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DIVISION OF OIL, GAS AND MINING

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TO: File

THRU: Joe Helfrich, Permit Supervisor

THRU: Daron Haddock, Permit Supervisor

FROM: Robert Davidson, Soils Reclamation Specialist
Paul Baker, Reclamation Biologist

RE: Experimental Practices - Technical Analysis of the West Ridge Permit Application Package, West Ridge Resources, Inc., West Ridge Mine, PRO/007/041-98-1, Folder #2, Carbon County, Utah

SUMMARY:

The first PAP submittal for the West Ridge mine was received on January 26, 1998. The Division completed and replied with their initial Technical Analysis response on August 20, 1998. West Ridge Resources resubmitted the PAP on October 7, 1998, and the Division responded with a Technical Analysis on November 27, 1998. A third submittal was received on January 11, 1999. The Division responded with memos from each of the review team disciplines on January 27, 1999. A fourth submittal was received on February 1, 1999 in response. This analysis and review of the fourth submittal is for Experimental Practices.

TECHNICAL ANALYSIS:

REQUIREMENTS FOR PERMITS FOR SPECIAL CATEGORIES OF MINING

EXPERIMENTAL PRACTICES

Regulatory Reference: 30 CFR Sec. 785.13; R645-302-210, -302-211, -302-212, -302-213, -302-214, -302-215, -302-216, -302-217, -302-218.

Analysis:

Chapter 2, Soils, incorporates traditional methods of salvaging/stockpiling and an experimental practice method for protecting soils in-place. The **Experimental Practice** is unique by taking a **Reclamation Approach** for topsoil protection.

Operations - Experimental Practices

Appendix 2-6, West Ridge Mine Experimental Practice In-Place Topsoil Protection, details protecting topsoil resources in-place for (1) buried topsoil areas, and (2) buried RO/RL (rock outcrop/rubbleland) Travessilla Complex soil area. These two combined areas account for 16.75 acres of the total 29 acres of disturbed area.

(1) Buried Topsoil Areas

West Ridge Resources is proposing a topsoil protection plan which incorporates **Experimental Practices (R645-302-200) for protecting in-place soil with a layer of geotextile fabric.** The geotextile fabric provides a protective barrier between the existing soils and the imported fill materials used to construct the mine pads. By utilizing this procedure, soils are not only preserved in-place, but the existing stream channel geomorphology and original ground surface configuration are preserved likewise. Approximately 4.75 acres of the proposed 29-acre disturbed area will be affected using the geotextile fabric.

(2) Buried RO/RL Travessilla Complex Areas

The buried RO/RL Travessilla Complex mapping unit will be included in the Experimental Practices. As stated in the Order-III soil survey, the RO/RL Travessilla Complex unit contains 35% soils by volume (25% Travessilla plus 10% other soils) that support a significant vegetation community. Successful reclamation requires the same soil and rock parameters that currently exist to establish revegetation success standards. By preserving these soils in-place underneath the pad fills, successful revegetation should be achieved. Placing the RO/RL Travessilla Complex mapping unit under Experimental Practices will not require the use of geotextile fabric. As stated in the plan, the RO/RL areas will not be covered with geotextile, but instead, fill will be placed directly over the existing ground surface which will be marked with brightly colored marker flagging strips placed on 8-foot centers for the purpose of identifying the original surface during reclamation and excavation of the pad fills. Marker strips will be used on approximately 12 of the 29 acres of the disturbed area.

Construction Sequence

Map 5-11, Construction Sequence, illustrates the different stages of construction for the West Ridge Mine site. Steps 2 and 3 illustrate the experimental practice steps for installing geotextile fabric and marker strips. Construction sequence steps are outlined as follows:

- Steps 1 through 4 are preparatory steps prior to topsoil salvage. Step 1 is removing vegetation; Step 2 is installing culvert and culvert backfill while placing geotextile in channel bottom and placing marker strips in RO/RL areas; Step 3 is installing geotextile

fabric over topsoil fill slopes, and placing marker strips in RO/RL areas; and Step 4 is pulling boulders from the surface of slopes that will be cut. Topsoil salvage occurs in Step 5. After topsoil salvage has occurred from the topsoil area and RO/RL areas, excavation of the side slopes will occur in Step 6. These excavated native materials will be used as pad fill and will be placed over the backfilled culvert adjacent to the cut slopes. Step 7 shows completion of the pad level by hauling in imported fill from offsite, commercial gravel borrow areas. A final cap layer of road base material is placed over the imported fill surface as shown in Step 8.

Reclamation - Experimental Practices

During fill removal, a 12- to 18-inch deep working layer will be left over the experimental practice slopes. Care will be taken not to subexcavate or disturb the geotextile soil surfaces. Equal care will be taken to protect the "ribbon" surfaces in the RO/RL areas. Fill removal from the slopes will be done carefully without disturbing the in-place soils located under the geotextile and marker strips. Fill removal will be done by small earth moving equipment and/or by hand labor if necessary to minimize disturbance of the topsoil. After the pad fill has been removed, the backfilled culvert will serve as the primary access way for machinery and materials associated with the remaining reclamation efforts.

Once the geotextile fabric has been exposed, the fabric will be carefully peeled away from the soil and the condition of the underlying soil materials observed at this time. The soil will be re-exposed in 5-10 foot horizontal zones that can be easily accessed and worked by hand from the adjacent pad fill level.

In RO/RL fill areas, fill will be removed down to the original, undisturbed surface as delineated by the marker strips. Because of the roughness of the ground surface, pad fill be removed to the extent possible.

To relieve soil compaction and increase the ability of the soil to absorb moisture, the re-exposed soil surface will be gouged and hay worked into the soil at the rate of 2,000 pounds per acre. Gouging depressions will approximately measure 24" X 36" X 18" deep and will create a pattern of depressions that help control erosion through water retention, minimize siltation, and allow for air and water penetration into the soil horizon.

Reclamation Sequence

Map 5-12, Reclamation Sequence, illustrates the different stages of reclamation for the West Ridge Mine site. Steps 3 through 8 illustrate all experimental practice steps involved with reclamation for removing fill, restoring buried soils and reclaiming the original soil surface. Reclamation sequence steps are outlined as follows:

•Steps 1 through 5 show reclamation steps prior removing geotextile and reclaiming the original soil surface. Step 1 is removing cap layer and surface structures; Step 2 is removing excess imported pad fills; Step 3 is removing remaining native pad fill and backfilling cutslopes; Step 4 is replacing topsoil on re-established slopes; and Step 5 is relocating boulders on re-established slopes and preparing soiled surface for revegetation. Steps 6 through 7 show removal of geotextile, soil restoration steps and revegetation; Step 8 shows final culvert removal and restoration of Channel, which includes geotextile removal and re-exposure of the original soil surfaces while maintaining the geomorphology of the stream channel.

Field Trials

In order to evaluate the effects of the geotextile and fill over the existing in-place topsoil resources, a test plot study area will be established in the upper right fork northeast of the topsoil stockpile. The purpose for the test plots is to evaluate the experimental practice reclamation plan proposed for the mine yard area.

The test plots will be established in an areas upstream from the topsoil stockpile in the right fork. As in the experimental practice, soil will not be salvaged from the west half of the test plot area. First, geotextile will be placed in the west half of the test plot area with the culvert and fill material placed on top of the geotextile in the same sequence and manner as used in the mine yard construction. Next, topsoil will be salvaged from the two different soil types in the east half of the test plot area and placed separately on the fill on the west side of the test plot area. Geotextile will then be placed on the northeast portion of the test plot area where soil was stripped (Strych soil) and the culvert extended through this area. Cut material from the southeast portion of the test plot area from which Midfork topsoil had previously been salvaged will be placed on top of the culvert. Finally, the test plot topsoil stockpiles on the west side of the test plot area and the cut and fill on the east half will be seeded with the interim seed mix.

After the test plot area is constructed, the cut/fill area will remain intact for five years to simulate the operation phase of the mine yard. Following the five year period, reclamation will be performed on the test plot area to actually implement and test the final reclamation plan in comparison to conventional reclamation techniques. Appendix 2-6 contains a complete discussion of the experimental practice test plot plan.

The resulting four test plots will be grouped into two categories, the "removed topsoil test plot" and the "in-place topsoil test plot". One portion of the test plot area could be treated/inoculated with a commercially available soil activator designed for revitalizing soil in order to evaluate whether inoculating the topsoil promotes faster or more diverse revegetation. Although this is not currently being proposed in the final reclamation plan, it could be used to assist vegetation establishment in the geotextile area at the time of final reclamation.

After the surface treatments have been applied, the plots will be seeded with the final reclamation seed mix. Canyon sweetvetch will also be seeded on the test plots. Because of the small area to be treated (about 0.31 acre), the seed will be broadcast on the surface and raked in by hand. Straw mulch will be applied over the seed bed of the test plot at a rate of 2,000 pounds per acre. Then the surface will be sprayed with a mulch and tackifier.

The test plot area will be accessed via the extreme edge of the topsoil stockpile and the adjacent cutslope during late summer or early fall. Any compaction or disturbance to the stockpile surface will be ripped and reseeded following completion of the test plot installation and reclamation of this area.

Vegetation monitoring will compare the results of plant growth between the experimental practice in-place soils to replaced topsoil. Monitoring will compare re-vegetation response for each soil type (Strych and Midfork) for each of the two soil surfaces (channel bottom and hillside). For example, comparisons will be made between in-place soils and replaced soils for the channel bottom soils consisting mainly of Strych; likewise, comparisons will be made for hillside Midfork soils. The experimental test plot area will also be compared with the reference area for the Douglas Fir/Maple vegetation type. Vegetation will be monitored for five years or until a determination of success has been made for the experimental practice. WEST RIDGE Resources will consult closely with the Division regarding the results of the test plot study. Should the results show a need to revise the reclamation plan, WEST RIDGE Resources will work with the Division to amend the plan and incorporate the changes needed to ensure reclamation of the mine yard area will be successful. As a last resort, West Ridge Resources will utilize the soil borrow area for obtaining soils to reclaim the site if the experimental practice is determined to be unworkable.

Analysis of the Proposed Experimental Practice

The soils regulations are intended to protect and preserve topsoil resources for the purpose of revegetation thus providing a stable surface capable of supporting the postmining land use. The proposed experimental practice, including operation and reclamation procedures, provides protection equal to or greater than what would be obtained through traditional methods required in the regulations. The Division has analyzed issues related to the proposed experimental practice, and the applicant has adequately addressed each of these concerns as follows:

1. **Compaction.** Pad fill material will compact the soil, but in reclamation, the applicant intends to gouge the surface eighteen inches deep and incorporate alfalfa hay. Below eighteen inches, there should be few effects from the fill. This procedure, combined with natural processes (e.g., freeze/thaw), should adequately alleviate compaction and allow vegetation to become established.

2. **Decreased microbial activity.** Soil that is buried for several years has been demonstrated to have few, if any, microorganisms when it is uncovered. Many microorganisms are beneficial in plant establishment and growth.

   While soils in the experimental practice area may have few live microorganisms when uncovered during reclamation, natural inoculation is likely to occur quickly since the site is surrounded by undisturbed areas. Nearly all of the proposed disturbed area would be less than 200 feet from undisturbed areas with the farthest being about 250 feet away. The Division is aware of a nearby area where cryptobiotic soils have become established naturally on a soil borrow area after eight years. The applicant will try a soil activation treatment on the test plots, and if the test plots are unsuccessful, a commercial soil inoculant could also be tried.

   Soil sterility is also a problem where soil is salvaged, stored for several years, and respread, so there is little difference between the proposed practice and what would normally be required.

3. **Preserving channel geomorphology.** The experimental practice will not only allow preservation of soils in place, it will also preserve the channel geomorphology resulting in decreased erosion and a more stable channel very similar to what currently exists.

4. **Contamination.** Native soils could be contaminated by imported fill material; however, no imported fill will contact the undisturbed soils. In reclamation, the imported fill will be taken away and the native fill from adjacent slopes will be replaced in the cuts (see Map 5-12). In all cases, there will be a buffer of native fill between the imported fill and the native soils. In order to minimize the impact of any deleterious effects of the imported fill, bright marker flagging will be placed between the native and imported fills to delineate between the two fills during reclamation for the purpose of ensuring complete excavation and removal of the native fills.

   After removing the imported fills, the native fills will be excavated and placed in the cutslopes to achieve approximate original contour. The native fill should not mix with the undisturbed Brycan soils because of the geotextile. There will be some mixing in RO/RL areas, but the native fill is essentially the same material as the RO/RL soil.

   The imported fill may mix with and contaminate some of the native fill; however, this potentially-contaminated material will be the first to be replaced on cutslopes and will be buried the most deeply.

Reclamation should be successful with the procedures shown in the application; however, to ensure these practices will be successful, the experimental practice procedure will be tested in the field trials. In addition, the applicant has included a topsoil borrow area from which additional soil could be taken if necessary. The Division considers it highly unlikely the experimental practice will fail and that the topsoil borrow area will be needed. The proposed reclamation plan should result in vegetative cover that meets or exceeds performance standard requirements.

Findings:

Information provided in the application is considered adequate to meet the requirements of this section. Specifically, in accordance with:

R645-302-214, The Division finds that the experimental practice:

1. Encourages advances in coal mine reclamation technology by demonstrating that in certain situations, topsoil storage in place provides the same degree of protection for the topsoil materials plus provides a soil bed that promotes faster establishment of vegetative cover and greatly enhances the stability of the reclaimed slopes while providing a very natural looking reclaimed surface.

2. Provides at least the same degree of protection of the topsoil resource as would be given using traditional salvage operations. In addition, stream channel morphology is preserved which should lead to less erosion and sedimentation. Soil structure and integrity would be easier to reestablish when the site is reclaimed. Rocks, roots, and other materials should still be present at the time of reclamation, and this should lead to greater surface structural diversity and greater plant and animal species diversity.

3. Disturbance of additional land is not required for the experimental practice. About 0.31 acres will be used for field trials, but this is less land than would be required if all soils were salvaged and stockpiled.

4. The proposed experimental practice will have no negative effect on public health and safety. It should, if anything, increase the stability of the reclaimed slopes thus assisting in providing safe and stable slopes.

R645-302-210, Issuance of this permit will specifically authorize West Ridge Resources, Inc. to conduct an experimental practice in conjunction with their approved Coal Mining and Reclamation Operations which allows for the protection of topsoil "IN-PLACE" rather than salvaging soil and stockpiling it for future reclamation. West Ridge Resources, Inc. will follow the plans as outlined in the approved Mining and

Reclamation Plan, Chapter 2 and Appendix 2-6 and will be required to evaluate the effectiveness of the experimental practice on an annual basis. The Division will conduct annual reviews of the practice to ensure that it fully protects the environment and the public health and safety. In the event that the experimental practice is determined to be not as environmentally protective as would otherwise be required by standards promulgated under R645-301 and R645-302, revised reclamation plans which utilize standard reclamation technology will be required.

RECOMMENDATION:

The Division recommends that the Office of Surface Mining approve the Experimental Practices for protecting topsoil in-place.

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