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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Lowell P. Braxton
Division Director

1594 West North Temple, Suite 1210
PO Box 145801
Salt Lake City, Utah 84114-5801
801-538-5340
801-359-3940 (Fax)
801-538-7223 (TDD)

February 15, 2000

TO: Internal File

THRU: Dave Darby, Team Lead

FROM: Robert Davidson, Soils Reclamation Specialist RAD

RE: Soils Technical Analysis for the Lila Canyon Amendment , UtahAmerican Energy, Inc., Horse Canyon Mine, ACT/007/013-SR98-1

SUMMARY:

The most recent re-submission was received on November 29, 1999. This third round of Technical Analysis for soils is in response to the most recent submittal. The chronology for the Lila Canyon Mine Permit Application Package (PAP) is as follows:

Action	Date
Original PAP submittal	September 8, 1998
Administratively incomplete, PAP returned	November 6, 1998
Re-submittal	December 14, 1998
Administratively incomplete	February 1, 1999
Re-submittal	February 11, 1999
Administratively Complete	February 25, 1999
1st round - Technical Analysis w/ deficiencies	May 26, 1999
Re-submittal	July 30, 1999
2nd round - Technical Analysis w/ deficiencies	October 18, 1999
Re-submittal	November 29, 1999

TECHNICAL ANALYSIS:

ENVIRONMENTAL RESOURCE INFORMATION

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. Relevant soils information includes prime farmland investigation, current and published soil surveys, soil characterizations, and substitute topsoil identification. The Analysis section discusses resource information as follows:

- Prime Farmland Investigation
- Soil Survey Information
- Soil Characterization
- Substitute Topsoil

Prime Farmland Investigation

A Prime Farmland site investigation was performed by the Natural Resources Conservation Service (NRCS). A determination was made that no Prime Farmland or farmland of statewide importance were found within the proposed Lila Canyon coal lease area and support facilities area because there is no developed irrigation system on arid soils. The determination letter from the NRCS dated June 8, 1998, was sent to Environmental Industrial Services and is included in Appendix 2-1.

Soil Survey Information

The soil survey information contains both general and site specific surveys as follows:

(1) General, Third Order Soil Survey

Appendix 2-2 and Soils Map 2-1 make up the general Order 3 soil survey. The unpublished Order 3 soil survey for Emery County is currently in progress by the U. S. Department of Agriculture, Natural Resource Conservation Service (NRCS). Portions of the Order 3 soil survey relevant to the Lila Canyon Mine project has been provided by the NRCS. The soil map (Plate 2-1) is scaled at 1:24,000 and includes map unit descriptions.

The Order 3 soil survey information provided by the NRCS identifies four soil mapping units located within the mine surface facilities area as:

- BNE2 Strych very bouldery, fine sandy loam, 3 to 20 % slopes
- BMD Strych very stony fine sandy loam, 3 to 30 % slopes
- NGG2 Gerst-Strych-Badland complex, 30 to 70 % slopes
- RZH Rock Outcrop-Atchee-Rubbleland Complex

In addition, the Order 3 soil survey (Appendix 2-2) and soil map (Plate 2-1) provide identities and information on the following soil mapping units as located within Permit Area "B" for Lila Canyon boundary as follows:

- DHG2 Comodore-Datino Complex
- DSG 2 (HUG) Midfork-Tingey-Comodore Complex
- GNA Neto fine sandy loam
- KXH Podo-Rock outcrop Complex
- MHE (MSC) Podo sandy loam, 1 to 8 percent slopes
- MRG Vassilla-Rock outcrop-Gerst Association
- MTH Cabba-Guben-Rock outcrop Complex
- MUE Cabba-Podo-Doney Complex
- NGG2 Gerst-Strych-Badland Complex
- NVF2 Gerst-Rubbleland-Badland
- NXC Lazear-Rock outcrop Complex, high rainfall
- RR Rock outcrop
- RWG Rock outcrop-Rubbleland-Vassilla Complex
- RZH Rock outcrop-Atchee-Rubbleland Complex
- UMF2 Guben-Pathead-Rabbitex Association
- VOH Guben-Rock outcrop Complex

Appendix 2-2 also provides typical soil pedon and soil descriptions for the following Soil Series: Atchee, Cabba, Comodore, Datino, Doney, Gerst, Guben, Lazear, Midfork, Neto, Pathead, Pinon, Podo, Rabbitex, Strych, Tingey, and Travessilla.

(2) Site specific, First Order Soil Surveys

In August 1998, a site specific Order 1 soil survey for the surface facilities area was performed by Mr. Daniel Larsen, Soil Scientist, Environmental Industrial Services, and his report is located in Appendix 2-3. 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. The detailed soil survey of the surface facilities site identifies six soil map units as follows:

- SBG Strych boulder 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
- DSH Strych fine sandy loam variant, 3 to 8 % slopes
- RBT Rock outcrop - Travessilla family complex

All mapping and soil survey work were performed according to the standards of the National Cooperative Soil Survey. Based on the site-specific soil descriptions, and laboratory data, each soil was classified according to current, unpublished NRCS soil taxonomy, and correlated with to a specific soil series. The RBT soil unit references the Travessilla family complex; however, the Travessilla family has been revised by NRCS and based on changes, the Atchee series is more appropriate to Map Unit RBT based on personal conversation between Dan Larsen and Leland Sassar, July 1999.

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.

An addendum has been attached to Appendix 2-3 to include the Lila Canyon Mine, proposed portal fan site soil evaluation. Two soil descriptions were taken at the site and include pits LC11 and LC12. Rating of soil suitability criteria shows good ratings, except for water holding capacity with a poor rating. Average soil depth is about 15 inches, with a range of about three feet to zero. The deeper soils are at the upper edge of the bench which grade to bedrock sandstone at the lower edge. Soils are derived primarily from colluvial materials.

Soil Characterization

Soil pedons were characterized by the soil horizons at each sampling location. All profile descriptions were recorded on standard NRCS forms and are provided in Appendix D within Appendix 2-3. The soil horizons at each sampling location were sampled and characterized according to the State of Utah Division of Oil, Gas and Mining (DOGM) guidelines for topsoil and overburden[1]. Sampled parameters included: soil texture; pH; organic matter percent; saturation percent; electrical conductivity; $CaCO_3$; soluble potassium, magnesium, calcium and sodium; sodium absorption ratio, and extractable selenium and boron. Available water capacity, alkalinity, total nitrogen and available phosphorus were not analyzed at this time; these parameters can be tested at reclamation time. Organic matter percent was substituted for organic carbon. Soil texture by hand-texture method, rock fragment content (% by volume), and Munsell color were determined in the field by Mr Larsen. Generalized soil properties, including percent surface stones and boulders, are summarized as follows for each soil type:

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[1]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.

Map Unit	%Surface Stones & boulders	Soil Depth	% Slope	Permeability	Water Erosion Potential
SBG	3-8	Very Deep >60"	5-15	Moderate to Moderately rapid	Moderate low
VBJ	8-20	Very Deep >60"	5-15	Moderately rapid	Moderate low
XBS	20-40	Very Deep >60"	10-45	Moderately rapid	Low to moderate
DSH	<2	Very Deep >60"	3-8	Moderately rapid	Moderate
RBL	>50	Shallow to Deep	20-70	Slow to moderately rapid	Severe on shale, Low on rock
RBT	>50	Shallow	30-100	Slow to moderately rapid	Severe to Low

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, except as noted below:

- **pH** was high (rated poor) in only one sample - LC3, 24-48" with pH 8.6. Sample LC4, 40-58" had a pH of 8.2, which is rated fair to good. All other samples tested from pH 7.1 to 8.0 for a good rating.

- **Electrical Conductivity** and **SAR** were high in samples LC3 48-55" and LC5 40-58". For sample LC3 48-55", the SAR was 18 with an EC of 2.48. 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. 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. All other samples had EC values ranging from 0.29 to 4.0 mmhos/cm, which is rated as good.

- **Soil textures** were classified as sandy loam, except for samples LC1 3-10" and LC10 0-4" which were sandy clay loam and silt loam respectively. Based on soil texture, all soils tested are rated as good for reclamation material.

- **Available water holding capacity** values ranged from good to poor. The majority of

samples were rated as fair; with LC1 0-3" rated poor; and LC1 10-23", LC5 29-40", LC5 40-58", and LC6 5-18" rated good.

- **Soluble boron** tested at less than 5.0 mg/kg on all samples, resulting in a good rating.

- **Extractable selenium** content tested at 0.02 mg/kg or less, which is considered good since all readings are less than 0.10 mg/kg.

- **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.

- **Soluble magnesium** exceeded soluble calcium below depths of 30 inches. In general for these samples, the soluble calcium decreases and magnesium increases with depth.

  Normally, higher ratios of calcium to magnesium exist in soil solutions. Calcium is retained much more readily than magnesium on soil colloid exchange sites, resulting in the total amount of calcium in soils exceeding that of magnesium. However, the cross-over can occur were calcium is being removed from the soil solution by calcium carbonate precipitation, which explains the higher magnesium level in the lower soil horizons containing higher levels of calcium carbonate.

- The **percent rock content** within the proposed facilities area is the main deterrent for soil suitability based on the current DOGM guidelines. Appendix 2-3 states that native soils with a higher rock content than the current DOGM guidelines allow, can be salvaged. DOGM encourages salvaging **native soils** with **intrinsic or indigenous rock content.** Using these natural rocky soils should enhance reclamation success by providing an environment similar to native conditions. Natural, intrinsic rock content provides for a more stable reclaimed surface, aids in water 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 higher rock content with the surface soils and shallow subsoils containing lower amounts of rock.

Substitute Topsoil

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

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 protection uses traditional methods of salvaging and stockpiling. The plan contains no measures for subsoil protection. The Analysis section discusses operation information as follows:

- 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, for an average salvage depth of 24 inches. As summarized, soil salvage estimates are broken down according to soil survey map units and are based on the entire disturbance area. Plate 2-3, Soil Salvage and Replacement, shows several undisturbed islands that effectively reduce the disturbance acreage. Section 232.100, Table (Available Soil Resources), identifies a **potential soil salvage** volume of 148,630 cubic yards from a 40.77 acre disturbance area for an average salvage depth of 25.4 inches. The following table summarizes the potential soil salvage volumes as presented in Section 232.100, Table (Available Soil Resources):

Potential Soil Salvage Volumes			
Soil Map Unit	**Potential Salvage (inches)**	**Acres**	**Volume (yd^3)**
SBG	48	11.69	75,439
VBJ	30	9.95	40,132
XBS	12	8.89	14,342
DSH	40	1.85	9,949
RBL	8	7.44	8,002
RBT	6	0.949	766
Total		40.77	148,630

Potential salvage depths were generated for each soil map unit based on evaluations of all field and laboratory data, plant rooting depth and subsurface rock content. 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. Typically, the dark colored A horizon is often referred to as topsoil. However, if the A horizon is less than six inches deep, topsoil generally consists of the A and upper B horizon soils that have suitable characteristics for plant growth and show natural fine to very fine roots. Soil salvage depths of suitable soil material are listed in the following table as compared to rooting depth and subsurface rock content:

Map Unit	**Salvageable Soil Layer (inches)**	**Many to Common Fine Roots Rooting Depth (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

Topsoil Salvage Practices

State regulations R645-301-232.100 are specific in requiring that all topsoil be removed from the area to be disturbed. Since the A horizon is less than six inches deep, the amendment defines "Topsoil" as the suitable soil for plant growth, generally, the upper 6 to 12 inches that consist of both the A and B horizon materials. Therefore, the amendment states that **actual topsoil salvage** will consist of removing the surface layer (true topsoil) averaging about 8 inches thick over the disturbed area and additional portions of subsoil about 10 inches thick and treating the mixture as topsoil. Large stones and boulders are considered part of the soil layer and are included in the topsoil volume estimates. Section 232.100, Table (Available Soil Resources) shows **actual topsoil salvage** as 47,603 cubic yards from 22.56 acres for an average salvage depth of 15.7 inches. Plate 2-3, Soil Salvage and Replacement, shows each of the proposed disturbed soil map units and salvage depth in each unit based on reduced acreage from undisturbed islands within the disturbance area, and on a maximum salvage depth of 18 inches, or down to shale, whichever is less.

Soil salvage volumes and disturbed acreage are in error as discussed in Section 231.400, Table "Available Soil Resource" and on Plate 2-3, Soil Salvage and Replacement. Soil Map Unit XBS, the upper, north portion of the portal access road, is not included in the estimates for topsoil removal and replacement. This area accounts for an additional 0.86 acres with 1,408 cubic yards of soil salvage. After correction, the total volume of topsoil salvage should be 49,011 cubic yards and the total salvage acreage should be 23.43 acres for an average salvage depth of 15.6 inches.

Actual Soil Salvage Areas	Soil Depth (inches)	Acres	Soil Volume (yd^3)
Topsoil* SBG	18	11.10	26,873
Topsoil* VBJ	18	3.87	9,364
Topsoil* XBS	12	3.87	6,250
Topsoil* DSH	18	1.36	3,291
Topsoil* RBL	8	2.35	2,524
Topsoil* RBT	6	0.88	709
Total		23.43	49,011

* 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 on-site, in the immediate disturbance area for fan installation. 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.

Topsoil salvage will occur under the supervision of a soil scientist to help maximize harvest of quality topsoil. 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. No attempt will be made to segregate topsoil and subsoil. Boulders of approximately three feet in diameter and larger will be separated from the topsoil and piled or placed at appropriate locations. Boulders above ground level are in addition to topsoil volumes and the amendment estimates that they may account for about 10,000 cubic yards.

Topsoil removal sequence in general would start from the lower elevations of the site and proceed up slope. Surface disturbance may not be required on all of the acreage identified as "Disturbed Area." Plate 2-3, Soil Salvage and Replacement, shows undisturbed islands within the disturbed area where no surface disturbance will occur and where no soil will be salvaged. Concerning protection of undisturbed islands and topsoil resources the following are needed:

- The actual disturbed area boundary needs to be delineated on all applicable maps and on the ground to prevent any accidental disturbance within the undisturbed island areas. The Soils Section shows an actual disturbance area of 22.56 acres (should be 23.43 acres) within the 40.77 acre Disturbed Area Boundary. Although these undisturbed areas are shown on Plate 2-3, they are not shown on other maps within the plan. For example, Surface Facility, Plate 5-2 does not show the undisturbed islands. In addition, Plate 5-2 shows graded land within these undisturbed areas.

- The PAP needs to identify what measures will be made during the life of the mine to protect undisturbed areas containing undisturbed topsoil resources from mining related impacts, such as blowing coal fines, vehicle traffic, and any other mining related impacts that would disturb and/or otherwise negatively impact these undisturbed soil resources. All undisturbed areas need to be marked on all maps. All undisturbed areas need to be marked during construction to avoid disturbance. All undisturbed areas need to be marked during the life of the mine to avoid mining related disturbance. If these undisturbed areas cannot be protected during construction and during the life of the mine, then all soils within the Disturbed Area Boundary need to be salvaged and stockpiled.

Subsoil Segregation and Salvage Practices

PAP Section 232.100 states that after topsoil removal, underlying subsoil will be used as fill or left in place. Below the upper 6 to 12 inches of topsoil, there is generally an increase in carbonates and rock. The PAP states that although these lower subsoils support plant roots, they are not considered as substitute topsoil in this case. Below the possible salvageable depths as listed for each soil, there is generally an additional large increase in rock content, upwards to 70 and 80 percent rock. Within the RBL and RBT soil areas, Mancos is encountered immediately below the shallow soils. In no case, should Mancos be salvaged with the overlying soils.

R645-301-200 states that soil salvage includes both the surface topsoil and subsoils as based on the soil survey and re-vegetation requirements. R645-301-232.500 states that the Division may require that the B horizon, C horizon, or other underlying soils be removed and segregated, stockpiled, and redistributed as subsoil if it finds that such subsoil layers are necessary to comply with the re-vegetation requirements of R645-301-353 through R645-301-357.

As established in the Order 1 soil survey, projected subsoil salvage is based on subsoil replacement rooting depth and soil suitability criteria. The amendment states that subsoils 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 also be needed during reclamation to reestablish rooting-depth subsoil. Therefore, subsoil resource protection is required for maintaining rooting-depth characteristics. Concerning Soil Map Units SBG, DSH, and VB subsoils which will be used as construction fill, the amendment needs to reference and discuss the following for preserving the subsoil rooting-growth characteristics:

- Identify areas on all applicable maps where subsoils from Soil Map Units SBG, DSH, and VB will be used as fill for construction of pads and other mining related areas.

- Identify the volumes of fill obtained from using subsoils from Soil Map Units SBG, DSH, and VB.

- Identify what measures will be used for protecting these subsoils from deleterious mining related impacts, including contamination from Mancos shale and excessive rocky soils during site construction and grading.

- If sufficient measures can not be given to protect the subsoil rooting-depth growth characteristics, then all suitable subsoils from Soil Map Units SBG, DSH, and VB must be salvaged and stockpiled.

Adverse Conditions

Sections 232.700 and 232.710 state that topsoil can be salvaged on areas to be disturbed. Local exceptions may exist where topsoil can not be salvaged because of rockiness and/or steep slopes in soil units RBL and RBT. The amendment needs to commit that if an area is too steep or rocky for soil salvage, then no construction activities will take place in these areas. If steep slopes are accessible to construction machinery for constructing cutslopes, soils are expected to be salvaged. Either steep, rocky surface slopes are safe for constructing cut slopes and likewise soil salvage, or they're not safe for either activity. If steep, rocky slopes and extremely bouldery surface materials render themselves suitable for constructing purposes using conventional construction equipment, (e.g., cutslopes, sediment pond basins, and pad fill), then these same indigenous soil and rock materials from the unconsolidated steep, rocky surfaces can be salvaged and stockpiled for later reclamation use. Therefore, on steep and extremely bouldery surfaces

planned for disturbance, underlying soils are expected to be salvaged.

Rocks - Boulders and Large Stones

Robert Davidson's discussion concerning salvaging soils with higher rock content has been misrepresented in the Appendix 2-3, Section 2.5, Soil Suitability For Salvage. The general idea is to salvage otherwise suitable soil containing indigenous amounts of rock that are typical within the soil salvage area. The main idea is that native soils with a higher intrinsic rock content than Division guideline deems acceptable, offer a greater potential for reclamation success as follows:

- allow a greater potential for moisture infiltration into the interstitial soils
- provide for a more stable reclaimed surface
- provide additional surface cover in sparsely vegetated areas, thus helping protect against rain drop impact and resulting soil surface erosion
- create wildlife habitat niches
- create micro-climates for plant establishment and vegetation survival.

The PAP appendix 2-3 states that surface stones and boulders in the soil that are present during salvage operations, could be removed to a rock pile on site and held there until replacement. Protection of topsoil resources includes salvaging "**native soils**" with "**intrinsic or indigenous rock content.**" Section 232.100 states that boulders of approximately three feet in diameter and larger will be separated from the topsoil and piled or placed at appropriate locations. Designate a "topsoil" rock stockpile on maps where salvaged rock will be stored for reclamation use.

Topsoil Substitutes and Supplements

Sections 224, 231.200, 232.720, 233, and 233.100 thru 233.400 state that no topsoil borrow nor substitute topsoil is needed.

Refuse Pile

Using R645-100, the rock slope material is by definition Underground Development Waste which is by definition Coal Mine Waste. All Coal Mine Waste must be properly disposed of in a Refuse Pile. A Refuse Pile means a surface deposit of coal mine waste that does not impound water, slurry, or other liquid or semi-liquid material. Underground Development Waste is Defined by R645-100 as waste-rock mixtures of coal, shale, claystone, siltstone, sandstone, limestone, or related materials that are excavated, moved and disposed of from underground workings in connection with Underground Coal Mining and Reclamation Activities. Therefore, the rock slope waste material is identified as Underground Development Waste and disposed of in the Refuse Pile.

Soil salvage volumes do not include the extra soil needed for covering the refuse area

with four feet of soil, which will require an additional 30 inches of subsoil in addition to the 18 inches of topsoil. Appendix 5-7 and Table 1 discuss and show the volumes of topsoil and subsoil needed to cover the refuse with 4 feet of material. Since this is not a case of pre-law disturbance without enough suitable soil resources, the plan provides for a minimum of 48 inches of cover using the on site soils.

Topsoil Storage

The application states that 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.

The application, Section 232.100, contains information concerning topsoil pile size and dimensions. Provide engineered drawings of projected stockpiles, showing size, exact placement, final configuration and cross sections for the topsoil stockpile, subsoil stockpile, and "topsoil" rock (boulders and large stones) stockpile.

Findings:

Information provided in the application is not considered adequate to meet the requirements of this section of the regulations. The applicant must provide the following in accordance with:

R645-301-120 and R645-301-232.100, Correct soil salvage volumes and disturbed acreage in Section 231.400, Table "Available Soil Resource" and on Plate 2-3, Soil Salvage and Replacement. Soil Map Unit XBS, the upper, north portion of the portal access road, is not included in the estimates for topsoil removal and replacement. This area accounts for an additional 0.86 acres with 1,408 cubic yards of soil salvage. After correction, the total volume of topsoil salvage should be 49,011 cubic yards and the total salvage acreage should be 23.43 acres for an average salvage depth of 15.6 inches.

R645-301-232.500 and R645-301-234.300 through R645-301-234.320, Concerning Soil Map Units SBG, DSH, and VB subsoils which will be used as construction fill, the amendment needs to reference and discuss the following for preserving the subsoil rooting-depth growth characteristics:

- Identify areas on all applicable maps where subsoils from Soil Map Units SBG, DSH, and VB will be used as fill for construction of pads and other mining related areas.

- Identify the volumes of fill obtained from using subsoils from Soil Map Units SBG, DSH, and VB.

- Identify what measures will be used for protecting these subsoils from deleterious mining related impacts, including contamination from Mancos shale and excessive rocky soils during site construction and grading.

- If sufficient measures can not be given to protect the subsoil rooting-depth growth characteristics, then all suitable subsoils from Soil Map Units SBG, DSH, and VB must be salvaged and stockpiled.

R645-301-121.200, R645-301-521.162 and R645-301-521.250, To prevent any accidental disturbance within the undisturbed areas (as shown on Plate 2-3) within the Disturbed Area Boundary, provide the following:

- Delineate actual disturbed area boundaries within the Disturbed Area Boundary on all applicable plates and maps.

- Commit and correlate between chapters, that all undisturbed areas within the Disturbed Area Boundary will be appropriately signed and marked on the ground during construction activities and during mine operations.

R645-301-333, Identify what measures will be made during the life of the mine to protect the undisturbed island areas from mining related impacts, such as blowing coal fines, vehicle traffic, and other uses that would disturb and/or otherwise negatively impact the undisturbed vegetation and topsoil resources.

R645-301-232.700 and R645-301-232.710, If steep, rocky slopes and extremely bouldery surface materials render themselves suitable for constructing purposes using conventional construction equipment, (e.g., cutslopes, sediment pond basins, and pad fill), then these same indigenous soil and rock materials from the unconsolidated steep, rocky surfaces can be salvaged and stockpiled for later reclamation use. Provide the following:

- On steep and extremely bouldery surfaces planned for disturbance, underlying soils are expected to be salvaged.

- Commit that if an area is too steep or rocky for soil salvage, then no construction activities will take place within these areas of the Disturbed Area Boundary.

- Identify specific areas inaccessible for construction machinery due to adverse, unsafe or impractical conditions.

R645-301-234.100, R645-301-521.160 and R645-301-521.165, Provide the following:

- Designate a "topsoil rock stockpile" on maps where salvaged rock will be stored for reclamation use, and sign these piles accordingly during the life of the mine.

- Provide engineered drawings of projected stockpiles, showing size, exact placement, final configuration and cross sections for the topsoil stockpile, subsoil stockpile, and "topsoil" rock (boulders and large stones) stockpile.

RECLAMATION PLAN

TOPSOIL AND SUBSOIL

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

Analysis:

Chapter 2, Soils, Sections 240 through 244, discusses the soils reclamation plan for the proposed Lila Canyon Mine. The Analysis section discusses reclamation information as follows:

- Soil Redistribution
- Soil Nutrients and Amendments
- Soil Stabilization

Soil Redistribution

Section 240, Reclamation Plan, describes the steps taken for reclamation. Reclamation will begin once all surface facilities and structures have been demolished and removed. Disturbed areas will be restored to approximate original contour (AOC) using pad material. Subsoil from Soil Map Units SBJ, DSH, and VBJ used as construction fill need to be identified and used appropriately during reclamation as root zone subsoils within these areas as follows:

- Identify what pad and mine areas containing subsoil will be graded to AOC.

- Identify methods for insuring that subsoil "construction fills" are used appropriately as root zone soils.

- Identify what measures will be used to ensure that graded subsoils are not contaminated from less desirable fills and materials (e.g., Mancos, shale, and excessive rock).

Section 241 states that after AOC is achieved, the disturbed surface will be scarified where practical, prior to soil redistribution. The rippers found on the rear of a dozer will be used to "scarify" the disturbed surface. Ripping will be on a minimum of 6 feet spacing.

Soil replacement volumes are shown in the following table. Soil replacement includes topsoil placement and 4 feet of soil cover over the refuse area.

Soil Replacement Reclamation Needs	Soil Depth (inches)	Acres	Soil Volume (cubic yards)
Rock Slope & Waste Rock Storage	30^	3.4	13,307
Topsoil* SBG	18	11.10	26,873
Topsoil* VBJ	18	3.87	9,364
Topsoil* XBS	12	3.87	6,250
Topsoil* DSH	18	1.36	3,291
Topsoil* RBL	8	2.35	2,524
Topsoil* RBT	6	0.88	709
Total			62,318

* Since the A horizons are less than 6 inches, the plan identifies topsoil as the top 18 inches.
^ Does not include the 18 inch topsoil placement.

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 purpose for pocking is to capture and retain moisture, and 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 states: "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." 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. Alleviating or minimizing soil compaction is not discussed. The following are needed:

- Clarify and describe what is meant by "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."

- Describe methods for minimizing and alleviating compaction of fill and replaced subsoil and topsoil.

- A plan for the reincorporation of stockpiled rock (boulders and large stones) with the redistributed topsoil.

Soil Nutrients and Amendments

Section 241 states that an inoculum will be applied to the soil to help assist in reactivating and regenerating soil activity for soil organisms, bacteria, microhorizia and mycelium. 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. Major nutrients include nitrogen, phosphorus and potassium content. 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 qualified by the operator and the Division of Oil, Gas and Mining.

Soil Stabilization

Section 244.100 states that vegetation will be the primary method for controlling erosion and fugitive dust. Other measures that will help in erosion control and soil stabilization is pocking and rock placement.

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. 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. The tackifier will be applied at a rate of 50 pounds per acre.

Findings:

Information provided in the application is not considered adequate to meet the requirements of this section of the regulations. The applicant must provide the following in accordance with:

R645-301-241 and R645-301-234.300 through R645-301-234.320, Identify areas where subsoil from Soil Map Units SBJ, DSH, and VBJ was used as construction fills. Replace subsoil "construction fill" during reclamation as root zone subsoils.

- Identify pad and mine areas containing subsoil "construction fills" that will be

graded to AOC.

- Identify methods to ensure that subsoil "construction fills" are used appropriately as root zone soils.

- Identify measures to ensure that graded subsoils are not contaminated with less desirable fills and materials (e.g., Mancos, shale, and excessive rock) during regrading AOC activities.

R645-301-121.100, Clarify and describe what is meant by the following statement used in Section 242.100: "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."

R645-301-242 through R645-301-242.200, Concerning soil and rock replacement, provide the following:

- Describe methods for minimizing and alleviating compaction of fill and replaced subsoil and topsoil.

- Describe how stockpiled "topsoil" rock (boulders and large stones) will be placed on the surface and reincorporated with the redistributed topsoil.

- Correct the plan to indicate surface preparation practices that are compatible with the rocky soil and surfaces, and that are consistent with other reclamation practices (e.g., pocking). Drilling, discing or raking are not compatible with extreme rocky soils, rocky surfaces, or with surfaces that have been deep gouged or pocked.

RECOMMENDATIONS:

The application should not be approved until the applicant has adequately addressed the deficiencies discussed in this memorandum.

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