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STATE OF UTAH
NATURAL RESOURCES & ENERGY
Oil, Gas & Mining

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April 9, 1982

Mr. Charles J. Jahne
Environmental Engineer
Sharon Steel Corporation
19th Floor, University Club Building
136 East South Temple
Salt Lake City, Utah 84111

RE: Response to Stipulation 7-81-2
King VI Modification
ACT/007/011
Carbon County, Utah

Dear Mr. Jahne:

In reviewing U. S. Fuel Company's response to Stipulation 7-81-2 (Revegetation Plan), the Division has noted several deficiencies and inadequacies. The following comments and suggestions, though formulated in reviewing Stipulation 7-81-2, are not exclusive to the King VI Modification and are, in many areas, designed to assist the applicant in formulating a comprehensive revegetation plan for the general mine and reclamation plan.

A. Interim Revegetation Plan

The interim revegetation plan, utilizing the seed mixes (high elevation and low elevation) and schedule as outlined, are acceptable. Though timing for any necessary supplemental seedings is appropriate (October), monitoring of revegetated areas should be conducted during the height of the growing season, such as in July, when plant cover is at a maximum and individual species are recognizable. Therefore, October is not an acceptable time to conduct revegetation monitoring.

When conducting revegetation monitoring of interim areas, in addition to total plant cover, percent cover by individual species should be recorded in order to gauge the success and survivability of each species planted. For example, it may be discovered that a particular grass species which was seeded survives and increases during the first two years after seeding where as another grass species does not survive and disappears after the first two years. Appropriate adjustments can then be made in species selected for revegetation, rates of application, and/or in treatments of the revegetation area (irrigating, fertilizing, etc.). In addition, monitoring of species which naturally invade the disturbed/revegetated area can be accomplished and the degree to which natural invasion occurs can be assessed.

The intent of providing a deer crossing along a conveyor belt is to facilitate deer movements from one side to the other. At a minimum, the side slopes and bottom of the underpass should be seeded using the interim revegetation seed mix and shrub seedlings (such as mountain mahogany or bitterbrush) should be planted around the entrances on either side in such a manner that would provide cover and forage for mule deer (pursuant to UMC 817.97[a]).

B. Seed Mixture for Revegetation and
D. Jusification for Use of Introduced Species

For final reclamation, introduced species may be approved for use in revegetation if justification is provided as per UMC 817.112. For example, if field trials have demonstrated that they can establish a diverse, effective and permanent cover capable of achieving the postmining land-use, are compatible with local flora and fauna, etc. Since justification has not yet been obtained, a list of native species should be drawn up for use in final reclamation of disturbed areas. This list may be modified at such time that justification for use of introduced species is provided.

Appendix 1 contains a listing of a variety of native species in the major life form groups which U. S. Fuel Company can consider in formulating a comprehensive revegetation plan for the Hiawatha Complex. Since the area is diverse with respect to elevation as well as exposure, suggestions for where these species would best be utilized follow each. A seed mix should be developed for each major vegetation type affected, using species which are adapted to the particular environments, e.g., northerly exposures, southerly exposures, arid areas, riparian areas, etc. Species occurring in the various vegetation types should be considered first.

It has been estimated in the general mine plan that two-three acres of riparian vegetation have been or will be disturbed during the life of the mine. These areas, limited in extent as they are, are highly important from the standpoint of wildlife habitat and must be restored as per UMC 817.97(d)(5). Appendix 2 suggests a variety of native species which may aid U. S. Fuel Company in formulating reclamation plans for the restoration of riparian areas.

Rates for seed application should be determined in terms of Pure Live Seed (PLS). The rationale behind PLS is that, depending upon when, where and how seed is collected and to what extent it is cleaned, the purity and germination of the seeds will vary. Pure Live Seed equals the percent germination multiplied by the percent purity or, in other words, the percent PLS indicates the percent of desirable seeds that would be expected to germinate.

In many cases, it is advantageous (in terms of successful reestablishment of plants) to utilize transplanted seedlings of shrubs and/or trees. (Early spring is the best time for planting seedlings.) For example, if it is desired to reestablish shrubs as well as herbaceous vegetation and shrub seeds

are planted simultaneously with herbaceous species, the herbs and grasses will often germinate and establish root systems more rapidly, thus outcompeting the "slower" shrubs for water and essential nutrients. If seedlings are to be used in reclamation, stocking rates (number of plants per unit area) for each species should be included in the reclamation plan. Regardless of whether shrubs and/or trees are seeded or transplanted, plants should be distributed or "grouped" so as to maximize benefit to wildlife where a primary postmining land-use is epxected to be wildlife habitat (as per UMC 817.97[d][9][ii]).

C. Clarification of Statements

1. "The use of native species . . . " - page III-42.

This statement directly implies that native species will be used for final revegetation. U. S. Fuel Company has submitted a final revegetation species list that is comprised of approximately 60 percent introduced species. Due to regulations which restrict the use of introduced species (UMC 817.112), this list should be amended or the necessary justification provided.

2. "No trees, shrubs or forbs . . . " - page III 37, 38, 40, 41

The postmining land-use, as is stated in the overall mine plan, is anticipated to be wildlife habitat and limited grazing. This land use requires that woody plants (trees, shrubs) be reestablished in reclaimed areas. (Currently, the regulations state that they be reestablished to a density of at least 90 percent of that in corresponding reference areas - see UMC 817.117[c][2].) Therefore, trees, shrubs and forbs (for wildlife use) should be reestablished and conflicting statements in this regard should be corrected in the Mine Reclamation Plan.

3. "The plan to reseed and plant trees . . . " - page IX-78

Since the postmining land-use is wildlife habitat, as has been previously discussed, trees will have to be reestablished in some areas, particularly riparian areas. Provision for their reestablishment should be made at this point in time (e.g., which species will be planted and where, stocking rates, etc.). If the postmining land-use changes in the future where trees are not needed to reclaim the area, modification to the MRP could then be made to reflect the "new" land-use.

4. "Seed mixture to enhance . . . " - page X-4

The seed mix should contain native species, as has been previously discussed and, since the area is considered winter and transitional range for mule deer, grasses, forbs, shrubs and, in some cases, trees should be reestablished. The species list submitted for final revegetation by U. S. Fuel Company contains nine grasses, seven of which are introduced, three forb species, one of which is introduced, and one native shrub species. The Division recommends the selection of native species. U. S. Fuel Company should consider utilizing species that occur naturally in the various vegetation types disturbed and/or those species recommended in Appendix 1 (as discussed under Section B of this letter).

D. Justification for Use of Introduced Species

This section has been previously addressed.

E. Mulches and Fertilizers

Though revegetation monitoring of areas reclaimed under interim reclamation may reveal that mulching is not necessary for reclaiming the Hiawatha Complex area, this will not be known for some time in the future. For reclamation plans which must currently be formulated, descriptions of mulching techniques are required as per UMC 784.13(b)(5)(iv), or justification for not mulching, such as data demonstrating successful revegetation without mulching, is required. It has been the Division's experience that some form of moisture retention is almost always necessary to successfully reestablish vegetation in certain areas, such as steep slopes, harsh arid areas, etc. (where mulch will aid in stabilizing soil and moisture retention).

Some examples of different types of moisture retention techniques are: land imprinting (small catch basins); straw or hay mulch, anchored with a chemical tackifier; straw or hay mulch, mechanically crimped into the soil; wood fiber mulch or hydromulch, sprayed or spread over an area. These mulches are applied at specific rates (e.g., two tons straw mulch per acre) after an area has been seeded. If a straw mulch is spread over an area and mechanically crimped in (e.g., with a tractor), shrub or tree transplants into the area would proceed after the mulch is anchored (during early spring).

A reclamation plan should address the planned treatments such as fertilizing, irrigating, pest control measures, etc. For example, if soil tests of areas destined for revegetation indicate that the soil (or "growth medium") is deficient in such elements as nitrogen or phosphorus, fertilizers supplying these deficient elements will be applied at rates correlated to the soil analysis. Another example: during periods of below average precipitation, supplemental water will be supplied to revegetated areas when plants appear desiccated. In other words, a reclamation plan should commit the applicant to various treatments or manipulations of revegetated areas when such treatments are necessary for successful revegetation.

F. Temporary Stabilization of Topsoil

The Division considers this subject to have been adequately addressed.

G. Method of Seed Application

Hand broadcasting is considered an acceptable method for seeding when areas are small and/or where terrain is steep, such as the 1.6-2.0 acres of the King VI conveyor. The Division would like to point out that, rather than actually "throwing" seed out by hand, seed is more uniformly broadcast using

some type of cyclone spreader. Small models can be carried by an individual and seed can be evenly spread. Cyclone spreaders are inexpensive and are more efficient in terms of time spent and uniform coverage of reseeded areas. Areas where seed is broadcast (either by "hand," cyclone spread, etc.) should be raked or harrowed immediately following seeding in order to cover the seeds.

In large areas of fairly gentle relief, such as the future reclamation of coal waste and slurry areas near Hiawatha, a larger cyclone spreader (mounted on a pick-up or tractor) could be utilized for reseeding. Other methods, such as drill-seeding, could also be considered for reseeding areas of this type.

H. Monitoring of Revegetation for Bond Release and
I. Providing Evidence Supporting Feasibility of Successful Revegetation Using Methods Proposed

For bond release, it will be necessary to demonstrate similarity between revegetated areas and their standards (e.g., reference areas) in terms of cover, productivity and woody plant density. These parameters should be monitored during the last two years of the liability period (as per UMC 817.116[B][1][ii]).

Sampling of revegetated areas for bond release should be statistically adequate (at 80 percent or 90 percent confidence and 10 percent precision). Sample size for each area and for each parameter (cover, production, density) should be large enough to reflect the true mean and variance. This requires that more than one quadrat be sampled in each area.

Demonstration of similarity in species composition between revegetated and reference areas via a similarity index (e.g., Jaccard's Community Coefficient, Sorenson's Index, etc.) will be higher when comparing areas revegetated for final reclamation with corresponding reference areas if the revegetated areas have been seeded and/or planted with native species which occur in the reference areas. In other words, if a species mix has been planted which includes species different from those which naturally occur in the area (i.e., introduced species), similarity would be quite low.

Interim revegetation monitoring will provide information relative to those species uitlized for interim reclamation as well as general information relative to differing treatments, etc. If reclamation is going to be done in an area which will not be subject to any further disturbance during the interim, final revegetation seed mix and suggested treatments (mulch, etc.) should be used. Monitoring these areas would give the applicant good indications of future success in terms of native species selected, seeding techniques, various treatments, etc. Data collected during monitoring could provide a basis for potential modifications to the final reclamation plan.

J. Schedule for Final Revegetation

In addition to an estimate of how much time (in weeks) it will take to accomplish the various steps in reclamation, estimates of when (what time of year) these various aspects related to revegetation will be conducted are required under UMC 784.13(b)(1). For example:

Regrading topsoil and seedbed preparation (harrowing, scarifiying, discing, etc.) will be done just prior to seeding the target area in late fall; mulching will immediately follow seeding. Seedling transplants (shrubs and trees) will be planted during early spring of the following year.

Anticipated times for augmented seedings (if necessary), monitoring of revegetated areas, etc., should also be outlined.

I hope the preceding is fairly clear and will assist you in formulating your reclamation and revegetation plans for the Hiawatha Complex. Confusion and discrepancies in interpretation of current regulations governing coal mining and reclamation do arise and there are areas in which clarification may be needed. The intent of the regulations regarding reclamation is to demonstrate not only the intent of the applicant to reclaim but also to do so using the best state-of-the-art technology. As technology changes, as well as potential changes in postmining land-use, land management practices, etc., reclamation plans may be amended to incorporate these changes so as to allow the applicant to use the best current practices. However, at this point in time, compliance must be met regarding regulations currently in force.

Please do not hestiate to contact the Division should you have any questions.

Sincerely,

Mary M. Boucek

MARY M. BOUCEK
RECLAMATION BIOLOGIST

cc: Shirley Lindsay, OSM
Wayne Hedberg, DOGM

MMB/btb

APPENDIX 1

SPECIES SUGGESTED* FOR USE IN FINAL RECLAMATION OF
DISTURBED AREAS AT THE KING MINES
Carbon-Emery County, Utah

Scientific and Common Name	Exposure[1]	Soil Type[2]	Moisture Adaptation[3]
GRASSES			
Agropyron dasystachyum Thickspike wheatgrass	3	2,S	1,2,3
Agropyron smithii Western wheatgrass	3	2,3,S	1,2,3
Agropyron spicatum Bluebunch wheatgrass	3	2,3	1,2
Bouteloua gracilis Blue grama	2,L	2,3	1
Elymus cinereus Great Basin wildrye	2	2,3,A	2,3
Elymus salina Salina wildrye	3	4,S	1,2
Festuca thurberi Thurber fescue	2	4	1
Hilaria jamesii Galleta	2	5,S	1
Oryzopsis hymenoides Indian ricegrass	2	1,2	1
Poa secunda Sandberg bluegrass	2	5,S,A	1,2
Sporobolus airoides Alkali sacaton	L	3,S,A	1
Stipa comata Needle- and threadgrass	2	1,2	1

Scientific and Common Name	Exposure[1]	Soil Type[2]	Moisture Adaptation[3]
FORBS			
Achillea millefolium Yarrow	3	5	1,2
Artemisia ludoviciana Louisiana sagebrush	2	1,2	1,2
Aster chilensis Pacific aster	3	1,2	1,2
Eriogonum umbellatum Sulphur flower	2	1,2,4	1
Hedysarum boreale Northern sweetvetch	2	1,2	1
Linum lewisii Blue flax	2	2	1,2
Lupinus sericeus Silky lupine	3	5	1,2
Penstemon eatoni Eaton penstemon	2	1,2	1,2
Penstemon palmeri Palmer penstemon	3	1,2	1
Sphaeralcea glossulariaefolia Gooseberryleaf globemallow	3	1	1
SHRUBS			
Amelanchier alnifolia Serviceberry	1	2,3	2
Amelanchier utahensis Utah serviceberry	2	2,3	1
Artemisia nova Black sagebrush	3	1,2,A	1
Artemisia tridentata tridentata Basin big sagebrush	2	2,3,A	1
Artemisia tridentata wyomingensis Wyoming big sagebrush	2	2,3,A	1

Scientific and Common Name	Exposure[1]	Soil Type[2]	Moisture Adaptation[3]
Atriplex canescens Fourwing saltbush	L	5,S,A	1
Atriplex confertifolia Shadscale	L	1,2,A,S	1
Ceratoides lanata Winterfat	2,L	5,A,S	1
Cercocarpus ledifolius Curlleaf mountain mahogany	2	2,3	1
Cercocarpus montanus True mountain mahogany	1	2,3	2
Chrysothamnus nauseosus albicaulis Rubber rabbitbrush	2	2,A,S	1,2
Cowania mexicana Cliffrose	2	2,3,4	1
Ephedra viridis Green ephedra	2	1,2,4,A,S	1
Mahonia repens Creeping Oregon grape	1	2	2
Pachistima myrsinites Mountain lover	1	2	2
Purshia tridentata Bitterbrush	2	5	1,2
Ribes aureum Golden currant	3	2	2
Ribes cereum Squaw currant	1	2	2
Rosa woodsii Woods rose	1	5	2
Symphoricarpos longiflorus Longflower snowberry	2	2	1,2
Symphoricarpos oreophilus Mountain snowberry	1	2	2

Scientific and Common Name	Exposure[1]	Soil Type[2]	Moisture Adaptation[3]
TREES			
Abies concolor White fir	1	2	2
Pinus edulis Pinyon pine	2	1,2	1,2
Pinus ponderosa Ponderosa pine	2	1,2	1,2
Populus tremuloides Quaking aspen	1	2,3	2,3
Pseudotsuga menziesii Douglas fir	1	1,2	2

*These species are only suggestions to aid the applicant in formulating reclamation plans. Other appropriate native species may be utilized as well.

[1]Exposure: 1 = north to east exposures; 2 = south to west exposures; 3 = all exposures; L = relatively level areas

[2]Soil Type: 1 = sandy texture; 2 = medium texture; 3 = clayey texture; 4 = rocky texture; 5 = variable textures; A = alkaline tolerant; S = saline tolerant

[3]Moisture Adaptation: 1 = dry areas; 2 = mesic areas; 3 = seeps, riparian areas, etc.

APPENDIX 2

SPECIES SUGGESTED FOR USE IN RESTORATION
OF RIPARIAN AREAS AT THE KING MINES
Carbon-Emery Counties, Utah

GRASSES/GRASSLIKE

Agropyron dasystachyum - Thickspike wheatgrass
Bromus ciliatus - Fringed brome
Carex spp. - Sedge
Elymus cinereus - Great Basin wildrye
Juncus spp. - Rush
Phalaris arundinacea - Reed canarygrass
Poa pratensis - Kentucky bluegrass

FORBS

Achillea millefolium - Yarrow
Clematis liqusticifolia - Western virginsbower
Fragaria virginiana - Wild strawberry
Hedysarum boreale - Northern sweetvetch
Lupinus sericeus - Silky lupine
Penstemon palmeri - Palmer penstemon

SHRUBS

Amelanchier alnifolia - Serviceberry
Chrysothamnus nauseosus albicaulis - Rubber rabbitbrush
Cornus stolonifera - Red osier dogwood
Ribes aureum - Golden currant
R. cereum - Squaw currant
Salix spp. - Willow
Symphoricarpos oreophilus - Mountain snowberry

TREES

Acer glabrum - Rocky Mountain maple
A. grandidentatum - Bigtooth maple
Betula occidentalis - Water birch
Picea pungens - Blue spruce
Populus angustifolia - Narrowleaf cottonwood
Prunus virginiana - Chokecherry