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TO: Folder #2

THRU: Daron Haddock, Permit Supervisor

FROM: Robert Davidson, Soils Reclamation Specialist

RE: Five Year Permit Renewal Changes, Star Point Mine, Cyprus Plateau Mining Corporation, ACT/007/006-96C, File #2, Carbon County, Utah

SYNOPSIS

As part of the five-year renewal for the Star Point Mine, Cyprus Plateau Mining Corporation (CPMC) has made several changes in their Mining and Reclamation Plan (MRP). These changes include a new reclamation plan for the refuse pile. The permit was renewed independent of the renewal changes within the MRP. This review analyzes the soils and the toxic and acid-forming property issues relating to the refuse pile.

ENVIRONMENTAL RESOURCE INFORMATION
SOILS RESOURCE INFORMATION

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

Technical Analysis:

Soil Survey and Soil Characterization

In 1980, Cyprus Plateau Mining Corporation (CPMC) commissioned Endangered Plant Studies, Inc. (EPS) of Orem, Utah to conduct a detailed 1st Order survey of areas adjacent to the Refuse Pile Expansion Area, the Unit Train Loadout Site and the Gentry Mountain Shaft Site. However, detailed soil profile descriptions and field notes are not found in the MRP. Soil pit locations are difficult to locate in the text body and correlate with the soil maps. Confusion exits between soil survey pits and other soil sampling points found on the soil maps. Soil maps

for these areas, lack the specificity of 1st Order soil surveys showing individual soils. In fact, the entire lower disturbance area soil maps are 3rd Order conservation maps which only include information for soil associations and complexes, not individual soil consociations. First Order soil surveys always include actual on-site soil pit excavations along with specific field data, detailed profiles descriptions, and appropriate map delineations.

Efforts have been made to correlate the 1st Order soil surveys with the 3rd Order soil surveys published by National Resource Conservation Service (NRCS). Correlated information aids in the delineation, clarification and interpretation of soils data for the purpose of identifying on-site soils. However, for all soil profile descriptions listed in Exhibit 222.300a, not a single referenced soil survey pit is located within Star Point's permit boundaries. Exhibit 222.300a contains no specificity concerning the actual on-site 1st Order soil profile descriptions. Soil maps lack the specificity of 1st Order soil surveys. The information and specificity of the 1st Order surveys would allow the assessment of soil quality, quantity, and volumes and determination for recoverable soils, substitute soils and fill materials.

Any pre-SMCRA area with disturbed soils should also be included in the soil survey. NRCS defines soils as "the collection of natural bodies in the earth's surface, in place modified or even made by man of earthy materials, containing living matter and supporting or capable of supporting plants out-of-doors." In fact, soil taxonomy provides nomenclature and taxonomic identification for soils with little or no profile development as Entisols. Therefore, pre-SMCRA areas containing disturbed soils should be included in the soil surveys, classified by depth and taxonomically identified. This specificity will allow the delineation of salvageable substitute soils and fill materials for reclamation purposes.

In conclusion, the current environmental resource section for the surface disturbance areas has insufficient information to determine accurately if additional quantities of appropriate, excess substitute soils exist to help supplement the present stockpiled soils. CPMC must provide soil surveys that adequately assesses the soil resources, complete with actual on-site soil profile descriptions, field notes, sampling documentation, and appropriate soil map delineations differentiating individual soil types. Survey information needs to be current, reported clearly and concisely, and be presented in a manner that provides the necessary information to construct cut/fill and soil mass balances for identifying any possible deficit and excess soils and substitute soils. Accordingly, the soil survey will supply the necessary information to project cut and fill mass balances for reclamation. From these mass balance calculations, excess fills and substitute soils may be located to help provide the required four feet of cover for the refuse pile. The Division requests notification for the location, sample density, and analytical procedures before CPMC conducts any additional surveys.

Refuse Pile - Toxic and Acid Forming Characteristics

Exhibit 231.200a, "An Evaluation of the Toxic and Acid Forming Properties of Overburden and Coal Refuse Materials" by Kent Crofts, IME, evaluates soils and refuse with respect to reclamation suitability. In the report, CPMC requested that the Division provide documentation on how the requested information relates to the determination of the reclamation suitability or protection of the environmental resources of the area. The report actually provides a suitable response for this request with the following statement: "Examination of the cited Tables documents the overburden is a 'cleaner' plant growth medium than is the native topsoil with respect to pH, EC, texture and percent clay, and equal to topsoil in suitability with respect to SP and SAR. Only with respect to the parameters of sand, selenium, boron and acid base potential does the overburden possess a lower reclamation suitability than the 'control' native soils."

With respect to selenium, the 1987 evaluation showed 15 percent of the refuse samples were classified as unsuitable and exceeded the 0.10 mg/Kg standard. During 1989, 18 percent of the refuse samples were classified unsuitable. As the 1987 report states, the potential for elevated selenium values to exceed the recommended standard exists within the refuse material. The Division concurs with this statement and is the basis for maintaining the four feet cover minimum requirement.

A complete evaluation of the 1989 selenium data is given in a report submitted to CPMC on February 26, 1992 entitled "An Evaluation of Plant and Soil Selenium Concentrations in Coal Refuse and Undisturbed Soils" by Kent Crofts, IME. The literature review is an excellent source of information on selenium with the report discussion focusing on many notable and relevant points. Based on the literature review and data analysis, several significant factors were presented in this report:

- Strong statistical correlations between selenium and other soil properties were shown to be critical considerations when determining potential plant selenium toxicity. Factors other than selenium should be considered when determining potential plant selenium toxicities. New standards need to be shown and substantiated by data.

- Salinity and sulfate levels dramatically influence plant selenium uptake. Numerous studies document an inverse relationship of plant selenium levels with increasing levels of sulfate. Since sulfur and selenium chemistries are similar, plants will uptake available selenium if sulfates are low. Likewise, if sulfates are abundant, even in the presence of high selenium, plant selenium uptake will likely

be lower. High levels of sulfate in seleniferous soils and waters should be considered when determining the availability and selenium phytotoxicity.

- 1989 data analysis conclude that elevated selenium occurs at the surface layer of refuse exposed to the atmosphere. The distribution of selenium in the experimental refuse plots show that uniform levels of elevated selenium occur at the zone that was originally the uppermost refuse layer prior to topsoil placement. Before topsoil placement, the oxidization of selenium in the surface refuse exposed to the atmosphere is probably the critical factor for finding elevated levels of extractable selenium within the refuse surface.

Plant selenium concentrations were statistically compared between native plants and plants grown on the refuse research plots. Conclusions showed that no statistical difference exists between native and refuse grown plants. However, these conclusions are not accurate for several reasons:

- Statistical comparisons and conclusions using less than values are not only inappropriate but invalid. A striking observation is the data comparison of native and refuse affected plots. Excluding the Prince's Plume samples, virtually all of the plant selenium concentrations for the undisturbed native sites were below the analytical detection limits. On the Refuse affected plots, data show that many of the plants contained detectable selenium, although none of the refuse plants produced forage with selenium levels exceeding the toxic 5 ppm level.

- Conclusions were made on data sets containing different plant species and distribution between the native and reclaimed soils. Such data is biased and negates the statistical assumption of unbiased data. Unpaired data cannot be used with T-test comparisons.

Based on the 1989 report, CPMC submits that the existing regulatory selenium standard of 0.1 mg/Kg is unsupported by scientific literature and that this lack of support results in gross exaggeration. The Division submits that selenium issues are not easily rectified because the selenium cycle is a highly dynamic system involving biological, chemical and physical pathways which add to the complexity to the system. These issues need clarification before a new standard is adopted by regulatory agencies. The ubiquitous presence of selenium found in overburden waste and coal refuse therefore makes these selenium issues highly pertinent and relevant for protecting the environment. It appears that the lack of available four feet of cover for the refuse pile is the justification for preparing the reports and the motivation for conclusions reached. Justification for DOGM's selenium standard is protecting the environment from mining

induced problems of selenium solubilization, leaching and toxicity. Therefore, before DOGM alters the current selenium standard to allow less than four feet of cover, CPMC needs to show by data and scientific research that a different standard value is substantiated.

The MRP concludes that based on examination of sampling data, no toxic or acid forming materials have ever been found at CPMC's mine site. This statement is inaccurate because not all sample sets include data for toxic/acid forming characteristics. In addition, several samples show toxic and acid forming characteristics. Toxic levels of selenium and boron are both discussed and shown in several overburden and refuse samples. Acid-base potential values based on sulfide material show several overburden and refuse samples having acid forming potentials. Specifically, the Wattis Split (Boney) sample substantiates the resulting acid forming potential (-40 tons $CaCO_3$/1000 tons) by having a 4.4 pH value.

Findings:

The permittee must provide the following, prior to approval, in accordance with the requirements of:

R645-301-220. Provide on-site soil surveys of the lower disturbance area with the detail and specificity necessary to describe adequately the soils and fills as for depth, volume, and quality. The detailed soil profile descriptions should include field notes correlated with soil pit locations and soil map delineations differentiating individual soil types. The purpose of this exercise is to clearly document the soil resource and provide the assessment of soil quality, quantity, and volumes for locating any recoverable substitute soils and fills to be used during reclamation. The Division requests notification for the location, sample density, and analytical procedures before CPMC conducts any additional soil surveys.

R645-301-120, and R645-301-130. All survey information needs to be current, reported clearly and concisely, and be presented in a manner that provides the necessary information to construct cut/fill and soil mass balances.

OPERATION PLAN
TOPSOIL AND SUBSOIL

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

Analysis:

Stipulation 817.24-(1)-(DD) from the 1987 Technical Analysis (TA)was never submitted by the October 31, 1987 deadline providing mass balance information for all areas to be topsoiled. Accurate assessment of the topsoil mass balances requires clarification of salvaged soils, their location and volumes. Although areas of soil salvage are discussed, the operation section needs to clearly outline and collectively assemble soil salvage information by providing a soil salvage table correlating with soil map delineations.

As explained earlier, the current environmental resource section has insufficient information to determine accurately if additional quantities of appropriate, excess substitute soils and fill materials exist to help supplement the present stockpiled soils. Based on adequate soil survey information, the MRP needs to project cut and fill mass balances for reclamation. As explained in the Mine Reclamation Plan (MRP) soils section, fill materials in the lower disturbance area consists of substitute topsoil materials. From these mass balance calculations, excess fills and substitute soils may be located to help provide the required four feet of cover for the refuse pile.

Findings:

The permittee must provide the following, prior to approval, in accordance with the requirements of:

> **R645-301-120.** Show topsoil mass balances that include the following: (1) Provide a soil salvage table detailing salvage volume, locations, disturbed acreage, salvage depths, and dates salvaged. (2) Correlate soil salvage locations on a soils map. (3) Determine reclamation cut and fill mass balances with a table identifying types of material, thickness depths, cut volumes, and catalog any deficit and excess fill amounts by area.
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> **R645-301-232.720.** (1) Coordinate reclamation cut and fill mass balances with topsoil mass balances to utilize any excess fill materials as a substitute topsoil supplement. (2) Based on mass balance results, determine if soil needs to borrowed to help supplement the four feet cover requirement for the refuse pile. If soil needs to be borrowed, then identify a soil-borrow area using a 1st Order soil survey, along with operation and reclamation details.

RECLAMATION PLAN
TOPSOIL AND SUBSOIL

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

Analysis:

Stipulation 817.24-(1)-(DD) from the 1987 Technical Analysis (TA)was never submitted by the October 31, 1987 deadline providing topsoiled areas mass balance of all areas to be topsoiled. Although nearly a decade late, fulfillment of this stipulation will provide the necessary information for accurately assessing the reclamation plan. This topsoil mass balance with the cut and fill mass balance information will help determine if any borrow material is needed to supply the soil requirements for reclamation.

In general, the MRP does not address suitable mulch and other soil stabilizing practices. Within the regraded and topsoiled areas, maintenance needs to be addressed for rills and gullies which either disrupt the postmining land use or vegetation reestablishment, or pollute receiving streams.

Specific reclamation issues that need to be addressed and corrected include the refuse pile cover, coal mine waste, mancos soils reclamation, and subsoil stockpile area reclamation. The following addresses each of these issues:

- Cyprus Plateau Mining Company (CPMC) has failed to demonstrate adequately that less than four feet of cover over the selenium contaminated refuse is sufficient. Therefore, based on R645-301-553.252 and the potential for toxic levels of selenium being released into the environment, CPMC must provide four feet of cover for the refuse pile. They have sufficient soil resources for 17 inches of cover. Additional best available, nontoxic and noncombustible material as appropriate fill and/or soil material needs to be identified to satisfy the requirement for the four-feet of cover.

- Within the disturbance areas, all coal mine wastes encountered need to be identified and placed in a controlled manner to ensure that final disposal will be suitable for reclamation and is compatible with the natural surroundings and post-mining land use. Primary and secondary coal mine waste disposal areas need to described and located on pre- and post-reclamation maps. These areas include, but are not limited to, all stray coal piles, coal waste piles and downcast coal material within the disturbed area boundaries. The Existing Structure Exemption does not apply to existing and new coal mine waste disposal facilities. Disposal needs to be described for all apropos and unanticipated coal mine wastes encountered before and during reclamation, respectively.

- Badland-Rubble Complex based soils were addressed under soil redistribution with the following statement: "...that for many areas to be reclaimed, it is nothing more than a matter of academic interest to state how much topsoil will be returned to these areas." CPMC further states that: "The concept of topsoil supplements or substitutes does not apply to these areas because in the reclamation of these areas, CPMC will be restoring a site to the same state that existed prior to being disturbed. For such areas, since little or no topsoil existed prior to disturbance, non can reasonably be returned." Again, the Division refers to the NRCS definition for soils. Under that definition, even these "non-topsoil" materials are defined as soil and must be surveyed, salvaged, protected, and reclaimed. In other words, these soils and the reclamation using these soils are protected under SMCRA. These soils will be returned, the area reclaimed, and the soils stabilized and revegetated. The reclamation section should give consideration to the special treatment of these highly erosive soils for stabilization.

- There is no discussion concerning reclamation of the Subsoil Stockpile area after the subsoil is removed. This discussion should include cross sections of the subsoil pile, removal methods, protection of the native soils beneath the subsoil during removal, soil stabilization, revegetation, and hydrological issues concerning drainage.

Findings:

The permittee must provide the following, prior to approval, in accordance with the requirements of:

R645-301-120. Provide a soil reclamation table detailing soil redistribution by location, acreage, needed volumes, average soil thickness, soil source and location.

R645-301-244. Suitable mulch and other soil stabilizing practices will be used on all areas that have been regraded and covered by topsoil and substitute topsoil. Within the regraded and topsoiled areas, rills and gullies which either disrupt the postmining land use or vegetation reestablishment, or pollute receiving streams will be filled, regraded, or otherwise stabilized; topsoil will be replaced; and the areas will be reseeded or replanted.

R645-301-553.252. Following final grading of the refuse pile, the coal mine waste will be covered with a minimum of four feet of the best available, nontoxic and noncombustible material. Amend the MRP for the coal refuse pile providing 4 feet of cover.

R645-100-430, R645-301-512.100, R645-301-512.230, R645-301-553.250, and R645-301-542.730. All coal mine wastes need to be identified and placed in a controlled manner to ensure that final disposal will be suitable for reclamation and is compatible with the natural surroundings and post-mining land use. All coal mine waste will be buried under a minimum of four feet of material. The Division may allow less that four feet of cover based on physical and chemical analyses which show that the requirements of R645-301-244.200 and R645-301-353 through R645-301-357 are met. All coal mine waste disposal areas need to described and located on pre- and post-reclamation maps. The Existing Structure Exemption does not apply to existing and new coal mine waste disposal facilities. Disposal needs to be described for all apropos and unanticipated coal mine wastes encountered before and during reclamation, respectively.

R645-301-200. (1) Badland-Rubble Complex based soils and the reclamation using these soils are protected under SMCRA. These soils will be returned, the disturbed areas reclaimed, and the soils stabilized and revegetated. The reclamation section should give consideration to the special treatment of these highly erosive soils for stabilization. (2) Provide operation and reclamation information concerning the Subsoil Stockpile area. Information should include cross sections of the subsoil pile, removal methods, protection of the native soils beneath the subsoil during removal, soil stabilization, revegetation, and hydrological issues concerning drainage.