subsurface Rock Content

Map Unit	Potential Salvageable Soil Layer (inches)	Depth of Fine Roots* (inches)	Subsurface Rock Within Soil Salvage Layer (percent)
SBG	48	48	10 to 65
VBJ	30	18	5 to 65
XBS	12	12	25 to 40
DSH	40	26	<5 to 45
RBL	8	not listed	30
RBT	6	6	35

*Only those soils having fine roots described with a frequency of "many" or "common" were included

The soils have a sandy loam texture, which correlates to an a available water holding capacity (AWC) of 0.11 - 0.13 according to the USDA, 1970.[7] Laboratory measurement of the AWC agrees with this approximation as most of the soils were rated good before adjusting for coarse fragment content (Appendix C of Appendix 2-3). By Division calculations, the rock fragment content at a depth of 18 - 48 inches averaged about 43 percent for the SBG, VBJ and DSH soils combined. Therefore, the reduction in AWC would be approximately 57% of that estimated by texture.[8] The good AWC value of 0.13 would fall into the fair range of 0.07.

The implications are that because rock content of the soil reduces the Available Water Holding Capacity, the soil must be suitable for plant growth for a depth of at least 48 inches for the roots to scavenge enough water during the hot summer months.

In the case of the SBG, VBJ and DSH soils, the salvage of 18 inches of topsoil will not include critical subsoils required for rooting depth. Therefore, in accordance with R645-301-232.500, the Division finds that the B horizon and C horizons must be removed to a depth of 48 inches from the SBG and DSH soil map units and a depth of 30 inches from VBJ soils. The subsoils will be segregated, stockpiled, and redistributed as subsoil, because such subsoil layers are necessary to achieve the rooting depth necessary to comply with the re-vegetation requirements of R645-301-353 through R645-301-357. The Division will allow this subsoil material to be stored within the operations pad, as described in Section 232.100 where it will be protected by a surface of asphalt, concrete or gravel underlain by an impervious membrane (Section 232.500). Furthermore, contamination of this subsoil with shale will not be permitted (Section 232.100, page 12 and Section 232.500, page 15). Within the RBL and RBT soil areas, Mancos Shale is encountered within 6 - 8 inches. In no case will the Mancos Shale be salvaged

[7]U.S. Forest Service. South West Region, March 1970.

[8] $AWC_{adj.}$ = AWC (1 - % coarse fragment).

with the overlying soils (Section 232.300 and 232.500). All practical precautions will be taken during design, construction, and reclamation to assure that shales or shale material will not be pushed on top of or mixed with un-salvaged subsoils (Section 232.100, page 12 and Section 232.500, page 15).

Also, in accordance with R645-301-232.500, the Division requires that a certified soil scientist will be on site during any pad construction and reclamation and that pedestals or other survey methods will be utilized to ensure subsoil recovery from Soil Map Units SBJ, DSH, and VBJ during pad development (for comparison with the Salvageable Soils Map Appendix A-2) and that volumes and locations of the subsoils as they are stored in the pad will be provided with As-Built drawings (Section 232.500).

Adverse Conditions

Section 232.710 says soil will not be removed from the area between the rock slope and the ROM stockpile due to rockiness and steep slopes. For the same reasons, disturbance will be minimal in this location, with only two bents planned to hold the conveyor. The Division agrees that leaving the soil on the rocky, steep slope is in accordance with R645-232.400.

Measures to protect the undisturbed soil will include:

- Jersey barriers along the perimeter of the ROM stockpile to prevent encroachment of coal onto the undisturbed ground (Section 232.710).
- Quarterly inspections of the undisturbed area (Section 234.220).
- Periodic cleaning of the undisturbed area soil, if the accumulation of coal fines exceeds one inch (Section 232.710 and 234.200).
- A covered conveyor and an enclosed crusher (Plate 5-8).

Additional measures could include a conveyor pan (Section 232.710).

Prevailing winds as reported in Section 724.412 are from west to east at a speed of 2.7 knots or 3.1 mph (knots x 1.1 = mph). Tom Ordh, meteorologist with the Division of Air Quality, Department of Environmental Quality indicated that the open areas such as Castle Valley would have a wind speed of six miles per hour and canyon winds would be faster, perhaps ten miles per hour.[9] Mr. Ordh indicated that the prevailing winds along the canyon would flow off the plateau. Down in the canyon the wind would be terrain driven. Ordinarily, the winds are upslope in the morning and downslope in the afternoon.

Topsoil Substitutes and Supplements

Sections 224, 231.200, 232.720, 233, and 233.100 thru 233.400 state that no topsoil borrow or substitute topsoil is needed.

9 Telephone conversation on 5/17/01 with Tom Ordh, meteorologist, Division of Air Quality, Department of Environmental Quality.

Refuse Pile

Plates 5-2 and 7-5 show rock storage areas north of the slope, rock and refuse storage area. As discussed in Section 232.100 (page 12) of the application, boulders may be stockpiled in these locations. These sites are not coal refuse disposal areas.

There is a 3.28 acre refuse disposal area within the mine facilities perimeter, which is designated to hold both rock slope waste and refuse. The portion of the disposal site reserved for refuse is shown on Figure 1, Appendix 5-7 is in the DSH soil mapping unit. The Available Soil Resources table in Section 232.100 indicates the potential salvage depth in this unit is 40 inches. According to the plan for the refuse pile, 18 inches of soil would be salvaged from the entire refuse pile area, and an additional 30 inches of subsoil would be moved to the side to facilitate burial of the refuse. Subsoils should not be excavated below 48 inches in the DSH soil mapping unit, as there are restrictions to salvage due to high rock contents and salt levels. For this reason, Section 232.500 indicates that pedestals will be utilized during construction to verify soil removal depths.

Topsoil Storage

The topsoil stockpile will be located and protected to avoid contamination and unacceptable compaction. The plan further states that the stockpile surface will be left rough and irregular to increase moisture retention during rainfall and snow melt. Seeding will be done following topsoil placement and after September 15. A silt fence or berm/ditch configuration will be used at the perimeter of the pile to protect against soil loss from water erosion.

Topsoil storage is addressed in several locations in the MRP: Section 231.100 (soil removal); Section 231.400 (pile construction); Section 232.100 and Figure 1 Appendix 5-7 (pile dimensions and storage capacity); Plate 5-2 (location and cross sections); Section 234.230 (mulching and seeding); Table 3-4/3.5 Interim and Final Reclamation Seed Mix (stockpile seed mix).

Topsoil will be salvaged from fan portal disturbance after the break out occurs. This topsoil will be placed downslope of the fan site in a berm around the site (Section 232.700 and Plate 5-2). This topsoil berm will receive the same protection afforded other topsoil stored on the site. A sign will be posted identifying the berm as topsoil. It will be seeded and protected from erosion. A silt fence will be utilized to prevent the topsoil from leaving the site.

Findings:

The MRP states that subsoil deeper than18 inches from Soil Map Units SBG, DSH, and VBJ will not be salvaged and will remain for use as construction fill during grading activities. Although these subsoils will be used as fill, they will be needed during reclamation to reestablish rooting depth potential.

Therefore, in accordance with R645-301-232.500, the Division finds that the B horizon and C horizons must be removed to a depth of 48 inches from the SBG and DSH soil map units

and a depth of 30 inches from VBJ soils. The subsoils will be segregated, stockpiled, and redistributed as subsoil, because such subsoil layers are necessary to achieve the rooting depth necessary to comply with the re-vegetation requirements of R645-301-353 through R645-301-357. The Division will allow this subsoil material to be stored within the operations pad, as described in Section 232.100, where it will be protected by a surface of asphalt, concrete or gravel underlain by an impervious membrane (Section 232.500). Furthermore, contamination of this subsoil with shale will not be permitted (Section 232.100, page 12 and Section 232.500, page 15). Within the RBL and RBT soil areas, Mancos Shale is encountered within 6 - 8 inches. In no case will the Mancos Shale be salvaged with the overlying soils (Section 232.300 and 232.500). All practical precautions will be taken during design, construction, and reclamation to assure that shales or shale material will not be pushed on top of or mixed with un-salvaged subsoils (Section 232.100, page 12 and Section 232.500, page 15).

Also, in accordance with R645-301-232.500, the Division requires that a certified soil specialist will be on site during any pad construction and reclamation and that pedestals or other survey methods will be utilized to ensure subsoil recovery from Soil Map Units SBJ, DSH, and VBJ during pad development (for comparison with the salvageable Soils Map Appendix A-2) and that volumes and locations of the subsoils as they are stored in the pad will be provided with As-Built drawings (Section 232.500).

Information provided in the application is considered adequate to meet the requirements of this section of the regulations.

SPOIL AND WASTE MATERIALS

Regulatory Reference: 30 CFR Sec. 701.5, 784.19, 784.25, 817.71, 817.72, 817.73, 817.74, 817.81, 817.83, 817.84, 817.87, 817.89; R645-100-200, -301-210, -301-211, -301-212, -301-412, -301-512, -301-513, -301-514, -301-521, -301-526, -301-528, -301-535, -301-536, -301-542, -301-553, -301-745, -301-746, -301-747.

Analysis:

Refuse piles

Under the definitions in R645-100, the material generated in excavating the rock slopes is considered underground development waste (coal mine waste) that must be disposed of in a refuse pile. The rock in contact with the coal is characterized as fine-to-medium-grained sandstone in the southern portion of the permit area and carbonaceous mudstone and siltstone in the northern portion of the permit area and overlying the lower coal seam in the southern area (Section 6.5.5.1 of the MRP).

In addition to the rock slope material, coal processing waste and other underground development waste (Section 6.6.3.2) will be disposed of in the refuse pile. Appendix 5-7 indicates that 25,000 CY of refuse will be generated. This refuse will be examined and tested as necessary (page 82 Section 536.) Three samples will be taken of the initial rock slope development excavation. These samples will be analyzed according to Table 2 of Appendix 5-7.

Testing of mining refuse will occur every 10,000 tons and follow the parameters in Table 2 of Appendix 5-7.

Figure 1 Appendix 5-7 differentiates between structural fill (rock slope waste) and refuse. The final burial location for both is approximately 3.28 acres[10]. As discussed above, approximately 25,000 cubic yards of rock slope waste will be stored in this location. The area designated for refuse is approximately two acres (300' x 300') and can hold 19,500 cubic yards.

The MRP plans for four feet of cover over the refuse pile (section 232.500 and Appendix 5-7.) The procedure for the creation of the structural fill is as follows:

1. Topsoil will be salvaged to a depth of 18 inches and stored in the stockpile.
2. The subsoil will be excavated an additional 30 inches and pushed to the side.
3. Refuse material will be placed in the excavated four foot pit created from the subsoil removal (Section 232.500 and Appendix 5-7).
4. Once the pit is filled, the subsoil will be placed over the top of the refuse.
5. A second pit will be excavated in the same manner adjacent to the previous pit.

The topsoil removal and storage, subsoil removal, refuse placement, and subsoil replacement procedures will be repeated, as additional refuse disposal is needed.

This process is shown in Figure 2, Appendix 5-7. From this figure, one can see that although the excavation is only 4' deep, refuse will be placed 15 to 19 feet deep and that refuse placement will actually exceed the initial surface elevation to create a mound which is level on its surface. Figure 2, Appendix 5-7 shows cross sections and a profile of the rock slope/refuse pile. The perimeter of the pile is graded at a 1 :10 slope into the surrounding terrain.

Finding:

Information provided in the application is considered adequate to meet the requirements of this section of the regulations.

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

[10] As per telephone conversation with Tom Paluso, Engineer with Industrial Environmental Services on 5/22/01, there is 1.35 acres designated for rock slope waste and 1.93 acres designated for refuse.

Analysis:

Acid and toxic-forming materials

Appendix 5-7 indicates that 25,000 CY of refuse will be generated by the development of the mine entry. This refuse will be examined and tested as necessary (page 82 Section 536.) Three samples will be taken of the initial rock slope development excavation. These samples will be analyzed according to Table 2 of Appendix 5-7. Testing of mining refuse will occur every 10,000 tons and follow the parameters in Table 2 of Appendix 5-7. Total sulfur in the coal is expected to be 1.1 to 1.3%, one-third of which is pyritic sulfur (Section 6.5.4.2). Analyses are provided in Appendix 6-2.

Finding:

Information provided in the application is considered adequate to meet the requirements of this section of the regulations.

RECLAMATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-240.

Analysis:

Soil Redistribution

Disturbed areas will be restored to approximate original contour (AOC) using pad material (Section 241).

In Section 232.500, the application says subsoil ranging in thickness from 12 to 30 inches from cutslope sites will be used as fill material for site development and replaced in an approximate original sequence during reclamation. Subsoil from Soil Map Units SBJ, DSH, and VBJ used as construction fill will be identified in As Built maps and used appropriately during reclamation as root zone subsoils (as discussed in Sections 241, 232.100 and 232.500).

Section 241 says that after AOC is achieved, the disturbed surface will be scarified (where practical), prior to soil redistribution. Rippers mounted on the rear of a dozer will break through the soil layers to a minimum depth of 16 inches.

The grading sequence is itemized in Section 241 as follows:

1. Grade all areas where no subsoil is being stored.
2. Replace subsoil on areas from which it was moved.

3. Rip the subsoil to a minimum of 16 inches.
4. Replace topsoil.
5. Replace boulders.
6. Gouge the topsoil.

Soil replacement volumes are shown below in the table below. Soil replacement includes topsoil placement and 4 feet of soil cover over the refuse area. This table does not show volumes of subsoil to be used in pad construction.

After topsoil redistribution, pocking will be the primary method for roughening the surface. Pocking is described in Figure 1, Appendix 5-8, as imprinting the soil surface with a pattern of depressions measuring approximately 36 inches across by 8 inches deep. The purposes for pocking are to capture and retain moisture and to provide a cradle for seedlings and vegetation. Best available technology will be used for enhancing the ability of the soil to absorb moisture.

Section 242.100 says previously stockpiled topsoil will be redistributed on the same areas in a thickness which approximates the reclaimed thickness on the scarified, post-mining graded surface. The plan states that every reasonable effort will be made to replace the same thickness of salvaged soil to each respective area.

On flat areas, soil will be reapplied using road grader and/or crawler tractor. On steep slope areas, soil will be reapplied using a front-end loader, crawler tractor, and/or trackhoe. Boulders will be replaced to achieve a near natural surface condition.

Soil Replacement Depths and Volumes

Soil Replacement Reclamation Needs	Soil Depth (inches)	Acres	Soil Volume (cubic yards)
Structural Fill & Refuse Storage	30^	3.4	13,307
Topsoil* SBG	18	11.12	26,910
Topsoil* VBJ	18	4.46	10,793
Topsoil* XBS	12	4.77	7,697
Topsoil* DSH	18	1.39	3,364
Topsoil* RBL	8	2.56	2,753
Topsoil* RBT	6	0.76	613
Total			65,436

* Since the A horizons are less than 6 inches, the plan identifies topsoil as the top 18 inches or all material down to shale, whichever is less.
^ Does not include the 18 inch topsoil placement.

Soil Nutrients and Amendments

Section 241 states that an inoculum will be applied to the soil to help assist in reactivating and regenerating soil organisms. The seed mixture will be either hand broadcast over the area and raked into the soil surface, or sprayed on the surface using hydro-mulch. A wood fiber mulch will be hydro-sprayed over the seed bed, then the surface will be sprayed with a tackifier. The tackifier will be applied at a rate of 50 pounds per acre.

Section 231.300 and Section 243 state that topsoil will be sampled and tested prior to replacement to determine what nutrients are necessary at reclamation time. Grab samples will be collected from the stockpile at various locations and depths. Fertilizer, if needed, will be applied to the topsoil prior to seeding and mulching activities. Sampling will either be performed by a Certified Soil Scientist, or by a person considered to be qualified by the operator and the Division of Oil, Gas and Mining.

Soil Stabilization

Vegetation will be the primary method for controlling erosion and fugitive dust (ection 244.100). Other measures that will help in erosion control and soil stabilization are pocking and rock placement. In addition, wood fiber mulch will be applied at a rate of 2,000 pounds per acre to the reclaimed areas that have been graded and covered by topsoil or substitute topsoil. The wood fiber mulch will be tacked to the surface with a tackifier.

Section 244.200 states that pocking will be the primary method used to roughen the soil surface as per Figure 1 in Appendix 5-8.

Findings:

Information provided in the application is considered adequate to meet the requirements of this section of the regulations.

RECOMMENDATIONS:

The application is ready for approval.

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