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WESTERN STATES MINERALS CORPORATION

FAX TRANSMITTAL SHEET

DATE: 8/3/93

ATTENTION: Mr. James Carter

COMPANY: UDOGM

FAX #: (801) 359-3940

FROM: Buzz Gerick

 # OF PAGES: 10 *(Includes this cover sheet).*

MESSAGE: Jim - I rec'd. Hord Tipton's letter of July 28, 1993 and I am transmitting the following information I have rec'd. from Sam Bamberg that refutes what he is saying:

4 pages → (1) 1993 Vegetation Survey (July 15, 1993) Addendum #1

5 pages → (2) July 1, 1993 letter (Bamberg to Gerick)

As ever -
Buzz

250 S. Rock Blvd., Ste. 130 • Reno, Nevada 89502 • (702) 856-3339 • FAX (702) 856-1818

ADDENDUM 1

VEGETATION TREND ANALYSIS FOR J.B. KING MINE, JUNE 1993

The trends of the vegetation changes in shrub density and total vegetation cover at the reclaimed J.B. King site can be analyzed from the surveys and monitoring conducted during the past four years from 1989 to 1993. The changes are related to two major factors: (1) natural plant succession on disturbed substrates with gradual changes in species composition, cover, and density over a period of time; and (2) responses to climatic conditions and local weather patterns, particularly precipitation amounts and timing. The trend in plant succession is from a weedy annual forb to perennial shrubs and grasses. The planting of seeds and seedlings during early revegetation activities during 1985 and 1986 partially shortcuts the weedy seral stage of succession, but the site has had various amounts of weedy cover depending on rainfall, the degree of soil and substrate disturbance, and the success of revegetation planting. In the local weather conditions, a three-year drought from 1988 to late 1991 has been followed with abundant snow and rain during the growing season in 1992 and 1993 .

The general trends in shrub density and plant cover (excluding weeds) are given in Table A1-1.

Table A1-1. Shrub Density and Desirable Plant Cover Trend Analysis for 1987 to 1993, J.B. King Mine.

Year	Shrub Density (shrub/acre)	Desirable Plant Cover (%)
1987	1970	--
1989	2146	12.9
1991	2430	13.3
1992	2224	22.0
1993	2880	24.9

As can be observed from this table the general trends has been for increasing shrub density from an average of 1970 to 2880 shrubs per acre from 1987 to 1993. The shrub density increasing trend has not been smooth, but is, nonetheless, significant. The decrease in 1992 may be a residual result of the previous drought, but the increase in 1993 was due to germination and growth of shrub seedlings, not all of which will survive. Plant cover of desirable species (i.e., excluding weeds) shows a gradual and steady increase on the site for the four years monitored. Cover increased from 13% in 1989 and 1991 during the drought period, to 25% in 1993 after two years of abundant moisture. This is a significant increase that is due in part to additional plant growth in natural

succession, and to better moisture in 1992 and 1993. The plant cover, based on conditions in the natural vegetation around the site, should stabilize at somewhere in the range of 8 to 20% depending on the range site.

The trend for total ground cover for the four years is presented in Table A1-2.

Table A1-2. Ground Cover Trend Analysis for 1989 to 1993, J.B. King Mine

Year	Percent Ground Cover*				
	Desirable Plant cover	Weeds	Bare	Rock	Litter
1989	13	8	53	10	16
1991	13	2	60	11	14
1992	22	28	39	8	5
1993	25	7	39	12	18

* These are an average of all plots and therefore may add to more or less than 100% ground cover.

The general trend in ground cover, as discussed above, is for a general increase in total vegetation cover with 1992 being an unusual year. The total vegetation cover during this year was about 50% with a corresponding decrease in bare ground and rock cover. The reason for this maybe the later sampling time and later rains which allowed for a very high weedy plant growth. Desirable plant cover and litter increased again in 1993 due to the abundant vegetative growth in 1992 and the continuing good moisture conditions.

The percent of vegetative cover of life-forms in presented in Table A1-3.

Table A1-3. Vegetation Cover Trend Analysis by lifeform for 1989 to 1993, J.B. King Mine.

Year	Total Vegetative Cover (%)	Percent of Total Vegetative Cover			
		Shrubs	Grasses	Forbs	Weeds
1989	21	33	27	1	39
1991	15	45	44	1	10
1992	50	23	16	3	58
1993	32	53	21	3	23

In years of abundant or normal moisture, shrubs make up the larger percentage of plant cover if weeds are ignored. Grasses and forbs make up a lower portion of

the vegetation, but actual ground cover is slowly increasing for these types of plants during this four year period. Weeds respond to moisture, especially summer storms by increased growth as evidenced by the large percentage of ground cover by weeds in 1992. Plots were monitored later in the season during July allowing weed growth. The trend, if natural succession is not interrupted, is for grasses and forbs to slowly increase in cover, and weeds will make a smaller portion of the ground cover depending on local weather patterns. Shrubs will continue to make up a large portion of the plant cover and biomass, but the species of shrubs will change with four-wing saltbush decreasing in dominance.

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Table A2-1. In-Plot Occurence of Shrubs and Percent Frequency for Reference Area Sampling, J.B. King Mine, June 1993.

Plot Number	11	12	26	45	69	100	104	106	113	149	ota	Freq.
Atriplex confertifolia	12	7	11	7	18	23	19	16	13	4	130	100
Total	12	7	11	7	18	23	19	16	13	4	130	

Table A2-2. Shrubs Denity for Reference Area Sampling, J.B. King Mine, June 1993.

Plot Number	Shrubs per 10 sq meters	Shrubs per hectare	Shrubs per acre
Atriplex confertifolia	13	13000	5200
Total	13	13000	5200

Table A2-3. Plant Cover by Individual Plant Species for Reference Area Sampling at the J.B. King Mine, June 1993.

Plot Number	11	12	26	45	69	100	104	106	113	149	tota	ave.
SHRUBS												13.8
Atriplex confertifolia	12	1	13	7	10	12	6	5	10	4	80	8.0
Gutierrezia sarothrae	4	4	5	8	8	7	6	6	5	5	58	5.8
GRASSES												9.1
Aristida longiseta		1									1	0.1
Buchloe dactyloides			T								0	0.0
Hilaria jamesii	5	13	2	1	3		4	9	4	5	46	4.6
Hordeum jubatum	1		1	1	T	1	1		1		6	0.7
Oryzopsis hymenoides	3	2				2	1	1	1	4	14	1.4
Sporobolus cryptandrus				5	T	2	6		2	5	20	2.2
Stipa comata			1								1	0.1
FORBS												1.7
Sphaeralcea coccinea	3	2	2	4	2		T		2		15	1.7
Townsendia sp.	T	T	T	T		T	T	T	T		0	0.0
CACTUS												0.1
Opuntia polyacantha									1		1	0.1
DESIRABLE PLANT COVER	28	23	24	26	23	24	24	21	26	23	242	24.2
LITTER	8	6	8	4	7	5	5	8	5	10	66	6.6
ROCK	10	12	3	6	2	4	2	5	2	3	49	4.9
BAREGROUND	54	59	65	64	68	67	69	66	67	64	643	64.3

cc: Larry Berg
FYI - Buzz 7-7-93

July 1, 1993

Samuel A. Bamberg, PhD
RA Consultants
26050 E. Jamison Circle
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Buzz Gerick
Western States Minerals
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Re: Results of the onsite meeting with Utah Division of Oil, Gas & Mining (DOGM) personnel for clarification of a change in the location of a reference area and standards for revegetation success for the Western States Minerals' (WSM) J. B. King Mine Project.

Dear Buzz:

This letter discusses the results of our onsite meeting at the J.B. King mine site conducted with DOGM personnel, Susan White and Henry Sauer, on the afternoon of June 21, 1993. The purpose of this meeting, as discussed in my letter of May 10th, was two fold. First, to do a field determination of appropriate reference areas for the reclaimed mine and, second, to discuss the technical aspects of the revegetation and reclamation program. At issue was the plant cover and density standards, and what ecological factors were equivalent on the proposed reference area(s) as compared to conditions on the reclaimed site. We walked to and reviewed the different reference areas proposed by WSM in 1991 to the northeast, and looked at other potential sites along the Dog Valley escarpment. The propose was to find potential reference areas that were the ecological equivalent to the reclaimed mine site for slope, aspect, soils, and approximate elevation. The present reference area is on a higher and flatter area east of the site and does not have equivalent soils, slope, or aspect.

The issues and items discussed during this meeting were:

1. Location of a suitable reference area or areas equivalent to the reclaimed site.
2. How the site should be partitioned and what revegetation standards will apply.
3. Review of the ecological conditions and factors on the reference area and reclaimed site, especially soils and degree of slope.

Reference areas and revegetation standards: Susan White and Henry Sauer rejected the proposed shaley slope reference area for use with the refuse pile. Their rationale was that the shaley slope did not have sufficient cover as a standard for the soil on the refuse pile according to Susan, and that the soils should be a sandy loam according to Henry. We examined the soils and direction the slope faced for both sites, and they were equivalent. Susan suggested either a north-

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facing slope or the flat alluvium would be appropriate as a reference area since these areas had a good vegetative cover. She also is recommending that the plant cover on the refuse pile needs to be higher (more than 20%) to prevent erosion and stabilize the slope; that is, the soil now covering on the refuse pile be altered to support a higher vegetative cover. Her suggestions were either moving and regrading the refuse pile, topsoiling, or other soil amendments to overcome the limitations of the shaley substrate of the present soil cover. The standard for cover on the refuse pile soils and a suitable reference area for the site in general was not resolved.

The soil on the proposed shaley slope reference area was a shaley loam. We took soil samples from the shaley slope reference area back to the refuse pile for comparison and examination. Although the soils covering the refuse pile are heterogenous, having been derived from various places on the mine site, the dominant soil texture was a clay loam equivalent to the shaley slope. The soil cover on the refuse pile was mainly derived from the west side of the mine site from what is now exposed shale in the designated "reseed area". Jim Blackburn was onsite during the placement of the cover on the refuse pile, and stated that most of the soil cover came from the shale on the western portion of the site. This issue on the texture, quality, and characteristics of the refuse pile soil was not resolved.

The problem of finding a suitable reference area acceptable to both DOGM and WSM remains. If the proposed reference areas are not acceptable as standards to DOGM using at least two range sites with different cover values, then there is little reason to change the reference area. The vegetative cover value from the one proposed alluvial reference area is acceptable for the entire site if treated as a whole. If the site is stratified or segmented into different zones for reclamation standards, then portions of the site, such as the refuse pile and the area borrowed for soil cover, cannot meet the general plant cover standards. These shaley substrate sites in the vicinity of the reclaimed mine do not support these cover values in the natural vegetation.

A major problem in meeting Susan's expectation of greater than 20% plant cover on the refuse piles is that, in the region of the mine site, the natural vegetation cover is generally below 20% even in years of excellent growth. The plants in the natural environment do not stabilize the soil or control erosion (George Cook, SCS, Price, Utah, personal communication). It is unreasonable to expect that conditions can be created on the mine site such that the vegetative cover will stabilize and control erosion. Neither the soils, topography, or desert climate are conducive to a vegetation dense enough to control erosion. Erosion, if it is under any natural or artificial control, is from resistant sandstone rock outcrop or armoring of the soil surface by rock. The bluffs and

slopes on the southern side of Dog Valley where the mine is located are sloughing and eroding at the present time, and are not naturally stabilized. There are also natural coal seams along these bluffs that are eroding and contributing coal sediment to the drainages. The plants in this region are adapted to the local conditions including erosion and the presence of coal sediments.

The viable revegetation option for WSM at this time is to continue controlling access to the site, and prevent equipment and cattle from entering. As a whole, the vegetation on the site is equal to the cover and density of the region and to the original reference area (the results of the vegetation monitoring are being prepared). Attempts to increase vegetative cover are expensive and at risk for success. Any procedure to increase vegetative cover will be temporary, and will last only until natural conditions are restored within a few years. In addition, any area on the mine site that is disturbed and revegetated will require resetting the bond release period for another ten years.

Our recommendation at the present time is to use the original reference area, since the procedure for changing the reference area seems to be difficult. There is no reason from an ecological sense to enhance vegetative cover on the site by extraordinary procedures given the conditions in this region, and the small chance of success or lasting effect. In our opinion, the site should be treated as a whole unit for vegetative success using the present reference area as a standard. There should be no segregation of the site into different zones unless there are different and attainable revegetation standards used for the zones derived from an ecologically equivalent reference area.

<u>Ecological conditions on the site:</u> The reclaimed mine site was surveyed in a general sense for the ecological conditions of soil, moisture, and the resultant vegetation growth. We felt that a good general survey of the site was necessary since there was no agreement with DOGM on the site ecological conditions. These surveys were conducted during the next three days period (June 22 to 24, 1993) during the vegetation monitoring.

The soils on the site have been disturbed first by mining and then by site regrading, and are highly heterogenous as a plant substrate. There is little in place soil, and mixtures of soil types occur including gravel from former pads. The predominant soil substrate was a clay loam grading into loams in the drainage mixed with some sandstone derived soils. The soil cover on the refuse pile and to the northern part of the site was mostly a clay loam derived from shale and some mixed loam. Two areas were scraped to partially weathered bedrock by the removal of soil for covering the refuse pile. The western flat area was scraped for soil removal into raw shale that has been partially covered by wash in of sand and clay, and by gravel from trailer pads. These substrates showed surface

evidence of alkali salts from the raw shale. The other area that had been scraped to mixed soil and bedrock was the ridge and slope to the northwest of the refuse pile. Both of the borrowed areas and the refuse pile are poor substrates for plant growth, and resemble rock and shale outcrop in the vicinity of the site. The drainage has a mixture of soils, but these are a better soil substrate for plant growth. The soils in the southern portion of the site in the vicinity of the covered portals resemble those in the drainage. Composited soil samples were taken from the mine site and adjacent slopes, and are currently being analyzed for nutrient status, and other physical and chemical characteristics for a comparative base.

Moisture for plant growth has been abundant the past two years and the plants have responded. Heterogeneity in soil moisture was high, and this is a major factor controlling plant growth, cover, and productivity. There are depressions on the site with good moisture conditions. The depressions still exist since the site is not yet adjusted for a good drainage pattern. The site has not been allowed nor has there been enough time for erosion to form rills and gullies for a natural drainage pattern. Both the heterogeneity of soil substrate and soil moisture conditions result in large differences in plant growth.

Vegetative growth on the site is a heterogenous mixture of shrubs and grasses with shrubs predominant. On the reclaimed mine, vegetation is in an early seral stage of succession with many plant species, especially weeds, that are common to disturbed ground. The general stages of plant community succession in this region have not been studied, but generally consist of pioneer and common weed species of plants followed by a more mature community of plants with saltbush species (*Atriplex* spp.) and grasses, mainly galleta (*Hilaria jamesii*) and dropseed (*Sporobolus cryptandrus*). Plant species and vegetation community types on the mine site have been partially a result of the revegetation program, and partly a result of natural reseeding from species in the region. The time necessary for natural plant succession to establish a mature community depends on soil processes and plant species changes. This may take from two to three hundred years in this arid climate, and is under climatic and topographic control.

The dominant species on the mine site are from those planted or seeded during reclamation. These are not the species that are prevalent in the natural vegetation types in this region. The major shrub onsite is four-wing saltbush (*Atriplex canescens*), but other shrubs including greasewood (*Sarcobatus vermiculatus*), winterfat (*Ceratoides lanata*), and shadscale (*Atriplex confertifolia*) have seeded in and are reducing the dominance of this saltbush. Wheatgrasses (*Elymus* (=*Agropyron*) spp.) are the dominant grasses. The vegetation species diversity, cover, and productivity on the reclaimed mine site are

equivalent to the native vegetation, but species dominance is different due to the disturbance and seed mixture used during revegetation program. The trends in the vegetation are for increasing diversity with native species (Gardner's saltbush (*Atriplex gardneri*i), galleta, blue grama (*Bouteloua gracilis*), needle and thread (*Stipa comata*), ricegrass (*Oryzopsis hymenoides*) becoming established through natural reseeding, and a gradual replacement of the current dominant species on the site. This process of plant succession with accompanying changes in soil characteristics will continue until the mine site has a plant community type that is adjusted to the regional climatic regime. Geomorphic process will keep some sites in a seral stage indefinitely because of erosion and soil features.

The reclaimed site is a functioning ecosystem with plants and animal species reestablished. The vegetation is productive and diverse and supports animals common to the region. Noted on the site the past four years were cottontail rabbits, ground squirrels, chipmunks, coyotes, harvester ant nests and other invertebrates, lizards, and a variety of birds. Elk have overwintered on the site the past two years. Both the four-winged saltbush and winterfat provide excellent browse for the elk. Given that the site is becoming a productive and diverse ecosystem, the most important consideration for continued development of the reclamation on the site is protection and preventing intrusion and further disturbance by continuing human activity. Construction and use of vehicle and equipment on the site should be kept to a minimum.

The present conditions and trends in the revegetation will be discussed in detail in the monitoring report under preparation.

Respectfully yours,

Samuel A. Bamberg

Samuel A. Bamberg