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TO: Pam Grubaugh-Littig, Permit Coordinator

FROM: Susan M. White, Senior Reclamation Biologist

RE: Phase II Bond Release, Western States Minerals, J.B. King Mine, ACT/015/002-BR99B, Folder #2, Carbon County, Utah

Summary

Western States Minerals submitted an application Request for Phase II and III Bond Release at its J.B. King Reclaimed mine site. The application was received June 11, 1999. The application does not meet the minimum regulatory requirement for completion of Phase III as required by R645-301-880.330. This technical analysis will review the application for only those issues associated with Phase II Bond Release.

TECHNICAL ANALYSIS:

VEGETATION

Regulatory Reference: 30 CFR Sec. 785.18, 817.111, 817.113, 817.114, 817.116; R645-301-244, -301-353, -301-354, -301-355, -301-356, -302-280, -302-281, -302-282, -302-283, -302-284.

Analysis:

Standards for Success.

The regulatory requirements for Phase II bond release are described in R645-301-880.320. The requirement for the vegetation portion of Phase II release is successful vegetation establishment. The Division has considered on previous Phase II bond releases, vegetation to be successfully established if it meets the regulatory and permit requirements for vegetative cover and vegetation is adequate to reduce erosion similar to off site levels. The Division has mostly assumed that if the cover is equal to off site then erosion is similar to off site also. The cover requirements for the J. B. King Mine in this instance are that the reclaimed site needs to meet 90 percent of the reference area cover at 90 percent statistical confidence.

Cover

The Bond Release application presented information from vegetation sampling in June 1998 performed by Bamberg Associates. Vegetative cover and shrub densities were sampled using techniques described in the Division's Vegetation Information Guidelines. Vegetation cover was surveyed using an ocular sampling method. A $4m^2$ quadrant was used on the disturbed area and a $1m^2$ quadrant used in the reference area. A completely random sampling design was used by establishing a grid system on site.

The average cover on the reclaimed site sampled by Bamberg was 18.4 percent vegetative cover. This cover value represents total desirable cover; annual weeds were excluded from the total. A total of 40 samples were taken (n=40). The minimum required sample size (n(min)) was calculated according to the Division's Vegetation Information Guidelines. Twenty-two samples were required to meet sample adequacy. The median (or middle value) was 17.0 percent vegetative cover.

The reference area is a shadscale-grass community and approved by the Division as a reference site in 1985. Total average vegetative cover of the reference site in June 1998 was 13.1 percent. A total of 20 samples were taken (n=20). The n(min) required to meet sample adequacy was calculated at 6 samples. The median cover was 13.0 percent.

No statistics are required to demonstrate that the reclaimed site exceeds the reference area standard in the Bamberg study.

The Division has traditionally performed it own vegetation sampling at the time of Phase II Bond Release. The reclaimed and reference area were sampled in early July 1998. The sampling methodologies were similar to Bamberg except that a stratified random sampling design was used. Total desirable plant cover on the reclaimed site had an average 17.2 percent cover (n=50). The n(min) required to meet sample adequacy was calculated at 141 samples. The median vegetative cover was 10.0 percent. Total desirable plant cover on the reference area measured 20.5 percent cover. The sample size was 20 (n=20) and the n(min) was 23. The median vegetative cover was 10.0 percent.

A comparison of means and medians for the Division sampling show no statistically significant difference between the means of the reclaimed and reference areas at the 90 percent confidence level. The Division did not meet the calculated minimum sample size on the reclaimed area because of the high variation in vegetation cover on site.

The results of the two studies are summarized in the table below.

	Division			Bamberg Associates	
	Reclaimed	Reference	90 % of Reference	Reclaimed	Reference
Mean % Cover	17.2	20.45	18.4	18.4	13.1
Confidence Interval	13.5 to 20.9	17.47 to 23.43	15.7 to 21.1	16.5 to 20.1	12.2 to 14.0
Median	10.0	20.5	18.45	17.0	13.0
Standard Deviation	15.7	7.7	7.0	6.7	2.4
Variance	246.0	59.7	48.4	44.7	5.7
Minimum Value	0.0	9.0		8.0	9.0
maximum value	75.0	38.0		32.0	18.0
n	50	20	20	40	20
n(min)	141	23		22	6

Vegetation cover on the reclaimed area measured by Bamberg Associates and the Division had similar average (mean) values but dissimilar median and variance values. This is explained by the wide range of cover values sampled by the Division (0 to 75 percent cover) verses the narrow range sampled by Bamberg Associates (8 to 32 percent cover). When asked, Bamberg Associates stated that no values or quadrats were excluded from the sample because of no or low cover values. The discrepancy in the large variance of the Division's data and low variance in Bamberg's data is of concern to the Division. Because of this concern the Division conducted another study in September 1998 and found a range of cover values (0 to 80) and thus variance (266) similar to the Division's July study.

The Division's requirement for sample size to meet a minimum calculated sample size provides protection against releasing the bond when the bond should not be released (statistically known as a Type II Error). A large range of sample values results in a large variance from the mean creating values with a large confidence interval. Large confidence intervals in the data will almost always insure the standard can be met. Sampling until the requirements for a minimum calculated sample size is met either:

- reduces the variance or

- ensures that enough samples have been taken to represent the true mean.

Bamberg Associates' and the Division's data indicate that vegetation establishment (cover) requirements for Phase II bond release are met. The vegetation of the reclaimed area is not significantly different than the reference area. In the case of the Bamberg study no statistical tests are required since the reclaimed area has greater vegetation cover than the reference area.

However, because of the discrepancy in the sample variance between the Division's and the Operator's data, the Division should be present and observe the Operator when sampling for Phase III bond release. Sampling can not be biased to excluded extremes in the vegetation cover.

Erosion

Erosion has been an on going issue at the J. B. King mine site since reclamation. Most all attempts (contour furrows, silt fencing, smoothing, stuffing with straw or rock, reseeding) at eliminating the accelerated erosion resulting in sheet flow and rill and gully formation have been unsuccessful. Vegetation establishment does not appear to have reduced the erosion to levels observed off site. Vegetation cover of 20 percent will reduce erosion to comparable off site levels, but will not eliminate erosion. In 1994, a rock mulch, biosolids, and surface roughening treatment was applied in efforts to reduce erosion and refuse exposure on the refuse pile. This effort has reduced the erosion, although, still apparent on the refuse pile. Completely recontouring the site to allow for base controls, complex slope shapes, continuation of off site drainage through the site, and topsoiling with low erosive materials could possibly stabilize the site to background levels. Completely recontouring the site is an unrealistic expectation nearly 15 years after initial reclamation.

Permit Amendment, Reclamation Plan Revision, J.B. King Mine, July 1995, section UMC 817.110 Erosion Monitoring Plan and Standard for Bond Release states that the standard for bond release will be "Upon the demonstrated establishment of Normal Erosion (as defined in the OSM document entitled *Technical Note - Method for Evaluation of Erosion on Reclaimed Coal Lands in Western United States* draft dated 12/5/90), WSMC will be eligible for release from site liability and surety bonding as related to erosion control."

The Phase II bond release application did not submit the above described documentation related to erosion control. The application contained a Soil Loss Evaluation using RUSLE to justify erosional stability. Robert Davidson, Division Senior Soil Scientist, is reviewing this portion of the application.

Findings:

Information provided in the bond release application do not meet the minimum regulatory and permit requirements for Phase II bond release. Prior to approval, the permittee must provide

the following in accordance with:

R645-301-353.140, the operator has committed to an erosion standard in section UMC 817.110 of the permit. The Phase II bond release application did not address this standard. The application must address the standard or change the permit to another erosion standard.

RECOMMENDATION:

Prior to approval of Phase II Bond Release, the requirements of **R645-301-353.140** must be provided as outlined above. The following recommendations are made:

- An Engineer should review the bond amount prior to Phase II release.
- The North Parimeter Ditch should be removed as soon as possible (see Sharon Falvey's, Division Senior Hydrologist, memo) but within a favorable planting time (October to February). Vegetation must be established (visual inspection) prior to Phase III Bond Release on this reworked area.
- A Division Biologist should be present on all future vegetation studies conducted for bond release.
- The current Phase II Bond Release Application should have all references to Phase III Bond Release Removed. The site is not eligible for Phase III Bond Release (see memo dated June 16, 1999 from Susan White to File).
- A Phase III vegetation study should be preformed in 2003 and 2004 to demonstrate the vegetation has met approved success standards for the last two years of the responsibility period.