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TO: File

FROM: Paul Baker, Reclamation Biologist

DATE: August 31, 1992

RE: Vegetation Sampling at Belina Mine, Valley Camp Coal Company, Belina Mine, Act/007/001, Folder #2, Carbon County, Utah

On August 13, 1992, Steve Tanner and I sampled the vegetation in three areas at the Belina Mine. The purpose of the sampling was to measure sites that have received interim reclamation treatments to show that revegetation is feasible on the types of slopes and soils that are proposed for final reclamation. Although similar sampling was performed in 1986 for the same reason, no comparison appears to have been made to a reference or other undisturbed area. Test plots were established in 1987 to show that the site is reclaimable using similar techniques to those proposed in the plan. According to 1991 data which, I emphasize, was gathered using different techniques and by different people, the test plots do not appear to be any better than the sites which we sampled this year.

Three areas were sampled using a ten-point pin frame. Each ten points was considered one sample. Area A is a southeast-facing slope in front of the bathhouse between the upper and lower pads. Area B is a north-facing slope above sediment pond 4 and below a stand of spruce and fir. The undisturbed area is an aspen-grass southeast-facing slope to the west and above the mine site. It was not permanently marked as a reference area. The gradients on the slopes were about 50%, 40-45%, and 35% for areas A, B, and the undisturbed area respectively.

Areas A and B were revegetated in 1980 using methods shown on page 96 of the plan. The areas were hydroseeded then hydromulched with 1500-2000 lbs. per acre of wood fiber mulch. A tackifier was included with the mulch. The plan states that, as of 1986, 100 lbs. per acre of nitrogen was applied every 3 years beginning the third year after seeding. Some additional applications of fertilizer may have been made since then. The seed mix included thickspike, western, streambank, and slender wheatgrasses; mountain brome; orchardgrass; Russian wild rye; Kentucky bluegrass; alfalfa; yellow sweet clover; big sage; and rubber and Douglas rabbitbrush.

Area A had 50% vegetation and 38% litter for a total of 88% cover. Bare and rock totaled 12%. Species encountered, in order of dominance, were Kentucky bluegrass, western wheatgrass, sagebrush, orchardgrass, and thickspike wheatgrass. The sample

size was 15, and the minimum sample size required was 9.39. The standard deviation for vegetation and litter was 21.04.

Area B had 40% vegetation and 25% litter for a total of 65% cover. Bare and rock totaled 35%. Species encountered, in order of dominance, were orchardgrass, Kentucky bluegrass, smooth brome, and white fir. Some moss was included in the calculation for vegetation and litter. The sample size was 11, and the minimum sample size required was 14.49. The standard deviation for vegetation and litter was 19.24.

Overstory vegetation was not measured in the undisturbed area although there was some aspen present. This area had 62% vegetation and 23% litter cover for a total of 95%. Bare and rock totaled 5%. Species encountered, in order of dominance, were Kentucky bluegrass, slender wheatgrass, and Letterman's needlegrass. The sample size was 6, and the minimum sample size requirement was 0.46.

The cover of area A (88%) is over 90% of the cover of the undisturbed area (95%), but statistical tests show that area B has not achieved 90% of the undisturbed area cover with 90% confidence. In 1986, some sampling of area B was performed by Cedar Creek Associates. They stated in their report that it had been agreed that only the top 25% of area B would be sampled because an overapplication of fertilizer had stunted some of the grass on the lower 75% of this slope. The effects of this overapplication should be gone by now, however, and I am not certain why cover is lower in this area. Although it is a north-facing slope which has snow on it longer than the other slopes, the most heavily vegetated portion is near the top by the spruce and fir trees which shade this portion of the slope and increase the time that the snow is present even further. The slope is basically a cut slope with little or no "topsoil". It does not have an overabundance of rocks, however.

One other problem with the current sampling is that a north-facing slope was not sampled to compare to area B. The adjacent area is a dense spruce-fir stand which has little understory growth but nearly 100% cover by litter. Some sagebrush-dominated slopes may exist nearby, and, because of their openness, they are probably more similar to area B than the undisturbed area that was sampled.

Based on this sampling, the soils and slopes that were used for area A should be adequate for final reclamation, but this has not been demonstrated for area B. The following additional sampling needs to be performed:

1. Sample the vegetation in a few other areas at the mine from which soil will be gathered for use as substitute topsoil material in final reclamation.

2. Sample a north-facing slope other than a spruce-fir site to make a better

comparison to area B. Include measurements of woody species density.

3. Measure vegetation, including vegetative cover and woody species density, at interim revegetation sites and undisturbed areas at the Valcam Loadout.

4. Measure cover, woody species density, and productivity on the test plots.

The test plot program needs to be completed, but the results are not expected to be much different from the results on the other slopes that received interim revegetation treatments in 1980. 1991 sampling did not show any differences between treatments at the Belina plots and the loadout plot only had one treatment.

If this sampling does not show that the vegetative cover of the adjacent undisturbed areas is being approached by either the test plots or the other areas that have been seeded, some changes to the reclamation plan might be needed. It appears now that additional efforts will be required to establish woody species beyond the methods that have been used in the past. Assuming that area B still does not meet the standards for success when comparing it to a different undisturbed area, further sampling will be needed to indicate a trend toward a potential standard for success in an undisturbed area.