STATE OF COLORADO

Simmons - DNR, Leigh <leigh.simmons@state.co.us>

Elk Creek Mine TR77 response review

1 message

Binns - DNR, Janet <janet.binns@state.co.us> Mon, Jun 24, 2019 at 3:14 PM
To: Leigh Simmons <leigh.simmons@state.co.us>

Hello Leigh,

I have reviewed Oxbow Mining's response tot eh Division's adequacy concerns for the Elk Creek Mine TR77. My comments are inserted in blue font into the attached document. Please let me know if you have additional questions.

Janet Binns
Environmental Protection Specialist III
Coal Regulatory Program

P 303.866.3567 ext 8107 | F 303.832.8106
1313 Sherman St., Room 215, Denver, CO 80203
janet.binns@state.co.us | http://mining.state.co.us

COLORADO
Division of Reclamation, Mining and Safety
Department of Natural Resources

Review of Elk Creek Adq resp-JHB.docx
47K

Oxbow Mining LLC: CDRMS Technical Revision 77 Adequacy Review Comments and Responses

1. Proposed Section 2.3.1 discusses seeding, with details of seed mixtures to be used on privately owned land, BLM land and USFS land given in Tables 3, 4 and 5 respectively. In the currently approved PAP, letters from the BLM, USFS and Hotchkiss Ranches, Inc. are included. These letters give specific consent to OMLLC for a variance from the woody plant standard as a criteria for revegetation success, see Rule 4.15.8(7).

Response: The letters from the BLM, USFS and Hotchkiss Ranches, Inc. will be retained in the revised Exhibit 2.05 – E6 for future reference.

The footnote to Table 5 with the commitment to use at least three of the listed forb species will be included in Exhibit 2.05 – E6 for future reference.

JHB-This response is acceptable

2. The Division had concerns with the proposed Section 2.6 text discussing grazing.

Response: The proposed text will be replaced with the approved text from Exhibit 2.05 – E6, that being:

"Should grazing occur to the extent that revegetation success standards cannot be met, then the operator will fence the affected areas."

JHB-This response is acceptable.

3. Proposed Section 2.8 discusses defines the Revegetation Success Criteria against which reclamation will be judged, and provides greatly appreciated clarity.

As the text describes, mining in the Elk Creek Mine area began in 1901 so much of the facilities area was disturbed prior to the passage of the Colorado Surface Coal Mining Reclamation Act and subsequent Regulations. In these "pre-law" disturbance areas no topsoil was salvaged prior to disturbance, and no baseline vegetation data was collected prior to disturbance. The currently approved post-mining land use on the pre-law disturbance areas is either "commercial and industrial", or "undeveloped land". These areas are subject to Rule 4.15.10.

Considering the lack of undisturbed land to use as a reference area, and the lack of pre-mining vegetative data, use of the modified Universal Soil Loss Equation (copied below, for reference) to calculate the necessary vegetative cover to achieve erosion control is an acceptable approach, however some additional information regarding the assumptions made in determining parameter values is needed.

$$C=A/(R*K*L*P)$$

Where:
C = Cover factor
A = Soil loss, (tons/acre/year)
R = Rainfall factor
K = Soil erodibility factor

LS = Length of slope and Steepness of slope factors combined
P = Control practice factor

The Division requested clarification as to the derivation of the values used in the USLE calculation.
Response**:** In the initial TR77 application submittal, values for the USLE were derived from 2011 field work conducted at adjacent sites and USDA and EPA references. With this submittal, site specific information from the Oxbow Elk Creek Mine has been employed to develop the factor values. The tables below specify the values used in the USLE calculation.

The derivation of a cover standard employed two calculations employing the USEL; first a calculation to obtain a value for **A** (soil loss). The values for factors R, and P were obtained from USDA and EPA manuals. The K factor was derived from the USDA manual after determining the prevalent soil type(s) at the Elk Creek Mine from the NRCS soil survey. The LS factor was derived from measurements of slope and slope distance derived from undisturbed areas surrounding the Elk Creek Mine facilities. The LS factor value was then obtained from the USDA manual.

With the calculation of a soil loss value from the undisturbed adjacent areas, the USLE equation was rearranged to solve for **C** (cover factor) instead of A (soil loss). The C factor value is then converted to a soil surface cover value from the USDA manual. This soil surface cover value then represents the soil cover (for our purposes, total live vegetation cover, plus litter) needed to control soil erosion to a level equal to the undisturbed adjacent areas. This value then represents the standard required by Rule 4.15.10.

R (rainfall) Factor

The R factor value in this case (33.30) was obtained from the U.S. Department of Commerce tables for the 2-year, 6-hour Type II storm event for Somerset, Colorado

P (control practice) Factor
The control practice factor (P) based on soil conservation practices was obtained from Barfield, Warner and Hahn, 1983, and concluded to be 1.0 as the areas of interest are native and not managed.

K (soil erodibility) Factor
The soil erodibility factor (K) was derived based on the following values from the NRCS web site and area soil survey. The area of interest (AOI) includes areas within the mine permit area, all of which are not disturbed. The mine related disturbances where the USLE cover calculation will be used are restricted to the Torriorthent-Rock Outcrop and Beenom-Absarokee Association map units. A weighted average of these two soil units K values based on their percentage presence in the area of interest yields a site specific **K** factor value of 0.16.

OXBOW AREA SOILS

Map Unit Name	% AOI	K	Source
Torriorthents-Rock Outcrop, sandstone complex (map unit 75)	34	0.05	USDA, NRCS Web Site 5/14/2019
Beenom-Absarokee Assoc. (map unit 13)	21	0.32-.037	Paonia Area, Colorado Soil Survey (1980)

Absarokee-Work loam (map unit 2)	7	0.28-0.37	Paonia Area, Colorado Soil Survey (1980)
Fughes loam (map unit 39)	7	0.2-0.32	Paonia Area, Colorado Soil Survey (1980)

LS (slope erodibility) Factor

The LS factor values for use in the USLE equation were derived from the published table in Barfield, Warner and Hahn, 1983.

LS FACTOR OXBOW AREA SLOPES	Slope Length	Elev. Rise	Grade	% Slope	LS Factor	Source
NATIVE						
E Yard Coal Waste Pile/Adjacent	520	360	0.69	69.2	~60	Barfield, Warner & Hahn, Ch. 5, Table 6
Rock Dust Site/Adjacent	260	120	0.46	46.2	30	Barfield, Warner & Hahn, Ch. 5, Table 6
Lower Elk Creek Drainage/Adjacent	260	130	0.50	50.0	31.8	Barfield, Warner & Hahn, Ch. 5, Table 6
W. Valley Fill/Adjacent	260	120	0.46	46.2	30	Barfield, Warner & Hahn, Ch. 5, Table 6
Lower Hubbard Creek Facilities/Adj.	800	550	0.69	68.8	~70	Barfield, Warner & Hahn, Ch. 5, Table 6
RECLAIMED						
E Yard Coal Waste Pile	208	80	0.38	38.5	15.6	Barfield, Warner & Hahn, Ch. 5, Table 6
Rock Dust Site	182	70	0.38	38.5	15.6	Barfield, Warner & Hahn, Ch. 5, Table 6
Lower Elk Creek Drainage	260	110	0.42	42.3	22.2	Barfield, Warner & Hahn, Ch. 5, Table 6
W. Valley Fill	260	120	0.46	46.2	25	Barfield, Warner & Hahn, Ch. 5, Table 6
Lower Hubbard Creek Facilities	800	350	0.44	43.8	50.2	Barfield, Warner & Hahn, Ch. 5, Table 6

C (cover) Factor

The value for the cover factor C in the initial USLE calculation to obtain a value for A (soil loss) was derived from a weighted average of the C values from the EPA, based on the percentage of the two vegetation types at the Elk Creek Mine area of interest. The C factor value for calculation purposes is 0.46.

OXBOW VEGETATION COVER CHARACTERISTICS

WESTERN RESOURCE DEVELOPMENT CORP. BASELINE VEGETATION INVENTORY-1982

Vegetation communities	%	C	Source
Juniper Woodland	24%	0.50	C Factors Table, EPA, 1977
Mountain Shrubland	76%	0.45	C Factors Table, EPA, 1977

Vegetation Community Data

Mountain Shrubland Cover	% cover
Trees	3.1
Shrubs/Sub-Shrubs	31.8
Perennial Graminoids	2.9
Annual Graminoids	10.0
Perennial Forbs	3.6
Annual/Biennial Forbs	4.0
Succulents	0.0
Cryptogams	0.2
Total Absolute Plant Cover	**55.6**
Bare	17.9
Litter	20.5
Rock	6.0
Total Ground Surface	**100**
Total Herbaceous Vegetation Cover	**20.7**
Total Perennial (non-nox.) Cover*	**5.6**

Juniper Woodland Cover	% cover
Trees	14.8
Shrubs/Sub-Shrubs	28.0
Perennial Graminoids	2.5
Annual Graminoids	5.2
Perennial Forbs	4.4
Annual/Biennial Forbs	0.7
Succulents	0.0
Cryptogams	1.9
Total Absolute Plant Cover	**57.5**
Bare	17.9
Litter	19.3
Rock	5.3
Total Ground Surface	**100**
Total Herbaceous Vegetation Cover	**14.7**
Total Perennial (non-nox.) Cover*	**6.2**

* quackgrass & whitetop (restricted noxious weeds removed from this calculation)

USLE Calculations: determination of A (soil Loss) for undisturbed areas and C (cover) for reclaimed areas
The derived site specific values for the USLE factors were applied to the equation with the following results.

USLE Calculations [#1 deriving A for undistrubed areas] and [#2 deriving C for reclaimed areas]						
#1			**Factor**			
USLE Calculations	**R**	**K***	**LS**	**C**	**P**	**Calculated A Value [A=R*K*LS*C*P]**
NATIVE						
E Yard Coal Waste Pile/Adjacent	33.3	0.16	60	0.46	1.0	147.1
Rock Dust Site/Adjacent	33.3	0.16	30	0.46	1.0	73.5
Lower Elk Creek Drainage/Adjacent	33.3	0.16	31.8	0.46	1.0	77.9
W. Valley Fill/Adjacent	33.3	0.16	30	0.46	1.0	73.5
Lower Hubbard Creek Facilities/Adj.	33.3	0.16	70	0.46	1.0	171.6
					Mean	108.7
#2			**Factor**			
RECLAIMED	**R**	**K***	**LS**	**A**	**P**	**Calculated C Value [C=A/R*K*LS*P]**
E Yard Coal Waste Pile	33.3	0.16	15.6	147.1	1.0	1.77
Rock Dust Site	33.3	0.16	15.6	73.5	1.0	0.88
Lower Elk Creek Drainage	33.3	0.16	22.2	77.9	1.0	0.66
W. Valley Fill	33.3	0.16	25	73.5	1.0	0.55
Lower Hubbard Creek Facilities	33.3	0.16	50.2	171.5	1.0	0.64
					Mean	0.90

Using the C Factors Table (EPA, 1977), the interpolated percent ground cover (with no appreciable canopy and a predominant grass vegetation) would be ~1 %. Common sense dictates that this amount of soil cover would be insufficient for erosion control. Therefore a modification of the calculations was undertaken by modifying the K factor to reflect a replaced soil growth medium more like the Beenom-Absarokee Association, with a K factor of 0.35. The following results were obtained.

USLE Calculations [#1 deriving A for undistrubed areas] and [#2 deriving C for reclaimed areas]						
Modified for reclamation soils						
#1			**Factor**			
USLE Calculations	**R**	**K***	**LS**	**C**	**P**	**Calculated A Value [A=R*K*LS*C*P]**
NATIVE						
E Yard Coal Waste Pile/Adjacent	33.3	0.16	60	0.46	1.0	147.1
Rock Dust Site/Adjacent	33.3	0.16	30	0.46	1.0	73.5
Lower Elk Creek Drainage/Adjacent	33.3	0.16	31.8	0.46	1.0	77.9
W. Valley Fill/Adjacent	33.3	0.16	30	0.46	1.0	73.5
Lower Hubbard Creek Facilities/Adj.	33.3	0.16	70	0.46	1.0	171.6
					Mean	108.7
#2			**Factor**			
RECLAIMED	**R**	**K***	**LS**	**A**	**P**	**Calculated C Value [C=A/R*K*LS*P]**
E Yard Coal Waste Pile	33.3	0.35	15.6	147.1	1.0	0.81
Rock Dust Site	33.3	0.35	15.6	73.5	1.0	0.40
Lower Elk Creek Drainage	33.3	0.35	22.2	77.9	1.0	0.30
W. Valley Fill	33.3	0.35	25	73.5	1.0	0.25
Lower Hubbard Creek Facilities	33.3	0.35	50.2	171.5	1.0	0.29
					Mean	0.41

Again using the C Factors Table (EPA, 1977), the interpolated percent ground cover (with no appreciable canopy and a predominant grass vegetation) would be ~9 %.

A comparison of this derived value with that of results from the baseline vegetation survey reveals that the derived number is significantly less than the total herbaceous vegetation cover values for the pinyon-juniper and mountain shrubland communities.

It is therefore proposed to utilize the weighted means from the baseline vegetation survey to establish a total vegetation cover standard of 19.3% for areas under Rule 4.15.10 revegetation success requirements.

JHB-The Division can accept a cover standard of 19.3% live vegetative cover.

4. In proposed Section 2.8.1 (and subsequent sections where the "cover only" standard applies), the text states that:

Total vegetation cover shall include live vegetation cover of all plants encountered during the quantitative cover sampling. Rule 4.15.1(1) states that: "Each person who conducts surface coal mining operations shall establish on all affected land a diverse, effective and permanent vegetation cover of the same seasonal variety native to the area of disturbed land, or species that support the approved postmining land use."

It is the Division's policy that noxious weed species do not count towards the cover standard (since they do not effectively support any approved post-mining land use); and that annual and biennial species may count for no more than 10% of relative cover.

Please note in the text that noxious species will not be used to count towards the total vegetative cover, and that annual/biennial species will be used to count for up to 10% of relative cover.

Response: The reclaimed areas where the "cover only" standard applies, fall under the specific requirements of Rule 4.15.10(1) whose requirements are,

> "For previously mined areas that were not reclaimed to the requirements of these Rules as a minimum **ground cover of living plants** shall not be less than can be supported by the best available topsoil or other suitable material in the reaffected areas, shall not be less than the **ground cover** existing before redisturbance**, and shall be adequate to control erosion**." [**emphasis added**]

The rule does not specify any restrictions to "ground cover", other than that the ground cover be "living plants". Therefore, the requirement that noxious weeds, annual or biennial forbs not be counted toward the cover standard is not in agreement with the language of the Rule.

Further, for the sake of discussion, the cover standard proposed, developed from the USLE and quantitative baseline vegetation surveys incorporated noxious weeds, and annual and biennial forbs in the calculation of the cover standard. If the Division requires removal of these plant categories from the reclamation success cover standard, then the corresponding assumptions and values must be modified to remove any of these species contributions used to create the cover standard. This is not a theoretical issue, the species of concern to the Division contribute significantly to the cover of all vegetation communities in the area; based on the baseline vegetation survey, 72.9% of the herbaceous vegetation cover of the mountain shrub vegetation community and 57.8% of the herbaceous vegetation cover of the pinyon-juniper vegetation community are comprised of the prohibited species.

OMLLC has committed to the control of noxious weeds on revegetated areas of the mine site:

> "Noxious weeds will be controlled on the revegetated areas of the mine site. Upon identification of an infestation, OMLLC will implement control measures. Control measures will be implemented based on recommendations of the local NRCS or agricultural extension office and may employ mechanical, chemical, or biological controls. OMLLC will modify the CDRMS permit as necessary to address any previously unspecified measures to be implemented. As part of its Annual Reclamation Report (ARR) required under Rule 2.04.13, OMLLC will summarize its weed control activities for the year."

Therefore, with regard to the presence of noxious weeds being problematic at the time of evaluation of revegetation success, the Division retains the ability to judge the adequacy of control of these species prior to any release of reclamation bond.

JHB-The Division Agrees that the operator is required to control noxious weed species during the liability period. Therefore, the presences of these species at bond release will potentially be minimal. The Division can accept the cover standard as proposed by the operator.

5. Proposed Section 2.8.7 defines Revegetation Success Criteria for areas that were disturbed since the passage of the Colorado Surface Coal Mining Reclamation Act and subsequent Regulations, and have a postmining land use of "undeveloped land". It is proposed that the cover, production and diversity of the reclaimed land in these areas be assessed against a reference area, however no detail is given about the nature or location of the reference area to be used.

Please provide more detail about the reference area referred to in Section 2.8.7, including reference to a map showing its location if appropriate.

Response: The following text is proposed to address the concept and application of the extended reference area at OMLLC.

EXTENDED REFERENCE AREA

Conceptual Framework for Establishing Revegetation Success Criteria

The Elk Creek Mine (formerly the Somerset Mine) has been in operation since 1901. Disturbance of the natural vegetation communities have taken place since that time and the characterization of the vegetation community to be re-established during reclamation was based on studies of the undisturbed native vegetation communities adjacent to the mining operations and facilities (WRDC, 1982, 1982a). Initially, a vegetation reference area, a linear powerline corridor adjacent to the mine disturbance areas, was established between approximately 6000 and 7400 feet in elevation. This linear corridor was comprised of the two native vegetation communities (mountain shrubland and juniper woodland) that represented those vegetation types originally, and subsequently, disturbed by mining operations. Quantitative sampling of the two vegetation types within the reference area would provide the data to establish final reclamation success criteria for the mine.

Subsequent to the initial permitting of the mining operation by CDRMS, additional vegetation types or communities have been disturbed during the conduct and expansion of mining operations for small disturbances associated with methane degas operations in higher elevation areas. The originally established reference area no longer encompassed the range of vegetation types and small discontinuous disturbances later encountered and/or disturbed by the Elk Creek Mine.

During the CDRMS permit renewal process (RN-06), concerns regarding the representative nature of the currently approved reference area were expressed. To address these concerns, a review and revision of the reference area concept at the Elk Creek Mine was proposed.

Extended Reference Area

Concerns with the representative nature and long-term management of "standard" reference areas have been expressed since the concept was developed in the late 1970's (e.g. Savage, 2000). Management and maintenance of a small reference area (generally three acres or less) often leads

to reference area vegetation that is no longer representative of the larger native vegetation community it was established to represent. For these reasons, it is proposed that an extended reference area concept be employed at the Elk Creek Mine to establish the final revegetation success criteria.

The concept for the extended reference area follows. Wherever mine related disturbance occurs, the adjacent *native* vegetation community would serve as part of extended reference area, subject to the native community being within the mine permit area and under permittee or land management authority (BLM or USFS). The extended reference area would be comprised of representation by each of the distinct vegetation communities disturbed by Elk Creek mining operations, currently and/or anticipated to be, aspen woodland, conifer woodland, juniper woodland, and mountain shrubland.

The only vegetation communities excluded from representation in an extended reference area would be those where mining related effects comprised less than 10 total acres. These areas would be deemed to be minor communities and their revegetation success criteria would be developed based on the most closely related vegetation community or other acceptable measures (including but not limited to technical standards).

In practical application, the extended reference area for any given vegetation community would extend from the near edge of mine related disturbance (a minimum of twenty feet away from the disturbance edge to minimize "edge effect") for a distance of 200 feet or the edge of the vegetation community, whichever was encountered first. This application would provide a reference area with similar aspect, elevation, soils, and topography to that affected and subsequently reclaimed and revegetated by the mining operation.

When eligible for bond release, quantitative analysis, or quantitative monitoring, the reclaimed area and adjacent undisturbed area would be sampled at the same time and in concert, reducing the potential for sampling anomalies related to season, grazing, and location. Additionally, where only portions of the mining operation became eligible for quantitative vegetation sampling and/or bond release, the quantitative sampling design would be tailored to sample only those areas, and their adjacent extended reference area, eligible for analysis and/or bond release.

Additionally, there would be no effects from management that would affect the vegetation of reclaimed/revegetated areas differently than the adjacent extended reference area. Both the reclaimed/revegetated area and the adjacent extended reference area would be treated as a logical vegetation unit.

Definition of the extended reference area would be easily achieved in practice, as the reclaimed and revegetated area perimeter would form the edge of the extended reference area, with the far boundary defined by the established and agreed width.

In the event that the total vegetation cover or total herbaceous production mean from a revegetated area is not equal to or greater than 90 percent of the value of the applicable criterion from the extended reference area, a statistical comparison may be employed to evaluate whether the revegetated area mean value is statistically different than that of the applicable extended reference area. The statistical evaluation shall take the form of a one-sided Student's t-test (Zar, 1974, or equivalent statistical text) with a corresponding alpha error probability of 0.10 percent, and to be judged successful the revegetated area mean must not be less than 90 percent of the applicable success criterion with 90 percent statistical confidence.

JHB-The Division finds the proposed extended reference area definition acceptable.

LITERATURE CITED

Savage, Michael S. 2000. Reference Area Reality Check. Proc. of the 2000 Billings Land Reclamation Symposium.

Western Resource Development Corporation. 1982. Baseline Vegetation Inventory: Somerset Mine, Gunnison County, Colorado

Western Resource Development Corporation. 1982a. Baseline Vegetation Inventory: Hubbard Creek Disturbance, Somerset Mine, Gunnison County, Colorado

Zar, Jerrold H. 1974. Biostatistical Analysis. Prentice-Hall